PROMOTION OF ORANGE-FLESH SWEETPOTATO AS A DIETARY SOURCE OF PRO-VITAMIN A: LESSONS AND STRATEGIES IN EASTERN AND SOUTHERN AFRICA.

PAGE 19……24

Regina Kapinga, Peter T. Ewell, Vital Hagenimana, Wanda Collins and Zhang

Abstract.

Vitamin A deficiency is a serious component of a larger and growing problem of malnutrition in sub-Saharan Africa, particularly among children. The International potato Centre (CIP) is working together with partner organizations in agriculture, nutrition and health to fight vitamin A deficiency through the promotion of orange-flesh sweet potato varieties as a dietary source of B-carotene, from which the human body synthesizes the vitamin. This approach complements supplementa-tion and fortification of food which cannot reach many people, particularly in rural areas, and will be sustainable as the new varieties and new uses and new markets for orange-fleshed varieties become established. Pilot studies have shown that contrary to past beliefs, orange-fleshed varieties are acceptable to African consumers, especially children. Varieties with a drier, starchier texture have now been selected that are accepted by local consumers in vitamin A deficient areas. Demand for the new varieties is to be further enhanced by adding value through processing-by promoting new recipes and new uses for new markets. Small-scale processing in the household or by women's groups or other community organization can increase incomes as well as improve the nutritional status of children and others at risk. The VITAA partnership- Vitamin A for Africa-aims to build partnerships between farmers, nutritionists, researchers, medical doctors, NGO's local based communities, extensions and entrepreneurs. The common goal is to promote orange-fleshed sweetpotatoes and other food-based approaches to solving vitamin A deficiency and wider problems of malnutrition.

COMPARATIVE STUDIES IN-VITRO CLEANED PLANTING MATERIAL AND FIELD SELECTED APPARENTLY CLEAN SWEET POTATO PLANTING MATERIAL. PAGE 25……27

JA Otoo and MD Quain

Abstract.

Four elite sweetpotato varieties were released by the Crops Research Institute in 1998 to enhance the production of sweetpotato.As a vegetatively propagated crop, the varieties had to be cleaned of viruses,fungi,bacteria and other pathogens to confirm the advantages of producing cleaned virus-indexed planting material over non-cleaned planting material of sweetpotato.Tissue culture methods were used to grow meriste cultures to produce disease-free planting materials which were virus-indexed to certify that the materials were clean. Two varieties were used for this study (Sauti and Faara).Certified materials were micropropagated and established in the screen-house. These and other apparently clean materials selected from the field were further multiplied in the nursery. A trial was planted on ridges. There were four treatments (2 varieties, cleaned or non cleaned) with 8 replicates, using Randomised Complete Block Design. The trial was harvested 4 months after planting. Results indicated that Sauti and Faara produced 30% and 12.3% increase in fresh tuber yields respectively with the cleaned, virus indexed sweetpotato compared to non cleaned sweetpotato.Percentage increase in top vine yield of clean, virus indexed planting material of Sauti was 24.4% higher than non cleaned. Cleaned Faara gave 18.5 higher top vine yields than the uncleaned planting material but this was not statistically significantly.

Vers une privatization du secteur de materiel de plantation des plantes a racines et tubercules en afrique de l'ouest.

Page 28……..37

K.Tetevi

Resume. Dans les cinq pays de l'Afrique de l'Ouest qui sont : le Bénin, la Côte d'Ivoire,le Ghana,le Nigeria et le Togo,les plantes à racines et à tubercules (manioc,igname,patate douce et taro) occupent une place primordiale dans l'alimentation de la population et de ce fait jouent un rôle important dans la résolution du probléme de l'insécurité alimentaire et de la lutte contre la pauvreté en milieu rural.Cependant les plantes à racines et a tubercules présentent des particularités qui font qu'elles ne trouvent pas la même place que les céréales par exemple dans le circuit de vulgarisation agricole ou de transfert de technologie,dans la plupart des pays précités.L'une des causes de cette situation est que le matériel de plantation des plantes à racines et a tubercules est lourd et encombrant.A titre d'exemple,pour semer un hectare de maïs, l'agriculteur peut mettre sur son vélo 20-25 kg de semences alors que pour planter la même superficie,il aurait besoin d'un véhicule pick up pour transporter 8.000-10.000 boutures (2000 tiges) de manioc ou 2000 kg de semenceaux d'igname.Pour ces raisons,les efforts consentis dans les années 1980 pour relancer la production des plantes à racines et a tubercules ont donné des résultats qui ne sont pas à la hauteur des moyens mis en œuvre.Les efforts entrepris en particulier par l'Institut International d'Agriculure Tropicale (IITA) avec les programmes nationaux de recherché et de transfert de technologies dans la sous-région ont donné des résultats quelque peu mitigés.Les productions n'ont pas considérablement augmenté dans la plupart de ces pays et beaucoup de technologies dévelopées n'ont pas atteint le champ du paysan.

Mais comment mettre en place un système de production et de distribution efficace du matériel de plantation des plantes à racines et a tubercules malgré les difficultés évoquées plus haut? C'est à cette question que tente de répondre la présente étude qui est réalisée pour le compte du WASDU (West Africa Seed Development Unit),un projet régional IITA/GTZs'occupant de la promotion des semences et du matériel de plantation en Afrique de l'Ouest.La méthodologie de l'étude comprend: la recherche bibliographique,des visites de terrain au Bénin,Ghana et une étude de cas au Togo.Cette étude de cas fait appel à une enquête auprés de 80 pays sélectionnés dans les principales zones de production de l'igname et de manioc.L'etude révéle les limites en marketing du matériel de plantation des plantes à racines et tubercules et la nécessité de procéder par étape.

L'etude recommande des mesures de formation et d'information des paysans, leur suivi et des actions d'accompagnement pour assurer la réussite du systéme propose.La formation sera centrée sur les technologies disponibles (variétiés améliorées, techniques de multiplication rapide, stockage et conservation, transformation, nouveaux produits de transformation etc.).les paysans seront également organizés en associations de producteurs de matériel de plantation.Les formations seront dispensées par les institutions de recherché et de développement impliquées dans les activités touchant aux plantes à racines et tubercules.Un plan d'action est proposé.

STRATEGIES FOR THE DEVELOPMENT OF A CASSAVA INDUSTRY IN AFRICA.

Page 38……47

Mpoko Bokanga
IITA, Ibadan, Nigeria.

Abstract. In the past ten years, cassava production has been increasing faster than the population growth rate. In some countries(e.g. Nigeria and Ghana),per capita production has nearly doubled; on others, particularly in central, eastern and southern Africa, cassava production has barely kept pace with population growth.However,there is a growing interest to use cassava as raw materials for new food products, in animal feed formulae and in industrial applications. In this paper, the constraints that hinder the increased utilization of cassava are reviewed and specific actions are recommended. To achieve this vision for cassava requires a demand-driven, integrated approach to research, development and investment in the crop. All the stakeholders in the cassava sector(producers,traders,prcessors,researchers,policy makers and consumers) need to come together and map out a strategy for the development of the cassava industry in each cassava producing country. This paper presents the element of a global cassava development strategy and suggests how these can be utilized in an African context to take advantage of opportunities for cassava as food, feed and industrial raw material.

MODELING OF YAM PRODUCTION FOR EFFECTIVE POLICY FORMULATION.

PAGE 48----------51

V.M.Manyong and S.K. Nokoe
International Institute of Tropical Agriculture (IITA),
P.M.B. 5320 Ibadan, Nigeria

Abstract. Efforts to increase agricultural production in sub-Saharan Africa had focused on raising land productivity through accelerated genetic improvement and labour productivity through mechanization. It is now an accepted fact that these efforts cannot yield high dividends in the face of harmful policies. The objective of this paper is to formulate effective policies to sustain yam production in the world largest yam producing country. The

authors applied quantitative techniques to model trends of yam in Nigeria over a period of 40 years from 1961 to 2000.A double Fourier function model was applied to yam production while an exponential model was used to model yam yields. Results from the two analyses identified a two amplitude cyclic period of 55 years for yam production and a rate of decline for yam production and a rate of decline for yam yields in the new yam growing area in the savanna(1.27%) higher than that experienced in the traditional yam growing area in the forest (0.97%).Technological changes are mandatory to avoid the cyclic period to reach is lowest level of production within the next 15 years.However,different policy interventions would be required because there are two distinctive intensification areas within the country. Changes in consumers' behaviors are also suggested to speed up the adoption of new technologies at the farm level and sustain a market oriented yam economy in Nigeria. There is an urgent need for disaggregated yam data for a sound formulation of effective agriculture policies for yam.

LES FACTEURS DÈTERMINANT LA VOLONTÈ DES PAYSANS Á ACHETER DES SEMENCES DES VARIÉTÉS AMÉLIORÉES D'IGNAME AU BÈNIN.

PAGE 52-------56

Jonas C.Hinivi el Isaïe Adje
Agro-économiste, RD Atacora, Bénin.Agro-économiste, RD savé, Bénin.

Résume.L'igname (Dioscorea spp.) est une importante source alimentaire des populations au Bénin.II existe plusieurs grands groupes mais le groupe *D.rotundata* est le plus utilisé au Bénin.L'igname se reproduit par voie asexuée et favorise une utilisation illimiée du même matériel végétal.La baisse de rendements enregistré aujourd'hui est en partie liée à la degradation du

potentiel de production des variétés actuellement utilisées et à la prolifération de maladies et d'insects. Un reel besoin d'introduction de variété améliorées d'igname plus productives et adaptées à l'environnement écologique et socio-économique des producteurs s'exprime de plus en plus dans les grandes zones de production et de consommation d'igname.Cette étude qui analyse les facteurs déterminant la volonté des paysans à acheter les semences améliorées de *D.rotundata* montre que les producteurs sont disposés à acheter ces semences à des prix supérieurs à celui des semences locales de 5% à plus de 50%.Avec un modéle multinomial logit,elle a montré que les facteurs socio-économiques qui affectent cette volonté paysanne sont l'âge sexe, le niveau d'éducation,le nombre de buttes de *D.rotundata*,la distance du champ au marché de gros et l'utilization de l'engrais sur le maïs.

ROLE OF PRODUCE PRICE IN THE DEVELOPMENT PROJECT PERFORMANCE: CASE OF CASSAVA IN CASSAVA MULTIPLICATION PROJECT (CMP).

Page 57----60

A.A.Adeniji, O.M.Jimoh and O.Vaughan
Root and Tuber Expansion Programme, Cassava Multiplication Project, Ijebu-Ife, Ogun State, Nigeria.

Abstract. This paper aims to share an important lesson in a cassava development project. The IFAD-assisted Cassava Multiplication Project (CMP) in Nigeria was packaged to promote the adoption of high yielding, disease and pest resistant cultivars of cassava by the poorest of the poor to alleviate poverty and hunger, and

enhance food security and farm-income.CMP stimulated increased cassava production from less than 10 million tonnes in late 1980s to 34.5 million tonnes in1997.The surge in production was ascribed to improved technical efficiency in cassava production. However, the inability of other critical success factors to complement the palpable technical efficiency has resulted in uncontrollable produce price fluctuations and unsteady farmers' incomes. Such factors include poor and inappropriate processing options as well as inadequate marketing outlets that could guarantee realistic profitability and stable prices for farmers. Using Ogun State data, there was a 25% decrease in cassava output in 1998/99 and a 18% drop in 1999/2000, cumulatively, resulting in the cassava (food) crisis in 2001.The major explanatory variable for this phenomenon is the fluctuating price and the concomitant income earned by farmers. The cyclical price effect reflects in farmers' income which determines the level of activity in the succeeding cropping season. This experience has undermined and threatened the achievement of CMP. It is, therefore, necessary to critically identify, *ex ante*, possible antagonists to successful project implementation and sustainability as well as appropriate remedies. Some recommendations are also proffered.

VARIETAL CHARACTERISTICS OF CASSAVA: FARMERS'PERCEP-TIONS AND PREFERENCES IN THE SEMI ARID ZONE OF WEST AFRICA

.

Page 61------68

P.Kormawa, M.Tshiunza, A.Dixon, E.Udoh, and V.Okoruwa.

International Institute of Tropical Agriculture (11TA), Ibadan, Nigeria. University of Uyo, Uyo, Nigeria. University of Ibadan of Nigeria.

Abstract. The study examines and models farmers' perceptions and preferences of cassava varietal characteristics vis-à-vis the decision to adopt cassava cultivars in their fields. The paper is built on the concept of effect of technology specific factors on adoption. By way of threshold decision modeling for each of the countries considered, the results reveal different scenario. Based on the varietal characteristics considered, environmental resistance quality(ERQ),high yielding

quality(HYQ),early maturing qualities (EMQ),leaf quality(LQ),in ground storability quality (ISQ)and taste quality (TQ) have declining importance in the order of listing. As such, environmental resistance quality appears a major varietal characteristic that the farmers perceived and preferred for cultivating any cassava cultivar in the zone. The results therefore reinforce the relative importance of varietal characteristics in choice and preference of cassava cultivars by farmers. It is therefore imperative for breeders to develop cultivars that will be acceptable to the farmers considering their level of preference and perceptions.

FACTORS AFFECTING THE ADOPTION OF AGRICULTUAL TECHNOLOGIES WITHIN YAM-BASED PRODUCTION SYSTEMS: PROSPECTS FOR THE DIFFUSION OF IMPROVED YAM VARIETIES IN NIGERIA.

PAGE 68------75

Amegbeto, N.K.V.M.Manyong, O.Coulibaly and R.Asiedu.
International Institute of Tropical Agriclture, Oyo

Road, PMB 5320 Ibadan, Oyo State, Nigeria. IITA.Biological Control Centre for Africa, 08 B.P 0932 Tri Postal Cotonou, Republic of Benin.

Abstract. This study examined factors associated with potential adopters of improved yam varieties in an effort to assist extension services and rural development agencies to target and efficiently disseminate newly released yam varieties. Inference is drawn from a sample of 631 producers interviewed in east and central Nigeria, and their attitudes towards existing technologies in the form of chemical fertilizers and seed varieties. Results show that empowering rural communities through education, infrastructure development, and improving the effectiveness of extension systems will contribute to adoption of improved yam varieties. Successful diffusion of the varieties should be designed carefully not to marginalize but to reach women producers who have been less likely adopters of existing technologies. In many locations of yam production where over-exploitation and population pressure are exacerbating the scarcity of fertile land, and where intensification through chemical fertilizer application represents the best option, farm households having larger family members or large scale of yam production should be targeted. Based on the

linkage between market orientation in yam production and likelihood of adopting improved cassava varieties or applying chemical fertilizer on maize, past trails of successful cassava variety dissemination or maize fertilizer diffusion could be followed. Drawing from the experience with cassava variety dissemination, it will require for the improved yam varieties development of a mechanism for community-based seed yam multiplication and a process of farmer-to-farmer variety diffusion. Further investigations should consider factors other than extension contacts that affect non-adoption of technologies by women farmers, and explore jointly distributed probability specifications for technology adoption models given the complexity of the production systems.

ROOT AND TUBER CROPS AT THE HORTICULTURAL RESEARCH CENTRE: RESEARCH AND DEVELOPMENT HIGHLIGHTS.
PAGE 76----78

Patient D.Dhliwayo

Horticultural Research Centre Box 810,
Marondera, Zimbabwe.

Abstract. In Zimbabwe sweetpotato is fast becoming a major root crop for household consumption, food security and income generation. The Horticultural Research Centre (HRC) has been making conceited efforts to improve and enhance production of this crop in the country. The sweetpotato program at HRC is funded by the Government of Zimbabwe together with some Non Governmental Organisations who also participate in the implementation of several programs on sweetpotato. Key activities that characterize the Sweetpotato Program at HRC include production and distribution of pathogen tested planting material, evaluation and selection of varieties and technology transfer. The timely supply of adequate high quality planting material of preferred varieties is considered of prime importance. A total of 20 pathogen tested sweetpotato varieties are distributed to growers from the Centre and also through community based sweetpotato nurseries in selected districts. A farmer participatory approach has been adopted in these selection of varieties to ensure successful delivery of new materials in different areas.Germplasm for testing includes traditional varieties collected from local communities and

those acquired from International and Regional Breeding Centres.The HRC also realises the need for capacity building and empowerment with technical skills and relevant knowledge in order to achieve the objective of sustainability in all the Sweetpotato Programs; technology transfer and information dissemination is achieved through training and demonstrations held on station and on station and on farm. Whist efforts to promote and expand sweetpotato production in the country should definitely be strengthened, the HRC and various other stakeholders acknowledge the need to enhance and promote processing and utilization for sustainable production of sweetpotato.The HRC also carries out work on the promotion of neglected root and tuber crops. So far there has been work initiated for the promotion and conservation of the Livingstone Potato (P.*esculentus*).There is also interest among local and regional scientists and local farmers to reintroduce yams (*Dioscorea* spp) and safeguard the scanty local germplasm still existing in the eastern border regions of Zimbabwe.

A MODEL FOR RATIONAL DETERMINATION OF PRICES OF SEED POTATO (*SOLANUM*

TUBEROSUM L.) TUBERS OF DIFFERENT SIZE GRADES USING AGRONOMIC DATA.

Page 79---81

Demo P., M.O.Akoroda and D.K. Njualem

Cameroon Potato Program, IRAD Bambui P.O Box 80 Bamenda,Cameroon.allieddba@bdanet.cm
Department of Agronomy, University of Ibadan,Ibadan,Nigeria.m.akoroda@cgiar.org

Abstract: In seed potato programs, tubers harvested from seed crops are always graded into different sizes. The seed selling price per size grade is often fixed arbitrarily.Thus, differences in the price of various seed tuber sizes are not proportional to the yield potential of the seed sizes. In this situation, it is more profitable to buy seed tubers of a given size. To develop a model for a rational determination of seed potato price per size grade, the yielding potential and other agronomic data of 6 different seed tuber sizes were determined in a field experiment conducted in Bambui Cameroon in 1996.The mean number of seed tubers/kg increased as seed tuber size (diameter) reduced from 15±0.7 for 45-50 mm seed to 1786± 378.1<5mm seed. The quantity of seed tubers required to plant one hectare of land increased with

increased in seed size from 23.3±3.7kg for<5mm seed to 2711.6±121.1kg for 45-50mm seed. Mean marketable tuber yield ha^{-1} increased with increasing seed size from 8040±2171kg for<5mm seed to 29659±2485kg for45-50mm seed. Using the above data, a model was developed for rational determination of seed price for different size grades. We conclude that for different size grades. We conclude that for maximum profit in ware potato production, the least diameter of seed tuber to plant is 20-30mm.

POVERTY ALLEVIATION THROUGH SUSTAINABLE ROOT AND TUBER CROPS PRODUCTION.

PAGE82----84

S.A.Akele and G.O.Chukwu

Abstract. The potentialities of root and tubers as food security crops in Nigeria are obvious. Farming is the predominant occupation within the Niger Delta where the Nigeria Agip Oil Company (NAOC) operates. The paper highlights the role of the NAOC, through the Green River Project established in 1987,

to alleviate poverty of the resource-poor root and tuber crop farmers in their host communities. Results showed that 86 cooperative societies and 11 youth associates have been formed as a veritable channel for disseminating extension messages and distribution of improved planting materials. Between 200 and 1996,a total of 12.786,500 cassava bundles and 88,943 seed yams were distributed to the farmers. Apart from infrastructural development of their host communities, free agricultural mechanization kits were also distributed.Consequently,cassava root yield in the area increased by 1,350% while root yield/farmers rose from 15.6% in 1996 to 8.5% in 1999.Similarly ,were yam production increased by 681.8% while incremental seed yam yield/farmers rose to 130.8% between 1997-1999.Participating farmers in the project has over 90% higher gross margin than non-project farmers, indicating that the strategies of NAOC-green River Project for Poverty Alleviation are effective.

THE POTENTIAL OF COMMERCIALISING SWEETPOTATO PRODUCTS: THE ZIMBABWE EXPERIENCE.

PAGE 85------92

T.Rukuni, A.Mutungamiri and M.Chitiyo
.

Abstract. The Development Technology Centre through funding from CIP/SARRNETS has embarked on sweet potato product development and pilot testing. The focus was on the following jam, ketchup (catup), chips, crisps, bakery products and stockfeed.Up until July 2001 the work showed excellent commercialisation potential because the sweet potato products had a handsome price advantage over existing competing products. Currently the sweetpotato prices have doubled because of shortage (shrinking supply) and also the high transport costs to the market. This price increase has eroded the price advantage of sweetpotato products especially bakery products.However, traditionally the sweet potato prices fluctuate depending on the time of the season

or availability. There is all the hope that if the supply side is addressed sweet potato prices will once again become competitive. The success of sweetpotato commercialization in Zimbabwe will largely depend on stable supply of well-priced sweet potatoes.

ANALYSIS OF GENDER ROLES IN CASSAVA PRODUCTION IN AKWA IBOM STATE, NIGERIA.

PAGE 88--------91

I.A.Akpabio and E.O.Ekpe

Abstract. Gender Analysis was utilized to identify the role of men and women (in farming households) in cassava production, as a first step towards determining reasons for the relatively low production of this staple in Akwa Ibom State. Results from 320 male and female respondents revealed that of the 13 identified role activites, women performed 5, and the male performed 2,

while 4 role activities were equally performed by both sexes. The farmers were however revealed to have constantly neglected the performance of 2 important cassava production operations. Implications of these findings have been identified for the consideration of policy makers.

MYTHS AND REALITIES OF POSTHARVEST TECHNOLOGIES FOR ROOT CROPS: A CASE OF CASSAVA IN NIGERIA.

PAGE 92-------95

Oladele O.I. and Arowojolu, O.

Abstract.Postharvest activities in the socio-cultural setting within agricultural households in Nigeria are the exclusive preserves of the women. They are predominantly involved in post harvest activities such that it has been refer to as the traditional role of women. The cassava postharvest system consist of on-farm and off-farm operations which involves several numbers of operations unique for any desired

product. Several technologies have been developed to assist processors. This paper examined the use and perception of such technologies as well as the relationships between them. The results showed that for each of the operations in cassava processing, women still combine traditional with modern techniques.Also, their perception of postharvest technologies was high for easy management and that technologies are not expensive (75%) apiece. There is a significant correlation of perception with the use of cassava a technologies ($r=0.70, p<0.05$).This study presents a scenario that demands effective feedback on technologies for processors, such that the myths and realities of technology development for root crops are highlighted.

RURAL WOMEN CASSAVA PROCESSORS: TECHNOLOGY AND ACUMEN FOR MARKETING IN NIGERIA.

PAGE 96----99

Stella O.Odebode.

Abstract. Imperative of technology derives from its ability to serve the users and the consumers of its output. This paper attempts to examine the extent to which cassava processed by rural women through improved processing technologies will attract large market as well as exploration of potential constraints. It also describes the relationship between cassava marketing and processing as well as varietal preferences for different cassava products. Stratified purposive sampling technique was used in selecting 160 participating and 160 non-participating women farmers from the six geo-political zones of Nigeria. Data analysis was carried out using frequency counts, percentages, t-test and chi-square. There was a significant relationship between the use of improved cassava processing technologies and marketing of cassava products. A significance difference also exists between the mean adoption sources of participating and non-participating women cassava processors. (t=6.52, p=0.05).Much (90%) of cassava is processed in remote areas than areas linked with good access roads. The higher the rate of cassava processed the greater the cassava output marketed. The high level of commercialization recorded was a product of the

advanced method of improved cassava processing technology, which adds value to the crops and increases shelf-life. The major problems encountered by women processors in order of severity include shortage of labour , high cost of processing, poor access to market, lack of fund and poor storage facilities. Most respondents recommended the promotion of improved technologies that will be time-saving, access to credit and extension information on farm management.

PROCESSING AND UTILIZATION OF SWEETPOTATO FOR FOOD AND LIVESTOCK FEED IN NIGERIA.

Page 100--------103

Elizabeth Tola Ojeniyi and O.O.Tewe

Abstract. A countrywide survey of sweetpotato utilization in Nigeria revealed that sweetpotato is traditionally consumed in boiled form. This can be

boiled with cereal grains or legumes to prepare porridge. A local sweetener is also prepared by peeling, sun drying and milling into flour. This can be fermented to a local drink kunu.It is pounded into dough or flour, stirred in hot water to prepare a paste usually in combination with cassava or yam flour. The chips are fried into chips, flakes and pies which are marketed in urban areas.Sweetpotato is a valuable energy and carotene source which compares favourably with maize and cassava chips in livestock rations. Its use in Nigeria is however largely limited to experimental stations. Only unmarketable small sized or damaged tubers are fed to livestock. The vines and leaves are popularly used in the fresh and dried forms for rabbits, sheep and cattle. Recommended levels of inclusion of oven dried sweetpotato flour in livestock rations are 10% for layers,,12% for broiler starter,18% for broiler finisher,17% for pig weaner and growers and 40% for growing fattening sheep.

CASSAVA LEAF UTILISATION AS A VEGETABLE SOURCE FOR HUMANS IN AFRICA.

PAGE 104-----109

Achidi A.U, O.A, Ajayi and Bokanga M.

Abstract. The rate of cassava leaf consumption in Africa was assessed by the combination of informal interviews, the use of questionnaires and information from the literature.Contries were rated to have high, average, low or no consumption of cassava leaves. The mode of cassava leaf preparation was studied with six people from Congo (3), Sierra Leone (1), Madagascar (1) and Nigeria (1). In each case, the procedure was observed from leaf picking in the field to serving the cooked dish. The first matured leaf up to leaf positions nine or ten are selected for consumption. The tender petioles and stem are also taken. There are country variations in the preference for particular varieties based on petiole colour and mild mosaic infection. Prior to cooking, cassava leaves are usually pounded or ground but pounding is the most popular method. The recipes from Sierra Leone and Nigeria took 40-60 min while the standard Congolese recipe took 90 min.However, there is a Congolese recipe using sodium

bicarbonate that cooks in only 20 minutes. From the comments made by 50 interview respondents from different African countries, it appears that there is a wide variety of cassava leaf based recipes suggesting that cassava leaves are a major food in Africa.

THE EFFECT OF ^{60}Co GAMMA RADIATION ON THE SIZE OF CASSAVA STARCH GRANULES AND ITS RELATIONSHIP TO MEALINESS

Page 110----114

O.Safo-Kantanka, K.Oppong-Agyare and R.Asante

Abstract. The problem of cassava cooking quality is very crucial in areas where fresh cassava is consumed. In order to be accepted, the cooked tubers must be mealy and poundable.Many environmental factors including soil type, and the rainfall pattern, affect cassava cooking quality. But there is a basic genetic control, which has not been hitherto exploited to the full. By irradiating cassava cuttings of an other-wise non-poundable variety with ^{60}Co

Gamma rays, a new mutant with acceptable cooking quality called Tekbanye has been released in Ghana. The starch granules of the mutant were found to have increased in size compared to the parent. This paper reports a similar change that has been induced in another cassava variety. Changes in starch granule size have also led to change in cooking quality. Mutants with granule size up to 10.5µm have been created compared to the parent with average granule size of 3.5µm.This work confirmed the previous work, clearly showing that cooking quality in cassava is under strong genetic control and must be exploited.

Feeding The Cassava Processing Industry: Cassava production Systems Improve with Cowpea.

Page 114------118

S.A.Ennin, J.N.Asafu-Agyei H.K. Dapaah

Abstract: Cassava is predominantly grown as an intercrop with maize with little or no fertilizer application resulting in rapid decline in soil fertility and crop yields. High yields to feed the growing cassava processing industry could be sustained through the introduction of leguminous crop. The study was conducted at three sites in the forest and forest-savannah transition zones of Ghana from 1997 to 1999 to develop a stable and highly productive cassava/maize/cowpea intercropping system with high cassava yields. There were two cassava varieties (main-plots): 'Gblemodoade' and 'Ankra', combined with five row arrangement (sub-plots) in a split plot design. The row arrangements were A1:1 row cassava (10,000 plants ha^{-1})/ 1 row maize-1 row cowpea after maize harvest;A2: 1 row cassava (20,000 plants ha^{-1})/ 1 row maize-1 row cowpea;A3: 1 row cassava (5,000 plants ha^{-1})/ 2 row maize-3 rows cowpea;A4: 1 row cassava (10,000 plants ha^{-1})/ 2 rows maize-3 rows cowpea and A5: 1 row cassava (3,333 plants ha^{-1})/ 3 rows maize intercrop-5 rows cowpea(A5).Productivity of all the intercrops was high(Land Equivalent Ratio of 1.25-2.83),with high maximum cassava yields(19.3-71.7 t/ha^{-1}) and high stability in the A1,A2,A3,A4, cropping systems with

‘Gblemodoade,’ and A1 and A2 arrangements with ‘Ankra’.These five cropping systems are recommended.

Food quality attributes of Pona yam

Page 119----121

Otegbayo, B.O., A.U.Achidi, R.Asiedu, and M.Bokanga

Abstract.Pona or Poona (Ghana),Kpouna (Togo and Benin) or Kponan (Ivory coast) are the names given to highly appreciated cultivars of Dioscorea rotundata yams which are rated superior to other cultivars in cooking quality attributes (mealiness,taste and texture).These attributes and the physico-chemical composition of 35 Pona accessions and 5 normal Dioscorea rotundata accessions were investigated. The results of our study indicate that Pona cultivars contain 39.33% dry matter of which 74.20% was starch,4.61% free sugars,4.30% protein,0.32% fat and 2.29% ash; the

average phosphorous content was 110.27mg/100g while the amylose ratio was 35.80%.The common Dioscorea rotundata yams had an average dry matter content of 31.25%, of which 77.24% was starch,5.57% sugar,3.64% protein,0.39% fat, and 2.76% ash; the average phosphorous content was 104.79mg/100g while the amylose ratio was 33.11% .Studies on the pasting characteristics of the fresh tubers showed that Pona had a higher peak viscosity,breakdown,final viscosity and setback, lower holding strength and lower pasting temperature compared with common Dioscorea rotundata cultivars. Sensory evaluation revealed that boiled pona yam tubers were sweeter and softer had a more mealy appearance after boiling and were more preferred than boiled common cultivars in terms of taste and texture. Statistical correlations of the chemical composition and sensory qualities showed that, there were significant correlations between mealiness and dry matter (r= 0.57), amylase(r=0.37), fat(r=-0.32). The high dry matter content and amylose ratio is thought to contribute to the texture of Pona cultivars, and may also be responsible for their superior cooking qualities

compared to other cultivars. However other indicators of yam food quality need to be identified.

Amidon d'igname de Cote d'lvoire (Dioscorea sp): diversité Biologique et variabilité des Propriétés physico-chimiques et Fonctionnelles.

Page 122------130

Amani, N.G., D.Dufour, C.Mestres, A.Buleon; A.Kamenan

Résumé.Les amidons natifs de 21 cultivars ont été extraits de 4 espéces d'igname de Côte d'lvoire.Afin de caractériser ces échantillons,des analyses chimiques,physiques,morphologiques et rhéologiques ont été réalisées.Les gels d'amidon de l'espéce *D.alata* sont les plus visqueux (valeur moyenne:292 mpa.s ; 4% bs) alors que le gel d'amidon de *D.dumetorum* ne dépasse pas 61

mpa.s.La clareté des gels varie de 9% chez *D.dumetorum* à 40,7% de transmitance chez *D cayenensis-rotundata*. L'étude de la diffraction aux rayons X met en évidence une cristallinité de 36% pour toutes les espéces.Une analyse en composantes principales (ACP) montre que les amidons d'igname de Côte d'Ivoire peuvent être regroupés en 3 classes homogénes: 1)La classe regroupant la totalité des amidons d'igname des espéces *D.alata* et *D.cayenesis-rotundata*,est caractérisée par un grain de gros diamèter (25µm environ),une teneur élevétes en amylase (voisin de 26% bs.) une forte viscosité intrinséque (190 cm3.g-1 en moyenne),une viscosité apparente éleée,et une enthalpie de gèlatinization faible (?H=15 j.g-1),2) la classe regroupant les *D.esculenta* est caractérisée par une petite taille de grain (ø6 µm), une viscosité intrinséque faible(121cm3.g-1), un ?H élevé (19j.g-1);3) la classe de D dumetorum se différencie de la classe de *D.esculenta* par un type cristallin de type A pur.Une régression multiple montre que la viacosité apparente des gels est a la fois liée à la fraction dispersée et à la taille des grains d'amidon.Cette étude met en évidence la grande diversité des propriétés physico-chimiques et

fonctionnelles des amidons d'igname et ouvre des perspectives de valorization spécifique en industrie alimentaire.

Effect of age of yam tuber at harvest on the qualities of yam foods.

Page 131------137

Abass, A.B, Olorunda, A.O., Asiedu R and Bokanga M.

Abstract. Two western Nigeria popular *D.rotundata* landraces (Lasirin, Olodo) planted in December 1999 by a farmer located in northern Oyo State, Nigeria were harvested in two batches (September and December 2000) and stored at ambient conditions in the barn till March 2001.The weight loss, spoilage, sprouting rate, edible food loss, chemical composition and food qualities of the boiled yam, pounded yam and fried yam chips were evaluated monthly. Results showed that the tuber weight loss, spoilage and edible food loss were

consistently greater in yam tubers harvested in September but sprouting of the September batch was lower. Both the tubers harvested in September and those harvested in December started sprouting at the same time. The moisture content of the tubers decreased and peeling loss increased with storage time. The amylose contents and pasting properties of the yam tubers did not exhibit any particular tend during storage. There was no drastic change in the colour of yam tubers and fried chips during storage. Analysis of overall quality index (OQI) suggest that better quality foods are made from the tubers harvested in December; the food quality increased two to three months after harvest and then declined. Moisture content of fresh yams and oil absorption of fried yam chips decreased as storage progressed.

Screening of sweetpotato for poundability into fufu.

Page 138----141

E.Adu-Kwarteng, J.A.Otoo, and I.Oduro

Abstract.Sweetpotato (Ipomoea batatas) is a nutritious, high-energy crop that produces well in all agroecologies of Ghana. It is, however, not very well integrated into the average Ghanaian diet due to its limited product diversity. In line with a wider effort to broaden its utilization base by developing products that fit into already existing food patterns, 13 sweetpotato accessions were screened for their suitability in making fufu.Fufu is a popular food in Ghana usually prepared by pounding boiled yam, cocoyam or plantain in combination with boiled cassava into a smooth paste and is eaten with soups containing meat and /or fish. It is highly acceptable to consumers if it has a cohesive, elastic texture. The objective of this work is to identify sweetpotato varieties that have acceptable pounding qualities in order to encourage their utilization alongside the starchy staples that are already widely consumed in the country. In this preliminary work, the parameters studied were optimum cooking time, total soluble sugars, pounded texture and overall eating quality. Cooking time ranged from 8 to 15 min and total soluble sugars range of 6.06-27.12%.Among the 13

accessions, 4 were identified as having acceptable fufu quality and one particular accession (no.112) was adjudged to have excellent fufu quality.

Physicochemical and pasting properties of flour from four Sweetpotato varieties in Ghana.

Page 142----145

Oduro I., Ellis, W.O., Nyarko,
L., Koomson, G, and Otoo, J.A.

Abstract. Flours were obtained from four varieties of sweetpotato (sauti, Santum pona, Faara and okumkom) recently released in Ghana. The sweetpotato flours were prepared by peeling the tubers, chipping, soaking in 0.5% sodium metabisulphite solution and washing in water prior to drying in a solar tent dryer. The dried chips were milled and sieved to obtain the flour. Physicochemical and pasting characteristics of the flours were determined. Wheat samples(Hard and soft),which served as reference, were also

analysed.The findings showed that moisture levels of the flours were low (9.67-11.81%).The ash content (1.26-2.33%) and crude fibre (1.90-3.00%) of sweetpotato flours were higher than the wheat flour with the exception of Santum Pona (1.90%). The crude protein and fat contents were low, ranging from 1.31-3.72% and 0.94-1.32% respectively. The carbohydrate and total sugar levels for the flours were high 70.09-83.19% and 20.51-32.65% respectively. The swelling power (9.04 and 10.06% and WBC(160.87-178.65%) for the sweetpotato flours were higher than that for wheat flour(7.3-7.87% and 63.22-64.98% respectively).The significant variation in pasting characteristics of the flour samples, may be due to variety. The flour from sweetpotato has a potential of being a good substitute for wheat flour.

Quality of gari from eighteen Sweetpotato varieties.

Page 146-----149

Ellis, W.O., Oduro, I. Fianko, K and Otoo, J.A

Abstract.Gari, the most commercial cassava product continues to increase in production, utilization and export. The basic raw material, cassava is finding expanded uses, thus the need to find alternatives and other less utilized sources.Sweetpotato appears to be a potential alternative source for gari production. Studies were carried out to screen 18 varieties of sweetpotato.Physical parameters such as swelling capacity and extraneous matter, and chemical factors such as moisture, crude fibre, pH, ash, reducing sugar, and total titratable acidity were measured. Yield of gari from each variety was also established. Results showed appreciable yield of gari with Farmers variety and Santom pona giving the highest.Most of the gari samples met international specifications. Moisture level was low(6.25-10.50%)and total acidity was appreciable(TTA,0.24-0.55% and pH,4.20-4.75).Almost all the samples(about 72%) were found to have very good swelling capacity (>3.0),low level of extraneous matter(<0.05%) and appreciable crude fibre content(1.66-3.90%).Ash contents were very

low(0.54-1.10%)Sensory evaluation showed that the gari samples were acceptable to consumers.However,there were significant variations ($p<0.05$) in the sensory attributes monitored.Gari from Satuma starch was the most preferred by consumers.

Importance of "kabalagala" processing to the sweetpotato product development needs in Uganda

Page 150--------156

C.Owori, E.Karuri, S.Mbugua, V.Hagenimana and P.Ragama.

Abstract. *Kabalagala* is a Ugandan traditional deep fried pancake made from a mixture of cassava flour and banana pulp.*kabalagala* is processed by small scale commercial processors.Curreently, sweetpotato product development efforts in Uganda are focused on developing and promoting sweetpotato flour for use in snack product processing. There is a need to

expand market demand for sweetpotato flour through development of sweetpotato flour-based products with wider consumer demand. To address this need, market and consumer research was conducted in Kampala and peri-urban village to assess the potential of the small-scale *kabalagala* processing industry as a market for swetpotato flour. Formal surveys of key players and field analysis of processing procedures was the method used to collect information and data. Results obtained revealed that there was considerable interest in *kabalagala* among low-and middle-income consumers. Approximately 1,028kg of cassava flour was used to process kabalagala worth U shs 4,930,000/= (US $2,900) per day. Processors (95%) were willing to try replacing cassava flour with sweetpotato flour in processing kabalagala while 90% of the retailers in urban areas thought that kabalagala products incorporating sweetpotato flour would be marketable provided their quality was good. Poor and inconsistent product quality, scarcity and high costs of sweet bananas and cooking oil competition from other snack products in the market and limited product demand were the major factors limiting the consumption, processing and sale of

kabalagala in both urban and peri-urban areas. Study results suggest that *kabalagala* processing has potential to create demand for sweetpotato flour. The work on sweetpotato product development must however consider the quality requirements and processing costs if *kabalagala* incorporating sweetpotato flour is to be accepted.

Utilization potentials of some selected sweetpotato, Ipomoea batatas (L.) Lam. accessions for staple consumption in African diet and industrial processing.

Page 157----160

P.O.Aikpokpodion, Q.Ng.M.O.Akoroda.

Abstract. The main processing qualities which dictate consumers' preference for a particular type of sweet potato cultivar are dry matter content, taste, colour and texture of cooked roots. The present study was carried out to assess the organoleptic and processing characteristics of some of the accessions

maintained in the sweetpotato germplasm at the International Institute of Tropical Agriculture, Ibadan, Nigeria.From the organoleptic evaluation, some forty-four accessions were classified as non-sweet. The mean fresh root yield of these accessions was 46.0t/ha(9.0-137.0t/ha) and mean dry matter yield was 15.2 tons/ha(3.4-47.8t/ha).Some of these accessions have tastes ranging from bland to that typical of boiled yam and cassava. Some 29 accessions were also classified for their extreme sweetness. These have mean fresh root yield of 44.3t/ha (15.6-137.0t/ha) and mean dry matter yield, 14.6t/ha (5.0-50.4 t/ha).One slightly bitter tasting accession, AOB-25 was identified. The utilization potentials of these genotypes for staple consumption and industrial uses are discussed.

Current status of production and utilization of some minor root crops in Nigeria: a preliminary investigation

Page 161----165

Asumugha. G.N. and O.B. Arene

.

Abstract. In Nigeria, attention appears to be focused on the development of the major root and tuber crops of cassava, yam, cocoyam, sweet potato, Irish potato and ginger to the negligence of other minor but economic root crops notably tumeric.sugarbeet, rizga, beetroot, turnip, radish, carrot, and two locals namely tumuku and amora. This study aimed at determining the current level of production and utilization of these root crops in Nigeria. Result showed that at the subsistence production level of the farmers, rizga, beetroot, turnip, radish and carrot are grown on large scale. These crops are propagated by-seed except turmeric and rizga which are grown through rhizome and tuber respectively. Utilization is limited to home consumption (as food and salad) and sale with no industrial utilization. It is recommended that scientific research in the development of these crops be enhanced to maximize their production and economic attributes.

Gari: food for the rich or the poor in Nigeria?

Page 166----168.

Meludu N.T, Ajani 0.0., and Akoroda, M.O.

Abstract. The consumption of gari - a dry granule processed from cassava roots - in Nigeria is now a nation-

wide habit and practice. Its price fluctuates so much that the question is now being asked as to whom should the commodity be target to? The poor or the rich? This paper reports a study of the factors affecting price changes and the determinants of who will in the foreseeable future are able to use the most cherished product form of cassava, a staple food in Nigeria. The preference of this form by consumers of cassava products was examined
as it relates to the export of the product as well as its storability.
Strategies and theories for a sustained gari economy in rural and urban areas are postulated for Nigeria.

Cost of various forms of energy used by gari processors and production constraints in Ijebu area of Ogun State, Nigeria.

Page 169-----172

J.O.Akinyemi.

Abstract. Gari is the most commonly used form of cassava in Nigeria and it accounts for about 70% of the entire cassava production. Presently in Ogun State, cassava is the most widely cultivated arable crop while gari is also one of the commonest foodstuff into which it is processed. A study was carried out in 1998 to determine the cost of various forms of energy used by gari processors (fryers) and the major production constraints. The results show that 85% of the respondents use firewood alone which cost N40-N60/bundle.About 5% reported using other forms of energy sources, which include palm kernel shell (uwa), palm oil sludge (kotopo), bamboo, dried cassava peels and sawdust. The remaining 10% of the respondents use both firewood and these other materials for gari frying. It was also noted that 80% of the respondents fry gari at least ten times in a month. Average production was 50-80kg/day.Major limitations to gari production in this study area include exorbitant cost incurred particularly during frying, poor technology presently being used and health hazard problems. The fear of sight problem from smoke and heat was particularly emphasized.

Enzymic Supplementation and Utilization of Cassava Root Sieviate by Growing Pullets.

Page 173----177

Aderemi F.A. and Tewe O.O

Abstract. An experiment was carried out to evaluate the performance of growing pullets fed supplemented and unsupplemented cassava root sieviate (CRS) as a replacement to wheat bran. It commenced with two hundred and ten growers at ten weeks old, and it lasted for 49 days. CRS was incorporated at two different levels of 12.5% and 25% as a replacement for wheat bran in cassava-based diets. The two enzymes, which were added separately, were Avizyme 1500® and Dried Pure

Yeast (DPY). Results revealed significant ($p<0.05$) effects of dietary treatment on the feed intake and body weight gain. Growers fed unsupplemented diet consumed 108.08 & 109.56g/bird/day which were significantly ($p<0.05$) lower than others. Growers on maize-based diet had the highest feed consumption of 128.78gfbird/day. Body weight gain of growers on the two diets with, Avizyme 1500® supplemented CRS had the highest values of 7.10&7.16g/bird/day, which were significantly ($p<0.05$) different from values obtained for birds fed other diets. Crude protein, crude fibre and ether extract digestibility of the growers were all significantly ($p<0.05$) affected by the dietary treatments. Although the Avizyme 1500® supplemented diet had higher body weight gains, economic analysis indicated that growers on unsupplemented diets were more economically efficient at the end of the feeding trial.

Factors influencing the quality of Nigeria fufu.

Page—182---184

Oyewole, O.B., Sanni, L.O., Dipeolu,

A.O.Adebayo, K., Ayinde, I.A.White
J.L., Tomlins, K.I.Westby, A.

Abstract. Effect of variations in the traditional processing and storage practices on the quality of Nigerian *fufu* was investigated. There were significant effects of variety and age on the qualities of cassava roots during steeping and the resultant fufu.In terms of acceptability, fufu produced from 8-12 months old cassava had the highest values. There was a significant effect on the addition of lime juice on sensory qualities of fufu.Use of grating to reduce the use of water was investigated. Acceptable products were prepared when the grated product was fermented for 3 days. There was an appreciable effect of type of packaging on the moisture content of wet fufu.

Postharvest and seasonal tuber changes in four cassava varieties: processing implications.

Page 185—188

Sanni, M.O. and A.O.Olubamiwa

Abstract. Cassava is the most important and versatile raw materials for staple food production in Nigeria.Pre-processing, processing and post-processing factors determine product quality. This study was carried out to evaluate the effect of pre-processing factors such

as: cultivars, post-harvest time, dry and wet seasons on tubers and deduce the possible effect of these changes on processing. Cassava tubers were harvested and stored for 0-7 days under shaded laboratory conditions. Improved cultivars: TMS 50395 and TMS 30572, and local favorites Odongbo and Okoiyawo were used. Physiological spoilage, microbiological spoilage and increasing peeling difficulty were observed signs of deterioration. Dry matter content was reduced from 34-45% in the dry season to 28-31% in the wet season. This dry matter content corresponds to a garification rate of 23-30% in the wet season. Average total cyanogens content was 5.4-9.4mg HCN equiv. /100g in the wet season and this increased to 9.3-27.1mg HCN equiv. /100g in the dry season. Spoilage of tubers reduced product yield, while increasing peeling difficulty meant more labor for women and children processors. Quick processing of harvested tubers within 1-3 days in the dry season, and 1-4 days in the wet season, is necessary to obtain maximum product yield from cassava.

The effect of ambient storage of cassava tubers on starch quality.

Page 189**----193**

Agunbiade S.O. and Sanni M.O.

Abstract. Starch is an important industrial raw material whose characteristics vary with the source of the starch whether cereal, tuber or otherwise. This study sought to evaluate the effect of postharvest storage on the quality of cassava starch from local cultivars Odongbo and Oko Iyawo, improved cultivars: TM 30572 and TMS 50395 from IITA.Tubers were obtained during the dry season from local farmers. They were processed daily and the holding period varied from 0-6 days at ambient

temperature of 30±1°C.The ensuing starch was washed with 50% alcohol and sun dried.Aliqouts of dry samples were analysed for cyanogen content, swelling capacity, proximate content, starch yield, ionic characteristics, bulk density, dry matter, water activity,pH and amylose content. Total cyanogen content was reduced by 99-100% to 0.00-0.25 mg/kg-1 in the starch. Swelling capacity for all starches was temperature dependent with maximum swelling at 60C.Ash content was<1% while protein and fat were not detectable for all samples. Starch yield was 16-24%.Samples were non-ionic and bulk density varied from 0.70 to 0.79;.Dry matter of starch varied from 87.5-90.5% water activity was 0.61-0-0.67, pH ranged from 6.15 to 6.85 Low amylose content was 17.2-18.6%.Delay in processing seemed to be an advantage especially for TMS cultivars.

Prolonging the shelf-life of fresh sweetpotatoes through solar curing.

Page 194------197

Kihurani, A.W.

Abstract. Investigation was carried out to evaluate the effectiveness of solar curing to prolong the shelf life of sweetpotato storage roots. Freshly harvested roots of a

Kenyan commercial sweetpotato cultivar, KEMB 20, were kept under conditions of high temperature and relative humidity and exposed to full sunshine for seven days. The roots were then stored at ambient tropical conditions and evaluated for marketability after 100 days. The solar cured roots had a significantly higher percent marketable root compared with uncured roots. Solar curing was found to effectively help to preserve market quality of the stored roots by reducing postharvest pathological deterioration and excessive shrinkage due to moisture loss.

Urban market opportunities for high quality cassava products in Ghana.

Page-198-----199

C.C.Collins, G.Van Dyck, S. Gallat and A. Westby.

Abstract. Growing urban populations and changing food preferences potentially offer new market opportunities that could be taken advantage of by rural processors or small and medium scale enterprises. This paper reports on a market assessment study conducted in four urban areas in Ghana. It was found that amongst the target group for the survey (young professionals in Living Standards Measures 5-8), there was a high willingness to accept the idea of purchasing hygienically prepared and packaged cassava products. Most (90%) were likely to purchase; but price, hygienic manufacture and packaging of products were the key criteria for their adoption.Accptable prices for these products are reported.

Importance off Bacillus and Clostridium spp.in the cassava fufu fermentation.

Page 200-----201

Nicola Piper and Andrew Westby.

Abstract. In this study, the presence and importance of *Bacillus and Clostridium* spp. in cassava fermented under water (*fufu*) were investigated because of their potential role in root softening and the safety of the product. Microbial profiles of freshly fermented and oven dried *fufu* sample were determined. Lactic acid bacteria were present at the highest levels (10^9 cfu/g), but *Bacillus* and *Clostridium* spp.were also detected at levels of 10^3-10^5 cfu/g. When identified using commercially available test kits, a range of *Bacillus* spp.were found, but the food borne pathogen, *Bacillus cereus* was common. *Clostridium butyricum* was the main *Clostridium* spp.present.Changes in the microbial population in a model system of cassava fermented under water were established.After,48 hours(corresponding with the start softening),the main groups of microorganisms detected were lactic acid bacteria (10^9 cfu/g),*Clostridium* spp.(10^7 cfu/g),*enterobacteriacae* (10^7 cfu/g) and *Bacillus* spp.(10^5 cfu/g).Therefore, anaerobic spore-forming bacteria, such as *Clostridium* spp.,which are present in significant numbers, could potentially play a far more important role in the *fufu* fermentation than previously anticipated. The food safety risk associated with the presence of *B.cereus* was investigated. Although it was able to grow during the early stages of the cassava fermentation, it was out

competed by other organisms such that only low residual levels were present in the wet and dry *fufu*.When the dry *fufu* was reconstituted (i.e. cooked into a ‘ready to eat’ paste), and stored at 30°C, none of the microbial flora, including *B.cereus*, were able to grow.*B.cereus* was not therefore perceived to be a major health risk in *fufu*.

Ceilsmo storage of yam: an innovation or abnormality?

Page 202-----204

G.O. Chukwu and K.E.Chukwu Nrcri.

Abstract. Fork science is the basis for Nigeria's leadership position among yam producing nations in the 20th century. It recognizes ecological variation and biodiversity in and among yam zones, which in turn has led to development of technologies that are adapted to specific situations. This is the case of ceilsmo storage of yam highlighted. It is a technology credited to yam farmers who inhabit the riverine areas of Anambra state, in the southeast agro-ecological zone of Nigeria. The ceilsmo is effective, relevant and meets the needs of the people from an ecological, socio-cultural and economic perspective. It creates opportunities for research to sustain food yams and enhance rural development. This calls for pragmatic but participatory approach to yam research and technology development by folk scientist (farmers) and institutional scientists this millennium.

Development and storage stability of some traditional snack foods from sweetpotato

Page 205----207

Idowu, M.A., Sanni, L.O and Farore, O.B.

Abstract. Traditional products-Kokoro and Kango were produced from sweetpotato flour substituted with maize at 0-60% using traditional method of processing. The products were stored at 4±1°C, 27±2°C, and 36±2°C for six weeks. The products were analysed for sensory properties, moisture content and free fatty acid.Kokoro and Kango samples at 4°C had the least moisture content (6.8; 1.5%db), free fatty acids (1.68; 2.81%) and most preferred in terms of overall acceptability after six weeks of storage.*Kokoro* and *Kango* made from 100% maize followed by products made from combinations of 40% sweetpotato + 60% maize was most preferred.

Effect of length of fermentation and varieties on the qualities of sweetpotato gari.

Page 208----211

L.O Sanni, DP Ikuomola and SA Sanni.

Abstract. Red and Yellow varieties of sweetpotato were produced into gari at 0-7 day fermentation period. The products were analysed for proximate, physicochemical, pasting and sensory qualities. The different sweetpotato varieties had no significant effect on the quality of the gari samples produced, except that the yellow varieties have lower proximate composition,physico-chemical properties and consistencies when compared with the red varieties.Gari samples have pasting temperature (72.5-90°C);peak viscosity (50-1065BU), time to reach peak viscosity (0.5-16.5mins),hot paste viscosity (0-980BU) and cold past viscosity(55-1530BU).There was significant difference($P<0.05$) for the colour,texture,aroma and taste of soaked and cooked sweetpotato

(eba) samples.Gari samples produced from the red and yellow varieties at zero and three days fermentation were moderately acceptable while that of the seven days were slightly acceptable. Further research should be carried out to improve the colour of the gari samples from the different sweet potato varieties.

Accumulation des réserves amylacées racinaires chez trios clones de manioc à odziba

Page 212---215

Resume.Malgré des indications relatives à la croissance, au développement, à la production en racines amylacées des plantes et à leurs inter-relations,le critére de sélection des clones de manioc pour une agriculture à bas niveau d’intrants ne semble pas encore être défini.Le probléme de l’adaptabilité des clones reste également posé au niveau de la diversité des systémes de culture rencontrés en Afrique.Dans l’optique de caractérisation et d’evaluation,deux types de clones ont été utilisés dans une expérimentation mise en place à Odziba,au Congo: un clone à Port érigé,avec peu de ramification(MM79) et deux clones à port étalé avec ramifications (MM86 et MM105). Au cours de la culture le poids de la partie aérienne des plantes des trios clones a augmenté et a quelquefois diminué,notamment pendant la saison séche oú on observe une forte perte en feuilles (8 et 18 mois).A chaque moment de la

culture la production des réserves amylacées racinaires (PRA=y)a été liée à la production de la partie aérienne(PPA=x) suivant la relation y = ax, a représentant l'efficience de la function d'accumulation des réserves amylacées racinaires (EFARAR). On observe que lorsqu'on connaît l'efficience de la fonction d'accumulation des réserves amylacées racinaires d'un clone ou EFARAR suivant une situation culturale donnée (site,âge,saison,maladies,etc….),la production en racines amylacées commercialisables n'est plus déterminée que par la production de la partie aérienne ou PPA.

Sweetpotato roots and tops for pullet chick production in Nigeria.

Page 216-----218

Ladokun, O.A. and O.O.Tewe

Abstract. A study was carried out on the utilization of sweetpotato roots (SPR) as a replacement for maize and sweetpotato tops (SPT) as a replacement for wheat offal in pullet chick diet. One hundred and fifty 1-week-old Yaffa pullet chicks with average initial weight of 55.51g were fed for seven weeks. The SPR was incorporated at levels of 25 and 50% to partially and completely replace maize respectively. The SPT was incorporated at levels of 9.2 and 18.4% to partially and completely replace wheat offal.

The daily body weight gain of chicks was significantly ($P<0.05$) different. The chicks fed the diet with the maize completely replaced with SPR had the least daily weight gain (5.82g) while those on partially replaced maize and control diets had similar daily body weight gain of between 7.03 and 7.04g.The chicks on the SPT diets also had similar daily body weight gain of between 6.59 and 6.83g compared with the control. The feed intake of the chicks fed was significantly ($P<0.05$) lowered by complete replacement of maize with SPR.Chicks fed SPT based diets had similar feed intake as those on control diet. The chicks fed partially replaced maize diet had lower feed: gain ratio ($P<0.05$) when compared with chicks on the other four diets. Results of the study show that:i)SPR can be included in pullet chick diet at not more than 25kg per 100kg of diet; and ii) SPT can replace wheat

offal to a level of 50% or 9.2kg per 100kg of diet for pullet chicks.

Potentials of Chinese Yam (Dioscorea esculenta) Flour in Bread Making.

Page 219------221

U.J.Ukpabi and N. Uchechukwu.

Abstract.

Flour from Chinese yam tubers cultivated in Nigeria was assayed for its suitability in bread-making, with wheat flour as a control. Proximate (chemical) and physico-functional analyses were carried out on the Chinese yam flour prior to its use for bread making at different levels of substitution with wheat flour.

Brabender amylograph readings of the Chinese yam flour (8.4% moisture, 6.5% protein) gave a maximum gelatinization viscosity of 330 A.U. (89.4°C mean gelatinization temperature) with the experimental wheat

flour (14.0% moisture, 9.0% protein) having 655 A.U. (84.2oC mean gelatinization temperature).Sensory evaluation scores showed that bread produced with 30:70 Chinese yam/wheat composite flour did not differ significantly (P=0.05) with the sole wheat bread in taste, flavour,freshness, sponginess, softness and general acceptability. Bread made with 100% Chinese yam flour had no cracks in the crust. However, the measured specific
Volumes (cm3/g) of the 100% Chinese yam bread and 30:70 Chinese yam/wheat bread were 40.6% and 68.3% of the sole wheat bread, respectively.

Effect of processing methods and storage conditions on the qualities of fried sweet potato chips.

Page 222-------223

Idowu, M. A., Sanni, L. 0. and Osunbitan, O.A.

Abstract. Fried sweet potato chips were produced from sweetpotato tuber and flour respectively. The chips were stored at 28+2°C and 18±2°C for 43 days. The fresh and

stored chips were analysed for proximate, vitamin C, free acid, reducing sugars and sensory properties. Fried chips from flour had higher proximate composition. There were significant differences ($P<0.05$) in the sensory qualities of fresh chips with chips from tuber having highest value. Fried chips from tubers stored at 18±2°C had higher values of vitamin C, lower values of moisture content and reducing sugars respectively. There was no significant difference ($P>0.05$) for sensory attributes except, for aroma of the chips stored at 28±2°C. Hence, chips from tuber were most preferred even after six weeks of storage.

Cost effective cassava-plant based rations for poultry and pigs

Page 229----234

Tewe O.O. and Mpoko Bokanga

Abstract: Two feeding trials were conducted with layers and grower pigs using dried whole cassava root and leaves in ratio 4:1 to replace the cereal component of their compounded feeds. The layer study which involved the

use of 48 birds in 3 treatments revealed that cassava can replace maize in layers ration with reduced feed cost and satisfactory performance even when presented in a milled form as long as the dustiness is controlled through oil supplementation, pelletized cassava ration has high potentials for layers if such diets contain fibrous ingredients to reduce fattiness in layers. Improvements in feed consumption and body weight show high potentials for use of pelletized cassava based feeds for broilers. Improved egg yolk colouration on pelletized cassava diets shows the advantage of cassava leaf colouration in such diets. The pig study which involved 20 growers in 5 treatments revealed supplementation of the local farmers diets of Palm Kernel Cake with cassava in the milled, threshed or pelletized forms improves body weight gain. Pelletized cassava for pigs confers the advantage of a higher feed conversion and palatability, faster growth rate and reduction in period of attainment of market weight of 100 kg from12 months on the local farmers diet to 6.5 months on the pelletized diet. The use of unpeeled whole cassava along with the leaves presents an environmentally-friendly approach to total cassava plant utilization for livestock feeding.

Studies on potato seed performance under on-farm storage conditions in Mount Kenya Region.

Page 235-----239

Alice Walingo, Charles Lung'aho, Peter Kinyae, Jackson Kabira and Ramzy El-Bedewy.

Abstract. In Kenya the informal potato seed supply produces most of the country seed requirement annually. Such seed is selected from farmers' own seed and kept under their rustic storage conditions until required. Seed storage is necessary for the establishment of a viable and sustainable agricultural system. This study was established to determine farmers' existing storage practices, storage characteristics and field performance of six varieties after storage. A total of 208 farmers were interviewed in 1999-2000 using a structured questionnaire and participants' observation. The results indicated that distribution of seed material was highly localized and farmers in the lowlands purchased seed from the high altitude area to reduce the incidence of diseases. Storage losses experienced were attributed mainly to rotting and

dehydration or shrivelling. On-farm traditional rustic stores takes advantage of natural ventilation. Seeds were mainly stored in heaps in the house or outside in pits to enhance sprouting. Other farmers were using multipurpose stores and a few in an improved potato stores (DLS) and in bags in the house. Farmers appreciated the importance of DLS technology for their potato seed. Storage data showed significant differences among varieties in weight loss, rotting and sprouting during storage period and when planted after storage. The stored varieties showed significant yield differences with Tigoni and Asante varieties out yielding the others by over 10%.

Combined use of soil fertility indicators and crop yields for determining appropriate cassava-based crop mixture for soils of eastern Nigeria

Page 240-----246

Asadu, C.L.A. and A.G.O. Dixon

Abstract. In this study soil chemical properties including four micronutrient elements were monitored in plots grown

to three common cassava- based crop mixtures in eastern Nigeria between 1998 and 2000.The changes in selected crop yield parameters were also determined. The aim was to combine the variations in both soil and crop parameters and determine the best cassava-based crop mixture for the soils of the area. The selected crop mixtures were cassava + yam + maize + pigeon pea, cassava + maize + pigeon pea, and cassava + pigeon pea. The crops were also grown as pure stands. The study was carried out in two locations, a virgin forest cleared in 1998 and a previously cultivated UNN farm. Though both soils have been classified as alfisols, the soils of the forest were relatively more fertile. At the forest location and in 1999 the soil properties that were significantly ($p \leq 0.05$) affected by the crop mixtures were exchangeable Ca, bases and available Fe. Those significantly affected at the UNN farm were organic matter, exchangeable K, Mn, acidity, and available P. In 2000, those significantly ($p \leq 0.05$) affected at the forest location by the crop mixtures were exchangeable Mn, available Fe, Cu, and B while at the UNN farm only exchangeable K and available Cu were significantly ($p \leq, 0.05$) affected. Thus in both years only exchangeable K and available Fe were significantly affected by the crop mixtures. Among the three crop mixtures, these nutrients were least affected in soils grown

to cassava + maize + pigeon pea and cassava + pigeon pea when compared to their original values in the soils of both locations at the beginning of the trials in 1998, From the crop yield analysis using land equivalent ratios, cassava + maize + pigeon pea proved to be superior to other crop mixtures. Thus this crop mixture was considered the best for the zone among the three.

Accumulation of cyanogenic compounds in the cassava tuberous roots as influenced by leaf expansion rate and crop growth rate.

Page 247--------256

Githunguri C.M., 1.J. Ekanayake, J.K. Imungi and Kimani Waithaka.

Abstract. Various environmental factors affect the pattern of growth and development and accumulation of cyanogenic glucosides in cassava plants. Five cassava genotypes were planted in three agro- ecological zones in Nigeria and sampled at various plant ages. Leaf

expansion rate, crop growth rate and root cyanogenic potential of cassava plants was determined at each sampling plant age. The influence of these growth parameters on the accumulation of cyanogenic compounds in the cassava tuberous roots was examined. Leaf expansion rate and root cyanogenic potential (CNp) were highest during the 4-6 months after planting (MAP) period during the rains, declining rapidly up to 8 MAP during drought, and then rising gradually during the 10-12 MAP period. Whereas leaf expansion rate started rising after 8 MAP, root cyanogenic potential rose slightly and levelled off thereafter. Even though leaf expansion rate and root CNps were highly positively correlated, regression analysis suggested a very weak positive cause and effect relationship between them. The plant age with the highest crop growth rate had the lowest root CNp. Between 6 and 8 MAP were the plant ages when the highest crop growth rate and lowest root CNp were observed implying a negative relationship (r was - 0.38 and - 0.95 for all Clones studied). Regression analysis between root CNp and crop growth rate suggested a cause and effect relationship between them (r^2 ranged between 0.64 and 0.90 for all clones except for clone TME2 where $r^2 = 0.14$). Crop growth rate peaked at 6 MAP at the end of the rains and started declining

thereafter up to 10 MAP. At 10 MAP crop growth rate started rising again. Correlation and regression analysis suggested that crop growth rate and CNp were negatively associated. This means that an increase in crop growth rate would lead to a corresponding decrease in its cyanogenic potential, which is highly desirable. The highest root CNp coincided with the 10-12 MAP which is a recovery period from drought. The same growth stage coincided with declining crop growth rate and increasing leaf expansion rate. Cassava plants at Ibadan (the wetter agro-ecological zone) had higher leaf expansion and crop growth rates and lower CNp than those at Minjibir (the drier agro-ecological zone).

Réponse du manioc à l'azote, au phosphore et au potassium sur les terres de barre au Sud du Bénin

A.M.Toukourou and R.J.Carsky

Page257--------259

Résumé. Au Sud Bénin, le manioc est l'une des principales cultures.Mais son rendement est encore faible sur le type de sol dominant de cette région, localement appelé terre de barre.Dans le but d'identifier les éléments les plus importants un essai a été conduit dans 15 champs paysans.A part un témoin No Po Ko sans amendement et une fertilization complète $N_1P_1K_1$ avec 60 k N, 16kg p et 146 kg K à l'hectare,un dispositif soustractif (No P_1K_1, N_1PoK_1, et N_1P_1Ko) a été testé plus un traitement composé uniquement de K parce que le potassium est soupçonné déficitarie dans ces sols.

Ll n' y apas de réponse significative à l'azote,au phosphore,et au potassium dans les quize champs sur lesquels le test a été conduit en 1999-2000.Par contre en 2000-2001 la réponse au phosphore est significative et pour le potassium trés significative.

La mauvaise pluviométrie enregistrée en 2000-2001 a influence négativement les rendement du manioc dans les différents traitements. La moyenne est de 19 t/ha sur les parcelles témoins et de 21 t/ha sur les parcelles fertilisées en 1999-2000 contre respectivement 16 t/ha et 19, 79 t/ha en 200-2001.Les résultats obtenus ne traduisent pas en

réalité le volume des mobilisations qui contribue à l’ épuisement du sol.

Response of the pona variety of yam (*Dioscorea rundata*) to the minisett technique of yam propagation.

Page260--------264

Tetteh J.P. and Charlotte Mensah.

Abstract. Two experiments were carried out to determine the causes and find remedies to the poor response of ‘Pona’ variety of yam (*Dioscorea rotundata*) to the minisett technique of yam propagation. Two varieties Pona and Asana were used. In experiment one, minisetts weighing about 30g were given four levels of growth regulator and two lime treatments. The growth regulators were

Strike, Mixyme, Charcoal, and control. The lime treatments were; Lime and no lime. In experiment two, the treatments were decapitation and no decapitation. Decapitation involved (slicing off the crown plus a thin layer of the head of the mother yam and storing for five weeks before cutting it into minisetts).Minsetts from the head, middle and tail portions of tubers were treated separately. Observations were made on the sprouting of the minisetts at the nursery, and on field establishment after transplanting. Sprouting of the minisetts at the nursery, and on field establishment after transplanting. Sprouting of the minisetts at the nursery was generally high for both Pona and Asana, (80.1 and 93.9 in experiment one, and 73.2, and 72.2 in experiment two) for Pona and Asana respectively. Neither the lime nor the growth rugulator treatments appeared to have any significant effect on the sprouting of the minisetts. Field emergence and survival after transplanting was rather low. The percentage of minisetts that survived from the nursery up to harvest time in the field for Pona and Asana were 36.9 and 35.7 in experiment one, and 50.3 and 55.3 in experiment two.Minisetts from decapitated mother yams outperformed those from

undecapitaed ones with respect to sprouting, field emergence after transplanting, and survival up to harvest time.Minisetts from the head portions outperformed those from the middle and the tail portions in every espect,but no significant differences existed between the middle and tail portions. It was realized that the poor response of Pona to the minisett technology was largely due to poor field establishment rather than poor sprouting at the nursery.

A technique for grafting of water yam (*Dioscorea alata*)

Page 265--------267

Hironobu Shiwachi, Toye Ayankanmi and Robert Asiedu.

Absract.Grafting of the vines of water yam (*Dioscorea alata* L.) was performed between a flowering variety and a non-flowering one, using the approach method, with the aim of inducing flowering in the latter. The flowering variety was used as rootstock and the non-flowering one as scion. About 60 percent of the grafted plants survived through the normal flowering period but flowering was not observed during the season .The compatibilities of different combinations of varieties (as rootstock and scion) and need to be studied.

Induction of germination in dormant yam (Dioscorea spp.)tubers with inhibitors of gibberellins.

Page 268-------270

Hironobu Shiwachi, Toye Ayankanmi, Michio Onjo and Robert Asiedu.

Abstract. The effects of two gibberellin inhibitors,uniconazole-P(UP) and prohexadione-calcium(PC),on the dormancy of yam tubers were investigated under different storage conditions in white Guinea yam (*Dioscorea rotundata*),water yam (*D.alata*) and yellow Guinea yam(*D.cayenensis*).The tubers were harvested before full senescence of the plants and treated with UP. Tuber dormancy was radically shortened in *D.alata* variety TDa 99/00049,but not in *D.rotundata* variety TDr 131.Variable responses were shown when UP PC were applied to tubers of seven varieties of yam at four weeks after harvest, though UP and PC are reported disturb tuber physiology during the endo-dormancy period. The results suggest that the effects of UP and PC vary with the depth or intensity of dormancy in yam varieties. It is therefore imperative to examine the appropriate treatment time for the use of UP and PC chemicals for the termination of dormancy in tubers of specific varieties of yams.

Mapping of fibrous root systems of cassava in the Nigerian savannas.

Page 272------277

Ekanayake, I.J.

Abstract. In order to select and tailor root systems of cassava (*manihot esculenta* Crantz) to meet environmental constraints of specific agroecological zones it is of critical importance that the developmental and physiological nature of the root systems are well characterized. Root growth plasticity is highly desirable in water limiting ecologies and in low fertility soils. Therefore fibrous root distribution and architecture of several Nigerian cassava clones were studied. Field trials were conducted in the Sudan savanna zone of Nigeria where 12-month cassava crop experienced severe drought stress from November to May. Soil pits (1m

x 1.5m monoliths) were dug and root distribution maps were constructed for each clone. Root distribution maps indicated genotypic differences for root distribution in different soil depths as well as lateral distribution. significant genotypic differences and site, season and soil profile depth interactions were noted for lateral and vertical root distribution, rooting density and other rooting parameters. Improved clones with better root distribution patterns in comparison to the landrace check were identified.TMS 83.00214,TMS 91934,and TMS 30572 had higher dense rooting ratios. Characterization of cassava root systems are helpful in better understanding and managing improved water use drought resistance in relation to better adaptation to the semiarid agroecologies.

Response to nitrogen and potassium by cassava (Manihot esculenta Crantz) varieties in the Nigerian derived savanna and southern Guinea savanna.

Page 278--------281

Oman Ghebreyesus

Abstract. A field trial was conducted under rainfed conditions at two sites with slightly acidic Alfisols in Ibadan (derived savanna) and Mokwa(southern Guinea savanna)using an improved cassava variety 92/02324 and a local cassava variety TME-I.The purpose of the experiment was to (1) examine the impact of applying 16 combinations of nitrogen (N) and potassium (K) and NxK on the average fresh tuber yields and total dry-matter biomass, and (2) compare the yields of the two varieties with respect to the fertilizer treatments at the two sites. In Ibadan, the results showed that significant tuber yield responses over those of the control plots were not obtained by either of the varieties using the fertilizer treatments. In Mokwa, the improved variety gave significant responses with respect of fresh tuber yields and total dry-matter biomass. Of all factorial fertilizer treatments, the applications of N had an impact on tuber yields 12 MAP. Among the applications of N treatments, applying 100 kg N ha^{-1} was the most efficient and gave an optimal fresh

tuber yield of 30.0 Mg ha^{-1}. Also, the improved variety out-performed the local variety in Mokwa.

The relationship between the accumulation of cyanogenic glucosides and free amino acid content in cassava (*Manihot esculenta* Crantz)

Page 282-------286

Chukwumah, Y.C. and Bokanga, M.

Abstract. The relationship between the cyanogenic glucoside content in the cassava plant and the amount of free amino acids in the metabolic pool of

cassava tissues during its growth cycle was investigated. Results from this study have shown that there is a correlation between the cyanogenic glucoside content and the amount of free amino acid in the whole plant (r=0.753) as well as in the woody stem(r=0.700), petioles (0.685), herbaceous stem(r=0.654) and leaves (0.573) of the cassava plant.However, both parameters have their peak and minimum values at different plants ages in the different plant parts. The pattern of cyanogenic glycoside accumulation and amount of free amino acid in the young herbaceous stem and the petioles generally showed the same trend from 16 weeks after planting (WAP) to maturity while in the leaves this was observed from 28 WAP to maturity.Such closely related trend was not observed in the other tissues.

Use of four cover crops for management of *imperata cylindrica* fallow followed by

cassava/maize intercrop in forest savannah transition and wet savanna zones of Nigeria.

Page287---------292

Melifonwu A.A. and J.E.G.Ikeorgu

Abstract. Effects of Mucuna pruriens var utilis, Mucuna IR2, Pueraria phaseoloides and Lab-lab purpureus one year fallow followed by cassava (Manihot esculenta Crantz)/maize (zea mays L.)intercrop the following season, on the control of spear grass(Imperata clindrica) were ingestigated in field trials conducted at the Otobi and Igbariam outstations of National Root Crops Research Institute,Umudike during the 1995 and 1996 cropping seasons. Results showed that Mucuna IR2, Mucuna pruriens var Utilis, lab-lab purpureus and pueraria phaseoloides suppressed Imperata in plots that were weeded once and fallowed for one year.Mucuna IR2 and Mucuna utilis performed better than the other cover crops and hoe-weeded control treatments. One year fallow with Mucuna IR2, Mucuna utilis, Lab-lab purpureus and pueraria

phaseoloides suppressed Imperata better than hoe-weeding in cassava/maize during the following season, resulting in improved yields of cassava and maize. The unweeded control performed lowest in respect of spear grass control and crop yields.

Evaluation of the contribution of leguminous cover crops to the conservation of soil resource base and productivity of yam based systems.

Page 293--------295
A.O.Ano, Orkwor, G.C.and Ikeorgu, J.E.G.

Abstract. A trial was conducted at the National Root Crops Research Institute's experimental farm at Umudike, Nigeria to determine the contribution of leguminous cover crops (bambara nut, ground nut, and pigeon pea) to the conservation of soil resource base and productivity of yam minisett based systems. The systems studied were: sole yam

minisett, yam minisett/bambara nut, yam minisett/pigeon pea. Highest seed yam yield of 5.30 t/ha and 5.20 t/ha were obtained with yam minisett/pigeon pea and sole yam minisett respectively which were significantly higher ($p<0.05$) than 3.60 t/ha and 3.50 t/ha obtained with yam minisett/bambara nut and yam minisett/groundnut respectively. Highest benefit cost ratio of 3.52 was obtained with yam minisett/pigeon pea followed by yam minisett/bambara nut with 2.71, sole yam minisett with 2.36 and lastly by yam minisett/ground nut with 1.82.Intercropping yam minisett with the legumes improved the organic matter of the soil resource base.

Compatibility of cocoyam (*xanthosoma sagittifolium* (L.) Schott), egusi melon and pumpkin
in intercropping system.

Page 296----------302

F.A.Nwagwu and H.Tijani-Eniola

Abstract. Field experiments were conducted in 1997 and 1998 at the Teaching and Research Farm, University of Ibadan, Southwestern Nigeria, to assess the compatibility of cocoyam (xanthosoma sagittifolium (L.) Schott) in intercrop with ‘egusi’ melon (Colocynthis citrullus(L.)) or pumpkin (Cucurbita pepo (L)).The experimental layout was a 2 x 5 factorial fitted into a randomized complete block design and replicated four times. The treatment combinations were: heap + cocoyam melon, heap +cocoyam + pumpkin, heap + cocoyam, heap + melon, heap + pumpkin, no tillage + cocoyam + melon, no tillage + cocoyam + pumpkin, no tillage + cocoyam, no tillage + melon and no tillage + pumpkin. Growth and yield of cocoyam as well as yields of melon and pumpkin were similar on both heap and no-tillage seedbeds. Pumpkin had greater competition with cocoyam on heaped seedbeds resulting in significantly lower (p=0.05) number of leaves per cocoyam plant n= (3.6 and 2.6) at 12 WAP than other heaped treatments in 1997 and all heaped and no tillage treatments except heap + melon in 1998 respectively. Pumpkin on heap suppressed leaf area index (LAI) of cocoyam by

53.8% at 12 WAP compared to heap with no cover crop(control).Cormel number per cocoyam plant was 9.2,8.4 and 6.0 for melon, no cover crop and pumpkin treatments respectively. Melon enhanced cocoyam yield by 13.2 and 18.9 in 1997 and 1998 respectively whereas pumpkin depressed cocoyam yield by about 17.6% in both years. Land equivalent ratio (LER) values for all intercropped systems were greater than one, the values of which ranged from 1.71 and 1.59 for cocoyam/pumpkin on heap to 2.07 and 2.34 for cocoyam/melon on heap in 1997 and 1998 respectively. Results of this study showed that intercropping cocoyam with cover crops in derived savanna ecology could be more productive than sole cropping but melon is more compatible with cocoyam than pumpkin.

Quelques aspects de l’evolution de la culture de I’igname au Bénin

Page 303------307

Philippe. VERNIER1, Romuald A. DOSSOU

Résumé. Le Bénin est un important producteur

D’igname et occupe le quatrième rang mondial. La production a fait preuve d’un remarquable au cours des demières décennies avec une augmentation annuelle de 3%, passant de 530,000 tonnes en 1961-63 à prés de 1, 5 millions de tonnes en 1996-98 soit une multiplication de la production par 2,8 en 35 ans. Cette expansion s’explique principalement par l’augmentation des surfaces cultivées par défrichement qui sont passées dans le même temps de 61,000 à 135,000 hectares. Le rendement moyen

a peu évolué, les techniques de cultures restant traditionnelles. Cette situation est semblable dans le reste de la sous région ouest-africaine. Cependant, au delà de la permanence du caractère traditionnel de cette production, des mutations importantes se sont produites avec une adaptation de la production à la demande commerciale notamment avec l'émergence d'une filière de transformation en cossettes, une intégration de l'igname dans les systèmes de culture à base de coton et un certain degré de sédentarisation. Pour l'igname, traditionnellement inféodée à la défriche brûlis, c'est une situation nouvelle en Afrique.

Effects of row-intercropping of minisett cocoyam/maize on component crop yields and productivity in a lowland rainfed ecology in southeastern Nigeria.

Page 308--------314

Okwuowulu P.A. and J.E.G. Ikeorgu

Abstract. Experiments were conducted in Otobi (Southern Guinea Savannah) in 1998 and 1999, to determine the effects of row intercropping of minisett cocoyam/maize component yields and total system productivity. The cocoyam cultivars used were NCY 001 (Xanthosoma) and NCY 004 (Colocasia) each at four populations (10, 20, 30 and 40 x 10^3 /ha) and row-intercropped with maize (FARTZ 23) at three populations (10, 20 and 30 x10^3/ha). They were grown in a lowland ecology using a factorial arrangement in a randomized complete block design, replicated three times. Varying compatible mixture populations for optimizing yields were determined. Row intercropping enhanced total yield of crops in a cropping system through complementarity. The relative yield totals (RYTs) and land equivalent ratios (LERs) gave production efficiencies greater than 100%. Colocasia maize intercrop was more compatible than Xanthosoma/maize. Increasing the cocoyam population from 10000/ha to 40000/h increased tuber yield by over 25% while maize grain

yield at 40000/ha and 60000/ha did not differ significantly (p=0.05) but were better than maize grain yield at 20000/ha. Maize grains gave higher monetary returns (N/ha) than cocoyams but cocoyams produced more biological energy (Kcals/ha).

Application of mycorrhizal and hedgerow technology in cassava production

Page 315--------317

0 .Fagbola and 0. Osonubi

Abstract. Cassava was planted in two years within an alley cropping system. The alley plots were

composed of Senna and Leucaena planted simply in rows as well as interplanted within rows. The experiment was a split plot in a randomised block design with three replicates. Another factor investigated was inoculation with arbuscular mycorrhizal (*Glomus clarum*). In the first and second year, mycorrhizal colonization of cassava were significantly increased when plots were inoculated with arbuscular mycorrhizal. Colonization in the non-alley cropped plots was the least. The yield of cassava was only significantly different between the alley-cropped and non-alley-cropped plots, but not within the different alley cropped plots. In the second year, with the application of mulch from hedgerow pruning, the yield of cassava in the alley-cropped plots were slightly reduced although not significant compared to the alley-cropped non- mulched control, with or without application of mycorrhizal inoculum. The tuber yield in the first year was comparable to the yield in the second year. The application of the findings for management of tropical soils with reference to nutrient demanding crops such as cassava are discussed with based on alley-cropping and mycorrhizal technology.

.

Effect of intercropping sweet potato with plantain on the growth and yield of the mixture

Page 318-----320

Akinyemi, S.O.S

Abstract Sweet potato (*Ipomoea batatas* L.) thrives under a wide range of environments and it is easy to establish. This enables it to be easily intercropped with other food crops. A study to assess the performance of sweet potato when mixed within the various densities of plantain was conducted for two seasons at the National Horticultural research Institute, Ibadan, Nigeria. Sweet potato at 10,000

Plants/ha was intercropped with plantain at 1666. 2500 and 3333 plants/ha. The sole sweet potato and sole densities of plantain serves as control. Sweet potato was replanted within the alleys in the second season. Results revealed that intercropping significantly increased number of days to shooting and decreased plantain bunch weight by 14, 21 and 36% in 1666, 2500 and 3333 plants/ha respectively when compared to their sole crop. Sweet potato yield was also decreased with increase in plantain density. This study suggests that sweet potato could be planted with plantain at the lowest density (1666 plants/ha). This combination gave the highest revenue than any sole crop. However, introducing sweet potato into plantain field in the second season may be a waste of effort.

Improving taro cropping system in Ghana: A participatory research-farmer-extension approach

Page 321--------323

Regina Sagoe, Ralph Bam, J. Manu-Adueing, J. Haleegoah, D. Dedzoe, J.P. Tetteh, J.K. Osei, 0. Safo-Kantanka and MOFA staff.

Abstract. Taro (*Colocasia esculenta* (L) Schott var. *esculenta*) is widely distributed and cultivated in the wet tropics of the world. In Ghana its cultivation is limited to river basins or banks in large cities. A few farmers were however found growing it on large scale and ranking it as their main source of income. The major problem identified in its production during a study in some parts of Ghana is the flooded culture which makes its cultivation very intensive and expensive. Insufficient planting material, high labour cost and seasonality in marketing the crop are some of the problems needing urgent attention. This necessitated the introduction of rice into the cropping system to increase productivity per unit area and increase income of farmers. To facilitate technology transfer and adoption of this technique, an integrated approach was suggested which highlights the complementation among the farming community, extension agents and researchers. The participatory research-farmer-extension approach is discussed. The taro production system as practiced in Ghana, constraints and the farmers' needs and perception is described.

The role of vesicular arbuscular mycorrhizal (VAM) fungi on cassava productivity in alley cropping systems with two tree species

Page 324----------329

Oyetunji, O.J. Ekanayake, I.J, and

Osonubi, O.

Abstract. Alley cropping is a promising and sustainable low-input soil management approach in the humid and sub-humid tropics. Cassava and maize are prominent annual crops grown in this system. The aim of this study was to attain an improve understanding of the eco-physiological relationships between the arables and perennials in order to address some of the issues of sustainability of nutrient use and system productivity. Field experiments were conducted at Ajibode and Alabata villages and IITA located in Ibadan (derived savanna zone), Nigeria to evaluate maize growth response to intercropped cassava, alley cropping species, and vesicular-arbuscular mycorrhizae (VAM) fungi inoculations. On-farm trials were conducted during the 1993/1994 and 1995/1996 growing seasons, in Rhodic Kandiustalf soil type with low nutrients. The alley cropping systems used *Leuceana leucocephala and Senna siamea* as hedgerow trees (main blocks), while VAM inoculation (with or without *Glomus clarum*, G. *mosseae, or C, fasciculatum*) served as

the subplots. Cassava cv, TMS 30572 and maize cv. DMR-ESR-W were
intercropped within alleys. Each trial was a 3x2x2x2 split-plot factorial with three replications. Several growth parameters and yield components of cassava and maize were analyzed during the season. Cassava root yield was highly enhanced by VAM fungi application. Positive contribution of mycorrhizae to cassava yield ranged between 20.5% to 254%, depending on the treatment combination. It was also noted that in older hedgerow plantations. S. siamea and suppressed cassava yield in particular. The suppression of cassava yield by the hedgerow trees was between -151% to -1.9% (the lowest at 74% whether inoculated or not). Early water stress significantly reduced the intercrop maize grain yield. Due to favorable factors it is desirable to encourage adoption of those improved technologies mentioned above such as the use of VAM in annual cropping in alley systems for derived savanna farmers.

Application oftheWaNuLCAS model in various cassava-based cropping systems in Benin, West Africa.

Page---- 330--------337

Lose S.J.;Agbo B.P.;Hilger T.H. and J. Kroschel.

Abstract .In Benin, on-station research showed that cassava as well as maize sole-cropping yields stabilized at a possible high level, 7.56 and 3.62 t ha^{-1} a^{-1} respectively, after six years of cultivation when mineral fertiliser was added. In contrast, the alley cropping systems indicated that competition between agroforestry species and food crops for nutrients, water and light limited the cassava yields between 4 and 4.78 t ha^{-1} a^{-1}, depending on the associated tree species. Subsequent on-farm

research in edapho-climatically different regions in Southern Benin, studying various agroforestry systems over six years, improved the performance of the agroforestry systems on associated crops compared to fertilizer application and no input use in non agroforestry treatments yielding 7.5 and 3.1 t ha^{-1} a-$^{-1}$ cassava tubers. This effect depended strongly on the management of the various agroforestry components. In particular, design and selection of tree species indicated a positive influence on cassava as well as maize yields. Tree blocks of perennial legumes established at one side of the cropping area reduced overall competition, leading to an average of cassava tuber yield of 4.2 t ha^{-1} $a^{-1.}$ *Cajanus cajan* (L.) Millsp. seemed to be a species which performed comparatively good due to less competition with food crops in alley cropping. In the studied area resulting average yields were 4.6 t $ha^{-1}a^{-1}$. Nutrient balances of the systems, however, indicated that the equilibrium of important nutrients could not be maintained without additional nutrient input. Beneficial effects of agroforestry systems depended on the spatial arrangement of the tree component, species selection, management of the system and choice of the associated crop. Supply of additional goods i.e. wood etc. and services i.e. fencing of fields etc. substantially improved adoption by the farmers. The use of the agroforestry model for water use and light capture in agroforestry systems (WANULCAS)

promising results, which can be further linked economic or landuse planning models.

Augmented Block Design (ABD): the choice design for large scale farmer participatory on-farm trials

Page 338--------342

K Sagary Nokoe

Abstract. Farmer participatory trials are usually kept simple with few treatments and farmers, but this needs not be the case if higher levels of adoption and impacts are desired. This paper addresses a

design useful for large-scale trials with treatments far from few and with as many farmers as are available. The procedure relies heavily on the ability to construct blocks of seemingly similar farms, sites or farmers. Augmented block designs involve the expansion of blocks with already assigned treatments to accommodate additional ones that is not usually replicated. The design is illustrated with examples and mathematical models for analysis.

Cassava variety and mound

height effects on productivity of

cassava in an inland valley swamp

ecology in Sierra Leone

Page 343-----347

A. Jalloh

Abstract. A field experiment was conducted at

Newton in Western Sierra Leone in 1997 to investigate the effect of mound height and cassava variety on the productivity of cassava in an inland valley swamp ecology with a fluctuating water table. Three improved cassava varieties and one local cassava variety were each grown on three different mounds heights (45 cm, 65 cm and 85 cm). The mounds were constructed in February after the water table level had sufficiently receded below soil surface. The base of each mound had a diameter of about 1m. Four cassava cuttings were planted at about 5 cm below the top of each mound. Plot size was 62 m2 (6.5 m x 9.5 m) and each plot contained 24 mounds. Plant population was 40000 plants/ha. Sixteen plants were harvested at monthly interval starting from 2 months after planting. Water table level was measured from planting till final harvest in August. At the time of planting water table level was 55 cm below soil surface. The level of the water table decreased further with time to more than 100 cm below soil surface in May. Water table level emerged above soil surface in June and increased till in August (42 cm above soil surface). The results revealed that plant establishment was not affected by mound height but varied significantly with cassava variety. Leaf and tuberous root yield were optimum in June (4 months after Planting); declining there after as the water table

level exceeded 20 cm above soil surface. Leaf number and tuberous root yield also significantly varied with both cassava variety and mound height. Raising mound height from 45 cm to 85 cm significantly improved the production of both leaves and roots. The waterlogging conditions that prevailed after June induced tuber rot. Tuber rot was significantly lower and occurred relatively later in roots of plants that were grown in the 80-cm high mounds. The result of this study indicate that productivity of cassava could be significantly improved by growing adapted varieties on appropriate mound heights in inland valley swamps.

Farmer participatory evaluation of dioscorea species in Ghana

Page 348----------352

Emmanuel Otoo E. Moses, J.N.L. Lamptey and J. Adu-Mensah.

Abstract. A multi-disciplinary team of researchers conducted a multilocational trial involving a total of thirty-nine (39) genotypes of *Dioscorea rotundata* at two locations - Fumesua (Forest) and Wenchi (Forest-savannah transition) in 2000. The objectives of the study was involving end-user participation to identify genotypes (1) with good and stable yields across the different agro-ecological zones in Ghana (2) with good culinary and storage qualities; and (3) good breeding potential. The experimental design was Augmented RCB consisting of three blocks of 12 genotypes with three common checks per location. There were 10 stands per genotype per row. Harvesting was on 17th January and 23rd January 2001 at Wenchi and Fumesua, respectively. Farmers'criteria for selection at both vegetative and harvesting stages were not significantly different at the two locations. At the vegetative stage, farmers at both locations ranked establishment, cracking of mounds, vine thickness, leaf size and colour, pest and disease status in decreasing order of importance. Tuber size and skin thickness were parameters reflecting good storage

qualities at harvesting stage. Tuber shape was considered essential by researchers and farmers but for different reasons, Sprouted at harvest was also considered as an indication of early maturity. Market value, storability, early maturity and high yields, were identified as the ultimate determinants of the choice of a particular variety in decreasing order of importance. Fifteen superior genotypes have been identified and would be tested more extensively on fanners' fields in the two agro-ecological zones to identify those to be formally released to farmers.

Development and evaluation of hybrid yams (*Dioscorea rotundata* Poir.) in pre-release multilocational trials in Nigeria

Page 353-----355

G.C. Orkwor, R. Asiedu, S.K. Hahn, D. Surma, U. Udensi and GO. Chukwu

Abstract. In 1996 and 1997 cropping seasons five breeders clones of hybrid yams developed by IITA and NRCRI were evaluated with local bests in multilocational trials in 6 locations: Umudike, Ibadan, Ubiaja, Abuja, Zaria and Katsina-Ala. The hybrid yams (white guinea yam) were TDr 87/00264 TDr 89/01444, TDr 89/02461, TDr 89/02565 and TDr 89/ 02677. The three local bests (landraces) used as checks were TDr 131, TDr 93-2 (Pepa) and DRN 010 at Abuja, Ibadan, Ubiaja and Zaria while at Umudike and Katsina-Ala TD 93-2 (Pepa), TDr 93-31

(Danacha) and DRN 010 were used. The results show that the hybrid yams performed significantly better than the landraces with the exception of DRN 010 in terms of uniform and early sprouting, crop establishment, vigor, survival up to harvest, total tuber yield, seed yam and ware yam productions. The trend was the same in all the locations. In terms of resistance to pests and diseases the hybrid yams appeared more susceptible to yam nematode attack anthracnose and beetles than the lancraces especially at Umudike location in 1997. The hybrid yams however were less susceptible to virus attack than the landraces. Based on their general performance including consumers preferences at the

various locations for two years the following were finally selected for release and have been released by the National Committee on crop release in Nigeria in April 2001. Details on the attributes of these hybrids yams are discussed in this paper.

Influence of yield improvement on economic productivity-of yam in South Western Nigeria.

Page 356------357

Agbaje, G.O; Adegbite, A. A. and Akinlosotu, T.A.

Abstract. Economic productivity of local and new hybrid yam varieties were compared to that of cassava using yield data obtained between 1992 and 1998 at Ibadan. Tuber yield from MS6 and TMS 30572 Vary from 23 to 28 t/ha under sole cropping and this was reduced by

I4 to 18 % under maize intercrop.

TMS 30572 had the highest yield under maize intercrop. Yield from yam varieties evaluated in sole and under intercrop with maize, was lowest in TDr

93-1, a local cultivar and highest in two hybrid varieties, TDr89/02565 and TDr89/02665 TDr93-l had a sole yield of 15.9 t/ha while the hybrids had a yield of 27 t/ha. Their sole yields were 11-14% higher than their intercrop yield. From the comparison, yield of yam was at par with those of improved cassava varieties due to the development of hybrid yam varieties. Net income from sole cropping was 36 to 41 % higher in both TDr 89/02565 and TDr 89/02665 than in TMS 30572 and net income per hectare under maize intercrop was N107, 000 in TDr 89/02565 N110,OOO in TDr89/02665 and N82,OOO in TMS30572

Monetary equivalent ratio from intercrop with maize was > 1.0 in MS6, TMS 30572 and TDr 89/02565

while that of intercrop with TDr 89/02665 was < 1.0 Net monetary equivalent ratio in both cassava intercrop was >1.0 while intercropped TDr 89/02565 and TDr 89/02665.were <1.0, inditing higher net income from sole cropping in hybrid yam than under intercrop system. Enhanced income from yam was obtained from breeding for higher yield and aggressive efforts should be made to extend these varieties to the farmers as it was done in the case of cassava. Also, the development of hybrid yam varieties tolerant to maize intercropping will further enhance farmers' income in yam production.

Off-season yam production to enhance food security in Nigeria

Page 358-----360

J.E.G. Ikeorgu and H.N. Igwilo

Abstract. A two-year trial was conducted at the inland valley of the NRCRI research farm during the dry seasons of 1999/2000 and 2000/2001 to evaluate the performance of *D. alata* (UM680) yam cultivar whose growth cycle had been physiologically altered such that it could break dormancy between August and October. During the first year the yams were grown from minisetts but in the second year, seed yams (100-150g) were used. The treatments were: yams mulched and staked, yams mulched only or staked only and the control was no mulch, no stake. Plots mulched and staked (4.83 t/ha and 14.60 t/ha) gave significantly higher tuber yield than mulching alone

(2.95 t/ha and 8.85 t/ha) and staking alone (2.47t/ha and 8.81 t/ha) in 1999/2000 and 2000/2001, respectively. The no mulch, no stake treatment (2.70t/ha and 7.40 t/ha) gave lowest tuber yields but did not however differ from those from the stake alone or mulch alone treatments for the two years.

Fertilizer efficiency and productivity of ginger on a haplic acrisol in southeastern Nigeria

Page 361----365
G.O.Chukwu and J.K.U. Emehute

Abstract. Fertilizer-use efficiency of NPK fertilizer rates and
productivity of ginger (*Zingiber officinale* Rosc)
cultivars were evaluated on a Haplic Acrisol at Umudike
Southeastern Nigeria, under field condition in 1998 and
1999 respectively. Four rates of the fertilizer (0,
150, 250 and 500 kg/ha) and 4 cultivars of ginger (UGI,
UG2, Maran and Himashal Pradesh) were laid out on a
randomized complete block design with 3 replications.
Results showed that highest mean percentage increase in
rhizome yield of 23.9 over the control, highest agronomic
efficiency, as well as
optimum yield return and reproductive
coefficient were achieved with fertilizer rate of 250
Kg/ha.Cultivar UG1 gave optimum fertilizer-use efficiency
and productivity of ginger. Application of fertilizer at
250 kg/ha gave 23.3 and 117.6% higher agronomic
efficiency than fertilizer rates of 150 and 500kg/ha.
application of NPK 20-10-10 fertilizer at 250kg/ha
equivalent to 50kgN/ha, and cultivar GUI are
recommended to optimize fertilizer-use efficiency and
total

productivity of ginger.

Effects of tuber portion and time of harvest on the dry matter yield of water yam (*Dioscorea alate L)* Planted through minisett

Page 364-------366

Ekpe E.O., Ndon, B.A. and Ukut, U.S.

Abstract. Field studies were conducted at the University of Uyo Teaching and Research Farm in 1998 and 1999 farming seasons to assess the effects of tuber portion and time of harvest on the dry matter yield of water yam (*Dioscorea alata* L.) Planted through minisett. The experiments were laid out in a split plot design in Randomized Complete Block. The main plot treatments were portions (head, middle and tail)

of tuber planted and the sub-plot treatments were days of harvest (60, 90 and 120 days after Planting). The results showed that portions of tuber planted had no significant effect on dry matter

accumulation in the leaves, vines, tubers, tuber size, number of tubers per stand. Time of harvest however, resulted in significant differences in dry matter accumulation in the leaves, vines and tuber thus suggesting that for optimum dry matter yield, farmers can harvest their water yam at about 120 days after planting.

Growth and yield responses of cocoyam cultivars to some tillage practices in Uyo, southeastern Nigeria.

Page 367------372

Ndaeyo N.U., E.O. Ekpe S.O. Edem and

Uwem G. Umoh

Abstract. Inappropriate tillage practice has been advanced as one of the reasons for low cocoyam yield in southeastern Nigeria. Therefore, a field studies was conducted at the University of Uyo Teaching and Research Farm for two cropping seasons (2000 and 2001) to assess the productivity of three cocoyam cultivars viz: *Colocasia esculenta* (L.) Schott, *Xanthososoma sagittifolium* (L.) Schott, the

red and white skinned types, under four tillage practices viz: surface hoeing (SH), zero (ZT), mounding (MD) and ridging (RG). A randomized complete block design with a split-plot arrangement, replicated thrice, was used. The tillage practices and cocoyam cultivars constituted the main-and sub-treatments, respectively. Results indicated that tillage practices had significant ($P<0.05$) effect on cocoyam sprouting but did not affect the height and number of leaves. Stem girth only differed Significantly at 2 months after planting with SH having 10-32% wider stem girth than other tillage practices. The corm and cormel yields were 5-16% and 9-18% higher in SH than other tillage practices.

C esculenta had 34-56% and 10-15% better sprouting and stem girth, respectively than other cultivars whereas *X. sagittifolium*, white type had 40-42% wider leaf area than other cultivars. The *X. sagittifolium* - white type also produced 8-21 % and 5-36% more corms and cormels than other cultivars. This study suggests that the adoption of surface hoeing for cocoyam cultivation, particularly for C esculenta and X. sagittifolium - white type, could be more beneficial to the farmers in this agro-ecology.

Effects of cultivars and fertilizer on the yield and culinary qualities of cassava

Page 373----------375

Ekpe E.O., O.W. Udoette and B.A. Ndon

Abstract. Nine cassavas clones were cultivated in the Teaching and Research Farm of the University of Uyo and harvested at 9 months after planting (MAP) to study the effects of cultivars and fertilizer on the yields and culinary qualities of cassava. The experiment was established as a split-plot, laid out in a Randomized Complete Block Design (RCBD) in 4 replications. Each block was divided into 2 split-plots corresponding to the fertilizer (F_1) and no-Fertilizer (Fo) application. NPK 15:15.15 fertilizer was applied (400kg/ha) at 8WAP. Results obtained showed that fresh tuber yields per stand differed significantly ($P<0.05$) among varieties and fertilizer. Highest fresh tuberous yield (36.88t/ha) was obtained from NR85207 and the lowest yield (17.66t/ha) was from NR 9035 while mean yields were 24.56t/ha (F_1) and 21.63t/ha (Fo) respectively. Mean numbers of marketable tubers per stand were 3.03 (F_1) and 2.71 (Fo). However, fertilizer also significantly affected the number of marketable tubers per stand. On the culinary qualities of the cultivars, cookability, Poundability and taste were significantly affected by the varities as well as the fertility regime. Boiling times were significantly different among the cultivars

and fertilizer application. In all, NR 88124 had the longest boiling time (44.00 minutes, Fo) while NR 920070 boiled fastest (29.00 minutes, F∘). TMS M94/0177, TMS 30572 and NR 920070 were highly poundable. Three varieties (NR88124, NR85207 and TMS 92B/00061) tasted very sweet while others were bitter or/and very bitter. Cooking quality appeared to be strongly under genetic control, although environmental influence cannot be ruled out. Taste yield as well as poundability equally appeared to be variety specific.

Archiving Root and Tuber Research Data

Page 376-------379

Okechukwu, R.U., C.C. Okonkwo, F.M. Quin, R. Asiedu and A.G.O. Dixon

Abstract. There are lots of research findings needed for frequent use by agriculturists that are not known simply because of not being in readily accessible state offered by computers. Apart from being tucked away in libraries in some Institutions, these information are stored in a variety of computer databases. Quite often these databases require a computer professional to manage them and their outputs may not always be user friendly. There is therefore need to summarize research findings and present them in a concise form via an attractive medium. Tuber and Root Information System (TRIS), an in-house geographic information system (GIS) produced by the International Institute of Tropical

Agriculture, offers a way of archiving such critical research information. TRIS runs on Arc View®, and contains 42 basic coverages as well as 50 point databases on cassava, yams, and sweetpotato. Information contained in TRIS can be used for scientific investigations, resource management, development planning, and emergency response. The user also has the privilege to utilize the full capacity of Arc View or modify TRIS shape files as necessary. The update of TRIS databases since its launch in 1997 has been slow owing to limited feedback from users. While recommending it to everyone, it is proposed that TRIS be updated interactively with the participation of all root and

tuber crop researchers.

Effect of poultry manure on yield performance of Livingstone potato /rizga (*Plectranthus esculentus*

N.E. Br) in southeastern Nigeria.

Page 380------381

Olojede A.O.; Igbokwe M.C.; and

M.C. Ikwelle

Abstract. A greenhouse investigation was conducted in the open tank at NRCRI, Umudike, Nigeria to evaluate four rates of applied poultry manure [0, 5, 10 and 15 t ha^{-1}] from a deep litter system on yield performance of Livingstone potato [Rizga]. The trial was conducted between April and October 2001 with the aim to identify optimum rate of poultry manure required for best performance of Livingstone potato in the S.E. agro-ecology. From the results, poultry manure application significantly [$P<0.05$] influenced

total fresh tuber yield per plot, marketable tuber weight, tuber yield per plant, marketable tuber number, total tuber number and average tuber number per plant. Poultry manure applied at a rate of 5t ha^{-1} was found adequate for optimum performance of Livingstone potato production.

Variation in seed yam production techniques across agro-ecologies in Cameroon.

Page 382------386

Nqeve J.M. and C. Nolte

Abstract. A participatory rapid appraisal survey was conducted for two years in the yam growing areas of Cameroon to study production constraints responsible for declining yam yields in the country The results showed that farmers were still using traditional methods of seed production which give low multiplication ratios, and thus enhance shortage of seed yams for commercial large-scale production. More males, generally considered hardworking, were engaged in yam agriculture than females, but in some zones, they need to synchronize their planting to take advantage of moisture provided by rainfall so

as to enhance seed yam production from the second harvest. Although most areas in the country have the potential for high production, the unavailability of yam seed material will continue to cause large decreases in production if the situation is not improved. Therefore, more sensitization and refinements of the minisett technique need to be done by the Research and Extension services so that farmers can adopt this technique, which has provides the only hope in solving the seed shortage problem in the country.

Yam production in Ghana: a food security enhancer or an environmental degrader

Page 387--------391

Emmanuel Otoo

Abstract Ghana is currently the number one exporter of yams in the world. With increasing importance of yams as major non-traditional foreign exchange earner, the importance of yam production to Ghana's Vision 2020 cannot be over-emphasized. Ghana also has a history of forest devastation. Between 70-90% Of the natural forest has been logged since the 1940's. Vegetation cover is declining rapidly with increasing demand for agricultural land as the main contributor to this decline. Yam production has been identified as the single most important activity in crop production that has significant adverse effects on both the soil and the environment. Its production is characterized by shifting cultivation on yearly basis in search of fertile soils and stakes. The importance of

yam production to Ghana's economy is analysed Vis-à-vis environmental cost and conclusions drawn with respect to its implications on Ghana's Vision 2020 programme.

Evaluation participative des clones améliorés de manioc en milieu paysan en Afrique de I'Ouest: cas du Bénin, de la Guinée, et du Togo.

Page 392------398

N. G. Maroya; S. Bah, K. Somana et K.Akapko

Résumé .Pendant deux années consécutives (1999-2001), des tests adaptatives des clones améliorés manioc ont été conduits en participation avec les

paysans dans différentes régions agroécologiques du Bénin, de la Guinée et du Togo. Trois à quatre clones améliorés issus des essais variétaux et une à deux clones locaux ont été évalués en première année par respectivement 16, 20, et 21 paysans au Bénin, Guinée, et au Togo et en deuxième année par 21 20, et 28 paysans. Les clones expérimentés sont variables d'un pays à 1'autre mais le dispostif expérimental est le bloc aléatoire complétement randomisé dans lequel chaque paysan constitue une répétition. Chaque clone a occupé une parcelle élémentaire de quatre ligne couvrant une superfine de $40m^2$ par paysan. Seul le Bénin a combiné l'engrais

minéra1 (N_{45} P_{45} K_{50}) avec les clones. Au niveau de chaque paysan les deux lignes centrales de chaque parcelle élémentaire ont été évaluées pour le taux de reprise des boutures, 1'incidence et la sévérité des principales maladies et attaques d'insectes, les facteurs de rendement et de productivité de chaque clone de manioc. D'une maniére générale les cones améliorés de manioc ont montré leur supénriorité par rapport aux clones témoins locaux dans tous les quatre pays et sur tous les sites vis à vis des maladies et attaques d'insectes. Pour le rendement en racines fraiches la situation varie d'un pays à l'autre et dans le même pays d'une région à l'autre et parfois d'une

année a 1’autre. Les choix des paysans a 1’issue de

ces deux années d’essais participatifs varient par

pays et combinent plusieurs caractéristiques

variétals telles que productivité.l’aptitude à la

transformation des racines et la qualité des produits.de

transformation. Le détail des meilleurs clones

améliorés retuenus par pays en participation avec les

paysans sont RB89509 et TMS92/0057 au Bénin;

Tokoumbo et TMS92B/0033 en Guinée; et TMS92/

0326 et TMS91/02327 auTogo.

Trait association and path analysis for yield of cassava genotypes grown in various agroecologies in Nigeria

O.O. Aina, A.G.O.Dixon and Akinrinde.

Page 399------404

.

Abstract. The association among different traits and direct and indirect influence on yield using path analysis were conducted with 30 broad-based and diverse cassava genotypes evaluated at four agroecological zones in Nigeria. Trait evaluated include reactions of the genotypes to prevalent pest

diseases, and shoot and root characteristics.
The result showed that cassava mosaic disease CMD) incidence and severity were significantly but negatively correlated (P<0.01) with root yield, with correlation coefficients of -0.44 and -0.45, respectively. Root yield was significantly and

positively correlated with number of stands harvested (r = 0.81), harvest index (r = 0.74) and stay green ability (r=0.37). Positive and significant correlation (P<0.01) between root yield and total root Number (r=0.91), number of large-sized roots (0.57), number of medium-sized roots (r = 0.95), and number of small-sized roots (r = 0.77) were also obtained. However, the results of path analysis showed that the largest direct effect on root yield was obtained for total number of roots harvested (direct path coefficient =0.64), and was followed by number of medium-sized roots (direct path coefficient = 0.25), and number of large-sized roots (direct path coefficient = 0.22). Negative direct effects on root were obtained with number of small-sized roots (direct path coefficient = -0.20) and stay green ability (direct path coefficient = -0.14). It is evident from this study that total number of roots, number of medium- and large-sized roots were important

contributing factors to yield enhancement in cassava, and could be used as selection criteria in genetic improvement of cassava.

.

The release of three new improved cassava varieties in Malawi.

Page 405--------411

Benesi, I.R.M, C.C. Moyo, J. Mkumbira, F.P. Chipungu. N.M. Mahungu and V.S. Sandifolo

Abstract. Cassava (*Manihot esculenta* Crantz) clones locally bred, and introduced in tissue culture form from the International Institute of Tropical Agriculture (IITA), Nigeria were evaluated together with Gomani and Mbundumali (local checks) in Uniform Yield Trials for three years at five locations of different agro-ecologies in Malawi. The clones were also evaluated on-farm in five Agricultural Development Divisions (ADDs). The objective was to further evaluate promising clones and select potential varieties to be released to farmers. The ideal varieties are those that are high yielding, resistant to major pests and diseases, and are adaptable to local environmental conditions. Results indicate that among the

introductions. TMS91934 and TMS60142B had average root yields of 19.6 and l3.6tons per hectare, respectively, while MK91/478(locally bred) had average yields of 20.7 tons per
hectare compared to the local checks: Gomani (13.2 tons per hectare) and Mbundumali (13.1 tons per hectare). The yields were also stable across environments. The improved clones showed field resistance to cassava mosaic disease (CMD) and cassava green mite (CGM). Similar trends were observed under farmers'conditions. The improved clones were higher yielding and more tolerant to CMD than the local varieties. These results were Presented to Malawi Agricultural Technology Clearing Committee on 18th May, 1999 and this committee officially released these varieties for farmer growing, with the following names: MK91/478 was named as Mkondezi, TMS60142B was named as Silira and TMS91934 is now called Maunjili.

Genetic improvement of the white yam by gamma irradiation of white yam mini-tubers.

Page 412------417

Nwachukwu, E. C. and I. U. Obi

Abstract. The white yam, *Dioscorea rotundata*, poir, is a difficult crop to improve by hybridization because many cultivars of the species do not flower at all and those that flower do, do so irregularly. There is also the problem of high ovule abortion after crosses and low fruit and seed production thus the inclusion of mutilation induction in our genetic improvement strategies for the yams. In the present report, mini-tubers of white yam, var. “Obiaoturugo”

exposed to gamma ray doses, 0,10,20,30,40,50,60, 70, 80 and 90 Gy were evaluated at the MV_1 and MV_2 generations. At the MV_1, generation, increasingly dosages of gamma ray irradiation progressively inhibited sprouting of setts isolated from treated mini-tubers as indicated by the number of days to first sprout, 50% sprout and the mean percentage sprout. These effects were more severe on setts isolated from the tail (T) region than those from the head (H) region of the mini-tubers indicating that the tail region is more radiation sensitive than the head region. Also, the plant heights, number of leaves, number of nodes and the mean tuber yield per stand decreased with increased gamma ray

dosages. LD_{50} (50% lethality) and GR_{50} (50% growth reduction) were observed at 40Gy and 30Gy respectively. There was complete inhibition of sprouting (100% lethality) at doses higher than 80Gy. At the MV_2 generation, the observed differences among the treatment means disappeared (were not significant). Mutant dwarf yam lines that may be cropped without excessive staking have been isolated.

Evaluation du rendement de 4 varietes ameliorees de manioc a differentes periodes de recolte en Guinee maritime

Page 418------420

Bah EI-Sanoussy et Savane djibril

Abstract. Cassava is an important food crop security in Guinea. It is cultivated for a period of seven months with a low yield of 6t/ha because of high infection of African cassava mosaic disease. The improved varieties cultivated for a period of 12 month are considered by the farmers unsatisfactory. Four improved cassava varieties were selected in our yield trials and evaluated for three seasons (1997 - 2000) at Foulaya station. Each variety was planted in a plot with ten ridges at an interval of one meter between plants in a randomised complete block design with four replications. Data was collected for fresh root yield at 6,8,10 and 12 months after planting (MAP) and analysed using Genstat. The results showed a variation of fresh tuber yield between yean for each variety and the varieties 92B/0033 and Tokumbo gave the highest yields. Between 8, 10

and 12 MAP, the yield did not vary much for H Tokumbo, while for the variety 92B/0033, the yield variation was not much different between 6 and 8 month after planting. The other varieties showed a significant variation for fresh root yield between the four harvest periods. It can be concluded from this study that Tokumbo can be harvested at 8 MAP and 92B/0033 at 6 MAP with a reasonable fresh root yield.

Evaluating sweetpotato clones for consumers in southwestern Nigeria

Page 421--------425

Edebiri, 0; Egeonu, IN and Akoroda, MO

Abstract. Sweetness, consistency, fibre content and yields are good criteria determining consumer's preference of boiled sweet potato (*Ipomoea batatas* L.) roots in the south-western Nigeria. From July 2000 to September 2001, some 15 sweet potato clones were evaluated at Ibadan so as to recommend suitable ones for cultivation and consumption in this

area. Three trials was carried out within this period in the field, polybag and then field environments. The mean fresh root yield for all trials across 3, 4, and 5 months after planting range from 1.57 to 12.66, 5.81 to 26.96 and 14.18 to 48.10t/ha respectively. Dry matter yield of root ranged from 0.56 to 4.67, 2.04 to 11.58 and 3.81 to 18.37 t/ha respectively in the same harvest periods. The fresh shoot yield for 3 and 4 months after planting ranged from 7.59 to 33.33 t/ha, and 7.92 to 45.87 t/ha respectively. While the dry shoot yield was 2.24 to 12.83 t/ha, 3.78 to 12.9t/ha Within the same period of harvest. Orange flesh Gr-3-25, Aob-25, TISXDB, Kayode and Shaba had the highest tuber and shoot yields. The clones found to combine low sweetness, high consistency, low

fibre content and high yielding potentials were TIS4400-2, Gr-3-25, Aob-25, TIS8250-op-1.50 and Orange flesh. These are recommended for on-farm trials for eventual cultivation by farmers.

Farmer participatory cassava variety evaluation and selection in Uganda.

Page 426-------434

G. N. Ssemakula, A. Bua, Y. K. Baguma,
S. Tumwesigye, W. Sserubombwe,
T. Alicai and C. Omongo

Abstract . Researchers in Uganda have traditionally

handled cassava variety development and evaluation with very little involvement of farmers. The

researchers have always been guided by information from both the extension service and informal/formal dialogues with farmers. Varieties developed basing on such information have very often fallen short of the farmers' expectations. Experience from elsewhere indicates that farmer variety needs can best be addressed by empowering their participation in variety development and evaluation. Against this background, the cassava program of the National Agricultural Research Organization, (NARO) in Uganda, initiated farmer participatory variety evaluation and selection in a bid to increase adoption of released cassava varieties. To date, seven varieties evaluated and selected jointly with farmers have been promoted for on-farm testing and preliminary findings indicate that 5 out of these varieties are highly acceptable to farmers. Three of these varieties have been officially released.

Importance of Disease in Participatory Cassava Breeding.

Page 435------437

Moses, E. , J.N.L Lamptey, J. Manu-Aduening, R.W. Gibson, R.L. Lamboll, G.M. Ampong and A. A. Dankyi

Abstract. A total of 18 families of cassava were evaluated for resistance to African Cassava Mosaic Virus (ACMV) and the major diseases of cassava. anthracnose (CAD) and bacterial blight (CBB) in a farmer participatory programme. The germplasm were evaluated under farmers conditions at two locations, Nkaakom and Aworowa (forest and forest-savanna zones) in Ashanti and Brong-Ahafo regions respectively. A third trial was sited on-station at Kwadaso (forest zone) in Ghana. The experimental treatments consisted of 14 half-sib families obtained

from crosses between *Manihot glaziovii* and landraces of M. *esculenta* ftom Ghana. Togo and Nigeria. Seeds of these families were obtained from I1TA, Ibadan, Nigeria. In addition, four released superior varieties were included as checks. Each family on the average was made up of a population of 40 plants. At each of the locations, a total of 30 farmers and a scientific team evaluated the germplasm. The main purpose of the project is to select for disease resistance particularly to ACMV with the participation of farmers. Scientists and farmers evaluated the germplasm at the 6th month and the 12th month (at harvest). In addition, Plant Pathologists collected data on the 3rd, 4th and 8th months after sowing seeds. Farmer's preference to genotypes and their reasons for selection were documented. At the three different locations farmers, reasons for preferring a particular genotype was

based on criteria such as healthy green leaves, stem sizes, branching of stem, nature of canopy, suitability for inter-cropping and cracks in the soil around a plant indicating potential for good bulking. Few farmers at the three locations mentioned disease resistance or tolerance as a criterion for selecting a variety. The families TME 9, TME I, TME 279 and TME 498 had over 50% of individuals showing no visible symptoms to ACMV: Some individual plants in certain families were severely affected by ACMV (with disease severity of 5 on a scale of I -5). Several of these individuals were stunted and therefore rejected. Cassava bacterial blight was recorded in

some of the families. Severity of anthracnose was low in most of the families.

Screening yams (*Dioscrea spp*.) for Organoleptic Quality

Page 438------441

Adeniji M. 0. and Asiedu R.

Abstract. An experiment was carried out at the International Institute of Tropical Agriculture (I1TA), Ibadan, Nigeria, to assess genotypes of *alata* and *D. rotundata* for organoleptic quality of their tubers. A 9-member sensory evaluation panel assessed the quality of two popular food products

(‘boiled yam’ and ‘pounded yam’) Prepared from tubers of 67 genotypes of *D. rotundata* and ‘boiled yam’ from 104 genotypes of *D. alata*. The *D rotunata* tubers were obtained from Advance

Yield trials while the *D. alata* ones were from

Advanced and Uniform yield trials. The attributes scored with respect to ‘pounded yam’ were colour, sheen, smoothness, consistency, elasticity, and

hardness. For ‘boiled yam’ taste, colour, softness,

mealiness and wetness were scored. Subjective

evaluation of quality of boiled *D. alata* tubers

Showed that 5% of the genotypes screened were

liked extremely, 55% moderately, and 9% were disliked. Regression analysis showed that smoothness

accounted for 60% of the variation of general

acceptability. In *D. rotundata*, ‘boiled yam’ from 6%

of the genotypes screened were liked extremely, 78%

moderately, and 2% were disliked. Taste accounted for 64% of the variation in general acceptability Pounded yam from 19% of genotypes from the same species were liked extremely, 64% moderately and 6% were disliked. Smoothness contributed 68% of total variation in general acceptability of pounded yam

A model for characterization of root and tuber crop germplasm in Ghana based on cassava

Page 442----447

0. Safo-Kantanka, E.Y. Boampong, I.K. Asante and S.K. Offei

.

Abstract. Germplasm collecting and conservation of root and tuber crops have long been neglected in Ghana and genetic erosion has been evident in some of these crops. For a number of years now, cassava breeding in Ghana has been undertaken through the introduction of germplasm from international research centres, especially the International

Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria. Under the National Agricultural Research Project of 1991-1997, germplasm collecting of root and tuber crops was initiated to fill this vacuum. A large number of accessions were collected and in some cases handling became difficult with consequent loss of germplasm. This paper reports on work that has been done on cassava germplasm collected from one region of Ghana and how it has been handled. The steps involved were morphological characterization followed by cluster analysis.
A representative sample was then taken for molecular characterization and also followed by cluster analysis. This has led to the selection of some promising materials for subsequent evaluation and the creation of a core sample that can be conserved in-vitro. Under the Root and Tuber Improvement Programme (RTIP), this approach has been recommended for the remaining root and tuber crops.

Morpho-Agronomic Characterization of Cocoyam (*Xantbosoma sagittifolium* (L.)

(Schott) Germplasm in Ghana

Page 456------460

Opoku-Agyeman, M.O. , S.O. Bennett-Lartey, Carol MarkweP, S.K. Boateng

Abstract. Cocoyam is a staple crop in West Africa grown mainly in Cameroon, Gabon and Ghana. The starchy cormel and tender green leaves of cocoyam consumed in various ways are excellent sources of Carbohydrates and minerals. Seventy-eight accessions of cocoyam (*Xanthosoma sagzttifohum* (L) Schott) were collected from seven regions of Ghana to gather the available varieties for conservation and use. The materials were planted at the Plant Genetic Resources Centre (PGRC), Bunso

and characterized morpho-agronomically using the International Plant Genetic Resources Institute's (IPGRI) descriptors for *Xanthosoma*. Twenty-two qualitative and nine quantitative characters were studied. Two main groups were found based on the pseudo-stem and the coloration of the apical portions of cormels. Three groups were however found based on cooked tuber qualities. A cluster analysis revealed eight distinct groupings as against five glaring groups. A further characterization using Molecular method is recommended to reveal more variability or otherwise in the germplasm.

Evaluation of phenotypic Variation in water yam (*Dioscorea alata* L.) germplasm using multivariate analysis.

Page 461------468

C.N.Egesi, R. Asiedu, J.K. Egunjobi And S.Ogunyemi.

Abstract. A multivariate study based on agro botanical

traits of 40 water yam (*Dioscorea alata* L.*)* accessions was carried out to evaluate individual and group variations and to identify the most relevant characters for distinguishing them. The first five principal components (PCs) were identified which together explained 63% of the total variation. The 1st PC (27% of the variation) was associated with distribution of anthocyanin on leaves and stems and with tuber characteristics. The 2nd PC (12% of the variation) was associated with leaf and stem dimensions. The 3rd PC (10% of the variation) was associated with foliar diseases symptoms severity ratings and percent tuber dry matter content. Cluster analysis revealed the differentiation of the accessions into two major groups with 9 subgroups. Grouping was not according to geographic origin of the accessions. Accessions with great potentials as parents in breeding programs were identified. The level of variation observed in this study indicated that an expanded germplasm collection might be necessary to ensure a broader representation of the water yam for breeding and improvement purposes.

Genetic relationships among local cassava germplasm in Sierra Leone based on agro-botanical characteristics.

Page 469------475

Massaquoi F.B., A. Jalloh and A.G.O. Dixon

Abstract. Some 123 accessions of local cassava germplasm was collected in Sierra Leone in 1999 and evaluated for 34 agrobotanical traits at two locations (Njala and Newton) in 2000. Principal component analysis conducted using the correlation matrix of

the 34 agrobotanical traits showed that the first four principal components accounted for 32.5% of the total variability. Storage root length, canopy height, storage root weight, severity of the African cassava mosaic disease, and plant height had higher weights in the first principal component which accounted for 14 % of the total variability. Higher absolute weights were also given to storage root weight, in addition to stem color, severity of cassava bacterial blight and fiber content of the storage roots in the second principal component, which accounted for 6.9 % of the variability. Canopy height which was also important in the first principal component, and sprouting percentage were important in the third

principal component, while petiole length, color of unexpanded and the first fully expanded apical leaves, pulp color of storage roots were important in the fourth principal component. The last two principal components accounted for only 6.3 % and 5.3 % of the total variability, respectively. The scatter diagram of the principal component scores for the first two principal components grouped the 123 accessions into 10 groups of clusters, which illustrate their genetic relationship with respect to the 34 agrobotanical traits evaluated. Within cluster groups, genotypes are genetically related and between groups, genotypes are unrelated suggesting that some of the accessions. The present study showed

that several of the accessions are genetically related as evident from the two larger cluster groups with 50 and 56 members, respectively. Varieties in a particular farmer's fields may not be unique as there is high degree of turnover of the varieties grown by farmers, who are continually introducing new genotypes with desired attributes from neighboring villages and region. Hence such genotypes may not be unique to those particular villages or locations, where the accessions were collected. The genetically distant groups of accessions may carry other sources of genes for desirable traits, because, cassava, being an open-pollinated and heterozygous plant, recombines on farmers' fields and also outcrosses to related species, resulting in greater genetic variability. Farmers' selection for adaptation to local conditions and utilization has taken place and numerous varieties may have emerged. It is thus important to make an extensive and complete collection of local germplasm in the country. The establishment of the genetic relationship of the cassava germplasm in the study would be useful in

the selection of parental materials in the breeding program in Sierra Leone for maximization of heterosis and hybrid vigor for desirable characteristics.

Genetic diversity in 96 accessions of cassava as revealed by random amplified polymorphic DNAs (RAPDs)

Page 476----------481

S.K. Offei, E.Y. Danquah, E. Okai, H.D. Mignouna and A.G.O. Dixon

Abstract. Some 96 accessions of cassava (*Manihot esculenta*) were evaluated for genetic diversity using random amplified polymorphic DNA (RAPD) primers. Ten out of 80 primers were considered highly informative and were used to fingerprint all of the accessions. Amplification of genomic DNA with the

primers revealed a total of 63 different banding positions ranging from 0.3 to 2.0 kb. The number of bands per primer ranged from five to nine. The RAPD patterns were highly reproducible. While no variation was observed among plants belonging the same accession, a large number of inter-accession polymorphisms enable us to reliably discriminate between all of the accessions. Cluster analysis based on the unweighted pair group method with arithmetic averages (UPGMA) using the Jaccard's coefficient separated the accessions into two major groups (accessions Acwl26, Mc90022, Kav90007, Kav90004 & Jk90021 in one group and the rest in the other group) at the 27% level of similarity. Some of the accessions with the same

local name were put in the same cluster whilst some duplicate accessions clustered into different groups. Accessions Kav90004 ‘Trailaoko’ and Eop8903 were the most distant accessions with similarity coefficient of 8% whilst Eop9802 ‘Yebesi’ and Eop9801 were the most closely related (87%).

Identification of molecular markers associated with a new source of resistance to the cassava mosaic disease.

Page 482----485

Yvonne Lokko, Melaku Gedil A.

Dixon, S. Offei and Eric Danquah

Abstract. The main source of resistance to the cassava mosaic disease (CMD) is known to be polygenic requiring multiple environmental evaluation to characterise resistant genotypes, which makes the detection of genes for resistance using segregation analysis inefficient. Bulk segregant analysis (BSA) and linkage analysis were used to determine molecular markers linked to resistance to CMD in a resistant cassava landrace. An SSR marker SSR30-180, which explained about 58% of the total variation, was found to be closely associated with resistance. Linkage analysis revealed

that the marker was 13.2 cM from a putative CMD resistance locus. When used to genotype 23 cassava clones with varying levels of resistance to CMD the marker revealed difference between some of clones with respect to the marker SSR-180, suggesting that different alleles may be involved in cassava resistance to CMD. The implication of the results in breeding for resistance to CMD is discussed.

Variation and genetic mapping of quantitative traits in an F intraspecific cross between two non-inbred parents in cassava (Manihot esculenta Crantz)

Page 486------497

Okogbenin E. and M.A. Fregene

Abstract. Quantitative trait loci (QTLs) for several important agronomic traits of cassava were mapped and characterized in an F_1 population of an intraspecific cross between TMS 30572, the female parent and CM 2177-2 the male parent. A molecular linkage map of this cross that was previously constructed based on 150 F_1 individuals and 278 markers were used for QTL mapping. The mapping

population was grown under field conditions at two distinct locations in the mid-altitude agro-ecological zone of Colombia. Plants were scored for plant height (PH), length of stem with leaves (LSL), fresh root yield (FRY), dry root yield (DRY), dry matter content (DMC), harvest index (HI), and fresh shoot weight (FSW). Large segregation was observed for these seven traits leading to diverse phenotypic variation in the Fl mapping population. Broad sense heritability estimates were moderate to high for these traits which showed significant genotype by environment interaction effect. For each trait, between 2 and 6 QTLs were identified with individual effects ranging between 6% and 19%

Altogether, the seven traits studied revealed 29

QTLs. QTL mapping results showed that some

QTLs (24%) were shared between FSW and component traits and similarly between root yield and foliage developmental traits. A general coincidence of the locations and direction of the effects of QTLs for related traits suggest pleiotropism as the most likely reason for the significant correlation observed between these traits. Identification of genomic regions controlling agronmically important traits provides ample opportunities for breeders to explore segregants from crosses and develop new genetic combinations that may have important applications in crop improvement through marker-assisted selection.

Effect of explant age on in vitro development of three Dioscorea species.

Page 498------501

Quain M.D. and Acheampong E.

Abstract. In tissue culture work, the main procedure begins with the introduction of plant material in vitro. The type of plant material used and the stage of development have a vital role to play in the development of culture. Nodal cuttings from vines of green house grown *D. alata*, *D. bulbifera* and *D. dumentorum* and were harvested over 20 week period

at two weekly intervals between the months of March and July. These were cultured on complete Murashige and Skoog's (MS) medium supplemented with 3% sucrose and 5/µM Benzyl amino purine (BAP), 0.5µM Naphthalene acetic acid (NAA) and solidified with 0.7% agar. Cultures were incubated under two photoperiods, namely; 12hours alternating light and dark and continuous darkness. After a 6-week period of incubation, cultures were transferred to MS medium supplemented with 0.08µM BAP for shoot development. The results indicated that to obtain rapid in vitro initiation of nodal cuttings and to have consistent growth in vitro, it is best to use explants from vines aged 2 weeks of *D.*

bulbifera, 6 weeks of *D. dumentorum* and *D. alata*. The results also indicated that nodal cutting cultures of *Dioscorea* species could be initiated under both 12hour photoperiod and continuous darkness conditions.

Cryopreservation of cassava

(*Manihot esculenta* Crantz)

Page 502------505

O.J. Adeniyi, M.O. Akoroda and

S.Y.C. Ng

Abstract. This study intended to develop and /or adopt the best cryopreservation protocol for the African cassava germplasm. Eleven protocols were Investigated. One protocol focused on the tolerance of pre growth meristems to DMSO (Dimethyl sulphoxide). The other 10 were cryopreservation protocols and were employed to determine the best possible procedure involved in terms of recovery rate. Seven cultivars obtained from the International Institute of Tropical Agriculture were used. These include TMS M80/00106, TMS 63397, and TMS 60142 TMS 30001, TMS 91/02324, TME 1 and TME 2

Amongst the seven DMSO concentrations tested on pregrowth meristems of four genotypes, 0 5% (v/v) DMSO was the right concentration in which highest tolerance was found. From the ten cryopreservation protocols carried out, five different dehydration period were tested. A 5-hr dehydration using alginate-bead dehydration method of cryopreservation emerged the best. It was evident that modification introduced at the cryoprotection stage was reasonable as 5% DMSO performed best when used alone as a cryoprotectant while 0.5% DMSO combined with calcium alginate and high sucrose proved equally good for cryopreservation of meristems and node cutting.

Integrated control of cassava bacterial blight by (1) combined cultural control measures and (2) host plant resistance adapted to agro-ecological conditions, and (3) improved pathogen detection

Page 506-----515

Wydra, k. Agbicodo, E. Ahohuendo, B., Banito, A. Cooper, R.M., A. Dixon, R.,Jorge, V., Kemp. B., Kpémoua, K. Rudolph, K., Verdier, V., Witt, F., Zandjanakou, M., Zinsou, V.

Abstract. Results of a collaborative EU-financed Project. a follow-up of a BMZ-financed research project at the International Institute of Tropical Agriculture (IITA) (1994-1999), with the partners listed above the German institutes being the coordinators are presented. The investigations resulted in up-to-date survey data on major cassava

diseases in Togo data from other West African countries had formerly been collected at IITA, the identification of locally and regionally well adapted control measures, using locally preferred, resistant varieties, intercropping with locally used crops, soil amendments with available material, fertilization, and recommendations on sanitary measures to reduce the disease. Few local varieties were selected as resistant after evaluation in multi-locational trials in various ecozones under inoculation with local, virulent strains as well as after challenging by a set of highly virulent strains from various geographic origin under glass house conditions. The cassava genome mapping population was tested for reaction towards African strains and new genetic markers

were identified. Pathotypes of African strains were found, leading to a differential reaction of genotypes of the mapping population. Quantification of in bacterial population dynamics in plants indicated the occurrence of resistance mechanisms in leaves

and stems, as well as genotypes expressing
| resistance on both or only on one level

Complementary studies by the European partners

and of African guests at European laboratories

elucidated some mechanisms of resistance, on

biochemical as well as molecular genetic level

DNA-AFLP, genes of pr-proteins), and molecular

host-pathogen interactions (specific interaction of

cell wall pectin with bacterial protein). Wax analysis

revealed an indication of a possible role of leaf

surface waxes in resistance. New methods for detection of *Xanthomonas campestris pv .manihotis*

using immunological (polyclonal, monospecific antiserum) and genetic techniques (nested PCR dot-blot). Were developed. In a project workshop recommendations to farmers, breeders, plant quarantine services and pathologists were formulated.

Reactions of white yam (*Dioscorea rotundata* Poir.) genotypes to three viruses

infecting yams

Page 516----521

Odu. B.O., J.d'A. Hughes, R. Asiedu, S A Shoyinka and O.A. Oladiran

Abstract. Reactions of 24 white yam (*Dioscorea rotundata* Poir.) genotypes to three viruses mechanically and vector transmitted were studied, and results were confirmed by enzyme-linked immunosorbent assay (ELISA) and symptom development. Dioscorea alata virus (DAV) genus Potyvirus; family Potyviridae, Dioscorea alata bacilliform virus (DaBV) genus Badnavirus, and Cu-

cumber mosaic virus (CMV) genus Cocumovirus, family Bromoviridae were the viruses whose reaction were studied in the D. -rotundata genotypes. The results obtained from the study showed that of all the infected genotypes, only TDr 95-128, a landrace cultivar from Nigeria, developed symptoms of infection to both CMV and DaBV in mechanical and vector transmission respectively. Of the 24 *D. rotundata* genotypes inoculated with the three viruses, ELISA showed that 9 remained uninfected by DAV, 11 were uninfected by CMV, and also by DaBV Genotypes TDr 747 and TDr 1640 show extreme resistance to all three viruses.

Nematodes: pre- and post-harvest pests of root and tuber crops in tropical and sub-tropical agriculture. A brief overview

Page 522-------526

Danny Coyne

Abstract. With a few specific exceptions, damage caused by nematodes to plants is often overlooked, misdiagnosed to secondary infections or attributed to unknown causes, nutrient deficiency, soil fertility decline or ‘soil sickness’. The visual impact of nematode damage is usually considerably less than

for example, the damage caused by insect defoliation, fungal pathogens or dense weed growth. Information on the economic importance of or the

damage caused by nematodes to tropical or subtropical crops is also scarce. This is partly due to

the relatively low number of people working on

nematode problems in the tropical and sub-tropical

regions, which is reflected by the number of publications on nematode related problems, in comparison with other areas of pest management. Securing

financial support for research on nematode related

problems, therefore, is constrained in that hard data

on nematode related losses is scarce, incomplete or

absent, providing little justification for such support. Secondly, the lack of obvious damage by nematodes further undermines the perceived need for

nematology research in the absence of hard data.

Consequently, research into nematode related problems tends, in general, to trail in the wake of other

disciplinary research. Pest management progress in

cassava, for example, has witnessed remarkable

achievements recently in the management of African cassava mosaic virus, cassava mealy bug, cassava green mite, and overall germplasm improvement. Speculation from the scant information available, is that root-knot nematodes are potentially serious constraints to cassava production. Under heavy infection, 98% yield losses have been reported and
in a survey in Uganda, 100% of fields observed were infected. Yet little attention has been paid to this potential constraint. On yam, the yam nematode (*Scutellonema bradys*) is a primary constraint to

increased adoption of the crop. Diseases have been

the focus of five times more articles than nematodes

however, over the past decade. For many crops in

tropical and sub-tropical conditions, basic diagnostic information on plant parasitic nematode occurrence and distribution is unavailable, necessary prerequisites to the

development of any pest management strategy. Donors are increasingly reluctant to support work based on ‘possible’ problems or for investigative diagnostic surveys. This paper provides a brief overview of nematode related problems in root and tuber crops and the potential implications of nematodes in relation to the increasing demands being made on available land.

Pests and Diseases of Potato (Solarium tuberosum L.) in Nigeria

Page 526----532

Nwauzor E.C. and Dalyop T.

Abstract. Potato like any other arable crop in Nigeria is fraught with a number of problems that limit its production output. Pests and diseases constitute a major limiting factor. Some of the pests and diseases are exotic, coming with initial introduction of the crop and subsequently with the importation of new varieties into the country, while others are indigenous. Although many pests and diseases are associated with potato, all are not of major economic consequences Some attack the crop in the field or in storage while others

commence their attack in the field and continue in store. Damage/symptoms range from leaves deformation and defoliation, wrinkling, lesions and chlorois of leaves, flower abortion, necrosis and rolling of leaves to stunted growth, wilting and total collapse or death of the plant. Necrosis and rottening of tuber knots or galIs and cracks on tubers are common. Loss from lack of control of these pests and diseases could be as high as 100%. This paper tries to identify and highlight the major pests and diseases of potato encountered in Nigeria. The economic consequences and available control measures are also given. The paper is organized into four main sections. The first is a general introduction of the subject. The second and third deal with the pests and diseases respectively while the last section is devoted to future perspective

and outlook with particular reference to pest and disease management in potato industry in Nigeria.

Comparative Analysis of Insect Pest, Disease and Nematode Incidence on Dry and Rainy Seasons planted Yams in Benue State, Nigeria

Page 533-----536

Ezulike T.O., E.G. Nwauzor and G.C. Orkwor

Abstract .The trial was carried out at the research farm of National Root Crops Research Institute Sub-Station, Otobi, Otukpo, Benue State of Nigeria. The objective was to compare the insect pest, disease and nematode incidence in the dry and rainy seasons planted yams. Four cultivars of D. rotundata (Nwopoko, Obiaoturugo, Asangwu and Ododio) and one cultivar of *D. alata*. Urn 680 were planted as seed yams in mounds in January 1994, for the dry season planting, and in April, for the rainy season planting. The trial was repeated in 1995. Insect pests, diseases and nematodes incidence were higher in

rainy, than in dry season planted seed yams. The yam tuber yield per hectare was significantly higher for the dry, than for the rainy season planted seed yams.

Screening sweetpotato cultivars for susceptibility to Rhizopus oryzae

Page 537------541

Muhanna M., D. Rees and J. Aked

Abstract. Studies carried out in 1997 and 1998 at Morogoro, Tanzania identified *Rhizpus oryzae* as the most important post-harvest pathogen that cause rotting of the roots in that region of Tanzania. In 1999 ten sweet potato cultivars commonly grown in Tanzania were screened against *R. oryzae* at Sokoto university of Agriculture (SUA) in Tanzania.

Cultivars were screened under high humidity conditions (95%). Temperature fluctuated between

27°C -31°C. During screening roots were Inoculated with discs of mycelia cut from the edges of three days old colonies of *R. oryzae*. Each disc was placed into the wound (11mm depth) made at the middle position of the root. Storage duration was three days. Significant difference ($p < 0.05$) among cultivars in susceptibility to *R. oryzae* was noted in almost all the screening experiments. The least susceptible cultivars were Budagala and Sinia, while the most susceptible cultivar was SPN/0.inconsistent susceptibility levels over seasons were observed for cultivar, Iboja.

The deployment of resistant sweet potato varieties in areas of Uganda where sweetpotato virus disease is prevalent

Page 542-----544

Gibson R.W., V. Aritua, l. Mpembe and J. Kalongs

Abstract. Previous surveys have identified that sweet potato virus disease (SPVD) is prevalent in sweet potato in Masaka and Rakai Districts of Uganda. Although direct yield loss occurs, a major source of yield loss is that farmers are unable to grow high-yielding but susceptible cultivars. Key

attributes claimed for several varieties of sweet potato recently released by Namulonge Agricultural and Animal Production Research Institute include a high yield of tuberous roots and resistance to SPVD. Therefore, a series of on-farm trials have been done (1999 - 2001) in collaboration with contact farmers of the Buganda Cultural and Development Foundation to test the potential benefits these new varieties might have for farmers in Masaka and Rakai. A high yield coupled with low SPVD incidence has been confirmed for several of the new varieties in on-farm trials in these two districts and farmers have begun to adopt them.

Control of postharvest fungal rot of white yam (Dioscorea rotundata Poir.) with botanicals.

Page 545---550

Sangoyomi, T.E., R. Asiedu and E.J.A. Ekpo

Abstract. Crude extracts from ten plants common in Nigeria were screened for their effects on major pathogens of the yam tuber in order to identify

suitable botanicals for control of rots during storage.

The effects of the extracts on growth of mycelia and production of spores/sclerotia by fungal pathogens were studied in vitro using the food poisoning technique. Agar plates containing crude extracts from specific plant species were inoculated at the centre with 4 mm-diameters of the respective fungal mycelia. All plates were incubated at 28°C and radial growth was measured daily for four days. The crude extract from *Allium sativum* caused 100% inhibition of the growth of *Botryodiplodia theobromae*, *Penicillium oxalicum*, *Rhizoctonia solani*, *Sclerotium rolfsii*, *Aspergillus niger* and *Aspergillus flavus*. It also reduced radial growth of

Fusarium moniliforme, *Fusarium oxysporum*, *Fusarium semisectum*, *Setosphaeria rostrata*, *Colletotrichum gloeosporioides*, and *Nattrassia mangiferae* compared to growth on the control. The crude extract from *Zingiber officinale* completely inhibited the growth of *Setosphaeria rostrata*. Hibiscus *rosa-sinensis* caused 75% reduction in growth of *Fusarium oxysporum* and *Fusarium semisectum* while *Ocimum gratissimum* caused about 80% reduction in the growth of *Rhizotonia solani* and *Sphaerostilbe repens*. Extracts from the other plant species (*Cymbopogon citratus*, *Chromolaena odorata*, *Azadirachta indica*, *Acalypha wilkesiana*, *Cassia alata*, and *Enantia chlorantha*) were not effective in reducing growth of the pathogens.

Subsequent in vivo studies have confirmed the effectiveness of the crude extract from *Allium sativum* in protecting yam tubers from fungal rots. Boiling destroyed the functions of the active ingredients in all the plant species if used during extraction.

Yield performance and late blight reaction of different potato genotypes in the highlands of Ethiopia.

Page 551-----553

G.Medhin W. Giorgis, Ramzy EI-Bedewy.
Bekele Kassa Modesto Olnya
Endale Gebre Atsede Solomon, and
Berga Lemaga

Abstract. Twelve potato CIP clones with a local check were evaluated in 1998-1999 long rainy season at differ agro-ecological zones in Ethiopia (altitudes 1700-2800 masl). The objective of the study was to identify potential clones for release. These clones were evaluated for tuber yield, late blight and other agronomic traits. In 1998 clones CIP-387792.5 and 381169.16 gave significantly higher tuber yield (38.6 & 35.9 t ha^{-1}, respectivety). All clones except CIP-386029.18 over performed The standard check Tolcha (15-8 t ha^{-1}) and the local check ((3.9 t ha^{-1}) in 1999. Clones CIP- 387792 .5,

384321.19 and 384321.9 gave higher mean tuber

yield (46.7, 44.9 & 43.3, t ha^{-1}respectively) across five location

in 1998. Late blight disease severity

in AUDPC in most of the tested genotypes
ranged from 157 to 564 while of the tested genotypes ranged from 157 to 564 while the AUDPC for the local check was 1890. The clones CIP-387792.5 and CIP-384321.19 are proposed for official release.

Reaction of 22 Potato (*Solanum tuberosum* L.) Genotypes to Wilt in Cameroon

Page 554-556

Njualem D.K., Demo P., Mendoza H.A., Koi J.T. and Nana S.F.

Abstract Bacterial wilt is the second most important potato disease in Cameroon, causes much yield reduction and storage tuber rot. To develop new varieties with good levels of resistance to wilt, 22 advanced clones bred at CIP and 4 Commercial varieties, Famosa, Desiree, CIPIRA and TUBIRA were evaluated for reaction to wilt at 6 locations in 1995 and 1996. The randomize complete block design with 3-6 replicates was used. Twenty tubers were planted per ridge of 6m. The number of wilted plants per plot was recorded each week starting 30 days after planting (DAP). The analysis of the percentage wilted plants, total and commercial yield revealed a highly

significant (P<0.01) effect of environment, genotype and genotype x environment interaction. Therefore environments had a differential effect on the above variables. Mean percentage wilted plants over genotypes at 72 DAP ranged from 10.3% at Dschang in 1996 to 89.4% at Befang in 1996. Clones LM-89.37., 377957.5, 389561.5, 389614.2 and 387091.37 showed the lowest average wilt infection of 7.0, 10.0,

12.2, 12.6 and 12.6 %, respectively. Total tuber yield averaged over the 8 environments with moderate wilt infection were from 13.9 t/ha for Desirée to 32.4 t/ha for clone 387093.5. Three clones (387093.5, 387795.2 and 387494.8) were susceptible to wilt as or slightly lower than CIPIRA. Potato genotypes differed significantly in reaction to wilt; and that evaluating genotypes reaction to wilt under severe disease condition may not be satisfactory as results obtained did not correlate well with those recorded under normal levels of infection.

Etiologie de la pourriture du manioc au Togo: identification et pouvoir pathogene de I'agent responsible

Page 557----561

Tchabana Béré et Kpemoua K.E.

Résumé : Au Togo et dans les zones Adélé et Akposso en particulier, une enquête a été menée sur la pourriture des tiges et des racines du manioc et a montré que 57% des champs ont présencé des symptômes de la pourriture. L'étude étiologique réalisé à partir des échantillons de boutures, de tiges et tubercules, a permis de mettre en évidence la présence des agents pathogénes suivants : *Botryodiplodia* (50 %), *Fusarium sp*. (19 %), *Sclerotiun sp* (5 %), *Diaporthe manihotis* (4 %). Aprés

1’inoculation artificielle, *Botryodiplodia* a provoqué des symptômes similaires à ceux observés au champ. Les autres isolats fongiques semblent jouer un rôle secondaire. En outre, 1’inoculation du cultivar Danyivi (cultivar sensible) avec différents isolats a permis de distinguer trois groupes d’isolats présentant des niveaux différents d’agressivité. L’inoculation de six cultivars en conditions contrôées par le *Botryodiplodia* a permis de distinguer les cultivars sensibles des cultivars tolérants. Des conseils sont donnés en vue de limiter á court terme les dégâts dus aux pathogènes.

Abstract : A survey conducted in Togo through

Akposso and Adélé zones on root and stem rot has showed that symptoms of disease occurred into 57% of farmer visited fields. The etiological study realised on sampled stem cuttings and tubers showed out the evidence that fungi pathogens involved in that pathogenesis process are *Botryodiplodia* (50 %), *Fusarium sp*. (19 %), *Sclerotium sp* (5 %) and *Diaporthe manihotis* (4 %). After artificial inoculations, symptoms caused by Botryodiplodia were similar to that observed in field. Then the remained fungal isolates seem to display secondary role. Moreover, 3 groups based on the aggressivity of isolates were revealed by the inoculation of susceptible cultivar Danyivi with all the isolates. Inoculation of 6 cultivars with Botryodiplodia allowed to see out in controlled conditions, the difference between susceptible and tolerant cultivars. Then some recommendations to farmers were made in other to limit damages caused by

pathogens.

Anthracnose disease of yams in West Africa: recent advances in research and future perspectives.

Page 562-----571

Abang M.M. Asiedu R. Mignouna H. D., Green K. R., Wolf G. A. & Winter S. .

Abstract. Water yam (*D. alata*) is the most widely cultivated yam species globally and is superior o *D. rotundata* in terms of factors such as yield potential, adaptability to low soil fertility, ease of propagation, early vigour for weed suppression and storability of tubers. The major limitation to the stable and reliable production of *D. alata* is its susceptibility to anthracnose disease caused by *Colletotrichum gloeosporioides* Penz. Early research emphasized chemical and cultural control measures, and programmes for the systematic breeding of yams for anthracnose resistance were largely non-existent. Chemical control measures are inappropriate for resource-poor farmers while cultural

methods are inadequate under conditions of high disease pressure. The availability of resistant varities could potentially form the cornerstone of an integrated management strategy for yam anthracnose. Collaborative research between International Institute of Tropical Agriculture (IITA), Ibadan- Nigeria and the German Collection of Micro-organisms and Cell Cultures (DSMZ), Braunschweig-Germany has contributed immensely to knowledge on the molecular taxonomy of Colletotrichum strains-associated with yam anthracnose, and on the phenotypic and genetic diversity of the pathogen. Isolates with complex virulence capabilities have been identified for

.anthracnose resistance screening of yams using rapid detached leaf or whole plant assays. Mapping populations have been developed for studies on

the genetics of resistance and the inheritance of resistance to the widely distributed fast growing salmon (FGS) strain of *C. gloeosporioides* has been elucidated. Two RAPD markers linked to anthracnose resistance were recently identified using bulked segregant analysis. Genetic studies have also led to the development of the first genetic linkage map of *D.alata* and to the identification of one QTL with minor effects and suggestions for future work on

on anthracnose resistance.Current research efforts

and suggestions for future work on anthracnose

disease of yams in West Africa are presented.

Cultural Control of Scutellonema bradys on Dioscorea spp

Page 572--------576

Claudius-Cole, A. 0., Asiedu R. and Fawole B.

Abstract. Up to 40% of tuber damage has been reported to be associated with dry rot caused by *Scutellonema bradys* in Nigeria resulting in a reduction of tuber weight and quality. Cover crops have been reported to influence nematode populations when used in rotation or as inter-crops In order to evaluate their potential, five cover crops

Aeschynomene histrix, *Lablab purpureus* *Crotolaria juncea*, *Pueraria phaseoloides* and *Mucuna pruriens (utilis*) were inter-cropped with yams on the field and in pots in a screen-house. The control for this treatment was without any cover crop. Yam varieties TDa 294 (*Dioscorea alata*) and TDr 608 (*D. rotundata*) were used for the study Except for the control, artificial inoculation of *S. bradys* was done with yam peels containing 10,000 nematodes for each plant on the field and 2,000 nematodes in pots. Nematode populations from tubers and soil associated with *Crotolaria juncea* and *Lablab purpureus*, however, were similar to those associated with no cover crop. Nematode

populations in the tubers and soil in plots/pots where yam was associated with Aeschynomene histrix *Pueraria phaseoloides* and *Mucuna pruriens* (*utilis*) were significantly lower compared to those associated with the tubers and soil that were without cover crops. These three cover crops hold promise for inclusion in yam-based cropping systems for soil maintenance.

Sources of Resistance to Cassava Anthracnose Disease.

Page 577------580

Owolade O.F., A.G.O Dixon and S.O.Osunlaja.

Abstract .A total of 436 African landraces and 497 Improved cassava genotypes were planted in 1996, 1997, 1998 and 1999 growing seasons in single row trials in an augmented RCBD. These were evaluated for their reactions to cassava anthracnose disease (CAD) under natural infection conditions at Ibadan (a high infection zone). The severity of the disease Was determined by counting the total number of cankers/plants and measuring the diameter the cankers. Data were collected at 6, 9 and 12 months after planting

The four-year data were pooled and subjected to statistical analysis using the GLM procedure of SAS. Result showed that of the 436 improved germplasm evaluated, 10 were resistant, 64 moderately resistant, 328 were moderately susceptible, and 95 were highly susceptible. The results also showed that 45 of the landraces were resistant, 87 moderately resistant, 354 were moderately susceptible, whereas 60 were highly susceptible. Of the resistant landraces and the improved, TME 19, TME53, TME113, TME244,TME 475 and TME 523; 185/02015 and 18700028 were

completely free of cankers. The resistant genotypes have been
introgressed into broad-based breeding
populations to diversify resistance to CAD in newly
improved genotypes.

Cassava System in Nigeria: Root Yield Management

Page 581-----583

Akoroda M.O.

Abstract. Cassava tuberous root yields in Nigeria

are influenced by many factors during crop growth

in farms. Management of these factors requires

careful synthesis of diverse data from many studies

to more clearly understand trends and underlying

patterns of their relationships. In the nearly past 400

years of cassava cultivation in Nigeria, numerous

field experience and piece-meal studies have been

undertaken. These studies have investigated few of the factors taken in combination. This paper is a statistical analysis of 20 such studies. The findings are that: cassava root yield is plastic and can vary widely according to farmers conditions of cultivating the crop; b) the general yield levels which currently average at 14.65 t/ha are not high enough to attract a sustained profitable production of cassava; c) new and more intense utilisation of superior varieties and a much stronger emphasis on weed control and soil fertility management through a combined application of manure and chemical fertilisers is sine qua non for a profitable medium-scale cultivation of the crop for tuberous roots production.

Cassava root rot disease in West Africa: Review of recent literature and the field situation in Nigeria, Page 584-------588

Onyeka T.J., E.J.A. Ekpo and A.G.O. Dixon

Abstract. In recent times, there has been an increasing report of cassava root rot disease in the West African countries of Benin, Cameroon, Congo, Ghana, Nigeria and Togo. Different pathogens were reported in different countries, and disease importance was related to the susceptibility of the varieties grown and the cultural practices of the

farmers. Recent literature were reviewed, and farmers fields were surveyed in Nigeria between 1998 and 1999 to investigate the distribution and importance of cassava root rot disease. Some 228 evenly distributed sites in 19 states across humid forest and forest transition ecological zones were inspected. Cassava root rot was widely distributed in the two zones, disease symptoms were observed in 115 (59.4%) of the 228 sites inspected. Field disease index was relatively higher in humid forest than in forest transition zone. A total of 115 symptomatic samples were collected from the diseased fields, from which 9 fungal general were isolated. These include *Botryodiplodia theobromae, species of Fusarium, Nattrassia mangiferae, Aspergillus niger, Rhizopus stolonifer, Penicillium oxadicum, Sclerotium rolfsii,*

Trichoderma spp and Macrophomina phaseolina. The pathogenicity of these fungi was established in the laboratory. The survey result showed that the most important pathogens of cassava root rot in Nigeria were *B. theobromae* and *N. mangiferae* considering their virulence and high field disease severity index in locations from which these pathogens were isolated.

Response of groundnut (*Arachis hypogaea* L.) in sole and intercrop with cassava (*Manihot esculenta* Crantz) to population density in an Alfisol in southwestern Nigeria.

Page 589-------593

V. 0. Aduramigba; H. Tijani Eniola and A. 0. Aduramigba

Abstract. Two field experiments were conducted

1993 main growing season at Ayepe (7°15'N;

5°90' S), Osun State, Nigeria to evaluate groundnut

performance at three densities in a cassava/ groundnut

intercrop. Experiment 1 was a farmer

managed trial (FMT), while experiment 2 was a researcher managed

trial(RMT). Cassava at a density

of 10,000 plants ha^{-1} was intercropped with

groundnut at 80,000; lOO,OOOand 160,000 plants ha^{-1}.

Both experiments were arranged in a randomized

complete block design. Results indicated that grain

yield of groundnut was depressed by cassava in

experiment 2 by 14, 19 and 23% respectively as the

densities increased; while increases of 13 and 15%

were observed in experiment 1 at the two highest densities.

Yield of groundnut ranged from 176 kg ha^{-1} to 346kg ha^{-1} in farmer's fields, and 108kg ha^{-1} to 177 kg ha^{-1} in the RMT. Cassava in mixed plots

had larger stems and increased foliage cover with

increasing groundnut population. Relative yield

values increased with increasing density (only in

FMT), indicating that less land would be used by

Intercropping cassava with groundnut at the optimal density. Suggested optimal groundnut population

in the intercrop was 100,000 plants ha^{-1} .

Effect of *Glomus deserticola* on the

yield and nutrient uptake of cassava

in an alley cropping system

Page 594-----596

Awotoye 0.0., 0. Osonubi and

0. Fagbola

Abstract .In a field investigation, laid out in split plot design with three replications, the effect of *Glomus deserticola on* the yield and nutrient uptake of cassava was evaluated. The main plot factor was inoculation with Glomus deserticola (an arbuscular mycorrhizal (AM) fungi) while the subplot factor was the hedgerow tree species. The species of hedgerow involved were *Senna siamea*, *Gliricidia sepium* and *Leucaena leucocephala*. Cassava cultivar used was

TMS 30572. In the first year of the investigation (no mulch application), AM fungi inoculation significantly increased the fresh tuber yield of cassava in both alley and sole-cropping plots. The increase ranges from 65% to 72%. Under each hedgerow, the increase in tuber yield due to AMF inoculation was in the order *Gliricidia* > *Leucaena* > *Senna*. In the second year of the investigation when pruning from hedgerow trees were applied as mulch, AMF inoculation significantly improved the fresh tuber yield of cassava only under Gliricidia and sole cropped plots. Under Senna, there was a reduction in fresh tuber yield when mycorrhizal inoculated plots was compared to the non-mycorrhizal plots, although the reduction was not

significant. Uptakes of N, P and K were significantly increased by mycorrhizal inoculation in either sole or alley-cropped plots. On the average, uptakes were 2-3 folds higher in the mycorrhizal inoculated plots compared to the non-mycorrhizal inoculated plots.

There was no consistent trend in the uptake of Ca and Mg with reference to AM fungi inoculation.

Bacterial tuber rot of seed yams (*Dioscorea rotundata*) in Nigeria and the Republic of Benin

page 597-------602

Ayodele M., J. d'A. Hughes, and R.Asiedu

Abstract. Bacterial species notably Erwinia *carotovara*, *Pseudemonas* sp, and unidentified bacterium were isolated from dry soft rot portions from 68 seed yams from nine cultivars/clones obtained from Nigeria and the Republic of Benin. The ability of the isolated bacterial species to cause

the rot was proved through pathogenicity test. In

hypersensitivity tests, the Erwinia carotovara isolate was more pathogenic than the Pseudemonas

sp and the unidentified bacterium species.

Production of Yams (Dioscorea spp.)in Sierra Leone: Initiative

Identification and potential use of RAPD markers linked to cyanogenic potential in cassava

page 603-----607

Ida Dossou-Yovo, Jacob H. Mignouna, Jesse Machuka, and Mpoko Bokanga

Abstract. Cassava breeding programs routinely measure the content of cyanogenic compounds in cassava roots at harvest using either the rapid and less accurate picrate method or the more accurate but more complex enzymatic method. We report here the first DNA marker for the cyanogenesis trait in cassava. Four out of 60 RAPD primers tested gave a stable polymorphism enabling to distinguish low-cyanide from high-cyanide varieties. Through Bulked Segregant Analysis, it was confirmed that the RAPD primer OPT7 gave a polymorphic band at 850 bp in low-cyanide varieties which is not found in high-

cyanide varieties. A genetic linkage map was constructed using the progenies of a cross between a high- and a low-cyanide genotypes. The $OPT7_{a850}$ marker was found to be located 2.1 centiMorgans away from the cyanogenesis gene locus. Such a marker when converted to a SCAR marker will be useful in the identification of low-cyanide genotypes, not only at harvest time, but at any stage of the cassava plant growth cycle.

Regional Integration of Demand-led Root Crops Research and Development: The Case of SADC countries.

page 608----- --615

N.M. Mahungu, S. Kolijn, P.T. Ewell,

M. Andrade I Kasele , J. Teri, A.K. Muimba, C.H.L. Mwale, V. Sandifolo, A. Mhone and F. Gondwe

.

Abstract. Since 1994, SARRNET activities in SADC region have taken a pragmatic and holistic approach to broaden its mandate to accommodate issues for the demand-led research and development to achieve high levels of commercialisation, a strong and vibrant private sector participation, increased environmental protection, expanded crop diversification and improved nutrition and health including involvement in HTV7AIDS programmes. Cassava and sweetpotato production in SADC countries is mostly done by small holder farmers for food security reasons. The average annual growth rate for cassava and maize

are at par registering 1.95%. The growth rate for cassava in the Sub-Saharan Africa alone is at 2.77% (Scott et al). Farmers also see cassava as a profitable crop with high gross margins compared to other traditionally produced crops. A Rapid Appraisal survey conducted with farmers in Malawi indicated that the cost/benefit ratio for cassava is 1:5.36 which means that for every dollar invested, the farmer gets 4.36 dollars in return as opposed to maize (1:0.9) and tobacco (1:1.1) the main staple and cash crops respectively (Akoroda and Mwabumba, 2000). Regional networking has already led to significant payoffs in generating technology spillovers that improve the size and speed of research impacts. There have been several cases where specific varieties or technologies of cassava and sweetpotato developed in one country have proved to be well adapted and acceptable to farmers in several other countries. Technologies for processing and utilisation have also spread within the region.

Notable progress has been made in strengthening

NARS and capacity building. Over 250 candidates have improved their skills for root crops research and development through training involving short courses, attachments, and exchange visits. Eight candidates have been trained for higher degrees (6 MScs and 2 PhDs). In-country training of farmers and extension workers has been an important activity in most participating countries. Research facilities have been improved and equipment for specialized research provided to national programs in Angola, Botswana, Malawi, Mozambique, Tanzania and Zambia. SARRNET vision is to promote a dynamic economic growth in the agricultural sector in the region by linking farmers to private industries so as to develop viable small, medium and large scale

enterprises both in the rural and urban areas that will look at root crops from a business point of view. It also believes that producers will only be motivated to increase their production and productivity if they can sell their produce to dependable and sustainable local industries and exporters based on a thorough understanding of domestic, regional and international markets.

Sub-regional Partnership for the Development of Yams in West Africa

Page 616------619

C.C. Okonkwo and R. Asiedu

Abstract. Poverty Alleviation and Enhanced Food Availability in West Africa Through Improved Yam

Technologies' is a sub-regional project covering five countries. The International Fund for Agricultural Development (IFAD) approved this strategic NARS-centred project in September 1999 and it became operational from November 1999. Yam programmes in Benin, Côte d'lvoire, Ghana, Nigeria and Togo are implementing the activities in this 4-year project in partnership with potential end users, local development agencies, as well as regional and international organisations with relevant expertise on yams. The project, aimed at sustainable increase in the productivity of yam cultivation, is in its second year of operation. This paper describes its goals, objectives and the progress made.

Contribution à la caractérisation

agro-morphologiques des ignames de I’especes Dioscorea alata L. en Côte d’lvoire

Page 620-----625

Amani Michel Kouakou, Hodeba D.

Mignouna, Ng N. Q., Robert Asiedu,

Jeanne Zoundjihekpon, N’Goran

Ahoussou, Sekou Doumbia, et

G.P.Zohouri

Resumé. L’igname, Dioscorea sp. de la famille des Dioscoreacees est une plante à reproduction essentiellement végétative. Elle constitue une importante source d’énergie pour les populations des Caraibes et de 1’Afrique. En Côte d’lvoire, elle

occupe la premiére place des productions vivriéres. Et 1’espéce *D. alata* est la plus cultivée. Au sein de cette espéce, les groupes varietaux ne sont pas clairement definis. Cette étude vise à mieux caractériser les clones de 1’espéce *D. alata*. A partir de 18 caractéres agro-morphologiques, 66 accessions de la collection du Centre National de Recherche Agronomique (CNRA) ont été classées en 5 groupes variétaux. Ces groupes sont: Bêtê- Bêtê, N’Za, Douoble, Brazo et Pyramid. La forme du tubercule, la coloration des feuilles et du pétiole, la présence d’anthocyane dans le tubercule, la forme des feuilles, la production de fleurs et le sexe de ces fleurs sont les principaux caractéres retenus pour la classification. De ces groupes formes, le Douoble est le plus homogéne, tandis que le Bêtê-Bêtê est tres vaste et hétérogéne. Les Florido sont contenus

dans ce demier groupe.