

REPORT ON THE TRAINING COURSE IN  
FOOD PRODUCTION AND UTILIZATION HELD AT THE  
FACULTY OF AGRICULTURE, UNIVERSITY OF GHANA, LEGON  
FROM 27<sup>TH</sup> DECEMBER 1987 TO 8<sup>TH</sup> JANUARY, 1988

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A C C R A.



FEB. 1988.

## 1. INTRODUCTION

The Food Production And Utilization Training Course was jointly organised by the Home Science Department of the University of Ghana and the Ministry of Agriculture, Ghana, and sponsored by the International Institute of Tropical Agriculture (IITA) and the Canadian International Development Agency (CIDA).

The main objective of the course is to train extension staff educators and research workers on the production and post-harvest technologies of selected underutilised food crops like soybean, sweet potato, winged bean, and recent developments on familiar food crops like cowpeas and cassava.

Participants at the course were drawn mainly from the Nutrition Division of the Ministry of Health, the Ministry of Agriculture, the Volta Regional Agricultural Development Project (VORADEP), the Nutrition and Food Science Dept. of the University of Ghana and the Food Research Institute.

The course lasted for two weeks.

This report summarises the subjects covered under the various food commodities during the course including a list of the practicals, demonstrations and field trips undertaken.

## 2. COURSE CONTENT

The topics covered included:

1. The History and prospects of production of cassava, cowpeas, soybeans, sweet potato and winged beans in Ghana.
2. Current research strategies in production techniques and utilization.
3. Diseases and insect pests and their control
4. Field experiences in production and utilization
5. Household level of utilization.
6. Post-harvest technologies in storage and processing for home and cottage industries
7. Field visits

## 2.1 CASSAVA

### 2.1.1. Prospects for Production and Utilization

Cassava was identified as having originated from South America. Production levels in Africa have reached 48 million tons from a total land area of 7.4 million hectares providing over 50% of the caloric requirements for 200 million people on the continent. It was also recognised that though the crop is not ecologically discriminative and has several recognised advantages and favourable characteristics, average yield in the country has been very low - 6 tons or less per ha out of a potential of 15 - 20 tons; and that even though the acreage planted yearly increases, yield always remains low.

The crop has a potential both as a foreign exchange saver and earner and therefore there is need to increase production.

### 2.1.2. Cultivation

Popular local high yielding varieties that were recommended for cultivation included: Akatawia, Tuaka, Enyan Abasa, Ankra, Kataware, Okwanyanka and Fufue.

Soil type, land preparation, planting method and selection of planting material, crop sequence, cultural practices, fertilizer application and harvesting were discussed and the advantages and disadvantages of inter-cropping elaborated upon.

### 2.1.3. Cassava Diseases and Their Control

Cassava diseases were classified into 3 groups:-

- I. **Bacterial Diseases:** These included the Cassava Bacterial Blight (CBB), Bacteria Leaf Spot, Angular Leaf Spot, bacteria stem rot and the bacteria stem gall which has not yet been recorded in Ghana.

II. Virus Diseases: The African mosaic disease, Cassava common mosaic, cassava brown streak, cassava leaf vein mosaic and the witches broom.

III. Fungal Diseases: These include the brown leaf spot and the white leaf spot.

The distribution, causal organisms, symptoms development and control of CBB, african mosaic disease, brown leaf spot and white leaf spot were outlined.

#### 2.1.4 - Processing Storage and Utilization

Products into which cassava is processed traditionally were outlined. They included kokonte, yakayake, starch, cassava dough, gari, and tapioca, other traditional food uses being ampesi fufu & agbelikaklo.

Newly developed storable products discussed include Instant Fufu Powder and The Dehydrated Cassava Dough.

Recent attempts of mechanisation of cassava processing were also discussed.

Four methods of cassava storage were highlighted - the storage periods, advantages and disadvantages of each method was outlined.

## 2.2 COWPEAS

### 2.2.1. - Production Practice

Ten steps towards increasing efficiency in cowpea production were discussed. These included:-

- a. planting high yielding varieties
- b. planting at appropriate time
- c. planting in rows
- d. planting as monocrop
- e. controlling weeds
- f. controlling pre-flowering insects
- g. controlling post-flowering insects
- h. early harvesting



- i. treating seed before storing, and
- j. saving good seed for next planting.

Other discussions were based on selecting a site, choosing a suitable variety, fertilizer application, recommended planting times and plant spacing for specific locations in Ghana, intercropping effects, weed control, harvesting and storage.

### 2.2.2 - Insect Pests And their Control

Major cowpea insect pest of Ghana and the type of damage caused by each, their control measures both chemical and cultural were outlined.

Insect pests were classified as:-

- a. Pre-Flowering Pests: Leaf hoppers, grasshoppers, Aphids, Foliage beetle and flower thrips
- b. Post-Flowering Pests: maraca pod borer, cydia pod borer, pod sucking bugs and legume bud thrips.
- c. Storage Pests: cowpea storage weevil (bruchid)

Recommended spraying schedules and application rates for particular cowpea insecticides were also elaborated upon.

### 2.2.3. - Processing

The chemical composition of red cowpeas, the unit processes involved in the processing of cowpeas and the objective of each unit process were discussed.

Processing of cowpea into flour and the preparation of a cereal-legume high protein food using cowpeas by means of a process called the 'Legon' process was outlined.

## 2.3 S O Y B E A N S

### 2.3.1. Production

Discussions on soybean production were based on:

- a. where to grow the plant, geographical regions and soil conditions most suitable for growth.
- b. criteria for selecting a site; land preparation, type of fertilizer to use and the rate of application.

- c. how and when to plant and the rate of application of various herbicides to control specific weed species.
- d. problems posed by birds, rodents and insects and how these could be controlled
- e. insecticides in current use and their rates of application.
- f. harvesting and storage
- g. equipment needed for mechanised production

The critical periods during cultivation were outlined as:

- i) crop establishment
- ii) pod-filling stage
- iii) maturity, and
- iv) storage

### 2.3.2 - Pest and Diseases

Some criteria upon which soybean diseases are classified include:-

- (a) Classification based on Causal Agent  
eg. (i) disease caused by causal organism like bacteria, fungi, nematodes etc.  
ii) non-parasitic diseases
- (b) Classification based on plant parts affected  
eg. root diseases, stem diseases etc.
- (c) Classification based on growth stage  
eg. seedling diseases, storage diseases etc.

Major soybean diseases that may cause crop loss at economic levels were identified as

- i) Anthracnose
- ii) Bacterial diseases (particularly Bacterial Blight/postule)
- iii) Frog eye Leaf spot.
- iv) Soybean mosaic virus diseases

Few insect pests are known for soybeans.

### 2.3.3. - Nutritional Value, Processing and Utilization

The amino acid profile, fat, mineral and carbohydrate contents of soya bean were outlined, in addition to other undesirable components like the trypsin inhibitor, Haemagglutinins, goitrogens, urease and phytic acid; their levels in soybeans and adverse effects on animals and how these are taken care of during processing were highlighted

Various dishes and food products for which soybean could be used were discussed. These included: soy milk, soybean curd, soups with soybean products, soy akra, moin moin etc.

## 2.4. SWEET POTATO

### 2.4.1. Origin And Production

The sweet potato originated from Tropical America, was introduced into Europe in 1492 and into Ghana in the 17th Century.

Production figures (1983) for China, Indonesia, Vietnam, India, Japan, Korea and Rwanda were given.

Morphological description of the stem, leaves, root system, flowers and tubers were also given and the environmental factors, moisture requirements, soil type and fertilizer requirements for growing sweet potatoes, together with cultural practices like Land preparation, planting material, time and method of planting, weed control, harvesting, post-harvest handling, curing and storage were thoroughly discussed.

It was reported that yields of 15 - 20 tonnes per hectare are obtainable on the average and with improved varieties up to 30 tons/ha may be obtained. However present average yields range between 8 - 12 tonnes/ha. Non-sweet varieties recommended as being high yielding include ITS 2, TIS 5125, TIS 9250 and TIS II (102). Other promising varieties and their characteristics were also discussed. Skin and flesh colour of the various varieties and the products for which they are most suitable were given.

#### 2.4.2 - Diseases, Insect Pests and Their Control Measures

Some of the diseases outlined included: sweet potato stem and foliage scab, sooty moulds, cercospora leaf spot, internal cork of sweet potato, mottle leaf or mosaic black rot, soft rot, storage and transportation rots and foot rot. Causal organisms, distribution, symptoms, spread and control measures for almost all these diseases were discussed.

The major pests are root knot nematodes, aphids, whitefly, sweet potato butterfly and sweet potato weevil. The description, distribution, type of damage, status and control of the nematodes, the butterfly and the weevil were elaborated upon.

#### 2.4.3 - Nutritional Value, Processing and Utilization

The Nutritive value of sweet potato was compared with that of other root crops and it was observed that sweet potato tubers are a good source of Vitamin C whilst the vines are rich in Vitamins C & A and Iron, with the mineral content of the leaves and vines comparing favourably with that of other local leafy greens.

Some of the traditional uses of sweet potato discussed included:

- a) Sweetening of porridges and products like Aboloo and Asante dokonoo
- b) as a snack when boiled
- c) as koliko when fried
- d) as mpotompoto

The potential of sweet potatoes for composite flour formulation was highlighted. A general selection guide for the purchase of potatoes was also given.

Processed forms included dried slices, dried shreds, starch and grits; - their processing methods were given. Other sweet potato recipes given were sweet potato koobi oto, sweet potato croquette, sweet potato yeast doughnut, sweet potato palava sauce, abunabunu leafy green vegetable soup etc.



## 2.5 - WINGED BEAN

### 2.5.1. Origin Agronomy And Prospects of Production

The winged bean, it was said, originated from Mauritius, Madagascar or the East Coast of Africa and spread to S.E. Asia and Papua New Guinea which is now the centre of greatest genetic diversity of the crop. It was introduced into Ghana in 1965.

Requirements for cultivation and plant behaviour were discussed. These included, rainfall requirement, germination time, flowering, spacing, man-days required to cultivate one hectare, harvesting, staking, yield and storage. It was observed that cultivation of the plant was labour intensive especially for staking. Present yield levels are unsatisfactory and a large scale monocropping of the winged bean can only be adopted in Ghana if self supporting high yielding varieties can be developed.

Competition from other available food crops, leafy vegetables and legumes makes the prospects of the various parts of winged bean finding a place in the Ghanaian diet very slim. The greatest prospect of the bean however lies in the use of the seed in formulation of infant weaning foods and poultry feeds.

### 2.5.2 - Processing And Utilization

The composition, including Vitamin content of different parts of the winged bean and the amino acid composition of the beans were discussed.

Some winged bean products like Milk, tempe, Oil and Winged bean flour were also discussed and some possible winged bean recipes outlined as

- a. winged bean curd
- b. nkontomire stew with winged beans
- c. winged bean ofam
- d. winged bean kakro
- e. apapransa
- f. winged bean akara

- g. winged bean stew
- h. winged bean moin moin

## 2.6 - PRACTICALS, DEMONSTRATIONS AND FIELD TRIPS

### 2.6.1 Practicals

- a. rapid multiplication of sweet potatoes and cassava
- b. planting of sweet potato and cassava
- c. processing of cassava into gari
- d. processing of sweet potatoes into grits, dried shreds, slices, and starch.
- e. cowpea production and pest control practicals
  - conducting a germinating test
  - planting in rows
  - calibrating a sprayer and calculating application rate.
- f. Processing of various cereal-cowpea combinations using the 'Legon' Process
- g. Production of soy milk and soybean curd.

### 2.6.2 - Demonstrations

- a. Preparation of various recipes from cowpea and soybeans
  - eg. Tubani, Akla, cowpea vegetarian pie, infant porridge, cowpea stew and cowpea cakes, soybean akla and moin moin.

### 2.6.3 - Field Trips - Institutions Visited

- a. Plant protection and Quarantine Unit of The Ministry of Agriculture, Pokoase
- b. Weiija Irrigation Project, Accra.
- c. Agric Research Station, University of Ghana, Accra.

### 3. IMPRESSIONS, OBSERVATIONS AND RECOMMENDATIONS

With the current drive towards a multi/inter-disciplinary approach to research and development work, the training can be seen to be very relevant in exposing nutritionists, home scientists and food processors to various agronomic practices and varietal differences between various crop species, whilst also exposing extension officers and agriculturalists to various processing activities and their relevance in enhancing work in their specific areas of specialisation. In exposing participants to various recipes the course has broadened the outlook of food processors in understanding the preparation of a variety of dishes from the crops discussed, so that in their product development efforts they can tailor their research into developing intermediate products, whose mode of utilization would not be extremely divergent from the traditional end uses; and to investigating the effect of varietal differences on the organoleptic properties of the end dishes and hence their effect on the quality of the intermediate products.

Furthermore, in understanding the intricacies of food processing and storage and the problems associated thereby, agriculturists are able to appreciate the fact that in their enthusiasm to increase crop yield through the use of improved seeds and application of various improved techniques, cognisance must be taken of facilities available for storing and processing these crops so that their efforts do not come to naught.

All these facts underscore the need for agriculturists to involve food technologists, nutritionists and home scientists at certain levels of their research, planning, development and extension works and vice versa.

The interaction between the various specialists participating in the training course provided a more healthy understanding of the need for a multidisciplinary/inter-disciplinary approach to research and development work.

One shortcoming of the training course however is that because the titling of the course didn't seem to consider processing as very relevant (it may be an oversight) undue emphasis was laid on utilization during the practicals to the neglect of processing and preservation. In our opinion the food problems of developing countries revolve around production and processing & preservation more than utilization, and these two ought to be given priority attention in any development efforts. It would therefore have been expected that the enthusiasm with which practicals were organised to promote utilization of the under-utilized food crops, the same enthusiasm would have been used to organise practicals to promote the processing and preservation of the familiar crops. But this was below expectation.

In conclusion we would like to recommend that in future, in the organisation of such courses which bring together persons of different disciplines, participants should be divided into work groups during the practical works, so that besides the general practicals carried out by all participants certain specific practical works are assigned to each group according to the need and interest of the group members.

Finally we would like to commend the Lecturers and other resource personnel for the enthusiasm, dedication, devotion and friendliness, they exhibited during the running of the course.



## A P P E N D I X

### LIST OF PAPERS PRESENTED AT THE COURSE AND THEIR AUTHORS

1. Prospects for Cassava Production and Utilization In Ghana,  
by B.K. Hama, Min. of Agric., Ghana.
2. Notes on Cassava Processing Storage And Utilization.  
by E.K. Ankrah, Food Research Inst., Accra.
3. Cassava Diseases And Their Control.  
by S. Korang-Amoakoh, Min. of Agric. Ghana
4. A Simple Method Of Storing Fresh Cassava:  
The Basket Wood Shavings Storage Systems.  
By A.F. Osei-Opare (Mrs.) Univ. of Ghana, Legon
5. Cowpea Production Practice  
by M.A. Hossain and G. Atuahene-Amankwa  
Ghana Grain Dev. Proj. Kumasi, Ghana.
6. Cowpea Production Practicals  
by M.A. Hossain and G. Atuahene-Amankwa , G.G.D.P. Kumasi.
7. Insect Pests of Cowpeas In Ghana And their Control  
by A.N. Aryeetey Agric. Research Station Univ. of Ghana.
8. Cowpea Processing  
by Dr. S. Sefa-Dedeh, Univ. of Ghana, Legon
9. How to Grow Soybeans (Large Scale Production)  
by M.A. Hossain, G.G.D.P. Kumasi.
10. Soybean Pests And Diseases  
by M.A. Hossain, G.G.D.P. Kumasi
11. Towards Soybean Development In Ghana:  
Re-Problem Of Cultivation And Processing:  
by Okofo Takyi Boateng, Soybean Processing Ind. Ltd., Accra.

12. Soymilk Production and Cottage Industry  
by L.A. Hughes (Mrs.) IITA, Ibadan, Nigeria.
13. Nutrition of Soybeans  
by Karl Weingartner IITA, Ibadan, Nigeria
14. Soybean Food Products  
by F.T. Denten (Mrs.) L.A. Hughes (Mrs. and  
S.M. Osho (Mrs.) IITA, Ibadan, Nigeria.
15. Sweet Potato Production, Land Preparation, Variety,  
Yielding Potentials, Planting, Crop Management,  
by Dr. Esi Blay, Crop Services Dept. Univ. of Ghana, Legon.
16. Sweet Potato: Insect Pests and Their Control Measures  
by Dr. Esi Blay
17. Sweet Potato Processing And Utilization (Theory & Practicals)  
by F. Osei-Opare and Gladys Adjei-Poku.  
Home Science Dept. Univ. of Ghana Legon.
18. The History, Agronomy, and Prospects of The Winged Bean  
(*Psophocarpus Tetragonolobus*) In Ghana:  
by J.K. Osei, Univ. of Ghana, Agric. Res. Station, Kade, Ghana.
19. Winged Bean Utilisation,  
by Dr. Betty Bediako-Amoah, Dept. of Nut. And Food Sc.  
Univ. of Ghana, Legon.
20. The Role Of Legumes And Starchy Staples In The Ghanaian Diet.  
by Mrs. Joana D. Nsarko, Home Science Dept.  
Univ. of Ghana, Legon.