



FOOD RESEARCH INSTITUTE

**REPORT ON TRAINING ON
MUSHROOM CULTIVATION USING AGRICULTURAL WASTES FOR
CASSAVA VALUE CHAIN ACTORS, SIERRA LEONE**



by
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April 2014

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INTRODUCTION

In Sierra Leone, there are about 400,000 hectares of cassava and a yield average of 5.2 MT/ha. Cassava varieties grown are mainly local cultivars although the National Research Institute is currently running a major variety improvement program. Commercialization of cassava in Sierra Leone involves mainly processing it into Gari and Fufu, which are major food commodities in Nigeria, the Democratic Republic of the Congo, Tanzania, Ghana, Mozambique, Uganda, Madagascar, Angola, Côte d'Ivoire, Cameroon, Benin, and Kenya, Liberia, Sierra Leone and Guinea (<http://sieragrassrootagency.tripod.com/id18.html>).

This large production and processing of cassava in Sierra Leone would reasonably result in the generation of masses of cassava peels, which are lignocellulosic materials which, when not utilised, could contribute to environmental pollution and post-harvest losses.

The Mushroom Unit of the CSIR – Food Research Institute (CSIR – FRI) conducts research on mushrooms and has years of experience in training people on mushroom cultivation as part of its technology transfer services. Despite being recognised as an authority when it comes to mushroom research and cultivation in Africa, the Mushroom Unit has also conducted research on utilising wastes from roots and tubers, especially wastes from cassava as a substrate for mushroom cultivation on the GRATITUDE Project, funded by the Bill and Melinda Gates Foundation. Findings from this research has proven that cassava peels can support commercial production of oyster mushrooms.

Based on these achievements, the Unit was subcontracted by the International Institute for Tropical Agriculture (IITA) to train Cassava Value Chain Actors in Sierra Leone on producing mushrooms from cassava peels as part of the Cassava Value Chain. The main project is a multinational CGIAR-led project called “Support to Agricultural Research for Development of Strategic Crops in Africa” (SARD-SC). SARD-SC has the overall objective of enhancing food and nutrition security and contributing to reducing poverty in selected Regional Membership Countries (RMCs) in Africa. The target RMCs are: Benin Republic, Cote d'Ivoire, DR Congo, Eritrea, Ethiopia, Ghana, Kenya, Lesotho, Madagascar, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Sudan, Tanzania, Uganda, Zambia and Zimbabwe. The project is funded by the African Development Bank and focuses on raising the productivity and profitability of four commodities; cassava, maize, rice and wheat.

Preliminary trainings for some Cassava Value Chain Actors were held in 2012, during which female cassava farmers were trained on Mushroom Cultivation using the Plastic Bag Method and Straw Mushroom Cultivation with the Low Bed Method. Although the trained farmers were motivated to start cropping mushrooms from bags given to them after the course, the farmers were unable to start up the mushroom business primarily due to lack of spawns (mushroom seeds), as there was no Spawn Multiplication Unit or personnel to produce the spawns in Sierra Leone. This was observed to be a large gap in this value addition venture in the cassava value chain in Sierra Leone.

In an effort to circumvent this occurrence and to ensure the beginning and sustainability of the Mushroom Industry using agricultural wastes with, special emphasis on cassava peels in the country, the IITA realised the need to set up a Spawn Multiplication Unit in Sierra Leone, where mushroom spawns could be multiplied by trained personnel.

As such, the objectives of the collaboration between the two institutions were to set up a Spawn Multiplication Unit to produce and provide spawns, and to organize and train essentially female cassava value chain actors on using cassava peels for mushroom production to maximize the value of the cassava plant to farmers. The training was to be a refresher course for some of the participants, who were also involved in the training held in 2012, and to serve as a newly acquired skill for the participants to whom mushroom cultivation was new.

To begin this partnership, a team of two from CSIR-FRI, Mrs Deborah L. Narh Mensah and Mr Richard K. Takli were requested to go to Sierra Leone from Sunday 30th March to Tuesday 8th April 2014 as resource persons. The purpose of this trip was mainly to train, largely, female Cassava Value Chain Actors from the Southern and Eastern Provinces of Sierra Leone on using cassava peels for mushroom production as a value added product. This report is on the activities carried out on this field trip.

PRE-TRAINING ACTIVITIES

As part of activities xxxx, the team attended a meeting organised by the IITA Sierra Leone Country Manager, Dr. Braima James in his office on Monday, 31st March 2014, to inform the team from CSIR-FRI about the status of the organization of the trainings and to streamline the activities for the trainings. In attendance was the Accountant of the IITA Head Office in Sierra Leone, Mr. Fannah (Figure 1). At the meeting, arrangements were made for an interpreter, drivers, a printer and generator to be provided for the trainings. A list of other required items for the trainings were also made and given to the accountant for purchasing. A training programme was also drawn up and a handout entitled TRAINING HANDOUT FOR STRAW MUSHROOM PRODUCTION was prepared and printed out by the team as a training material in addition to the hand-out on CULTIVATION OF EDIBLE AND MEDICINAL MUSHROOMS USING CASSAVA BY-PRODUCTS.

A brief meeting was also held at the Fourah Bay College, University of Sierra Leone (FBC) with the Head of the Biology Department of the Faculty of Pure and Applied Sciences and other Faculty members (Figure 2 and Figure 3). Discussions held in this meeting involved locating a venue for the proposed Spawn Multiplication Unit at the college to produce spawns to ensure the continuity of the mushroom cultivation line of the cassava value chain.



Figure 1: Meeting with Country Director, IITA



Figure 2: Meeting with HOD, Biology Department, FBC



Figure 3: Group picture after discussions



Figure 4: Proposed site for Spawn Multiplication Unit

After the meeting some items required for the trainings were purchased in Freetown while some others were purchased in Bo town on Tuesday, 1st April 2014. The team also journeyed for about 4 hours to Bo, where they lodged during the first training.

TRAINING ACTIVITIES

Two trainings were held; one at Koribondo, a village in the Southern Province and the other at Kenema, the third largest city in Sierra Leone (after Freetown and Bo), the largest city in the Eastern Province, as well as the capital and largest city of the Kenema District according to Wikipedia.

Part of the morning of Wednesday, 2nd April and Saturday, 5th April were used for purchasing some items required for the trainings. Due to this and upon request of our IITA partners, both trainings were held for 3 days instead of the intended 2 days according to the attached timetable.

Both trainings were given in English. However, Ms Mamako Demby (Post Harvest Field Assistant, IITA), who served as the official translator for the trainings, did most of the translation to the local language, Mende. Mr. Fannah and other IITA staff also interjected some translation when appropriate. The Mende language is spoken as a regional lingua franca by members of smaller Sierra Leonean ethnic groups that inhabit the Southern and Eastern Provinces of Sierra Leone. The language is spoken by around 46% of Sierra Leone's population.

The projector and other electrical gadgets were powered with a generator. The training objectives, training content and details of the activities for both trainings are described in the ensuing sections.

Training Objectives

The general objective of the training was to train Cassava Value Chain Actors on mushroom cultivation using cassava peels in order to add more value to the cassava production chain.

The Specific objectives of the training are:

- To inform participants about the diversity of mushrooms available world wide
- To give an overview of the medicinal and health benefits of mushrooms to participants
- To familiarize the participants with benefits of mushroom cultivation
- To demonstrate appropriate methods and techniques involved in the production of high quality fresh mushrooms.
- To provide some basic information on the underlying principles, methods and techniques involved in the production of good quality compost bags
- To demonstrate appropriate methods and techniques involved in the production of high quality fresh mushrooms using cassava peels.

Training Content

The content of the training is detailed in the programme attached.

Brief lectures were given on;

- the introduction to mushrooms
- advantages of mushroom farming
- nutritional properties of mushrooms
- medicinal properties of mushrooms

Emphasis was placed on the following topics;

- ❖ mushroom cultivation with the plastic bag method
- ❖ mushroom cultivation using the low bed method

The practical sections included composting, bagging, sterilization, inoculation, incubation and cropping/harvesting. Details of the two training programmes are as follows:

A. FIRST TRAINING PROGRAMME

The first training for the cassava value chain actors was conducted from 2nd to 4th April 2014 at the Muamia Women's Cooperative Cassava Factory at Koribondo, Sierra Leone. The training was attended mostly by female cassava farmers from Muamia, Lorgbana, Muwumao, Mandu Magbenyani, and Pujehun. Some participants had attended the training in 2012 (see highlighted names in participant list). There were also two participants from the Njala branch of the Sierra Leone Agricultural Research Institute (SLARI). Forty-five attendants were at the opening ceremony and 37 participants in total, although only about 20 were expected. Of this total number of participants, 81 % were females.

Details of programme

Day 1 (2nd April 2014)

As some of the materials required for the training had not been purchased, most of the morning on 2nd April was spent on purchasing items like hack saws, rubber bands, PVC pipes and foam at the Bo Market in Bo, the second largest city in Sierra Leone. Bo is also the largest city in the Southern Province and serves as the capital and administrative centre of Bo District. Details about the opening ceremony and the actual training are described in this section.

o Opening ceremony

The training programme started with an opening ceremony, which was honoured by the chief of the town and a representative of the Ministry of Agriculture, Forestry and Food Security (MAFFS) (Figure 5). In his speech, the representative urged the participants to take the trainings seriously because it will help them use cassava peels from their farms for producing mushrooms to improve their lives. He mentioned that the ministry will continue to work with IITA in ensuring that the farmers are able to utilize the knowledge acquired to improve their lives. Forty-five (45) people, 30 of whom were women, attended the opening ceremony. Attendants were mostly Cassava Value Chain Actors from Koribondo and other villages in the Southern District including, Muamia, Lorgbana, Muwumao, and Lowa Sama (Figure 6; see Participant List, Koribondo). The two participants from the Njala site of SLARI were also present. There was also a Field Extension Officer from MAFFS in attendance.



Figure 5: MAFFS representative giving a speech during opening ceremony



Figure 6: Group picture taken after opening ceremony

○ **Actual training**

The training was started at 12:00 noon after the early lunch and continued as per the attached Training Time-Table, but with some modifications to ensure proper time-management as most of the day had been lost. For instance, a practical session on soaking of substrate (dried cassava peels and plantain leaves) for straw mushroom production was done on this day instead of composting of substrates. A familiarization exercise was done during which resource persons and participants introduced themselves followed by the singing of one local music and dancing.

PowerPoint presentations as well as exhibition of samples of some of the materials required for bag preparation were used during the lectures (Figure 7). Lectures, given by Mrs Mensah, on this day were focused on introductory aspects and lectures on the Plastic Bag Method, including results from the GRATITUDE Project. During this period, Mr. Takli ensured that the wooden racks for sterilization was made according to specifications, by the in-house carpenters. Participants were randomly divided into four groups preceding the practical sessions, such that members from the same community were found in each of the groups to enhance interaction among the participants (see participant list).

Mr. Takli mainly handled the practical sessions on bagging and sterilization with support from Mrs Mensah and Ms Demby (Figure 8). Sawdust and dried cassava peels were weighed in the available plastic bowls and the weight of a heaped substrate in the bowl was standardised (Figure 9). Quick lime weights were standardised using tablespoons. This was done to teach the farmers, who may not have weighing scales on their facilities, how to

standardize the weight of their substrate for attaining correct substrate composition when they start their mushroom business. Bagged compost bags were kept till the next morning.

Closing prayers were said around 17:30 pm after soaking banana peels and cassava peels separately in quick lime solution in preparation for straw mushroom production on Day 2 of the training. The practical training was intensive and all participants participated actively (Figure 8, Figure 10, and Figure 11). The participants were also taught how to pack the prepared compost bags (Figure 12) into the oil drum for sterilization and informed to start the sterilization at 8:00 am on the next day.



Figure 7: Ms Demby explaining a slide in local dialect (Mende) during lectures



Figure 9: Substrate being weighed in plastic bowl to standardise the weight



Figure 8: Interaction between resource person and participants during practical session



Figure 10: Participants preparing the substrate



Figure 11: Participants bagging the substrate



Figure 12: Compost bags made during practical session

Day 2 (3rd April 2014)

The participants came in at 8:00 am, packed the compost bags in the oil drums as demonstrated to them on Day 1, and started sterilizing the bags (Figure 13). The bags prepared by groups 1 & 2 and 3 & 4 respectively were sterilized together in two drums. The day was officially started with breakfast followed by a Muslim and a Christian prayer. There was a brief recap of the activities held on the previous day during which salient points to remember were reiterated (Figure 14), and the participants' questions were addressed (Figure 15). This was done by the resource persons with translations by Ms Demby. By the end of this discussions, it was about time to start timing the sterilization. Participants were taught what to look out for and the length of time required for sterilization (Figure 16). They were also told to keep the heat level constant by ensuring the firewood was well lighted throughout the sterilization period.



Figure 13: Sterilization being done in oil drums fuelled with firewood



Figure 15: Cross section of participants during recap of previous day's activities



Figure 14: Reiterated salient points being translated during recap of activities



Figure 16: Explanations being given concerning sterilization

Following these discussions and demonstrations, participants were taken through a practical session on compost formulation during composting, using a mixture of cassava peels and sawdust. Rice bran and quick lime were used as additives (Figure 17 and Figure 18). The participants participated actively during these practical sessions (Figure 19 and Figure 20).



Figure 17: Resource person giving explanations on compost formulation



Figure 18: Dried cassava peels being poured on sawdust with quick lime and rice bran



Figure 19: Participants participating in practicals during composting



Figure 20: Prepared compost

The practical session preceded the lecture because the resource persons realised the lecture period could serve as a resting period after the active work during composting and would be a better time-management style.

Lectures were given mainly on the “straw mushroom” which is also known as the “oil palm mushroom”. Although not mentioned to the participants because of their literacy level, this mushroom’s botanical name is *Volvariella volvaceae*. In this lecture, given with pictorial PowerPoint slides (Figure 21), participants were asked if they had ever seen this mushroom growing on the trunk of felled oil palm trees. Almost all the participants responded in the affirmative. The lecture focused on the cultivation technique used in producing this mushroom and why some of the steps were taken during this mushroom’s cultivation. The high perishability of this mushroom was also mentioned and steps to take to circumvent the mushroom spoilage were briefly mentioned. Although relatively simple to cultivate, it

became apparent that the participants would not like to cultivate this mushroom because of its perishability. Participants were highly attentive and asked relevant questions (Figure 22).



Figure 21: Lectures being given with pictorial PowerPoint slides



Figure 22: Attentive class with one participant asking a question

The sterilization time had elapsed by the end of the lecture and the fire was quenched to allow the drum to cool gradually. Lunch followed. The bags were removed from the oil drums (Figure 23) and packed in the incubation room for cooling and onward inoculation. Both resource persons handled this aspect.

The practical session on straw mushroom production by Mr. Takli followed. The previously soaked cassava peels and dried plantain leaves were used for making the beds for the mushroom's production (Figure 24).

Participants were informed about the activities for the next day. The day ended at 17:00 with the closing prayers.



Figure 23: Sterilized bags being removed from oil drum



Figure 24: Beds being prepared with soaked cassava peels and plantain leaves

Day 3 (4th April 2014)

○ Activities for the day

The participants arrived at 8:30 am. A 1 hour session was held in the gari-making hall, during which a recap of the activities for the previous day was done and question time (Figure 25) was given to address the participants' enquiries after the opening prayers. This was done by Mrs Mensah and interpretation was done by the Muamia Factory Manager (Figure 25).

The practical session on bag inoculation, incubation, cropping and harvesting were done afterwards in the same building. The cropping house had the shelves for cropping on one side and the shelves for incubation on the other side (Figure 26). The participants were advised to have a separate incubation room, where they could also inoculate the bags. Bags opened for demonstration purposes on Sunday by Mr Takli had flushed by now (Figure 27) and participants got to practice harvesting and watering during the practical session. This part was mainly done by Mr Takli.



Figure 25: Recap of activities and question time.



Figure 27: Flushing compost bags used for demonstrations on harvesting and watering



Figure 26: Practical session on inoculation

- **Closing ceremony**

The training was formally closed with a closing ceremony attended by the representative from MAFFS, who was introduced by Mr Fannah (Figure 28). In his speech, he entreated the participants to make use of the training they had received to improve their lives. He mentioned that the ministry will continue to collaborate with IITA. The resource persons gave their closing remarks and a participant gave a vote of thanks on behalf of the participants (Figure 29).

Participants were given copies of the various handouts and some deserving participants were rewarded with Kingsbite chocolates (Figure 30). The closing ceremony was covered by the press and Mrs Mensah was granted an interview by Tiva Ansumana for radio broadcast on Radio Bo Kiss 104 FM, a station which airs nationwide.



Figure 28: Mr Fannah introducing the representative from MAFFS during closing ceremony



Figure 30: Kingsbite chocolate being given to a deserving participant



Figure 29: A participant giving the vote of thanks

Training evaluation

The evaluation forms were filled by 2 respondents randomly selected among participants from each community. The course was also evaluated by one woman from SLARI and the MAFFS representative. The general impressions on the training was very good. All respondents liked both the lectures and the practical aspects of the course and had no suggestions/requests for a modification of the course content or its structure.



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PARTICIPANT LIST
KORIBONDO, SIERRA LEONE –
TRAINING FOR CASSAVA VALUE CHAIN ACTORS

No	NAME	SEX	LOCATION AND SIZE OF CASSAVA FARM / INSTITUTION	TELEPHONE/ MOBILE NO AND ADDRESS	GROUP NO
1	JATTU JAMES	F	MANDU 100 AC MAGBENYANI	076 496022	3
2	ELIZABETH NALLIE	F	MANDU 100 AC MAGBENYANI	076 939404	3
3	PATRICK GANDI	M	MANDU 100 AC MAGBENYANI	078 871446	1
4	GBESSAY BATALOMI	F	MANDU 100 AC MAGBENYANI	078 009983	2
5	HASSAN SAWIE	F	PUJEN GROWTH CENTER	078 271557	1
6	SALLAY FORTUNE	F	PUJEN GROWTH CENTER		2
7	KADIATU KAMARA	F	PUJEN GROWTH CENTER		4
8	MUSU FEIKA	F	PUJEN GROWTH CENTER	079 430466	2
9	IBRAHIM S. BORBOR	F	LOWA SAMA CASSAVA FACTORY	078 037689	1
10	LUCY ABDULAI	F	LOWA SAMA CASSAVA FACTORY		3



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**PARTICIPANT LIST; KORIBONDO, SIERRA LEONE –
TRAINING FOR CASSAVA VALUE CHAIN ACTORS**

No	NAME	SEX	LOCATION AND SIZE OF CASSAVA FARM / INSTITUTION	TELEPHONE/ MOBILE NO AND ADDRESS	GROUP NO
11	ISATHA KONDA	F	LOWA SAMA CASSAVA FACTORY		4
12	GARDIE MUNDA	F	LOWA SAMA CASSAVA FACTORY	076 283330	4
13	YEABU TURAY	F	MUWUMAO CASSAVA FACTORY (100AC)	078 512995	3
14	MABEL JUNISA	F	MUWUMAO CASSAVA FACTORY (100AC)	076 673842	3
15	FAMATA SHERIFF	F	MUWUMAO CASSAVA FACTORY (100AC)	078 758451	1
16	MUSTAPHA ALIE	M	MUWUMAO CASSAVA FACTORY (100AC)	076 944391	2
17	ABUBAKARR JAMES	M	KORIBONDO (100 AC)	079 686065	4
18	JEBBEH MASSAQUOI	F	MUAMIA		4
19	TENNEH SAIDU	F	MUAMIA	076 398543	2
20	JENNEH SOWBIE	F	MUAMIA	078 630532	1

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**PARTICIPANT LIST; KORIBONDO, SIERRA LEONE –
TRAINING FOR CASSAVA VALUE CHAIN ACTORS**

No	NAME	SEX	LOCATION AND SIZE OF CASSAVA FARM / INSTITUTION	TELEPHONE /MOBILE NO AND ADDRESS	GROUP NO
21	ESTHA TUCKAR	F	KORIBONDO (100 AC)	-	2
22	ADAMA JARAH	F	KORIBONDO (100 AC)	-	1
23	HAWA BIO	F	KORIBONDO (100 AC)	076 644641	3
24	MARIAMA SHERIFF	F	KORIBONDO (100 AC)	076 344866	4
25	JULIET MENJOR	F	SLARI NJALA	076 450367	4
26	MARY DANGBA	F	SLARI NJALA	076 869550	3
27	MOHAMED TURAY	M	FIELD EXTENSION WORKER / MINISTRY OF AGRICULTURE, FORESTRY AND FOOD SECURITY (MAFFS)	076 522949	REP. CHIEF
28	HABITU ALIEU	M	LORGBANA /MULONA	-	4
29	ABIBATU KOROMA	F	LORGBANA /MULONA	-	2
30	MATTA ALIEU	F	LORGBANA /MULONA	-	2

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**PARTICIPANT LIST; KORIBONDO, SIERRA LEONE –
TRAINING FOR CASSAVA VALUE CHAIN ACTORS**

No	NAME	SEX	LOCATION AND SIZE OF CASSAVA FARM / INSTITUTION	TELEPHONE/ MOBILE NO AND ADDRESS	GROUP NO
31	ADAMA GASSIMU	F	LORGBANA (100 AC)		2
32	JENEBA SHERIFF	F	KORIBONDO (100 AC)		1
33	IBRAHIM KOROMA	M	KORIBONDO (100 AC)	076 589708	4
34	MASSAH KAMARA	F	KORIBONDO (100 AC)		4
35	ALIEU BIO	M	KORIBONDO	078 543838	3
36	EHUJUO CHINEDU	M	SLECAD	076 923968	
37	ALIEU MAMIH	M		076 841156	4
38	MOHAMED KIJAMU	M	KORIBONDO	CHIEF/ KORIBONDO	
39	EDISON L. BIAMAH	M	IITA-BO	076 206792	
40	MARRIE S. KARTEH	F	KORIBONDO MUAMIA		2
41	THOMAS KAMARA	M	MUAMIA, KORIBONDO (100AC)		4
42	ABU BAKARR JALLOH	M			CHIEF
43	CHRISTIANA BANGALIE	F	MUAMIA		
44	JUNISA M. KOROMA	M	MUAMIA		
45	MOHAMED KOROMA	M	MUAMIA		



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**TRAINING COURSE FOR CASSAVA VALUE CHAIN ACTORS ON
MUSHROOM CULTIVATION USING AGRICULTURAL WASTES**

KORIBONDO AND KENEMA, SIERRA LEONE

APRIL 2014

TIME TABLE

DAY	TIME	ACTIVITY	ACTION BY
1	8:00am	Arrival and registration	Mrs. Mensah
	8:15am – 8:30am	Opening prayer and Introductory Speech from IITA Personnel	Mr. Fannah
	8:30am – 8:45am	Speech from Rep. of Chief/ Community elders	
	8:45am – 9:00am	Speech from DCE	
	9:00am – 10:30am	Lectures: Introduction to Mushrooms	Mrs Mensah
	10:30am – 11:00am	Coffee break	
	11:00am – 1:00pm	Practical: Bagging and sterilization	Mr. Takli
	1:00pm – 2:00pm	Lunch Break	
	2:00pm – 3:00pm	Lectures: Plastic bag method and Gratitude	Mrs. Mensah
	3:00pm – 4:30pm	Practical: Composting	Mr. Takli / Mrs. Mensah
	4:30pm – 4:40pm	Closing	
	2	8:00am – 9:00am	Practical: Inoculation / Soaking of substrates
9:00am – 10:00am		Lectures: Straw mushroom cultivation	Mrs. Mensah
10:00am – 10:30am		Coffee break	
10:30am – 12:30pm		Practical: Straw mushroom cultivation	Mr. Takli / Mrs. Mensah
12:30pm – 1:30pm		Lunch break	
1:30pm – 3:00pm		Question time	
3:00pm – 4:00pm		Evaluation / Appraisal	
4:00pm – 4:40pm		Closing and Departure	

B. SECOND TRAINING PROGRAMME

This training was conducted from 5th to 7th April 2014 at the Cassava Processing Factory at Kenema, Sierra Leone, where there was one incubation room, and two cropping houses, one each for oyster and straw mushroom cultivation. The training was attended by 19 participants who were Cassava Value Chain Actors from four communities; Combena and Kpandebu in the Kenema District, Tonge and Sajila in the Kailahun District. Some participants had attended the training in 2012 (see highlighted names in participant list). Thirteen (13) of the participants were female (see participant list). This number represented 65 % of the total participants. There were also some in-house participants. These were young men who lived on the premises of the Cassava Processing Factory, where the training was held. Like in the case of the first training, Mrs Mensah handled lectures whereas Mr Takli was the resource person mainly in charge of the practical sessions. Ms Demby did interpretation to the local dialect.

Details of programme

Day 1 (5th April 2014)

With the exception of hack saws, rubber bands and a small weighing scale, all other items were available. Hence, the resource persons did not spend much time on purchasing items at the Kenema market. Details about the opening ceremony and the actual training are described under the ensuing subsections.

○ Opening ceremony

The training programme started with an opening ceremony, which had a representative from MAFFS and the Country Manager, IITA (Figure 31). In his speech, the representative mentioned that he was present in 2012 when the first training was held and that he recognised the need for a Spawn Multiplication Facility to be put up in Sierra Leone (Figure 31). He urged the participants to take the trainings seriously because it will help them use cassava peels from their farms for producing mushrooms for value addition and as a source of income to improve their lives. He mentioned that the ministry will continue to work with IITA in ensuring that the farmers are able to utilize the knowledge acquired to improve their lives. Mr. Fannah also stated that the purpose of the training was to disseminate knowledge and skills to the Cassava Value Chain Actors on mushroom production as an additional tool in the cassava value chain for income generation. One of the resource persons, Mr. Takli,

encouraged Sierra Leoneans to maintain the peace in the country and to take the training seriously and further, to practice mushroom cultivation to improve their lives. A group picture was taken after the opening ceremony (Figure 32).



Figure 31: MAFFS representative speaking at the opening ceremony



Figure 32: Group picture after the opening ceremony

- **Actual training**

The training was started at 9:00 am after breakfast on the introductory aspects of the lectures. This was done preceding the Opening Ceremony. The attached Time-Table was followed with some slight modifications to ensure proper time-management. For instance, a practical session on soaking of substrate for straw mushroom production and composting were both done on this day. Lectures were interspersed with practical session to keep the participants alert and active.

A familiarization exercise was done during which resource persons and participants introduced themselves followed by singing one local music and dancing (Figure 33). The lecture was given by Mrs Mensah using PowerPoint presentations. During this period, Mr Takli saw to it that the venue for the practical was properly set-up. Participants were randomly divided into four groups preceding the practical sessions, such that members from the same community were found in each of the groups to enhance interaction among the participants (see Participant List, Kenema).



Figure 33: Resource person and participants during familiarization exercise



Figure 34: Active participation during practicals

The introductory lecture was followed by a practical on compost formulation , taken mainly by Mr Takli with assistance from Mrs Mensah. Participants were taught how to standardize weight measurements in containers available to them (Figure 35). Dried cassava peels were collected, milled and added to sawdust to make the compost (Figure 35- Figure 39). Quick lime and rice bran were used as additives.

The participants were attentive and were involved in the practical demonstration.



Figure 35: Standardization of weight of substrate in plastic bowl



Figure 36: Dry cassava peels being collected in plastic bowls



Figure 37: Cassava peels being milled



Figure 38: Milled cassava peels being added to sawdust



Figure 39: Finishing the compost

The second lecture, which followed the composting practical, was focused on the Plastic Bag Method of oyster mushroom production, where the individual steps involved were mentioned and explained using similes from cassava cultivation or vegetable farming to ensure the farmers understood the concepts involved in mushroom cultivation. Aside the PowerPoint slides, a thickened compost bag and a flushing compost bag were used for demonstration (Figure 40 and Figure 41). There was also a question time during which participants asked questions for clarification.



Figure 40: Participants observing thickened compost bags for pinheads



Figure 41: Resource person lecturing about harvesting

A second practical session was held, during which sawdust and cassava peels were formulated for bagging. Compost bags were made and packed in two oil drums for sterilization on day 2 (Figure 42-Figure 45). Cassava peels and dried plantain leaves were also soaked in quick lime solution as was done in the first training. The participants participated actively in the practical sessions.

The day came to a close at 17:30 after the participants activities of the day were summarized and the activities for day 2 were briefly mentioned. Participants were also informed to light the firewood at 8:00 am to start sterilization of the compost bags packed in the drums.



Figure 42: Participants performing the sqweeze test



Figure 43: Resource person demonstrating bagging



Figure 44: Participants bagging the substrate



Figure 45: Compost bags packed on wooden rack for sterilization

Day 2 (6th April, 2014)

The participants started the sterilization as they had been told to.

Something interesting happened on Day 2.

Breakfast was late so participants were informed too come in for a brief lecture. The resource person, Mrs Mensah, noticed the participants were not really responding so she decided to wait till after breakfast to start the lecture. Interestingly, the participants went out and started enthusiastically bagging the substrate formulated with fresh sawdust with quick lime and rice bran (Figure 46). When asked why, they said they preferred bagging the substrate than sitting in a lecture on an empty stomach.



Figure 46: Participants happily bagging substrate amid singing before breakfast



Figure 47: Recap of previous day's activities and question time



Figure 48: A participant taking notes and lectures being video recorded



Figure 49: Participants indicating they have ever seen the straw mushroom on felled oil palm trees

The lecture was held only after breakfast, beginning with a recap of the previous day's lectures and activities and question time. Participants were now very involved, asked questions and the few literate ones took notes (Figure 47 and Figure 48). The lecture focused on the straw or oil palm mushroom. Participants were shown a picture of the mushroom's fruiting body and were asked if they had ever seen that mushroom on felled oil palm trees, to which almost all the participants responded happily in the affirmative (Figure 49). This session lasted for about one and half hours.

A practical session on the straw mushroom cultivation followed, during which compost beds were made with the soaked cassava peels and plantain leaves from the previous day.

More of the hand-outs on straw mushroom production were printed onsite during the practical session on straw mushroom cultivation. A set of all training hand-outs was given to each participant including the farm hands.

The sterilized substrates were unloaded into the incubation room for cooling (Figure 52). Another compost was formulated, but this time, with sawdust only with addition of quick lime and rice bran as additives. This was done to ensure that the participants could eventually compare the yields from bags prepared with all four substrates (fresh sawdust only, fresh sawdust and cassava peels, composted sawdust only and finally, composted sawdust and cassava peels).



Figure 50: Compost bed covered with polyethylene and a local material



Figure 52: Sterilized compost bags being packed in the incubation room for cooling and inoculation



Figure 51: Training hand-outs being printed onsite

Day 3 (7th April 2014)

o Activities for the day

The participants arrived at 8:30 am. Compost bags prepared during the entire training were inoculated with EM-1 spawns, labelled and properly arranged on shelves in the incubation room for incubation.

There was also a practical session on turning the compost (Figure 53-Figure 56). The participants were allowed to feel the heat in “Layer C” (innermost layer) of the compost heap (Figure 53), and were taught how to identify the different layers formed during composting (Figure 54) and how to properly turn the compost (Figure 55 and Figure 56). Participants were however advised to first turn the compost on either the 4th or 5th day after making the compost heap and consequently after every 3 days.

A practical session on cropping and harvesting of bags which were brought from Ghana and opened earlier was done in the cropping house.

A final session of question time was held to ensure that participants fully understood what they had been taught. During this session participants were asked to describe the steps in the

Plastic Bag Method followed by the Low Bed Method of straw mushroom production (Figure 57).

The whole training was covered by the press and participants were interviewed on tape (Figure 58). The resource persons, Mrs Mensah and Mr Takli, as well as Mr Fannah and two selected participants (male and female) were also interviewed on camera.



Figure 53: Participants feeling the heat within the compost heap



Figure 56: Finishing the turning



Figure 54: Collecting compost layer B during turning



Figure 57: A participant describing a step used in the Plastic Bag Method



Figure 55: Ring of layer B made during turning

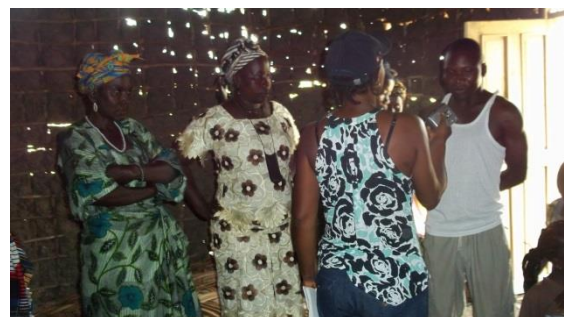


Figure 58: Participants being interviewed on tape about the training

- **Closing ceremony**

During the closing ceremony, the resource persons and Mr Fannah reiterated the importance of the participants making use of the knowledge and skills acquired during the training. Mr Takli again encouraged the participants to actively contribute to maintaining peace in Sierra Leone as nothing fruitful can be done without peace. Mrs Mensah urged the participants to make active efforts in putting up their growth structures and starting up something on their own.

The resource persons also rewarded some participants who showed keen interest in the training and participated enthusiastically in the practical sessions with mushroom-shaped crests (Figure 59) or Kingsbite Chocolate (Figure 60 and Figure 61). There was also the final singing and dancing to end the programme at 12:30 (Figure 62).



Figure 59: The most hardworking participant being awarded with a mushroom-shaped crest



Figure 61: Presswoman and her 7-week old "mushroom baby" receiving their chocolate



Figure 60: A recipient of one of the chocolates shaking hands with the resource persons



Figure 62: Final singing and dancing to a traditional Mende song to end the programme

Training evaluation

The evaluation forms were filled by 2 respondents randomly selected among participants from each community. The course was also evaluated by the IITA personnel. Like in the first training, the general impressions on the training was very good. All respondents liked both aspects of the training (the lectures and the practical aspects) and there were no suggestions/requests for a modification of the course content or its structure.

FOOD RESEARCH INSTITUTE

PARTICIPANT LIST

KENEMA, SIERRA LEONE –

TRAINING FOR CASSAVA VALUE CHAIN ACTORS

No	NAME	SEX	LOCATION AND SIZE OF CASSAVA FARM / INSTITUTION	TELEPHONE / MOBILE NO AND ADDRESS	GROUP NO
1	HENRY MASSAQUA	M	COMBENA CASSAVA FACTORY	076 596664	2
2	THERESA SUDEH	F	KPANDEBU GROWTH CENTER	076 886825	1
3	MOHAMED KAWAH	M	KPANDEBU GROWTH CENTER	078 477910	1
4	FATIMATA KAMARA	F	KPANDEBU GROWTH CENTER	076 560705	2
5	FATIMATA S KAMARA	F	KPANDEBU GROWTH CENTER	076 560705	1
6	BAINDU KANNEH	F	COMBENA CASSAVA FACTORY		1
7	AMIE MUSTAPHA	F	COMBENA CASSAVA FACTORY	078 449582	1
8	TENNEH KARIMU	F	COMBENA CASSAVA FACTORY		2
9	SENESE WOMOH	M	COMBENA CASSAVA FACTORY	078 065861	1
10	FEYESE KERITO	F	COMBENA CASSAVA FACTORY	076 528769	2



FOOD RESEARCH INSTITUTE

PARTICIPANT LIST

KENEMA, SIERRA LEONE –

TRAINING FOR CASSAVA VALUE CHAIN ACTORS

No	NAME	SEX	LOCATION AND SIZE OF CASSAVA FARM / INSTITUTION	TELEPHONE / MOBILE NO AND ADDRESS	GROUP NO
11	ENSAH BOCKARIE	M	TONGEA WOMEN DEVELOPMENT ASSOCIATION	076 913594 / 077 205012	2
12	MESSIE TARNBA	F	TWDA	078 996303	2
13	FANTA BANGULA	F	TWDA		1
14	HAWA JANES	F	TWDA		1
15	VANDI S. KPEWA	M	SAJILA MOAMALLEH FACTORY	076 229623	1
16	TAJOE ABDULAI	F	SAJILA MOAMALLEH FACTORY		2
17	MESSIE VANDIE	F	SAJILA MOAMALLEH FACTORY		2
18	TAJOE SELLU	F	SAJILA MOAMALLEH FACTORY		1
19	SAMUEL ENSEL	M	COMBENA CASSAVA FACTORY	076 884236	2

GENERAL TRAINING EVALUATION

In this session, the participant age and gender distribution is evaluated.

Participants' Age Distribution

Females were dominant among the participants. Participants at both trainings were mostly within the age range of 30-49 (Figure 63). A higher percentage of participants at the training held in Koribondo were within the range of 18-29 and 50-59 than the participants trained at Kenema within the same age ranges (Figure 63). The opposite was observed between participants trained at the two locations for the age range of 60-69. Overall, the participants for both trainings were in their youthful age (Figure 63). Although all participants were involved in the training, it was observed that most of the elderly ones (50-69 age range) were not active. Although this may be expected during the practical sessions because of the tasks involved, they were seen not to be very active during the lectures as well.

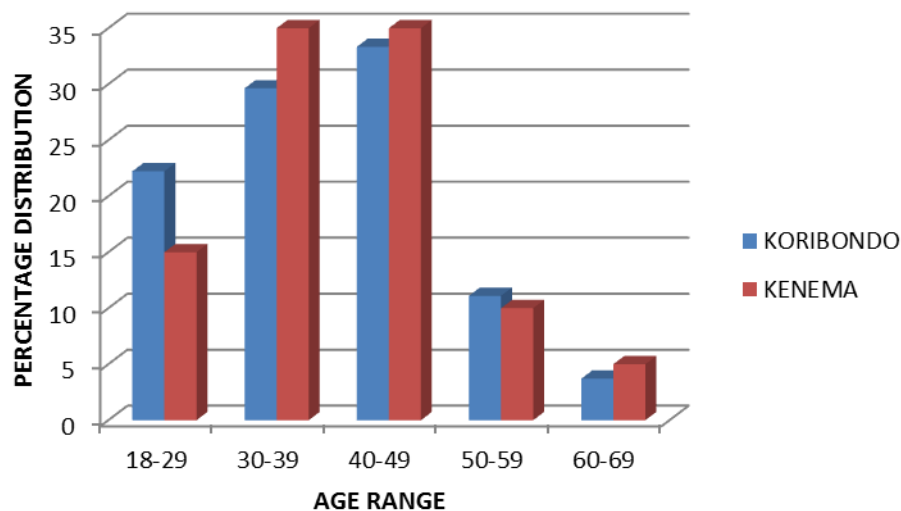


Figure 63: Age distribution of participants

Participant's Gender Distribution

Participants at the first training held in Koribondo were female dominated (75%). The same trend was seen in Kenema, where 65 % of the participants were female. Although the composting and bagging steps in mushroom cultivation is perceived to be cumbersome, the female participants were seen to be actively involved in the practical sessions with enthusiasm, and even preferred to bag the compost than to sit in a lecture on empty stomachs. This gives an indication that Mushroom Production activities can be taken up by women.

CONCLUSIONS AND RECOMMENDATIONS

Both trainings were largely successful in terms of the number of participants and the general impressions of how well the participants understood the contents of the training. There were no observed hindrances on any gender being able to carry out tasks in mushroom cultivation. However, age seemed to have an effect on the ability of participants to be actively involved in the lectures and practical sessions and this raises a concern of whether or not the elderly participants could eventually put the knowledge acquired into practice, or to train others on mushroom cultivation. It is therefore recommended that age should be taken into consideration in selecting participants for other trainings on mushroom cultivation.

The overall success of the training can only be fully regarded to be successful when participants actually start putting cultivated mushrooms on the shelves in supermarkets or supplying hotels and other consumers with cultivated mushrooms.

On a lighter note, the resource persons could not help but notice with wonder the dominant presence of mushroom-shaped termite mounds in Sierra Leone (captured on the cover page of this report). Indigenes seemed not to know why these termite mounds were shaped like mushrooms. Would it be interesting to investigate this? We think so!