



Growing orange-fleshed sweetpotato for a healthy diet

A supplementary learners' resource book for upper primary schools

Regina Kapinga • Patience Byaruhanga • Thomas Zschocke • Silver Tumwegamire



International Potato Center (CIP) • Vitamin A for Africa
(VITAA) Partnership Program • Kampala, Uganda

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International Potato Center
Apartado 1558, Lima 12, Peru
cip@cgiar.org • www.cipotato.org

Preface

This learning resource about orange-fleshed sweetpotato for pupils in upper primary schools (primary levels 5–7) was designed to supplement the teaching of topics in the agriculture, integrated science and related curricula. It is not a pupil’s book in the real sense, but rather an innovative invitation by the teachers for the pupil to explore characteristics and health benefits of the orange-fleshed sweetpotato through the second-hand investigation.

The concept and design incorporates current research about science education, reading and text comprehension at the upper primary school level. The book is conceived to help pupils in primary levels 5 to 7 to advance their understanding of key scientific and agricultural concepts and their ability to reason scientifically.

The book is written in the first person and presented by the pupil Akello. She thinks out loud as she (a) generates questions prompted by the phenomena she has experienced, (b) plans and conducts investigations to address her questions, (c) interprets the data she has collected, and (d) determines how these data address her questions.

The book is designed to be used in interactive ways. For example, even before the pupils see the outcome of an experiment, they are encouraged to predict what will happen in the situation. They are asked to evaluate the relationship between the real world problems and the model that the first-person narrator of the book, Akello, constructs and to indicate whether they think her model is a fair test of the question she is posing.

The book is structured loosely around a three phased learning cycle. In the first phase, the text invites the reader to engage with and mentally explore ideas about orange-fleshed sweetpotato. In the second phase, the relevant concepts are explained. In the third phase, the reader is given the opportunity to apply and elaborate about the new ideas.

The book can be read in sequential order or in any order as it seems to the interest of the reader. We encourage teachers and pupils to use this resource as a supplement of their guided inquiry science or agriculture instruction. In the “second-hand investigations” presented in this book, the pupils inquire about others’ investigations and interpretation of phenomena in agriculture, while the recommended “first-hand investigations” using learning cycles will allow pupils to explore directly the physical world of agriculture by manipulating variables in phenomena that they are investigating, making observations and measurements, and

drawing conclusions about the world of agriculture.
A glossary has been provided for the new words and
scientific names used in the book.

A note to pupils

Hello, my name is Akello. Do you like the picture on the cover of the book? The girl in the picture is one of my friends eating a delicious sweetpotato,



rich in vitamin A. It is actually quite simple to grow vitamin A rich sweetpotato in your school garden or at home in the backyard. Do you notice the colour of the sweetpotato in the picture on the left? It is very orange just like the

school uniform of the boy in the picture below. That is why it is sometimes referred to as orange-fleshed sweetpotato. This is not just any kind of sweetpotato, but a particularly healthy and nutritious one. You might say why? Well, this is what this book is all about.

I will share with you my inquiries into the orange-fleshed or vitamin A rich sweetpotato. Scientifically sweetpotato is known as *Ipomoea batatas*. There is a lot to learn about how to grow, manage, process



and market this crop. Are you still interested to embark with me on this discovery journey? We will be conducting our own investigations to find the answers to our questions—just like the real scientists would do.

Special recognition

We want to recognize and specially thank the National Curriculum Development Center of Kampala – Uganda, for their institutional support, suggestions and guidance in the production of this publication.

Contributing partners

The learners' resource book about orange-fleshed sweetpotato for primary agriculture evolved out of a school garden project involving teachers and pupils from primary schools and from neighbouring communities in the Kawempe and Rubaga divisions of Kampala city, Uganda. We are especially grateful to the following teachers and their schools, whose contribution made this publication become a reality:

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If you would like more information about this book please use the contact details below:

The Liaison Officer
International Potato Center,
P.O. Box 22274, Kampala, Uganda.

Or,
International Potato Center,
Apartado 1558, Lima12, Peru
cip@cgiar.org • www.cipotato.org

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It's all about roots! Or isn't it?

1.1 Sweetpotato in our community

Today at school, my class had a visitor. She was a scientist from the local agricultural research station. Our teacher invited her to talk about sweetpotato because she does sweetpotato research as her work. Thus, she is a real expert in this matter. I was impressed! The scientist found us viewing different types of crops and food products (photograph 1) as demonstrated to us by our science teacher.

My friend Okiror and I are very fond of eating sweetpotato. They are part of our regular diet. I consider Okiror to be an expert in sweetpotato because he always brings a little snack made out of it when we play together, for instance, small buns or doughnuts. We were both very surprised when we saw the different types of sweetpotato roots that the visitor spread out on our teacher's desk.

The roots were in different sizes, shapes and colours shown in photograph 2. Some of them still had stems on them. Others were without leaves but pieces of soil were sticking to their skin. I have not seen that many different sweetpotato roots at my home before.



Photograph 1. Pupils view the demonstration of different crops and food products in the class



Photograph 2. Sweetpotato roots in different shapes and sizes

Then the scientist took a knife and began cutting a few roots. She put them next to each other on the nylon sack just like in photograph 3 and asked us to

Photograph 3. Different inside colours of sweetpotato roots



observe different colours of the cut sweetpotato roots. She explained that there are sweetpotato roots that are white, yellow (or cream) and orange colour inside. She continued saying

that some of these roots especially the orange-fleshed ones, give our body the energy and vitamin A needed to play and have good health.

I asked Okiror if he was aware of the orange-fleshed sweetpotato. He responded that he has not seen that type of sweetpotato in his life nor was he aware of all its health benefits. Immediately I thought about my mother and what kind of sweetpotato she would use for cooking. When we sit together for our meals like the family in photograph 4 we always have a few cooked sweetpotato to add to our dish. They would always taste sweet; that is why I like them so much.

Photograph 4.
Family enjoying
meal of cooked
sweetpotato



The scientist mentioned that sweetpotato is one of the important staple crops in the countries in East and Central Africa, such as: Burundi, the Democratic Republic of Congo, Kenya, Rwanda, Tanzania and Uganda.

In East Africa, sweetpotato is predominantly grown by women for both, home consumption and to

supplement household income by selling it at local markets.

Unfortunately, I sat too far in the back of the classroom and was not able to see clearly all what the scientist was showing. I remembered that there were many different types of sweetpotato roots like those shown in photograph 5. So, when I saw this picture, shown to us by the scientist, I was curious about these different types of sweetpotato.

Photograph 5.

Farmer
presenting
different fresh
sweetpotato
roots



1.2 Good sweetpotato varieties

After hearing from the scientist who came to our school, the next day, I decided to compare different sweetpotato myself. To do this, I would need different types of sweetpotato like the ones the scientist who visited our school brought. So I joined my mother on her way to the village trading centre. There, I went around and visited different traders who were selling sweetpotato roots as shown in photograph 6. These traders were sitting behind various piles of sweetpotato roots.

Photograph 6.
Different sweetpotato varieties in the market



I asked them to give me one root from each of their piles and wrote their names on a piece of paper. At the end of the trip, I managed to get a set of sweetpotato

that looked very different: some had light skins, others were darker. This was amazing! The scientist last time she visited our school she told us that different types of sweetpotato were known as varieties.

When I brought my sweetpotato roots home I peeled some of them and others into approximately equal parts as shown in photograph 7. I had picked some vines when I was at the trading centre so I placed them next to the sweetpotato roots.

Photograph 7.
Different
sweetpotato
varieties on
display



Then I prepared an alphabetical list of the names of the different sweetpotato that the traders had given me, and marked the inside colour of sweetpotato roots in the columns next to them as shown in table 1.

Table 1. Root colours of the common sweetpotato varieties in Uganda

Name	Inside colour of the root		
	White	Yellow or Cream	Orange
Abuket			X
Bwanjule	X		
Ejumula			X
Kakamega			X
Naspot 1		X	

The next day, I showed the results of my investigation to my friend Okiror. He was quite impressed by my effort. The results of this investigation almost matched the demonstration done by the scientist and our teacher the other day in our class. But Okiror indicated that there were too many different types of sweetpotato varieties to remember.

So we both decided to continue with one type of sweetpotato that seemed to be the most interesting. We selected the variety Ejumula for our small study because it had a very attractive orange colour.

In our class we rearranged the sweetpotato into three piles on the table and placed the Ejumula variety in the middle, like in photograph 8. I remembered that Ejumula is orange due to the presence of Vitamin A as the scientist told us when she visited our school last time. So, we put a little label of vitamin A sweetpotato next to it.

Photograph 8.
Sweetpotato varieties on display table in the classroom



Then, we followed the steps of the scientist in our class and cut the full root of variety Ejumula into two parts. Some roots were not cut. We placed them on a separate pile together with the leaves. To show the size of the sweetpotato we placed a small pen as shown in photograph 9 on the left.

We boiled some of the roots. Look at the orange colour in photograph 9 on the right hand side. Isn't attractive? It also tasted nice and sweet when we ate it in the class.

Photograph 9.
The fresh (left)
and cooked
(right) roots of
variety Ejumula



Our teacher explained to us that Ejumula is one of the varieties that are good for nutrition because of Vitamin A. Again our teacher added that Ejumula is a good source of energy like any other varieties. He said that farmers growing Ejumula can produce a lot of roots at harvest, it matures fast. It tastes good and can be used to make sweetpotato products.

After getting this information, I wanted to understand the importance of all these special characteristics. So, I went back and revised the notes

about the growth habits and importance of variety Ejumula and all other varieties that we got from the scientist who visited us last time. These are shown in table 2.

Table 2. Major characteristics of the Ejumula variety

Characteristics of Ejumula	Explanation
It grows quickly	Ejumula takes only 3-5 months to grow until harvest. This is important especially for areas where the rain period is short and other crops cannot grow well.
It gives high yields	A good yield allows farmers to have food all the time and sometimes sell some of it in the market to get money.
It is tolerant to damage by insects	Ejumula's root yields are less affected by weevils.
It gets sick	Ejumula's roots and vines are very much affected by sweetpotato virus diseases.
It has good taste	Ejumula is sweet, children and their parents like it.
It has different uses	Ejumula can be used to produce different types of foods when boiled, fried or dried into chips.
It gives energy	Our body needs energy to work and play. Energy comes from the foods that we eat. Sweetpotato gives more energy than other root and tuber crops like potatoes, yams or cocoyam.
It has a lot of vitamin A	Its orange colour is a sign of vitamin A, which keeps our bodies protected from common diseases more especially night blindness. Vitamin A is particularly essential for children and mothers who are still producing children.

Exercise: Having looked at characteristics in table 2,

1. Go to the school garden with a classmate and think of more characteristics that are not mentioned in the table. List them and include your observations in the new table.

2. Do the characteristics of Ejumula differ from those of other types of sweetpotato that are common in your community?

What about other food crops such as carrots, potatoes or mangoes?

1.3 The nutritional value of sweetpotato

When we completed our new table 2, we realized that we also talked about the other sweetpotato varieties which were being eaten by people in our village. I remembered the last time the scientist visited our class, she explained a lot about the nutritional value of sweetpotato, more especially the orange-fleshed types. She said that sweetpotato, like other foods, is very good for our bodies and makes us strong and healthy. This is because it contains important nutrients that we need in our bodies, such as: carbohydrates, proteins, vitamins and minerals.

She emphasized that sweetpotato has high amounts of carbohydrates in the form of starch. When we eat sweetpotato, our bodies use or burn the carbohydrates to generate energy. Actually, our bodies need the energy to do what we like best like walking, studying or playing at school and growing.

We also need a lot of energy to make our school gardens. Energy is like the heat produced by the fire on the stove that my mother uses for cooking. You need to have energy in order to be active!

The scientist had also given an example that when we eat one medium-size boiled sweetpotato piece (about 200-300g) per day, we obtain about 10-15% of the energy we need every day. With the exception of cassava, sweetpotato has higher carbohydrate content than others in the category of root and tuber crops.

Exercise: In your exercise books, list which of these root or tuber crops are eaten regularly and are important sources of energy for you. What is the importance of sweetpotato in what you eat everyday when compared to your other sources of energy? Then discuss your results with the ones of your neighbour in the class. Find out if they have ever eaten the orange-fleshed sweetpotato and whether he or she liked it.

The scientist, who visited our school last time, also emphasized that vitamins are another important type of nutrient that we obtain when we eat orange-fleshed sweetpotato. Our bodies need vitamins to function properly and be protected from diseases (also called increased immunity). The orange-fleshed sweetpotato like Ejumula has high amounts of beta-carotene (i.e. the orange pigments that our bodies use to make vitamin A). Enough vitamin A in our bodies helps us to grow strong and well. With vitamin A we don't become sick often and are less affected by major diseases like measles, malaria and diarrhoea. Vitamin A is also important for our eyes; it helps us to see better at night. Many children who do

not have enough vitamin A normally develop vision problems, especially at night; they are blind at night. This is a disease, which is commonly known as night blindness.

It was, however, good to learn from the scientist that we don't need to eat a lot of sweetpotato for our daily vitamin A requirement. With one medium size boiled root (200-300g) we can get the amount of vitamin A that we (children of 11-13 years old) need every day. She advised that it is good to eat something that has fat or oil at the same time so that our body will be able to absorb the beta-carotene from sweetpotato. You can get fats from eating different foods for instance a piece of avocado.

The scientist mentioned that there are other foods such as eggs, liver and milk that are also rich in vitamin A. But, many of these foods are neither easily available nor cheap to buy by ordinary people. We can also eat dark-coloured fruits (mango and pawpaw) and vegetables (pumpkin, carrots, dark green leafy vegetables) to get a lot of beta-carotene.

She explained that several programs in Uganda have been promoting the use of orange-fleshed sweetpotato (as shown in photograph 10). Sweetpotato in the country is one of the cheapest sources of vitamin A and is consumed by many people.

Photograph 10.
Banner
promoting the
consumption of
orange-fleshed
sweetpotato



If you have seen sweetpotato in the garden or field, you would know that the leaves are dark green. They can be eaten and are a good source of vitamins and minerals.

Exercise: Discuss with any of your classmates about the sweetpotato leaves. Ask them if they have eaten sweetpotato leaves before and if they liked it.

The teacher told us that sweetpotato leaves are also a source of protein, which you need to build your muscles and bones and become strong. It is also important for your organs, skin and blood. If we eat sweetpotato leaves once per day (about 100g), we can get about 10% of the amount of protein that we need every day.

1.4 Other useful parts of the sweetpotato plant

Apart from the roots, sweetpotato has other parts that can be eaten. It was interesting for example to note from the teacher that, we can also use the sweetpotato leaves as a vegetable. In addition, roots, vines and leaves can be fed to animals such as cows to provide the energy and vitamin A that the animals need.

When I met with the traders the day I went to the village trading centre together with my mother, the traders told me that they generally feed the roots to pigs while the vines are fed to different types of animals, including goats, pigs, cows, chicken and rabbits. Photograph 11 gives you an example of my neighbour's cow feeding on sweetpotato vines.

Photograph 11.
A cow feeding
on sweetpotato
vines



Exercise: When you finish classes today, I suggest that you walk through your own village or community and ask the farmers if and how they use sweetpotato as animal feed. You may even notice differences in how the roots and vines are fed to the animals.

I learnt from the traders that it is a good practice to cook the roots before feeding the pigs so that the roots can be easily digested.

They also said that vines can be fed fresh, dried, fermented, or made into silage. What I observed is that the most common practice is to feed fresh vines during the harvesting season, and to dry the vines or make silage after harvest. This practice, however, is very common in places like town centres where there is no land for grazing of animals.

During the first part of my investigation on sweetpotato I learnt to distinguish between the roots of the sweetpotato plant and its vines. I also found out that both plant parts can be eaten as well as fed to animals. But now I wanted to find out more deeply about the sweetpotato plant. In order to do this I visited my aunt who grows a lot of them and asked her to show me a complete sweetpotato plant.

Exercise: Photograph 12 shows my aunt holding a sweetpotato plant from her garden. Look at the photograph and try to distinguish the different parts of the plant. Make a sketch of the plant in your exercise books and name the different parts. Then compare your notes with the drawing in diagram 1 left by the scientist in the classroom last time.

Photograph 12.
A woman holding
a sweetpotato
plant



Last time, the scientist explained that sweetpotato is a flowering plant as seen in diagram 1 and

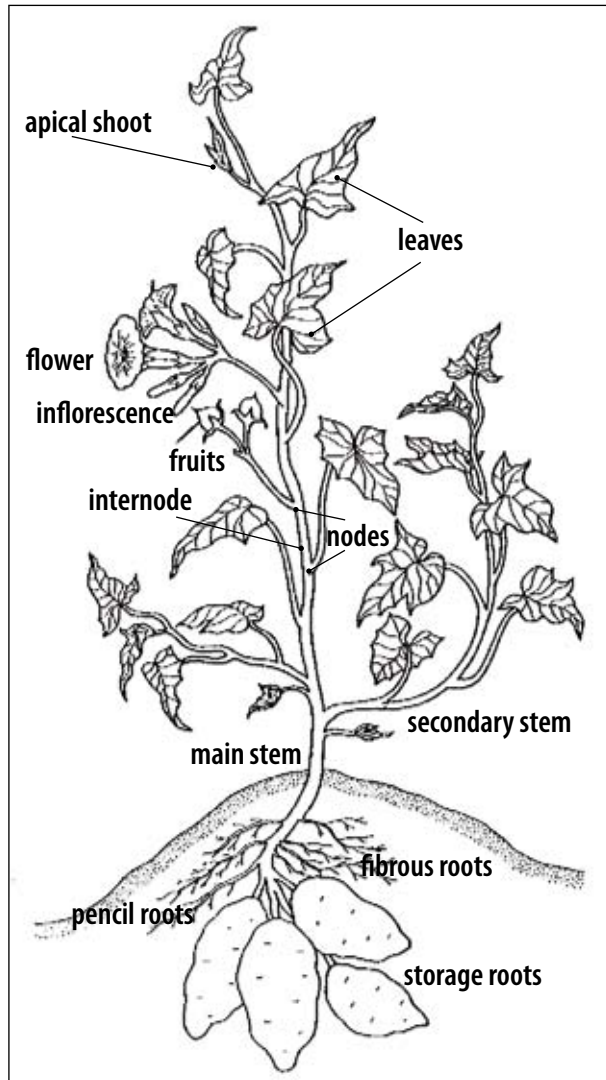
Photograph 13.
A sweetpotato
flower



photograph 13. She explained that some sweetpotato scientists use the seeds formed from flowers to do research on sweetpotato.

When I reached my aunt's home, I asked her how sweetpotato grows. She explained that unlike pumpkins or tomatoes that grow on stems above

Diagram 1.
Drawing of a
sweetpotato
plant and its
parts



the ground, sweetpotato grows under the ground like potatoes and carrots. As the plant grows, new sweetpotato roots form in the soil. These with time they grow big and become storage roots which we normally harvest and take home for eating or selling.

While I was still with my aunt, I wanted to study closer the storage root itself. I asked her to show me

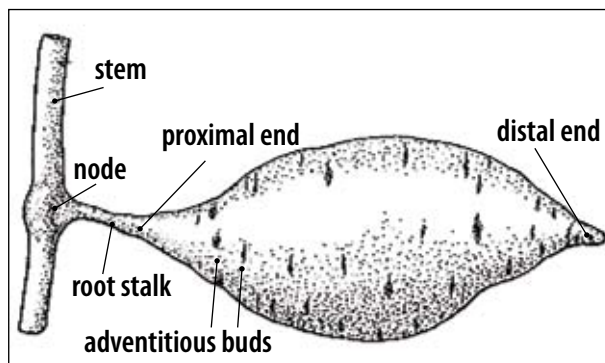
the sweetpotato roots and explain to me about the different parts.

Exercise: Get your exercise book and pen and do the following: Take a look at photograph 14. Draw a sketch in your exercise book and name the different parts of the root that you have seen. Did you notice the sign in the photograph? These roots are from another variety called Mafutha. Compare your diagram with diagram 2 that the scientist left in the class when she visited our school. Does your diagram look like diagram 2?

Photograph 14.
Farmer holding
sweetpotato
storage roots



Diagram 2.
Drawing of a
sweetpotato root







What makes sweetpotato grow?



2.1 Getting planting material

After knowing the usefulness of sweetpotato in our lives, it is important to know how to get planting materials for producing the sweetpotato. The other day I attended a public event with my class, where the use of orange-fleshed sweetpotato was being promoted in our community. We were all given orange t-shirts and received a lot of information about the nutrition and health benefits of orange-fleshed sweetpotato. During the event, groups of school pupils sang songs and made a skit about farmers planting sweetpotato as shown in photograph 15. We ate different products cooked from different sweetpotato varieties. This made me

Photograph 15. Pupils singing a song during the promotion of orange-fleshed sweetpotato



want to understand how I could plant sweetpotato in my school garden or at home in our backyard. In fact the organizers at the promotion gave us sweetpotato vines for planting as shown in photograph 16.

Photograph 16.
A pupil holding
sweetpotato
vines for
planting



Now that I had received the planting material I wanted to know how I could get my own good planting materials for the next season. To do this I decided to observe how the sweetpotato farmers in my community selected good planting materials that do not have diseases from a nursery bed as shown in photograph 17.

Photograph 17.
Farmers
selecting
good vines for
planting



Exercise: Go to the school garden and observe the plants. Think of specific characteristics of good planting material as you normally observe from your parents' gardens at home. Make a list of your suggestions in your exercise book. Are the characteristics you wrote down similar to those summarized in table 3?

Table 3. Comparison of characteristics of good and bad planting material

Good for planting	Not good for planting
No sign or symptoms of pest attack	Damage to leaves, stem and / or roots
No sign or symptom of diseases	Plant has diseases
The leaves are still green and strong	Leaves are dry and not strong
2-3 months old	Older than 5 months

I noticed that as farmers were selecting vines for planting, they left the bad ones that had diseases like the ones shown in photograph 18. Notice the yellowing of the leaves and the smaller size of the

Photograph 18. Sweetpotato plant affected by viruses



plants showing that the plants are affected by sweetpotato virus diseases.

The farmers also never picked vines that were affected by drought. In our area, rainfall is not reliable, thus farmers need a variety that could also grow well even with small amount of rainfall. Compare the effects of drought on two different sweetpotato varieties in photograph 19.

Photograph 19.
Comparison
of effects of
drought on two
sweetpotato
varieties



Not affected



Affected

The farmers explained that the two sweetpotato varieties were grown under similar conditions. Did you notice that the sweetpotato variety on the left was less affected by the extended dry period? This variety could serve as planting material. The other plants (on the right) were severely affected by drought, so it is not recommended to use them as planting material in the areas that receive less rainfall.

From the above observations, I concluded that farmers always select good planting materials by inspecting the field and identifying those that are not affected by diseases and drought. This technique

was explained to us by the scientist who visited us to be known as “Positive Hill Selection”. As you can see, this is a relatively simple technique that we can do by ourselves. You can try to use it in your own field, school garden or at home.

While visiting the farmers’ field, I made notes about the characteristics of the good and vigorous planting material and compared them with those that were not suitable for planting. I then compared my observations with those listed previously in table 3.

As you may have noticed, some farmers have been selecting good planting materials from a sweetpotato garden while others from the nursery bed. Actually, at my school we have established similar nursery beds to multiply planting materials for our school garden as shown in photograph 20 though the area is much smaller in size.

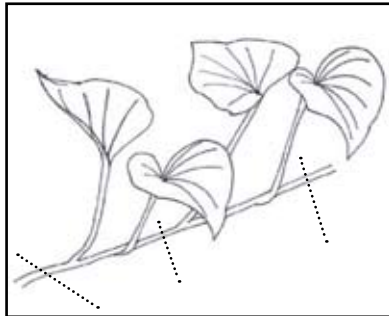
Photograph 20.
Sweetpotato
nursery beds
in the school
garden



Notice a teacher in photograph 20 explaining how to plant very short cuttings in a nursery bed. These are known as 'mini-cuttings' as explained by the teacher. He explained that this is known as "Rapid Multiplication Technique (RMT)". The vines that were used were cut from a field with very strong and good

looking plants. Our teacher told us to follow the recommendations illustrated in diagram 3 when preparing the mini-cuttings for planting in the nursery beds.

Diagram 3.
Drawing of a vine for the production of short cuttings



- Use a cutting from the upper part of the vine (25-30 cm in length)
- Cut the vine into short pieces ("mini" cuttings)
- Each "mini" cutting should have 2 or 3 nodes
- Keep one leaf at the top part of each mini cutting

Exercise: Think about what I said earlier about the different reasons for selecting a good healthy vine. What do you think about our teacher recommending us to use the top part of the vine instead of the middle or base part? Copy table 4 to your exercise book and mark the appropriate columns with your answer. Consult our teacher about the results you have.

After this process, we were able to get started with the planting of the mini-cuttings in nursery beds at

Table 4. Which part of the vine fits with the reason given?

Reason	Top part	Middle part	Base part
Affected by cutting			
Sprouts quickly after planting			
Grows faster			
Contains weevil eggs, pupae and larvae			
To be used when vines are in scarce			

school as shown in photograph 21. Below are the steps we followed, as recommended by our teacher:

Photograph 21.
Pupils holding sweetpotato vines for planting in the nursery bed



- Prepare the nursery bed with a mixture of loose, humus-rich soil, organic compost or animal manure, and kitchen ash
- Irrigate the soil before planting
- Plant the mini-cuttings on rows that are 20cm. apart at the

spacing of 10 between plants

- Bury at least one node under the soil
- Irrigate the nursery bed regularly, at least once a day as pupils are doing in photograph 22
- Remove any weed by hand
- Remove diseased plants by uprooting them out
- After four (4) or more weeks, the vines can be harvested

Photograph 22.
Pupils watering
the nursery bed



Exercise: Use the schedule of activities in table 5 to plan and keep record about the management of our school nursery bed. This should be put on the wall at the back of our classroom for everybody to see it.

Table 5. Schedule of activities

Schedule to maintain planting activities in our school garden

Date	Pupil's name	Planting	Watering	Weeding	Rouging	Harvesting

2.2 Sweetpotato growing practices

After only a few weeks my class was able to harvest the vines from our nursery bed to the sweetpotato garden. We took great care to plant the crop late in the afternoon to avoid excessive loss of water, wilting and transplanting shock due to sunshine.

Our teacher told us that in East Africa sweetpotato can be planted at any time of the year as long as there is enough moisture in the soil. It grows better with temperatures above 24°C, on well-distributed rainfall of 750-1000 mm per year and on good sandy loamy soils.

Before we planted our sweetpotato garden we visited the farmers in our community to observe how they plant sweetpotato. The farmers told us that sweetpotato can be planted either as an opening (clearing) crop after the rest (fallow) period of a field or as a closing crop at the end of a crop rotation cycle. This process is called crop rotation. It helps the farmers to grow more than one crop in the same area without removing many nutrients from the soil. In table 6 you can review a list of crops provided by our teacher which are or not recommended for crop rotation with sweetpotato.

Exercise: Why do you think sweetpotato should not follow the root and tuber crops listed at the end of table 6?

Table 6. Crop rotation and sweetpotato

Crops for rotation	Recommended	Not recommended
Maize	X	
Sorghum	X	
Upland rice	X	
Finger millet	X	
Beans	X	
Cowpeas	X	
Soybeans	X	
Sesame (simsim)	X	
Cassava		X
Yams		X
Potato		X

Photograph 23. Field of sweetpotato intercropped with maize



In order to grow more than one crop at the same time, farmers told us that they some times use another cropping method called “Intercropping”. This means that you may plant two or more crops together in the same field. Sweetpotato can be grown alone or intercropped with other crops, as shown in photograph 23.

To understand the advantages and disadvantages of intercropping with sweetpotato, I conducted a little experiment: I asked my parents to lend me a small field that I divided into three small plots. In one plot I planted only sweetpotato. In the second one, I planted one row of sweetpotato between two rows of beans. In the third plot, I planted sweetpotato and potatoes together in the same row. At the end of the experiment I summarized my observations as shown in table 7.

Table 7. Results of the intercropping experiment

Plots	Crops	Observation
1.	Sweetpotato grown alone	I got normal root yields
		No additional crop harvested
2.	Sweetpotato and beans	I got normal root yields
		I also got beans
		I used almost the same amount of labour as with sweetpotato grown alone
		Not much weeds
3.	Sweetpotato and potato	I got reduced yields
		I got additional potatoes but few
		Both crops seemed to lack nutrients
		Ground seemed overcrowded

I discussed my observations with my friend Okiror. He agreed that these observations confirm the common practice of farmers to grow sweetpotato.

“Table 7 shows the advantages and disadvantages of intercropping”, Okiror said.

But then, Okiror asked me if I had considered the effect of intercropping on soil fertility. I told him that I had not considered this aspect. I had concentrated on observing the root yields of the crops.

Okiror told me that intercropping can promote the crop growth and increase the yield of the crops if these are well selected. In fact, some crops seem to improve the soil fertility. The question for me to think about was if the effect on soil fertility was the same with any crop used for intercropping. He also told me that some plants drop leaves that cover the soil surface and become mulch, which increases the soil fertility.

Then, we went to the plot where I had planted sweetpotato together with beans. Okiror carefully dug out one of the bean plants and showed me round structures on the roots of this crop. Okiror explained to me what the scientist had told us, that these swellings on the roots are called root nodules. There are bacteria living in these nodules that we cannot see with our own eyes. These bacteria are able to absorb nitrogen from the atmosphere and change it so that the plant can use it to make its own food and helps to improve the fertility of the soil. The scientist said that the whole process is known as nitrogen fixation. Therefore, Okiror explained

that since I had planted sweetpotato together with beans, they could also benefit from this nitrogen and grow well.

Based on our observations on the farmers' gardens, my class proceeded with the planting of the sweetpotato in the school garden field.

Exercise: Review our photographic journey of sweetpotato farmers in the following pages. Visit your nearby farmers and look for similar things they are doing and compare with the activities taking place in the photographs.

Preparing the land. First, we have to prepare the land for planting sweetpotato vines using a hoe like the farmer in photograph 24; other farmers use oxen ploughs (photograph 25).

Photograph 24.
Farmer hoeing top soil to make mounds for planting





Photograph 25. Farmers ploughing field with oxen to make ridges for planting

Our teacher told us that this practice is not tiring and does not need much labour. Preparing the soil by means of hoeing and ploughing aims to turn over the topsoil, control weeds and produce mounds or ridges for planting. The plant residues and fertilizers that have been applied to the soil surface are put under, so that they decompose faster. Additionally, the oxygen (air) content of the soil increases during soil preparation; this favours the development of roots and bacteria that will decompose the organic matter.

Maintaining a fertile soil. Our teacher explained the advantages of maintaining the fertility of the soils for planting crops such as sweetpotato. He said that soil is the place where plants live or grow and feed. The soil provides the plants with nutrients and water; it holds them firmly in the ground.

He said that the nutrients that sweetpotato need as its food include the following:

- Nitrogen: Plays a role in the increased absorption of sun light (photosynthesis); stimulates leaf growth; enlarges size of leaves and roots
- Phosphorus: Stimulates storage root development
- Potassium: Increases the number and size of storage roots; enhances resistance against diseases; increases vitamin A content

Because of this, we used farm manure in our garden, especially cow dung, compost (decomposed plant material) and green manure as organic fertilizers to feed the sweetpotato with the necessary nutrients.

Planting the vines. After the preparation work, we proceeded to plant the sweetpotato vines in the field. Planting is done by pushing the basal portion of the vine cutting into the soil. The cutting can be planted horizontal or vertical depending on the common practice of the community. Mounds or ridges can be used as demonstrated in photographs 26 and 27. Farmers explained that the vines are

Photograph 26.
School pupils
planting
sweetpotato
vines on ridges



Photograph 27.
A farmer
planting
sweetpotato
vines on mounds



normally planted at a spacing of 25-30 cm between plants and 60-100 cm between ridges. Where mounds are used, 3-4 cuttings per mound are planted.

Okiror explained that actually the mounds (or ridges) we have prepared to plant sweetpotato are also a way to promote soil fertility. They also help to control soil erosion when it rains heavily. Careful mounding and ridging may ensure that all the weeds and seeds in the top layer of the soil will be buried within the mound or ridge. And perhaps more importantly this



Photograph 28.
Sweetpotato
planted on the
ridges

makes it easier to harvest the mature roots later. Photograph 28 shows a field of ridges planted with sweetpotato.

Knowing that farmers usually plant 3-4 cuttings per mound to get fully grown large sweetpotato, I asked myself: What would happen to the crop if I change the number of the vines planted on the mound? To investigate this question I prepared two small boxes filled with soil, just like a small nursery bed, and prepared a mound in each of them. In one box I planted three vine cuttings per mound just as the farmers would normally do. In the other box I planted ten cuttings in the mound very close to each other. At the end of the growing period I harvested the sweetpotato from both boxes. The first mound produced a regular yield with good sized sweetpotato roots similar to those shown in photograph 29. The other box where I planted ten cuttings per mound produced many but very small storage roots.

Photograph 29.
Yield of
sweetpotato
harvest



I told my friend Okiror about this experiment. He congratulated me for demonstrating that crowding of vine cuttings on the mound reduces the root yields of sweetpotato. We concluded that the plants competed for nutrients in the soil, each getting little nutrients on average and thus produced smaller storage roots.

Managing the crop. In order to ensure proper growth of our crop we had to maintain the garden on a regular basis. Our teacher explained that sweetpotato tends to develop roots from the stem nodes along long vines creeping over the soil surface. These additional small roots are smaller in size; they use up water and nutrients from the soil and lead to yield losses. This waste can be prevented by lifting the vines so that the roots growing on the

stem nodes are cut off and will not continue to grow. He further elaborated that the soil on mounds or ridges would crack and expose the storage roots to weevils. By putting extra soil onto the sides of the ridges or mounds (hilling up) the insects' damage, more especially from weevil, can be reduced.

The teacher also emphasized that unwanted plants called weeds (grass, sedges, or broad-leaved plants) compete with the sweetpotato crop and should be removed (weeding). I have mentioned earlier the use of crop rotation and intercropping when planting sweetpotato. These are other effective strategies to control weed growth.

When sweetpotato is grown on ridges, farmers often move the soil down from the sides of the ridges after a couple of weeks after planting, in order to remove weeds. We also mentioned the use of mulch, where cover crop residue, left on the soil surface, can help to prevent weed from emerging. Some cut weeds that easily die should be left on in the field as soil cover.

We observed our field where we had planted three different varieties: The sweetpotato took between 100-150 days to mature depending on the variety. I have summarized in diagram 4 the four stages of one sweetpotato variety I recorded during five months of maturity.

Exercise: Take note of the individual maturity stages and the corresponding characteristics of the crop in each stage.

To understand more about what takes place in the soil, I set up a little experiment as illustrated in diagram 5.

I took one root and inserted toothpicks on its sides to hold it in position. Then I placed it on top of a jar with water covering the bottom part and set it aside next to a window. This was my experimental sweetpotato. I filled a second jar with only 1/3 of water and placed another root on top of it so that it would not touch the water. This was my control sweetpotato i.e. help to make a comparison. During the experiment I added water to the jars on a regular basis maintaining the level as specified above.

Diagram 4.
Observed
growth stages of
sweetpotato

Initial stage

- Planting
- Fast growth of young roots

Week 1-6



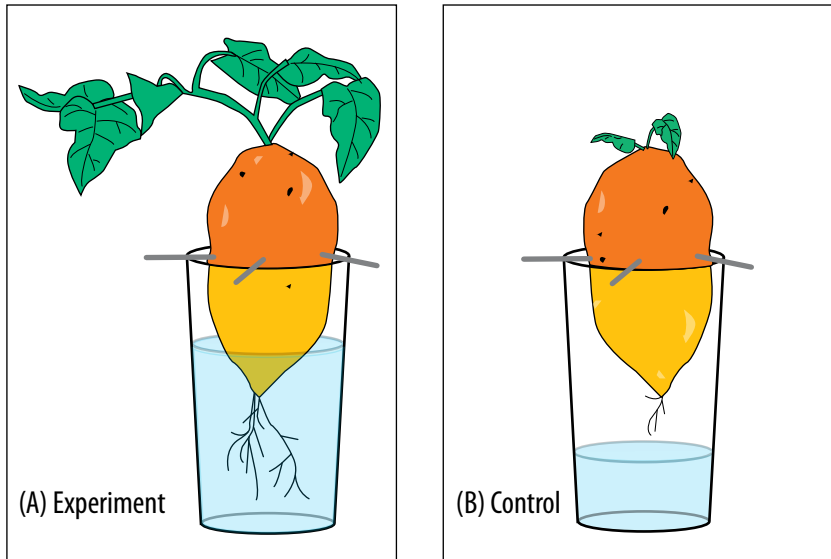
Middle stage

- Fast growth of vines
- Expansion of storage roots
- Rapid expansion of leaves

Week 6-12



Diagram 5.
Growth of
sweetpotato root
in water (A) and
without water
(B)



However, this time I wanted to work like the scientist who visited us last time. So, I prepared two worksheets, one to explain my thinking and questions and the other to collect my data or information. You can use these worksheets on the following pages to help you conduct your own experiments.

Middle to final stage

- Growth of vines
- Rapid root expansion

Week 12-15



Final stage

- Growth of vines reduces and finally stops
- Leaves become old and fall

Week 15-20



Experiment worksheet

Name of pupil: _____

Date: _____

1. The variable I want to test is:

2. The question I will try to answer about the variable is:

3. How I will test that variable:

4. What I will measure:

5. What I will count:

6. What I will observe:

7. How I will record the information:

8. My hypothesis is (this is what I think will happen to the sweetpotato):

Observation and information collection sheet for experiment

Name of pupil: _____

Date: _____

The variable I am testing is:

I started my experiment on _____ (date) at _____ (am/pm).

Changes in sweetpotato	Control sweetpotato		Experimental sweetpotato	
	Time & date	Observations	Time & date	Observations
Roots emerge	A.		C.	
	B.		D.	
Vines emerge	A.		C.	
	B.		D.	
Roots grow	A.		C.	
	B.		D.	
Vines grow	A.		C.	
	B.		D.	

In this experiment I was able to study the effect of water on the establishment and growth of the sweetpotato plant. In the experiment, I recorded the time when the roots began to sprout and the length of growth of vines. I also counted the amount of vines that were growing as well as their thickness. I observed the growth of the sweetpotato roots over four months and recorded my results in the table in the second worksheet. I was thinking that when the sweetpotato root does not receive enough water it will not grow properly to its full length.

Exercise: Copy the worksheets into your exercise book and fill in the empty spaces with your description of the experiment.

My results show that the growth pattern of the plant in the first jar was regular and compared well with what I had seen in our school garden. It showed that the plant began to sprout after about 10-15 days, and during the next 4 months the vines grew fully from the root. The root in the second jar, filled with just a little bit of water, produced neither roots nor vines. In fact, it died due to the lack of water.

When I showed the observations to my friend Okiror he was very impressed. He asked me if I had considered the effect of light on the growth of the sweetpotato plants. Together we set up another experiment with 2 pots. In the first pot we planted one root and placed the pot (the control sweetpotato) close to a window so it would get

enough light. In the second pot we planted another root and placed it (experimental sweetpotato) in a shaded corner of our classroom opposite of a window. We watered both pots regularly. We had predicted that lack of light will affect establishment and growth of the sweetpotato plant. During our observations we noticed that the sweetpotato in the pot next to the window grew normally as we had expected. The other sweetpotato in the dark corner of the classroom also grew, but slower and looked weak, thin and tall. The vine grew towards the window on the opposite side of the room, but it was much thinner compared to our control sweetpotato.

Okiror continued to challenge me about our experiments. He said that by now I should have understood that light, as well as good level of water, play an important role in the growth of sweetpotato. Also temperatures affect the growth of sweetpotato. Cold temperatures slow the growth of sweetpotato as our teacher told us. But Okiror suggested that we should also look at other factors such as the effects of different types of soils, the amount of water or the amount and timing when providing nutrients to the plant.

Exercise: You can repeat these and other experiments like those suggested by Okiror, in your class or even at home. Use the worksheets that I have prepared to develop your hypotheses (predictions), your questions and the activities you need to do in order to set up the experiment and collect the information as the real scientist shown in photograph 30.

Photograph 30.
Scientist
recording
information in
the sweetpotato
field at
harvesting







Sweetpotato can get sick

3.1 Natural enemies of the sweetpotato

Sweetpotato crop has enemies that affect health and growth and it is important to know and guard against them. The other day our teacher walked with us to the school garden to visit our sweetpotato field. The teacher told us that we had come to the garden to study the plants and their surroundings. Then



Photograph 31. Studying the beetles on sweetpotato leaves

he asked us to closely look at the leaves and see if we could notice anything which did not look normal on the plants. At first, we did not understand what the teacher meant. All the leaves looked fine to us, but then we began noticing leaves that were damaged as if someone or something had eaten from them. So we bent down and looked closer. We began turning some of the leaves upside down because we wanted to know what had caused that damage. After a few minutes, We found some insects that our teacher told us were beetles (photograph 31); we also found larvae hidden in the vines as shown in photograph 32.



Photograph 32.
A mature
larva on the
sweetpotato
vines

Our teacher told us that these insects have needs just as humans or plants: they all need to eat. Our teacher, however, remarked that insects, like those we found, eat and cause damage to our sweetpotato crop, and are therefore, not needed in the garden. That is why they are called pests. The teacher explained that if they were only a few of these pests in our sweetpotato garden there would be no problem. However if they are too many in the field, then they cause severe damage to the crop, which could lead to a big loss in yields.

Now that had learnt that pests were benefiting from our sweetpotato, I wanted to understand the extent of the damage to the crop that could be. For that reason I marked the plant with beetles by placing a tall stick. Then I looked for a plant furthest away from the first one with no beetles' damages. Each day I went back and took notes in a worksheet to record my observations.

Exercise: See the record sheet below. It is another example of how you can record your observations. Use it to record your observations in your exercise books.

Pupil worksheet for experiment

Name of pupil: _____

Date: _____

Problem:

Pests can damage a sweetpotato plant. How severe is that damage?

My guess is that:

Pests like larvae and beetles can damage a sweetpotato plant in such a way that it leads to the total loss of leaves.

Experiment:

Study materials: Two sweetpotato plants (one with pests and the other doesn't); a record sheet

Procedure: Observe two sweetpotato plants in the field

Record Sheet

Days	Sweetpotato plant with no pests	Sweetpotato plant with pests
1		
2		
3		
4		
5		
6		
7		
8		

Conclusion: Did your experiment confirm or contradict your thinking? Why?

My observations showed that the plant with no pests did not show damage and grew to a regular size as I had expected. But the plant with the pests lost most of its leaves. Again I told my friend Okiror about these findings. Okiror congratulated me on my observations and me asked if I had considered damage caused on other parts of the plant by the pest. And, whether there are other types of pests that cause other types of damages to the plant. So we decided that we should invite other pupils in our class to investigate this with us.

Exercise: Walk through the school garden and observe the different types of insect pests. While still in the garden, take records of the damage you observed on leaves, stems or storage roots. Collect the common pests found in almost all the plants you study. Discuss the findings with the teacher and request him to tell you the names of the common insect pests you collected.

Our teacher told us several names of different types of pests including the wireworm, the cucumber beetles, the grubs and the sweetpotato flea beetles. He, however, explained that those were not very dangerous and that is why we did not find them every where. The most dangerous one was the sweetpotato weevil shown in photograph 33. Interestingly every one of us had collected these weevils and recorded the level of damage they had caused in the field.

Photograph 33.
An adult
sweetpotato
weevil



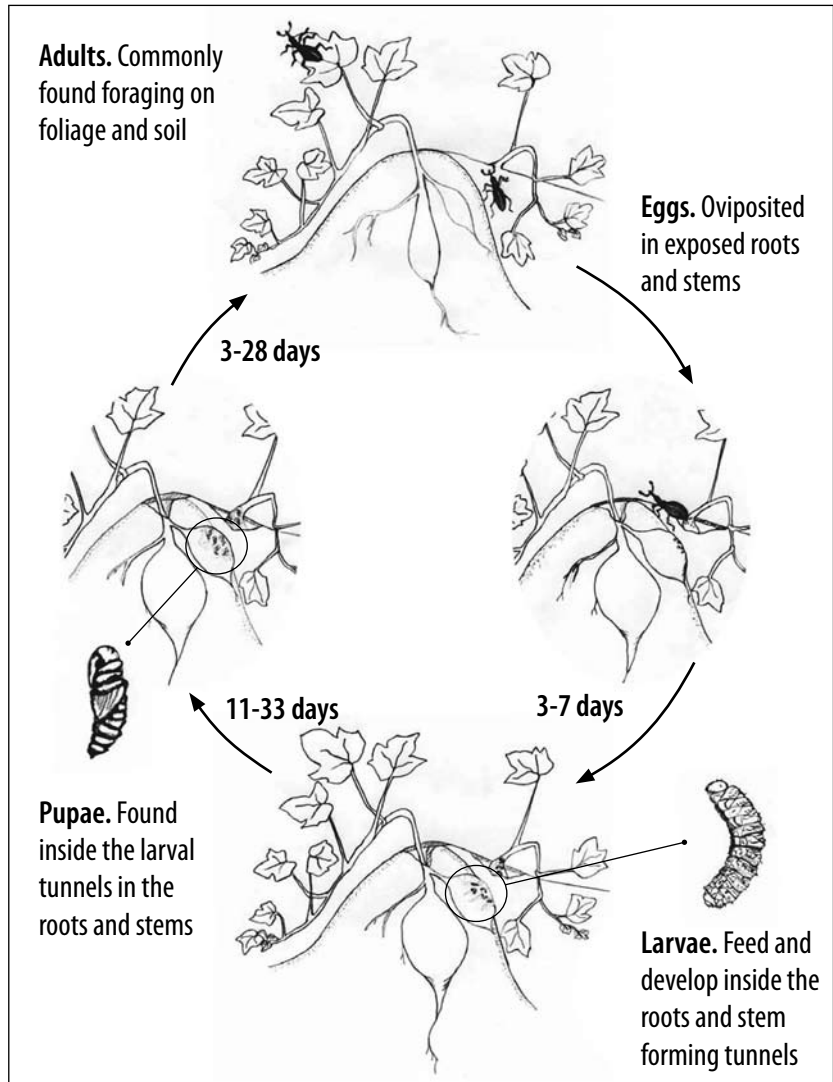
With these observations, we requested our teacher to give us more details on this dangerous pest. He explained to us that we had to study first its life cycle to enable us to understand in which stage it causes serious damage to the sweetpotato. He showed and explained us an illustration of the weevil's life cycle. See diagram 6.

The sweetpotato weevil has a life cycle of four stages:

1. Egg
2. Larva
3. Pupa
4. Adult

After mating, female weevils lay eggs on sweetpotato vines or leaves. The eggs will hatch into larvae after 3 –7 days. The larvae do not have legs and are white in colour. The larva is very dangerous because it feeds on the vines by making holes and feeding on the juices and sap. The larvae can live for

Diagram 6.
Illustrations of
the life cycle of
the sweetpotato
weevil



11 – 33 days before developing into pupa. The adult weevils emerge from the pupa after 3 – 28 days. The development of the sweetpotato weevil from egg to adult takes only 32 days on average. Once the adult sweetpotato weevils have fully developed, they leave the root zone in search of males for mating. High numbers of weevils in the leaves usually indicate that

there is a high number in the roots. The female adults can live for 140 days.

Damage to the roots. Our teacher explained to us that the most severe damages are made to the storage roots. Once the storage roots have developed, the adult sweetpotato weevil will move to the roots through the cracks in the soil. The teacher mentioned that there is another type of sweetpotato weevil that is also considered dangerous; it is called Sweetpotato Rough Weevil. It attacks the skin of the roots, making it rough as shown in photograph 34.

Photograph 34.
Damage caused
by the rough
sweetpotato
weevil



The external root damage lowers the root quality, and can reduce the market price. The internal damage caused by the larvae can lead to complete loss.

Our teacher concluded the explanation on sweetpotato weevils, by asking the factors that should be considered when observing damage caused by pests. We made the following conclusions:

- ***The number of individual pests on the plant.***
During my first experiment I looked at the damage caused by larvae, but I had failed to count their number. I understood that the more larvae attack a plant, the more severe is the damage. I once read that the older larvae of the sweetpotato hornworm can actually defoliate a whole field in one night only.
- ***At what stage of crop development do they damage the plant?*** When Okiror and I reviewed the life cycle of sweetpotato weevils we noticed the different stages. During the teacher's explanation, he indicated that the insect at different stages lives in different parts of the plant.
- ***Which is the most preferred part of the plant?***
If we take an example of the weevils, the most severe damage seems to be made on the periderm (outer part of the root).

The last question was about the way to control the attacks by pests. Our teacher had mentioned that sometimes these pests have natural enemies that could help to reduce them in the field by eating them. But the most effective way to control pests, especially the sweetpotato weevil, is through good cultivation practices. Some of them were described by the scientist earlier in the chapter - about planting sweetpotato.

The teacher also provided us with a list for our review:

- Remove all the old plants of the sweetpotato from the field
- Use planting material with no diseases
- Plant and harvest early before the dry season
- Plant in a new field away from the old one which has weevils or use other crops around the sweetpotato field
- Cover the base of the plants with soil to prevent soil cracks especially in the dry season
- Irrigate the field to reduce or prevent soil cracks
- Cover the field with mulch to keep the soil moist and prevent cracks, and provide a more favourable place for natural enemies
- Harvest the big roots and cover the holes with soil to prevent the other roots from being attacked by weevils.

Other pests include termites and millipedes. Our teacher pointed out also that vermin like rats, wild pigs, porcupines, baboons, monkeys, elephants, hippos, guinea fowls and even domesticated animals can severely damage the storage roots. These animals feed on the roots and leaves and often pull up the whole plants in the garden.

Other damages are found in the leaves, these are mainly caused by butterfly larvae. As shown in photograph 35. Other pests include the clearwing moth.

Photograph 35.
Larva causing
leaf damage



3.2 Knowing your sweetpotato diseases

In class, our teacher continued the session about damages to sweetpotato. This time we turned our attention to the diseases that attack the sweetpotato crop. Because we could not readily see diseased plants in our school garden, our teacher brought a few pictures showing symptoms of sick plants.



Photograph 36.
Symptoms of
sick leaves of
sweetpotato

The leaves in photograph 36 show the light green colour of the leaves when the sweetpotato plant is sick. Our teacher said that sick plants show these or similar symptoms that make them different from healthy plants. After this explanation, he asked us to go to the school garden again and try to compare

a healthy and a sick sweetpotato plant. This was quite easy since we noted a big number of diseased plants. For instance, notice the two plants at the right of photograph 37, these are diseased sweetpotato plants that are much smaller in size and yellowish when compared to the plant on the left.

Photograph 37.
Healthy (left)
and sick (right)
sweetpotato
plants in field



After the class, my friend Okiror and I sat down to learn about these disease symptoms. So far, we had noticed that they affect the colour and texture of the leaves, as well as the size of the plant. The questions we asked ourselves were two: First, we needed to find out what actually caused the disease symptoms. And second, we were wondering if different parts of the sweetpotato plant would show disease symptoms, similar to the damages caused by pests to the plant.

Our teacher told us that one of the major causes of sweetpotato diseases are the viruses. So our first experiment was about the disease symptoms that are caused by a virus. We wanted to investigate ourselves about how a virus would affect the growth

of a sweetpotato plant. With the help of our teacher, we contacted the sweetpotato scientist who had visited our class days before. We asked her to give us two types of sweetpotato vines, one that was healthy and another that was affected by the sweetpotato virus. After we received these vines we prepared two pots with soil. In one pot we planted the healthy vine and in the other we planted the sick vine. We set them apart by 500 m away from each other and irrigated them regularly. We guessed that the sick plants would grow shorter and smaller in size with light green coloured leaves as shown in photograph 38.



Photograph 38.
Sick sweetpotato
plants at harvest

Also, at harvest they had few small storage roots or even none. After the end of our experiment, the results confirmed our guess that the sweetpotato virus would be transmitted to a new plant and affect root yields. In photograph 39, you can see a 3 – 4 months old healthy plant that has not been affected by the virus.

Photograph 39.
A healthy
sweetpotato
plant at harvest



Exercise: As a group in the class, visit the school garden again and list all the symptoms observed in the plants affected by virus diseases.

Our teacher mentioned the major ways in which virus diseases are spread:

- Small insects that are white in colour, commonly known as white flies
- Continuous planting of sick vines affected by the virus diseases
- Continuous planting of sweetpotato varieties that are not tolerant to the virus diseases

The teacher further explained that most often these diseases affecting sweetpotato are transmitted from previous or nearby older crops or wild plants. Usually the diseased sweetpotato plants are the main source of infection for newly-planted crops. Okiror whispered to me, "Just think of how you can catch

a cold from someone in your class who is coughing and sneezing due to a cold he or she may already have.” That is why it is important to remove the sick plants just like the farmer is doing in photograph 40.



Photograph 40.
A farmer
removing sick
plants caused
by virus diseases
from the field

I then remembered the farmers in my village that we recently visited. They had told us that they attended a training session in agriculture at our demonstration centre and were advised to remove all sick plants from their fields as shown in photograph 40 above.

One of our classmates wanted to know if there are other diseases. Our teacher agreed and promised to explain these to us in the second class. Otherwise he wanted us to take note of other factors that affect the good growth of sweetpotato. These include nutrient deficiency or excess, bad soil texture such as clay soil, high or low temperatures, little or too much water, and inadequate or excessive light or sun.

Exercise: Study other symptoms of the sick plants in your school garden or in your community. Make a collection of sweetpotato leaves from sick plants. Compare the symptoms and think about what might have caused them. Consult your teacher to identify the disease.

As a group the next couple of weeks we spent a few hours each day in the school garden to look for symptoms. We also spoke with some of the sweetpotato farmers in our community and asked them to show us examples of sick plants. Based on what we earlier learnt from our teacher, we summarized our results as shown in Table 8.

Table 8.
Symptoms of diseases caused by different agents

Disease causing agents	Symptoms
Nematodes	Swellings or cracks on the storage root
	Swellings on the fibrous roots
	Death of large portions of the root system
Fungi	Black areas, often roughly circular
	Spots or powdery areas
	Large groups of filaments
Bacteria	Wounds-at the surface
	Root rotting
	Dead plant parts
Viruses	Stunted growth
	Pale green leaves with clear veins
	Distorted and curled leaves
	Pigmented leaves (mainly purple colour)
	Reduced production of storage roots

The farmers that we consulted about sweetpotato diseases told us the following on sweetpotato cultivation practices that should be avoided because they favour the spread of diseases:

- Planting sweetpotato fields close to each other will speed the transmission of diseases between crops.
- Planting the sweetpotato fields at intervals that are not regular, so that new crops find old ones not harvested. The old field can be the source of diseases
- Piece-meal harvesting allows the sweetpotato crop long duration in the field, which in turn allows more time for the disease to progress in big quantities.

Leaving the leaves and storage roots in the old field because they can grow again into sick plants and start spreading the diseases.





Harvesting sweetpotato

4.1 Bringing in the sweetpotato harvest

Photograph 41.
A pupil showing
sweetpotato
roots at harvest



Finally our sweetpotato school garden was ready for harvesting. We had waited for about four months after planting. In photograph 41, our classmate is showing some of the mature roots harvested from our field. The weather at our school is very dry and so harvesting could not extend longer to avoid weevil attack as explained earlier on. Our teacher

told us that there are certain factors that we need to observe when determining the best time of harvest:

- The growth period of the used variety and its ability to stay for long time in the soil
- The environmental conditions such as rainfall distribution, soil conditions, and weather
- The pest and disease effects
- The demand for sweetpotato in the market
- The buying and selling prices
- The need for land to plant next crop
- The market price of the next crop

In our case, the varieties we used had reached their maturity time after the foliage looked old enough and the vines stopped growing. The leaves became small, old, yellow and fell off the plant. In photograph 42 you can see some of the yellowing of the leaves that takes place towards the end of the growing cycle.

Photograph 42.
Sweetpotato
field ready for
harvest



Exercise: Can you think of a reason why the demand in the market and prices would determine the time of harvesting sweetpotato?

Now that my class was ready to harvest the sweetpotato I was asking myself what would be the best method of harvesting. Together with my friend



Photograph 43.
A farmer
harvesting
sweetpotato

Okiror we visited one of the sweetpotato farmers to find out how he was harvesting his sweetpotato crop.

Okiror and I learnt from observing the farmer (photograph 43), that harvesting sweetpotato is mainly done manually. The farmer told us that great care needs to be taken to avoid damaging the roots during harvesting. In photograph 43, you can see a farmer using a hoe to loosen the soil before pulling the sweetpotato roots out of the soil and putting them aside.

Do you remember the question about market demand and market price? The farmers in photograph 44 are sorting the sweetpotato roots in their field, so that they can know the amount of money they will get from the whole field. Farmers can estimate the root yield in their garden by using the weight of the harvested roots from just a few plants, to calculate the market value of their crop.

When we finally harvested the whole school garden, our teacher asked us to measure carefully each root. He wanted us to estimate the harvested roots and to compare these with the actual measurements. Our

Photograph 44.
Farmers
assessing the
yields from
few plants for
estimating the
market value



teacher gave us a set of worksheets indicated below to record our answers.

First, each of us took few roots. Then we drew a picture of each root and noted all the special characteristics they had. Then we recorded the estimates of the weight, length, width and circumference into the worksheet. Finally, we did the accurate measurements using objects provided to us in the class and entered these results into the worksheet as well.

After completing the assignment, each of us presented his or her results in class. This enabled us to share our observations and note how our individual measurements were compared to others in the class. Farmers sometimes go through a similar process when assessing their harvested crop in the field as you can see in photograph 45.

Photograph 45.
Farmers
comparing yields
of different
sweetpotato
varieties



Data record sheet

Name of pupil: _____

Date: _____

Notes on the root appearance:

Drawing:

Measurements

	Estimation	Accurate measurement	Comments
Weight			
Length			
Width			
Circumference			

Of course, sweetpotato farmers do more than just assessing the individual roots. They also assess the shapes of the roots, skin and inside colours as well as the sizes.

Our teacher also told us that sometimes farmers participated in harvesting the sweetpotato in the research gardens of the Agricultural Research Stations such as Namulonge. So one day we made a short trip to Namulonge to see how they were doing this. Photograph 46 shows how farmers were participating in the assessment of the sweetpotato research field at harvest. This is always done with the scientists to make sure that at the end, the farmers are able to select the good varieties suitable for production in their areas. Again, we saw them after harvesting assessing the cooked roots for good

Photograph 46.
Farmers and scientists assessing sweetpotato yields at the research station



Photograph 47.
An assessment
of sweetpotato
cooked roots for
acceptance by
farmers



taste and texture in addition to attractive colour, see photograph 47.

The scientist at Namulonge showed us how to estimate the total number of plants in the whole garden. She said that this can be done by determining the average number of all productive plants per walking step along a ridge. Then, you count the total number of steps across all ridges or mounds in the field. We were then shown the steps to follow in assessing the yields and the market value of a harvested sweetpotato crop in a garden. These are summarized in diagram 7. We returned to our homes very happy after getting all the knowledge on sweetpotato harvesting from the research station.

Diagram 7.
Assessment
of the yield
and value of a
sweetpotato
harvest in a field

Step 1	<i>Calculating the weight of roots per plant:</i> Plant 1 = 0.35 kg Plant 2 = 0.50 kg Plant 3 = 0.40 kg Plant 4 = 0.75 kg Plant 5 = 0.50 kg Plant 6 = 0.55 kg Plant 7 = 0.60 kg Plant 8 = 0.20 kg Plant 9 = 0.65 kg Plant 10 = 0.40 kg
Step 2	<i>Calculating the average weight of roots per plant:</i> Total weight of the 10 plants = 4.9 kg Total weight divided by 10 = 0.49 kg Average weight of roots per plant = 0.49 kg
Step 3	<i>Calculating the average amount of productive plants per field:</i> One walking step along a ridge = 5 plants Steps per ridge = 125 steps Ridges per field = 4 ridges Total number of steps = 4 x 125 = 500 steps
Step 4	<i>Calculating the number of plants in the whole field:</i> Plants per step x Number of steps = 5 x 500 = 2,500 plants
Step 5	<i>Calculating the root weight of the whole field:</i> Average weight of root x Number of plants = 0.49 x 2,500 = 1,225 kg
Step 6	<i>Calculating the total crop value:</i> Multiply the total harvest (kg) by the prevailing market price per kg of storage roots

4.2 Transporting and storing sweetpotato

Now that we had collected our harvested sweetpotato roots in the school garden and estimated its value, we were facing another problem. Where would we store all the sweetpotato? We could neither just leave them in the field nor put them into our classroom. They could be rotten or damaged by animals. Because we intended to use our harvest for our personal consumption at school as well as at home, we concluded that the sweetpotato needed protection. With this problem, we needed to get some advice.

Photograph 48.
Farmers
harvesting
and collecting
sweetpotato

Okiror and I decided to visit a field in our community where the farmers were harvesting their sweetpotato. We wanted to observe how they would collect their harvest. Photograph 48 shows the



harvest and collection of sweetpotato in the field. Based on the calculations we made at school, the average root weight per plant was about 0.5 kg. So we asked ourselves the following: how many



sweetpotato roots could each farmer carry without getting tired or pain? And also, what was the best way to carry them.

We had thought that we would have two options to carry the sweetpotato from the garden. Either, to use a traditional method to carry them in a basket on the head as shown in photograph 49 or to collect the roots in a strong bag and carry them on the back or across the shoulders as shown in photograph 50.

Photograph 49.

A farmer carrying on her head sweetpotato roots from a field

Then we asked the farmers how they would carry sweetpotato roots based on their experience. They said that they normally collect and carry sweetpotato on their heads using traditional baskets like the woman in photograph 49. However, some farmers said that few roots of sweetpotato can be carried with this method and, it's easily used by children and women. The farmers also indicated that they normally collect and carry sweetpotato in bags like

Photograph 50.

A farmer carrying on his back sweetpotato roots from the field



in photograph 50. After seeing a few farmers carrying a bag with sweetpotato on their back, we concluded that this is more difficult because the weight is

not spread uniformly across the back and must be very tiring for the body. It is however important to note that with the bags, many roots can be carried at once.

Exercise: Try out these calculations in your exercise book. I pointed out earlier that a sweetpotato plant produces on average 0.5 kg of roots. Supposing you are able to carry 1 kg, how long would it take to bring all the harvest when you have 200 plants in your school garden, and you need 15 minutes for one trip? How many pupils do you need to bring all the harvest from the field in 2 hours?

Photograph 51.
Farmers filling bags with sweetpotato vines

On a different occasion, I observed some farmers collecting sweetpotato vines and packing them in big sacks, just like the farmers in photograph 51.



I compared this with the problem of transporting sweetpotato roots. I noted that because these vines are very big in volume it is difficult to carry them without the help of a bag that would keep them together. And because they are not very heavy, you can pack a large amount of vines in one bag and carry it from the field.

I spoke with my friend Okiror about these observations. He confirmed that these were common ways for farmers to transport their harvest (both roots and vines) from the field. But then he asked if I had observed other factors that would have to be considered during collection and transportation of roots. I said that I had not done it.

For me, it seemed that the farmers would just carry their whole harvest as it is. Okiror reminded me about the special attention that needs to be taken during harvesting. For instance, farmers need to take good care not to damage the roots when harvesting using a hand hoe. I concluded that the same care is needed when preparing to transport the roots.

Okiror and I continued our discussion about the next steps after harvest. We wanted to understand the effects of storing sweetpotato roots. Okiror and I predicted that if good care is given to fresh roots after harvest, a farmer would have more benefits than if he or she leaves the roots in the ground longer than necessary.

In our school garden we marked four good looking plants with pegs. Okiror and I decided to harvest the first two plants as soon as they were mature, and to leave the other two plants in the ground until a later time.

Then, we sorted them according to size, weight, circumference, and so on, similar to the farmers in photograph 52. We followed the steps of the exercise I had conducted earlier at school when our teacher asked us to describe and measure individual roots. This helped us to select good looking roots that could be sold in the market. We set aside the remaining ones for later use so that we would have fresh roots for a longer period of time.

Photograph 52.
Farmers sorting
their harvested
roots



Okiror and I concluded that by harvesting early, we actually made the field available to plant other crops.

Exercise: Remember what our teacher said earlier about crop rotation. Discuss with your friends some of the advantages of harvesting soon after the sweetpotato matures as compared to leaving all the roots in the ground in the field.

Then Okiror suggested studying the sorted piles of roots again. We had prepared one pile with very big roots, and another with very small ones. The piles were then kept in separate holes for three months, as farmers in my village do.

While we were waiting for the results of our small experiment we went to the market together with my parents. We wanted to know if the farmers were getting good prices for their sweetpotato roots. We learnt from the farmers that there are currently a lot of sweetpotato roots sold in the market so, they don't get a good price. They suggested that if we wanted to sell our harvest at good price we should wait until the season is over.

Exercise: Discuss with your friends the difference between selling sweetpotato during the season and when the season is over.

At the end of our experiment we noticed that the smaller roots in our piles had become thin because they lost water and weight during the storage. Some of them were even rotten and we could neither eat

nor sell them. Only the pile of large roots was still good and could be eaten or sold.

Then, Okiror and I returned to the plants we had marked in our school garden. We harvested the two plants that had been in the ground for a long time after maturity. Here, we found that most of them were very damaged. Remember what the teacher said about pests and diseases? Because we left the roots too long in the ground they were damaged by weevils and rodents. Some roots even were rotten. We concluded that it is very important to harvest early enough so as to reduce yield losses due to damage from pests and diseases.

Unfortunately, Okiror and I observed similar signs of damage in some of the roots we had harvested earlier and stored in the ground. Not only did we lose the smaller roots in one pile, but all of them were also damaged by weevils and rodents. After this observation we concluded that we needed to do another experiment. Sweetpotato roots that were stored in a shaded area in the open air like in photograph 53 stayed well.

Exercise: Discuss with your friends the reasons why it is important to be careful when storing the harvested sweetpotato roots in the ground or in a shaded area. Think of the possible solutions that may help to prevent the harvested sweetpotato roots from being damaged.

Photograph 53.
Farmers
spreading fresh
sweetpotato
roots under the
tree shade



Okiror and I talked about how we can improve the situation of storing fresh sweetpotato roots. Again we asked my mother to accompany us to see the sweetpotato farmers in my village. We explained to the farmers our problem and they were kind enough to show us the ways how they store their sweetpotato roots. They told us that they also had similar problems at first, of rotting roots when they did not store the fresh sweetpotato carefully.

The farmers reminded us that the first thing is to select only good roots that are not damaged at all. They told us that it is very important to provide protection from direct contact with moisture and sunlight.

Then, we learnt from the farmers that there are two major ways of storing fresh sweetpotato roots. One is to dig a hole in a dry ground. The hole is covered with dry grass on the walls as shown in photograph

Photograph 54.
Farmer building
a store for fresh
sweetpotato
roots with dry
grass



54. The roots are put on the grass and then covered with more dry grass before covering them with soil. The dry grass helps to protect the roots from damage while in the store by acting as a cushion. It also absorbs moisture, stopping the pit from becoming too wet and thus preventing the roots from rotting.

The other method is by the use of a clamp storage demonstrated by the farmer (see photograph 55).

Photograph 55.
Farmers building
a clamp store
for sweetpotato
roots



These structures are like little huts, on a raised flat mound of earth above ground level. The base is covered with dry grass. Again, the dry grass acts like a cushion and absorbs excess moisture. The roots are put on top and covered with more dry grass and soil to seal the clamp to protect the roots from the sun and rain.





Making sweetpotato products

5.1 Processing sweetpotato

When Okiror and I had solved the question of storing fresh sweetpotato roots, another question came to our minds. Usually, sweetpotato are consumed as boiled roots. But we remembered that you can also buy sweetpotato as dried chips, or flours or baked products made from either flours or mashes. Okiror and I were thinking about this for quite some time. We went back to the issue of storing fresh roots and why it is done. We concluded that drying and further processing of sweetpotato roots would be another way of preserving them for later consumption or marketing.

Exercise: Think of other benefits of drying and processing sweetpotato roots. You can discuss this with your friends and make a list. Remember that farmers do not only consider processing sweetpotato for consumption in their homes only, but also they look for opportunities to sell them in the markets.

In fact, I remember what our teacher told us on the effects of pest and diseases problems when storing dried sweetpotato chips. Therefore Okiror and I wanted to prevent this from happening. We

Photograph 56.
Storing dried
sweetpotato
chips in a basket
with mudded
wall



remembered that farmers use different techniques to store dried sweetpotato chips. Okiror asked if I could think of any specific storing technique by comparing how my mother stores food items at home. I told him that she uses traditional baskets (as shown in photograph 56), plastic or metal containers, bins, and so on. “Well,” Okiror said, “you have just listed most of the traditional practices means to store dried sweetpotato.”

Okiror explained that our teacher, in the last class that I missed due to sickness, told them that one way of storing dried sweetpotato chips is to use closely woven baskets or baskets with mudded walls. Mudded walls provide protection from rain, prevent the absorption of moisture by dry products and make the structure stronger. Farmers also use solid wall bins or metal bins or empty water tanks. Also dried sweetpotato chips

can be stored in bags as shown in photograph 57. It is important, however, that bags are never placed directly on the floor, this would then allow air flow and will stop the bags from getting wet from absorption of moisture from the floor. Storing and handling dried sweetpotato in bags is very convenient. They can be easily removed for consumption, inspection or sun-drying, and is immediately available for sale.



Photograph 57.
Storing dried
sweetpotato
chips in bags

Exercise: Discuss with your friends different possible methods and practices of storing dried sweetpotato in order to prevent losses from pests and diseases. Think about what methods and practices are used at your home to store other dry food products.

Now that I understood better the ways of storing dried sweetpotato, I wanted to know how I could process roots into chips. Again, I approached my friend Okiror to help me in this matter. We asked my mother to take us to the village trading centre to see how the farmers process sweetpotato into dried chips and flour.

At the village processing centre, we noted the steps followed by one of the processing groups and recorded them as indicated below:

1. Selecting only good roots.

2. Cleaning, peeling and removing the damaged parts of the roots as shown in photograph 58.
3. Washing the roots in water until they are clean.
4. Spreading the roots for 10 minutes to remove off the water.
5. Cutting the roots into slices of about 5mm thick using a clean sharp knife or a motorized slicing machine as shown in photograph 59.
6. Spreading the slices in the sun on the raised racks made locally from bamboo trees as shown in photograph 60.
7. Drying can take only one day if the slices are small or two days if they are big.
8. Milling can be done if flours are required
9. Sweetpotato flour or chips can be packaged and stored in bags for further use

Photograph 58.
Farmers peeling
sweetpotato
roots for
processing



Photograph 59.
Farmers drying
(left) and
slicing (right)
sweetpotato
roots

Some traders who process flours they are also including dry sweetpotato chips with grains such as maize, sorghum or millet to produce mixed flours for food or porridges.



Photograph 60.
Drying
sweetpotato
chips on the
raised wooden
racks



5.2 Cooking sweetpotato

Photograph 61. Children testing and selecting the best cooked sweetpotato roots

Once, my mother took me to a sweetpotato products' tasting event in our community. It was good because we were able to test all different kinds of sweetpotato dishes. Some of them were different kinds of boiled roots. Here we were asked to taste all of them and select the best as shown in photograph 61. The sweetpotato were very sweet, more especially the orange-fleshed sweetpotato which in the earlier chapters was indicated to have a lot of vitamin A when boiled and eaten.



We also tested the different products that ranged from sweetpotato porridge and doughnuts, to

sweetpotato juice. But I was more interested on how I could prepare one of the sweetpotato products by myself. So, I told my friend Okiror about this. We both made a trip to the sweetpotato expert who agreed to assist us. She stays at one of the Agricultural Research station located in Kawanda. Here are some of the most favourite sweetpotato recipes the expert showed us how they are made. We have summarized the procedures for making some of the products. You can request your parents to prepare them for you following the steps listed below per product.

Sweetpotato buns

What you need:



Sweetpotato mash	1 cup
Wheat flour	3 cups
Sugar	2 tablespoons
Salt	pinch
Yeast	1½ teaspoons
Oil or fat	3 tablespoons
Water	adequate

Photograph 62.
Sweetpotato
buns

How to prepare:

1. Put the yeast with 1 teaspoon of sugar in a cup
2. Add 2½ tablespoons of warm water and leave to rise
3. Put the boiled mashed sweetpotato in a mixing bowl and sift in the dry ingredients
4. Add the oil/fat and rub in till it crumbles

5. Add the risen yeast and mix
6. Add water and press or squeeze till done to the required texture
7. Roll into a ball, put into mixing bowl and cover with wet cloth
8. Press or squeeze the dough
9. Divide dough into equal small balls and roll out to make desired shapes
10. Put in oiled baking pan and leave at room temperature for 10 minutes
11. Bake for 20 minutes at 170°C or 350°F or till crust is golden brown

Sweetpotato relish

What you need:



Sweetpotato leaves (tender)	1 kg
Onions	2 medium
Tomatoes	4 medium
Flavour	4 tablespoons
Oil or fat	4 tablespoons
Salt	1 tablespoon
Warm water	½ container

Photograph 63.
Sweetpotato
relish

How to prepare:

1. Clean the tender leaves by removing the dirty
2. Prepare the onions and tomatoes and slice them into separate dishes
3. Shred the leaves

4. Wash them twice in warm water to remove the anti-nutrients
5. Heat the oil and fry the onions till they start to get brown
6. Add the tomatoes and let them cook for a while
7. Add the vegetables and let them cook for 5 minutes
8. Add the flavour, stir the contents and let cook till done
9. Serve with cooked bananas / ugali or kaunga, sima or nshima / rice

* The flavour of the relish can be changed with milk, groundnut paste, coconut milk or soya flour among others.

Sweetpotato soya chapatti

What you need:



Grated sweetpotato	1 cup
Wheat flour	2 cups
Soya flour	1 cup
Salt	1 teaspoon
Lukewarm water	adequate
Oil	½ cup

Photograph 64.
Sweetpotato
chapatti

How to prepare:

1. Mix the dry ingredients together in a bowl
2. Add the grated sweetpotato and mix
3. Add 1 tablespoon of oil to the flour and mix well

4. Add the water to the mixture in the bowl and mix by hand till a stiff smooth paste is formed
5. Divide the dough into 8-10 equal balls
6. On a floured surface roll one ball at a time
7. Fold each ball at a time to form a strip
8. Coil each strip to form a circle and put aside for 20 minutes
9. On a floured surface, roll out each coil into a thin circular sheet
10. Grease a shallow frying pan
11. Fry each circular sheet while turning both sides till golden brown
12. Ensure to grease both sides
13. The product is the chapatti and can be served with stew or sauce or tea

* Note that some people make chapatti without soya and it tastes equally good.





Growing sweetpotato as a business

6.1 Marketing sweetpotato

After we had completed the growing cycle of the sweetpotato crop, I wanted to continue my investigation. So far I had learnt that I can produce sweetpotato for my own consumption, eating it either as boiled fresh roots or baked/fried snack products. But I asked myself what I needed to consider. What if I wanted to sell some sweetpotato and get money?

My friend Okiror was really excited about the idea when I told him that I wanted to find out how one can sell his or her sweetpotato. I told him that in selling my sweetpotato, I wanted to be as innovative as the father of my friend in our village, in photograph 65. He has painted a big drawing on the

Photograph 65.
The “Naspot House”





Photograph 66.
The “Naspot
House” sign

front of his house, right under the main window to show a particular sweetpotato variety called Naspot that was brought to our village by the sweetpotato scientist from the research station of Namulonge.

I guess nobody can miss seeing this beautiful drawing of the mounds, vines and roots of the sweetpotato, as you can see in the big picture in photograph 66. Our teacher likes this house because he once visited my friend’s father who was growing this variety. He sold some of the vines and roots, and consumed the other at home. The money he obtained was used to build the house.

Okiror since he came from the family which was doing business, he cautioned me in my excitement.

He told me that selling sweetpotato is more than just making big drawings to attract the attention of the customers. He explained to me that marketing is an exchange process in which both, the seller (farmer) and the customer (consumer or trader) will benefit from this exchange. The seller will earn money and the customer will get fresh produce in return for his or her money.

I remembered our investigations and discussions about the care we needed to have when growing sweetpotato, using vines that have no diseases, avoiding the spread of pest damages and diseases and the need to store the harvested roots properly to protect them. I told Okiror that all this is important to get good quality sweetpotato roots for selling in the market.

One major question that I remained with was to find out how do farmers sell their sweetpotato?" Okiror told me that from the previous lessons that I missed when I was sick, our teacher had explained this in detail. He said that one can sell sweetpotato as fresh roots, or dried sweetpotato chips or different processed products like the sweetpotato buns, chapatti, and cakes. I had also noted from my friend's father in our village that one can sell the vines. All these are what marketing experts call sweetpotato products, Okiror said.

"But what else would you need to consider when marketing your sweetpotato products? I asked

Okiror. “Well,” he said, “one thing to consider is the place where you can sell your sweetpotato products.” Okiror explained further by saying that sometimes farmers allow people to pick the roots directly from their fields or sell the roots on the roadside as shown in photograph 67. The other options, he explained, are to take the sweetpotato door to door or actually put a stand at the local market.

Photograph 67.
Selling
sweetpotato
roots at the
roadside



“There are both advantages and disadvantages of each of the above places where you can market your sweetpotato,” Okiror said. “For example, for each of the places, you need to calculate the different costs involved in marketing your sweetpotato”. When I thought about this, I slowly realized that marketing sweetpotato involves spending and getting money. “That is correct,” said Okiror, “This is what marketing experts call the price.” Well, that was a real problem.

I have to find a way to determine a price that those who want to buy my products agree with, but that would also provide me with the additional money called profit, that I can use for myself.

For instance, if I grow sweetpotato as a business I will have to hire people to help me in planting, weeding and harvesting my crop. These costs will be my expenses. Other costs will include the money I pay for handling and transportation of the crop, storage, processing and packaging. Later when I sell the harvest in the market I will need to pay for a fee for my table (see the different means of transportation in photograph 68). All of these costs will determine the price of my sweetpotato that I need to ask for.



Photograph 68.
Transporting
sweetpotato
roots (left) and
vines (right) on
a truck

Exercise: Think of other costs that can lead to the way the price is determined. Discuss this with your friends. Think of the different steps of growing sweetpotato and what you need to get good yields.

As I came to realize, the price is very important. “But you can not ask for any price,” Okiror continued. “The

price that people would be willing to pay for your crop depends on the quality of the sweetpotato roots you are selling, what price other farmers are selling their produce, and if your sweetpotato is very much needed." Okiror added that a low price would not bring me the profits I need, but also too high price will force people to buy from someone else.

As I have learnt earlier, the price is important because it affects my profit. Okiror explained to me that to plan or determine my profit I need to calculate the marketing costs. "Then" Okiror continued, "You can calculate the income by multiplying the price of each by the quantity you sold". Income is the money I would get from my sale. Then, I can calculate the profit by subtracting the income from the total cost.

Then, I remembered again the girl in front of the Naspot house (look again at photographs 65 & 66). This is actually a good way of advertising our sweetpotato. This is called promotion as Okiror explained to me. 'Promotion basically means that you tell others about your product, for instance, its price, quality, availability, and so on". Okiror said.

Now I understood that to complete the job of marketing my sweetpotato I had to pay attention to everything: the product, the price, the place, and the promotion.

Okiror further explained to me another word of 3 C's which our teacher had told them that it is a key in

the marketing skills. I was very eager to know what the 3 C's meant.

Okiror agreed to give some more explanation on the meaning of 3 C's by referring to what our teacher told them last time I missed the class. He said that in order to know the Customers, you need to know, for instance, who is buying your sweetpotato, what type of product they want, what they are willing to pay. The other thing is: "Knowing the Competition. He explained that this means to know who else is selling the same product as yours, who is buying from them, and what price they are asking for. The final 'C', Okiror said is the 'Commodity'. He said that this was about knowing what you are allowed to sell, how you are allowed to sell it, or how the government can assist you in the sale.

Okiror concluded our conversation about the marketing of sweetpotato by saying that the 3 "C's" are influenced by what marketing experts call offer (supply) and demand (ask for) as explained by the teacher. "You as the sweetpotato farmer," Okiror said, "are the supplier of sweetpotato, and the customer who eats or uses your sweetpotato crop creates the demand." To complete the whole chain of supply and demand I said finishing our conversation, "I need to consider not only myself as the supplier and the consumer, but also, I need to consider for example, other traders and transporters as part of it.

My friends this is the end of our discovery journey on growing, using and marketing sweetpotato. It is my hope that you have learnt a lot about the crop more especially orange-fleshed sweetpotato which gives us Vitamin A.

As we end our journey let us request God to keep sweetpotato feeding us. This is a prayer that our friends from Namungoona Kigobe Primary School in Kampala prepared for the communities during the promotion of orange-fleshed sweetpotato.

**“Oh, God save we children and all the sweetpotato farmers
Unto you alone we put our trust
Remember we are dust in dust
Bring forth the rain
To enable the orange-fleshed sweetpotato grow and feed us
And bring health to us!
Bless the orange-fleshed sweetpotato from planting to dinner
time
You are the saviour of your people more especially we children
From everlasting to everlasting
You are good
Amen!”**

Glossary

- **Adoption:** Taking up or accepting to use something new
- **Agents:** Some types of pests that carry and transmit diseases from a sick plant to another
- **Beetles:** Are a type of insects usually with hard cover wings and a rigid skeleton structure
- **Capacity building:** Increasing the knowledge through training etc.
- **Combat:** To fight e.g. fighting disease
- **Cracked:** Breaking apart of soil
- **Curious:** Eager or interested to know something new
- **Data:** Information recorded
- **Decompose:** Rotting of dead plant or animal materials
- **Defoliation:** Natural loss or deliberate removal of leaves from the plant
- **Demonstration:** A show or display; the act of presenting something to the viewers
- **Discarded:** To remove or reject something
- **Discolouration:** Loss of original colour and attain another colour e.g. green leaves becoming yellow
- **Disrupted:** Disorganized or interrupted
- **Dissemination:** Distributing or spreading of something
- **Distinguish:** Differentiate between two or more things

- **Dramatically:** In a very impressive manner
- **Drought:** Dry period
- **Elaborate:** Explain more
- **Emerging:** Coming out from a closed object
- **Emphasis:** Something of importance
- **Enthusiasm:** Interest or keen
- **Etiolation:** An abnormal increase in stem elongation typical of plants growing under low light intensity or in complete darkness.
- **Excitement:** A condition of increased activity in an organism
- **Exposed:** To leave something open to danger
- **Fallow:** Leaving land uncultivated for a period to regain fertility
- **Feasibility:** Possibility or likelihood
- **Foliage:** The leaves of plants; a cluster of leaves
- **Innovative:** Thinking or creating something new on your own
- **Institution:** Organization
- **Investigation:** To look into something or find out about something
- **Micronutrient:** Food nutrients or food values needed in small quantities in our bodies e.g. iron, zinc
- **Mulch:** Ground cover with dry or fresh plant material
- **Night blindness:** Condition of the eyes in which vision is normal in daylight but abnormally poor at night or in a dim light
- **Nutritional values:** Different nutrients found in a type of food

- **Partner:** Someone who is associated with another one in a common activity
- **Persistence:** An act of keeping or carrying on doing something
- **Phenomenon:** Fact or happening or event
- **Pigments:** The colouring matter in the cells of plants and animals
- **Pioneered:** Started for the first time
- **Precursor:** A stage or state passed through to go to the next one
- **Predict:** Guess
- **Predominantly:** Mostly or mainly
- **Processing:** Cooking, baking, drying, mixing, grinding etc.
- **Residues:** Crop leftovers that are normally collected and used to make manure.
- **Resistance:** Ability of a plant or animal to stay free from diseases or pests attack
- **Rouging:** Uprooting and removing diseased plants in a garden
- **Sequential:** In order
- **Severe:** Serious or harsh
- **Skit:** A short, usually comedian drama performance
- **Sprout:** Growing of a shoot from a vegetative part of a plant e.g. storage roots for sweetpotato, tubers for yam and potato, stems for cassava.
- **Strategies:** Planned ways or methods of doing something
- **Symptoms:** Physical signs of a disease
- **Technique:** A way or method of doing something

- **Technologies:** Are new skills or knowledge or equipment or tools
- **Texture:** The feel of a surface or a fabric; “the wall had a smooth texture”
- **Vermin:** Wild animals and birds that destroy crops
- **Wilting:** A condition when a plant lacks enough water and looks as if it is drying



The International Potato Center (CIP) seeks to reduce poverty and achieve food security on a sustained basis in developing countries through scientific research and related

activities on potato, sweetpotato, and Andean root and tuber crops, and on the improved management of natural resources in the Andes and other mountain areas.



Pioneered and led by the International Potato Center (CIP), the Vitamin A Partnership

for Africa (VITAA) is promoting the increased production and use of orange sweetpotato to combat vitamin A deficiency in sub-Saharan Africa.

VITAA's goal is to have healthy populations through food-based approaches to nutrition, focused on Vitamin A. The specific objective is that children and adults (specifically mothers at child bearing age) consume orange sweetpotato in levels that lead to reduced vitamin A deficiency

For more information visit the VITAA Website www.cipotato.org or contact the VITAA Coordination Unit at CIP Office, Box 22274, Kampala, Uganda. Phone: 256 414 287 571.