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Sazani Trust

Teaching Guide 9

Agriculture

Healthy and Sustainable Schools Programme 2nd Edition

Preface

The Healthy and Sustainable Schools Programme is a result of Sazani Associates UK and Sazani Trust Zanzibar's ongoing partnership with the Ministry of Education to improve the quality of education and learning in Zanzibar.

The project is aligned with the Sustainable Development Goals and actively supports teachers and schools in achieving Global Education Target 4.7.

By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development (UNSD, 2021).

Focusing on the combined importance of key skills and healthy and sustainable life skills, we have revised and updated our series of fifteen Teaching Guides to support competency based curriculum linked learning.

The teaching materials are suitable for use in the last two years of primary across the transition to the first two years of secondary school.

There are fifteen Teaching Guides in this series, themed around topics that contribute to healthy and sustainable life styles within the context of Zanzibar, as follows:

1. Why we need to eat well
2. Getting enough food
3. Keeping food safe and clean
4. Population and health
5. Water
6. Sanitation and waste
7. Tourism
8. Biodiversity
9. Agriculture
10. Fisheries and marine resources
11. Energy
12. Land transport
13. Land use
14. Climate change
15. Participatory action learning

Each Teaching Guide is themed and contextualized to bring Zanzibar and contrasting localities into a classroom setting and to make learning engaging and relevant to local livelihoods. Activities are gender responsive, participatory and proven to support numeracy, literacy, English language and critical thinking.

For more information please visit our website **www.sazani.org**

Acknowledgements

This series of fifteen Teaching Guides has been adapted from Sazani Associates HSSP topic books by Rajab S. Ali, Safia M. Abdalla, Mwanawije M. Makame, Patrick Rutledge, Nicola Shone, Joshua Shawe and Rashid O. Shehe, with editorial review by Marilyn James and Dr Cathryn MacCallum. Graphic design and layout by Seven Six Design.

Contents

1 Introduction

The learning content and activities in this Teaching Guide have been designed to be easily integrated across the curriculum. Throughout the resource, knowledge, skills, attitudes, and values are interlinked and are built into all the topic areas addressed.

We have revised and updated our series of fifteen Teaching Guides to support competency-based, curriculum linked learning and development by focusing on the combined importance of key skills including numeracy, literacy, critical thinking and English language for healthy and sustainable lifestyles. The teaching materials are suitable for use in the last two years of primary across the transition to the first two years of secondary school.

There are different methods of displaying this information, through text, tables, diagrams, images and activities. Each activity includes icons to illustrate which curriculum area and which key skills are used as summarized in the tables below.

Key skills

Numeracy	Literacy	Critical thinking	English language	Creativity
				

Activity / STD V-VI	Maths	English	ICT	Civics	Geography	History	Science	Religion	Arabic
Food produced in Zanzibar and Pembrokeshire		X	X	X	X	X	X	X	X
Food produced in Zanzibar and Pembrokeshire Map					X	X	X		
Farming in Pembrokeshire and Zanzibar		X	X	X	X	X	X	X	X
From spade to fork	X	X	X	X	X	X	X	X	X
Spice trade		X		X	X	X	X		
Letter to the Prime Minister		X		X	X	X	X	X	
Group work discussion	X	X	X	X	X	X	X	X	X
Growing some of your own food				X	X		X		
Buying most of your food				X	X		X		
Traditional recipes from Wales and Zanzibar		X	X	X	X		X		
Pilau and cawl		X		X	X		X		

Activity / Form 1-2	Maths	English	ICT	Civics	Geography	History	Biology	Chemistry	Physics	Religion	Arabic
Food produced in Zanzibar and Pembrokeshire		X	X	X	X	X	X	X	X	X	X
Food produced in Zanzibar and Pembrokeshire Map					X	X	X				
Farming in Pembrokeshire and Zanzibar		X	X	X	X	X	X	X	X	X	X
From spade to fork	X	X	X	X	X	X	X	X	X	X	X
Spice trade		X		X	X	X	X				
Letter to the Prime Minister			X	X	X	X	X			X	
Group work discussion	X	X	X	X	X	X	X	X	X	X	X
Growing some of your own food				X	X		X				
Buying most of your food				X	X		X				
Traditional recipes from Wales and Zanzibar		X		X	X		X	X			
Pilau and cawl		X		X	X		X				

2 Topic overview

Key words

Agriculture: science or practice of farming.

Cultivation: the act of growing something or improving its growth, especially crops.

Rearing: the process of keeping, feeding, breeding and medical care of useful animals.

Export: sold to other countries.

British colonial period: time under British rule.

We all need to eat! Agriculture is the science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and other products.

Principally, it is used to satisfy our food needs. When more food is produced than is required to feed the population, agricultural outputs are sometimes exported to generate income from exports.

In Zanzibar, our population is growing and more tourists are arriving. Land available for agriculture is limited.

Export crops in Zanzibar

The Zanzibar islands of Unguja and Pemba was once known as 'the green island" by Arab writers because for many years, it used to provide timber and agricultural products to mainland Africa. When Omani Arabs and their slaves settled in the island, they replaced most of the natural vegetation with clove trees, which became the primary export crop that dominated the economy. This continued through the British colonial period. However, there was increased reliance on basic food imports.

3 Agriculture

Key words

Livestock: farm animals who are raised to generate a profit.

Foreign exchange: overseas trading.

Hoes and pangas: tools for cultivating soil.

Manure: animal waste.

Agriculture is the process of cultivating land for plants growth and also includes the keeping of livestock. It is the key development in the rise of human civilization. From human history we learn that, agriculture was the earliest activity in which it helped in making people settle in a particular place.

3.1 Agriculture in Tanzania

- Agriculture is the major sector in Tanzania's economy in which over 70% of the population living rurally depend and are engaged in.
- The agriculture industry makes a large contribution to the country's foreign exchange earning in economy with more than US$1bn in earning from cash crops, in which crops like tea, cotton, coffee, pyrethrum, sugar, sisal, oil crops, clove and cashewnuts are grown.
- At one point in its agricultural history Tanzania was the largest producer of sisal in the world.

3.2 Agriculture in Zanzibar

- The agricultural process in Africa as well as Zanzibar involves rearing animals and farming in particular areas, thus agriculture can be categorized in small and large scale:

1. Characteristics of small-scale agriculture

In Zanzibar, most farmers are members of the family who use quite simple tools such as hoes and pangas to cultivate. This method is ineffective for high yield production. Therefore, agriculture in Zanzibar is still in small scale farming. In Zanzibar main food crops are cassava, maize, yam, banana, millet, and rice. Farmers also keep goats, cows, and poultry in which their dung is used as manure on the farms.

3.3 Clove in Zanzibar

Clove is the main cash crop of Zanzibar and it contributes to over 70% of its economy.

Clove trees are mostly nourished in the western area of the islands in area such as Gando, Mtambwe, Kuyuni, Tundauwa and Kionwa in Pemba, while in Unguja areas around Donge clove trees survived best.

3.4 Seaweed farming in Zanzibar

Seaweed farming in Zanzibar was introduced in 1988, currently more than 25,000 people, mostly women, are engaged in seaweed farming. Mwani as it is known in Kiswahili is not planted in a natural way of using soil to plant on, it is cultivated by knotting some on plastic rope and leaving it to grow for some weeks.

Areas in Paje, Tumbatu and Makangale are among the places in Zanzibar where seaweed is planted.

4 Large scale agriculture

Key words

Commercial: making or intended to make a profit.

Profit: a financial gain, especially the difference between the amount earned and the amount spent in buying, operating, or producing something.

Yield: produce or provide (a natural, agricultural, or industrial product).

Organic: relating to or obtained from living things organic matter.

Drainage: the action or process of draining something.

Aeration: the introduction of air into a material.

Larva: is a distinct juvenile form many animals undergo before metamorphosis into adults. Animals with indirect development such as insects, amphibians, or cnidarians typically have a larval phase of their life cycle.

Nematodes: a worm of the large phylum Nematoda, such as a roundworm or threadworm.

Sustainable: able to be maintained at a certain rate or level.

Large scale agriculture is the cultivation of land in vast carried out on large tracts of land for commercial purposes, to maximise profit from the scale of the crops. In Tanzania large scale farming can be found in the mainland Tanzania where crops such as sisal, rice, maize, coffee and tea are grown in large area of lands.

Agriculture in the world

Maize plantation in USA, wheat in Canada and rice in Kashmir are good examples of large scale agriculture in the world.

Challenges on the agricultural sector in Tanzania includes:

- Poor farming methods.
- Lack of technology.
- Droughts.
- Floods.

4.1 Good soil - the secret of success

Without good soil, most crop yields will be poor and we will not get enough food for ourselves or for our animals.

For good plant growth, soil needs to have:

- The ability to absorb water for plants to use.
- Good drainage to allow excess water to flow away.
- Air spaces so that plant roots can breathe.
- Nutrients that will allow plants to grow.
- Good structure so that plant roots are well supported.

Zanzibar soil is loose in structure due to the fact that the islands are located in the Indian ocean areas, therefore the soil does not help retain water, does this mean that we cannot grow good crops? Of course not!

It does mean that farmers in Zanzibar have to keep their soil in good condition by caring for it well. Presently, the good soil obtained in some areas of the island accelerates food production and promotes commercial agriculture such as clove plantation (dominant in Pemba).

Up to 1990 and many years before, Zanzibar was well known for the production of high quality and quantity of cloves. More than 60,00 tons of cloves used to be produced annually.

4.2 Zanzibar

All soils need to contain organic matter, the properties of soil are improved if there is plenty of organic matter present. Organic matter gives better structure to all soils. It increases the water-absorbing capacity, and allows for better drainage and aeration. It provides nutrients and helps plants to absorb nutrients from the soil. One of the main reasons it can do all this is because it is full of life!

One teaspoon of soil may contain more than 5 million individual organisms and several thousand species, not just earthworms and millipedes, but tiny insects, insect larvae, nematodes, snails, mites and numerous others, many of these animals, together with fungi and bacteria, break down dead plant and animal material, releasing the nutrients within them into the soil. In the tropics, organic matter breaks down very fast, in as little as three months. In forests, the organic matter is replenished by a continual supply of dead leaves, small branches, animal droppings, etc, but a farmer has to find other ways to keep his or her soil in good shape!

4.3 Pembrokeshire

Agriculture has always been the main industry in Pembrokeshire. In addition to the traditional mixed farming, it has specialised, in the last half century, in potatoes, turkey breeding and vegetables, notably cauliflower and broccoli, have been grown on a limited scale. Pembrokeshire's moderate climate with its early springs and mild winters gives the area a long growing season. Thus, crops such as its famous new potatoes often arrive in British shops earlier in the year than products from other parts of the UK.

The good quality soils have favoured agriculture, and approximately over 10,000 people are hired in the sector. As well as arable crops such as potatoes, the main agricultural activities are dairy farming of cattle for milk and cheese, sheep farming, beef production and some arable crops, such as rapeseed.

4.4 Achieving self-sufficiency in food production

To be truly sustainable we should be producing all our food, although we produce cassava, vegetables and fruits we cannot produce rice and flour, so we have to import these items. Also, not only is the population growing, but we also have to feed the tourists who visit our islands. The animals, birds and insects need to eat too. Therefore, we have to aim for sustainable production of those crops and animals that we can produce.

5 How farmers can increase production while helping the environment

Key words

Mixed cropping: growing different crops together.

Conserve: protect (something, especially something of environmental or cultural importance) from harm or destruction.

Pesticides: a substance used for destroying insects or other organisms harmful to cultivated plants or to animals.

Mwarobaini tree: is a tree that many would like to know as their sole property. Its name in Swahili is "Mwarobaini" which means "forty" and represents its supposed ability to heal forty diseases.

Greenhouse: a glass building in which plants that need protection from cold weather are grown.

Permaculture: the development of agricultural ecosystems intended to be sustainable and self-sufficient.

Irrigation: the supply of water to land or crops to help growth, typically by means of channels.

1. Mixed cropping

Mixed cropping means growing different crops together (including trees), or growing them one after the other on the same plot of land. The choice of crops helps conserve moisture, enrich and maintain the soil, while on the other hand it helps to keep the number of pests and weeds at a manageable level.

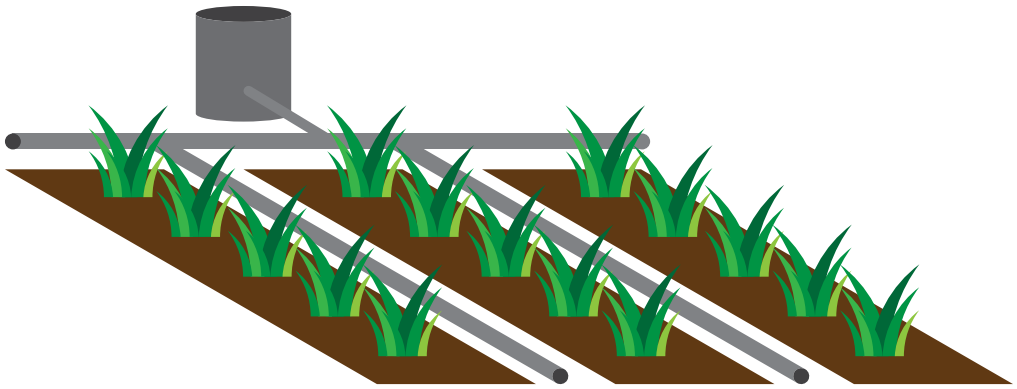
Trees provide shade, and a home for birds, spiders and useful insects, which can help to reduce pests. Falling leaves add organic matter to the soil. Mixing and rotating crops also encourages the natural enemies of pests. Some plants have natural scents which insects don't like, so they keep away, e.g. pisanli, garlic.

2. Organic (natural) fertilizer and fertigation

Used, soil is improved as fertiliser in many ways. Organic matter can be applied as compost (decomposed plant and animal material), manure (animal dung and droppings) or as a mulch (fresh plant material that is put on top of the soil around crops). Chemical fertilizers, on the other hand, are often made from non-renewable resources. Artificial fertilizers are not good for environment, they are expensive, they pollute the environment and soil while often becomes degraded after long-term use.

Is there a way we can use them more efficiently?

Fertigation is a way of supplying the plants with chemical fertilizers and water (irrigation) at the same time, minimum amount of fertilizer and water is used, and it is done at the best time, so that the plants get maximum benefit. Farmers can save money and there is almost no run-off of polluting fertilizers, but it is still important to add organic matter to the soil.

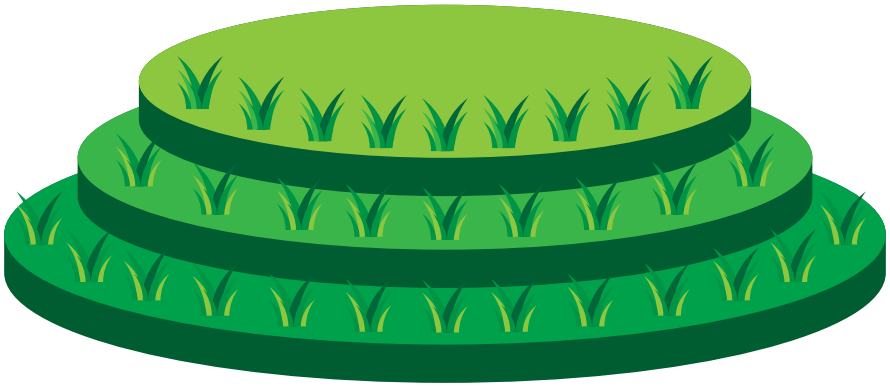


3. Anti-erosion practices

Practices that reduce soil erosion are very important.

One method is steps along the contour of sloping land.

Another method is to construct terraces, and then plant grass over the face of the terraces, or use the vetiver (a type of grass) at the edge of each terrace. The use of mulch to cover the soil is also important.



4. Pesticides

Pesticides are poisonous substances used to kill insects but are also harmful to both humans and the environment.

It is important to use the minimum amount of pesticide, for example by using a limited amount at exactly the right time.

Good management is better and there are also alternatives to pesticides such as:

- Soap solution gets rid of some insect pests.
- Certain plants such as chilli, garlic and onions produce oils that can be sprayed on crops.

Some plant leaves can also be used as pesticides such as Mwarobaini tree. This tree is a famous tree as the leaves are mostly used in Zanzibar for fever release, its leaves are very useful as insecticide. The leaves are pounded then mixed with water, the mixture is used to spread in plants.

Soil pests can be removed by adding chicken manure to the soil and then covering it with clear plastic sheeting (the sun's heat kills the pests and good organisms soon return). Marigolds (pisanli) planted between crops also help to keep soil pests away.

5. Protection of crops

Crops need to be protected from damage by heavy rain. This can be done using a tropical greenhouse which shelters the crops, allows circulation of air and reduces the amount of moisture on and around the plants, so that diseases are less of a problem in the rainy season.

6. Permaculture and organic farming

Permaculture is short for permanent agriculture. It is a small-scale method of farming which is organic, produces a lot of different foods and is sustainable.

The aim is to feed people, avoid pollution, and save energy. Permaculture combines as many different food plants, fruit and nut trees, and animals as possible. Plants are grown close together to squeeze out the weeds and only organic fertilizer is used, all wastes are recycled.

Keeping plants that attract pollinating insects ensures that crop flowers will be fertilized.

Converting plants that people cannot eat (and crop remains) into useful energy, domesticated animals can provide a valuable contribution to the human diet. Animals such as chickens and ducks are reared among the plants, their droppings improve the soil, and they eat any weeds that appear. Rainwater is collected and used for irrigation and fishponds. The diversity provides stability and food security and helps farmers to cope with changes in the weather, this kind of farming could become especially important in Zanzibar.

7. Farming and nature

Did you know that there are some ants that keep "cows"? If you find a plant that has mealy bugs or aphids on it, look for black ants as well. If you watch carefully you will see that the ants take drops of a sugary fluid from these insects. This is the "reward" that the ants get for protecting the mealy bugs from predators.

There are some crops that are pollinated by the wind, e.g. wheat, rice, but most crop plants depend on insects for their pollination. Many depend on bees to take pollen from one flower to another. The flowers are specially adapted to attract the bees, with bright coloured petals and sweet nectar to drink. When the bee visits a flower it collects both nectar (which is turned into honey) and pollen (which is fed to the larvae), the bee often gets a lot of pollen on its hairy coat, and when it visits the next flower, pollen brushes off and allows the flower to form seeds and fruit. Local bees are often better pollinators than honey bees because they collect more pollen.

6 Things you can do

- Buy locally grown, locally packaged and locally processed food as much as possible.
- Beware of imported fruits and vegetables – they may contain pesticides!
- Grow some of your own food if you have a garden. you can grow plants such as chillies, thyme, tomatoes and green peppers in large pots, big empty water bottles, sacks or banana trunks.
- Make a compost heap and use the compost to fertilise your garden.
- Process some of your home-grown food into scrumptious tasting jams, pickles, dried fruits.
- Food doesn't have to be full of additives. It is good to grow food together, cook food together and eat together.

Discussion Point

Can we start our own garden at our school and home?

Gardening for vegetables can be done at our schools and homes even if there is no gardening area by using pots, empty bottles, sacks and old tyres.

7 What we have learned:

- Good soil is necessary for healthy crops – soil therefore needs caring for.
- Organic matter is the most important material a farmer can add to soil to improve it.
- Insects are important pollinators of food crops.
- Farmers can help the environment by adopting good management practices such as mixed cropping, use of organic fertilizers, fertigation, anti-erosion measures, use of a tropical greenhouse, integrated pest management and permaculture.

Knowledge and Skills	Attitudes and Values
Understand the importance of food production; assess food cultivation and use in the home; debate issues about food production.	Be aware of environmentally friendly methods of farming; value locally produced fresh food and locally processed food.

8 Learning activities

How How How activity

Refer to the **How How How activity** detailed in the "Participatory Action Learning" book to help the student explore different ideas and concepts and challenge each other's points of view.

Activity 1: Food produced in Zanzibar and Pembrokeshire

Resources required:

- Paper
- Pens / pencils
- Tennis ball

Set up:

This can be played as a game in an outside space in a circle. The teacher starts off with the tennis ball and names a locally produced food in Zanzibar or Wales and throws it to someone to name a food of the other place. The game continues until everyone has named a food.

Alternatively learners can work individually or in small groups / pairs to make lists.

Activity:

- After throwing the tennis ball to each other and taking it in turns to name locally produced food in Zanzibar and Wales, ask learners to make a list of locally produced food in Zanzibar and Pembrokeshire.

Zanzibar	Pembrokeshire

Review:

The following questions may arise:

- Do learners eat a lot of locally produced foods?

Activity 2: Food produced in Zanzibar and Pembrokeshire map

Resources required:

- Paper
- Pens / pencils

Set up:

Learners can use the list made in activity 1 to plot where they think these foods will be grown in Wales and Zanzibar. They may need to research Wales.

Activity:

- Create maps and plot where the locally grown foods are produced in Wales and Zanzibar.

Review:

The following questions may arise:

- Did they find this difficult or easy?

Activity 3: Farming in Pembrokeshire and Zanzibar

Resources required:

- Paper
- Pens / pencils

Set up:

Learners can write a letter, draw a picture or do a descriptive piece.

Activity:

- Compare a traditional Pembrokeshire farm with a spice farm in Zanzibar. Taste, smell and compare crops from each country.

Review:

The following questions may arise:

- What were the main similarities?
- What were the main differences?

Activity 4: From spade to fork

Resources required:

- Paper
- Pens / pencils
- Internet / knowledge of methods of growing a fruit or vegetable

Set up:

Learners can work in pairs or individually.

Activity:

- Take part in the programme 'from spade to fork' by describing the process of growing and eating fresh fruits and vegetables.
- Ask learners to choose a fruit or vegetable they know a lot about, perhaps their family or someone they know grows them.
- Ask learners to create a step by step method of growing a fruit or vegetable.

Review:

These questions may arise:

- Do learners already grow any fruits and vegetables?

Activity 5: Spice trade

Resources required:

- Paper
- Pens / pencils
- Internet / (optional) research issues surrounding the slave trade

Set up:

This can be a class discussion or learners can work in groups.

Activity:

- Ask learners to look at the history of the spice trade and explore some of the issues around the slave trade.

Review:

- Do the learners eat particular spices?
- What do they think of the spice trade and the effect on the world?
- What do they think of the issues around the slave trade?

Activity 6: Letter to the Prime Minister

Resources required:

- Paper
- Pens / pencils

Set up:

Investigate whether the growing of seaweed in Zanzibar is fair trade.

Investigate the government's policy regarding the sale of seaweed abroad and to tourists.

Activity:

- Look at the impact on the seaweed farmer.
- Write a letter to the Minister of Agriculture of Zanzibar persuading him to allow fair trade for the seaweed producers.

Review:

- Compare to the trade in milk in Pembrokeshire. Is this fair trade? Is it fair to the producer?

Activity 7: Group work discussion

Resources required:

- Paper
- Pens and pencils

Set up:

Ask learners to work in small groups.

Learners should be prepared to discuss the following questions / issues.

Activity:

- Ask learners to discuss the following:
- In which types of agricultural activities is your family engaged? Why do they prefer that type of agriculture than others?
- Agriculture is a backbone for economic development – do you agree or disagree? Why?

Review:

The following questions may arise:

- In what ways can agriculture damage the environment? Discuss.

Activity 8: Growing some of your own food

Resources required:

- Paper
- Pens / pencils

Set up:

This can be a class discussion or in small groups.

Activity:

- Make a list of all the different foods that are grown at your home. It is best if you divide your list into groups, such as fruits, vegetables, root crops, animals, spices.
- What do you do with this food that your family produces: do you eat all that you produce? Do you give some away, or share it with friends and neighbours? Do you sell some of your produce? Do you preserve excess food, for example by salting meat, making jams or pickles (e.g. kachumbari)?
- Write a paragraph to describe what you do with the food you produce.

Review:

- Hold a class discussion to find out what other families produce and what they do with their food crops and animals.
- The class could draw a table showing the number of families producing each of the different crops and animals. You could also draw a chart with pictures showing what people do with their food.

Activity 9: Buying most of your food

Resources required:

- Paper
- Pens / pencils

Set up:

This can be a class discussion or small groups.

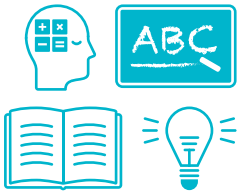
Activity:

- Make a list of what your family buys in the way of fruits, vegetables, spices, meats, and other food that is produced locally.
- Find out where your family gets these foods – for example, the market, food stalls by the roadside, local shops, a supermarket, gift from friends or other people.
- Make a list of fruits, vegetables, spices, and other foods that have to be imported into Zanzibar because they cannot be produced here.
- Hold a class discussion about the places where Zanzibari's buy their food. can you get the fresh, locally produced food that you want in these places? Look at the list of imported foods – should we be importing these into Zanzibar? Can we and should we be producing more of our own food? Should we import all of our food and use agricultural land for other purposes?

Review:

- In groups choose any type of vegetable and establish your garden by using any of the used materials available in your school environment.

Activity 10: Traditional recipes from Wales and Zanzibar



Resources required:

- Paper
- Pens / pencils
- Internet / recipe ideas
- Ingredients for recipes

Set up:

Research traditional recipes from each country to produce a menu from locally-sourced food.

Activity:

- Produce recipes and menus for each country.
- If possible ask learners to collect the ingredients for a school cook in to create the meals.
- If easier, ask learners to create the meals at home for homework, and bring in for lunch the next day.
- Use this as a cultural celebration of each country and include music, song, language, religious practices, culture and dress traditional to each place.

Review:

- Compare the air miles for each meal.

Activity 11: Pilau and cawl

Resources required:

- Paper
- Pens / pencils

Set up:

Research the ingredients and recipes for pilau and cawl.

Activity:

- Ask learners to create a recipe for pilau or cawl.
- Ask learners to present their recipes to the class.
- If possible, grow the vegetables needed for pilau or cawl in the school garden.

Review:

The following questions may arise:

- Were any of the same ingredients needed for these recipes?

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