

UNITE for the Environment

Sustainable Banana Growing and Service Learning

3rd Term 2019 - Teacher Training Manual



Learning objectives

- Discuss the requirements for sustainable (environmentally, socially and economically viable) banana production
- Demonstrate how a banana plantation is established and maintained
- Identify course objectives that can be addressed using service learning

INTRODUCTION

Bananas are one of the many and most important crops which have been grown in Uganda for a long time. Some people have nicknamed Uganda as the banana republic! Increases in banana yields have been mainly caused by the expansion of banana plantations and not due to the application of better farming practices.

Generally better farming practices are not well known to many farmers and those who know the principles do not put them into practice. As a result many farmers have continued to get poor yields. Banana is a crop which has been accepted by people in different parts of the country. It has spread rapidly through the country even to areas where it was not traditionally grown

Discussion: What are the key environmental requirements for sustainable banana production?

Bananas can grow in many types of soils and climate. However in order for the plant to grow well and produce big bunches, the following are required.

Rainfall: Bananas require a lot of water. Therefore they thrive better in areas which get rainfall for long periods during the year (2000 to 2500 millimeters per year). Regions where dry seasons last longer than four months should be avoided unless one can afford irrigation.

Temperatures: The ideal temperatures favorable for banana growing range between 25 and 30 degrees Celsius. There will be stunted growth of the banana if temperatures fall below 16 degrees Celsius.

Soils: Soils provide nutrients to the plant and for bananas to flourish, they need deep light soils with few or no stones which will enable roots to develop unhindered and soils with sufficient nutrients. In the same way humans need good nutrition to grow strong and healthy, banana plants also need good nutrition to make enough food to produce good fruit. The main nutrients are: nitrogen (to keep the leaves green and healthy), magnesium (to help leaves use the light they have captured), and potassium - to help move the food and water from the roots to the leaves. Deficiency of major nutritional elements affects proper growth of the plant.

Light: Banana plants do well in sunny situations, since a high degree of sunlight is beneficial to their growth and cuts down the development of fungal parasites.

ESTABLISHING A BANANA PLANTATION (PRACTICAL SESSION)

Materials

Garden tools (hoe, forked hoe, panga, wheel barrow)

Measuring tape

Two banana suckers or corm bits

Organic manure

Procedure:

Ask participants what are the main steps they have to consider when establishing a banana plantation. These may include

- Site selection for the plantation

- Land preparation
- Planting

Discuss in detail each of these and identify an area that is suitable to plant a banana.

Site selection: Besides the environmental factors above, when establishing a banana plantation it is also important to bear in mind the following

- **Slope:** The preferable area for establishing a banana plantation should not be a steep slope, due to the effects of erosion. However applying recommended methods such as mulching, planting indigenous trees, making contour trenches, stone bands and terracing can help reduce erosion.
- **Big trees:** Big trees with very long roots are dangerous to bananas. This is because the tree roots bear a disease called *armillaria* fungus which causes a lot of harm if it attacks the banana plants. It is therefore recommended that suckers should not be planted in an area with such trees until they are completely uprooted
- **Bad weeds:** Bad weeds such as couch grass should be cleared manually. These deprive banana plants of nutrients thus causing them to become stunted or dying completely
- **Accessibility:** It must always be borne in mind that at harvest, the produce must be transported to the house or market as quickly as possible. This is to reduce damage during storage because of the delicate nature of the banana. It is therefore desirable to establish plantations as close to the road as possible. This is to make it easy to move the planting materials and inputs to the site of the plantation. It will also be cheaper to transport the harvested bananas to the market or to the homes. For big plantations, access roads should be constructed within the plantations

Land preparation: The procedure of land preparation for planting will depend on the kind of vegetation and the soil formation in the area.

- Clear the site by using suitable tools and equipment. Collect all the cut vegetation and trash and use them for making compost manure or keep them for mulching later
- Uproot all the stumps, unwanted trees and their roots, if any
- Cultivate the area by using either the usual hoe or forked hoe to prepare the ground. This will enable the soft banana plant roots to penetrate the soil easily. During cultivation, make sure all weeds are dried up in the soil or used for preparation of manure/compost
- After clearing the ground of all weeds and tree stumps, and smoothing the soil, digging of the holes for planting should begin

Planting and spacing: This will depend on the purpose for which the spaces among plants will be used and it varies between 10-20 ft apart. The spacing depends on

- **Variety of banana:** Different varieties have different heights and the taller the variety, the wider the spacing
- **The amount of rainfall in the area:** Wider spacing is used in areas which receive little rainfall
- **Soil fertility:** If the soils are fertile, bananas may be planted with close spacing, if the soils are infertile, it is better to give the plants more space

- Whether the bananas will be inter-planted with other crops or not. If you intend to interplant permanent crops such as coffee, the space measurements should be more than 10-20 ft apart. The farmer is advised to consult an extension worker to be guided on most suitable spacing for such situations

Digging holes:

Pegging: After putting the above-mentioned factors in mind, make out the places in the lines where the holes are going to be made with pegs. The pegs should be 10-15 meters apart. If the area is on slope, it is better to make contours for control of soil erosion before pegging. These contours can either be sunken trenches, bench or stone contours. Wind breakers should also be established on the raised bands along the contours.

Hole size: This also depends on the amount of rainfall in the area. The diameter and depth of the holes should at least be 3ft X 2 ft (Diameter by depth) larger holes have the following advantages

- They enable the roots of the future plant to utilize the greatest volume of soil possible
- Act as a reservoirs for both plant nutrients and water
- Keep the corm underground for a longer period

There is no need for digging holes deeper than 2 ft because bananas roots do not go beyond two feet downwards.

When digging holes, remove the top soil up to 1 ft and put it on one side of the hole. This is usually the black soil and contains organic matter. Remove the second layer sub soil up to 1 ft and place it separately on the other side of the hole. This is usually brown in color with little organic matter

NB holes should be dug early, 1-2 months before planting to allow the hole to cool down.

Applying manure in the hole: After digging the holes, organic manure should be applied. If the farmer has no farm yard manure, he can use manure from other domestic animals like goats, sheep, pigs and poultry. In the absence of these, manure such as coffee husks can be used. All the above should be completely decomposed and broken up to become as soft as soil.

After preparation of manure, apply organic manure to the top soil of each hole. The exact quantity will depend on the amount of manure you have and the fertility of the soil.

Mix thoroughly and place the mixture in the hole, preferably this should be done just before the start of the rains and one month before planting. This will enable it to cool and mix well in the soil so that the suckers are not affected by the heat generated from the manure.

Choice and preparation of planting material

Bananas can be grown by either planting a sword sucker or a corm (corm bits or paired corms).

a) Sword Sucker

Suckers are young plants /off-springs produced by a mature banana plant. A sword sucker which is suitable for planting

- Should have narrow leaves.

- Should come from a mother plant which is healthy (free from pests and diseases) and which produces good quality banana bunches.
- It should be between 3- 4ft high.
- The diameter of the lower part of the stem of the sucker should be between 0.5 and 1 ft.
- It should have a healthy root system. However these should be removed before planting.

Preparation of suckers for planting

- Uproot the suckers well using a hoe
- Remove all leaves, roots and all parts of the underground that appear diseased to speed up the growth of new roots and to reduce the risk of pests such as nematodes.
- A slanting part is made to remove the top part thus preventing water from collecting on the top and causing the sucker to rot from the top.
- Immerse the underground stem of the sucker in cold water for 2 days. This is effective against weevils and nematodes. This water could be mixed with a herbal concoction of marigold or neem to become more effective.

Planting suckers

A suitable time to plant suckers is at the onset of the rainy season so that the planted sucker gets sufficient water for a long period.

Planting procedure

Make an adequate hole in the middle of the hole which was filled with mixture of top soil and manure.

Place the sucker in the middle of the dug hole at a depth of 1ft, leaving 0.5 ft to the bottom.

Return the soil you had previously dug up and cover the corm and part of the pseudo-stem.

Advantages of using suckers

- Suckers are easier to prepare.
- It is easy to spot the qualities of the sucker to be planted by looking at the mother plant.

b) Corm bit

If a farmer is to grow banana from corm bit, the following steps should be taken

- Choose good suckers suitable for planting and uproot them
- Use a panga to separate the corm from the stem of the sucker
- Cut off all the roots to remove the trash and soil from the corm
- Use a knife to peel off the outer skin of the corm about 3 mm deep. The reason for doing this is to remove nematodes which if present can only penetrate the corm up to a depth of 2 mm.
- Remove any damaged part on the corm that could have been caused by banana pests

- Wash the corm with clean water
- Use a panga to cut it up into 4-7 bits depending on the visible buds and the size of the corm. Every cut bit should have a healthy bud. The bud should be in the middle of the bit or 4 cm from the cut end. It is this bud that will develop into a new plant.
- Soak the corm bits in neem or marigold solution overnight before planting

Planting

When planting, place the corm bit in the middle of the dug hole. The bits should be placed under the soil with the eye facing downwards and the cut end upwards as this prevents the eye from rotting.

The corm should be covered 1 ft deep below the soil surface

Sprouting takes place within 30 days, the shoot will come out and the sucker will continue to grow fast

Advantages of using corm bits

- This is the only way in which a farmer is assured of having a clean planting material free from nematodes and weevils
- In places where there is scarcity of suckers, this method will provide you with enough planting materials from the few suckers in a small container as it is done with corm bits
- It is easier to transport corm bits than suckers

Note: A farmer who has planted suckers and another who has planted corm bits will both harvest at the same time.

MAINTANENCE OF A BANANA PLANTATION (Discussion)

After establishing a banana plantation, what follows is maintaining it. The banana stool keeps on utilizing the same soil zone and this determines the management practices of the crop to be followed. As mentioned earlier, bananas require a lot of water, sufficient sunlight, and high levels of organic matter and well drained soils. Below are essential practices to be performed at various periods and if these practices are followed, a farmer can be assured of having a good plantation

Weed control

Like in many other plants, weeds are great enemies of banana plants. They deprive the banana of nutrients thus causing them to become stunted or killing them completely. For this reason, they should be removed manually. Avoid using chemicals on your banana garden.

Mulching

Mulching is very important in modern banana farming because it helps in reducing water evaporation from the soil, reduces weeds, allows penetration of water, maintains conducive soil temperature, and protects soil against erosion, and adds organic matter to the soil. There are different mulching techniques

Live mulch: These are cover crops such as legumes planted between banana rows. These are recommended to be used during the first 8 months when the bananas are not yet established.

Crop and weed residues/dry mulch such as bean husks, dry banana leaves, as well as pseudo stems. This should be done to the depth of 0.5 feet and is recommended to be used when the banana plants are well established.

Note: Mulching materials should not touch the sucker or the plant. The mulch should be about 2 ft from the stool. This is done to avoid too much heat around the stool, prevent pest infestation and prevent roots from growing towards the surface.

Thinning (Demonstration)

This is a continuous process of selectively reducing the surplus suckers from the parent plant using an appropriate tool in order to leave only the required number of suckers per stool. The suckers which are removed can either be planted elsewhere or destroyed. Modern banana husbandry requires farmers to only have three suckers per stool at different stages at time. The recommended plants to be left per stool should be

- The banana plant bearing a fruit bunch (Mother)
- The banana plant which is about to bear a fruit bunch (Daughter)
- The young banana plant (Granddaughter)

The husbandry system is known as “**mother-daughter-granddaughter**” and reduces competition for water, nutrients and light and results in production of better quality banana bunches at regular intervals. This system is also used to determine whether there are sufficient or insufficient nutrients in the soil depending on the size of the mother plant compared to the daughter plant as follows.

If the stem size of the daughter is larger than that of the mother plant, it means that the nutrients in the stool area are sufficient even for the granddaughter plant, and if the stem size of the daughter plant is equal to that of the mother plant, that means that nutrients enough but the granddaughter will require more nutrients to be added.

The size comparison should be done when the mother plant starts flowering.

Advantages of thinning

- A large crop yield with big banana bunches is continuously obtained
- Banana plants bear fruits early
- There is less risk of attack by banana weevils
- There is a greater possibility that the banana plants will continue to grow in straight rows and this easier to manage
- The thinned suckers can be used as mulch

Pruning (demonstration)

Pruning mainly involves removal of dry leaves and male bud (flower)

There are two thinning systems of thinning bananas

Linear system: Under this system, the banana plants (mother, daughter and granddaughter) are left to grow in a straight line. However, under this system, with time plants move away from the planting hole which originally had manure and this can result into smaller bunches compared to the previous harvests. Also banana plants may lose their original straight rows and spacing will grow close together in some parts of the plantation.

Rotating system: Under this system, banana plants are made to grow in circles or rotating manner. This helps the plant to continue using the same planting hole for a long time, maintains the spacing initially used for planting, maintains the quality of the plantation and maintains the straight rows for a long time.

NOTE: In case a farmer wants to maintain the above system, stimulating of suckers to grow at pre selected place can be done by digging up soil and mixing it with manure near the stool area where you want a sucker to grow. Normally the sucker will come up at the chosen spot. This will enable the farmer to rotate the suckers in a particular stool.

Suckers should not be left to grow big before being removed as this creates a problem for the farmer deciding which suckers to remove as they all look good and big. The farmer may be tempted to leave more than the recommended plants per stool.

The plantation therefore should be inspected frequently to spot suckers that should be removed every 6 to 8 months.

Pruning

This involves removing of dry leaves and male bud

Removal of dry leaves

As the banana plant grows, new leaves develop and old ones dry up and die. The plant must not accumulate any dry leaves or fibers, they should be removed. This is because they harbor harmful pests, obstruct the stem from light and consequently reduce the area of the plant, which manufactures food. Dry leaves also increase the surface area, make the plant vulnerable to wind damage and make the banana plant look less attractive. However, do not remove sheaths before they are dry as this weakens the banana plant and pruning should be done during the rainy season, so that the plant does not lose a lot of water.

Advantages of removing dry leaves

- It makes the plant grow new leaves, which is an important factor to plant's long life
- It helps control harboring of banana pests
- It enables the sun rays to penetrate the inner green parts of the banana plant
- The plantation looks attractive

Removal of a male bud (flower)

At the bottom of the banana bunch is a red head that contains the male flowers. This is a wasteful nutrient sink because instead of the nutrients going into the fingers, they go into the bud. It should thus be cut off as soon as the fingers begin to fill or when they begin curving upwards.

Supporting and propping of bananas

Forked props are used to prevent plants from falling due to wind and extra weight of the bunch. While using props, farmers must be careful not to cause lesions (wounds) on the bananas or damaging the bunches themselves. The prop therefore should be placed where the stalk joins the pseudo stem.

Soil fertility management

Continuous soil improvement is essential for maintaining production of banana plantations that give good quality bunches every year. Nutrients in the plantation decrease year after year. The fertility decreases because of the following

- Uptake by the growing banana which feeds on nutrients in the hole
- Weeds are also a great enemy to the banana plant since they tend to share the existing nutrients in the soil.
- Leaching in case the mineral nutrients are taken by water in deeper soil levels where they cannot easily be accessed by the plant

Therefore, unless some more nutrients are added, the yields are bound to keep declining as more bananas are harvested; leading to decreased bunch sizes and total bunch production.

Methods used to ensure sustained soil fertility

- Observe soil and water conservation measures such as making contour trenches, grass bands and mulching so as to reduce loss of soil nutrients through erosion. Contour trenches help control soil erosion and conserve water and nutrients in the soil. These contours can either be “fanya juu” or “fanya chini” Fanya Juu is when you heap soil got from the trench on the upper side to form an embankment while fanya chini is when you heap soil got from the trench on the lower side of the trench.
- Another method that can be used to sustain soil fertility is by applying nutrients to the soil. The major sources of organic nutrients are; crop residues, elephant grass, green manures, animal wastes and mixed composts.

Applying of organic manure

Organic manure should also be applied during the rainy season. The manure should be placed 45-60 cm from the plant.

Ring composting: This is where a ring is made around the stool at a radius of 2 ft and 0.5 deep. Then compost manure is applied in the ring pit created and covered with light soil

Trench composting: This where trenches are made in between the banana plant rows and filled with compost manure to spread to the different banana plants. Remember that trenches used for soil erosion control should not be used for trench composting

Sunken basket compost: This is made in form of a round pit made in the middle of every 4 banana stools to act as a source of fertilizers for those plants. It is also known as the fertility baskets.

Procedure of making sunken basket compost (practical)

- Dig a pit (5ft wide and 2 ft deep) in the middle of 4 banana plants
- Fill it with biodegradable material in the following order
 - Place dry materials such as dry grass, leaves from trees like jackfruit, mangoes and other trees
 - Water them with about 20 liters of water to make them palatable for decomposing organisms

- Then place a layer of fresh material such as fresh leaves, green grass/weeds
- Sprinkle a layer of ash
- Place a layer of animal waste such as cow dung, pig litter and many others
- Repeat the same order of laying out the materials until the pit is full.
- Cover it well with soil, then mulch the area

The basket of nutrients will be ready for plant utilization after 4-6 months. When it rains, water and nutrients are trapped and conserved by the manure in the pit and this will be used during the dry season.

Another method of ensuring sustained soil fertility is by adding ash, animal dung and urine liquid manures (rested for 2 weeks) as they contain some nutrients essential for plant growth.

Lastly trees grown in a banana plantation not only reduce wind to bananas but also assist through their leaves which when they fall, decompose. Good trees for banana plantations include ficus (mutuba), and albizia (omugavu). It is important to note that when such big trees are inter-planted in the banana plantation, the appropriate spacing should be 40X 40 ft. Other trees such as Lucina, Sesbania and kaliandra, improve soil fertility by fixing nitrogen into the soil. The spacing of these legume trees should be 10 by 10 ft

PESTS AND DISEASES

Bananas are mainly affected by two pests

Banana weevil: The adult weevil is a brown black beetle 12- 14 mm long. It has six legs with long proboscis, which is hooked at the tip. The female weevil lives for about 2 years and lays up to 200 eggs mostly in the upper part of the corm above the ground level. Eggs may also be laid in trash.

After about a week, the eggs hatch into legless larvae-white with a brown head, which then bores tunnels into the banana corm and stem and thus feeding on the plant and sap until it matures. This is the most dangerous stage.

These tunnels can reach 3 ft high inside the stem, which rot into the black tissue

If there are a lot of tunnels, the corm weakens and the plant falls over or produces a very small bunch

The larva takes 14- 21 days to become a pupa which takes another two weeks to become an adult. The adults which mainly feed on dead or dying banana plants then start a new life cycle. The banana weevil can live long without food and mainly spreads through planting infested plants and the adult crawling from infested plantations to new places

Symptoms

- Yellowing of leaves
- Young suckers may wither and stop growing
- The mature banana plants weakens and gets stunt
- The affected plants are easily blown off by wind
- There are many burrows in a spilt corm

Control measures

- Clean, healthy planting materials should be used for starting a new plantation

- Corm bits could be used instead of suckers
- Good husbandry practices such as timely weeding, manuring and mulching should be regularly carried out
- Planting relatively resistant varieties
- Using traps to catch the weevils. This is done by cutting the pseudo stem after harvesting at the ground level and exposing the corm then chop the cut stem into pieces of approx 1 ft and split them into two. Cover the exposed part of the corm with the splits. The following day remove the splits, pick the weevils and kill them.
- Splitting pseudo stems after harvesting should be done and strictly followed as a practice by the farmer. It also requires discipline just like leaving the right number of plants per stool.

Banana root nematodes

These are very small pests which live on roots. The female nematodes lay eggs in the root tissue and completes its life cycle in 25 days. The nematodes move through the soil from damaged roots to undamaged roots

Symptoms

- Plants get stunted
- Plants especially those bearing braches are easily blown by wind
- The root system is destroyed, whereby roots are very short, reduced in number and blackened.
- Leaves lose their green color because damaged roots fail to absorb nutrients and water from the soil
- Banana bunches have few hands with small fingers

Control measures

- Plant resistant variety or a variety which is a non host to nematodes
- Plant nematode free suckers
- Prepare the land for planting during the dry season. This will kill the nematodes
- Mulch the plantation and apply animal and plant manures
- If the plantation is highly infested, uproot all banana plants and leave the plantation to fallow for 2 or more years
- Make rotation of crops

Banana plantation diseases

The main banana diseases are

Sigatoka disease: This is caused by fungus and it attacks banana leaves causing them to have dry spots. The disease is favored by

- Rain and moisture
- Undrained soils
- Where there is a lot of shade
- Infertile soils
- Agricultural practices which increase humidity in the plantation such as close spacing, not weeding for a long time, poor thinning, poor pruning.

Symptoms

- Small lesions or wounds on the leaves between the veins
- In the later stages, the lesions darken and become brown

- The center of each spot eventually dries out becoming light grey but a narrow dark brown or black border remains making an eye spot appearance
- The attacked banana leaves appear as if they had been burnt
- In severe cases, the fruits do not mature, they ripen before maturity
- The fruits do not appear normal and have small fingers

Control measures

- Maintaining improved soil fertility. This enables the development of healthy plants which can fight the disease
- Removal and burning of infected leaves
- Controlling weeds and removing unwanted suckers thereby reducing humidity
- Planting varieties resistant to the disease such as Mbwazirume, Namaliga, Musakala, Kibuzi, Mudwale etc
- Avoiding planting materials from infested plantations

Panama wilt disease

This is a soil borne disease which can live in the soil for a long time even if there were no plants to attack. It enters the plant either through the stems or by the farm tools which have been used in infested areas. After entry, the fungus slowly moves to the corm, from where it spreads very fast to the plant. It is favored by transportation of plants or soils from infested areas

Symptoms

- Yellowing of leaf edges. Later the yellow color turns brownish and ultimately the plant dies
- Collapsing of the petiole while some leaves are whitish

Control of the disease

- Plant panama free suckers or corm bits
- Impose your own quarantine by completely stopping transporting suckers, corm bits, manure, trash, banana fibers and leaves from panama infested areas to your plantation
- Uproot and burn all infested plants

NB: For any pests and diseases that can't be identified by the farmer, consultation should be made immediately

THE COST OF ESTABLISHING AND MAINTAINING A ONE ACRE BANANA PLANTATION FOR THE FIRST 5 YEARS

For purposes of getting a good picture of cost benefit analysis, it has been assumed that there are trees in the area where the plantation will be established and these have to be uprooted using hired labour, the land has to be cultivated, have to get grass for mulching dig at least 440 holes, buy manure, intercrop legume in 1st eight months, and mulch the whole plantation

Estimated cost of establishing a banana plantation (1 acre)

Description of Activity	Amount (Ugx)
Clearing the area and leveling	200,000

Cultivation	160,000
Mulches	400,000
Digging holes(440 hole@1000)	440,000
Organic manure	528,000
Costs for suckers	450,000
Transport	120,000
Intercropping legume	500,000
Labor for mulching	100,000
Others	200,000
Total	3,098,000

Costs of maintaining the plantation in the consequent years

Activity	Costs (in Ugx)
Purchase of manure (440X 20liters)	176,000
50 bundles of mulch	200,000
Transportation costs	240,000
Weed control (30,000 monthly)	360,000
Others	200,000
Total	1,176,000

Summary of costs in the first 5 years

Year	Costs (in Ugx)
2014	3,078,000
2015	1,176,000
2016	1,176,000
2017	1,176,000
2018	1,176,000

Expected revenue

The table below shows expected revenue in five years with respect to the prices of the different bananas sizes

Year	Costs	Number of bunches	Average price (in Ugx)
			10000
2014	3,078,000	0	
2015	1,176,000	400	4,000,000
2016	1,176,000	600	6,000,000
2017	1,176,000	880	8,800,000
2018	1,176,000	880	8,800,000

This example is intended to demonstrate to a farmer how banana farming can improve his or her economic well being if they use modern methods. High costs are met initially on the establishment of the plantation but the maintenance costs are less. The farmer should be able to recover the costs of establishment and annual expenditures in the 2nd and 3rd years

Main records to keep in banana growing

Date	Activity (Expenses)	Number	Cost/rate	Total cost	Sales Qty	Prices	Total sales

SERVICE LEARNING (DAY 2)

Service-learning refers to learning that actively involves students in a wide range of experiences, which often benefit others and the community, while also advancing the goals of a given curriculum topic. Community-based service activities are paired with structured preparation and student reflection

Ask teachers what value they see in service learning and supplement on their responses

Service learning offers direct applications of theoretical models. In service learning the real-world application of classroom knowledge in a community setting allows students to learn course material in more meaningful ways. Common goals achieved by service learning include: gaining a deeper understanding of the course/curricular content, applying knowledge to solve real-world problems, thus fostering greater critical-thinking skills and providing greater motivation for learning, and an enhanced sense of civic responsibility.

Qualities and benefits of service learning

1. Integrative: The service-learning experience goes beyond traditional ideas of classroom learning. Service-learning holistically integrates class learning objectives as well as community perspective and priorities. When engaged in genuine service students participate as both learners and community members. Students demonstrate success both academically and interpersonally.

2. Reflective: Effective service-learning experiences are those that provide 'structured opportunities' for learners to critically reflect upon their service experience. Structured opportunities for reflection can enable learners to examine and form the beliefs, values, opinions, assumptions, judgments and practices related to an action or experience, gain a deeper understanding of them and construct their own meaning and significance for future actions.

3. Contextualized: Service-learning provides students a unique opportunity to access knowledge and expertise that resides in the context of community. There is opportunity to connect the knowledge of a discipline, as explored in class, to the knowledge in practice, as evidenced in communities. Learning experiences in community settings immerse students in the unpredictable and complex nature of real world situations. Working alongside community members and experienced professionals, the opportunity to construct learning and responses can be immediate and uncontrived.

4. Strength-based: Service-learning draws upon existing community strengths and resources, and honors community members and organizations as co-educators of students. Communities are never built from the outside in. A strength-based approach focuses on the capacity and expertise that exist in every community, rather than on what is absent. By shifting away from a deficit mentality, students learn partnership strategies to identify and develop each community's unique strengths.

5. Reciprocal: The service-learning relationship offers all parties involved some measure of benefits; it is a two way street. Students give time, talent and intellectual capital in order to gain deeper understanding of course material and the complex nature of social issues. Teachers modify their teaching practice to include service-learning and are rewarded with deeper student engagement of course material. Community members and organizations invest time as co-educators and in turn accomplish more toward their mission and goals through the work of students.

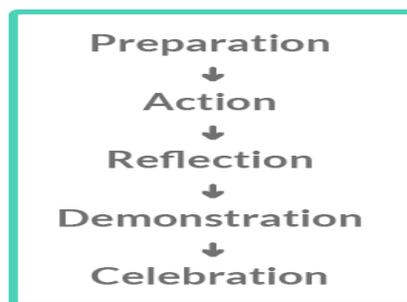
6. Lifelong: Service-learning is learning that sticks. By combining theory and practice, this educational method provides a distinctive, meaningful and influential life experience. Students build relationships, solve problems, value a sense of community and gain self-awareness. Service-learning is beyond memorable; it can influence one's career path and enhance civic responsibility. Service-learning extends learning beyond the academic term; it lays the foundation for continual personal growth throughout the student's academic experience and beyond.

In summary service learning can:

- Help students make connections between different academic subjects by using an interdisciplinary teaching approach
- Encourage students to positively contribute to their communities, while also aligning to class curriculum
- Allow for a hands-on learning experience
- Improve academic outcomes, attendance rates and class engagement
- Promote mutual respect and kindness
- Boost levels of self-esteem, empathy and responsibility
- Increase awareness of community needs and local or global issues
- Reduce the risk of behavioral problems in the classroom
- Strengthen classroom communication

Steps in service learning

Introduce and discuss the steps in service learning.



Preparation — This is the stage where you prepare yourself and your students to take on their service project. You can start by deciding on a project to tackle, figuring out how to tie it in with your curriculum, and forming community partnerships with local organizations your class can work with. Then you can teach your students about the community issue to prepare them for action. Make sure you choose a project that is relevant to your community.

- *Tip: Give your students a voice during this stage to keep them interested. For example, you can have the class vote on which community issue they want to support or on individual roles within the project.*

During this stage, students can learn about the issue they are going to tackle using:

- Class and small group discussions
- Visual brainstorming sessions
- Books

Action — This is the hands-on component where the class gets to use what they've learned and apply it to a real service project. Students will now directly help community partners and those affected by the issue with actual community service work.

During this stage students can serve their communities by taking part in:

- Field trips
- Research projects
- Events
- Crafts
- Fundraisers
- Awareness campaigns and advocacy
- Various service projects (clean ups, building FES, gardening etc.)

Reflection: This stage lets students reflect on their service project, consider what they learned from it, and apply their learning to the curriculum. Reflection is encouraged during every step, but this stage allows for a more in-depth process where students can consider what they've learned and how they feel about the service they provided.

Students can reflect on their experiences with:

- Group discussions
- Essays
- Poems or songs
- Visual art submissions

Demonstration — Students can show what they've learned about the issue to their class, school or community. This is an opportunity to raise awareness of the issue and what others can do to help. Students can demonstrate what they've learned about the issue by creating:

- Final presentations
- Skits
- Graphs or charts

Celebration — Students can congratulate themselves and each other for their hard work and positive contributions.

- *Tip: During this stage, make sure to emphasize effort rather than results. A positive outcome is wonderful to celebrate, but your students' hard work and dedication to the cause is the most important part.*

Students can celebrate their hard work and success by:

- Making thank-you cards or gifts for peers and community partners
- Being recognized at the next school assembly
- Discussing the impact their efforts have made
- Having a class party

Activity

1. Ask if there are any teachers who have used service learning and ask them to share how they have done it.
2. As a group, evaluate the few experiences and discuss which steps have been and have not been well tackled based on the presentations and what is done routinely by most teachers.
3. Discuss with teachers which projects are suitable for service learning / service projects have considerable opportunity for growth.
4. Using Kitchen garden as a service project and divide teachers in groups of 6, ask half of the groups to tackle “reflection” and the other group to tackle “demonstration”. Key things to include in their presentation are;
 - How will they engage learners in their respective steps (either reflection/demonstration) to implement the project
 - 3 reasons why the step is important in implementation of the project and in learning
5. Have 4 groups (2 “reflection”, 2 “demonstration”) present their work and briefly critique the presentations
6. Discuss with teachers how they can deliver examples of reflections and demonstrations as a follow-up to this training that would link back to their work on conservation projects and teaching