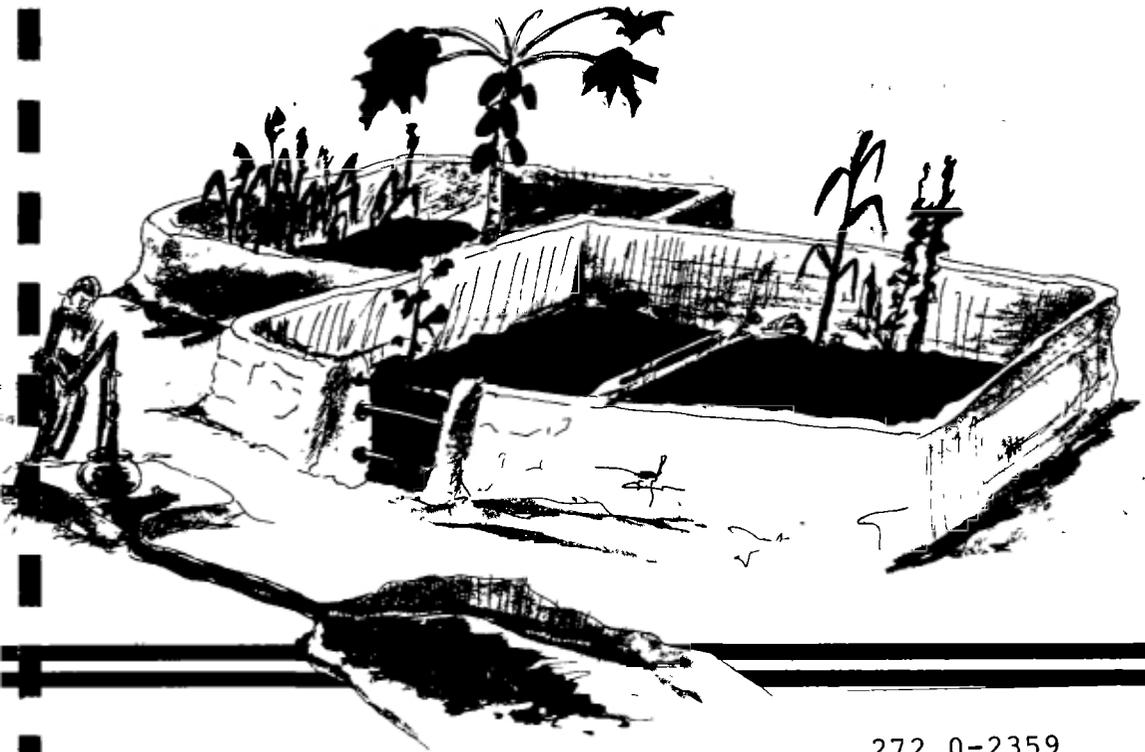
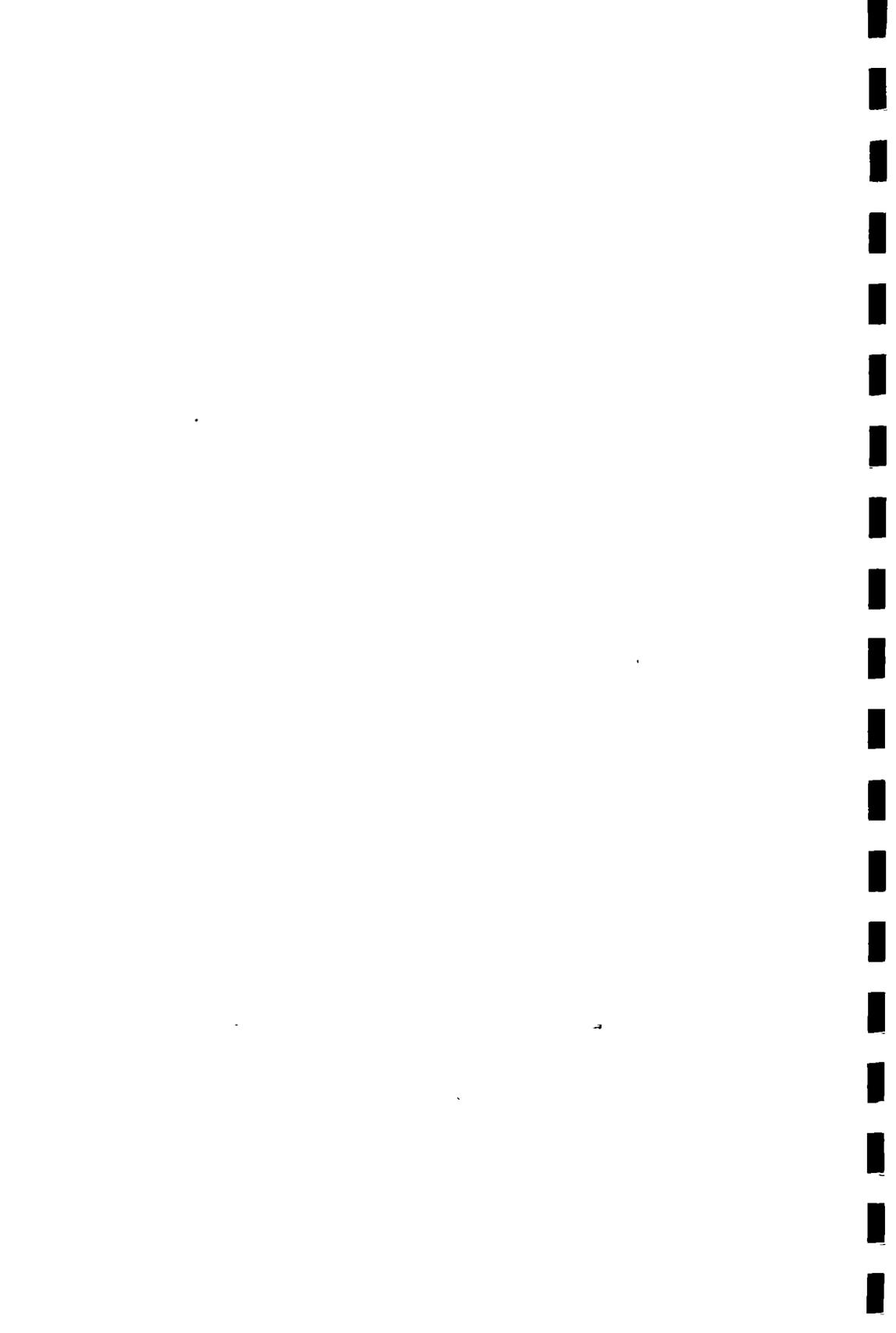


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EVERY SEASON GARDENING FOR IMPROVING CHILD NUTRITION



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Written by
Paul Sommers

Illustrated by
Paul Nerquaye-Tetteh

LIBRARY, INTERNATIONAL REFERENCE
CENTRE FOR CHILDREN AND ADOLESCENTS
UNICEF
1200 17th Avenue, New York, NY 10036
Tel: (212) 366-7000 Fax: (212) 366-7001

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TABLE OF CONTENTS

SESSION	SUBJECT	PAGE
	Introduction To Training Course.....	1
	Training Schedule	1A
1....	Introduction To Dry Season Gardening	2
2....	Identifying The Nutritional Needs of Young Children	3
3.. .	Planning And Preparing The Garden Site	4
4....	Field Visit To Existing Dry Season Gardens...	5
5 ...	Field Visit To Home Level Processing And Preparing of Infant Foods	6
6....	Methods for Community Participation.	7-8
7....	Extension Methods And Materials.....	9
8....	Implementing A Dry Season Garden Plan	10
9....	Methods For Improving Dry Season Gardening	11
10. . .	Project Design For Nutrition-Oriented Garden	12-13
<u>TECHNICAL GUIDELINES</u>		14
	An Introduction To Dry Season Gardening.	14-15
	Identifying Nutritional Needs of Children...	16-18
	Methods of Community Involvement	19-21
	Extension Methods and Materials	22-23
	Design Of A Dry Season Garden	24-27
	Implementation Of A Dry Season Garden	28-30
	Crop Management Techniques	31-43
	Harvest and Post Harvest Activities	44-45
	A Checklist For Dry Season Gardening	46
	An Outline Of A 3 Year Project Plan	47
<u>REFERENCES</u>		48
	Field Notes	49

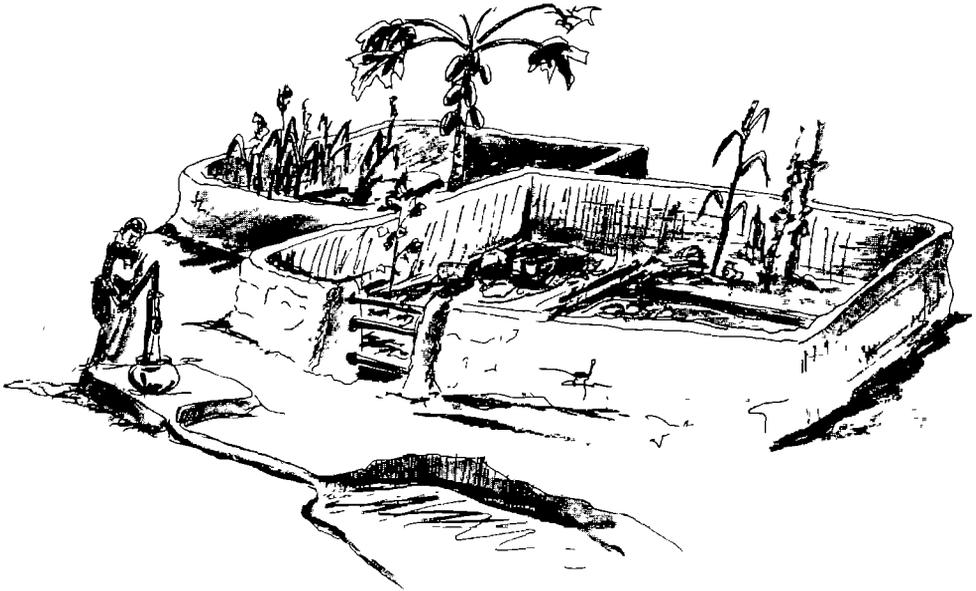
INTRODUCTION

This 4-day training course is designed for community development workers and their village counterparts to teach means of improving nutrition and health through food production around available water sources.

Dry season gardening is a crop production method where plants are grown in small individual plots near a community water source. While gardening around hand dug or hand pump wells is the most popular technique in many regions, gardening in dry river beds, streams and dams is also popular. The garden plots are typically 15 square meters and contain a variety of crops. The crops are generally for home consumption. Local tools and plant materials are used, keeping the cost within the means of the local community.

It is important to promote dry season gardening where feasible as it can provide an important amount of food, especially for young children. It can be undertaken during the long, dry season when supplies of fresh food are scarce. The possibilities and opportunities are worth exploring.

The training course will present some of the promotion, management and technical aspects of dry season gardening for improving nutrition. A variety of teaching techniques will be used, including lectures, small group discussions, field observations and practical skill development. The students will develop a plan of action for the communities in which they work.



TRAINING SCHEDULE

SESSION: MORNING

SESSION: AFTERNOON

DAY ONE

- | | |
|--|---|
| 1. Introduction To Dry Season Gardening | |
| 2. Identifying The Nutritional Needs Of Young Children | 3. Planning And Preparing The Garden Site |

DAY TWO

- | | |
|-----------------------|----------------------------------|
| 4. Garden Field Visit | 5. Field Visit: Food Preparation |
|-----------------------|----------------------------------|

DAY THREE

- | | |
|---|---------------------------------------|
| 6. Methods of Community Involvement And Participation | 8. Implementing The Dry Season Garden |
| 7. Extension Methods And Materials | |

DAY FOUR

- | | |
|---|---|
| 9. Methods For Improving Dry Season Gardening For Nutrition Improvement | 10. Project Design For Dry Season Gardening |
|---|---|

NOTE:

The times listed for each session are approximations only.

SESSION I

INTRODUCTION TO DRY SEASON GARDENING

Time: 90 Minutes

- Goals:**
- 1) To introduce a system of food production and utilization primarily for child nutrition from available water sources.
 - 2) To explain the importance of this approach in overall village development.
 - 3) To discuss the structure and function of existing dry season gardens, their limitations and prospects for improvement.

Overview: The session focuses on the concept of dry season gardening, its importance in overall community development, and the structure and function of existing dry season gardens.

Activities:

- | | |
|------------|--|
| 5 Minutes | Trainer states goals and relevance of the session. |
| 10 Minutes | Participants develop a working definition of dry season gardening. |
| 15 Minutes | Whole group discussion on the definition of dry season gardening. |
| 15 Minutes | Whole group discussion on the definition of dry season gardening |
| 30 Minutes | Small group discussions (6 per group) will focus on the interconnection between village water sources, food production, and utilization. The importance of this connection for the nutritional improvement of young children will also be discussed. The structure and function of existing dry season gardens will also be discussed. |
| 30 Minutes | Each group will present a summary. |

Trainer's Note:

Each small group should be assigned one of the following questions:

- 1) Explain the interconnection between water sources, a food garden, and the use of the food by a family.
- 2) Explain the importance of dry season gardening on the nutritional status of young children.
- 3) Explain the present structure and function of a dry season garden.

SESSION II

IDENTIFYING THE NUTRITIONAL NEEDS OF YOUNG CHILDREN

Time: 2 Hours

Goal:

- 1) To discuss some of the nutritional and non-nutritional factors that affect the nutritional status of young children.
- 2) To familiarize the trainees with the nutritional requirements of young children and major deficiencies.
- 3) To categorize the nutritive value of local foods and their importance to young children.

Overview: This session will introduce the trainees to some of the nutritional factors that influence the food intake of a young child. The basic nutritional requirements of young children along with the nutritive value of local foods will also be discussed.

Activities:

5 Minutes	Trainer states goals and relevance of the session
10 Minutes	Trainees write a definition of good nutrition.
10 Minutes	Group dialogue on the definition of good nutrition.
30 Minutes	Group discussion on some of the nutritional and non-nutritional factors affecting the nutritional status of young children.
30 Minutes	Lecture/discussion on the nutritional requirements of young children, major local nutritional deficiencies, and the use of local foods to improve the nutritional status of young children.

Materials:

- Flip chart paper
- Food composition table
- List of the most popular local crops
- Chart on the three main food groups
- Chart on the nutritional requirements of young children

SESSION III

PLANNING AND PREPARING THE GARDEN SITE

Time: 3 Hours

Goal: To provide trainees with a working outline on some factors to consider with planning for and preparing a garden site.

Overview: This session will provide trainees with some of the skills they will need to plan and prepare a site for dry season gardening. Included are physical and biological as well as socio-economic factors to consider, the importance of planning for optimum nutritional benefit will be stressed. The trainees will visit an undeveloped garden site and survey its potential.

Activities:

5 Minutes	Trainer states goals and relevance of the session.
30 Minutes	Small group discussions will address the various factors that need to be considered in planning a dry season garden.
30 Minutes	Each group will present a summary.
30 Minutes	A group discussion will focus on the importance of preparing land for a garden and local methods of land preparation.
60 Minutes	The trainees will receive an initial demonstration on how to prepare the land. They will then prepare the land for a garden in their own plot of land.

Trainer's Note:

- 1) Ask for a demonstration on land preparation from a trainee with practical experience. The size of the plot should be 4m × 4m with a "basin" type garden system. The students should participate after each activity is demonstrated. Activities may include:
 - Cutting of weeds
 - Removing weeds
 - Removing weeds with a hoe
 - Forming "Basin" soil beds
- 2) The small groups should be assigned one of the following questions:
 - What are the physical and biological factors that need to be considered when planning for a garden?
 - What are the socio-economic factors that need to be considered?

SESSION IV

FIELD VISIT TO EXISTING DRY SEASON GARDENS

Time: 4 Hours

Goal: To expose trainees to examples of existing gardens around water sites.

Overview: Field visits to existing gardens will provide students an opportunity to link lecture and classroom group discussions with actual field examples. The on-site visit will offer a practical forum for trainees to discuss with actual practitioners the constraints and opportunities of gardening around water sites.

Activities:

- | | |
|------------|---|
| 10 Minutes | Trainer states goals and relevance of the session |
| 4 Hours | The group will divide into two groups and visit two existing gardens. Discussion and observation techniques will be used to document the structure and function of each garden. |
| 30 Minutes | The trainer and trainees will discuss the field visit and relate it to their field experience. |

Materials: Camera
Notebook
Transportation

Trainer's Note:

- 1) Selection of gardens
 - A) Choose field sites within 30 minutes of the training centre.
 - B) Gardens should be planted near the water site.
 - C) Gardens should be of local materials.
 - D) The actual planters of the garden should be requested to be resource persons.
- 2) Processing (After the Field Trip)

Discussion should centre on the questions of:

 - A) How many of the trainees have or have had similar gardens in their community?
 - B) What are some of the strong and weak aspects of the gardens visited?
 - C) How will the information be used from the field visits?

SESSION V

FIELD VISIT TO HOME LEVEL PROCESSING AND PREPARING OF INFANT FOODS

Time: 4 Hours

Goal: To expose trainees to existing methods of processing and preparing infant foods.

Overview: Field visits to homes that process and prepare home grown foods for infants will provide the trainees with an opportunity to observe and discuss various techniques. After the field visit classroom discussion will center on how the observed practices can be used in project programming.

Activities:

- | | |
|------------|---|
| 10 Minutes | Trainer states goals and relevance of the session. |
| 4 Hours | The group will divide into two groups and visit two households. Discussion and observation techniques will be used to document the methods used in processing and preparing infant foods. |
| 30 Minutes | The trainer and trainees will discuss the field visit and how the information can be used. |

Materials: Camera
Notebook
Transportation

Trainer's Note:

-
- 1) Selection of Households
 - A) Choose households within 30 minutes of the training site.
 - B) Households should produce their own food and process it using local materials and techniques.
 - C) The household members should be the resource persons.
 - 2) Processing (After the Field Trip)
 - A) How many trainees have or have had projects in processing and preparation of infant food?
 - B) What were the strengths and weaknesses of the methods used by the households?
 - C) How will the information be used from the field trip?

SESSION VI

METHODS FOR COMMUNITY PARTICIPATION

Time: 2 Hours

Goal: To develop community organizing skills in linking the use of community water sources to improving nutrition.

Overview: Community participation is essential in a garden project if the project is to be sustained past the pilot phase. Organizing a community to recognize their nutrition problems and the means by which to solve them are important skills for a community development worker. The participants will discuss what skills are necessary and different approaches that can be used. A role play will also be presented on how to encourage a community to participate.

Activities:

5 Minutes	Trainer states goals and relevance of the session.
45 Minutes	Small group discussions will focus on the skills needed and approaches that can be used
30 Minutes	Each group will have 10 minutes to present their findings to the entire group.
20 Minutes	A role play will be performed on how to encourage a community to participate in the design of a garden.
15 Minutes	Discussion on the role play.

Materials: Flipchart paper for each group

Trainer's Note:

Small group discussions

Each group should be assigned the following questions:

- 1) Once baseline information is gathered, how can it be used to develop a garden project?
- 2) How can a promoter involve the community in assessing their own nutritional needs?
- 3) How can a promoter assist the community in establishing dry season gardens?

Role Play:

Title: Promoter and village colleague attempting to involve the community in a project design for nutrition improvement

Actors: Promoter, village colleague, 4 members of a community organization.

Scene: Promoter and village colleague are invited to make a presentation to a community organization on the nutritional status of the community. They also recommend mixed gardening by water sources as one means of improving the situation. Some members are for the project, others are against it.

Objective: How can the promoters make the members of the organization feel it is their project and solicit their participation?

Processing: A group discussion should address the following:

- 1) What is your assessment of the techniques used to persuade the group to participate in a project?
- 2) Can you suggest alternative methods?

SESSION VII

EXTENSION METHODS AND MATERIALS

Time: 90 Minutes

Goal: To familiarize trainees with various extension methods for promoting the use of dry season gardens for nutrition improvement.

Overview: The trainees are provided with examples of different training methods. Discussion will focus on the effectiveness of different extension methods under local conditions and ways to improve communications with the community.

Activities:

5 Minutes	Trainer states goals and relevance of this session.
45 Minutes	Each group will discuss popular local methods of extension and the effectiveness of each method. The group will also suggest appropriate extension methods for improving nutrition through dry season gardens.
30 Minutes	Each group will have 10 minutes to present their findings to the entire group.
15 Minutes	A general group discussion will follow.

Materials: Flip Chart

Trainer's Note:

Small group discussions

- 1) How is baseline nutrition and garden information linked to the choice of an appropriate extension activity?
- 2) How useful is knowledge of traditional communication techniques in designing extension activities?
- 3) What extension activities would be most effective in promoting nutrition improvement through dry season gardens and why?
- 4) How do you adjust extension methods to reflect realities of the present situation?

SESSION VIII

IMPLEMENTING A DRY SEASON GARDEN PLAN

Time: 4½ Hours (Field Session)

Goal: To apply the acquired classroom information and field observation to actual gardening skill development.

Overview: This is the session in which the trainees do hands-on field work. They will initially observe the steps involved in implementing a garden design. The trainees will then work as a group in planting a garden followed by planting of individual garden plots. Exposure to unforeseen situations that may arise in planting a garden is an important aspect of this exercise.

Activities:

- | | |
|---------------|--|
| 15 Minutes | Trainer states goals and relevance of the session. |
| 2½ Hours | Trainees will first observe the steps involved in laying out the garden. Then they will work as a group to implement the garden plan after each skill is presented by the trainer. Initial skill development will include land preparation, staking out the dimensions of the plot (3m × 5m) marking the eventual locations of the crops, constructing mud fences, and constructing trellises. Next is the plant material placement and digging of holes for plants. Organic plant material can be placed in the holes before planting. The final activities after planting include watering, replacing stick markers and protecting the new plants. |
| 15-30 Minutes | Discussion and summary of planting exercise. |

Materials: Local Planting Materials
Local Tools
Local Materials for Trellising and Fencing
Local Plant Protection Materials
Local Organic Soil Amendments

SESSION IX

METHODS FOR IMPROVING DRY SEASON GARDENING

Time: 60 Minutes

Goal: To provide trainees with an opportunity to discuss methods for improving the use of food now produced from dry season gardens.

Overview: This session acts as a review of the training course by discussing the lectures, field observations, and the gardening skills developed and how existing practices of food production and utilization can be improved.

Activities:

5 Minutes	Trainer states goals and relevance of the session.
60 Minutes	The entire group will discuss their observations on what they learned and how existing practices can be improved.

Materials: Flip Chart Paper

Trainer's Note:

The entire group should discuss the following questions:

- 1) What are some ways that food production can be improved at the water sites?
- 2) In what ways can the utilization be improved of the food produced at the garden sites?
- 3) How do you plan to use the information from this training course in your community?

SESSION X

PROJECT DESIGN FOR NUTRITION-ORIENTED DRY SEASON GARDEN

Time: 4 Hours (Individual Work)

Goal: To provide the trainee with an opportunity to apply the information presented in the training course into a practical program for nutrition-oriented household food production.

Overview: This is the final session where the trainee will use the technical information on crop production and nutrition and combine it with project management information to develop a village level project to improve food intake from home gardening activities. The project should include year-round activities. The technical part of the project design should be based on the available local resources. The management part should include maximizing community participation. The entire project cycle from needs assessment to evaluation should be included.

Activities:

4 Hours

The trainee, reviewing the information presented during the training course, will design a nutrition-oriented home gardening project. Some of the subjects to be included are:

- 1) What are the objectives of the project?
- 2) What methods will be used to determine household food and nutritional needs?
- 3) In what ways will community participation be encouraged throughout the project cycle including needs assessment, project design, implementation, monitoring, and evaluation?
- 4) What food and nutrition activities will be covered in the project?
- 5) What criteria will be used in selecting plant materials and other inputs?
- 6) What approach will be used to motivate households to orient their gardening activities towards improving family food intake?
- 7) What evaluation methods will be used to determine if the home garden project is truly improving nutrition?

Continued on next page

- 8) How can the project be assured to move from the pilot phase to actual integration by the community?
- 9) What is the specific role of a community development worker throughout the project?
- 10) How much time is needed for project activities?
 - A) Needs assessment (*baseline information*)
 - B) Project design
 - C) Implementation
 - D) Monitoring
 - E) Evaluation

Time: 3 Hours

Trainer will meet with the trainees on an individual basis to review their project design.

TECHNICAL GUIDELINES

AN INTRODUCTION TO DRY SEASON GARDENING

What Is Dry Season Gardening?

Dry season gardening is a crop production method by which crops are produced around water sites. Examples include wells that are dug or fitted with handpumps, hand dug wells, streams, dams, dried river beds. Dry season gardens exist in the semi-arid zone and there is a potential for expansion in some areas. In northern Ghana, gardens are typically 15 square meters and crops are produced the year round. The plant material, tools, and fencing are usually available locally.

Dry season gardening is an example of an efficient use of local materials and technology which is appropriate to the existing socio-economic and climatic environment of northern Ghana.

Why Promote Dry Season Gardening?

In the semi-arid region crop production is generally limited to a few short months during the rainy season. From December to May little crop production takes place, and animal husbandry becomes the main farming activity. Many people do have some time available for farming activities but due to a lack of rain little can take place. However, now that wells are being dug and fitted with hand pumps, water is available to many communities right in their village. Water puddles can often be seen around water wells. This stagnant water could be channeled a few meters away from the water well and used for producing crops.

Some of the advantages include:

- Removal of stagnant water thereby reducing a potential health problem
- Making productive use of an available resource
- Provide fresh food during a food-scarce period
- Perhaps provide additional income if a crop surplus exists
- Enhancement of the local environment

Some of the disadvantages include:

- The potential for overuse of water that may be extremely limited in some water well sites
- The possible conflict between land and water utilization for crops or animals
- Possible land tenure conflicts

In general, a potential does exist for improving food availability through dry season gardening. The opportunities are worth exploring.

What is the structure and function of a dry season garden?

In one garden in northern Ghana, six different crop species were growing in 15 square meters. The garden included pigeon pea, tomato, cassava, bean leaves, a chili plant, and a papaya. All of these crops were for home consumption.

The crops were surrounded by a 4 foot mud fence. This was to protect the crops from animals that used the water well. The crops were grown in a "basin" system. The crops were planted in a garden bed below the normal ground level. This helps to prevent water run off. The crops were fertilized using local goat and cow manure. A straw mulch covered the soil. Six one gallon containers of water were used daily on the garden; three in the morning and three in the afternoon. Locally available seed and locally made tools were used. Approximately one half hour was spent each day on the garden.

The primary function is food and opportunities do exist for expanding the function of the garden. Some possibilities include growing trees around the garden for firewood, shade, fodder, and food. Some medicinal plants could also be included.

The introduction of trellising would make the garden a multi-story plant structure, permitting more crops to be grown in a limited space.

IDENTIFYING NUTRITIONAL NEEDS OF YOUNG CHILDREN

Why Focus on Young Children?

Children between the ages of six months and three years are in the most critical time of their physical and mental development. Proper nutrition levels are necessary the year round in order to ensure proper development. Unfortunately, some children do not receive their proper food intake which limits their potential physical and mental development. A 15 square meter garden that provides good quality and quantity of crops could potentially have a positive impact on a young child.

What Are Their Nutritional Needs?

Following is a hypothetical example of meeting the nutritional needs of a young child through a 15 square meter garden.

Potential Nutrient Yield From 15 Square Meters of Mixed Crops Every 90 Days

Recommended intake of nutrients for a child of 1-3 years old is 1,360 kcal., 22 grams of protein and 400 international units of vitamin "A."

Example No. 1:

Cowpea yields 1,500 grams of edible product per square meter (3 plants/sq. meter and each plant yields 500 grams). In 15 square meters, 22,500 grams are produced every 70-90 days. (1,500 grams/sq. meter \times 15 sq. meters = 22,500.) One cup of cowpeas = 130 grams or approximately 12 cups/ square meter. (500 grms./plant : 130 grms. per cup = +/- 4 cups \times 3 plants/ sq. meter = 12 cups) Two cups of cowpeas = 380 grams of kcal. (2 \times 190 grms./ cup) and 26 grams of protein (2 \times 13 grms. of protein)
Twelve cups of cowpeas = 2,280 kcal. and 156 grms. of protein per square meter.
180 cups of cowpeas are produced in 15 sq. meters (15 \times 12 cups = 180) 15 sq. meters of cowpeas can supply the recommended intake of nutrients for protein and 28% of the calorie requirement for one child every 90 days.

Example No. 2:

Sweet potato tubers yield 6,000 grms. per square meter (6 plants) (40 pieces \times 150 grms./tuber = 6,000 grms.) Fifteen square meters yield 90,000 grms. every 90 days. (15 \times 6,000 = 90,000)
One sweet potato piece = 155 kcal. or 6,200 kcal./ sq. meter (155 kcal. \times 40 pieces = 6,200)
15 square meters of sweet potatoes = 93,000 kcal. (6,200 \times 15 sq. meters)
Sweet potatoes can supply 75% of the recommended intake of calories for one child every 90 days. -

Continued on next page

Example No. 3:

Tomatoes yield 1,000 grms./square meter (2 plants/sq. meter × 500 grms./plant) every 90 days.

Tomato (1 cup raw) = 200 grms. or 5 cups/ sq. meter

Nutrient yield (1 cup raw) = 2,000 I.U. of vitamin "A" or 10,000 I.U. per square meter.

Eight plants in 4 meters are needed to meet the recommended intake of nutrients for a young child.

Summary

The combination of sweet potatoes, cowpeas and tomatoes grown in a mixed cropping system of 15 square meters can meet the recommended intake of nutrients for protein, calories and vitamin "A" for a child of 1-3 years every 90 days.

SOME SOURCES OF NUTRITION FROM THE DRY SEASON GARDEN

Vitamin A

Taro leaves
 Drumstick leaves
 Bitter melon
 fruits & leaves
 Sweet potato leaves
 Cassava leaves
 Squash leaves
 Hot chili pepper
 leaves
 Spinach
 Amaranth leaves
 Carrot
 Parsley
 Mango (ripe)
 Banana
 Papaya (ripe)
 Hibiscus leaves
 Baobob leaves

Vitamin C

Papaya
 (uncooked)
 Muskmelon
 Citrus
 Sugar apple
 Soursop
 Pineapple
 Guava
 Anona
 Mango
 Tomato
 Strawberry
 Cashew (fruit)
 Sweet pepper
 Baobob pulp

Protein

Peanut
 Peas
 Cow pea
 Mung bean
 Pigeon Pea
 Soybean
 Lima bean
 Yardlong bean
 Wing bean
 Cocoa bean
 Chick pea
 Watermelon seed
 Banana tuber
 Cashew nut
 Pili nut

Energy

Corn
 Sweet Potato
 Taro
 Yam
 Potato
 Cassava
 Avocado
 Coconut (mature)
 Banana
 Jackfruit
 Breadfruit
 Sugar cane
 Frafra potatoes

Fats and Oils

Avocado
 Coconut Milk
 Pili nut
 Peanut
 Cacao bean
 Cashew nut
 Soybean
 Bambara groundnuts
 Shea butter
 Earth bean
 Neri
 Kapok seed
 African locust bean

Iron

Mustard
 Amaranth
 Green onion
 Spinach
 Drumstick leaves
 Cassava leaves
 Sweet potato leaves
 Swamp cabbage
 Dried fruits
 Dried beans

METHODS OF **COMMUNITY INVOLVEMENT**

What should be the role of the **community development worker?**

The community development worker should be the outside promoter who works with the community to improve the existing situation. Oftentimes the community development worker has access to information that a local community may have difficulty obtaining. The challenge is to apply the information that is appropriate under local conditions with the community for the benefit of the community.

Why is It important to Involve the community?

The main goal of community development work is to involve the community in realizing their problems and develop a means by which to solve the problem. Therefore, the community's involvement from assessing needs through evaluation is essential if the project is to be sustained. Projects that are created "for" communities without their participation often fall short of their expected impact. Communities must feel that the project is theirs.

How do you involve the community in realizing the **nutritional problems of young children?**

The community development worker needs solid data before proceeding. A community profile will add credibility by indicating an understanding of the particular needs of the community. The following are examples of some basic information that would be useful in developing a community profile.

Local Conditions

Information that needs to be documented varies by country and even by region. Generally, it will fall into the following categories:

Nutrition: Types of food consumed; variations in diet for children and women by season; changes in growth rates of children by season; incidences of nutritional deficiencies and nutrition-related illnesses.

Food Production: Crops currently grown and their seasonality; trends toward commercial or subsistence crops; traditional cropping system; crop losses and their causes; soil fertility; source of animal goods such as eggs, meat, milk and leather.

Economics: Level of income and seasonal variation; type of employment; seasonality of employment; percentage of income spent on food, annually and by season.

Water Supply: Water quality; quantity used in food production; location of sources; time allotted for collection; system of water catchment.

Agricultural and Equipment Supply: Sources of planting materials, reliability, quantity and prices of materials; availability of tools, fencing and trellising materials.

Storage: What foods are stored and in what quantities; losses in storage and their causes; what foods are purchased and in what season.

Cultural Condition: Food taboos; social relations in food distribution; traditional responsibilities of women and men; time availability of targeted participants.

Once the general nutrition deficiencies are known the community development worker should prepare a presentation to the community. The facts can be presented and the community development worker can ask the community what are the consequences for children. The community development worker can then explain the importance of proper food intakes and what local foods can provide a balanced meal. The community can be asked if these crops can be produced and if so where would be a possible location.

This is an example of how to involve a community in realizing the nutritional problems of young children and solution to the problem through dry season gardening.

Continued on next page

After the needs have been assessed,
what is the next step?

The community development worker must now involve the community in designing a plan of action to solve the problem. The materials and crop production techniques will be disclosed in the section on "The Design Of A Dry Season Garden."

Organizational aspects of the project need to be addressed by the community before they can begin. Some issues include:

- (1) How will the physical constraints of land and water be managed?
- (2) How will the project participants be selected?
- (3) How will the dry season garden project be linked to the existing food system in the village?
- (4) Who will be responsible for the logistics of the crop inputs and management of the garden site?
- (5) What monitoring and evaluation techniques will be used to determine if there has been a genuine improvement in the nutritional status of young children?

Once these questions have been answered, a project design outline can be developed (A suggested three-year plan is included at the end of the handbook.)



An extension worker discussing the possibilities of establishing dry season gardens around the hand pump

EXTENSION METHODS AND MATERIALS

What are some factors that should be known before designing extension activities?

Extension activities should be designed on a location-specific basis reflecting the existing community situation. The challenge for the community development worker is to extract information from national or international extension books and adapt the information to local conditions.

Some of the factors to consider include socio-economic of the target group.

- Level of education
- Level of experience in gardening
- Time available for gardening
- Time available to attend extension activities
- Funds available for garden inputs

What role does the community play in the development and implementation of extension activities?

The community development worker and the community need to work together in deciding what extension activities are necessary to promote nutrition through gardening.

A few popular extension activities for motivation are dramas and demonstration plots.

Dramas have the advantage of.

- Presenting the nutritional problems of young children in a popular method of communication
- Local community members are involved in the script and presentation thus lowering the education conflict that often arises between extension agents and the community.

Dramas can also have the disadvantage of being perceived as pure entertainment by the community with no motivational impact.

Demonstration gardens have the advantage of:

- Demonstrating to the community that it is physically possible to grow a garden near a water source
- Showing that local materials can be used

Demonstration gardens can have a negative impact if the materials used are imported as the community may have difficulty in obtaining those same materials.

These are a few of the extension activities that can be used. Extension activities that involve the community in the design can help to ensure understanding and participation.

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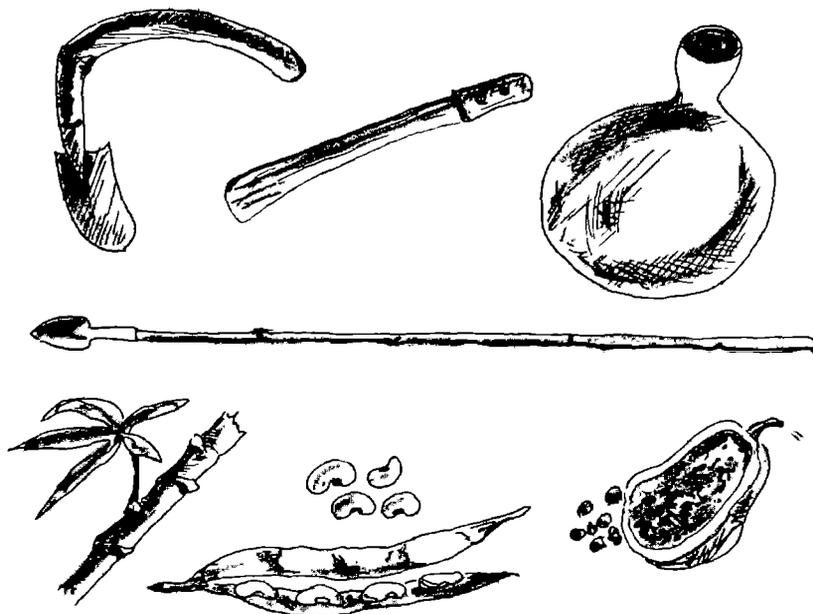


The extension worker showing community members a demonstration garden using local materials.

DESIGN OF A DRY SEASON GARDEN

A few facts need to be gathered before the actual design of a garden can take place. The project management aspects were discussed previously in the section under "Methods For Community Involvement." A simple land use assessment including physical and biological resources should be undertaken to have a clear picture of the potential for crop production in the area. Some of the questions that should be asked include:

- (1) How much land is available around each water well and is it available the year round?
- (2) How much water is available for gardening and are there periods of shortage?
- (3) How will the potential land use conflict be solved between animals and gardens?
- (4) Is the soil fertile or has it been depleted of soil nutrients?
- (5) Is the soil easy to cultivate by hand?
- (6) Are there periods of strong wind during the year?
- (7) Are traditional plant materials available locally in sufficient quantities?
- (8) Are there new crops that could be adapted that would require little maintenance?
- (9) Are there sufficient supplies of local biological resources that can be used for fertilizer, mulch, and other crop maintenance activities?



**A garden's design should be based
on local plant materials and tools.**

Crop Selection

Once these questions have been answered the next step is to select crops that are appropriate to the local environment. The selection of crops should be based on the following criteria:

- (1) Physical Requirements:
 - (a) Adaptability to the local environment (low water or high water)
 - (b) Length of growing season (long or short)
 - (c) Crop management requirement (high or low)
 - (d) Enhancement of the environment
- (2) Nutritional Value
 - (a) High food value with low crop maintenance requirements
 - (b) Potential for processing and storage
- (3) Economics
 - (a) *Low labor and financial requirement*
 - (b) Crop inputs locally available
- (4) Social Environment
 - (a) Family preference
 - (b) Multi-purpose
 - (c) Culturally acceptable

Companion Planting

The next step after developing a list of crops that meet the above criteria is to design the garden to maximize production in the limited available space. This is called "companion planting."

Maximizing production in a limited space requires an understanding of individual crop characteristics in terms of space and time.

Plant Physiology

Some Factors to Consider

- Root Structure (Tap root or fibrous)
- Plant Height (Erect or prostrate)
- Light Requirement (Full sun or part shade)
- Water Requirement (Drought-tolerant or requires frequent irrigation)
- Maturity (Fast growing or slow growing)
- Edible Portion (Roots, stem, leaves, fruits)
- Plant Nutrition (Sensitive to or tolerant of a wide range)

Once there is an understanding of a crop's characteristics, a system of companion planting can be developed. Companion planting can be effective with crops which have similar, as well as different requirements.

Different Requirements

- Shade Tolerant with Full Sun
(Leaf crop and flowering crop)
- Short Maturing with Long Maturing
(60 days and 100 days)
- Nitrogen-Producing with Non-Nitrogen-Producing
(Legume and root crop)
- Erect with Prostrate
(Corn and Squash)

Similar Requirements

- Light. (Shade with Shade)
- Water. (Drought Tolerant)
- Plant Nutrition (Light Feeders)
- Soil. (Heavy Soil)
- Pest Tolerance (Resistant to Insects
and Diseases)

Plants That Grow Well In Companion

Plant Combinations

Sweet potato	Okra, eggplant, tomato, chili, pole bean, yardlong bean, wing bean, lima bean, amaranth, corn, pigeon pea.
Cassava	Sweet potato, nightshade, lettuce, garlic, vine squash, peanut.
Tomato, Okra, Eggplant.	Sweet potato, vine squash.
Corn	Okra, tomato, sweet potato, bush bean, pole bean, cabbage, peanut, vine squash, yardlong bean.
Vine Squash	On trellis: bottle gourd, sponge gourd, cucumber.
Bittermelon	On trellis: legumes, lima bean, yardlong bean, hyacinth bean, wing bean.
Vine/Legumes.	On trellis: banana stalk, papaya trunk

Crop Locations In The Garden

Plants for wet areas:

Taro
Swamp cabbage
Sugar cane
Banana

Plants for trellis:

Climbing legumes
String bean
Yardlong bean
Wing bean
Yam bean

Climbing fruit vegetables:

Squash
Gourds
Cucumber
Bittermelon

Plants for under the trellis:

Taro
Swamp cabbage
Sweet potato
Ginger
Bito

Plants for dry areas:

Legumes	Jackfruit
Cassava	Grapes
Pineapple	Cashew
Tamarind	Guava
Mango	Soursop
Sugar apple	

Plants that make good

live fences:

Giant ipil-ipil
Madre de cacao
Drumstick plant
Casarina
Bamboo
Pineapple
Cassava
Cactus

Plants that suppress

weed growth:

Sweet potato
Swamp cabbage
Squash

IMPLEMENTATION

Background

- Nutritional needs have been determined
- Year-round garden plan is developed

At The Garden Site

- Start site preparation at the beginning of the rainy season
- Have the necessary tools at the garden site (knife, hoe, planting stick, watering container)
- Have all other materials at the site (temporary fencing, crop protection, planting stock)

Land Preparation

- ~~Cut weeds~~ to the ground. Leave until dry. Remove rocks and other debris. Gather dried weeds into a pile. Cut weeds, save, and cultivate ground with a hoe.
- Stake out the area for planting indicating the location of holes to be dug. (This will show if the garden plan and actual implementation are compatible.)
- Construct a temporary fence or mud fence
- Construct trellises
- Dig all the holes for the seeds and seedlings before starting to plant (If most compost material is available—place a handful in each hole and mix with the soil.)

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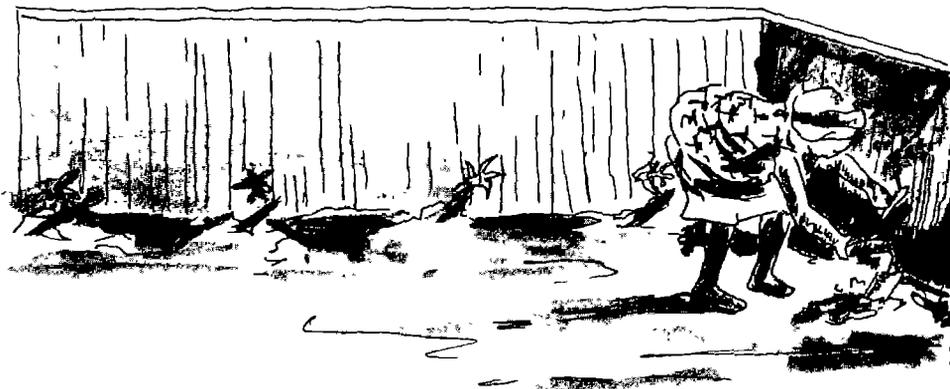
**Constructing
a mud fence
is an important
garden
preparation
activity.**



Removal of weeds from the garden.

Planting

- Start with the crops nearest to the fence and trellises.
- When planting roots and tubers such as banana and cassava, place the ashes from the weeds in the hole and mix with the soil. After planting the crops, apply a mulch of 6 cm. around the plant. Next, provide protection from stray animals, strong rains, and sun. Finally, water the plant
- In transplanting seedlings of fruit trees and some vegetables, the same procedure is used as that for the roots and tubers, except that ash is not necessary.
- Direct-seeded vegetables require less attention and labour at the planting stage than the previously mentioned crops. After planting the seed, place a wooden marker next to it and water. Cover the area with leaves for a few days to conserve moisture. Mulch may be applied approximately one month after seed germination.



Planting cassava next to the fence.

CROP MANAGEMENT TECHNIQUES

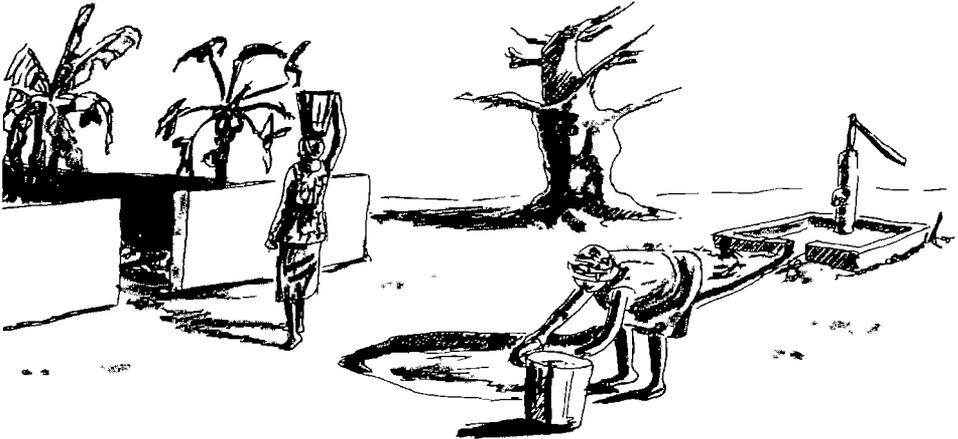
(1) Water Management

Water will be the most critical factor in the successful production of crops during the long, hot, dry season. Several techniques can be used to conserve and use water efficiently.

Excess Water From The Well

Many handpump wells have cement water troughs that lead away from the pump for animals. This water could be used for garden crops. It should be applied directly to the soil and not on the leaves.

If no water trough exists, a small canal can be dug from the well to the garden site.



**Collecting excess water from the water pump
for use in the garden.**

Hand Dug Wells

In areas with a high water table, wells can be dug and gardens planted around the well.



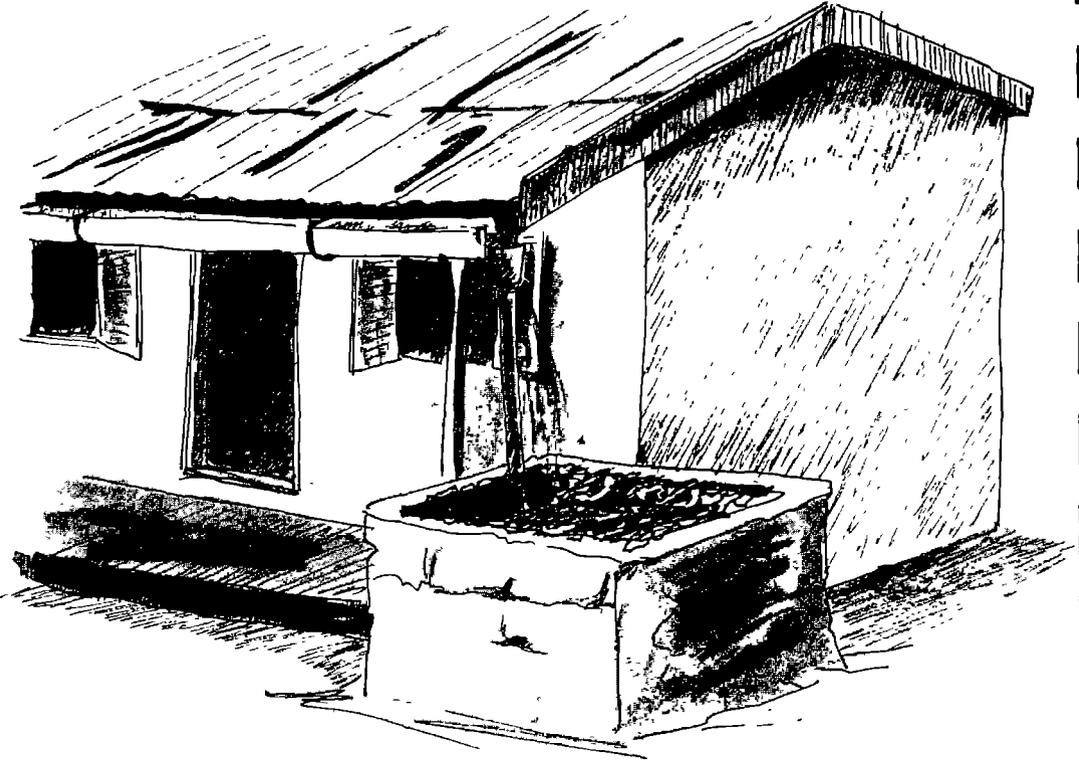
Producing crops from a hand dug well.

Dams

In many parts of the Upper Region, dams have been constructed. Gardens can be established at the base of dams to take advantage of the water runoff.

Rain Water Catchment

A water tank collection system can be constructed to capture rain water from a building's roof. A roof surface of 10 feet × 20 feet can capture approximately 2,000 gallons from 20 inches of rain.



Rain water catchment system

Water Well Trellis

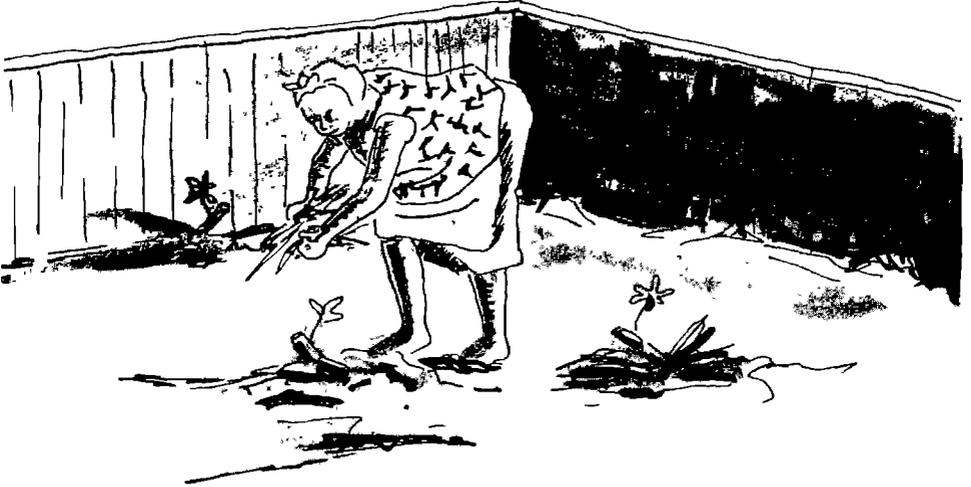
A trellis can be constructed over the water well. Vine crops could be planted at each post and shade-tolerant crops could be grown underneath. The trellis would also provide shade for those fetching water.



A garden of trellised crops around a water pump

Dry Mulch

Straw from the staple field or dried weeds can be used to conserve moisture. Yields of cabbage have been doubled by the use of 6 centimeter-thick mulch, and water requirements are reduced by 50%. One note of caution: the mulch should be dry and free of diseases, as mulch can harbor insects and diseases.



Applying a straw mulch to garden crops

Living Mulch

Vine crops that trail on the ground can also be effective in conserving moisture. Gourds, beans, and sweet potato are popular crops that could be used.

Planting of Drought-Tolerant Crops

Selecting crops that do not require large amounts of water is another method of water conservation. Legumes, cassava, squash gourds, and sweet potato are a few examples.

SOIL MANAGEMENT

In the home garden some of the factors to consider in appraising the potential soil for crop production includes:

- Soil Texture (Heavy clay to sandy)
- Areas Soil Located (Water-logged or dry areas)
- General Soil Fertility (Dark colored or light colored)
- Present Vegetation (Where it is or is not growing)
- Slope of Land (Hilly or flat)

After appraising the soil situation, recommendations for action may include:

Soil Texture Improvement

Heavy soil may drain better with the addition of organic matter.

Sandy soil may retain more moisture and nutrients with the addition of organic matter.

Water-logged Areas

Grow hydrophyllic (water-loving) plants such as swamp cabbage, sugar cane, banana and taro.

Dry Areas

Drought-tolerant crops such as legumes and some trees.

Darker Colored Soils (generally good fertility)

Crops that are sensitive to proper nutrition which includes most shallow rooted annual crops.

Continued on next page

Lighter Colored Soils (generally poor fertility)

Most leguminous trees, some grains and cassava. (Regular additions of organic matter should improve the situation.)

Present Vegetation

Grow sensitive crops in the area with good vegetation. Plant less sensitive crops in areas with less vegetation

Slope of the Land

Hilly areas should be planted with a combination of less sensitive annual and perennial crops.

Flat areas may be reserved for crops that require good soil fertility.

The conservation of organic matter should be encouraged as its utilization is generally linked with increased crop yields. This usually results in more food availability for the households.

PLANT NUTRITION

A basic understanding of plant nutrition: the availability, absorption, and utilization of plant food is an important part of understanding the relationship between garden produce and nutrition.

The Macronutrients and Availability in the Garden

Nitrogen:

This element is most often needed by crops and is also the most difficult to provide to plants in the amount and frequency needed. Simply stated, nitrogen in combination with other elements promotes active vegetative growth. Proper nitrogen levels at the beginning of the growth period will help ensure a smooth passage into the reproductive stage. Without nitrogen, plant growth will appear weak and yellowed—usually resulting in poor yields.

Under home garden conditions, several materials can be used to feed nitrogen to plants. These include the green leaves of leguminous plants, animal manure and urine. Digging these materials into the soil will result in a more productive use of the nitrogen than placing it on the soil surface.

Phosphorus and Potassium:

These elements combine with others in developing strong root, stem and leaf cells to protect against pests. In addition, these elements are needed in the reproductive phase to produce flowers and fruits. Some common garden materials that can be used to supply phosphorus and potassium are the residues of banana and sugar cane plants as well as wood ash. The bones of livestock are also useful.

Plant Nutrition and Nutritional Values:

Plant nutrition and its effects on mineral and vitamin content of fruits and vegetables must be considered in combination with garden practices such as irrigation and weed management, and post-harvest operations including handling, storage, and processing.

Plants require 16 elements in order to grow properly. If one of the 16 elements is not available in sufficient quantity, then plant growth will be affected. This in turn will influence the nutritional value of the crop. For example, if iron is lacking in a plant grown for its leaves, then the amount of available iron along with other minerals for use as a food is less than food composition tables would normally indicate.



Applying liquid manure using local materials

PEST MANAGEMENT

Pest management is the control of harmful insects and diseases. Major pest infestations are generally seasonal, occurring mostly during the wet, humid period. However, pests tend to be less of a problem in home gardens (especially mixed gardens) than in modern conventional farming systems.

Some of the techniques for pest management in a home garden are:

- Removal of diseased plant parts
- Companion planting—combining different plant species and varieties
- Using materials grown in the home garden to repel insects

Removal of Diseased Plants or Plant Parts

Often this is an effective control method for preventing the spread of a plant pest. A plant may be obviously under attack by insects or diseases. By first removing the diseased parts, spreading throughout the plant may be prevented. If that proves unsuccessful, removal of the entire plant and burning it is advisable.

Companion Planting

The natural mixture of plant species is the most effective passive activity for managing pests. Pests are host specific and attack only a certain range of plants. Growing and mixing a large number of different plant species will help prevent pest build-ups. Certain plants naturally repel insects and are resistant to diseases. Certain soil and airborne diseases can be prevented from spreading by combining plants with different heights and roots. In addition, maintaining proper plant nutrition will help control pests. Planting plants in their proper soil requirements is also a pest control method.

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Home Garden Materials as Pest Control

Certain plants and other materials have been traditionally used to manage pest problems. Chewing insects have been repelled by using chili peppers and garlic. Sucking insects have been repelled by the combined use of soap, kerosene, and water. Some crawling insects are managed by spreading wood ash around a plant's base.



Applying local pest control materials

WEED MANAGEMENT

Weeds (unwanted plants) are a major pest in home gardens and can significantly affect a crop's growth and yield. Weed growth is most active during the humid period.

Weeds should be removed from the garden because they:

- Act as a place for insects and diseases
- Compete with the garden crops for light, space, water and nutrients

The removed weeds can be used for:

- Plant food in the form of ash or compost
- Livestock feed
- Bedding for livestock
- As a mulch for water conservation and soil erosion
- Packing material for fruits and vegetables

Some techniques for managing weeds include:

- Mulching
- Companion planting
- Hoeing
- Shading

Mulching

Mulching, the placing of decaying plant and animal residues on the soil surface, is an effective weed management technique. Mulch, when placed at least six cm. high around a plant, will control weed growth by preventing sunlight from making contact with the soil. Decaying weeds can be used as a mulch to prevent other weeds from growing.

Companion Planting

Companion planting, a key element in mixed gardening, can also be an effective technique in weed management. Traditionally, the plant and animal residues produced under mixed gardening conditions are allowed to remain in the garden. The combination of a layer of decayed organic matter coupled with the shading of soil common in companion planting, results in limited sunlight coming into contact with unprotected soil.

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Hoe Cultivation

The physical removal of weeds by hoeing or slashing by knife, is another technique for weed management under home garden conditions. This method is more frequently used during the early development of a garden when trees are still small and mulching material may be limited.

Shading

A mixed garden with its combination of trees and animal crops becomes an effective means of weed management as the garden matures. During the early years, the young structure of a mixed garden allows for more sunlight to come in contact with the soil. However, as the garden matures, those trees create more of a shading effect on the soil, preventing weed growth.

HARVEST POST

HARVEST ACTIVITIES

Harvesting is the collection of products from the home garden that have reached a desired stage of maturity. In a mixed garden, with its numerous crop species, harvesting can usually occur daily. A well-balanced diet can be realized through initial good planning and proper crop management. Two items that require special attention in a home garden are harvesting for maximum nutrition, and establishing a living storage unit.

Harvesting For Maximum Nutrition

The major goal of a nutrition-oriented mixed garden is to produce the maximum amount of nutritious crops with the least amount of time, space, and expense. Harvesting crops to ensure maximum nutritional benefits requires a few basic concepts.

A nutrient will reach its maximum value at a particular stage of growth. In some beans, for example, the vitamin "C" content may be higher in the early fruit development stage, while the protein content is low. However, at full maturity, the protein content is usually highest and the vitamin "C" content may be decreased.

In addition, different parts of a plant contain different concentrations of nutrients. For example, the sweet potato plant is considered for both its roots and leaves. Most annual crops have more than one part that is edible

In sum, deciding on a crop's most valuable nutrient contribution will provide guidance in selecting the appropriate time to harvest.

Establishing a Living Storage Unit

A mixture of annuals and perennials provides an opportunity to establish a living storage unit. Generally, bi-annual and perennial crops that have edible leaves and annual root crop plants are in this category. Certain root crop species can be stored in the garden and harvested when needed. Crops with edible leaves such as chili pepper, sweet potato, and the drumstick plant are examples of crops with leaves that can be harvested daily before meal preparation. In addition, many fruit tree species produce over a several month period, and their fruits may be harvested as needed.

SEED SELECTION AND STORAGE

Selecting quality seeds and storing them correctly are important activities in ensuring a continuation of crop production in the home garden

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Seed Selection

The first step in selecting seeds for the next crop is to determine which crops from the present season are the most pest-resistant, productive, and vigorous. A general rule is to save 50% more seeds than normally needed for planting. Seed selection is in three categories and is done at the end of the crop cycle.

- For leaf vegetables, harvest the seeds when the flowers turn yellow. Dry the pods and remove the seeds by threshing.
- For legumes, allow the seeds to mature on the plant, then harvest and dry in the sun. Remove seeds from the dried pods.
- For fruit vegetables, allow them to mature on the plants. Then harvest, remove seeds, and wash the pump away. Dry in the sun.

Storage

Containers can be made from home garden crops including coconuts, bamboo and gourds. The seed containers should be thoroughly dried. Wood ash or charcoal are good sources to protect seeds from insects and diseases. Fill one-fourth of the container with either material. Place the seeds inside. Seal and shake to spread the ash or charcoal around the seeds. Store in a cool, dry location.

A CHECKLIST FOR DRY SEASON GARDENING

1. The garden provides a variety of food, medicinal and building materials. (The greater the diversity, the greater the chance for adaptation by the local people.)
2. The plant canopy is multi-storied, making efficient use of solar energy. (A large number of crops can be grown in a limited space without significantly competing with one another.)
3. The garden provides better use of soil water and soil nutrients through its various root zone levels. (A large number of crops can be grown in a limited space without significantly competing with one another.)
4. Weed growth is controlled through shading by the upper canopy level and by trailing edible vines. (Controlling undesirable growth gives the desired plants a good opportunity for growth.)
5. Mixed-crop planting arrangements are such that a high plant density is achieved. (Makes maximum use of a limited growing area.)
6. Plant material is available locally and can be easily propagated. (Lessens dependence on non-local resources.)
7. Plant has the capacity for identical parental regeneration. (Reduces the chance of losing desired qualities.)
8. Crops grown require little or no commercial pesticides and fertilizers. (No necessity to spend severely limited funds on food production.)
9. Crop combinations have biological crop protection and synergistic relationships for nutrients. (Companion planting increases crop production efficiency.)
10. Organic matter is allowed to remain in the garden and additional nutrient sources, from farm animals, the family, and threshing, are applied to the plants. (Using on-site materials removes the need for fertilizer expenditures.)
11. A steady supply of crops is harvested throughout the dry season (Provides food and other essentials during staple crop shortages)
12. Labor requirements are minimal and do not interfere with the major income activity. (Essential in integrating into daily activities.)
13. The garden provides a variety of quality nutrients to ameliorate deficiencies in the diet. (Provides the opportunity for a good dietary intake.)
14. The garden is unlikely to create conditions that will damage the ecosystem.
15. The garden will not conflict with human or livestock water requirements.

AN OUTLINE OF A THREE YEAR PROJECT PLAN

Objectives

- To reduce undernutrition of mothers and young children in selected communities
- To work with communities to develop self-management plans for action on improving nutrition through dry season gardening
- To study and determine with the community effective methods of using locally available water resources for dry season gardening.

Phase I—Development Stage

- (a) Develop a community co-ordinating committee on dry season gardening for nutrition improvement
 - Assess research needs in food, nutrition and water resources
 - Develop a policy of using existing water resources for dry season gardening
 - Develop guidelines for project operations leading to community management
- (b) Develop extension/communication materials (pilot)
 - Community and individual
- (c) Identify target groups and field sites (local water sources)

Phase II—Implementation And Piloting

- (a) Training of target groups
- (b) Implementation in field sites
 - Extension of practical food production, food preservation, preparation and nutrition information through group meetings household visits
 - Distribution of planting materials
 - Monitoring of nutritional status of mothers and children
 - Evaluation of the process of self-help nutrition improvement through dry season gardening

Phase III—Expansion

- Evaluation of the project in the pilot areas, refinement of the project, expansion to other communities

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