MARKET ORIENTED AGRICULTURAL PROGRAMME (MOAP)

TRAINING IN AGRICULTURAL LITERACY

(CITRUS PRODUCTION AND SMALL SCALE FRUIT PROCESSING AND MARKETING)

PREPARED BY:
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A. PREFACE TO THE MANUAL

The Market Oriented Agricultural Programme (MOAP) is a programme funded by GIZ with the objective of promoting pro-poor, income raising business models for competitive agricultural value chains. As part of its activities, MOAP provides technical support to different actors across the pineapple and citrus value chains in the Central Region. However, low financial literacy and financial management skills among farmers and poor cash flow for servicing loans have played roles in preventing growth in the smallholder finance market. On the other hand, many local banks simply lack specific agricultural expertise in designing appropriate financial products for the agricultural sector in general and for smallholder farmers and processor specifically. They also often do not understand the economics behind crops such as citrus and can therefore not judge whether a loan application makes sense or not. The programme therefore recognises the need for training of local banks in agricultural literacy to better understand the production cycles and investment needs of Value Chain (VC) operators to better positioned to structure their interventions to meet the demands of smallholders along the agricultural value chain.

MOAP, with support from CDC Consult Limited, Accra has developed this manual which encompasses basic knowledge, skills and tools to support training in Agricultural Literacy (Citrus Production and Small Scale Fruit Processing and Marketing) for selected officers of the banks.

B. OVERALL OBJECTIVE OF TRAINING PROGRAMME

The objective of the training is to equip selected officers with the required knowledge on production cycles and investment needs of VC actors along the citrus value chains.

C. EXPECTED OUTCOME

It is expected that at the end of the training, selected community banks, based on their understanding of the crop cycles and activities of VC actors, will be able to develop products that meet the needs of citrus actors along the agricultural value chain.

D. TARGET PARTICIPANTS

Target participants for the training include Credit Managers and Credit Officers.

E. USERS OF MANUAL

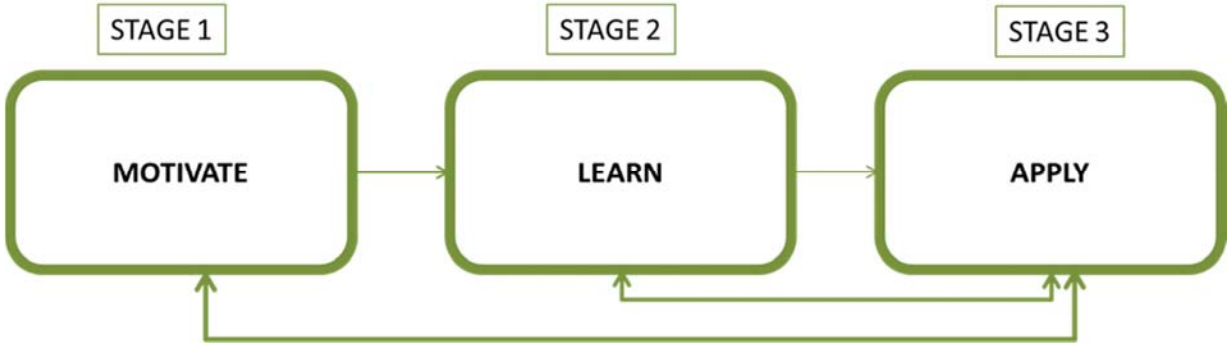
This manual is a reference document to be used by credit officers in their day to day interactions with citrus value chain actors

F. COURSE CURRICULUM

Course Title	Agricultural Literacy
Targeted Participants	Officers of the Rural Bank Credit Department
General Objective	The objective of the training is to equip selected officers with the required knowledge on production cycles and investment needs of VC actors along the citrus value chains.
Duration	Two (2) days

Approach and Methodology

The Agricultural Literacy Training will be adapted CDC Consult's Motivate-Learn-Apply (MLA) Approach to Financial Literacy as approach for the training. The "Motivate, Learn and Apply" approach focuses on creating (Motivate) a change in mind-set. This motivation triggers the desire for knowledge acquisition (Learn). The acquired knowledge is then applied (Apply) to achieve the desired for change created in the initial stage.



In the case of the Agricultural Literacy training, the segment on Motivate helps participants to understand the relevance of citrus production to the economy, It highlights the current challenges faced in the economy It also highlights the role of the Rural Bank in addressing these challenges through financial -support to citrus value chain actors.

The segment on "Learn" focuses on equipping participants with basic knowledge on citrus production and small scale fruit processing and marketing, costs and investment needs as well as risks in citrus production, processing and marketing.

The Apply pillar is driven by the first two pillars of Motivate and Learn. It provides participants with the steps to take and tools to use in designing financial products for citrus value chain actors.	
Modules and Sub Topics	
Introduction, Workshop Objectives, Expectations and Pre-Training Evaluation	
PART 1 – CITRUS PRODUCTION	
Module 1	Citrus Production
Module 2	Stages and Activities in Citrus Production
Module 3	Designing Financial Productions for Citrus Production
PART 2 – SMALL SCALE FRUIT PROCESSING AND MARKETING	
Module 1	Small Scale Fruit Processing and Marketing in Ghana
Module 2	Stages and Activities in Small Scale Fruit Processing and Marketing
Module 3	Designing Financial Products for the Small Scale Fruit Processor

G. COURSE LEGEND

	**Activity:** This symbolizes an activity in the form of an exercise, case study, discussions etc. that will result in deepened understanding of the key issue in the session.
	**Question:** This symbolizes a question under a particular topic that participants are required to provide responses to.

PART 1 - CITRUS PRODUCTION

MODULE 1.0 CITRUS PRODUCTION IN GHANA

About the Module

This module is designed to enhance participants understanding on the importance of citrus as well as challenges faced in Ghana's citrus industry. It throws a challenge to participants to identify their roles in addressing these challenges, leading to improved conditions for the citrus farmer, their community and the country at large.

MODULE OBJECTIVES	SESSIONS	MODULE OUTCOME
The objectives of the module are to: • Introduce participants to citrus production in Ghana; • Explain the types of citrus produced in Ghana; • Identify the importance of citrus; • Discuss the challenges faced in the citrus industry;	Session 1.0: Citrus Production and Types of Citrus Produced in Ghana Session 2.0: Importance of Citrus and Challenges in Citrus Production Session 3.0: Role of Rural Bank in Addressing Challenges in Citrus Production	At the end of this module, participants would be able to: Explain the types of citrus produced in Ghana; Identify the importance of citrus; Discuss the challenges faced in the citrus industry; Identify the role of the Rural Bank in addressing challenges in the Citrus Industry.

• Identify the role of the Rural Bank in addressing challenges in the Citrus Industry.		

PRE AND POST EVALUATION TEST ON CITRUS PRODUCTION

Q1.	Citrus fruit is one of the most important sources of vitamin C.	Yes	No	I don't know
Q2.	The three main stages of citrus production are pre-planting, planting and post planting.	Yes	No	I don't know
Q3.	Pre-planting activities involve all activities carried out before planting.	Yes	No	I don't know
Q4.	Citrus grows well in regions with high amounts of rainfall is evenly distributed.	Yes	No	I don't know
Q5.	The best time to plant citrus trees is early in the wet season.	Yes	No	I don't know
Q6.	Intercropping is an activity that is also carried out at the planting stage.	Yes	No	I don't know
Q7.	Pruning is a post planting activity.	Yes	No	I don't know
Q8.	Lack or excess of the right amount of nutrients can cause unhealthy growth in citrus plants.	Yes	No	I don't know
Q9.	Most of the citrus in Ghana is produced under rain fed conditions.	Yes	No	I don't know
Q10.	Orange trees do not fruit until they have been established in the same spot for three to four years.	Yes	No	I don't know
Q11.	Maturity of orange fruits occurs 7 to 8 months after flowering for most of the varieties.	Yes	No	I don't know
Q12.	There are four types of supply base for a processing business.	Yes	No	I don't know
Q13.	There are 8 types of citrus fruits cultivated in Ghana.	Yes	No	I don't know

Q14.	Access to finance is a challenge to citrus fruit production.	Yes	No	I don't know
Q15.	In designing a product for citrus production, market research is necessary.	Yes	No	I don't know
Q16.	In pricing a product for citrus production, market potential is considered.	Yes	No	I don't know
Q17.	In designing a product for citrus production, product risk analysis must be conducted.	Yes	No	I don't know
Q18.	Pilot testing of products designed for citrus production informs product refinement.	Yes	No	I don't know
Q19.	Product cost analysis conduction is necessary after organizing the roll out of the product.	Yes	No	I don't know
Q20.	In designing products, potential challenges and risks of products should be considered.	Yes	No	I don't know

Session 1.0: Citrus Production and Types of Citrus Produced in Ghana

Session Objectives

At the end of this session, participants would be able to:

1. Provide an overview of citrus production in Ghana;
2. Identify the types of citrus fruits produced in Ghana.

1.1 Agriculture and Citrus Production in Ghana

The contribution of Agriculture, the backbone of Ghana's economy, to the country's Gross Domestic Product (GDP) has continuously dropped over the past years. Within the past seven (7) years, the contribution has dropped by 12.8% from 31.8% in 2009 to 19% as of September 2015[1]. The consistent decline is a cause for concern considering that the sector employs 44.7% of the Ghanaian population that are 15 years and older[2].

Ghana's primary cash crops include cocoa, beans, palm, oil, pineapples, cotton, tomatoes, bananas, **citrus fruits** (orange, lemon, grape, etc.), coconut, tobacco, cashew and fresh vegetables. Over the years, higher priority has been placed on cocoa production unlike production of the other cash crops. In recent times however, there has been the need to provide the needed attention to the production of other cash crops, including citrus fruits.

Citrus can be grown anywhere in Ghana provided the soil and soil moisture requirements are satisfactory. However, the forest zones (Central, Western, Eastern, Brong Ahafo, Ashanti and Volta regions) with high amounts of rainfall evenly distributed but with dry periods of two to three months flowing, are most suitable.

1. **What are the main types of citrus fruits grown in Ghana?**
2. **How important is the production of citrus to the Ghanaian economy?**

[1] http://www.myjoyonline.com/business/2015/december-7th/agric-contribution-to-gdp-in-a-7-year-slump.php

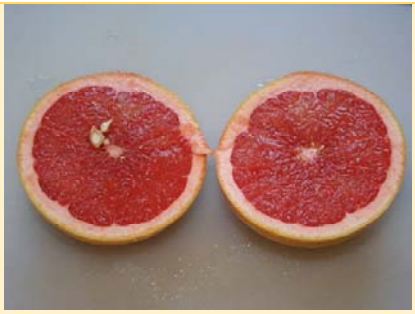
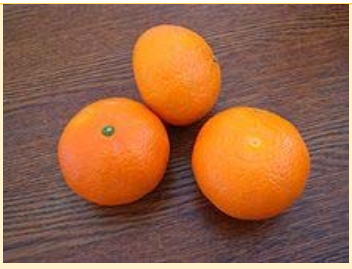
[2] http://pulse.com.gh/agriculture/declining-fortunes-the-declining-fortunes-of-ghana-s-agricultural-sector-id4383491.html

1.1 Types of Citrus Fruits Cultivated in Ghana

The main types of citrus fruits cultivated in Ghana are sweet orange, tangerine, lime, lemon, grapefruits, pumelo, tangors and tangelo. The last two types, tangors (hybrid of mandarin orange and sweet orange) and tangelo (hybrid of tangerine and pomelo or grapefruit), are hybrids. The types and their species are presented in Table 1.

Table 1: Citrus Types and Species

Citrus Types	Species	
Sweet Oranges	Asuansi, Baninhia Navel Orange, Bengia,Frost, Hamlin, Kwesi-Nyarko, Late Valencia, Mediterranean Sweet, Mrs. Wright, Natal Valencia, Nigerian Green, Obuasi, Ovaletto, Pineapple, Portuguese Sweet, Red Blood Orange, Rhode Red Valencia, Sekkan, Shamar, Washington Navel Orange.	 Red Blood Orange  Late Valencia
Mandarins /Tangerine (Easy Peelers)	Clementines, Ponkan, King De-Semis, Kara De-Semis, Cleopatra Robinson Imperial Mandarin, Local Tangerine, Satsuma.	 Satsuma Fruits
Lime	West Indian (Mexican, Key), Sweet Lime, Rangpur.	

Citrus Types	Species	
		West Indian
Lemon	Volkamariana, Swingle Citromell, Rough Lemon, Kumquat.	 Rough Lemon  Kumquat
Grapefruits	Walters, Thompson Pink, Aburi, Prestea, USSR, Duncan Grape Fruit, STG Delta, Ruby, Foster Pink.	 Foster Pink
Pumelo	Shaddock	 Shaddock Fruits
Tangors (hybrid of mandarin orange and sweet orange)	Ortanique	-  Ortanique

Citrus Types	Species	
Tangelo (hybrid of tangerine and pomelo or grapefruit)	Miniola, Samson, Orlando.	 **Miniola**

1. What are the health benefits of citrus fruits?
2. What are the challenges of citrus cultivation in Ghana?
3. How can the rural bank help in addressing challenges of citrus value chain actors?

Session 2.0: Importance of Citrus and Challenges in Citrus Production

Session Objectives

At the end of this session, participants would be able to:

1. Describe the importance of citrus production to the Ghanaian economy;
2. Mention the challenges that affect the cultivation of citrus fruits.

1.2 Importance of Citrus to the Ghanaian Economy

The importance of citrus to the Ghanaian economy can be seen in three main areas. These are health benefits, foreign exchange earnings from export and employment opportunities to farmers and the youth.

1.2.1 Health Benefits of Citrus Fruits

Citrus fruit is known as one of the most important sources of vitamin C (ascorbic acid), folic acid and dietary fiber. It also contains phytochemicals. These naturally occurring compounds found in plants have a wide range of physiological effects and may help to protect against various chronic diseases, including cancer and heart disease. Citrus fruit is fat free, sodium free and cholesterol free which are associated with cardio vascular diseases. They have substantial quantities of potassium, calcium, folate, thiamin, phosphorus, magnesium, and copper which also help to reduce heart diseases and types of cancer. The soluble solids of oranges are made up of soluble sugars and organic acids which are stable compounds.

There are numerous health benefits deposited in citrus fruits. They help in the prevention of cardiovascular diseases, hypertension, stroke, cancer, neural tube defects (spine bifida and anencephaly) and anemia.[3] In recent times, many Ghanaians have become conscious of their food intake. With the heightened level of health consciousness, the demand for fruits have also increased thereby creating more demand for fruits, as well as citrus fruits.

[3] http://www.fao.org/docrep/x2650t/x2650t03.htm

1.2.2 Foreign Exchange Earnings from Exports

Citrus fruits cultivation and export has become a potential foreign exchange income contributor to the Ghanaian economy. This has become more necessary as the country explores other avenues from which it can earn more foreign exchange and reduce the over-reliance on few cash crops such as cocoa. Compared to other African economies, Ghana has competitive advantage in citrus exports to Europe[4].

The edible part and the peels of citrus fruits, are source of foreign exchange to the country. Trade partners, such as Germany and Netherlands, currently demanding dried orange and lemon peel from Ghana. The dried lemon and orange peels are mainly used as infusions in the production of beverages such as tea. With this new innovation, Ghana can earn additional foreign exchange earnings from export of the peels.[5]

1.2.3 Employment Opportunities for Farmers and Youth

The citrus sub-sector of Ghana's agricultural industry has the potential to create an estimated one million jobs in Ghana. As at 2015, there were about 20,000[6] farmers in Ghana engaged in the cultivation of citrus in Ghana.

1.3 Challenges in Citrus Production in Ghana

Despite the importance of the citrus fruit production to the country, citrus farmers are affected by several challenges which affects production levels and eventually income levels of farmers. Presented are the key challenges of citrus fruit cultivation in Ghana.

[4] https://www.modernghana.com/news/542090/ghanaian-farmers-crying-over-dying-citrus-plantations.html

[5] http://www.ghanaweb.com/GhanaHomePage/NewsArchive/Citrus-peel-in-high-demand-in-EU-market-312206

[6] http://www.ghanaweb.com/GhanaHomePage/NewsArchive/artikel.php?ID=353006

Figure 1: Challenges in Citrus Production

1. **Access to finance**: Due to the high risk faced in financing agricultural products and seasonality of produce, financial institutions shy away from this sector. This has resulted in difficulties in accessing financing by small holder farmers in the country.
2. **Loss of citrus produce due to pest and disease infection:** The prevalence of pests and diseases such as the angular leaf spot disease result in high levels of loss of product. It is recorded that this disease causes a crop-yield loss of over 50 percent[7].
3. **Lack of access to international market:** Countries such as the United States, United Kingdom, France, New Zealand, Germany and Netherlands demand citrus and citrus peels from Ghana. A sack of dried certified citrus peel is said to weigh about 12 kilos whiles that of lemon weighs about 16 kilos. It is sold by Ghanaian suppliers to their European clients for an average €2 per kilo. However, due to factors such as pests and diseases, poor harvest and post-harvest challenges, the fruits do not meet international requirements, hence cannot be exported.

[7] http://www.modernghana.com/thread/291334/542090/1

4. **Poor harvesting and post-harvest handling**: Methods of harvesting of fruits, types of containers used to collect fruits, types of containers used in hauling and condition of roads for transporting fruits contribute to the poor quality of produce offered to consumers and post-harvest decay amongst most citrus producers.
5. **Unreliable market / low price for produce**: Generally, most farmers in Ghana lose their farm produce due to unavailability of processing factories to transform perishable fruits into processed fruits which stay longer than fresh fruits. The case is not different from that of citrus farmers. During the harvest period when there is abundance of fruits, there are high levels of loss due to lack of storage facilities and markets to absorb the high levels of production. Farmers at this period sell their produce at very low prices or hoard the fruits which eventually rot away.
6. **Inadequate extension agents:** Inadequate personnel of the agricultural extension services of Ministry of Food and Agriculture (MOFA) to train citrus farmers in best farming practices.

Session 3.0: Role of Rural Bank in Addressing Challenges in Citrus Production

Session Objectives

At the end of this session, participants would be able to:

1. Identify the roles that rural banks and financial institutions in general can play to address challenges faced in the citrus industry.

1. Identify 5 roles that your Rural Bank can play in addressing challenges faced in the citrus industry.
2. What will be the face of the citrus industry if this support is provided?
3. What will be the effect of these challenges, if addressed, on:
    - The Citrus Farmer
    - Your Community
    - The Country

MODULE 2.0: STAGES AND ACTIVITIES IN CITRUS PRODUCTION

ABOUT THE MODULE

This module is designed to enhance participants understanding on the various stages in citrus production. It highlights the costs incurred under the various activities as well as risks faced in production.

MODULE OBJECTIVES	SESSIONS	MODULE OUTCOME
The objective of this module is to: • Discuss the stages and activities in citrus production; • Identify the costs in citrus production; • Identify the risks faced at the various stages.	• Session 1.0: Stages and Activities in Citrus Production • Session 2.0: Summary of Operational Costs for Citrus Production	At the end of this module, participants would be able to: • Describe the various activities in citrus production; • Describe the cost incurred in citrus production; • Identify the risks faced in citrus production.

Session 1.0: Stages and Activities in Citrus Production

Session Objectives

At the end of this session, participants would be able to:

1. Describe the various activities undertaken in citrus production;
2. Identify the cost and investment that goes into citrus production;
3. Identify risks that citrus farmers face in producing citrus.

1.1 Stages in Citrus Production

Generally, citrus farmers, like all other farmers undertake series of activities in growing citrus. There is the need for the farmer to obtain a suitable land for the crop, perform all other cultural practices to ensure that the quality of the fruit produced is good enough to cover all expenses incurred. The various activities undertaken from land acquisition to the harvesting and eventually sale of the fruits can be grouped under three main stages of pre-planting, planting and post planting as presented in Figure 2.

Figure 2: Stages in Citrus Production

1. What are major activities that take place under the pre-planting, planting and post planting stages in citrus production?
2. What are the key considerations for the financial service provider?

Under the pre-planting, planting and post planting stages, the farmer undertakes a series of activities which incur cost. These activities also come with different levels of risks. Understanding the key activities, costs incurred and risks would position the financial service provider to design appropriate financial products for the citrus farmer.

1.2 Pre-Planting Activities

1. What are pre-planting activities?
2. What are some of the pre-planting activities undertaken by the citrus farmer?
3. Mention the costs incurred by the farmer in undertaking the various activities under the pre-planting stage.

Pre-planting activities involve all activities carried out before planting. Pre-planting activities for a typical citrus farmer includes site selection, land preparation, lining, pegging and hole and seedling care.

A. **Site selection:** Site selection involves all the activities that the small holder farmer undertakes to ensure that the site for planting the citrus fruit is adequate enough for production and quality fruits. Having the ideal site to grow citrus fruits is impossible. This is because every site has its own limitations, however, with the appropriate practices such as irrigation, the citrus farmer can be assured of a certain level of quality for his/her fruits. Factors considered by the citrus farmer during site selection include the type of soil, availability of water, land location etc.

1. What are the implications of the factors affecting site selection on the citrus farmer?
2. What considerations must the financial service provider make in designing savings and loan products for farmers who request for loans for land purchase?

The higher the quality of the land, the higher, among other factors, the quality of the citrus fruit produced. However, this also means high cost of land acquisition for the citrus farmer. The main cost incurred at this stage of production is the cost of land acquisition.

B. **Land Preparation**: The next activity after site selection is the preparation of the land. At this stage, the farmer clears the land for planting. A thorough land is always necessary for early crop establishment and adequate weed control. **For large acres of land or farmers who do**

not have the physical strength to clear their own land, the services of weeding gangs are hired. The most common tools used for land preparation are cutlasses and hoes.

C. **Establishment of Wind breaks**

	1. **What are wind breaks?**

Wind breaks are linear planting of trees and shrubs designed to reduce wind speed in open fields, preventing soil erosion and protecting adjacent crops from wind damage. Wind breaks are necessary where citrus trees are exposed to strong winds. This is because constant intense winds affect the growth and performance of citrus plants. The number of wind breaks acquired by the small holder farmer usually depends on the acreage of the site and the wind intensity/constancy. **Most common tree species used as wind breaks include mango trees, which provide additional revenue to the citrus farmer.**

D. **Tree Spacing:** The tree spacing and field layout adopted usually allows for the maximum interception of sunlight to obtain the highest yield per hectare. The most important planting patterns used are the square, the rectangle and the triangular patterns. The number of plants per hectare vary with the layout. Even though the rectangle and square lay outs facilitate movement, the triangular layout makes more efficient use of space by allowing a narrower interior and about 15% more trees to be planted. Figure 3 shows examples of planting patterns for citrus and Table 2 provides tree spacing for square and triangular layouts of citrus.

Figure 3: Planting Patterns for Citrus

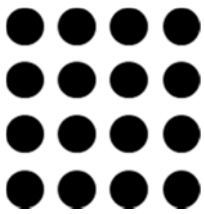
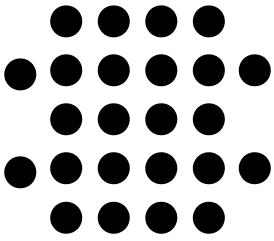
	
Square layout	**Rectangular layout**

Table 2: Citrus Types and Species

Citrus Type	Layout	In rows	Between rows	No of trees/ha
Orange	Square	6m (18ft)	6m (18ft)	278
	Triangular	6m (18ft)	5m (16.7ft)	333
Grape Fruit	Square	7m (22ft)	7m (22ft)	204
	Triangular	7m (22ft)	5.5m (18.3ft)	260
Lime	Square	4.5m (15ft)	4.5m (15ft)	494
	Triangular	4.5m (15ft)	4m (13.3ft)	556

1.3 Planting Activities

1.3.1 Planting

Citrus grows well in regions with high amounts of rainfall is evenly distributed. The best time to plant citrus trees is early in the wet season. This is because trees planted at this time can become well established before the dry season period begins. Materials used at this stage of the production processes include **seedlings**.

1.3.2 Intercropping

Intercropping is an activity that is also carried out by most citrus farmers at the planting stage. Intercropping is a multiple cropping practice involving growing two or more crops in proximity. The most common goal of **intercropping** is to produce a greater yield on a given piece of land by making use of resources that would otherwise not be utilized by a single crop. Crops intercropped with young citrus trees include maize, plantain, pineapple and cocoyam.

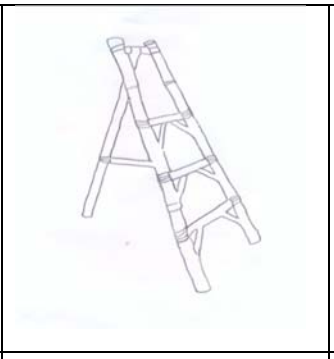
1.4 Post Planting Activities

1.4.1 Pruning

One key factor the small holder farmer considers after planting is pruning. Pruning is the selective removal of plants (branches, shoots) to improve plant health, vigour and structure and enhance fruit and or flower development. **At this stage of the production process, the cost**

incurred by the farmer are mainly input costs which include cost of tools for pruning such as the secateurs, loppers, clippers, saws, tripod stand and pruning saw as presented in Figure 4.

Figure 4: Pruning Tools for Citrus

			
Secateurs	Loppers	Tripod stand	Saw

1.4.2 Nutrient Management and Fertilizer Application

Nutrient management is critical for the attainment of sustainable high yields and quality fruits over the productive life of the orchard estimated to be between 25 and 30 years. To maintain vigorous growth, citrus need a variety of element, which are supplied in the form of fertilizers. Both organic and inorganic fertilizers are suitable for citrus production. Fertilizers are best applied at the beginning of the rainy season. Specifically, first round fertilizer is applied in April/May and the second application in September/October. Table 3 and Table 4 presented the fertilizer application amount and splits for juvenile and fruiting trees respectively.

Table 3: Fertilizer Application Amount for Juvenile Trees

NUTRIENT TYPE	NO. OF SPLITS/YR	TIME
N-P-K 15-15-15 + Urea (1:1)	2	At the onset of rains / after pruning
Well decomposed poultry manure	2	

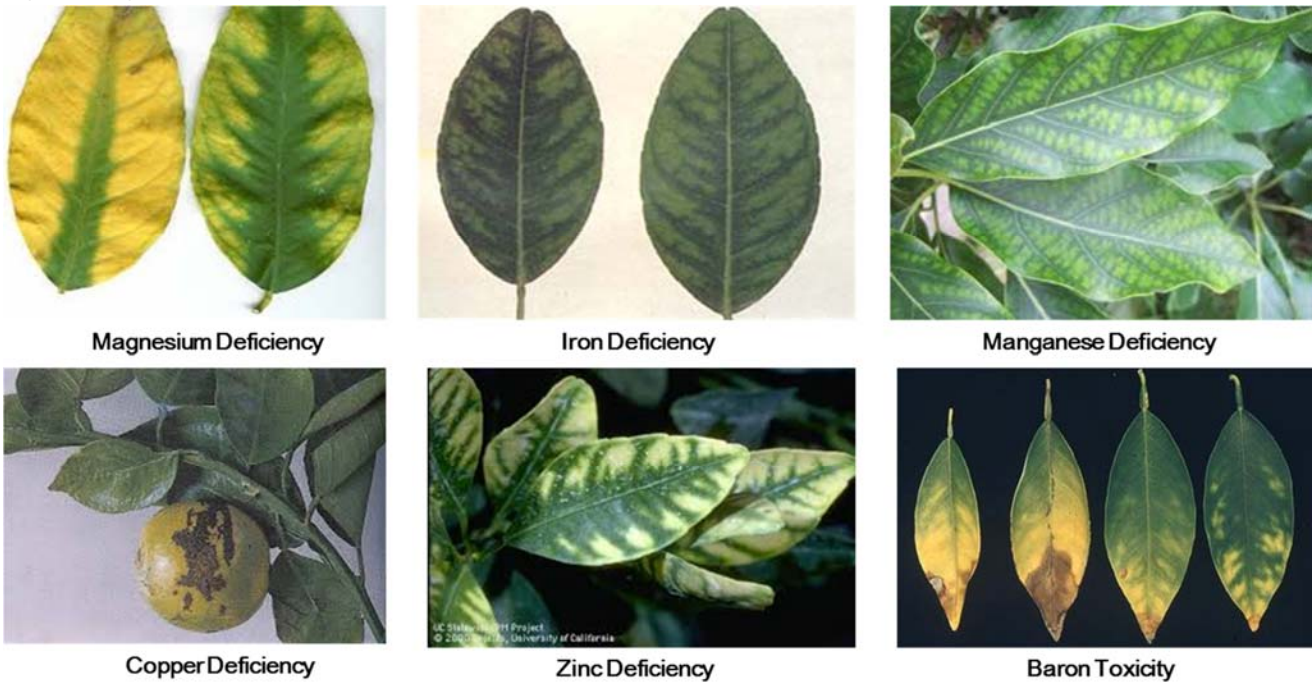
Table 4: Fertilizer Application Amount for Fruiting Trees

NUTRIENT TYPE	AMT/HILL	NO. OF SPLITS/YR	TIME

N-P-K 15-15-15 + Urea + KCl (1:1:1)	0.5 – 2kg		At flowering
Well decomposed poultry manure	30kg	1	After pruning/ after harvest

Lack or excess of the right amount of nutrients may cause unhealthy growth in citrus plants. Figure 5 shows the signs for lack of key nutrients in citrus plants.

Figure 5: Signs of lack of Key Nutrients



1.4.3 Water Management

Most of the citrus in Ghana is produced under rain fed conditions. Where annual rainfall is below 1000mm, supplementary irrigation is necessary. Different types of irrigation may be adopted depending on the soil and climate conditions and the amount of investment the farmer is willing to make. The most suitable irrigation mechanisms are the drip irrigation and furrow irrigation. Trees can also be mulched to conserve soil moisture. The following quantities of water is required when rainfall ceases for 10 continuous days.

- New transplants: 30 litres per tree every week
- 2 year old tree: 100 litres per tree every week

- 3 year old trees: 300 litres per tree every two week
- Bearing trees: 500 litres per tree every two weeks

1.4.4 Crop Pest Management

Citrus is plagued by a wide range of insects and mites which can cause unhealthy plant appearance and poor growth and yield. A variety of pest control measures can be adopted based on an understanding of the lifestyle and seasonality of the pests, damage caused, appropriate pesticides and application methods and techniques. This approach is called Integrated Pest Management. Common citrus pests include fruit flies, apids, leaf miners, mistletoe and mites. Diseases include Citrus canker; Blossom blight; Sooty mould; Citrus fruit spots and Citrus Tristeza Virus (CTV).

Citrus are affected by a range of diseases which may reduce yields, affect juice quality and make fruits unmarketable or even cause tree death. Weeds can also be a major problem in citrus production, especially in nurseries and newly planted orchards where plants are young and yet to develop full canopy cover and even in old orchards with broken canopies. They compete with the trees for water, light and nutrients, resulting in low yields. Strategies for controlling weeds include mulching, biological, mechanical, manual and chemical means. The strategy mostly adopted is the manual, where farmers hire weeding gangs to hand weed and hoe their orchards.

1.4.5 Harvesting and Post Harvesting

Orange trees do not fruit until they have been established in the same spot for three to four years. Maturity, which occurs 7 to 8 months after flowering for most of the varieties, does not always depend on the colour of the peel. Mature fruits are well rounded with smooth skin and have a high juice content and brix level above 9.5. The brix levels are determined with a **refractometre.** Fruits are usually picked, handled and packed properly to avoid damage or potential damage when storing and or transporting to the market. The fruits are either placed in crates or bags that are then collected and transported to the relevant markets. The standard weight of crates are 41kg for oranges and 36 kg for grape fruits. A well-managed orchard should

yield 3 crates/tree or 30 tonnes per hectare oranges or 6 crates per tree or 40 tonnes per hectare grapefruit. The main tools used for harvesting include ladder, sack, basket/crates, hand clippers or secateurs.

Session 2.0: Summary of Operational Costs for Citrus Production

Session Objectives

At the end of this session, participants would be able to:

1. Identify the various costs items and risks associated with citrus production.

SCHEDULE ON COST OF CITRUS PRODUCTION

ACTIVITIES	KEY ACTIVITIES	COST ITEMS	PERIOD OF ACTIVITY	RISKS
I. PRE-PLANTING				
Site Selection	- Farmer searches for suitable land for citrus production. Well drained soil and access to roads.	- Land acquisition.	Anytime.	**Production factors** i. Machinery risk ii. Risk of building destruction iii. Pests and disease risk **Natural Resource factors** i. Climatic risks ii. Risks of natural disasters **Input Cost** i. Input price risks **Farmer**
Land Preparation	- Farmer cuts trees and remove stumps; - Manual weeding.	- Labour costs for manual weeding and stump removal; - Cost of farm tools such as hoes, cutlasses, mattock, etc.	1-4 weeks before planting.	
Windbreak Establishment	- Planting of windbreak trees e.g. mango.	- Labour cost of planting windbreak trees; - Cost of seedlings.	A year before planting of citrus.	
Tree spacing	- Field layout and mapping of planting distances (6mx6m).	- Labour cost for mapping planting distances.	March.	
II. PLANTING				
Planting of seedlings	- Sourcing for certified seedlings; - Transportation of seedlings; - Planting.	- Cost of seedlings; - Cost of transplanting; - Labour cost for planting.	Plant at the beginning of major raining season (May-August).	
Intercropping	- Planting of crops that can be used for intercropping (e.g. maize, plantain, pineapple, etc.).	- Labour cost for planting intercropping crops.	May- August.	
III. POST-PLANTING				

ACTIVITIES	KEY ACTIVITIES	COST ITEMS	PERIOD OF ACTIVITY	RISKS
Weed control	- Manual weeding; - Herbicide application (for conventional farms).	- Labour cost for manual weeding. - Labour cost for herbicide application; - Cost of herbicides.	At least 2 times in a year.	i. Work health risk ii. Capital risk iii. Business and tax risk **Marketing** i. Production loss risk ii. Risk of quality loss iii. Price risk iv. Excess supply risk **Cash** i. Liquidity risk
Scouting	- Scouting; - Counting; - D-leaves check.	- Labour cost for scouting, counting and D-leaves check.	All over the year and as often as possible.	
Pruning	- Pruning.	- Labour cost for pruning - Cost of farm tools such as secateurs, saw, etc.	April.	
Organic fertilizer application	- Organic fertilizer application.	- Labour cost for organic fertilizer application; - Cost of organic matter such as chicken manure, compost.	April.	
Pest and disease control	- Weeding; - Organic insecticides application; - Organic fungicides application; - Fruit fly monitoring and control; - Collection of dropped fruits.	- Labour cost for weeding; - Labour cost for application of organic insecticides and fungicides. e.g. neem and soap; - Cost of organic fungicides and insecticides; - Labour cost for fruit fly control;	Throughout the year. Depends on results after scouting.	

ACTIVITIES	KEY ACTIVITIES	COST ITEMS	PERIOD OF ACTIVITY	RISKS
		- Cost of fruit fly traps (bottle traps and pheromone traps); - Labour cost for collection of dropped fruits.		
Harvesting and transportation	- Harvesting of fruits from trees; - Carrying harvested fruits into trucks.	- Cost of harvesting equipment such as tripod stands, sacks and crates; - Labour cost for harvesting. - Labour cost for loading harvested fruits into trucks.	When the weather is dry (Major: October – Dec; Minor: February to March).	

MODULE 3.0: DESIGNING FINANCIAL PRODUCTS FOR THE CITRUS PRODUCER

ABOUT THE MODULE

This module is built from the first two modules. It is designed to support participants in designing financial products for the citrus producer, using the knowledge gained in the first two modules.

MODULE OBJECTIVES	SESSIONS	MODULE OUTCOME
The objective of this module is to: 1. Describe the steps in financial product design; 2. Use the steps in financial product design to design products for the citrus farmer.	• Session 1.0: Financial Product Development	At the end of this module, participants would be able to: 1. Describe the steps to take in designing financial products and services; 2. Design financial

Session 1.0: Financial Product Development

Session Objectives

At the end of this session, participants would be able to:

1. Describe the steps in financial product development;
2. Design financial products for the citrus producer.

Developing financial products to suit the needs of specific targets like citrus producers needs to cover specific financial product development process. In designing financial products for citrus producers the steps in Figure 6 can be considered.

Figure 6: Steps in Financial Product Development

1. Market research

Market research is the first step in the product development process and is essential to evaluate the market demand for a financial product or a service for citrus producers and value chain actors. The market research provides the financial service provider with information to help in the product design. The research for citrus producers should cover and consider the following areas as presented in Table 5.

Table 5: Market Research Areas

Area	Key factors to consider
Market size	This focuses on the number of citrus producers or value chain actors that will demand the financial services. 1. How many citrus producers/ farmers are available in your community?
Demand for different product types	1. What are the financial needs of citrus producers?

Area	Key factors to consider
	2. How many people will be demanding savings or loans products in the value chain?
Competition	1. Which financial service providers are serving the agricultural sectors? 2. Are there financial service providers that provide financial services to the citrus sector? 3. What type of products do the providers provide to this target market?
Market segmentation	This section focus on segmenting the target market and developing specific products for the various segments. The segments can focus on farm size, location of farmers, the target market for the citrus produce for instance producers for the local market, etc., 1. Which segments of citrus producers can the rural bank providers develop specific products for? 2. What specific needs do the segments require?

2. Product Design

After undertaking the market research, the product design is the next step in the financial product development process. Product design explores the processes used for the design of financial products. In designing products for the citrus producers, the rural bank needs to take into consideration the following:

- Incorporating agriculture and citrus sector knowledge into the design;
- Developing the initial product concept;
- Considering the potential challenges and risks of products;
- Soliciting feedback from clients on the product;
- Finalising the prototype for pilot.

1.2.1 Product Design Framework

In designing financial products, there are key product features that should be considered. The traditional 8Ps can be adopted to guide the designing of financial products for citrus producers.

PRODUCT	INDICATORS
The features of the loan	• Target clients (example farmer with one acre land or farmer with 20 acres); • Loan amount; • Loan term; • Guarantees or collateral, if any; • Borrower Eligibility Requirements; • Loan Purpose.
PRICING	**Includes:**
Pricing considers the market potential and profit/sustainability objective using various strategies that include cost based, cost-plus, demand based and break even. It looks at behavioural attitudes and perceived values. During the initial design phase, it is best to price conservatively.	• Interest rate; • Loan fees; • Penalties; • Incentives.
PLACE	**Includes:**
Is the financial product accessible where and when it is wanted? Important lessons can be drawn from the informal sector where access to debt is readily available, but at a high price.	• Place of loan disbursement/distribution; • Place of repayment; • Location of operations.
PROMOTION	**Includes:**

PRODUCT	INDICATORS
Refers to sales communication, which is used to inform and persuade clients.	• Advertising; • Marketing.
PEOPLE	Includes:
Considers how the citrus producers are treated during the process of obtaining financial products. To deliver the best customer service, the bank needs to recruit the right staff and train staff on citrus production as well the financial products and processes targeted at citrus producers.	Rural bank Staff.
POSITIONING	Includes:
The banks effort to occupy a distinct competitive position in the mind of the citrus farmer; perception of the citrus farmer.	• Transaction cost; • Price; • Quality; • Turnaround time; • Professional service.
PHYSICAL EVIDENCE	Includes:
The presentation of the citrus financial product.	• Physical appearance of offices; branches, points of service; • Loan officers; • The appearance of the brochures and posters; • Transaction receipts; • Loan cards and passbook.
PROCESS	Includes:
How the citrus financial product is delivered to a citrus producer.	• Loan origination; • Loan appraisal and approval; • Loan disbursal;

PRODUCT	INDICATORS
	• Loan repayment; • Processing and documenting of transactions.

Source: Adapted from WASH Financial Product Development Toolkit

1.2.2 Product Risk Analysis

During the concept product design stage, it is helpful to conduct a product risk analysis on the citrus financial product ideas, to highlight the potential risks associated with each product. The market research will help identify some of the risk areas and can inform the risk analysis. The risk areas with respect to institutional, external factors and viability may be adapted to the rural bank's context. Some risk areas to assess are:

Areas	Questions for Consideration
Institutional	• Does the bank have sufficient expertise in the production of citrus? • Are there any staff concerns with launching a citrus financial product (capacity, training, etc.)? • Does the bank have a standard protocol in place for launching new products? • Will the citrus financial product require special processes? • What will the relationship be between the staff and clients? • What are the policies, procedures and internal controls like? • Will the bank be able to adapt to product needs?
External Factors	• Are the local economic, seasonal patterns, and programs conducive to the product? For example, is the bank considering the impact on financing citrus if the government is planning to increase taxes on

Areas	Questions for Consideration
	fertilizer? Is there competition from other rural banks offering the same product?
Viability	• What is the potential for client default? • Will the clients be able to afford the cost of the improvement? • Are the terms of the citrus financial product manageable for the targeted clients? • Will the product be demanded by the targeted clients? • Will the cost of managing the citrus financial product be more than revenue to be earned? • Is there sufficient cash flow to launch the product?

1.3 Pilot Testing a Citrus Financial Product

A pilot test is a limited offering of a product to a narrow geographic area and/or a limited number of clients. The test allows the rural bank to assess market demand and product effectiveness, which will inform product refinement prior to full scale roll-out. By pilot testing a new product, the rural bank can identify potential problems and make the necessary adjustments to product terms, marketing strategies, staffing and/or procedures. Pilot testing offers an opportunity to test out the prototype, allowing the bank to avoid problems during full scale product roll-out. The earlier problems are detected, the lower the cost of correction will be for the bank.

To effectively pilot test financial products for citrus production the following steps can adopted:

Steps		Details
Step 1.	Compose the pilot test team	The team needs to be representative of the departments involved with the product to

Steps		Details
		ensure effective coordination and product viability prior to launch. If possible, the product development team can continue as the pilot test team.
Step 2.	Define the product objectives	In order to determine the success or failure of the pilot test, it is essential that the objectives for the new product is clearly defined. The objectives can be to improve the quantity of citrus produce available for export, increase the number of farmers that are into citrus production, increase the income levels of citrus farmers, expansion of financial products into new markets, increase earning of prospective rural bank, etc.
Step 3.	Develop the testing protocol	A testing protocol provides an outline for how the pilot test team will manage the test. It dictates the terms of reference (TOR) for the test and includes the specific tasks, requirements and precisely how and when the test will be monitored. It should also include guidelines under which the test would be paused or terminated. The terms of the pilot test protocol should include the following: • Anticipated location and number of clients to be included in the test. • Duration of the test (start/end dates). • Reporting dates. • What data should be analysed, and when.

Steps		Details
		• Specific factors that may pause or call off the test.
Step 4.	Prepare systems	Prior to launching a pilot test, the rural bank should prepare the management information system (MIS) as well as any systems necessary to manage collaborations with external parties. All of these processes and systems must be ready before pilot testing begins. Once the processes are finalized, all respective staff must be trained.
Step 5.	Develop financial projections	Financial projections for the citrus product should be developed to provide a clear financial picture and serve as a basis for informed decision-making. As new products are unlikely to reach their full potential within the first year, the financial projections are usually prepared for a three- to five-year period. The financial projections should cover direct cost, indirect cost as well as the revenue streams. Some of the costs are easily determined, like the direct costs of staff, training and fixed assets. Indirect costs and variable direct costs, on the other hand, can be difficult to project and track. Indirect cost includes office rent, depreciation of furniture and fittings and other equipment. The revenue streams mainly include interest income and fee income on loans. Though the financial projections can be a difficult process, it is

Steps		Details
		critical to understand the full cost of the product.
Step 6.	Document product definitions and procedures	Clear documentation is necessary to ensure that everyone implementing the pilot test will fully understand both the policies surrounding the product and the procedures for its operation. Policy and procedure definitions must address all areas that affect, or are affected by, the product, including credit staff (with direct customer contact) and their supervisors, marketing staff and back-office operations (human resources, accounting and IT). Document in detail the procedures for each process relating to the product. As a new product, the rural bank should develop a document to cover all processes of the product marketing and delivery.
Step 7.	Train relevant staff	Effective training of all staff involved with the citrus financial product is essential to ensure by-in and commitment.
Step 8.	Develop customer marketing strategies and materials	Marketing citrus financial products may require unique marketing strategies in cases where demand is dormant. For example, to generate active demand for citrus financial products.
Step 9.	Start the product test	This involves the Contingency funds should be built into the budget to deal with any issues as they arise.

Steps		Details
Step 10.	Evaluate the test results	The pilot test team should meet as needed to evaluate the data and the progress of the pilot against the previously defined objectives.

1.4 Product Launch

Launching of the product often requires a step-by-step approach to move the product from the successful conclusion of the pilot test, to the point where it is fully operational. The product launch process involves multiple steps and feedback loops that provide data for decision making.

Steps		Details
Step 1.	Team Formation	This focuses forming a working team that will be involved in the launch of the new product. The team should include personnel from the human resources department as well the leadership.
Step 2.	Examine internal capacities	The rural bank's capacity must be reassessed at every step of the product development process. This is especially important when considering the rollout of a new product. Lessons learned from the pilot phase are integrated into the launch and rollout of the product. Question to be considered include: 1. Does the citrus financial product fit within the bank's strategic plan? 2. Based on the pilot test, does the product satisfy objectives relating to expected product returns? etc.
Step 3.	Organize product rollout	The bank can adopt a ''soft or public method' roll out to the launch of the new product. With the soft method, little or no marketing is done

Steps		Details
		in the launching of the product. In this case, the bank can identify few citrus producers and sell products to. The ''public'' roll-out, launch involves extensive marketing with the expectation of receiving many clients.
Step 4.	Conduct a product cost analysis	One of the basic objectives of pilot testing is to determine product profitability. Profitability is a factor of the: 1. Costs related to the product. 2. Revenues earned from the product. It is recommended that bank conduct product costing analysis to understand product profitability.
Step 5.	Train staff	This step involves assessing the training on the product undertaken at the pilot stage to identify the strengths and weakness. This is to either accept the approach or revise the approach and also train staff on new areas added.
Step 6.	Update the marketing plan	To ensure that effective marketing is done, the bank needs to develop a detail marketing plan. The marketing plan should cover market assessment, product marking goal and objectives, strategies, etc.
Step 7.	Product launch and rollout	This step puts together all the various strategies undertake from steps 1 to 6. Once the marketing plan is ready, the product can be launched.

1. **Read the case below and provide responses to the questions**

DEVELOPING A LOAN PRODUCT FOR CITRUS FARMERS

Mr. Ntim is a citrus farmer who cultivates oranges in Ekumfi-Essuahyia. He has been in citrus production for the past 10 years. He has five (5) acres of land which he cultivates with the help of his two sons and labourers. The labourers are hired during the pruning, fertilizer application and weeding stages. Mr. Ntim, harvests his produce twice in a year. The first period is between February and March and the second is between October and December. He harvests an average of 1,400 sacks of oranges per acre during each period. To obtain the average of 1,400 sacks of oranges, he undertakes all the necessary citrus farm maintenance activities. The activities he undertakes and the cost involve in terms of inputs and labour are presented below.

Activity	Inputs Cost (GHS)	Labour (GHS)
Scouting	-	70
Pruning	-	100
Fertilizer application	300	100
Fruit fly control	50	10
Weeding	-	150
Collection of drop fruit	-	15
Total for inputs/labour	350	445
Total cost for all activities		**795**

From the table, Mr. Ntim spends **GHS 795** to maintain an acre of his farm. To maintain all 5 acres, he needs GHS **3,975.** He is unable to raise this amount of money, because he spent most of the previous year's profit on paying his children's school fees, feeding his household and other expenses. Mostly, he obtains credit from his suppliers for the inputs and also hires the labourers and pays them when the crops are harvested. He makes an average sale of GHS 7,000 (GHS 5 for 1400 sacks) of oranges per acre.

Just like Mr. Ntim, there are other farmers in Ekumfi-Essuahyia and other surrounding communities who are also in the cultivation of citrus produce. They have similar financing challenges as Mr. Ntim and require financing to enable them produce large quantities of oranges. The farmers, including Mr. Ntim, have over the past two years approached the ABC Rural Bank to provide them with some financial support to enable them continue with their cultivation. The Bank's only response is that they do not have loan product to suit the needs of the farmers. The persistence of the farmers has made the Bank reconsider their decision. They realised that they can generate some additional income from providing loans to the farmers and have planned to develop a loan product to suit the farmers' needs.

Questions

1. What kinds of loan product can the bank develop for the farmers?
2. To develop the loan product, which steps should they take?
3. Based on Mr. Ntim's case, what do you think should be the features of the loan product.
4. Complete the table below and calculate the total repayment amount using the following assumption:
    a. The loan amount requested is GHS795.
    b. At interest rate of 35%.
    c. Loan duration 9 months.

LOAN PRODUCT	USE OF LOAN	PRODUCT FEATURES			
		Principal Loan Amount (GHS)	Interest Rate (%)	Repayment Duration (months)	Monthly Repayment Amount (GHS)
Working Capital Loan	• Supplier credit facilities (This will involve purchase of fertilizers, seedlings, pesticides and weedicides) • Overdraft for labour				

Solution

LOAN PRODUCT	USE OF LOAN	PRODUCT FEATURES			
		Principal Loan Amount (GHS)	Interest Rate (%)	Repayment Duration (months)	Monthly Repayment Amount (GHS)
Working Capital Loan	• Supplier credit facilities (This will involve purchase of fertilizers, seedlings, pesticides and weedicides) • Overdraft for labour	**795**	**35%**	**9**	**119.25**

With the above assumptions, the total repayment amount will be **1073.25**

PART 2 - SMALL SCALE FRUIT PROCESSING AND MARKETING

MODULE 1.0: SMALL SCALE FRUIT PROCESSING AND MARKETING IN GHANA

ABOUT THE MODULE

Module 1 is designed to provide relevant knowledge on the processes involved in fruit processing and to give the participant an understanding of the various stages and challenges associated with them.

MODULE OBJECTIVES	SESSIONS	MODULE OUTCOME
The objectives of the module are to: 1. Present the concept of in fruit processing; 2. Understand the importance of small scale fruit processing and marketing to the economy; 3. Understand the challenges associated with small scale fruit	1. Small Scale Fruit Processing and Marketing and its importance.	**At the end of this module, participants would be able to:** • Identify the categories of small fruit processors and marketers in Ghana; • Describe the importance of small scale fruit processing. • Describe the challenges faced by small scale fruit processors and marketers.

processing and marketing.		

PRE AND POST EVALUATION TEST ON SMALL SCALE FRUIT PROCESSING AND MARKETING

Q1.	Fruit juices are the most consumed beverage next to water.	Yes	No	I don't know
Q2.	Fruit processing requires a higher demand in quantity of fruits.	Yes	No	I don't know
Q3.	Small scale fruits are seasonal.	Yes	No	I don't know
Q4.	Prices of small scale fruits fluctuate all year round.	Yes	No	I don't know
Q5.	The last step in the process is the bottling of the juice and corking of the bottles.	Yes	No	I don't know
Q6.	Post- processing involves the storage, transportation and distribution of processed fruits to the wholesalers or final consumer.	Yes	No	I don't know
Q7.	Pre-processing activities involve all activities carried out before fruits and other raw materials are available at the work station of the fruit processor.	Yes	No	I don't know
Q8.	Pineapple is the main base to which the other raw materials are mixed with in processing.	Yes	No	I don't know
Q9.	The more complex and lengthy the marketing chain, the higher the marketing costs.	Yes	No	I don't know

Q10.	The price paid to the farmer for an orange cannot be directly compared with the price paid by the consumer for a bottle of fruit orange juice.	Yes	No	I don't know
Q11.	For juicers, the fruits are smoothened into paste and the solid is separated from the liquid.	Yes	No	I don't know
Q12.	In designing financial products it is important to consider the marketing chain as well as the various categories of costs that are incurred in marketing processed fruits.	Yes	No	I don't know
Q13.	In designing a product for small scale processing, market research is necessary.	Yes	No	I don't know
Q14.	In pricing a product for small scale processing, market potential is considered.	Yes	No	I don't know
Q15.	In designing a product for small scale processing, product risk analysis must be conducted.	Yes	No	I don't know
Q16.	Pilot testing of products designed for small scale fruit processing informs product refinement.	Yes	No	I don't know
Q17.	Product cost analysis conduction is necessary after organizing the roll out of the product.	Yes	No	I don't know
Q18.	In designing products, potential challenges and risks of products should be considered.	Yes	No	I don't know
Q19.	Feedback from clients on products developed must be solicited.	Yes	No	I don't know
Q20.	In designing a product for small scale processing, market research is necessary.	Yes	No	I don't know

Session 1.0: Small Scale Fruit Processing and Its Importance

Session Objectives

At the end of this session, participants would be able to:

1. Identify the categories of small scale fruit processors and marketers in Ghana;
2. Understand the importance of small scale fruit processing and marketing to the economy;
3. Understand the challenges associated with small fruit processing and marketing.

1.1 Small Fruit Processing and Marketing in Ghana

Consumption of fruit juice in Ghana has become popular and is increasing daily. The domestic market for fruit juices has become strong in part because Ghanaian consumers increasingly appreciate the natural taste and health benefits. It is believed that fruit juices are the most consumed beverage next to water, however approximately 70% of these juice products produced are imported[8]. According to estimates, 10.4 million litres of fruit juice is consumed yearly in the country.

Ghana's location offers conditions that are close to optimum for growing tropical fruits. Ghana is endowed with an assortment of fruit, including mangoes, banana, papaya, pineapples, **citrus** and coconut amongst others. The opportunity to transform agricultural produce into juice and other value added consumer products for domestic and foreign markets, and ultimately dominate the processed fruits industry exists, but very few local companies have taken advantage of this opportunity.[9]

1. What are the categories of small fruit processors and marketers in Ghana?
2. How important is the processing and marketing of small scale fruit to the Ghanaian economy?

[8] http://fpmag.org/8/The-Fruit-Juice-Industry-in-Ghana

[9] http://fpmag.org/8/The-Fruit-Juice-Industry-in-Ghana

1.1 Categories of Small Fruit Processors in Ghana

There are various kinds of fruit processors in Ghana. These include fresh cut fruit processors and fruit juice producers. Some categories and examples of small fruit processors and marketers in Ghana are presented in Table 6.

Table 6: Categories of Small Fruit Processors and Marketers

Categories of Fruit Processors	Examples of processors	
Small Scale fruit processors		
Fresh cut fruit Processors	• Bomarts Farms • Peelco Limited	
Large scale Processors/ Fruit juice producers	• Akpanga Organic Citrus Farms • Coastal Groove Limited • Fruittiland • Oprimquans • Profound Integration • Beilaa Enterprise • Flag Fruits Cottage Industry • Blue Skies HPW • Peelco • Pinorora	

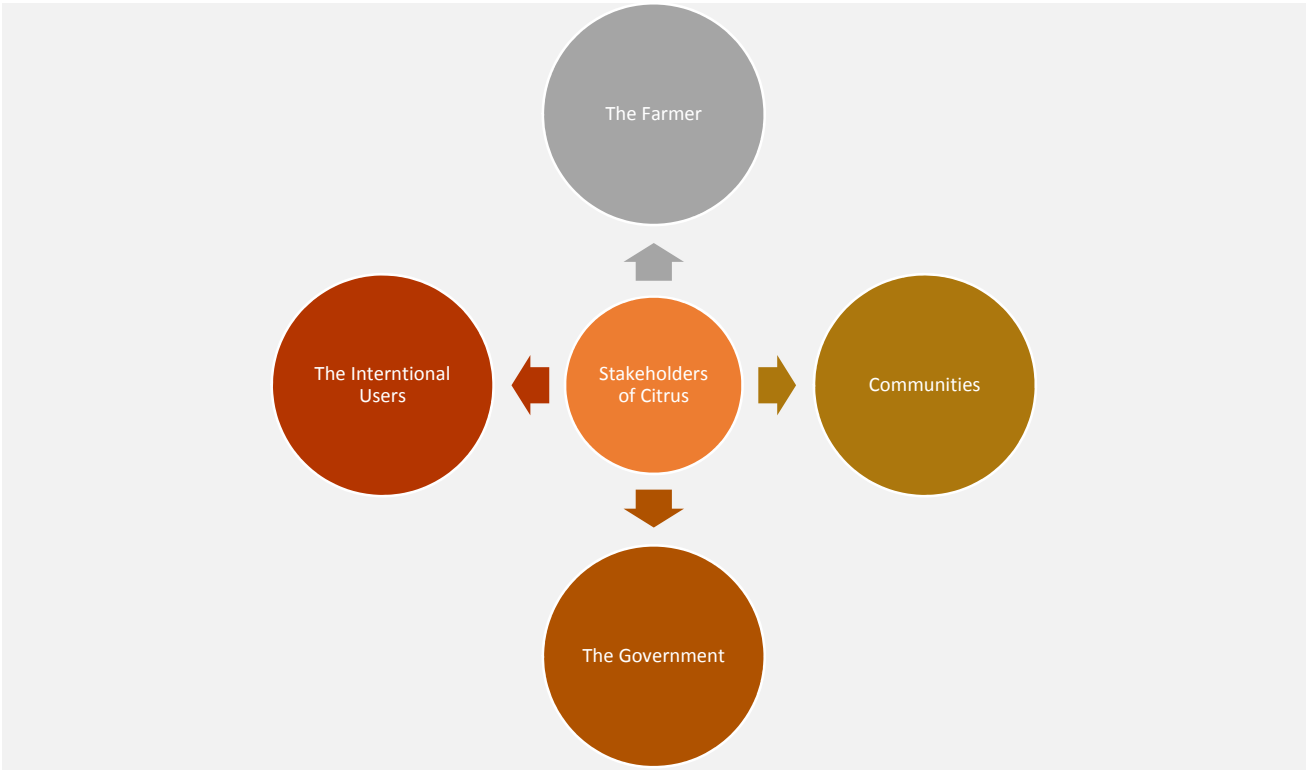
1. What are some of the challenges of processing and marketing small fruits you can identify?

1.2 Importance of Small Fruit processing and marketing to the Ghanaian Economy

There are several stakeholders who benefit from the processing and marketing of fruits in Ghana. They are presented in Figure 7.

These various stakeholders benefit in one way or the other from the processing of small fruit in the country. The Farmer for example would have increase in production and gain more income. This is because fruit processing requires a higher demand in quantity of fruits. The higher the demand, the higher the income the farmer gets on his yield.

Figure 7: Stakeholders of Processing and Marketing



The community and its youth through fruit processing gain access to employment, as fruit processing and marketing require more hands, which creates employment opportunity for the community. Areas in the fruit processing chain that involve labour and thereby

employment creation are along the stages of peeling, washing, packaging, branding/labeling and drying of fruits. The government and the economy also benefit from the processing and marketing of fruit through the increase in foreign exchange earnings from exports. Processed fruit is exported to other countries which increases the foreign exchange derived.

International users of the processed fruit also benefit by importing fresh and neatly packed fruits and juices of different variety for sale on their market which would generate income for the various businesses.

1.3 Challenges in Small Fruit Processing and Marketing in Ghana

Although there are many benefits to be derived from small fruit processing and marketing, there are a number of challenges that are faced in the sector. Presented are some key challenges of small fruit processing and marketing in Ghana.

Constant price changes of raw materials due to seasonality of fruits: Small fruit processors and marketers face challenges with the pricing of raw materials which leads to re-negotiation of payment terms. This is due to the fact that the fruits or raw materials are seasonal and therefore prices fluctuate all year round.

Lack of modern technology: Technology used in processing has not improved over the years and processors tend to use more manual methods of processing, relying heavily on human labour. The technology used in processing are mostly obtained from the Ghanaian local market and are usually manufactured without particular attention paid to technical dimensions or efficiency which cause frequent problems and reduce productivity.

High cost of production and lack of financial resources: Lack of finances also contributes to low productivity. The cost of processing is high, and as such the end product is also priced to make up for the cost implications of processing. Another factor that is closely linked to this is the demand for the end products as the price of the end product affects

its demand. The lack of adequate finances also affects the advertisement and increase of the local market for the products.[10]

[10] Report on Follow-up Survey Conducted on the Fruit Processing Industry in the Greater Accra Region

MODULE 2.0 STAGES AND ACTIVITIES IN SMALL SCALE FRUIT PROCESSING

ABOUT THE MODULE

This module is designed to enhance participants understanding on the various stages in small scale fruit processing and marketing. It highlights the costs incurred under the various activities as well as risks faced.

MODULE OBJECTIVES	SESSIONS	MODULE OUTCOME
The objectives of the module are to: 1. Present the processes involved in fruit processing; 2. Identify the cost incurred in small scale fruit processing and marketing.	Session 1.0: Fruit Processing Session 2.0: Fruit Marketing Session 3.0: Summary of Operational Costs for Processing and Marketing	**At the end of this module, participants would be able to:** • Recognize the various stages in processing and the resources required; • Identify the costs incurred by marketers.

Session 1.0: Fruit Processing

Session Objectives

At the end of this session, participants would be able to:

1. Understand the process involved in fruit processing;
2. Recognize the various stages in processing and the resources required.

Processing in relation to food, involves the transformation of raw ingredients, by physical or chemical means into liquid or solid substance for consumption. There are a number of activities that take place before, during and after the processing of fruits by small scale processors. The activities have been categorized under three main activities as presented in Figure 8.

Figure 8: Stages in Fruit Processing

For each of major activity, it is important for the financial service provider to understand the various inputs, cost and risks to be able to provide the appropriate financial products and services to the small scale fruit processors.

1.1 Pre-Processing

1. What are pre-processing activities?
2. What are the various pre-processing activities undertaken by small scale processors?

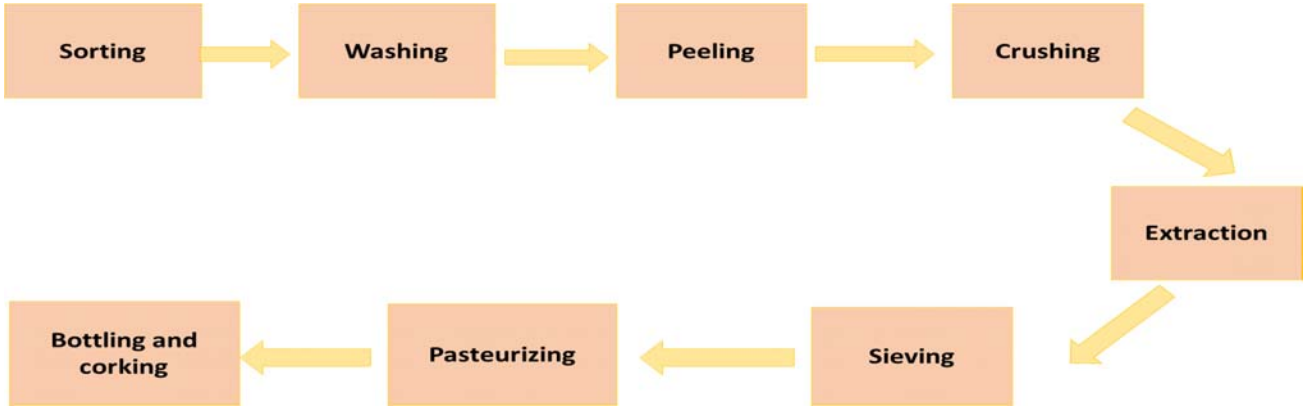
Pre-processing activities involve all activities carried out before fruits and other raw materials are available at the work station of the fruit processor. This stage involves the selection of production site, facilities, the buildings, the material handling and the equipment for the processing. For already established processors, their main concern will be choosing the right fruits. Small scale processors buy their raw materials from small

scale farmers, plantations as well as middlemen/traders in the Eastern and Central Regions of Ghana whiles others have their own farms which provide the needed fruits. In addition to the raw fruits, water, sugar, and artificial additives are added to the processed fruits. Processors also source bottling and packaging materials. It is important for the financial service provider to consider all materials used in the processing of fruits during the design of products. The final products of processed fruit include fruit juice, chopped fruits, smoothies, fruit cake etc. Each of the final products has similar or distinct ingredients used in the production.

1.2 Processing Activities

Fruit processing basically involves an eight step process as presented in Figure 9. The steps may vary slightly for some processors.

Figure 9: Fruit Juice Production Process



Source: Improvement of product quality and market access of small scale juice producing companies in Greater Accra Region, Ghana.

1. Describe brifely what each of the steps mention above involve?
2. For each of the eight steps mentioned in the fruit processing, identify resources a processor will require?

The process begins with the sorting of fruits through to bottling and corking. After the first three steps are concluded the juice is extracted and sieved to separate the pure juice from fruit flesh.

After the pure juice is fully separated it goes into pasteurization stage. Once pasteurized the last step in the process is the bottling of the juice and corking of the bottles. For each of the steps there are key equipment and labour required for the processing. For each of the steps in Figure 9, the rural bank needs to identify the resources required, how the resources are obtained and the cost involved in acquiring the resource for production. Prior knowledge of the aforementioned, can help the rural bank to design financial products that meet the demand of processors.

1.2.1 Steps, Description and Resources Required in Fruit Processing

Steps		Description	Resources Required
Step 1	Sorting	Prior to fruit washing, spoiled fruits are eliminated from the good fruits. This is to avoid contamination of good fruits during washing.	Labour.
Step 2.	Washing Fruit	Fruits are washed to remove soil, microorganisms and pesticide residues. Some usual practices in fruit washing are: • addition of detergents or 1.5% Hydrochloride (HCl) solution in washing water to remove traces of insect-fungicides; • use of warm water (about 50°C) in the pre-washing phase.	Labour, Water, Wash tanks, buckets.
Step 3.	Peeling	This involves the removal of the back or skin of the fruits to get to the edible part.	Labour, Knives, Peeling Machine.
Step 4.	Crushing/ Slicing	For juices, the fruits are smoothened into paste and the solid is separated from the liquid. For solid processed fruits, the fruits are cut, dried or fried.	Slicers, Knives.
Step 5.	Extraction	Juice can be extracted from fruits in a number of ways, depending on the	Labour, Fruit Press.

Steps		Description	Resources Required
		hardness of the raw fruits. Citrus fruits are usually reamed to extract the juice without the bitter pith or skin. Harder fruits, such as pineapple, are peeled and pulped using a liquidizer and pressed to extract the juice.	
Step 6.	Sieving	This involve the separation of solid substance from the liquid in the case of juice.	Large bowls
Step 7.	Pasteurizing	This step focuses on preservation of the fruit juice. It involves heating, which vastly reduces the bacteria, molds and yeasts in juices. One of the following methods is used in pasteurization: • heating the juice and hot-filling into clean, sterilised bottles; • cold-filling, sealing and heating the bottles in large pans of simmering water.	Labour, Large pans, Gas Stoves and cylinders, Electricity,
Step 8.	Bottling and Corking / Canning	This involves filling of processed fruits into bottles or containers ready for consumption.	Labour, Bottle coolers, Containers for Packaging, Labels, Preservatives.

Post-processing

This stage involves the storage, transportation and distribution of processed fruits to the wholesalers or final consumer. Processors require large storage facilities to store their finished as well as partly finished products from spoilage.

Session 2.0: Fruit Marketing

Session Objectives

At the end of this session, participants would be able to:

1. Understand the cost incurred in marketing.

2.1 Marketing of Small Scale Fruits

1. What is a marketing chain?
2. What are the various costs incurred by marketers in marketing small scale fruit?
3. What are the implications of these costs on the design of financial products for small scale fruit processors and marketers?

2.2 The Marketing Chain

The sequence of stages involved in transferring produce from the farm to the consumer is generally referred to as a marketing chain. The consumer may be as close to the farmer or may be one in another country. All transfers to ensure that the fruits get to the final consumer involve marketing activities of some form and these activities involve costs. At the simplest level, the cost involved in the transfer of citrus fruits from the farmer to the consumer may simply be the time taken by the farmer to walk to a nearby market and stay there till his/her fruit are sold. At the most complex level, a processed fruit product may have to be stored for several days, transported long distances and processed several times before reaching the form in which it is finally sold. In simple terms, the more complex and lengthy the marketing chain, the higher the marketing costs.

In designing financial products therefore, it is important for the financial service provider to consider the marketing chain as well as the various categories of costs that are incurred in marketing processed fruits.

2.3 Categories of Costs Incurred by the Small Scale Fruit Processor and Marketer

Costs incurred by the small scale fruit processor and marketer can be put under eight (8) main categories. These are packaging, handling, transportation, product losses, storage, processing, capital costs and other costs.

Processing costs: Processing is often an important marketing cost. Fruit juices have to be sorted, washed, pealed, crushed, extracted, sieved, pasteurized and bottled. In working out the total marketing costs, there is the need to consider the conversion of the fresh raw fruit to the bottled fruit, as well as the value of any by-products. Consequently, the price paid to the farmer for an orange cannot be directly compared with the price paid by the consumer for a bottle of fruit orange juice. Processing costs will also vary according to the company's costs which can depend on factors such as fuel costs, depreciation costs, import duties, taxes and wages.

Packaging Costs: Types of packaging used for fruits may range from a simple jute or polythene bag, which may account for less than one percent of the marketing cost, to sophisticated plastic packaging for direct transport of fruits to consumers in supermarkets within and outside the country, which would account for much more.

Handling costs: At all stages in the marketing chain, fruits will have to be packed and unpacked, loaded and unloaded, put into store and taken out again. Each individual handling cost will not amount to much but the sum total of all such handling costs can be significant.

Transportation Costs: Once packed, produce is then transported. The initial transportation may be done by agents who work in or with processors. Transportation costs will vary according to the distance between the processing unit/factory and the market. The quality of the roads, whether good or bad, will also determine the transportation speed and eventually cost. In cases where the processor hires a truck to facilitate transportation of processed fruits, the costs of transportation will vary as well depending on the distance, quality of roads amongst other factors.

Product losses: Losses are common with agricultural produce marketing. Even if nothing is actually thrown away products may lose weight in storage and transit. Thus one kilogram of a product sold at retail level cannot be compared with one kilogram sold by the farmer. Sometimes very high losses can be recorded, particularly for a perishable fruits. Losses will probably be highest in the main season when “gluts” of produce mean that much has to be thrown away unsold. In general, the longer the distance between processor and consumer the higher the likely loss. The treatment of losses in marketing cost calculations can be fairly complex. In particular, produce which is bought but not sold can still incur costs such as packaging, transport and storage. If there are no quantity losses there can still be quality losses and this is reflected in the price at which produce is sold.

Storage costs: Storage is an important cost for many products. The main purpose of storage is to extend the availability of produce over a longer period than if it were sold immediately after harvest. The assumption behind most storage is that the price will rise sufficiently while the product is in store to cover the costs of storage. Such costs will vary, depending on the costs of building and operating the store but also on the cost of capital used to purchase the produce which is stored. If a store is used to its maximum capacity throughout the year, costs will obviously be much less than if it is only used for a few months and is, even then, kept half empty.

Capital costs: Capital costs may not be very visible but are extremely important. To operate, small scale fruit processors and marketers may have to borrow money from the bank. The interest they pay on that money is a cost. If these processors and marketers use their own money we cannot say that they have no costs since they could have left the money in the bank to earn interest instead of using it for processing the fruits. The opportunity cost of using their own funds is thus the interest they are not receiving.

Other costs: The costs considered above are the major costs that are faced in small scale fruit marketing. These include market fees charged for agents or traders who use markets, license fees, toll fees, taxes etc. All these costs have to be built into the calculations.

Prices and margins: Finally, costs have to be related to prices received. In a retail market in the morning fresh sliced processed fruits may be selling at a high price which appears to give the marketing agent or trader an excellent profit. By the evening, however, the agent may be selling them at a far lower price, knowing that the next day a supply of fresh sliced fruits will be arriving. This must be kept in mind when comparing the selling price with the amount paid to the farmer. The price paid by the eventual consumer is thus made up of the amount of money paid to the farmer for his produce plus all of the costs involved in getting it to the consumer in the form in which he or she purchases it and a reasonable return to processors and marketers. The percentage share of the final price which is taken up by the marketing function is known as the marketing margin.

Session 3.0: Summary of Operational Costs for Processing and Marketing

Session Objectives

At the end of this session, participants would be able to:

1. Identify the various costs items associated with fruit processing.

1. Identify the main activities and costs items in fruit processing and marketing.

STAGES AND ACTIVITIES	COST ITEMS
Processing Site Selection and preparation	- Building acquisition; - Equipment; - Labour; - Transportation.
Raw materials acquisition	- Fruits; - Bottling and packaging materials acquisition; - Natural and artificial additives; - Transportation.
Sorting	- Labour; - Equipment.
Washing fruit	- Labour; - Water; - Wash tanks; - Buckets.
Peeling	- Labour; - Knives; - Peeling machine.
Crushing/ Slicing	- Slicers; - Knives.

STAGES AND ACTIVITIES	COST ITEMS
Extraction	- Labour; - Fruit press.
Sieving	- Large bowls.
Pasteurizing	- Labour; - Large pans; - Gas stoves and cylinders; - Electricity.
Bottling and Corking/ Canning	- Labour; - Bottle coolers; - Containers for packaging; - Labels; - Preservatives.
Processing	- Labour; - Water; - Wash tanks; - Buckets; - Peeling machine; - Slicers; - Knives; - Fruit press.
Packaging and handling	- Labour; - Containers for Packaging; - Labels; - Product losses.
Storage	- Rent; - Labour; - Product Losses.
Transportation and Distribution	- Fuel; - Product losses; - Labour.

MODULE 3.0: DESIGNING FINANCIAL PRODUCTS FOR THE SMALL SCALE FRUIT PROCESSOR

ABOUT THE MODULE

This module is built from the first two modules. It is designed to support participants in designing financial products for the small scale fruit processor, using the knowledge gained in the first two modules.

MODULE OBJECTIVES	SESSIONS	MODULE OUTCOME
The objective of this module is to: 1. Describe the steps in financial product design; 2. Use the steps in financial product design to design products for the small scale fruit processor.	Session 1.0: Financial Product Development	At the end of this module, participants would be able to: 1. Describe the steps to take in designing financial products and services; 2. Design financial products for small scale fruit processors

Session 1.0: Financial Product Development

Session Objectives

At the end of this session, participants would be able to:

1. Describe the steps in financial product development;
2. Design financial products for the small scale fruit processor.

Developing financial products to suit the needs of specific targets like small scale fruit processors needs to cover specific financial product development process. In designing financial products for small scale fruit processors the steps in Figure 10 can be considered.

Figure 10: Steps in Financial Product Development

1. Market research

Market research is the first step in the product development process and is essential to evaluate the market demand for a financial product or a service for small scale fruit processors and other value chain actors. The market research provides the rural bank with information to help in the product design. The research for small scale fruit processors should cover the areas and consider the following as presented in Table 7.

Table 7: Market Research Areas

Area	Key factors to consider
Market size	This focuses on the number of small scale fruit processors or value chain actors that will demand the financial services. 1. How many small scale fruit processors are available in your community?

Area	Key factors to consider
Demand for different product types	1. What are the financial needs of small scale fruit processors? 2. How many people will be demanding savings or loans products in the value chain?
Competition	1. Which rural banks are serving the agricultural sectors? 2. Are there rural banks that provide financial services to the fruit processing sector? 3. What type of products do the providers provide to this target market?
Market segmentation	This section focus on segmenting the target market and developing specific products for the various segments. The segments can focus on farm size, location of farmers, the target market for the processors etc., 1. Which segments of small scale fruit processors can the rural bank develop specific products for? 2. What specific needs do the segments require?

2. Product Design

After undertaking the market research, the product design is the next step in the financial product development process. Product design explores the processes used for the design of financial products. In designing products for small scale fruit processors, the rural bank needs to take into consideration the following:

- Incorporating agriculture and fruit processing and marketing sector knowledge into the design;
- Developing the initial product concept;
- Considering the potential challenges and risks of products;
- Soliciting feedback from clients on the product;

- Finalising the prototype for pilot.

1.2.1 Product Design Framework

In designing financial products there are key product features that should be considered. The traditional 8Ps can be adopted to guide the designing of financial products for small scale fruit processors.

PRODUCT	INDICATORS
The features of the loan	• Target clients (example a processor into fruit juice bottling and one into fresh fruit slicing/cutting); • Loan amount; • Loan term; • Guarantees or collateral, if any; • Borrower Eligibility Requirements; • Loan Purpose.
PRICING	**Includes:**
Pricing considers the market potential and profit/sustainability objective using various strategies that include cost based, cost-plus, demand based and break even. It looks at behavioural attitudes and perceived values. During the initial design phase, it is best to price conservatively.	• Interest rate; • Loan fees; • Penalties; • Incentives.
PLACE	**Includes:**
Is the financial product accessible where and when it is wanted? Important lessons	• Place of loan disbursement/distribution;

PRODUCT	INDICATORS
can be drawn from the informal sector where access to debt is readily available, but at a high price.	• Place of repayment; • Location of operations.
PROMOTION	Includes:
Refers to sales communication, which is used to inform and persuade clients.	• Advertising; • Marketing.
PEOPLE	Includes:
Considers how the small scale fruit processors are treated during the process of obtaining agric financial product. To deliver the best customer service, the rural bank needs to recruit the right staff and train staff on key areas such as costs in processing and marketing as well the financial products and processes targeted at small scale fruit processors.	Staff of the rural bank.
POSITIONING	Includes:
The rural bank's effort to occupy a distinct competitive position in the mind of the processor farmer; the processor's perception.	• Transaction cost; • Price; • Quality; • Turnaround time; • Professional service.
PHYSICAL EVIDENCE	Includes:
The presentation of the financial product.	• Physical appearance of offices, branches, points of service; • Loan officers; • The appearance of the brochures and posters;

PRODUCT	INDICATORS
	• Transaction receipts; • Loan cards and passbook.
PROCESS	Includes:
How the financial product is delivered to a farmer.	• Loan origination; • Loan appraisal and approval; • Loan disbursal; • Loan repayment; • Processing and documenting of transactions.

Source: Adapted from WASH Financial Product Development Toolkit

1.2.2 Product Risk Analysis

During the concept product design stage, it is helpful to conduct a product risk analysis on the financial product ideas, to highlight the potential risks associated with each product. The market research will help identify some of the risk areas and can inform the risk analysis. The risk areas with respect to institutional, external factors and viability may be adapted to the rural banks context. Some risk areas to assess are:

Areas	Questions for Consideration
Institutional	• Does the rural bank have sufficient expertise in fruit processing and marketing? • Are there any staff concerns with launching the financial product (capacity, training, etc.)? • Does the rural bank have a standard protocol in place for launching new products? • Will the financial product require special processes? • What will the relationship be between the staff and farmer or clients? • What are the policies, procedures and internal controls like? • Will the rural bank be able to adapt to product needs?

Areas	Questions for Consideration
External Factors	• Are the local economic, seasonal patterns, and programs conducive to the product? For example, is the rural bank considering the impact on financing fruit processing and marketing if the government is planning to increase taxes on plastics? Is there competition from other rural bank's offering the same product?
Viability	• What is the potential for client default? • Will the clients be able to afford the cost? • Are the terms of the financial product manageable for the targeted clients? • Will the product be demanded by the targeted clients? • Will the cost of managing the financial product be more than revenue to be earned? • Is there sufficient cash flow to launch the product?

1.3 Pilot Testing a Financial Product

A pilot test is a limited offering of a product to a narrow geographic area and/or a limited number of clients. The test allows the rural bank to assess market demand and product effectiveness, which will inform product refinement prior to full scale roll-out. By pilot testing a new product, the rural bank can identify potential problems and make the necessary adjustments to product terms, marketing strategies, staffing and/or procedures. Pilot testing offers an opportunity to test out the prototype, allowing the bank to avoid problems during full scale product roll-out. The earlier problems are detected, the lower the cost of correction will be for the bank.

To effectively pilot test financial products for processors, the following steps can adopted:

Steps		Details
Step 1.	Compose the pilot test team	The team needs to be representative of the departments involved with the product to ensure effective coordination and product viability prior to launch. If possible, the product development team can continue as the pilot test team.
Step 2.	Define the product objectives	In order to determine the success or failure of the pilot test, it is essential that the objectives for the new product is clearly defined. The objectives can be to improve the quantity of fruit processed for export, increase the number of individuals that are into fruit processing, increase the income levels of fruit processors, expansion of financial products into new markets, increase earning of prospective rural bank, etc.
Step 3.	Develop the testing protocol	A testing protocol provides an outline for how the pilot test team will manage the test. It dictates the terms of reference (TOR) for the test and includes the specific tasks, requirements and precisely how and when the test will be monitored. It should also include guidelines under which the test would be paused or terminated. The terms of the pilot test protocol should include the following: • Anticipated location and number of clients to be included in the test • Duration of the test (start/end dates) • Reporting dates

Steps		Details
		• What data should be analysed, and when • Specific factors that may pause or call off the test.
Step 4.	Prepare systems	Prior to launching a pilot test, the rural bank should prepare the management information system (MIS) as well as any systems necessary to manage collaborations with external parties. All of these processes and systems must be ready before pilot testing begins. Once the processes are finalized, all respective staff must be trained.
Step 5.	Develop financial projections	Financial projections for the financial product should be developed to provide a clear financial picture and serve as a basis for informed decision-making. As new products are unlikely to reach their full potential within the first year, the financial projections are usually prepared for a three- to five-year period. The financial projections should cover direct cost, indirect cost as well as the revenue streams. Some of the costs are easily determined, like the direct costs of staff, training and fixed assets. Indirect costs and variable direct costs, on the other hand, can be difficult to project and track. Indirect cost includes office rent, depreciation of furniture and fittings and other equipment. The revenue streams mainly include interest income and fee income on loans. Though the financial

Steps		Details
		projections can be a difficult process, it is critical to understand the full cost of the product.
Step 6.	Document product definitions and procedures	Clear documentation is necessary to ensure that everyone implementing the pilot test will fully understand both the policies surrounding the product and the procedures for its operation. Policy and procedure definitions must address all areas that affect, or are affected by, the product, including credit staff (with direct customer contact) and their supervisors, marketing staff and back-office operations (human resources, accounting and IT). Document in detail the procedures for each process relating to the product. As a new product, the bank should develop a document to cover all processes of the product marketing and delivery.
Step 7.	Train relevant staff	Effective training of all staff involved with the financial product is essential to ensure by-in and commitment.
Step 8.	Develop customer marketing strategies and materials	Marketing financial products may require unique marketing strategies in cases where demand is dormant.
Step 9.	Start the product test	This involves the Contingency funds should be built into the budget to deal with any issues as they arise.

Steps		Details
Step 10.	Evaluate the test results	The pilot test team should meet as needed to evaluate the data and the progress of the pilot against the previously defined objectives.

1.4 Product Launch

Product launching often requires a step-by-step approach to move the product from the successful conclusion of the pilot test, to the point where it is fully operational. The product launch process involves multiple steps and feedback loops that provide data for decision making.

Steps		Details
Step 1.	Team Formation	This focuses forming a working team that will be involved in the launch of the new product. The team should include personnel from human resources department as well the leadership.
Step 2.	Examine internal capacities	The rural bank's capacity must be reassessed at every step of the product development process. This is especially important when considering the rollout of a new product. Lessons learned from the pilot phase are integrated into the launch and rollout of the product. Question to be considered include: 1. Does the financial product fit within the bank's strategic plan? 2. Based on the pilot test, does the product satisfy objectives relating to expected product returns? etc.
Step 3.	Organize product rollout	The bank can adopt a ''soft or public method' roll out to the launch of the new product. With the soft method, little or no marketing is done

Steps		Details
		in the launching of the product. In this case, the bank can identify few small scale fruit processors and sell products to. The ‘’public’’ roll-out, launch involves extensive marketing with the expectation of receiving many clients.
Step 4.	Conduct a product cost analysis	One of the basic objectives of pilot testing is to determine product profitability. Profitability is a factor of the: 1. Costs related to the product 2. Revenues earned from the product It is recommended that bank conduct product costing analysis to understand product profitability.
Step 5.	Train staff	This step involves assessing the training on the product undertaken at the pilot stage to identify the strengths and weakness. This is to either accept the approach or revise the approach and also train staff on new areas added.
Step 6.	Update the marketing plan	To ensure that effective marketing is done, the bank needs to develop a detail marketing plan. The marketing plan should cover market assessment, product marking goal and objectives, strategies, etc.
Step 7.	Product launch and rollout	This step puts together all the various strategies undertake from steps 1 to 6. Once the marketing plan is ready, the product can be launched.

1. Read the case below and provide responses to the questions

CASE STUDY

NKZ Fruit Juice Limited, located at Kasoa in the Awutu Senya- East in the Central Region of Ghana was established in 2008. It is planning for expansion in 2017. Activities in 2016 will focus on acquiring and installing machines at the processing site. The plant capacity is expected to be 20 metric tonnes per day and processing will be six days a week (3 days for processing and 3 days for non-processing activities), excluding public holidays resulting in a total of 300 working days in a year. Operation rate of the project is at 70% of plant capacity in year 1 and 2 and increases to 90% in year 3 and 4; and to 100% in the fifth year. The conversion rate for pineapple is 0.6 tonne of juice per tonne of fresh fruit purchased. A tonne of pineapple fruit cost GHS 500 and a crate of pineapple fruit juice is sold at GHS 20. Total investment cost for year 0 is estimated at GHS 108, 800 which includes land, processing plant and other equipment such as juice extractor, corking machine, pasteurizer, etc. The operating cost is mainly made up of variable cost of production such as fresh pineapples, labour cost including administrative staff and labourers at processing site and utilities (water and electricity). Other cost incurred by the firm in its daily activities include bottles, fuel, boxes, corks and labels. This is based on the assumption that costs of items are constant over the project life and additional total cost is commensurate with the increase in the use of plant capacity. A projected cash flow of the firm is shown in Table 8.

Table 8: Projected Cash flow of NKZ Fruit Juice Ltd.

Year	Cash Outflow (GHS)	Cash inflow (GHS)
0	100,800	-
1	103,134	120,960
2	103,134	120,960
3	125,539	155,520
4	125,539	155,520
5	139,983	173,180

Year	Cash Outflow (GHS)	Cash inflow (GHS)
6	136,183	172,800
7	136,183	172,800
8	136,183	172,800
9	136,183	172,800
10	136,183	221,976

Question

i. At the cost of capital of 20%, is this project viable?

ii. At the cost of capital of 30%, is this project viable?

iii. At what cost of capital will this project break even?

Solution

i. The Net Present Value (NPV) is estimated to be GHS 23,535. Since the NPV is positive, it means the project is viable. Alternatively, the Benefit-Cost Ratio is found to be 1.03. This is greater than 1 meaning the project is profitable.

ii. The Net Present Value (NPV) is estimated to be GHS (15,869). Since the NPV is negative, it means the project is not viable. Alternatively, the Benefit-Cost Ratio is found to be 0.97. This is less than 1 meaning the project is not profitable.

iii. The project will break even when the Net Present Value is zero. i.e. NPV=0. The interest rate at which the net present value is zero is the internal rate of return (IRR). The IRR is found to be 25%. Therefore, the project will break even at 25%.

PROCESSOR LOAN PRODUCT FEATURES

LOAN PRODUCT	USE OF LOAN	PRODUCT FEATURES							
		Loan Amount (GHS)		Interest Rate (%)		Repayment Duration (months)		Repayment Amount (GHS)	
		Min	Max	Min	Max	Min	Max	Min	Max
Fixed Asset Loan	Purchase of distribution van	**23,000**	**45,000**	**30**	**35**	**36**	**60**	**1,000**	**2,000**
	Purchase of juice extractor	**7,000**	**8,000**	**30**	**35**	**24**	**36**	**300**	**500**
	Purchase of bottle coolers	**3,000**	**4,000**	**30**	**35**	**12**	**24**	**150**	**200**
	Purchase of refrigerators	**5,000**	**8,000**	**30**	**35**	**12**	**24**	**200**	**400**
	Purchase of labelling machine	**5,000**	**6,000**	**30**	**35**	**12**	**24**	**200**	**400**
	Purchase of pasteurizer	**10,000**	**12,000**	**30**	**35**	**36**	**60**	**300**	**500**
	Purchase of corking machine	**4,000**	**6,000**	**30**	**35**	**12**	**24**	**200**	**500**
Working Capital Loan	Supplier credit facilities *(packaging materials, water, electricity supply, detergents, etc.)*	**600**	**1,000**	**30**	**35**	**1**	**6**	**100**	**1,000**
	Credit facilities for fresh fruits	**3,500**	**5,500**	**30**	**35**	**1**	**6**	**1,000**	**5,000**
	Overdraft for labour	**8,000**	**12,000**	**30**	**35**	**1**	**3**	**2,800**	**12,000**
	Transportation cost	**2,100**	**3,000**	**30**	**35**	**1**	**3**	**1,000**	**3,000**
Expansion Loan Product	• Expansion of processing facility	**40,000**	**50,000**	**30**	**35**	**36**	**60**	**1,200**	**2,000**

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