



**KIT** Royal  
Tropical  
Institute



# INCLUSIVE BUSINESS MODELS FOR COCOA NURSERIES IN GHANA



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## Colophon

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## Acronyms

BoP	Bottom-of-the-Pyramid
CHED	Cocoa Health and Extension Division
CMC	Cocoa Marketing Company
CCSVD	Cocoa Swollen Shoot Virus Disease
COCOBOD	Ghana Cocoa Board
CODAPEC	Cocoa Disease and Pest Control
CRIG	Cocoa Research Institute Ghana
CSR	Corporate Social Responsibility
FC	Ghana Forestry Commission
FGD	focus group discussions
FSD	Forest Services Division
IB	inclusive business
KIT	KIT Royal Tropical Institute
LBC	licensed-buying company
MASO	Next Generation Youth in Cocoa Programme
MOCA	Promoting Opportunities for Youth in Cocoa-Growing Communities
NGO	non-governmental organisation
SCPP	Sustainable Cocoa Production Program
SPD	Seed Production Division
UENR	University of Energy and Natural Resources
USD	United States Dollar
VSLA	Village Savings and Loan Association
WCF	World Cocoa Foundation





# 1. INTRODUCTION



The CocoaTarget project aims to develop and strengthen climate-smart strategies in cocoa production systems to improve the livelihoods of up to 800,000 Ghanaian smallholder farmers who depend on cocoa for income. The project uses a citizen science approach - which involves on-farm testing of cocoa varieties - so that farmers and their communities constantly update their knowledge on cocoa varieties which are better adapted to changing local climate; and use this knowledge for decision-making in sapling production and plantation renewal to manage current and future climate risk.

The project runs from 2019 until 2022 and is being implemented by a consortium of international and local research institutes, led by the Alliance of Bioversity – CIAT, and supported by the KIT Royal Tropical Institute (KIT), Cocoa Research Institute of Ghana (CRIG), Kokoo Pa Farmers Association (Kokoo Pa), and the World Cocoa Foundation (WCF).

One of the key objectives of the CocoaTarget project is to design appropriate dissemination and scaling mechanisms by supporting inclusive business development to ensure the delivery of diverse and adapted genetic materials of cocoa that meet the specific needs of farmers.

To contribute to this objective, this research explores the following research questions:

**Are nurseries inclusive business opportunities for rural women and youth, and under what circumstances?**

- What are the different types of business models for cocoa nurseries?
- How do cocoa nurseries currently operate in Ghana?
- Under what circumstances are cocoa nurseries attractive opportunities for women and youth?

This report includes a review of grey and peer-reviewed literature on different definitions and types of inclusive business models and on which type of cocoa nurseries currently exist in Ghana. In addition, a field team, led by the University of Energy and Natural Resources (UENR) and supported by Alliance of Bioversity – CIAT, carried out fieldwork from 2-23 May 2021 in Akantansu, Debra Camp, and Donkoto in Atwima Mponua District of the Ashanti Region of Ghana. The fieldwork aimed to identify the circumstances under which nursery operations can be attractive for rural women and the youth (age 18-35) among nursery operators, farmers, and other institutions.

In the remainder of this report, we explain the context of the cocoa seed sector in Ghana and stress the urgency of addressing the cocoa seed shortage (Chapter 2). In Chapter 3, we explain the methodology of our research. In Chapter 4, we present the findings from a literature review and share a definition of inclusive business models and present an emerging framework that outlines five different dimensions of business models for cocoa nurseries. Following that, we explain how cocoa nurseries currently operate in Ghana by describing their profiles, business models,



challenges and opportunities (Chapter 5). In Chapter 6, we share the calculations of a cost-benefit analysis, which assesses the profitability of three nurseries, looking at different scenarios. In Chapter 7, we assess the inclusiveness of cocoa nurseries. Finally, in Chapter 8, we present our conclusions and formulate recommendations to improve nurseries as inclusive business opportunities.



## 2. THE SHORTAGE OF COCOA SEED IN GHANA



Cocoa is an important cash crop in Ghana and a major contributor to the country's gross domestic product and foreign exchange. Over 2 million people – about 7% of the population - work in the cocoa industry. The cocoa seed sub-sector is entirely within the purview of the Ghana Cocoa Board (COCOBOD) and its subsidiaries (Box 1), with an entirely closed value chain up to the point of the provision of seed pods from one of the 27 Seed Production Division (SPD) seed gardens. At this point, farmers, cooperatives and private operators may acquire cocoa pod seed to establish seedling nurseries. The SPD also manages a number of nurseries that raise seedlings for direct distribution to cocoa farmers. Officially, pods and seedlings from the SPD are provided cost-free to farmers or official intermediaries.

**Box 1. COCOBOD subsidiaries (Source: COCOBOD, 2021a)**

**The Cocoa Marketing Company (CMC)** has a monopoly on marketing cocoa.

**The Cocoa Research Institute Ghana (CRIG)** has the mandate to conduct research to solve disease and pest problems of cocoa, soil fertility and good agricultural practices.

**The Cocoa Health and Extension Division (CHED)** provides free services for fungicide and pesticide application through the Cocoa Disease and Pest Control (CODAPEC). CODAPEC is also tasked with identifying Cocoa Swollen Shoot Virus Disease (CCSVD) outbreaks and countering the spread of disease by uprooting infected trees, and supporting Ghanaian farmers through the Hi-Tech fertiliser distribution programme.

**The Seed Production Division (SPD)** is charged with producing and distributing seedlings to farmers.

COCOBOD (through CRIG and SPD) follows a policy that ensures field-level genetic diversity of hybrid-only cocoa varieties. This means that farmers receive a mix of varieties without being able to distinguish the different cocoa varieties in the mix. A benefit of this strategy is that genetic diversity mitigates production risk, but farmers cannot observe the performance of particular hybrids and provide feedback to CRIG.

The WCF coordinates seed-pod orders on behalf of institutional buyers, including the cocoa companies and larger farmer organisations, which then establish their own community or institutional nurseries and distribute to their farmers at no cost. For non-institutional seed recipients, usually individual farmers, seedlings are distributed on a first come, first served basis. No seed pre-ordering system is available.

Increasingly, the private sector has become an investor in cocoa, mainly through establishing direct relations with farmer organisations and/or licensed-buying companies (LBCs), who are responsible for domestic trade. The LBCs that participate in certification schemes invest in farmer relations and support farmer groups,



for example, with training and inputs (on credit) in exchange for the cocoa. These LBCs are financially supported by international processors/traders and chocolate manufacturers that would like to establish more direct sourcing relations with farmers. Some international traders have set up a LBC themselves.

Due to the rehabilitation of all 27 SPD seed gardens in 2016-17. It will take until 2022 for all the trees to become fully productive. This offers opportunities for entrepreneurs to establish private seedling nurseries. In addition, a major driver of investment in the Ghana cocoa seed system is the fact that about 40% of cocoa plants in Ghana are either overage (23%) or affected by cocoa swollen shoot virus disease (CCSVD) (17%), meaning they have a low productivity. COCOBOD is addressing this situation through the cocoa rehabilitation program and has set up nurseries in various communities to provide seedlings to farmers, however, the demand for seedlings and seeds by farmers far exceeds the available supply. Fully replacing all overage and CCSVD-affected trees would require approximately 825 million cocoa seedlings and cost USD1.2 billion. During the 2020/21 cropping season, COCOBOD delivered approximately 92 million seedlings for replacement and areal expansion (COCOBOD, 2021b). At this level of seedling turnover and taking into account the ongoing aging of the current tree stock and some mortality of the produced seedlings, replacement of all old and diseased trees will take well over a decade, if not two.





### 3. METHODOLOGY



## 3.1 Approach

This research is based on an iterative and explorative research approach that stems from a qualitative approach to research. Our methodology is inspired by a range of tools, combined with anthropological data collection tools such as transect walks and participant observation. Through focus group discussions (FGDs) and key informant interviews (KIIs), we aimed to give space to the respondents to elaborate on their own experiences and perceptions on access to seed, nurseries, and opportunities for women and youth. For the FGDs, we aimed for a maximum of eight participants to ensure that all participants had enough time and opportunity to share their experiences. The research process has been open-ended and iterative as new themes and questions during one focus group inform the questions for the next FGD or the sampling for the next interview.

The methodology is inspired by the following existing tools:

1. **The lean canvas** (Figure 1 in Annex I: Research templates) is 1-page business plan template, adapted from the business model canvas, created by Alexander Osterwalder, and optimised for start-ups (Maurya, 2012). It is a format for brainstorming business models and exists of nine building blocks that guide you through logical steps: customer segments (including early adopters), problems (including existing alternatives), solutions, unique value proposition, channels, success, unfair advantages, costs, and revenues (Mullen, 2016).
2. **The value proposition canvas** (Figure 2 in Annex I: Research tools) that helps to identify farmers or nursery operators innovations, as a response to changes in the landscape. The concept of 'pains and gains' is adopted from the value chain proposition canvas and constitute the respective challenges and opportunities that nursery operators experience. We see these 'pains and gains' as potential triggers for innovation as community members may find new ways of addressing challenges and exploiting opportunities using their own initiative and resources to relieve their 'pains' and create their 'gains'.
3. **The ladder of power and freedom** is a qualitative data collection tool designed to provide data on perceptions of the capacity of men and women to exercise agency and make major decisions in their lives. Agency refers to the capacity to make important decisions in one's life and act upon them (Petesch & Bullok, 2018). On the lowest step (Step 1) of the ladder stand individuals in the community with little capacity to make their own decisions about important events in their lives. They have little to say about if or where they will work, or about starting or ending a relationship. On the highest step (Step 5), stand those who have great capacity to make important decisions for themselves. In this research, the tool helps to assess inclusiveness of nurseries, by understanding social and gender norms related to women and men's engagement and aspirations in crop nurseries.



## 3.2 Data Collection

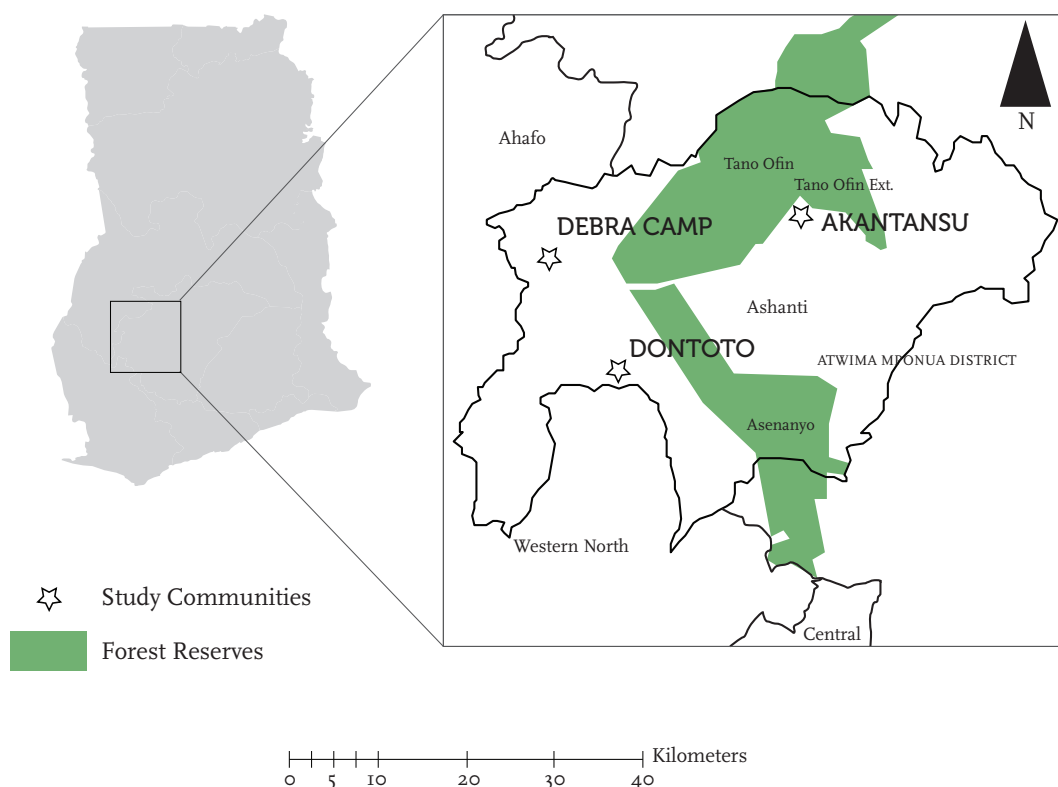
A five-day pre-fieldwork training was organised for the team from UENR and the Alliance of Bioversity – CIAT by the KIT Team from 19 – 23 April 2021. The field team were taken through the field data collection issues, which resulted in the team designing the field guides. The outputs of the training were the instruments and topic-guides for data collection, and a detailed field work schedule. Table 1 presents the topics addressed per research activity.

**Table 1. Topics addressed per research activity**

Activity	Respondents	Topics addressed
Transect walk		<ul style="list-style-type: none"> <li>• First-hand impression and general insight into the community</li> </ul>
Key Informant Interviews (KIIs)	Opinion leaders	<ul style="list-style-type: none"> <li>• Introduction to the community</li> <li>• Developments around crop nurseries in the community</li> </ul>
KII	Nursery operators	<ul style="list-style-type: none"> <li>• General profile of the nursery</li> </ul>
KII	Nursery operators	<ul style="list-style-type: none"> <li>• Lean canvas</li> </ul>
KII	Nursery operators	<ul style="list-style-type: none"> <li>• Financial model: understanding cost-benefit of the nursery</li> </ul>
FGD	Nursery operators (male & female)	<ul style="list-style-type: none"> <li>• Developments affecting the nurseries</li> <li>• Pains and gains of nursery operators</li> <li>• Pain relievers and gain creators</li> </ul>
FGD	Potential youth operators (male & female)	<ul style="list-style-type: none"> <li>• Challenges and aspirations</li> </ul>
FGD	Farmers (male & female)	<ul style="list-style-type: none"> <li>• Relevant developments and challenges in the community affecting farmers and crop nurseries</li> <li>• Farmers' access to seedlings</li> <li>• Pains and gains of farmers in relation to nurseries</li> </ul>
FGD	Farmers (male & female)	<ul style="list-style-type: none"> <li>• Ladder of power and freedom</li> <li>• Aspirations for engagement in crop nurseries</li> </ul>

## 3.4 Sampling

The research was conducted with nursery operators and farmers as key respondents in three communities in the Atwima Mponua District of the Ashanti Region of Ghana: Akantansu, Debra Camp, and Donkoto (Figure 1). In total, 171 respondents were sampled using both purposeful and random sampling methods. The total sample (n=171) constitutes 86 (50.3%) men and 85 (49.7%) women comprising opinion leaders, owners of crop/tree nurseries, farmers, youth, and heads of the SPD, the CHED of the Ghana Cocoa Board, and the Forest Services Division (FSD) of the Ghana Forestry Commission (FC) were involved in the study (Table 2).



**Figure 1. Three research communities (Source: UENR field team)**

**Table 2. Total number of type or respondents**

Stakeholder	Male respondents	Female respondents	Total respondents
Community nursery operators	8	5	13
Private nursery operator	1	0	1
Farmers	54	59	113
Youth	14	16	30
Forestry Commission nursery	1	0	1
CHED	1	0	1
SPD	2	0	2
CHED Nurseries	5	5	10
<b>Total respondents</b>	<b>86</b>	<b>85</b>	<b>171</b>

In total, the field team engaged 14 nursery operators (13 community & 1 private). Not all nursery operators participated in the KIIs covering all topics (general profiles, lean canvas, and the financial model) depending on relevance of the tool (e.g., based on whether the respondent is selling seedlings or producing for his or her own farm), knowledge of the respondent, and the availability of the respondent. All 14 nursery operators covered the general profile of the nursery, out of which 10 covered the lean canvas, and 7 covered the financial model.

### 3.5 Validation

The findings of this research were presented and validated on a National Learning Platform Workshop on 16 February 2022, organised by WCF, CRIG and the Alliance of Bioversity – CIAT under the CocoaTarget project. This is the second learning platform of the CocoaTarget project, with the theme ‘putting nurseries to work for smallholder cocoa farmers in Ghana’. The National Learning Platform Workshop offers a platform for discussion on how the activities of these nursery operators can be (semi) formalised and how they can be supported to become more profitable with a particular focus on the livelihoods of women and youth. The outputs of the workshop will be shared in a briefing paper for policymakers.



A woman with dark skin, wearing a yellow dress with a geometric pattern and a headscarf with a floral pattern, is shown from the chest up. She is holding a pink plastic bowl in her left hand and pouring a stream of small, dark, round seeds or beads from her right hand into it. The background is a plain, light-colored wall.

## 4. DIFFERENT TYPES OF BUSINESS MODELS

This chapter answers the first sub-question of this research: What are different types of business models for cocoa nurseries? The findings are based on a literature review on inclusive business models, drawing from examples in Ghana and globally. In Section 4.1 we define inclusive business models, and in Section 4.2 we build an emerging framework which outlines five different dimensions of business models.

## 4.1 Definition of inclusive business models

A business model describes how companies and individuals (e.g. farmers or entrepreneurs) create, deliver and capture ‘value’. Value traditionally refers to economic value and, more broadly, it involves social and ecological values (Rosenstock et al., 2020). More specifically, it describes how any given enterprise does business, markets its products and sources inputs and finance (Kelly et al., 2015). There is broad agreement that ‘inclusive business models’ expand opportunities for low-income groups by integrating them in the value chain. However, definitions vary in terms of the exact benefits of inclusive business, as well as a clear definition of the concept of ‘inclusiveness’ (DCED, 2017). Table 3 presents a number of definitions of inclusive business models from literature.

**Table 3. Definitions of inclusive business models**

Source	Definition
UNDP (2010)	Inclusive business models include the poor into a company’s supply chains as employees, producers and business owners or develop affordable goods and services needed by the poor. Here, human and business development go hand in hand. Sustainability, also with regard to natural resources, is inherent in the concept.
Kelly et al. (2015)	Inclusive business models promote the integration of smallholders into markets with the underlying principle that there are mutual benefits for poor farmers and the business community.
Accenture (2019)	Business models are ‘inclusive’ if they have two main characteristics: 1) if they engage people at the base of the pyramid in developing countries in core business activities in at least one of the following ways: customers, suppliers or employees; and 2) they serve unmet needs and thereby creating positive social impact” (e.g. no clean water, no decent housing, no formal identity, no literacy, no formal job).
Kaminski et al. (2019)	Inclusive business models are pro-poor, equitable, profitable business activities that integrate low-income and/or marginalised producers, processors, retailers, distributors, and/or consumers in the value chain and generate positive development outcomes
ADB (2019)	Inclusive Business (IB) is a business entity that generates high development impact by (i) improving access to goods and services for the base-of-the-pyramid population (i.e., low-income people); and/or (ii) providing income and/or employment opportunities to low-income people as producers, suppliers, distributors, employers, and/or employees. An inclusive business must be commercially viable, it must meet non-sovereign operation standards of viability.
Rosenstock et al. (2020)	Inclusive business models are ways of creating, delivering and capturing value that provides access to resources (e.g. finance, technology, market channels) to the Bottom-of-the-Pyramid (BoP), as well as space for decision-making over their use.
Schonenveld (2020)	A type of sustainable business model that seeks to productively engage income-constrained groups in the value chain by providing solutions to neglected problems.
IFC (2021)	Inclusive businesses provide livelihood opportunities and help close key developmental gaps, such as access to water, for the poor and the underserved—people often referred to as being at the base of the economic pyramid. The companies achieve both commercial viability and development impact by focusing on people across their value chain, as suppliers, employees, distributors, retailers, or customers.



Some differences and nuances exist across definitions in the following ways:

**1. Inclusiveness of 'low-income groups'**

Inclusive business models expand opportunities for 'the poor' (UNDP, 2010) 'the underserved' (IFC, 2021), 'smallholders' (Kelly et al., 2015), people at the 'base or bottom of the pyramid' (BoP) (Accenture, 2019; ADB, 2019; Rosenstock et al., 2020), 'low-income and/or marginalised groups'; (Kaminski et al., 2019), or 'income constrained' groups (Schonenveld, 2020). Some groups - such as low-income, poor, or BoP - are often defined in simple economic terms. For example, many governments and development organisations define poor and low-income populations as those with an income below an absolute subsistence minimum, such as the global poverty line of \$1.90 per day for low-income countries and \$3.20 for low- to middle-income countries. Others use relative poverty lines, using a threshold of 50-60% the national median income (Schonenveld, 2020). The BoP is often defined as people earning under \$8 per day (Accenture, 2019). Moreover, groups that are 'vulnerable' or 'marginalised' can be adversely impacted or at risk because of their status (LeBlanc 1997, cited in Schonenveld, 2020), and are often used for youth, women, elderly, disabled, migrants, unemployed, prisoners, single parents, homeless, smallholder farmers or those who are part of a racial, ethnic or religious minority (Chapman & Carbonetti, 2011; cited in Schonenveld, 2020).

**2. Integration in the value chain**

Where some definitions focus specifically on the integration of smallholder farmers into markets (Kelly et al., 2015), most definitions consider integration of low-income groups along the value chain, as producers, suppliers, processors, retailers, distributors, and/or consumers; and both as business owners or employers and employees or workers (UNDP, 2010; Accenture, 2019; Kaminski et al., 2019; ADB, 2019; Schonenveld, 2020; IFC, 2021).

**3. Outcomes of inclusive business**

Some definitions mention specific outcomes beyond integration in the value chain. For example, some mention that inclusive business can make affordable goods and services more accessible to low-income groups as consumers (UNDP, 2010; ADB, 2019), and provides employment and income opportunities (ADB, 2019), livelihood opportunities (IFC, 2021), or generally generates positive development outcomes (Kaminski et al., 2020). Accenture (2019) argues that inclusive business models create positive social impact because they serve unmet needs such as e.g. access to clean water, decent housing, formal identity, literacy or formal jobs. Rosenstock et al. (2020) mention that inclusive business model does not only provide access to resources (e.g. finance, technology, markets) but also a space for decision-making over their use. Schonenveld (2020) adds that inclusive business should also anticipate and articulate how it intends to respond to unintended outcomes, including safeguards.

Ros-Tonen et al. (2021) unpacked the concept of inclusivity based on a comprehensive review of three bodies of literature: inclusive business, inclusive value chains, and inclusive development. They find that literature on inclusive



business primarily conceives inclusiveness as being instrumental to achieving business goals (including those related to sustainability), while inclusive value chain literature more explicitly aims to address inequalities and power imbalances in the chain. Inclusive development theory proposes a transformative agenda that focuses on social, relational and environmental outcomes, explicitly addressing underlying norms, institutions and discourses that produce marginalisation.

A similar stream of literature on social enterprises describes how these use commercial strategies to achieve social and/or environmental goals. In the literature, social entrepreneurship, is commonly defined as “entrepreneurs with an explicit and central social mission” (Drees, 1998), entrepreneurial activity with embedded social purpose” (Austin et al., 2006; Mair et al., 2006), or “entrepreneurs primarily driven by a motivation to create value for society, not to capture value” (Santos, 2008). An inclusive business can be considered a type of social enterprise (Schonenveld, 2020).

#### **4. Profitable core business activities**

Some definitions explicitly indicate that an inclusive business should be profitable (Kaminski et al., 2019) or commercially viable (ADB, 2019; IFC, 2021). In addition, many definitions assume a ‘win-win situation’, based on the underlying principle that there are mutual benefits for the poor (farmers) and the business community (Kelly et al., 2015), because human and business development go hand in hand (UNDP, 2010), because they are pro-poor, equitable and profitable (Kaminski et al., 2019), or it achieves both commercial viability and development impact (IFC, 2021). Moreover, some argue that the inclusiveness should be part of the core business operations and activities. Therefore, Corporate Social Responsibility (CSR) is not the same as inclusive business, as these activities are often separate philanthropic activities (UNDP, 2010; Accenture, 2019; Schonenveld, 2020).

## **4.2 Five dimensions of business models**

Based on the literature review, we developed an emerging framework which outlines five different dimensions of business models for cocoa nurseries: governance, formality, commercial intent, integration, and inclusion. In this section we describe the different dimensions and provide examples of these models both in Ghana and globally.

### **1. Governance**

In term of governance, we distinguish between community, private, public, non-governmental organisation (NGO), or hybrid nurseries. In the literature, community nurseries are defined as those managed and owned by individuals or groups in the community. Laliberté et al. (2015) conducted a review on different propagation methodologies, where they identified that in West-Africa (Ghana and Ivory Coast) both individual entrepreneurs and communities operate nurseries in a more permanent nature. Irawan et al. (2017) conducted a survey amongst nursery

operators in Sulawesi (Indonesia) and found that 92% of nurseries were owned by either individuals or families, compared to 5% operated by communities under the government programme, and 3% were owned and operated by schools. Also SCPP (no date) promotes both individual as well as group and cooperative nurseries because they acknowledge that collective structures have advantages but do not work in all settings.

Private nurseries are nurseries managed and owned by private companies. An example of a large scale player in Ghana is Tree Global, which is an international tree nursery company which produces 'high performance tree seedlings' by building state-of-the-art nurseries to grow up to 20 million seedlings per facility per year. Tree Global mainly supplies seedlings for large scale agroforestry and landscape restoration projects (Tree Global, 2020).

Public nurseries are managed and owned by the government. In Ghana, it is the SPD of the COCOBOD that has the mandate 'to multiply and distribute high quality cocoa and coffee planting materials in the most efficient and cost effective manner in adequate quantities to farmers'. The SPD operates 27 Cocoa Stations and 18 nurseries to produce and deliver improved cocoa varieties. The government has given the SPD the mandate to raise 60 million cocoa seedlings for distribution to farmers free of charge (COCOBOD, 2021). The literature also refers to these as central nurseries. NGO nurseries are nurseries that are developed and supported under NGO programmes. Two examples in Ghana are the Next Generation Youth in Cocoa Programme (MASO) and Mobilizing Community Action and Promoting Opportunities for Youth in Ghana's Cocoa-Growing Communities (MOCA) Programmes. MASO is a five year programme, funded by Mastercard Foundation, and implemented by Solidaridad, Aflatoun, Ashesi University, Fidelity Bank and the COCOBOD. The programme focused on creating employment opportunities for youth in Ghana's cocoa communities. The MASO Business Academy is a business incubator that provided training and support in starting businesses along the cocoa production chain, including nurseries (MASO, 2017). In addition, the MASO Agro Academy established nurseries for training and learning purposes, where youth acquire the skills needed for maintaining and transplanting seedlings (MASO, 2018). Another example is the MOCA Programme, implemented between 2015-2019 by Winrock International and Community Development Consult Network (CODESULT). MOCA introduced a cocoa nursery management model to women farmers and youth students in eight communities. At the end of the season, the income was divided, partly to the students for their ongoing studies and partly to reinvest in the nursery (IMPAQ International, 2019).

Hybrid nurseries are a combination of the categories above. For example, if a private or NGO nursery is subsidised by the government, or in the case of multi-stakeholder initiatives. For example, the Sustainable Cocoa Production Program (SCPP) brings together government institutions, private sector companies, public donors and Swisscontact in a public-private partnership to work towards sustainable economic growth in the Indonesian cocoa sector. SCPP strengthens the capacity of farmer-led

cooperatives, farmer groups and individual farmers to establish nursery enterprises and clonal gardens (SCPP, no date). Another example of public-private collaboration is the Cocoa Sustainability Partnership in Indonesia, where different public and private organisations work together on research and development initiatives in Indonesia. Under this partnership, Mars is teaching and training farmer groups on how to start a nursery (Hafid & McKenzie, 2012).

## **2. Formality**

Formality can be defined in different ways. For example, informal can refer to small, unregistered businesses, operating as street vendors or at home. In contrast, formal businesses are then businesses operating from fixed building structures located on business stands demarcated as such by the local government (Ligthelm, 2013). Others distinguish between formal (as public and private) and informal (as farmers and community-based) seed systems, while also allowing for intermediary systems (systems that are on their way towards formalised regulation) (ISSD, 2021).

Laven & van Heck (2016) conducted a study to identify small and medium enterprise services in cocoa growing communities in Ghana. They found that quality inputs (including seeds) do not reach farmers and that the supply gap opens up business opportunities around input supplies, and that the number of ‘informal’ nurseries is already rising. They identified accessible reliable private nurseries as business opportunities to complement public nurseries.

## **3. Commercial intent**

Even though we define inclusive business models as activities that are economically viable while contributing to positive social development outcomes, we include ‘commercial intent’ as one of the dimensions in our framework to confirm this with our respondents during field work. Asare & David (2010) also distinguish between nurseries established mainly for a household with no commercial intention – and nurseries established for commercial purposes.

## **4. Integration**

In this research we defined ‘integrated’ nurseries as nurseries that are linked to other actors in the value chain. For example, they may have fixed arrangements with cooperatives or cocoa companies. Grow Asia (2015) identifies nursery business as a potential business model for farmer cooperatives. Opportunities include that it could generate additional income and that it could be a source of high quality planting materials for cocoa and shade trees. Risks include that it could lead to potential conflicts within the cooperative on who has to do (voluntary) work, or how profits are distributed. Another example is the SCPP in Indonesia, which strengthens cocoa cooperatives to run nurseries, called Smallholder Cocoa Enterprises. Each Smallholder Cocoa Enterprise is an umbrella of several farmer groups that draw on the advantages of collective innovation (SCPP, nd). The WCF also mentions that the costs of establishing and running community nurseries are often shared by companies and farmer associations (WCF, 2019). Another example in Ghana is the Mondelez International Cocoa Life Program, in partnership with NGOs and Kuapa-



Kokoo, which is taking steps to build the capacity of women through pilots such as Barry Callebaut's tree nursery and farmer training as well as the WCF's use of video clubs to reach women cocoa farmers (Danso-Abbeam et al., 2020).

## 5. Inclusion

Some nurseries or initiatives may target specific (vulnerable) groups, such as women, youth or others. Often NGO initiatives have a specific mandate of inclusion, towards women and/or youth, including the MASO and MOCA programmes mentioned above. Moreover, Mondelez in Ivory Coast identified operates through Village Savings and Loan Associations (VSLAs) for creation of economic shade tree nurseries. In addition, women associations were trained as nursery workers, on techniques of shade tree production (Mondelez, 2018). Also the Cocoa Life Program worked with VSLAs and established women-only nurseries (WCF, 2019).

Table 4 summarises the different dimensions of cocoa nursery business models that we identified through the literature review. It is important to note that the table is not complete but it helps us to identify and understand different business models that currently exist. Moreover, nurseries can change its typology over time (e.g. when a community nursery that continues after a NGO project ends).

**Table 4. Characteristics of nursery business models**

Dimension	Type	Definition
<b>Governance</b>	Community: Individual & groups	Managed and owned by individuals or groups within the community (informal nurseries)
	Private	Managed and owned by private companies
	Public	Managed and owned by the government
	NGO	Developed and supported under NGO programmes
	Hybrid	Combination of the categories above, e.g. in the case of subsidies or multi-stakeholder initiatives
<b>Formality</b>	Informal	Unregistered businesses
	Formal	Registered businesses
<b>Commercial intent</b>	Yes	Intention to be commercial by selling seedlings
	No	No intention to be commercial, production for own farm(s)
<b>Integration</b>	Yes	Fixed arrangements with cooperatives or public/private companies.
	No	No fixed arrangements
<b>Inclusion</b>	Yes	Special focus on women, youth, people with disability, or other.
	No	No special focus

## 4.3 Key messages

- Here we define inclusive business models as profitable business activities that integrate rural women and youth in the value chain and generate positive development outcomes. In this research, we assess both the profitability (Chapter 6) and inclusiveness of cocoa nurseries (Chapter 7).

- We distinguish between five different dimensions of business models for cocoa nurseries: governance, formality, commercial intent, integration, and inclusion. In the next chapter, we use the five dimensions to better understand the business models of the nursery operators who participated in this research.





## 5. NURSERY BUSINESS MODELS



Chapters 5 and 6 answer the second sub-question of this research: How do cocoa nurseries currently operate in Ghana? The findings of this chapter are based on the field research. To answer the sub-question, Section 5.1 explains the general profile of the nursery business models based on the five dimensions presented in the previous section. Then, Section 5.2 continues with the lean canvas, and Section 5.3 presents the nursery operators 'pains' and 'gains'. Finally, Section 5.4 presents farmers' seed use and preferences.

## 5.1 General profile of the nurseries and their operators

Table 5 shows an overview of the nurseries visited, including the basic demographics from the nursery operators and the business model characteristics. The majority of nursery operators interviewed for this research were community nurseries, informal, with commercial intent, and without integration and inclusion. The total sample includes 13 community nurseries, 1 private nursery, and 2 public nurseries (COCOBOD CHED & Forestry Commission). All the community nurseries are managed by individuals or families (rather than by groups).

When zooming in further on the community nurseries, we see that they include eight male nursery operators and six female nursery operators. In addition, the sample includes three youth nursery operators (one male and two females below the age of 35). The women and youth (aged 18-35) are highlighted in yellow in the table below. Moreover, the majority is engaged in cocoa only (10x), while three nurseries are diversified into cocoa & palm oil (2x) or cocoa & vegetables (1x). Out of these three diversified nurseries, only one is commercial for both cocoa & palm oil, the others are selling either only palm oil or only cocoa seedlings. Overall, the majority of community nurseries are commercial (8x) or partly commercial in case of diversified nurseries (2x), while others indicated that they only produce for their own farms (3x). We find limited integration among the nurseries. There is one male community nursery operator who also works as a cocoa purchasing clerk. He provides cocoa seedlings as an incentive to farmers who sell him their cocoa beans. In addition, the private nursery operator produces tree species for the Forestry Commission.

Furthermore, there is one nursery with a special focus on inclusion: the Forestry Commission nursery works with youth employees through a so called 'Youth Employment Agency Nursery' division. One female nursery operator indicated that she has learned the nursery practices from an NGO that trained women in the community and later again from Kokoo Pa. She was the leader of an established Kokoo Pa women group nursery but has started her individual nursery three years ago. Also they 'did not do the group nursery' this year. This example shows that these business model typologies are not fixed and can change over time.

**Table 5. Nursery operators profile and business model**

Nr	Sex	Age	Crop	Governance	Formality	Commercial	Integration	Inclusion
1	M	48	Cocoa	Community	Informal	Yes	No	No
2	F	40	Cocoa	Community	Informal	No	No	No
3	F	69	Cocoa	Community	Informal	Yes	No	No
4	F	32	Cocoa	Community	Informal	Yes	No	No
5	M	60	Cocoa & palm oil	Community	Informal	Only palm oil	Only cocoa	No
6	M	55	Cocoa & palm oil	Community	Informal	Yes	No	No
7	F	37	Cocoa	Community	Informal	No	No	No
8	M	69	Cocoa	Community	Informal	No	No	No
9	M	54	Cocoa	Community	Informal	Yes	No	No
10	M	57	Cocoa	Community	Informal	Yes	No	No
11	M	38	Cocoa & vegetables	Community	Informal	Only cocoa	No	No
12	M	28	Cocoa	Community	Informal	Yes	No	No
13	F	32	Cocoa	Community	Informal	Yes	No	No
14	M	37	Tree crops & tree species	Private	Formal	Yes	Only tree species	No
15			Cocoa	Public (CHED)	Formal	No	No	No
16			Tree species	Public (FC)	Formal	No	No	Yes

In addition to the profile or the business model characteristics, we found differences in nursery practices. The remaining section looks at the practices from community nurseries only. Table 6 and Table 7 summarise a number of practices related to other sources of income production, method, sources of pods, labour, record keeping and profitability for all community nurseries. In both tables, the numbers 1-13 correspond to the same nursery operators as in Table 5. Women and youth (age 18-35) are again highlighted in yellow, and commercial nurseries are highlighted in green in the first column.

**Table 6. Nursery practices – Part 1**

Nr	Sex	Age	Started	Other sources of income	Production last year (cocoa seedlings)	Method	Receives free pods	Buys pods
1	M	48	2011	Cocoa farming	30,000	Polybags	Yes	Yes
2	F	40	2021	Cocoa farming	200	Water sachets	Yes	No
3	F	69	2018	Cocoa farming	2,000	Both	Yes	Yes
4	F	32	2016	Cocoa farming	5,000	Both	Yes	No
5	M	60	2006 (cocoa) 2011 (palm oil)	Cocoa purchasing clerk	n/a	Both	Yes	No
6	M	55	2013 (cocoa) 2017 (palm oil)	Cocoa farming	6,300	Both	Yes	No
7	F	37	2020	Cocoa farming & food vendor	500	Water sachets	No	No
8	M	69	1966	Cocoa farming	500	Both	No	No
9	M	54	2016	Cocoa farming	6,000	Polybags	Yes	Yes
10	M	57	n/a	Cocoa & vegetable farming	1,000	Both	Yes	No
11	M	38	2011	Cocoa & vegetable farming	2,000	Polybags	Yes	Yes
12	M	28	2018	Plans moving to the city	5,000	Polybags	Yes	Yes
13	F	32	2017	COCOBOD nursery worker	2,000	Polybags	Yes	No

Firstly, Table 6 shows that **female and youth operators started more recently with their nursery businesses**. Women indicated that they started in between 2016 and 2021, whereas most men started between 2006 and 2018. One 69-year old man indicated that he started his nursery practices 50-60 years ago, by picking pods from his grant parents' farm. The three youth nursery operators interviews started between 2016 and 2018.

The majority of nursery operators indicated that they learned nursery practices from Kokoo Pa and COCOBOD. Some indicate that they learned it from peers or family members. One woman learned the nursery practices from an NGO. The one male youth nursery operator has an agricultural degree at the university. Half of the nursery operators indicated that they receive technical advice from Kokoo Pa or COCOBOD.

Secondly, **almost all nursery operators have additional sources of income**. When looking at the commercial community nurseries, we see that the majority is engaged in cocoa farming, or cocoa & vegetable farming. One female youth nursery operator is also working at COCOBOD nursery. One male youth operators mentioned that he is planning to establish another “lucrative” business in the city, but after expanding the cocoa nursery in the next 5-10 years (nursery as stepping-stone). Even though he wants to move to the city, he also wants to expand and maintain the nursery.



Thirdly, our data suggests that **on average male nursery operators produce more seedlings than female nursery operators**. Looking at only the cocoa seedling production, the female nursery operators interviewed produced on average 1,940 seedlings last year, and male nursery operators produced on average 7,257 seedlings last year. The youth produced on average 4,000 seedlings last year. When we exclude the community operators that are not commercial, the average production is a bit higher for both males and females: 3,000 seedlings for female nursery operators and 8,800 seedlings for male operators.

Fourthly, **all commercial nursery operators prefer to use polybags** over planting in seed beds or using water sachets. Some may use water sachets if they are financially stressed or if there are not sufficient polybags available. Polybags are more expensive and preferred because they allow for more space for the roots and more topsoil. In addition, polybags are softer and can be transplanted with the seedlings, whereas the water sachets need to be removed before transplanting. Lastly, the polybags already have openings that allow roots to grow and flow of excess water, which the water sachets do not have. The two nursery operators that only use water sachets, are both women operators who produce seedlings for their own farms only.

Fifthly, **almost all nursery operators receive pods for free from COCOBOD and Kokoo Pa**. The two nursery operators that do not receive free pods are both not commercial and they indicated that they use pods from their own cocoa farms. Five commercial nursery operators – four male and one female - indicated that they buy additional pods if they don't receive enough free pods.

**Table 7. Nursery practices - Part 2**

Nr	Sex	Age	Family labour	Support from children for a small fee	Casual labour	Permanent labour	Record keeping	Profitability (cocoa only & self-reported)
1	M	48	Yes	Yes	Yes	No	Only for sales	Yes
2	F	40	No	Yes	Yes	No	No	No
3	F	69	Yes	Yes	Yes	No	Yes	Yes
4	F	32	Yes	Yes	Yes	No	Yes, but incorrectly	Yes
5	M	60	Yes	No	Yes	No	No	Yes
6	M	55	Yes	No	Yes	No	Only for sales on credit	Yes
7	F	37	Yes	No	No	No	No	No
8	M	69	Yes	No	Yes	No	No	No
9	M	54	Yes	No	Yes	No	No	Yes
10	M	57	Yes	No	Yes	No	No	Yes
11	M	38	No	No	Yes	No	No	Yes
12	M	28	Yes	No	Yes	No	Yes	Yes
13	F	32	Yes	No	No	No	n/a	Yes

Moreover, Table 7 contains the same highlights to indicate women and youth (yellow) and commercial nurseries (green). The table shows that **almost all nursery operators make use of family labour and casual labour for their nursery activities**. In most cases it is really a family business. There are two nursery operators (1 female and 1 male) who indicate that they do not rely on family labour at all. In addition, there are two female nursery operators that indicate that they do not hire casual labour, as they both rely on family labour. Furthermore, some nursery operators (3 female and 1 male) mentioned that they receive support from children in e.g. picking water sachets or filling water sachets for a small fee. None of the community nursery operators employs permanent labourers. Overall, women nursery operators rely more often on family labour in combination with support from children compared to male nursery operators – who rely overall more on casual labour in combination with family labour.

Lastly, **all the commercial nursery operators indicate that they make a profit out of their business, while only a few keep records**. Two nursery operators (1 female and 1 male) indicate that they keep records. In addition, one female nursery operators indicated that she keeps records but that she does not have the right skills to do it correctly. Finally, there are two male nursery operators who only keep records of sales and sales on credit.

## 5.2 Lean canvas

In this section, we further discuss the business model of the commercial community nurseries, through the lean canvas tool. The lean canvas exists of the following nine building blocks: customer segments (including early adopters), problems (including existing alternatives), solutions, unique value proposition, channels, success, unfair advantages, costs, and revenues. The main findings are summarised in Table 8 below.

**Customer segments.** Almost all nursery operators indicated that they sell to farmers within the community and from surrounding communities. One nursery operator indicated that he is only selling to farmers within the community because of the small quantity of seedlings produced. Moreover, almost all nursery operators mention that they sell both to men and women. There are differences between the ‘main customers’ of the nursery operators. On the one hand, some argue that female farmers are the majority of their customers because for them it is hard physical work to make their own nurseries. On the other hand, others mention that male farmers are the majority of their customers because they are the “head of the household” and are the ones who have money. In addition, one nursery operators indicated that even though female farmers prefer seedlings from his nursery, they hardly visit the nursery themselves but that they usually send children to collect the seedlings. Some nursery operators indicate that their customers are mostly landowners because they have more money to spend compared to sharecroppers. However, others mention both landowners and sharecroppers are equally represented. Furthermore, most nursery operators indicate that they have mostly fixed customers that buy seedlings from them every year.

**Problems.** According to the nursery operators, all customers face issues with access to seedlings. They indicate that there is a shortage of available seedlings, and more specifically a shortage of *timely* available *quality* seedlings *nearby*. Farmers that get seedlings from outside the community face issues with transport of seedlings which is costly, takes time, and leads to higher mortality. Many farmers do not have time and resources to get involved in nurseries, so they rely on pods from their old farms (for home nurseries or planting at stake), commercial nursery operators, CHED, or ‘cars from outside the community’ that sell seedlings for higher prices, but from ‘fake varieties’ or an ‘unknown source’. In addition, these cars only come to the community during primary season but are not there when farmers need seedlings later in the season to refill their farms. One nursery operator mentions that the seedlings supplied by COCOBOD are often overgrown. Furthermore, nursery operators indicate that their customers face financial stress due to low cocoa yields and late payments from the government for cocoa. Some farmers lack money to buy seedlings during planting season.

Nursery operators mention that sharecroppers tend to face more difficulties in getting enough seedlings because most sharecroppers are migrants who have no own farm in the community to take old pods from. In addition, because they are migrants they are less connected in the community. Because they are charged for the land they use, they have limited resources to buy seedlings. In addition, some respondents indicated that even though men and women face similar problems in getting seedlings, it is more challenging for women because of their responsibilities at home. One nursery operator indicated that when the woman is the head of the household and she has young children it becomes more challenging.

**Solutions.** To overcome these channels, nursery operators offer different solutions to their customers. The main solution is access to timely, quality seedlings within the community. In this way, farmers can carry them to their farms – in batches if needed– which reduces mortality compared to longer transport from outside of the community. In addition, some respondents mentioned that they provide seedlings in the community for the primary and the minor season, and emphasised that the seedlings are ready when it rains and the planting season starts, unlike COCOBOD or sellers from outside.

The majority of respondents mentioned that they provide advice to their customers (mostly on seedling transplanting). Other topics of advice mentioned were irrigation, the use of shade trees, planting in lines, weed management, or nursery practices. Some indicated that they receive advice from COCOBOD and they pass it on to their customers.

To compensate for mortality, five nursery operators provide a ‘top-up’ of free seedlings to cover mortality during transportation. Some mention that they provide a 10% top-up but that it is only a service for those who buy in large quantities, or that it depends on the relationship with the customer.



Around half of the nursery operators (including the three women and youth nursery operators) offer seedlings on credit for those who cannot pay cash. This eases the financial stress on those farmers who do not have enough money during the planting season. There is only one male youth nursery operator who charges a different price for seedlings sold on credit (0.70 GHC) compared to seedlings sold cash (0.50 GHC). On the other hand, there are also nursery operators who indicated that they don't sell on credit because they faced issues with farmers who refused to pay back the money, especially when the seedlings did not survive after transplanting.

Two male nursery operators specifically mentioned that they treat all customers the same. One referred to equal treatment of those clients who pay in cash and on credit. In this way, he ensures that seedlings are distributed equally amongst customers rather than only servicing 'those that come with money'. The other nursery operators mentioned that he treats all customers fairly and well, and that he helps female farmers by offering advice or by visiting their farms if needed. One female nursery operator mentioned that in the future she would like to offer transport assistance to her customers.

**Unique value proposition.** The "unique" value proposition of most nursery operators is they ensure affordable, timely available, and quality seedlings within communities. In addition, they provide advice to their customers, and are a trusted source of seedlings within the community. Some offer additional services to reduce financial stress through the 'top-ups' or sales of seedlings on credit.

**Channels.** The majority of nursery operators announce when their seedlings mature through the community Information Centre. In addition, nursery operators use their own network for announcements, such as (chief) farmer meetings, farmer group members, or other personal connections. Most nursery operators also proactively reach out to their existing customers by phone, especially to those outside the community. Some customers will come and visit and because the nursery is located close to the road new customers visit when they see pass by and see the nursery. Generally, many nursery operators benefit from word-of-mouth marketing. Only the two youth nursery operators use social media to promote their seedlings. They share pictures through their WhatsApp status or advertise on the KoKoo Pa WhatsApp Platform.

**Success.** The success of the nursery is defined in a number of ways. First of all, the quality of the seedlings is an important measure of success to the majority of nursery operators. Quality is defined as healthy and beautiful seedlings with green leaves, thick and robust stems, good growth rates, devoid of pests and diseases. Other success indicators are low mortality and proper arrangement of polybags. Moreover, income and profitability are important indicators of success. As a result, respondents are able to take care of themselves and their families, or, for example, support children or siblings to go to university.

Furthermore, the majority of nursery operators indicated that they gain status, respect, or popularity in the community. One female nursery operator mentioned that she is proud to be known as ‘queen farmer’ in the community. The young female nursery operator explained that she is now invited to community meetings where elders are called to discuss matters concerning the community and its farmers, even though she is originally not from the community. Also the young male nursery operator is invited to contribute at the elderly meeting and among peers due to his success in the nursery. Lastly, customer satisfaction is mentioned by some as an indicator of a successful nursery.

Two male nursery operators indicated that they do not consider themselves successful because of the quantity of seedlings produced. They argue that a nursery is successful when it produces at a large scale (20,000 – 50,000 seedlings per season), it is able to satisfy the needs of all farmers in the community and beyond, and has a high level of income.

**Unfair advantage.** Overall, the nursery operators experience little competition because the supply of seedlings does not meet demand. Most nursery operators mention that their unfair advantage is that they use pods from COCOBOD, which is a trusted source for good quality seedlings. In addition, the majority of respondents mentioned that they have a good relationship with their customers, and that good customer service (including advice, follow-up, sales on credit, top-ups) contributes to a good reputation in the community. One nursery operator distinguishes himself by selling seedlings at lower price than others (0.40 GHC).

**Costs.** As indicated in the previous section, the majority of nursery operators do not keep records, and some only keep records of sales or sales on credit. For most respondents, the biggest expenses are the costs of polybags, and hiring labour for digging of soil and filling of polybags. In addition, many nursery operators mentioned that irrigation costs are high. In addition, some nursery operators mention that they pay high costs to transport pods when they travel to other cocoa stations outside the district to get extra pods. Some nursery operators indicated that they save money because their nursery uses family labour.

**Revenues.** Customers pay either in advance, ready-cash or on credit. Almost all nursery operators sell their seedlings for 0.50 GHC per seedling. One nursery operator sells seedlings for 0.40 GHC, and one nursery operator sells seedlings on credit for 0.70 GHC. The two female nursery operators indicated that they hope to sell their seedlings for 0.60 GHC next year. All commercial nursery operators indicate that they make a profit.

**Table 8. Lean canvas summarised**

<b>PROBLEMS</b>	<b>SOLUTIONS</b>	<b>UNIQUE VALUE PROPOSITION</b>	<b>UNFAIR ADVANTAGE</b>	<b>CUSTOMER SEGMENTS</b>
Availability of seedlings	Quality seedlings in the community	Offer affordable, timely available, and quality seedlings from a trusted source within the communities.	Supply does not meet demand	Farmers within the community & surrounding communities
Timely access to seedlings	Supply of seedlings during primary and off-season		Pods from a reliable source (COCOBOD)	Men & women
Availability of seedlings nearby	Advice		Good relationship with customers	Landowners & sharecroppers
Outsiders selling fake varieties	Top-up to compensate for mortality		Reputation in the community	
Financial stress	Sales of seedlings on credit			
	Equal treatment of customers			
	<b>KEY METRICS</b>		<b>CHANNELS</b>	
	Quality and healthy seedlings		Community information centre	
	Low mortality		Own network	
	Proper arrangement of bags		Existing customers	
	Income & profit		Word-of-mouth	
	Livelihoods		Social media	
	Status & respect			
	Customer satisfaction			
<b>COSTS</b>		<b>REVENUES</b>		
Majority of nursery operators do not keep records		Customers pay in advance, ready-cash or on credit		
Largest costs include polybags, labour, watering, transport of pods		Most nursery operators sell seedlings for 0.50 GHC		



## 5.3 Pains and gains

Identifying ‘pains’ and ‘gains’ are central elements to the value proposition method used for this research. We conceptualise nursery operators ‘pains’ and ‘gains’ as the challenges they endure and the opportunities they see. Pains and gains are the positive and negative results of developments in the community related to crop nurseries. Moreover, ‘pain relievers’ and ‘gain creators’ are ways that nursery operators attempt to reduce or overcome challenges and capitalise on its opportunities.

In total, four FGDs were conducted with nursery operators to discuss their pains and gains: one with male nursery operators only, one with female nursery operators only, and two mixed. During the FGDs the participants were asked to list developments in the community affecting crop nurseries. Then, five developments were prioritised and further discussed. Pains were more often prioritised over gains; therefore, the section below presents the pains that have been prioritised by at least two FGDs, and gains that have been prioritised by at least one FGD. Table 8 summarises the pains and introduces the pain relievers. Similarly, Table 9 summarises the gains and introduces the gain creators.

### Pains

The first identified pain is that there is **a limited number of pods available**. Pods are in small amounts (60-100 pods) distributed for free by Kokoo Pa and COCOBOD. Some nursery operators also buy (additional) pods from COCOBOD. This occurs at a first-come-first serve basis, so nursery operators have to wait in long queues at the COCOBOD station and don’t receive sufficient pods. As a result, they are often not able to meet their production capacity, which leads to lower sales and financial stress. Some nursery operators mix seeds from different sources and varieties to compensate for the low number of pods available.

Secondly, **pests and diseases** affect the seedlings’ quality and increase mortality. Nursery operators mention a variety of caterpillars, worms, aphids, butterflies, snails, and termites. They indicate that they have to invest a lot of money in pest control through agro-chemicals. This is especially expensive for women nursery operators, as they usually hire someone to spray.

Thirdly, **erratic rainfall leads to a lack of water for irrigation**. Most nurseries depend on rainfall for irrigation. When it doesn’t rain, rivers dry up and nursery operators have difficulty accessing water to irrigate their seedlings. Women find pumping water tedious, so they have to hire labourers. When nurseries are not close to water sources, a lot of money goes into buying water from boreholes and operators have to walk long distances to get water from other sources since the entire community depends on these boreholes as water sources. Others hire tricycles to fetch water from community

outskirts, which also significantly increases costs. For irrigation and shading, women usually hire labourers because it is a tedious and challenging job, which increases their costs compared to men. Erratic rainfall also delays the sale of seedlings as farmers buy seedlings when there is enough rainfall to transplant them into the field. If they wait too long, the seedlings become overgrown in the nursery, meaning the roots get damaged when they are uprooted, which increases mortality in the field.

Fourthly, **high temperatures** have a major negative effect on nurseries and seedling mortality. This challenge was prioritised by the FGD with female nursery operators as the challenge with the largest negative impact. The sun both increases mortality at the nursery, as well as in the field after transplanting. High temperatures also further increase the lack of water since seedlings require more water in order to survive. Lastly, financial stress is mentioned across the different FGDs. Setting up a nurseries requires a lot of money, and in addition to start-up costs, other significant costs include irrigation, pod transportation, and inputs such as polybags and agro-chemicals. Female nursery operators indicated that they suffer more because they are less ‘financially sound’ in comparison with men.

**Table 9. Nursery operator pains & pain relievers**

Pains	Pain reliever
Limited number of cocoa pods available	Ask for free pods from COCOBOD & Kokoo Pa Look for other sources of cocoa seeds: mix various sources and varieties
Pests and diseases	Use agro-chemicals to control pests and diseases Spread ashes over seedlings to prevent damage from caterpillars, aphids and butterflies Use rock salt or the content of old/used batteries to kill termites
Erratic rainfall & water scarcity	Nursery operators in wet areas dig wells and access ground water Provide extra irrigation Less water is needed when the nursery is protected by shading
High temperatures	Planting seedlings close to shade trees (cocoyam or plantain)
Financial stress	Kokoo Pa Village Savings and Loans allow access to little loans Using seedbeds or water sachets instead of polybags.

## Gains

The first identified gain is the **introduction of Kokoo Pa into the community**. Female nursery operators particularly value the work done by Kokoo Pa. Specifically, they indicated that Kokoo Pa had improved their livelihood by teaching them about new innovations and building their capacities in raising seedlings. In addition, Kokoo Pa introduced them to a savings and loans group which helps them to save money and lend small amounts to each other. These savings and loans groups have been separated for males and females, which according to our respondents helps women to express themselves without the influence of their male colleagues.

Secondly, farmers have **better access to cocoa seedlings because of private nurseries**. There used to be no commercial nurseries, but these have started to appear in the last ten years. Before, farmers would rely on outsiders selling seedlings of fake varieties. These private nurseries mean farmers do not have to wait for these outsiders or the government to bring seedlings before they can plant their farms.

Thirdly, the **introduction of hybrid cocoa seed** leads to cocoa trees with high growth-rates and early fruits. In addition, the nursery operators mention that they appreciate that they receive pods free of charge.

Lastly, farmers have a **high-level of interest in planting shade trees**. Increases in temperatures mean farmers have learned to use other crops to provide shade for the seedlings. Popular shade trees are, for example, Terminalia Superba and Terminalia Ivorensis. Plantain and cocoyam are also popular as they provide additional income and provide additional food for the household.

**Table 10. Nursery operator gains & gain creators**

Gains	Gain creator
<b>Introduction of Kokoo Pa in the community</b>	Introduction of saving and loans groups Start nursery business
<b>Easy access to commercial cocoa nurseries</b>	Farmers buy better quality seedlings (new varieties) at the right time from commercial nurseries
<b>Introduction to hybrid cocoa seeds</b>	Better growth-rates and early fruits
<b>High interest in planting shade trees</b>	Planting of shade trees protects crops from the sun, and potentially provide additional sources of income or food for the household

## 5.4 Farmers seed preferences

Overall, farmers are very familiar with the concept of crop nurseries for vegetables (e.g., tomatoes, pepper, garden eggs, cabbage), cocoa, plantain and shade trees. They often nurse vegetable seeds and cocoa but plant other crops at stake. Many farmers make their own nurseries, especially for cocoa. Women are actively involved in nursing their cocoa for farming. For vegetables, farmers usually buy seeds at the local market and nurse their own vegetable seedlings for planting. Demand is higher for cocoa seedlings because it is more difficult to access cocoa pods for farmers, whereas vegetable seeds are available in agro inputs shops at the market. Crop nurseries used to be along the river Agogo, but the river has recently dried up, forcing farmers to open nurseries in their homesteads to allow for easier watering.

Farmers obtain cocoa pods through their own farms, from other farmers, or even steal pods from other farms with good quality trees. In addition, farmers receive free seedlings and cocoa pods from COCOBOD SPD. Cocoa seedlings are raised



by the SPD and distributed to farmers for free by the CHED of COCOBOD. In the last two years, Kokoo Pa has also given cocoa pods to their farmers for free. In addition, farmers buy cocoa seedlings from commercial cocoa nursery operators to complement those they get for free. However, the number of seedlings produced by commercial operators are currently insufficient to meet the demand of farmers in the communities. Farmers confirmed that cocoa pods can be purchased from SPD Stations across the country at 0.20 GHC per pod and that commercial operators also sell a seedling for 0.50 GHC in the community.

Furthermore, farmers indicated that they trust the quality of pods and seedlings from COCOBOD because they trust the government, and have witnessed benefits from using the improved variety that COCOBOD provides. In addition, they trust the seedlings from commercial nursery operators as they source their pods from COCOBOD. Borrowing pods from friends or taking pods from other farms without permission are perceived as unreliable sources. Farmers also confirmed that they had issues with sellers from outside the community who claimed they were selling improved varieties but instead sold old low-quality varieties.

Farmers usually carry seedlings to their farms, depending on the quantity that they can plant within a day. This is done until the whole farmland is filled appropriately. In addition, some farmers nurture cocoa seeds until they have germinated, transport them to their farms in buckets for planting at stake. When seedlings are collected from outside the community they travel by motorbike. However, in this case mortality is higher due to the shocks of transporting.

Farmers mentioned a number of other challenges related to seed access and seed use. Firstly, farmers confirmed that they have limited access to cocoa pods and seedlings. Moreover, some farmers waste seeds by planting at stake because seeds fail to germinate or are destroyed by pests. In addition, some farmers face high seedling mortality due to transportation shocks, high temperatures, or a lack of rainfall and shade on the farm. Some of the farmers mentioned that the erratic nature of rainfall forces them to plant the same plot of land multiple times.

## 5.5 Key messages

- Almost all community nursery operators have additional sources of income, mostly from cocoa farming. In addition, the majority makes use of family labour and casual labour for their nursery activities. Finally, all the commercial nursery operators indicate that they make a profit out of their business, while only a few keep records.
- Female and youth operators started more recently with their nursery business and produce on a smaller scale compared to male operators. In addition, women nursery operators more often use family labour in combination with support from children for a small fee, while male nursery operators more often use casual labour in combination with family labour.

- Nursery operators offer relevant services to their customers that offer a solution to their customers' key problems (availability of affordable, timely, and quality seedlings from a trusted nearby source). Farmers trust the quality of pods and seedlings from COCOBOD and commercial nursery operators and prefer these over other sources (e.g., friends, other farmers, traders).
- In addition, nursery operators experience limited competition as supply currently does not meet the demand for seedlings. Farmers confirmed that the number of seedlings produced by commercial operators are currently insufficient to meet their demand.
- Nursery operators experience a number of challenges, including the limited number of pods available, pests and diseases, erratic rainfall leading to a lack of water for irrigation, high temperatures and financial stress. Because of the limited number of pods available, some nursery operators are not currently producing at peak capacity, which leads to lower revenues and financial stress.
- Positive developments are the introduction and activities by Kokoo Pa in the community, the introduction of commercial private nurseries and hybrid cocoa seeds, and a high interest amongst farmers to plant shade trees.



## 6. COST-BENEFIT ANALYSIS



In this chapter we continue to answer the second sub-question: How do cocoa nurseries currently operate in Ghana? Chapter 6 assesses the profitability of three nurseries, looking at three different scenarios. The data is collected via an Excel tool, that lists all variable costs, fixed costs, and revenues of the nursery operator. In total, the tool was filled with data from six community nursery operators, one private nursery operator, and two public nurseries.

In the remaining section we work with three ‘fictitious’ nursery operators. We assume that nursery operator 1 (NO1) has a production of 2,000 seedlings per year, and nursery operators 2 (NO2) and nursery operator 3 (NO3) have a production of 6,000 and 30,000 seedlings annually respectively. It is important to note that in the field it was challenging to collect these figures, as few nursery operators knew the exact figures and do not keep records. Therefore, we developed the cost-benefit analysis presented below by combining the figures that we collected from all respondents to get an overview that is as complete as possible. However, we would like to emphasise that these are not the ‘real’ figures from the particular nurseries. Instead, the section presents a model that helps us to assess the profitability of nursery businesses. In addition, we work with different scenarios (e.g., based on mortality, amount of rain, and the type of labour used). The models provide us with insights on the businesses but remain estimates based on (mostly incomplete) data from different nursery operators. We have included all our assumptions in Annex II. In Section 6.1 we present calculations for three types of variable costs (related to inputs, labour, and water use) and in Section 6.2 we present calculations for the fixed costs. Finally, in Section 6.3, we combine them into a full cost-benefit analysis where we include calculations for three different scenarios.

## 6.1 Variable costs

Variable costs are costs that change in proportion to how much a business produces. For this research, we distinguish between three types of variable costs: (1) Inputs: pods (including transport), polybags, potting medium, fertiliser, and pest and disease control; (2) Labour, depending on the total number of days labour is needed, and whether these are done by hired labour or family labour; and (3) Watering, depending on the number of days of rain in a season.

Firstly, Table 8 shows the variable costs for inputs for the three nursery operators. We assume that NO1 receives the pods for free from COCOBOD or Kokoo Pa, and that NO2 and NO3, who operate on a larger scale, pay 0.20 GHC per pod. In addition, in this model, we assume that all nursery operators use their preferred method of raising seedlings in polybags (rather than using water sachets). The table shows that the polybags are by far the largest input cost. In practice, the costs could be lower if nursery operators decided to use water sachets or a combination of polybags and water sachets. In total, the variable costs are 190.00 GHC for NO1, 554.40 GHC for NO2 and 2,551.40 GHC for NO3.

**Table 11. Variable costs (inputs)**

Variable Costs	Quantity	Unit	Price/Unit	Total
<b>NO1: 2,000 seedlings</b>				
Seeds	60	Pods	0	0
Transport of pods	1	trip	20	20
Polythene bags	2,000	bags	0.05	100
Potting medium	1	bag	35	35
Fertiliser	0.33	L	30	10
Pests and disease control	1	spray	25	25
<b>Total (GHC)</b>				<b>190.00</b>
<b>NO2: 6,000 seedlings</b>				
Seeds	172	Pods	0.2	34
Transport of pods	1	trip	60	60
Polythene bags	6,000	bags	0.05	300
Potting medium	1	bag	70	70
Fertiliser	1	L	30	30
Pests and disease control	1	spray	50	50
<b>Total (GHC)</b>				<b>544.40</b>
<b>NO3: 30,000 seedlings</b>				
Seeds	857	Pods	0.2	171
Transport of pods	1	trip	300	300
Polythene bags	30,000	bags	0.05	1500
Potting medium	1	bag	350	350
Fertiliser	5	L	30	150
Pests and disease control	2	L	40	80
<b>Total (GHC)</b>				<b>2551.40</b>

Secondly, we look at the variable costs for **labour** (Table 9). The different activities and estimated number of days for each activity are presented in the table below. For some activities, labourers charge a fixed daily fee per of 30 GHC. However, the rates for filling polybags with growth medium and planting are calculated based on a fee per number of bags, which leads to a fee of 15 GHC per day. The exact calculations are included in Annex II.

It is important to note that the totals indicated in Table 12 are based on the assumption that the nursery operators would charge a daily fee for all their own time spend on the nursery. In other words, the totals include the opportunity costs: what could a nursery operator or his or her family members earn if they would spend this time working for someone else? However, in the scenarios below we do not include opportunity costs in the calculations. We assume that not all the hours spend by the nursery operator and his or her family could be substituted by wage work. Many

nursery operators have the nursery at the homestead and spend an average of two hours per day at the nursery. Others have a nursery on their farms and combine it with their farm work.

Therefore, in our later calculations we will not use the total costs from Table 12, but the total number of days spent on the nursery, which is 20 days for NO1 and 47 and 207 days for NO2 and NO3 respectively. In addition, in the scenario calculations we will use the average prices of labour per day for hiring of casual labour for the three nursery operators, which are: 21.75 GHC (NO1), 19.79 (NO2) and 18.41 (NO3).

**Table 12. Variable costs (labour)**

Variable Costs	Quantity	Unit	Price/Unit	Total
<b>NO1: 2,000 seedlings</b>				
Filling polybags with growth medium	7	days	15	105
Planting	4	days	15	60
Fertiliser application	1	day	30	30
Spraying	1	day	30	30
Weeding	2	days	30	60
Digging of soil to fill polybags	4	days	30	120
Perforation of polybags	1	day	30	30
<b>Total (GHC)</b>	<b>20</b>			<b>435.00</b>
<b>Average price of labour/day (GHC)</b>				<b>21.75</b>
<b>NO2: 6,000 seedlings</b>				
Filling polybags with growth medium	20	days	15	300
Planting	12	days	15	180
Fertiliser application	1	day	30	30
Spraying	1	day	30	30
Weeding	2	days	30	60
Digging of soil to fill polybags	8	days	30	240
Perforation of polybags	3	days	30	90
<b>Total (GHC)</b>	<b>47</b>			<b>930.00</b>
<b>Average price of labour/day (GHC)</b>				<b>19.79</b>
<b>NO3: 30,000 seedlings</b>				
Filling polybags with growth medium	100	days	15	1500
Planting	60	days	15	900
Fertiliser application	3	days	30	90
Spraying	3	days	30	90
Weeding	10	days	30	300
Digging of soil to fill polybags	16	days	30	480
Perforation of polybags	15	days	30	450
<b>Total (GHC)</b>	<b>207</b>			<b>3810.00</b>
<b>Average price of labour/day (GHC)</b>				<b>18.41</b>



Thirdly, the variable costs of **watering** are highly dependent on the amount of rain. Based on World Bank data on the average number of rain in Kumasi in the period of 1991-2020, we estimate that on average 21 weeks of watering is needed. See Annex II for more detailed calculations. In this model we assume that the costs of watering are 30 GHC per week for NO1 and NO2 and 60 GHC per week for NO3.

## 6.2 Fixed costs

Fixed costs are the costs that do not directly increase or decrease the number of seedlings produced. Fixed costs are presented for NO1 (Table 10), NO2 (Table 11) and NO3 (Table 12), and include the structure (e.g., palm fronds, shade nets, pillars, fencing) and equipment (e.g., pickaxes, spades, rakes, wellington boots). It is important to note that there is a lot of variation in the data related to equipment used. The full assumptions related to units, prices, and years of depreciation are included in Annex II. We have added the equipment that is reported by at least two nursery operators. However, we do not assume that all nursery operators use the full list of equipment. In addition, nursery operators may borrow some equipment from others, or rent it for a small fee rather than buying it themselves (e.g. wheelbarrows). Therefore, we work with a discounted rate for the total costs of the equipment: 0.50 for NO1, 0.75 for NO2, and 0.90 for NO3. This leads to fixed costs totalling 103.11 GHC for NO1, 172.88 GHC for NO2, and 322.86 GHC for NO3.

**Table 13. Fixed costs NO1: 2,000 seedlings**

Fixed Costs	Unit	Price/Unit	Depreciation	Total/Year
<b>NO1: 2,000 seedlings</b>				
Cutting & transport of palm fronds	3	0	1	0
Pillars for shading structure	1	100	10	10
Fixing of pillars	1	30	10	3
Fence (mesh 6m*6m)	2	40	10	8
Pickaxe	1	30	10	3
Measuring tape	2	32.5	4	16
Nylon ropes	2	4.5	1	9
Spade or shovel	1	25	10	3
Rake	1	21	10	2
Trowel	1	7	10	1
Watering can	1	32.5	8	4
Water hose (rubber pipe)	1	55	1	55
Wheelbarrow	1	120	10	12
Scissors	2	3	10	1
Wellington boots	1	50	2	25
Knapsack sprayer	1	110	2	55
Sub-total (GHC)				206.21
Discounted rate				0.50
<b>Total (GHC)</b>				<b>103.11</b>

**Table 14. Fixed costs NO2: 6,000 seedlings**

Fixed Costs	Unit	Price/Unit	Depreciation	Total/Year
<b>NO2: 6,000 seedlings</b>				
Cutting & transport of palm fronds	3	0	1	0
Pillars for shading structure	1	160	10	16
Fixing of pillars	1	30	10	3
Fence (mesh 6m*6m)	4	40	10	16
Pickaxe	2	30	10	6
Measuring tape	2	32.5	4	16
Nylon ropes	3	4.5	1	14
Spade or shovel	2	25	10	5
Rake	1	21	10	2
Trowel	1	7	10	1
Watering can	1	32.5	8	4
Water hose (rubber pipe)	1	55	1	55
Wheelbarrow	1	120	10	12
Scissors	3	3	10	1
Wellington boots	1	50	2	25
Knapsack sprayer	1	110	2	55
Sub-total (GHC)				230.51
Discounted rate				0.75
<b>Total (GHC)</b>				<b>172.88</b>

**Table 15. Fixed cost NO3: 30,000 seedling**

Fixed Costs	Unit	Price/Unit	Depreciation	Total/Year
<b>NO2: 6,000 seedlings</b>				
Cutting & transport of palm fronds	6	0	1	0
Pillars for shading structure	10	30	10	30
Fixing of pillars	2	300	10	60
Fence (mesh 6m*6m)	6	40	10	24
Pickaxe	4	30	10	12
Measuring tape	2	32.5	4	16
Nylon ropes	4	4.5	1	18
Spade or shovel	4	25	10	10
Rake	1	21	10	2
Trowel	1	7	10	1
Watering can	3	32.5	8	12
Water hose (rubber pipe)	1	55	1	55
Wheelbarrow	1	120	10	12
Scissors	5	3	10	2
Wellington boots	2	50	2	50
Knapsack sprayer	1	110	2	55
Sub-total (GHC)				358.74
Discounted rate				0.90
<b>Total (GHC)</b>				<b>322.86</b>

## 6.3 Scenarios

In this section we present the cost-benefit analysis for NO1 (Table 16), NO2 (Table 17) and NO3 (Table 18), using three different scenarios. The first scenario is the most pessimistic scenario, where nursery operators have higher mortality (12%) and there is less rain, so the number of weeks that watering is needed increases to 27. The second scenario is the average scenario with 8% mortality and 21 weeks of watering needed. The third scenario is the most optimistic, with the lowest mortality (5%) and only 15 weeks of watering needed. The variables that change for these three scenarios are marked in orange in the tables below. The models shows that a higher mortality leads to reduced revenues. Increasing the number of weeks of watering increases the variable costs (watering).

In addition, for each scenario we work with three different sub-scenarios, based on the number of days of family labour used versus the number of days casual labour is hired. The A scenarios assume that 50% of the total number of days are spent on family labour. The B scenarios assume that 75% of the total number of days are spent on family labour. Lastly, the C scenarios assume that 100% of the total number of days are spent on family labour. In the model, variable costs (labour) decreases when more family labour is used.

In the cost-benefit analysis we look at profitability and return on family labour. Profit is calculated by the revenues minus costs (variable and fixed). The return on family labour is calculated by dividing the profit by the number of days invested as family labour. The return on labour is a measure to understand how much nursery operators earn for each they that their family spends on the nursery.



Table 16. Cost-benefit analysis NO1

**NO1: 2,000 seedlings**

Scenarios	Scenario 1: Pessimistic High mortality & watering needed			Scenario 2: Average Av. Mortality & watering needed			Scenario 3: Optimistic Low mortality & watering needed		
<b>Assumptions</b>									
Production	2,000			2,000			2,000		
Mortality	12%			8%			5%		
Seedling price (GHC)	0.50			0.50			0.50		
Average costs per day (hired labour) (GHC)	21.75			21.75			21.75		
Watering costs per week (GHC)	30.00			30.00			30.00		
Number of weeks watering is needed	27			21			15		
Type of labour used	1A: 50% family labour	1B: 75% family labour	1C: 100% family labour	2A: 50% family labour	2B: 75% family labour	2C: 100% family labour	3A: 50% family labour	3B: 75% family labour	3C: 100% family labour
Number of days hired labour	10	5	0	10	5	0	10	5	0
Number of days family labour	10	15	20	10	15	20	10	15	20
<b>Costs</b>									
Variable costs (inputs)	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00
Variable costs (watering)	810.00	810.00	810.00	630.00	630.00	630.00	450.00	450.00	450.00
Variable costs (labour)	217.50	108.75	0.00	217.50	108.75	0.00	217.50	108.75	0.00
Fixed costs	103.11	103.11	103.11	103.11	103.11	103.11	103.11	103.11	103.11
<b>Revenue</b>									
Sales of seedlings	880.00	880.00	880.00	920.00	920.00	920.00	950.00	950.00	950.00
Return on labour (per day) (GHC)	-44.06	-22.12	-11.16	-22.06	-7.46	-0.16	-1.06	6.54	10.34
Profit (per year) (GHC)	-440.61	-331.86	-223.11	-220.61	-111.86	-3.11	-10.61	98.14	206.89

Table 17. Cost-benefit analysis NO2

**NO2: 6,000 seedlings**

Scenarios	Scenario 1: Pessimistic High mortality & watering needed			Scenario 2: Average Av. Mortality & watering needed			Scenario 3: Optimistic Low mortality & watering needed		
<b>Assumptions</b>									
Production	6,000			6,000			6,000		
Mortality	12%			8%			5%		
Seedling price (GHC)	0.50			0.50			0.50		
Average costs per day (hired labour) (GHC)	19.79			19.79			19.79		
Watering costs per week (GHC)	30.00			30.00			30.00		
Number of weeks watering is needed	27			21			15		
Type of labour used	1A: 50% family labour	1B: 75% family labour	1C: 100% family labour	2A: 50% family labour	2B: 75% family labour	2C: 100% family labour	3A: 50% family labour	3B: 75% family labour	3C: 100% family labour
Number of days hired labour	23.50	11.75	0	23.50	11.75	0	23.50	11.75	0
Number of days family labour	23.50	32.25	47.00	23.50	32.25	47.00	23.50	32.25	47.00
<b>Costs</b>									
Variable costs (inputs)	544.40	544.40	544.40	544.40	544.40	544.40	544.40	544.40	544.40
Variable costs (watering)	810.00	810.00	810.00	630.00	630.00	630.00	450.00	450.00	450.00
Variable costs (labour)	465.07	232.53	0.00	465.07	232.53	0.00	465.07	232.53	0.00
Fixed costs	172.88	172.88	172.88	172.88	172.88	172.88	172.88	172.88	172.88
<b>Revenue</b>									
Sales of seedlings	2,640.00	2,640.00	2,640.00	2,760.00	2,760.00	2,760.00	2,850.00	2,850.00	2,850.00
Return on labour (per day) (GHC)	27.56	27.29	23.67	40.33	36.59	30.06	51.81	44.97	35.80
Profit (per year) (GHC)	647.65	880.18	1,112.72	947.65	1,180.18	1,412.72	1,217.65	1,450.18	1,682.72

Table 18. Cost-benefit analysis NO<sub>3</sub>**NO<sub>3</sub>: 30,000 seedlings**

Scenarios	Scenario 1: Pessimistic			Scenario 2: Average			Scenario 3: Optimistic		
	High mortality & watering needed			Av. Mortality & watering needed			Low mortality & watering needed		
Assumptions									
Production	30,000			30,000			30,000		
Mortality	12%			8%			5%		
Seedling price (GHC)	0.50			0.50			0.50		
Average costs per day (hired labour) (GHC)	18.41			18.41			18.41		
Watering costs per week (GHC)	60.00			60.00			60.00		
Number of weeks watering is needed	27			21			15		
Type of labour used	1A: 50% family labour	1B: 75% family labour	1C: 100% family labour	2A: 50% family labour	2B: 75% family labour	2C: 100% family labour	3A: 50% family labour	3B: 75% family labour	3C: 100% family labour
Number of days hired labour	103.50	51.75	0	103.50	51.75	0	103.50	51.75	0
Number of days family labour	103.50	155.25	207.00	103.50	155.25	207.00	103.50	155.25	207.00
Costs									
Variable costs (inputs)	2,551.40	2,551.40	2,551.40	2,551.40	2,551.40	2,551.40	2,551.40	2,551.40	2,551.40
Variable costs (watering)	1,620.00	1,620.00	1,620.00	1,260.00	1,260.00	1,260.00	900.00	900.00	900.00
Variable costs (labour)	1,905.44	952.72	0.00	1,905.44	952.72	0.00	1,905.44	952.72	0.00
Fixed costs	322.86	322.86	322.86	322.86	322.86	322.86	322.86	322.86	322.86
Revenue									
Sales of seedlings	1,3200.00	1,3200.00	1,3200.00	1,3800.00	1,3800.00	1,3800.00	1,4250.00	1,4250.00	1,4250.00
Return on labour (per day) (GHC)	65.70	49.94	42.06	74.98	56.12	46.69	82.80	61.34	50.61
Profit (per year) (GHC)	6,800.31	7,753.02	8,705.74	7,760.31	8,713.02	9,665.74	8,570.31	9,523.02	1,0475.74



Table 16 shows that under these assumptions, **NO1** would only make a small profit in the most optimistic scenario, and when they rely mostly (scenario 3B) or fully (scenario 3C) on family labour. In addition, the return on family labour is, in this case, much lower than the average salary for casual workers. The cost-benefit analysis also shows that the variable costs for watering and inputs are relatively high. In the case of **NO1**, one way to reduce costs (and, therefore, increase profits) is to use water sachets instead of polybags, which would lower the variable costs for inputs. In addition, the costs for watering are disproportionately high. These costs could be lower for nursery operators located close to a water source. There are also ways to increase revenues by, for example, charging a higher price or increasing production. Two female nursery operators indicated that they are planning to increase the prices per seedling to 0.60 GHC. In addition, fixed costs can be brought down further by borrowing or sharing equipment with others.

Furthermore, the cost-benefit analysis shows that **NO1** is vulnerable and highest affected by risks such as lack of rain. Lastly, the figures indicate that for **NO1** it is costly to hire casual labourers. When producing 2,000 seedlings, under these assumptions nursery operators only make a (small) profit when relying mostly or fully on family labour.

When looking at Table 17, we see that **NO2** makes a profit in the pessimistic, average and optimistic scenarios and is, therefore, less vulnerable to risks than **NO1**. In addition, **NO2** has more flexibility to hire casual labourers where needed. Even though profitability decreases, **NO2** still makes a profit when hiring 50% casual labourers in all three scenarios. The return on family labour is for the average and optimistic scenarios above 30 GHC, and for the pessimistic scenario, only slightly below 20 GHC per day.

Lastly, Table 18 shows that **NO3** makes the largest profit and is most stable across all three scenarios. **NO3** has the most flexibility to hire more labourers. In addition, the return on family labour remains far above 30 GHC for all scenarios.

## 6.4 Key messages

- The model in this section is a first attempt to assess the profitability and return on labour of cocoa nurseries. The model is based on three fictitious nurseries and includes a range of assumptions based on extensive but partial field data. We encourage others to validate the model and the underlying assumptions made and further improve it. In addition, promoting record keeping amongst farmers and nursery operators would assist in getting more accurate insights.
- There is a clear business case for nurseries that produce at a larger scale (**NO2** & **NO3**). In addition, these nurseries are better able to absorb shocks and still make a profit in a more pessimistic scenario with higher mortality and less rain. Lastly, if they use more casual labour and less family labour, they are still profitable.

- For smaller-scale nursery operators it is more difficult to make a profit. They are more vulnerable to shocks that lead to a more pessimistic scenario, and they can only afford to hire a few days of casual labour. Opportunities to increase profitability include increasing production, locating the nursery close to a water source, using mainly family labour, lowering mortality (by providing shade & pest control), or borrowing or sharing equipment.
- These figures show that nurseries become more profitable and more stable when production increases. Higher production leads to a direct increase in revenue, while the fixed costs and variable costs for watering only marginally increase. Our data suggest that women produce on average on a smaller scale compared to men, which means that they make a smaller profit and are therefore more vulnerable to shocks such as drought.
- Setting up a nursery is hard physical work (e.g. cutting palm fronds, building the shade structure), which is perceived to be more difficult for women. For these tasks, female nursery operators often rely on support from their male family members or on hired labour. In addition, nurseries have a relatively large start-up costs, which makes it challenging to start a nursery, especially for women and youth who often have less capital and less stable incomes.
- Watering costs are very high for nursery operators. With the current water resources available, nurseries should be located close to a water source (e.g., pump, river, or well to access ground water), especially those that operate on a smaller scale.
- Lowering mortality is another way to potentially increase profitability. In addition to water scarcity, high temperatures and pests and diseases are mentioned as causes of mortality. The use of pest and disease control techniques and shade trees could help to lower mortality.





## 7. INCLUSIVE NURSERIES

In this chapter we answer the third sub-question: Under what circumstances are cocoa nurseries attractive opportunities for women and youth?

## 7.1 Ladder of power and freedom

In this research, the ladder of power and freedom helps us to understand women and men's perspectives on their position in society, and how social and gender norms relate to women and men's engagement in crop nurseries and the cocoa value chain. Individuals in the community with little capacity to make their own decisions about important events in their lives, stand on the lowest step of the ladder (Step 1). Those who have the capacity to make important decisions for themselves stand on the highest step (Step 5). In total, nine FGDs were conducted with farmers across the three communities. In each community, a FGD was conducted with women, young women, and young men. The full ladder of power and freedom is included in Annex III for women, young men, and young women. Here we only present the key findings relevant to the research questions.

**Women** perceive women on Step 5, as those who are heads of their households, make their own money and make all decisions for their households. In addition, respondents identified a female nursery operator in the community as on Step 5 because she is rich, makes her own decisions and she has an understanding husband. However, they also indicated that most women are on Step 3 because they cannot make all the decisions on their own as they are married, do not have adequate resources, and have financial stress. Women on Step 3 are involved in nurseries but not on a commercial basis. For them, it is difficult to move up the ladder as they would require support from their husbands and are limited by time because they have to balance household duties with their farm work.

**Young men** perceive young men on Step 5 as those with a house, a farm and a family; and who control their income. However, the respondents indicated that there is no youth on Step 5 because they often stay at their parent's house and have no land or money. They argue that sharecroppers cannot be at Step 5. Like the women, the young men also place the nursery operators they know in the community at Step 5. According to the young men, most of the young men in the community are on Step 3 because they believe they have the freedom to make certain life decisions but do not have total control over their lives.

**Young women** perceive young women on Step 5 as those who can get themselves a job, work hard for a high and secured income and have control over their own lives. The respondents did not recognise any young women on Step 5. Overall, respondents mentioned marriage, religion and social rules as factors that hinder young women from climbing the ladder. Social rules dictate that women should do household chores, while young men are out labouring to get their own money. Jobs available to young women include breaking cocoa pods, cleaning for food vendors, and assisting at a commercial nursery, however, they indicate that they are paid less compared to jobs available for young men.



## 7.2 Aspirations for engagement in crop nurseries

When asked about their aspirations, the **women** indicated that in the future, they would like to be involved in small businesses to improve their incomes and family welfare. Most want to engage in trade or cocoa farming. Some women indicated that they are already involved in cocoa and vegetable nurseries for their own farms. Others were interested in starting nursery practices in the future but only for their own farms. In addition, a number of respondents mentioned that they would be interested to be involved in nurseries for commercial purposes. They see it as a lucrative business and think that a commercial nursery would be an asset for their children.

However, most women indicated that they are constrained by time and a lack of land and money, which prevents them from engaging in crop nurseries commercially. Nurseries require a lot of time and energy, which is hard to combine with household chores and other livelihood activities. In addition, many women do not have access to lands. They explained that women primarily farm with their husbands, who are the owners of the farmlands. Even though some women have their farmlands, the lands are not close to water sources that would support their nursery activities. Most of the land around water sources belong to males who were dominant in raising seedlings in the community. In addition, it requires capital to start and operate nurseries (e.g., for polybags, building the shade structure, watering and labour). The respondents indicated that women are not financially stable enough to do it independently and would require support from their husbands and children to operate the nursery. Furthermore, some women indicated that they are most interested in vegetable nurseries because vegetable seeds are abundant in the community, whereas cocoa pods are difficult to access.

Most of the **young men** in the FGD indicated that they are currently engaged in farming as sharecroppers and that in the future, they would like to own their own farms. In addition, they would like to engage in other income-generating activities such as poultry farming, selling agro-inputs or opening a provision store to compensate for the lack of money in the cocoa off-season. Some were also interested to start a commercial nursery in the future. They noted that the profitability of nurseries is a motivating factor to go into nurseries in the future. However, others do not perceive nurseries as attractive as many farmers buy on credit and refuse to pay later. In addition, they mentioned that nurseries are also annual businesses, which doesn't earn a lot of money compared to the time and effort it requires. Overall, many male youths are farming, but others prefer quick cash and engage in 'galamsey' (illegal small-scale gold mining).

For those interested in nurseries, a lack of land close to water and money hinders them from engaging in nurseries at the moment. In addition, labourers are hard to find in the community. Because it is difficult for youth to have access to land, they get into sharecropping and buy the land once they have the money.

Most **young women** aspired to own businesses such as provision and clothing stores. In addition, some young women aspire to go into nursery operations in the future because they have seen examples of women who 'have made fortunes from it'. Some youth also indicated that they would be interested to work for private nursery operators or as an employee in a COCOBOD nursery. All young women were only interested in cocoa as they see it as more lucrative compared to vegetable nurseries. One woman indicated that she would like to open a shade tree nursery in order to supply the government. However, many respondents were not interested in going into nurseries because they lack experience or see them as a 'tedious and slow-growing job'. They noted that the only way to be involved in the nursery would be on a small scale for their own farms. Overall, the young women indicated that youth in the community perceive nursery jobs as dirty and tedious, so they do not show interest. According to those interested in nurseries, access to land is a major constraint for young women. It is especially difficult to get access to land which is located close to a water source. Furthermore, they lack the capital to buy the materials required for the nursery and indicated that putting up necessary structures is more difficult for women. One woman indicated that she would like to start a nursery if she would get access to cocoa pods from a trusted source.

### 7.3 Youth nursery workers as potential nursery operators

In total, three FGDs were conducted with youth who work in nurseries, one with males, one with females, and one mixed. The duties of nursery workers include filling the polybags, arranging them in line, preparing seeds for nursing, weeding, and watering. Male and female workers share almost the same duties. However, the males are the ones who dig the soil for filling as this is hard physical work, while the females mostly carry the soil to the site. In addition, it is mostly female workers who fill the polybags.

Overall, male respondents are more satisfied with their jobs, even though they indicate that they would love it if they had a permanent position rather than the current temporary contracts. However, they indicate that they have a passion for the job and want to work hard 'to move Ghana forward'. Female respondents also indicated that they love working for COCOBOD but would prefer to work at offices rather than the nursery site because the work is tedious. Moreover, some women indicated that they are proud to earn an income to support their children with education. Others mentioned that they would leave the job if they found something with a higher salary.

Across the FGDs, the nursery workers mentioned a number of challenges. Firstly, their temporary contracts bring a lot of uncertainty. Employees have 10-month seasonal contracts that are renewed every three months. During the season many contracts are not renewed. Respondents report that this happens without prior notice and that around 40% of the employees are laid off during the season because there

is less work to do towards the end of the season. As women are mostly the ones hired at the beginning of the season to fill the polybags, they are mostly the ones to be laid off. Secondly, workers often lack the equipment and protective clothing needed for the work, which exposes them to the risk of injury while working, such as snakebites, body rashes. In addition, women mentioned that there is no shade in the place where they fill the polybags, which exposes them to direct sunlight. Thirdly, across the FGD, workers indicated that their salaries are low compared to the nature of the work. Lastly, women indicated that it is difficult for them to combine the duties in the workplace with those at home. They indicate that due to household chores, it is challenging for them to start at the same time as the men (at 6 am), but if they are late, they are at risk of being fired without prior notice. In addition, women mentioned that because the work is time-consuming, it is difficult to combine it with another business or job.

Finally, during the FGDs, we explored their interest in establishing their own commercial nurseries. The majority of men indicated that they have not considered starting their own nurseries. Some of them mentioned that they would prefer a permanent position at the COCOBOD. Others indicated that they had started saving for their own business, but they preferred to establish their own cocoa farms and use their experience from the nursery on their own farms. A few men were interested in establishing their nursery but indicated that they did not have the capital to start the business. Most women did not intend to start their own nursery but preferred to work for COCOBOD. However, three women mentioned that they would start their nursery if they would have sufficient capital. One of the women even indicated that she intends to start her own private nursery and has been able to acquire a plot of land that is close to a water source. However, she could not proceed because of pregnancy. Another woman indicated that she had started her own commercial nursery with her sister.

## 7.4 Key messages

- Many women are already engaged in non-commercial nurseries to supply their own cocoa farms. It could be an opportunity for women to earn money for some of the work that they already do. On the other hand, there are social and gender norms that hinder women from engaging in paid work.
- Commercial nursery operators have a high status in the community as women and youth perceive successful (female) nursery operators to be on Step 5 (highest) of the ladder of power and freedom. Despite the high status of nursery operators, the majority of youth were not interested in starting a nursery. Young men mostly prefer jobs that provide quick money, and young women lack experience and find it a 'dirty and tedious job'.
- Interested women see it as a lucrative business and as a future asset for their children. Also, interested youth see it as a profitable business opportunity and potential steppingstone to other income generating activities.

- Women interested in nurseries experience a number of challenges preventing them from engaging in nurseries commercially, including a lack of time (combining nursery with other household and farm) and lack of quality land. Most of the land around water sources belongs to males. In addition, women lack capital and require support from their husbands and children to operate the nursery.
- The main barriers for youth interested in nurseries are a lack of land, and a lack of capital for the investments needed to set up and operate a nursery.
- Inclusive nurseries not only require financial investments, but also a change in social and gender norms to overcome some specific barriers for women and youth to engage in commercial nurseries, including access to quality land close to water sources, distribution of household tasks, restricted mobility, and a lack of capital.





## 8. CONCLUSION



This research was conducted under the CocoaTarget project, which aims to design appropriate dissemination and scaling mechanisms by supporting inclusive business development to ensure the delivery of diverse and adapted genetic materials of cocoa that meet the specific needs of farmers. It is based on a literature review and fieldwork, led by the UENR and supported by the Alliance of Bioversity – CIAT, carried out from 2-23 May 2021 in Akantansu, Debra Camp, and Donkoto in Atwima Mponua District of the Ashanti Region of Ghana. In this chapter, we conclude the research by answering the research questions formulated in the introduction.

### **What are the different types of business models for cocoa nurseries?**

We defined inclusive business models as profitable business activities that integrate rural women and youth in the value chain and generate positive development outcomes. To identify different types of business models, we developed an emerging framework that outlined five different dimensions of business models for cocoa nurseries: governance (community, private-public, hybrid), formality (formal, informal), commercial intent, integration, and inclusion.

### **How do cocoa nurseries currently operate in Ghana?**

The majority of nursery operators interviewed for this research were community nurseries, informal, with commercial intent, and without integration and inclusion. All the community nurseries are managed by individuals or families. When looking at the community nurseries, we see that almost all nursery operators have additional sources of income, mostly from cocoa farming. Moreover, female and youth operators started their nursery business more recently and produce on a smaller scale compared to male operators. Almost all nursery operators make use of family labour and casual labour for their nursery activities. Overall, women nursery operators often use more family labour in combination with support from children than male nursery operators – who use more casual labour in combination with family labour. Finally, all the commercial nursery operators indicated that they make a profit out of their business, while only a few keep records.

We found that nursery operators provide their customers with different relevant services that offer a solution to key problems (e.g., availability of affordable, timely, and quality seedlings from a trusted nearby source). In addition, they experience limited competition as supply does not currently meet the demand for seedlings. Farmers confirmed that they trust the seedlings from commercial nursery operators.

Nursery operators experience a number of challenges, including the limited number of pods available, pests and diseases, erratic rainfall leading to a lack of water for irrigation, high temperatures and financial stress. In addition, positive developments are the introduction of and activities undertaken by Kokoo Pa in the community, the introduction of commercial private nurseries and hybrid cocoa seeds, and a high interest amongst farmers in planting shade trees.

In addition, we assessed profitability and return on labour of nursery operators based on a cost-benefit analysis. The calculations show that there is a clear business case for nurseries that produce at a relatively larger scale (6,000 and 30,000 seedlings). These nurseries are better able to absorb shocks and still make a profit in a scenario with higher mortality and less rain. The data also shows that for smaller-scale nursery operators (2,000 seedlings) it is more difficult to make a profit. They are more vulnerable to shocks that lead to a more pessimistic scenario, and they can only afford to hire a few days of casual labour. Opportunities to increase profitability include increased production, locating the nursery close to a water source, using mainly family labour, lowering mortality (by providing shade & pest control), or borrowing or sharing equipment. Our data suggest that, on average, women produce on a smaller scale compared to men, which means that they make smaller profits and are, therefore, more vulnerable to shocks such as drought.

### **Under what circumstances are cocoa nurseries attractive opportunities for women and youth?**

Many women are already engaged in non-commercial nurseries to supply their own cocoa farms. Commercial nurseries could be an opportunity for women to earn money for some of the work that they already do. In addition, commercial nursery operators have a high status in the community. Despite the high status of nursery operators, the majority of youth was not interested in starting a nursery because they prefer jobs that provide quick money or find it a 'dirty and tedious job'.

The interested women, see it as a lucrative business and as a future asset for their children. Interested youth also see it as a profitable business opportunity and a potential steppingstone to other income-generating activities. However, women and youth face a number of constraints that prevent them from engaging in nurseries commercially. For women, challenges include a lack of time, a lack of suitable land close to water sources, and a lack of capital. In addition, women require support from their husbands and children to operate the nursery. The main barriers for youth interested in nurseries are a lack of land and a lack of capital.

Inclusive nurseries not only require financial investments, but also a change in social and gender norms to overcome some specific barriers for women and youth to engage in commercial nurseries, including access to quality land close to water sources, distribution of household tasks, restricted mobility, and a lack of capital.

### **To answer the main research question: are nurseries inclusive business opportunities for rural women and youth, and under what circumstances?**

Despite the rehabilitation of SPD seed gardens, the shortage of cocoa seed will still remain. There is an urgent need and opportunity for others to establish private and community nurseries to support the public sector with the production and distribution of seedlings to farmers.

This research shows that there is an opportunity for community nurseries because there is a large demand amongst farmers for quality seedlings nearby, and there is a business case for community nurseries, especially for those that operate at a larger scale (6,000+ seedlings). However, there is currently a shortage of available pods, which prevent existing nursery operators from increasing production and hinders potential nursery operators from starting. Therefore, there is a need for public-private collaboration to improve the production and distribution system for cocoa pods to nurseries.

Women often produce on a smaller scale compared to male operators because they experience a number of specific challenges preventing them from engaging in commercial nurseries or increasing the scale of production. Therefore, 'Inclusive nurseries' not only require financial investments but also a change in social and gender norms, including access to suitable land close to water sources, distribution of household tasks, restricted mobility, and a lack of capital.

**Finally, we would like to conclude with three recommendations.**

Firstly, we would like to invite others to validate the financial model and the underlying assumptions presented in this paper. Promoting record keeping amongst farmers and nursery operators will also lead to more accurate insights.

Secondly, the findings of this research suggest that there is a dichotomy in that larger nursery businesses are more viable, but smaller nurseries are more inclusive and closer to the client. We would like to recommend further research to explore and validate new business models that combine these two existing models and build on the advantages of both systems. For example, a franchise model could combine working with small-scale community nurseries with reaching economies of scale.

Thirdly, we hope that this study provides a renewed impetus for a sector-wide assessment and agenda for action on some of the challenges and opportunities identified in this report. The research shows that nurseries have the potential to be inclusive business opportunities for women and youth. However, for truly inclusive business opportunities, there are a number of preconditions that require systemic change - including transformative changes in social and gender norms and changes in the cocoa seed production and distribution system.





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## ANNEXES

## Annex 1. Research Tools

<b>PROBLEM</b> <i>List your top 1-3 problems</i>	<b>SOLUTION</b> <i>Outline a possible solution for each problem</i>	<b>UNIQUE VALUE PROPOSITION</b> <i>Single, clear, compelling message that states why you are different and worth paying attention</i>	<b>UNFAIR ADVANTAGE</b> <i>Something that can not easily be bought or copied</i>	<b>CUSTOMER SEGMENTS</b> <i>List your target customers and users</i>
<b>CUSTOMER SEGMENTS</b> <i>List how these problems are solved today</i>	<b>KEY METRICS</b> <i>List the key numbers that tell you how your business is doing</i>		<b>CHANNELS</b> <i>List your path to customers (inbound or outbound)</i>	
<b>COST STRUCTURE</b> <i>List your fixed and variable costs</i>		<b>REVENUE STREAMS</b> <i>List your sources of revenue</i>		

Figure 2. Lean canvas (Source: Leanstack)

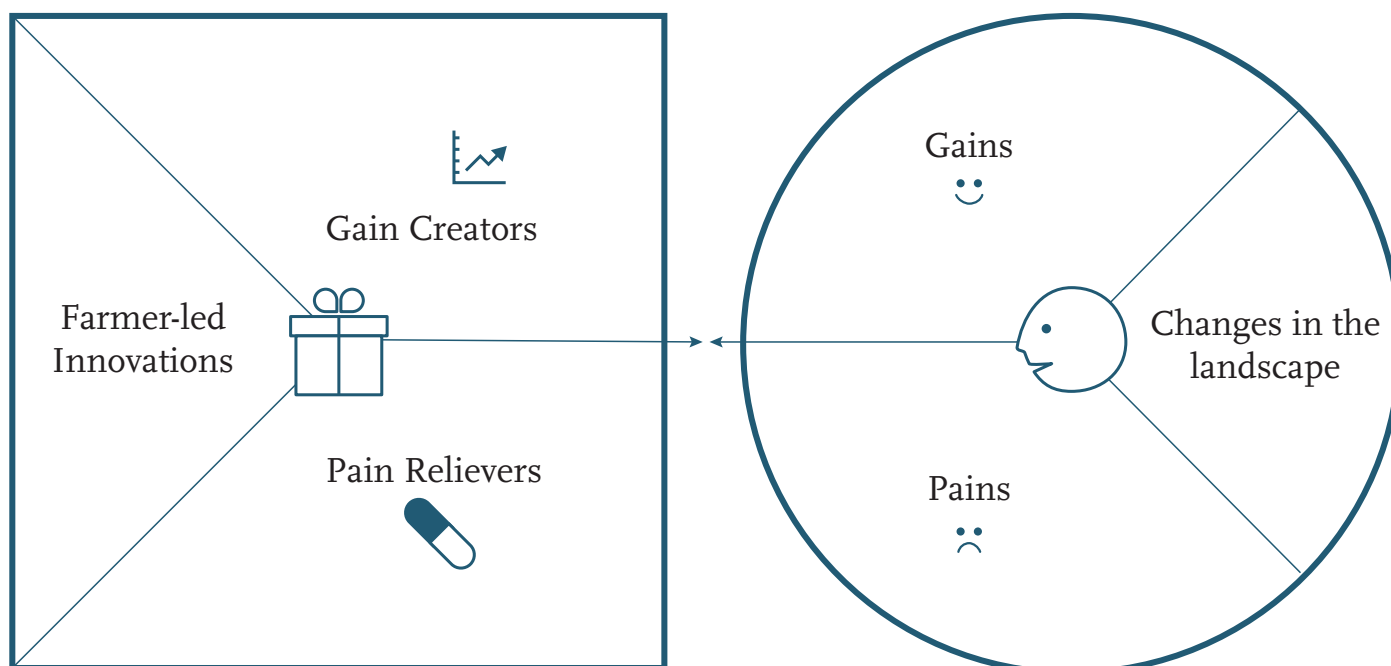


Figure 3. Value proposition canvas (Source: adapted from Strategyzer)

## Annex 2: Assumptions

Value	Assumption
<b>Variable costs (inputs)</b>	
Seeds	Based on average number of seedlings/pod = 35 NO1: gets pods for free NO 2: buys 172 pods (=6,000/35) NO 3: buys 857 pods (=30,000/35)
Transport of seeds	Based on 60 GHC for 6,000 seedlings NO1: 20 GHC NO2: 60 GHC NO3: 300 GHC
Polythene bags	Based on 100 bags/5 GHC NO1: 100 (=2000*0.05) NO2: 300 (=600*0.05) NO3: 1500 (=30,000*0.05)
Potting medium	Based on 70 GHC for 6,000 seedlings NO1: 35 GHC (=70*0.5) NO2: 70 GHC NO3: 350 GHC (= 70*5)
Fertiliser	Based on 1L for 6,000 seedlings NO1: 1/3 L for 10 GHC NO2: 1 L for 30 GHC NO3: 5L for 150 GHC
Pest and disease control	Based on sprays (50 GHC per spray for 6,000 seedlings) or litres (40 GHC per litre for 30,000 seedlings). NO1: 1 spray for 25 GHC NO2: 1 spray for 50 GHC NO3: 2 L for 80 GHC
<b>Variable costs (labour)</b>	
Costs of casual labour	Casual labour costs 30 GHC per day. Some activities (filling and planting of polybags) are based on a fee per number of bags filled, leading to a daily fee of 15 GHC.
Estimate number of days per activity	Overall, the figures for labour are most diverse or incomplete and therefore difficult to estimate. Assumptions are based on a few figures and estimated per ratio for the others (based on number of seedlings produced).
Filling polybags with growth medium	5 GHC per 100 bags filled. They fill 300 bags per day for 15 GHC. NO1: 7 days for 15 GHC NO2: 20 days for 15 GHC NO3: 100 days for 15 GHC
Planting	Filling 500 bags per day for 15 GHC. NO1: 4 days for 15 GHC NO2: 12 days for 15 GHC NO3: 60 days for 15 GHC



Fertiliser application	Daily fee of 30 GHC for casual labour NO1: 1 day for 30 GHC NO2: 1 day for 30 GHC NO3: 3 days for 30 GHC
Spraying	Daily fee of 30 GHC for casual labour NO1: 1 day for 30 GHC NO2: 1 day for 30 GHC NO3: 3 days for 30 GHC
Weeding	Daily fee of 30 GHC for casual labour NO1: 2 days for 30 GHC NO2: 2 days for 30 GHC NO3: 10 days for 30 GHC
Digging of soil to fill polybags	Daily fee of 30 GHC for casual labour NO1: 4 days for 30 GHC NO2: 8 days for 30 GHC NO3: 16 days for 30 GHC
Perforation of polybags	Daily fee of 30 GHC for casual labour NO1: 1 day for 30 GHC NO2: 3 days for 30 GHC NO3: 15 days for 30 GHC



Variable costs (watering)			
Number of weeks watering is needed	The average number of days of rain in the Ashanti region per month is listed below (World Bank, 2021). The data is based on the period of 1991-2020. Based on the millimetres of rain, we estimate that the average number of weeks that watering is needed is 24 weeks.		
	Assumption of number of week watering needed per mm rain: 0-40 mm: 4 weeks 40-80 mmm: 3 weeks 80-120 mm: 2 weeks 120-160 mm: 1 week 160+ mm: 0 weeks		
	Therefore, we assume that on average, 21 weeks of watering is needed. The number of week watering estimated by the nursery varies between 10-24 weeks.		
	Month	Millimetres	Average number of weeks watering needed
	January	13.3	4
	February	48.0	3
	March	93.7	2
	April	138.5	1
	May	166.3	0
	June	184.6	0
	July	126.8	1
	August	88.7	2
	September	145.3	1
	October	161.2	0
	November	57.8	3
December	21.8	4	
Total (year)	1246.1	21	
Costs of watering	Watering is done twice a week for 30 GHC per week, when it doesn't rain. NO1: 30 GHC per week NO2: 30 GHC per week NO3: done by 2 people so 60 GHC per week		
Fixed costs			
	Quantity	Price	Depreciation
Cutting and transport of palm fronds	n/a	0 GHC per day, as it included as family labour (as mostly reported)	Yearly renewed (1)
Pillars for shading structure	Only total prices provided	Smallest price mentioned used for NO1, mid-price used for NO2, largest price mentioned for NO3	Own estimate: same as maximum value (10)

Fixing of pillars	Smallest quantity used for NO <sub>1</sub> & NO <sub>2</sub> ; largest quantity used for NO <sub>3</sub>	0.30 GHC per day for hired labour, as it is included as hired labour (as mostly reported)	Own estimate: same as maximum value (10)
Fence	Own estimates. Smallest quantity used for NO <sub>1</sub> , mid-quantity used for NO <sub>2</sub> , and largest quantity used for NO <sub>3</sub> , relative to seedling production	Mean value of 6	Maximum value (10)
Pickaxe	Own estimates. Smallest quantity used for NO <sub>1</sub> , mid-quantity used for NO <sub>2</sub> , and largest quantity used for NO <sub>3</sub> , relative to seedling production. For NO <sub>2</sub> quantities are only increased for those items with a difference between NO <sub>1</sub> and NO <sub>3</sub> .	Mean value of 5	Maximum value (10)
Measuring tape		Mean value of 2	Own estimate (4)
Nylon ropes		Mean value of 4	Own estimate (1)
Spade or shovel		Mean value of 7	Maximum value (10)
Rake		Mean value of 2	Own estimate: same as maximum value (10)
Trowel		Mean value of 1	Own estimate: same as maximum value (10)
Watering can		Mean value of 6	Maximum value (8)
Water hose (rubber pipe)		Two very different values were given: 55 and 250. We assume the lower value.	Own estimate (1)
Wheelbarrow		Mean value of 5	Own estimate: same as maximum value (10)
Scissors		Mean value of 5	Own estimate: same as maximum value (10)
Wellington boots		Mean value of 6	Maximum value (2)
Knapsack sprayer		Two very different values were given: 110 and 300. We assume the lower value.	Maximum value (2)
Discount rate	In addition, we use a discount rate for NO <sub>1</sub> & NO <sub>2</sub> because of the assumption that they may not have all equipment that is listed. It is also possible to rent or borrow equipment from others, or farmers may already own some of the equipment for their farms. Discount rates are: 50% for NO <sub>1</sub> & 75% for NO <sub>2</sub> , and 90% for NO <sub>3</sub> .		
Scenarios			
Mortality	Average mortality of all is 8%, then, Average mortality of all below 8% is 5% Average mortality of all above 8% is 12% These are the three values we use for the pessimistic, average, and optimistic scenario.		

## Annex 3: Ladder of Power and Freedom

**Women** define power as having total control and authority over everything they do without the interference of others. Power is exercised by people based on their money, position and educational level. For example, leaders are powerful, but parents are as well because they are responsible for their children's well-being. Freedom means that they have the liberty to take their own decisions and do what they want.

**Step 5.** The respondents perceive women who are heads of their households, make their own money and make all decision for their households as being on Step 5. In addition, women who are rich, educated and dress smartly, but are not arrogant, are on Step 5. The indicate that a married woman with an understanding husband can also be on Step 5. Furthermore, the respondents revealed that marriage and religion may prohibit many women to 'even be on the ladder of power and freedom', because they need permission for their husband before going out of the house. The respondents identified a female commercial nursery operators as on Step 5 because she is rich, makes her own decisions and she has an understanding husband. In addition, they identified a COCOBOD extension officer as on Step 5 because of her education and high-profile job where she earns a lot of money.

**Step 3.** Most respondents agreed that the average women is op Step 3 because they have some financial liberty. However, they cannot make significant decisions on their own because they are married, do not have adequate resources and financial stress. For married women, husbands have the final say in anything they do, including their occupation and finances. However, most single women do not have jobs and do not have the money to be on a higher Step. Women on Step 3 are involved in nurseries but not a commercial basis as they would require support from their husbands. However, they can also support their husbands through their involvement in farming. In addition, they mentioned time as a limiting factor to move up the ladder because they have to balance their house chores with their farm work. Even though they have their farms, they are usually smaller which allows them to balance farming with their home duties. Women that own a piece of land can work harder to move to the top of the ladder.

**Step 1.** The respondents indicated that some women in the community are on Step 1, who are classified as lazy, aged (70 years and older), or suffer from a terminal disease. Their power and freedom is often in the hands of their family members. In addition, they indicate that women who are in prostitution are under the control of those men she is doing business with. Some married women who depend on their husbands for everything in their lives are also in this group. In one of the FGDs, the women indicated that four out of five women are on Step 1 because they do not have power, freedom and money, while only one woman they know is on Step 5 and very few are on Step 3.

**Young men** define power as having control over others or things, while freedom is having the right to make choices and do whatever they want. They indicate that someone that is older than you has power over you. In addition, people with education or leadership positions have power. Parents also control their children but they will be free from parental control when they grow up.



**Step 5.** The describe young men at Step 5 as those who are married and have kids, control their family, and control the money they make. In addition, some add that those with a house, a farm and a family at Step 5. The respondents indicated that there is no youth at Step 5 because they often stay at their parents' house and have no money. Youth who are under the control of their parents are not free. Youth who are 'out of control' decide on most decisions in their lives, but their lifestyle does not show power. In addition, sharecroppers cannot be at Step 5. The young men identified a female commercial nursery operator at Step 5 because she is 'a forceful and hard-working woman' who has money and power in the community because elders invite her during meetings where decision are made. In addition, she has a farm and does not depend on her husband for money. Overall, the place nursery operators at Step 5 because they help other farmers in the community by giving them some free seedlings.

**Step 3.** According to the young men, most of the young men in the community are on Step 3 because they believe they have the freedom to make certain life decisions but do not have total control over their lives. They mostly work on family lands or other lands and do not have their own houses even though they might be married. However, they go to school, take labouring jobs earning their own income and can decide how the spend it. For example, they are acquiring lands, getting married and building their own houses. Example decisions that are made for them by their parents include what food to eat at home and whether or not take a girlfriend. They indicate that when they would stop listening to their parents they will stop to care or provide for them.

**Step 1.** Young men identify young women on Step 1 because they depend on them for money and decision-making. In addition, young men on Step 1 are those who cannot have control over anything and depend on others for their livelihood. For example, children depend on their parents for life decisions, even by law. Usually, those at Step 5 received support from others to move up the ladder, e.g. in the case of parents supporting their children or landowners giving land to sharecroppers.

**Young women** describe power as having control over what they have or what they do. Power also means the ability to protect and control others or things. Power is given to people depending on money, skills or education. Freedom is the ability to do whatever they want, by their own time, and with their own resources - without control or hindrance from anyone else.

**Step 5.** Young women on Step 5 have the ability to get themselves a job, work hard for a high and secured income and have control over their own lives. The respondents did not recognise any young women on Step 5. Young women who are not married are under their parent's care, are financially dependent and cannot cater for themselves. In addition, married women are suppressed because they are expected to submit to their husbands. Some respondents argued that married women can only be on Step 5 if 'piece exists between them and their husband'. Others mentioned that married women cannot reach Step 5 because their husbands control them, denying them their freedom to make even simple decisions (e.g. what to wear). Overall, respondents mentioned marriage, religion and social rules as factors that hinder young women to climb the ladder. Social rules dictate that women should do household chores, while young men are out labouring to get their own money. In addition, for those that earn money, the level of dignity of the job determines the position on the ladder. For example, women who sell their body to men cannot be at Step 5, no matter how much money she earns. Youth that could be considered for Step 5 are engaged in jobs such as farming, trading, or small-scale gold mining.

**Step 3.** Some young women identified themselves as on Step 3 because they have jobs (e.g. trading vegetables and second-hand clothing or sewing) which gives them some income. However, their position at the ladder depends on the stability of their incomes. Jobs available for young women include breaking cocoa pods, cleaning for food vendors, assisting at a commercial nursery – however, they indicate that they are paid less compared to jobs available for young men. On the other hand, some respondents indicated that a lot of young women are into farming which provides them with long-term money. Some women argued that education does not matter, and that the position on the ladder only depends on money. Others identified education as important opportunity to climb the ladder.

**Step 1.** Some respondents argued that most young women in the community are on Step 1, because they are held back by dependency on their families and young men. In addition, they indicated that young women are below young men on the ladder because men choose to engage in farming and have the strength to do labouring jobs. However, in another FGD, young women indicated that youth at Step 1 are only school drop-outs, ‘who smoke and show negative behaviour’, which impacts the community negatively. Lastly, the other FGD indicated that nobody in the community is on Step 1, except for children, especially those who are orphans or overly controlled by their parents.

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