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Agricultural Policy Research in Africa



THE STRUGGLE TO INTENSIFY COCOA PRODUCTION IN GHANA: MAKING A LIVING FROM THE FOREST IN WESTERN NORTH

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ACRONYMS

COCOBOD

Ghana Cocoa Board

EXECUTIVE SUMMARY

Since cocoa began to be cultivated in the 1880s in southern Ghana, it has created jobs, incomes and prosperity for the many farmers growing the crop. Until recently, cocoa farmers could make use of highly favourable conditions when clearing forests to plant cocoa. They needed to do little other than plant seedlings then wait to harvest the pods. When trees aged, or soil fertility declined, or swollen shoot viral disease attacked the trees, they could abandon the old groves and move to establish new stands of cocoa in virgin forests. Over the decades, the frontier for new cocoa farms moved west across the country.

By the 2000s, however, the last available forests in Western Region were being taken up and the frontier closed. With no new land available for cocoa, farmers would need to maintain and renew their groves to preserve their incomes, and to intensify production if they wanted to earn more from cocoa. At the same time, farmers faced increasing attacks from pests, fungi, parasites and the deadly threat of swollen shoot – while their trees aged and needed replanting.

When we interviewed farmers in Juaboso District of Western North Region in late 2019, their accounts of cocoa farming were dominated by these technical challenges and their responses to them. For many of the problems they faced, solutions are known – although when it comes to chemical control of pests and fungi, questions arise over the environmental consequences of the heavy and repeated use of chemicals. The main exception appeared to be swollen shoot viral disease for which the remedy of destroying affected trees, sterilising the soil, and replanting (preferably with resistant stock) was both costly and, even then, there was no guarantee the disease would not return.

Farmers, however, struggled to meet these challenges, even the ones for which remedies existed. To some extent this was as a result of a lack of technical knowledge, including the ability to discriminate among the profusion of chemicals on offer in markets, some of them of dubious quality. More important, many farmers were chronically short of capital to pay for inputs and labour when needed in their cocoa groves. In the past, cocoa farmers had few other demands on their cash

incomes, but by the late 2010s school and education fees, medical bills, and paying for items that have become necessities, which formerly were absent in the villages – mobile phones, electricity, etc. – pre-empted funds for farming. Many farmers thus under-invested in their cocoa, weeding less than needed, spraying less frequently, leaving mistletoe uncut, accepting that they would harvest fewer pods as a result.

Some farmers were especially unfortunate: those hit by accidents and ill health – with costly bills to pay, those too old to work on their farms. Their farms might then be partly abandoned with pitiful yields, if any at all. They faced a poverty trap.

Formal (and informal) credit was scarce. Purchasing clerks might make some small cash advances, labour gangs might wait for payment after harvest, but these arrangements fell well short of meeting the credit needs of farmers.

It is still possible to making a living from cocoa. Indeed, a well-managed cocoa farm where working capital was available to pay for inputs and labour, might generate returns equivalent to US\$20 for every day worked on the farm. But for this to be a prospect for most farmers, two things would be necessary. One, the farmers need better advice on technical responses to the challenges they face. More spending on extension may well have a high return. Two, farmers need more access to working capital. This should be possible, through value chain arrangements – it should be possible to inject finance through the buyers to the growers, growers who have to sell to buyers and can then repay advances.

Our study also revealed the travails of older farmers who can no longer work, and of those who suffer from ill health and accidents. They have little support, but their suffering calls for a remedy. Some form of social protection – mutual funds, insurance, pensions (perhaps funded by a levy on cocoa sales) – could make a difference.

If progress can be made towards overcoming these challenges, the future of cocoa can be as bright as it has been so often in the past.

1 INTRODUCTION

Cocoa farmers in Western North Region, Ghana face a quiet drama. Their livelihoods depend heavily on cocoa. Local conditions are well suited to the crop. High quality cocoa, much demanded on world markets, can be grown.

Although cocoa can potentially provide decent livelihoods for current and future farmers in Western North, to do so, a double challenge, partly technical, partly economic and political, must be overcome. To understand the twin challenge, appreciating the history of cocoa growing in Ghana helps. The rest of this introduction summarises that history before setting out the aims of this paper.

1.1 A brief history of cocoa in Ghana

Cocoa has been grown in Ghana since the 1880s. From the first few farms planted in Akwapim with seedlings brought to Ghana from Fernando Pó, cocoa farming spread quickly. Farmers from the Akwapim ridge descended into the forested lowlands of Akim Abuakwa to the north and planted large areas to cocoa. The first exports of cocoa were registered in 1891. By 1895, 13t were exported, rising to 5,093t by 1905, to 22,629t by 1910, and to over 50,000t by 1914, when total export value was over £2 million (Hill, 1963) (Figure 1.1).

Cocoa created unprecedented cash incomes for farmers and labourers, plus export revenues for the administration of the Gold Coast – largely run by indigenes from the early days of British occupation. Cocoa incomes and cocoa taxes allowed private and public investments in houses, schools, health posts, universities, railways and roads. The early development of cocoa in Ghana is a remarkable story of indigenous capitalist development led first and foremost by the initiative and enterprise of the farmers from Akwapim (Hill, 1963).

Cocoa growing continued to expand until the mid-1930s – with exports (Figure 1.1) surpassing 300,000t in 1936 (Green, 2017, quoting Austin, 2014). In 1936 swollen shoot disease broke out in Eastern Region leading to widespread death of trees. The price of cocoa on world markets also fell in the 1920s and 1930s, in real terms to a quarter of what they had been (Figure 1.2)

This, however, did not reverse the growth of cocoa farming. Parts of Ashanti Region further north and west of Akim had already been planted by migrants from the cocoa heartland of Eastern Region. Swollen shoot in Eastern meant that the lost groves were replaced by the establishment of new groves in Ashanti and Brong-Ahafo.

When next it became profitable to grow the crop, as prices rose in the 1940s (Gilbert, 2012), new land in virgin forest further west was planted to cocoa. The cocoa frontier moved further west, reaching the high forest of Western Region in the 1950s and 1960s.

Further shocks to cocoa arose in the 1970s when gross mis-management of the economy, with a massively overvalued Ghanaian cedi, and a heavily-staffed and overly-costly Ghana Cocoa Board (COCOBOD), combined to reduce the effective price to cocoa growers to derisory levels. Some farmers were able to headload their cocoa across the borders to Côte d'Ivoire and thereby get a decent price, but most lived too far from the border to do this.

Economic reforms from 1983 onwards under President Rawlings saw the Ghanaian cedi devalued, the macroeconomy stabilised, and the staffing, operations and costs of the COCOBOD much reduced. Farmers were once again offered a price that made cocoa worthwhile. As cocoa revived, yet again the frontier pushed west, into the remaining forests of Western Region. Here chiefs still had forest land they could allocate to locals as well as to incomers, 'strangers', seeking to open new cocoa groves.

Within a decade production had recovered to previous highs and subsequently have increased with the tonnage of all cocoa products – beans plus butter, paste, powder – reaching almost 900,000t in the late 2010s.

Increasing cocoa production simply by opening new farms in the forest could not continue for ever. With part of the forest designated as reserves, by 2000 the frontier was closing in the high forest of Western Region: by 2010 few new lands could legally be developed. By 2019 when this study took place, the frontier had been closed.

Cocoa, that had been developed largely by extending the cultivated area since the 1880s, would henceforth depend on intensification if production were to increase.

1.2 Aims of this paper

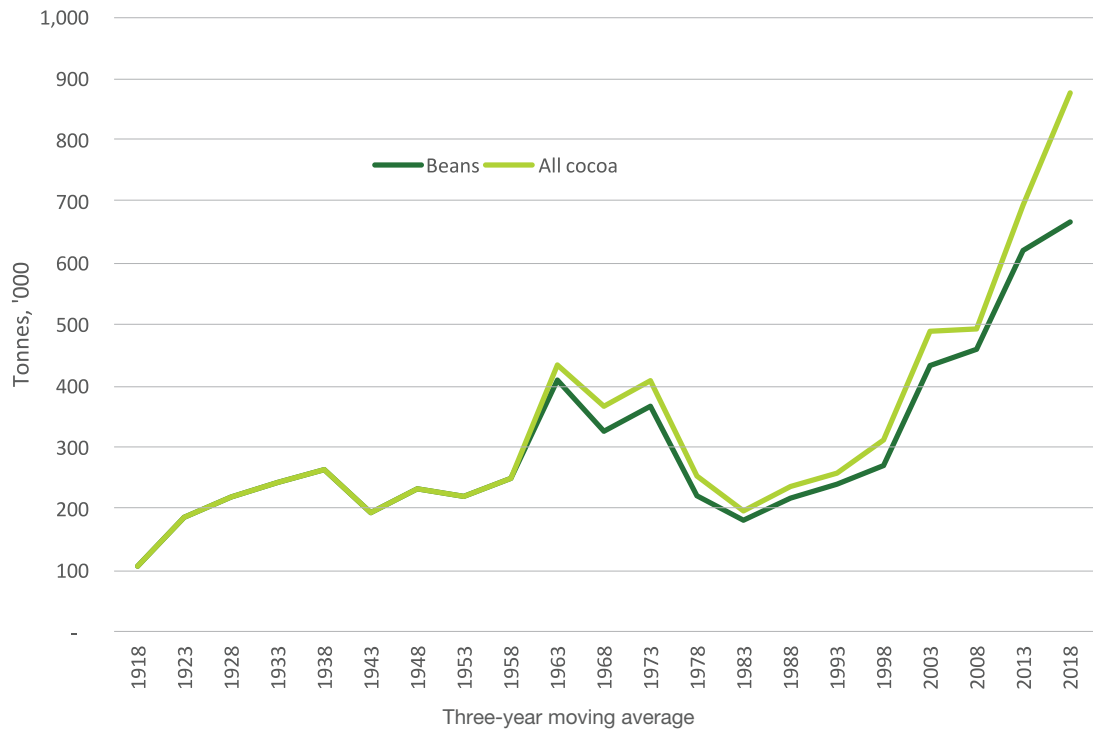
The 2010s were a pivotal moment for cocoa farmers. An enterprise that had, since the 1950s, created new livelihoods for succeeding generations of cocoa farmers by extending the planted area, would depend on intensification for further progress. Moreover, the very sustainability of existing cocoa farms faced rising threats from pests, diseases and in some cases, from loss of soil fertility.

This paper has two aims:

- to set out the challenges, technical and economic, facing the farmers of Western North Region in the late 2010s, their perceptions and responses to them; and,
- to assess the implications for the continued growth of cocoa growing in the region and for the future livelihoods of cocoa growers.

The next section describes the methods and data used to inform this study. Findings then consist of the technical challenges faced, and the economic and political dimensions. The conclusion discusses the implications.

Figure 1.1 Exports of cocoa from Ghana, 1918 to 2018



Source: Authors' own, using data from Hill (1965) for averages over five years from 1916/20 to 1956/60; thereafter three-year moving averages taken from FAOSTAT data

2 METHODS AND DATA

Within Western North Region, five communities in Juaboso District were chosen: Juaboso Nkwanta, Abrokofe, Boizan, Aferiwa and Antobia (Figure 2.1). Juaboso-Nkwanta and Abrokofe were chosen for in-depth analysis: the former because it is a long-established market centre on the main regional highway; the latter because it represents communities less well connected and more rural.

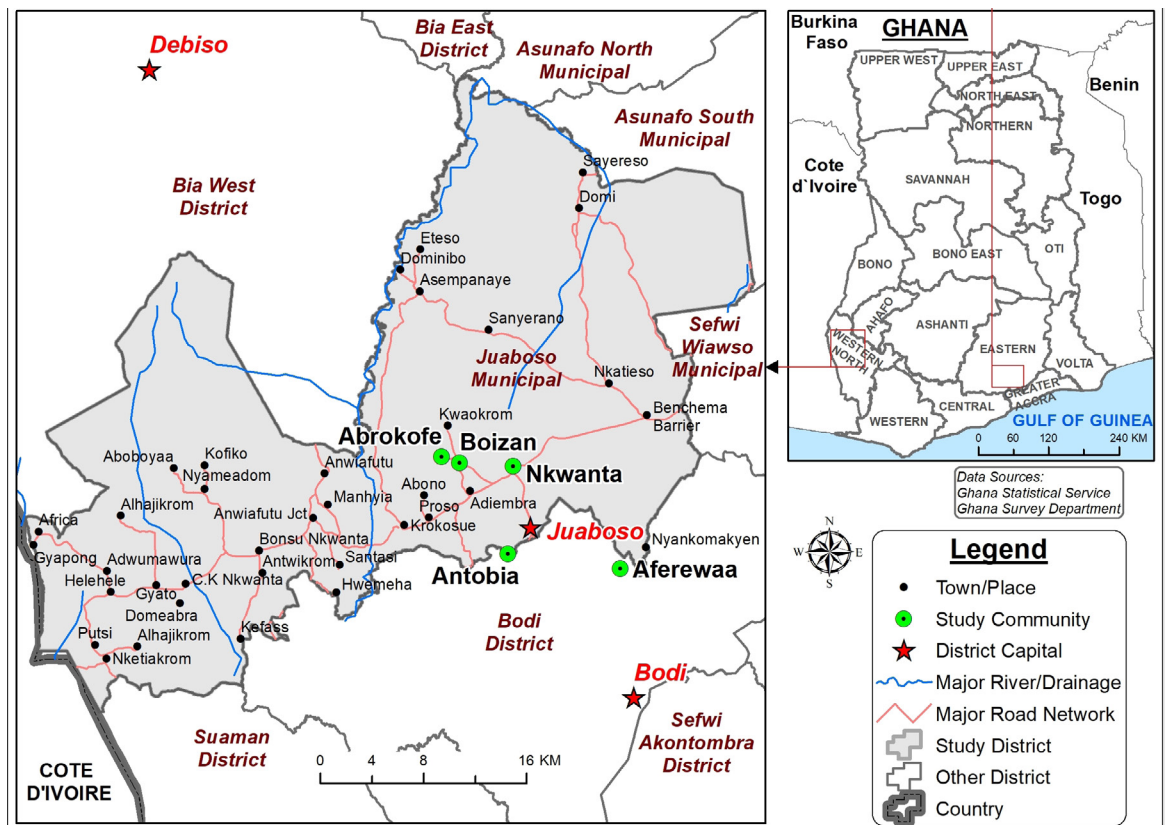
A reconnaissance of the area took place in May 2019 to outline the issues facing cocoa farmers. Four focus group discussions, two interviews with chiefs, and ten in-depth interviews were carried out in Juaboso Nkwanta and Abrokofe.

The full study consisted of qualitative investigations during which semi-structured interviews were carried

out with 54 farmers, five cocoa labourers, two chiefs, four cocoa purchasing clerks, and two cocoa extension officers. Nine focus groups of cocoa farmers, differentiated by men and women, adults and youth, were held. The life histories of 14 senior farmers, five women and nine men, were compiled. In addition, to establish local history, we also reviewed the literature.

A household survey was also conducted. A structured questionnaire was used to collect largely quantitative data from the five farming communities. Systematic sampling was used to select 276 farmers. Trained enumerators and their supervisors walked from one end of the community to another and selected houses that participated in the study, using the sampling interval.

Figure 2.1 Study communities



Source: © Ghana Statistical Services, adapted by authors

3 FINDINGS

3.1 Technical challenges

Cocoa can grow well in newly-planted forest land. All that is required is to clear the forest – although some trees are commonly left to shade the cocoa seedlings – plant cocoa seeds or seedlings, weed the cocoa groves, then when the cocoa trees mature from three or more years onwards – depending on the variety – harvest the pods, break them to extract the beans, ferment and dry the beans. While cocoa saplings grow, food crops such as plantain, cassava and cocoyam can be planted among the seedlings until the trees grow large enough to establish complete cover. Hence a mature grove of cocoa can require little more than weeding and harvesting.

That has usually been the experience for cocoa planted on new land. Over time, however, more has to be done to counter falling soil fertility, and rising incidence of pests – above all capsids (mirids) and stem borers (fungi) – above all black pod – infestations of mistletoe, and viral diseases. Left unattended, these problems will reduce yields, while swollen shoot viral disease will kill the trees completely.

To maintain yields, farmers must defend their cocoa trees – and that requires technical knowledge and skill, increased labour time, and buying agro-chemicals. If the virus strikes, then groves need to be cut down, sterilised and then replanted.

Innovation is not only defensive. Research has been undertaken to develop varieties of cocoa that yield more, that begin to yield at as early as three years, and that have some resistance to pests and diseases. The effects of shade trees, planting densities, fertiliser application, and effective defences against pests and diseases have also been researched.¹

The technical challenge for farmers in Juaboso is thus to adapt research findings to suit their farms, to invest and innovate so that although they work longer and

spend more, the returns more than compensate them. Table 3.1 presents an overview of the innovations that have been developed to adapt to the technical challenges, and qualitative assessment of the cocoa farmers' adoption of the innovations.

3.1.1 Improved varieties and planting

The Cocoa Research Institute of Ghana has, since the introduction of the first cocoa variety, engineered newer hybrid varieties to resist disease and raise yields. From the survey results², 92 per cent of farmers reported their trees to be hybrids, 9 per cent reported Amazonia and less than 2 per cent stated their trees to be Amelonado (Tetteh Quashie variety).³

'Many farmers cultivate the hybrid variety. I think the varieties we cultivate have been performing well. We still have some varieties of the Amazonia in the system but currently we are cultivating the hybrid. So those who cultivated cocoa five years ago and got the seeds from us used the hybrid seeds. Some of the farmers sometimes take the pod from the trees of other farmers when they see how the farm is improving but this comes with the danger of transferring diseases from that farm and many of the new trees will die in less than 10 years.'

(Interview: extension agent, Juaboso, 2019)

Many farmers, who do not replace the entire farm at the same time, tend to have all three varieties but certainly very little of the old varieties as newer (hybrid) varieties replace them. New farms and replanted plantations are populated with new varieties through the state support of providing free seedlings or pods for propagation. These state initiatives matter, according to focus groups, because replanting is costly and without the offer, farmers would simply use seeds from selected pods, irrespective of the variety.

1 What is now the Cocoa Research Institute of Ghana was established in Tafo in 1938.

2 From here on, mention of farmers using or adopting a practice are derived from the survey of 276 farmers in Juaboso.

3 The fraction sum to just over 100 per cent because a few farmers reported having multiple varieties.

'I had to cut down all the trees on the first farm which had the Tetteh Quarshie variety because it got to a point where the farm got destroyed. So, we started afresh and cultivated Amazonia on that farm in the 1980s. The Amazonia often matures and starts yielding within three to four years after planting. We used to have coffee here which matured even before the cocoa did but it was [more] tedious managing the coffee farm than the cocoa, so I gradually replaced it

with cocoa. I have given my first cocoa plantation to my children who helped me to replant it.

I worked on the second farm which had the Amazonia variety from 1966 to 1986. We used to pay for the cocoa pods and seeds, unlike today when the state is giving them out for free. I have, since the 1990s, been receiving seedlings or pods from the extension or the seedling multiplication centres.'

Table 3.1 Overview of innovations and cocoa farmers' adoption of the innovations

Innovation	Rationale	Adoption in Juaboso
Improved varieties – hybrids developed by the Cocoa Research Institute of Ghana	Hybrids mature early, three to four years, higher yields, disease resistance – although farmers question this	92% claim to use hybrids, although 66% report that their seed came selected from local farms, rather than seedlings from COCOBOD nurseries.
Planting seedlings in rows with strict spacing to replace broadcasting of seeds (<i>atodwe</i>)	Even growth of trees. Optimal spacing of trees for high fruit yield (450 trees/acre – 1,200/ha) Regular rows facilitate spraying, weeding and pruning.	82% plant seeds, not seedlings. 66% get seeds from local farms. Farmers like broadcasting seeds (<i>atodwe</i>) because it guarantees complete population of trees of same age
Chemical fertiliser	To boost yields, to counteract falling fertility of former forest soils.	93% do not use fertiliser. Most believe their soil to be fertile. Only 12% believe their soil to suffer from poor fertility: 21% see soils as middling fertility; 67% report high to very high fertility. Farmers, however, notice falling soil fertility, but some claim fertilisers harm crops, especially yams.
Chemicals to control pests	Insects attack both leaves and stems of trees. Mirids (<i>capsidae</i> , <i>Akate</i>) are seen as most harmful. Insects tend to migrate from cleared forest to cocoa.	A government mass spraying strategy is freely available. 96% spray against insects. A free market in chemicals means that poor quality and fake inputs are available.
Chemicals to control fungi	Black pod (<i>asukuo</i>) is the main threat.	96% spray against fungi.
Cutting of mistletoe	Mistletoe (<i>nkranpan</i>) deprives trees of nutrients.	Pruning machines and formation of pruning gangs are provided by the Cocoa Health Extension Division office. Most farmers report that they cut mistletoe from their trees.
Cut out and replant to counter swollen shoot	Swollen shoot virus (<i>sosobro</i>) is transmitted by infected mealybugs, and kills trees. The only treatment is to cut infected trees and those close by, sterilise the soil, then replant with clean material. There is some, but not complete resistance, bred into hybrids.	Farmers are reluctant to see their groves cut, preferring to keep their trees while they still yield – but this then allows transmission from infected trees to those that are still healthy.

Source: Authors' own, using interviews with farmers and adoption rates from APRA's household survey

(Interview: 78-year-old male farmer, Juaboso, 2019)

Most farmers claim to have started growing the hybrid variety from around the early 2000s, most preferring it to earlier varieties.

'I plant the hybrid or 'Abrewa bedi' variety. That variety is good. If you get a good land then it starts bearing in three years.'

(Interview: 45-year-old male farmer, Juaboso Nkwanta, 2019)

Some farmers preferred hybrids because they bore fruits within three years – an incentive when engaging labourers who are entitled to proceeds within the first four years of production before the farm is shared.

'*Abrewa bedi* means the 'old lady will eat' referring to the early income the hybrid variety enables through early maturity, and because the trees are smaller than older varieties, land between trees can grow food crops for longer since the canopy closes later than older varieties.

'I prefer the Agriculture (hybrid variety) because it is easy to manage. There could still be food crops on the farm and the cocoa will start bearing fruit. We space out when planting so it bears well.

Now people do not cultivate large acreages, the land is even finished.'

(Interview: 90-year-old female farmer, Juaboso Nkwanta, Nov. 2019)

'I plant a mixture of the hybrid and Tetteh Quarshie, but more of hybrid. The hybrid bears more fruits than the Tetteh Quarshie.'

(Interview: 42-year-old male cocoa farmer, Abrokofe, 2019)

Farmers, however, could see disadvantages with hybrids, including the premature death of cocoa trees which they blame on excessive use of agrochemicals and poor quality of soils:

'Most farmers have lost their farms planted with a new cocoa variety as a result of the cocoa trees dying off prematurely. People have cited various reasons for this misfortune; some say the problem has to do with the soil and then others also say it is the excess application of fertilisers on the farm.'

(Interview: 70-year-old male cocoa farmer, Antobia, 2019)

'My grandfather was above 100 years before he died and his cocoa farm is still functioning. However, the agriculture (hybrid) type of cocoa that I planted has not been long, just from early 2000s, most of the cocoa trees have started dying and I have to replant new ones.'

(Interview: 40-year-old male farmer, Juaboso Nkwanta, 2019)

'In the past cocoa farms used to have a longer lifespan as compared to now and I honestly do not know what is causing this. I am saying this because my grandfather's cocoa farm which he had cultivated way before I started mine is still healthy, but my cocoa trees are rather dying off.'

(Interview: 56-year-old male farmer, Juaboso Nkwanta, 2019)

Some farmers believed older varieties of cocoa were more resistant to pests and diseases.

'I think the local (older) variety of cocoa was better than the hybrid breed we are cultivating now because, in those days when our parents were cultivating the local breed, we didn't know of all these diseases that are affecting and destroying our cocoa farms now. I think the hybrid variety came with these various cocoa diseases we are suffering from today.'

(Interview: 52-year-old female cocoa farmer, Abrokofe, 2019)

'It (hybrid variety) is easily attacked by some insects called '*nfote*⁴ that are found in the soil. So we have used an insecticide to get rid of those insects before we were able to successfully plant the hybrid variety.'

(Interview: 70-year-old female cocoa farmer, Abrokofe, 2019)

It is not clear that the new varieties are responsible for pests and disease. Insect attacks rise as the forest is cut back, according to extension staff, causing resident insects to migrate to the cocoa trees.

Farmers tended to plant selected seeds – 66 per cent of surveyed farmers, mostly (82 per cent of farmers) by broadcasting (*atodwe*) rather than at regular spacing.

4 Nematodes.

Atodwe has the advantage of guaranteeing coverage of the plot, with excess seedlings then thinned out.

'I use the '*atodwe*' planting method and the variety of cocoa I cultivate is the hybrid variety.'

(Interview: female cocoa farmer, Abrokofe, 2019)

Many farmers have paid attention to extension advice which is to plant seedlings in regular rows, according to focus group participants, with trees 3m apart.

'I used to sow raw seeds but at some point, I used the nursed seedlings. I visited the Agricultural office once and saw how they were using it so I came back and nursed some myself.'

(Interview: 52-year-old male cocoa farmer, Abrokofe, 2019).

'About 60 per cent of farmers now use the line system of planting. Farmers complain that our recommended planting distance is too wide. The argument that the '*atodwe*' method leads to early canopy coverage which reduces the need for weeding is bad for two reasons. It is very difficult to apply chemicals on farms that the farmer used the *Atodwe* method because you will not even know where you started from. Also, there is loss of the opportunity to grow food crops, when the people are complaining of scarcity of land in the area. But it is easy to work in the lines and know where you have gotten to at any point in time.'

(Interview: extension agent, Juaboso)

Practice can be mixed:

'I mixed planted; I planted the nursed seedlings at a portion of the farm and then the rest of the farm I employed the *atodwe* method.'

(Interview: 54-year-old female cocoa farmer, Abrokofe, 2019)

A younger female farmer explains why she shifted to the new method:

'At first, the land was good so you could use the raw seeds but now it is not like that. The nutrients are depleted, and the birds pick the seed.'

(Interview: 37-year-old female cocoa farmer, Antobia, 2019)

Newer farms tended to employ recommended methods. Farmers with access to state-subsidised

seedlings and seeds were more likely to plant in rows, especially when promised further inputs.

Improved visibility of extension through farm visits provides the morale for farmers to adopt recommended methods, compared to sporadic visits by extension services. Scale also seems to be important in the adoption of new farm methods as smaller farmers find it a waste of time using these methods on less than 0.4ha of replanted surface area, compared to farmers who are replacing larger farms or portions of their farms.

Research on shade trees shows they have merits, although not with complete shade. COCOBOD now recommends retaining or planting ten trees per acre (24 trees/ha) of specific species. Shading prolongs the life of the cocoa trees, promotes better yields, and can reduce insect infestation (Environmental Protection Agency, 2008). In 1890, Sir Hesketh Bell, an officer with West Indian experience, visited the Aburi Gardens and pointed out that the cocoa had been planted on an exposed hillsides with no shade which accounted for its failure (Green and Hymer, 1966). Farmers in the past, however, have been advised – including by non-governmental organisations – to clear trees to allow the cocoa to grow in clear sunlight. Clearance has also been encouraged by the rights to trees being separate from the rights to cultivate, so that trees may be sold to loggers who then invade the cocoa groves and cause damage by felling trees and dragging out the trunks. According to Ruf and Schroth (2004) high yielding hybrid varieties were comparatively tolerant to low/no shade conditions, thereby reducing shade requirements on cocoa farms. This campaign in the early days of the introduction of hybrids, therefore, led to the abandonment of the old practice of shading, recognised long ago as important for cocoa production.

3.1.2 Soil fertility management

Most farmers see their soils as fertile: 19 per cent reported their soils as very fertile and 48 per cent as quite fertile; against just 12 per cent who saw their soils as infertile or infertile (22 per cent thought their soils to be middling fertility). Not surprisingly, then, the survey showed 93 per cent of farmers in Juaboso used no fertiliser at all.

In interviews, however, farmers frequently mentioned falling soil fertility – attributed to declining forest cover, and with no opportunity to fallow the land.

'In the past, we used to get almost one basket full of cocoyam just from one cocoyam plant. But today you can uproot over six plants and not even get half of a basket. The fertility of the land has reduced.'

(Interview: 78-year-old male farmer, Juaboso, 2019)

The government has promoted fertiliser for at least 20 years, partly to compensate for falling soil fertility, but mainly because research trials show good yield response to fertiliser (Asare, 2014). Hence some farmers have started to fertilise their cocoa groves.

'Fertilisers are a recent phenomenon when the government decided to improve land fertility. I was not even using fertilisers in 2000 and that was when I took over my uncle's farm. But it was around that time that I got to know of fertilisers. I had not even seen one before. We joined a group called Abrabopa and they recommended the fertilisers to us and that was around 2012 and that was the first time I sent a fertiliser to my farm.'

(Interview: 78-year-old male farmer, Juaboso, 2019)

Most farmers interviewed, however, were sceptical of the value of fertiliser. Some had tried, but given up.

'I used to apply fertiliser on my farms but I stopped because I realised that was not giving me any benefits.'

(Interview: 56-year-old male farmer, Juaboso Nkwanta, 2019)

Participants in a focus group claimed that fertilisers given to them by the authorities had destroyed their farms.

'The first time I used fertiliser, which is five years ago, my cocoa got damaged. The following year I decided to try another one and it was not of any help to me.'

(Interview: 40-year-old male farmer, Juaboso Nkwanta, 2019)

Chemical fertiliser was also seen to generate other side effects on farms with food crops.

'The fertiliser kills and destroys yams and so if you have yams on your cocoa farm and you go ahead to apply the fertiliser, you will lose all the yams. The yams are very important to me personally so in order not to destroy them, I had to stop applying fertiliser on the farm.'

(Interview: 56-year-old male farmer, Juaboso Nkwanta, 2019)

Farmers, however, reported they liked liquid fertiliser to apply to foliage.

'I do not apply fertiliser on my cocoa farm anymore because some farmers are complaining that the fertilisers they apply on their farms are killing their cocoa trees prematurely.'

I only apply the Sidalco liquid fertiliser on my farm as at now but not the other brands of fertiliser.'

(Interview: 52-year-old female cocoa farmer, Abrokofe, 2019)

It seems that different brands of fertiliser have proliferated on the open market with some either being of a poor quality or not appropriate for the soils in the area and for the crop. Farmers generally praised fertilisers supplied by COCOBOD in the past which they claim are now substituted by poorer open market brands.

3.1.3 Control of pests, fungi and parasites

Cocoa in Western North is vulnerable to insects – shield bugs (*Bathycoelia thalassina*, Heteroptera: Pentatomidae) that attack pods and capsids (Heteroptera: Miridae) that feed on foliage; to fungi and oomycetes principally black pod (*Phytophthora palmivora* and *P. megakarya*); and to parasitical mistletoe (*Tapinanthus bangwensis*).

Chemicals to control insects began to be applied in the 1950s when Akati was distributed by extension officers.

'I used the PP Kum Akati chemical from the agricultural office. The price of a litre was even less than 5 pesewas [5 per cent of a cedi] then. That was around 1956 and when I was harvesting my mother's cocoa. This was the time I started applying chemicals on the cocoa farms.'

(Interview: 78-year-old male farmer, Juaboso, 2019)

Subsequently an increasing range of chemicals, applied by knapsack sprayers, has been used to counter insects and fungi. Some 96 per cent of surveyed farmers sprayed against insects and fungi.

Government policy has also been inconsistent. COCOBOD tried to supply quality chemicals to farmers, but rarely have there been enough to go round. COCOBOD also provided mass spraying services, in which contracted gangs try to cover all farms. Again, resources have been insufficient to cover all farmers and all their farms. Needing to ration these free chemicals and services, distribution has been politicised: chiefs, elders and ruling party cadres get the services, others get little or nothing.

'During the mass spraying exercise, people are hired to do the spraying and these people are usually hired by the party in power. So, there is a task force for that purpose. I have led that task force on two consecutive occasions The supervisor for the sprayers is also part of the party in power.'

(Interview: 78-year-old male farmer, Juaboso, 2019)

'When it comes to spraying, they do it on a political party basis, so it is the supporters of the party in power that benefit the most.'

(Interview: 45-year-old male farmer, Juaboso Nkwanta, 2019)

Just 18 per cent of farmers obtained chemicals for free, and only 14 per cent had benefitted from mass spraying. Almost all (96 per cent) had thus had to buy their chemicals from dealers.

Poor quality and fake chemicals have proliferated.

'When the government was providing the agrochemicals, the ones we got were of good quality. Then with the politicisation of the sharing of the agrochemicals, a lot of companies have infiltrated the system selling all sorts of fake chemicals.'

(Interview: 45-year-old male farmer, Juaboso Nkwanta, 2019)

This has become a headache for extension workers.

'We advise chemical sellers to bring in the only approved chemicals. They know what they are supposed to do but they will not do the right thing because of selfish interests. They want their money and [are not interested in] the farmer's interest. We arrested unapproved chemical sellers initially when I was posted here but I had to stop because I was threatened and my wife advised me to stop.'

(Interview: extension agent, Juaboso, 2019)

Farmers have become confused.

'We, the farmers, do not know anything apart from what they [the State] tell us. So, whatever they bring to us is what we use. Once a new government comes, they change the chemicals for us. When we start applying the new chemical, then the colour of the cocoa changes. That is what is causing these problems.'

(Interview: focus group with male cocoa farmers, Antobia, 2019)

Farmers who once trusted COCOBOD, now query the quality of recommended and distributed chemicals. Procurement by price alone can mean that low quality chemicals are bought.

3.1.4 Response to swollen shoot

Swollen shoot virus (*sasabro*) is a menace to cocoa farmers. Once it infects a tree, the tree will die: no remedy exists. Since the disease was first detected in 1936, the only sure way to counter it has been to cut down the trees, sterilise the soil and any plant matter, then plant with clean seedlings – and try to maintain a gap between the clean trees and any other trees. Even that is imperfect: infected mealybugs that spread the virus may return.

'The swollen shoot is a big disease in the soil so you have to apply a chemical called Fuladan. It is killing a lot of cocoa trees here but when you teach the other farmers they don't listen because you are not an extension officer.'

(Interview: 48-year-old male farmer, Juaboso Nkwanta)

'The main problem is the "cocoa sasabro" or swollen shoot disease. It makes the cocoa shoots turn yellow and the cocoa dies.'

(Interview: 46-year-old male farmer, Antobia)

'Swollen shoot is the disease that often attacks my cocoa farm and this started just about three years ago; the disease causes my cocoa trees to die prematurely.'

(Interview: 31-year-old male farmer, Abrokofe)

'Swollen shoot is the major disease that attacks my cocoa farm. Currently I have seen a couple of my cocoa trees affected by that disease.'

I cut off the affected tree to prevent it from spreading to others; after cutting down the cocoa tree I make sure to plant a new one to replace what I have lost to the disease.'

(Interview: 56-year-old male farmer, Juaboso Nkwanta)

Government policy is to compensate farmers, then enter the farm, cut down the trees, sterilise, replant with clean seedlings and plantain, then hand the replanted grove over to the owner after two years. Once again, however, it seems that resources are scarce, and this does not always happen. Senior farmers interviewed for their life histories reported that if they cut their trees they would have to replant

at their own expense, but they lacked the capital to do so. One elder was indignant that he had cut 11 acres (4.45ha) of infected trees, but the government had never fulfilled its promise to replant.

'I had 22 acres [8.9ha] of cocoa at Juaboso Nkwanta but we have cut down 11 acres [4.45ha]. We were told that if we cut it down, government will provide some compensation and will assist us to replant, but nothing like that happened. I had to replant it myself and if you should see the work I have done, you will be impressed.'

(Interview: 90-years or older male farmer, Antobia)

Consequently, some farmers have been reluctant to cut infected trees, especially in the first two years of infection when some yield can still be had – at the risk of allowing further infection of adjacent trees.

3.1.5 Access to extension services

COCOBOD records cocoa farms, dividing the planted areas into cocoa districts to which it assigns extension officers to work with the farmers to provide advice, to register them for inputs, and to carry out donor-funded mini-projects. In Juaboso cocoa district:

'We have about 25 disease spotters, nine chain saw operators, eight contract technical assistants, 18 extension officers and other administrative staff. Each officer has his/her own operational area. Mine is about 15 communities. The district is divided into 19 operational areas.'

(Interview: technical assistant, Juaboso)

In Juaboso, however, many farmers get little attention.

'No agricultural extension officer has ever visited my farm or given me any education on how to go about my cocoa farming.'

(Interview: 52-year-old male cocoa farmer, Abrokofe, 2019)

Agricultural extension officers visited communities but not the farms and thus not all farmers received direct instruction. Focus group participants claimed that officers were not abreast with what was happening on most farms because they attended only to a few farms – which not only got the advice, but which were also first in the queue for services and free inputs.

With limited means, COCOBOD services were rationed politically. At the time of the study, an extension officer reported that every activity had been politicised so people were unable to express their opinions and

tell the truth about input distribution for fear of being targeted. When COCOBOD was independent, things were done without politicians interfering. Committees to allocate subsidised inputs and other services, however, are now seen as being politicised.

'We have a community task force, which comprises of the chief farmer, the traditional chief representative, unit committee chairman or assembly man, and then the extension officer who is the chairman. The chemicals are sent to the community and given to the task force.'

However, a politician has changed this constitution of the task force to include: the party chairman, party secretary and party organiser. I told him I will not agree to this arrangement, but they reported me to higher levels and are intimidating me ... the DCEs [District Chief Executive] are very influential, some will stop you from doing your job while the good ones will tell you to distribute it to all the farmers and even ensure that the farmers do get it.'

(Interview: extension officer, Juaboso)

Mass spraying was particularly affected.

'... the mass sprayers work directly under my supervision, but they are employed by the party in power. The sprayers will use just a few of the chemicals and you will not know where the rest will go to. A colleague reported a group of sprayers who were misbehaving, but it rather led to his transfer out of the district because the DCE listens to the mass sprayers rather than the extension agents ...'

It is very wrong and one thing is that it is political. The politicians are the cause of all this. The chemicals are not supposed to be given to the farmer to hold on to for the mass sprayers to come for it when it is time to spray the farms. The sprayer is supposed to spray the entire farm even if it is 100 acres [40.46ha] before moving to the next person's farm. ... some people who are not allowing for that political interference to continue are being targeted and punished unlawfully.'

(Interview: extension officer, Juaboso)

Although the extension staff recognised farmers' skills and knowledge, in the best use and safe use of chemicals, farmers were often confused.

'... a chemical came called Regent; the people of Bunso Nkwanta were crying because they said the chemical destroyed their cocoa farms

and it was a wrong information. The usage of this chemical is supposed to be 13ml per load of knapsack, but they were adding 50ml. They were using the cover of the bottle which was 50ml.

Akati global for instance is supposed to be 20ml and I told a farmer to just take one cup of the bottle cover and he remarked that it is too small. And I told him that it is effective even in that quantity and he said that we always want them to measure smaller quantities of the chemicals ...

the practice of mixing chemicals to save on the cost and time of spraying is a major contributor to the destruction of cocoa farms. Many farmers mix liquid fertilisers and insecticides even though we have advised that they apply these separately. Unfortunately, this practice was introduced by some contracted mass spraying teams who mixed Sidalco liquid fertiliser with pesticides, from whom farmers learnt the bad practice.'

(Interview: community extension agent, Juaboso, 2019)

Extensionists reported that they struggled to convince farmers to prune their trees, to plant in rows, and to plant around 450 trees an acre [1,100/ha] – instead of almost double that by many farmers.

In recent years, the extension agents had begun to pay specific attention to women farmers. One said women honoured his invitations every time for training while men had excuses for not being available. The women were then teaching their husbands what they had learned. Women were willing to listen and experiment, while men tended to argue, dismiss innovations, and stick to longstanding practices which they saw as part of a golden age of cocoa in the time of their grandfathers.⁵

3.2 Economic challenges

Farmers repeatedly reported chronic problems in accessing working and investment capital for their cocoa. Disease and pest attacks are increasing, hence the need to buy inputs and commit more labour

to control them is rising. If capital is lacking, farmers can become trapped in a downward spiral in which they spend time and money on their farms to get remunerative yields and, without these, they cannot save money to reinvest in inputs and labour.

The issue is clear in interviews where time and again farmers explained why they could not invest in their cocoa as they knew was necessary. Out of 60 farmers interviewed, at least 16, a quarter, struggled to finance their cocoa farming, investing less than they would have had they had the means. The reasons behind this include several dimensions: the many demands on farmers' incomes; a shortage of labour; the misery of those hit by misfortune; and the lack of formal credit. On the other hand, there were some arrangements that reduce the need for capital.

3.2.1 Demands on farmers' cash incomes

Elderly farmers claimed that in the past they needed little if any cash for daily living. Food came from their own farms, sales of cocoa could pay the bills for (simple) clothing, housing materials, occasional travel and so on.

Times have changed. A decent life in a village now requires more material goods than before. The survey showed that 90 per cent of cocoa households had a mobile phone, 76 per cent a radio, 74 per cent a television, 59 per cent a fan, and 41 per cent a fridge. Electrification of villages – which took place in the 1990s and 2000s – was a boon, it made these items possible and desirable. Such luxuries⁶ would have been very rare in rural Juaboso a generation ago. They all cost money, although not as much as in the past: rural Ghanaians have benefitted from the economies made in manufacturing in Asia.

Cocoa earnings were commonly spent on building and improving housing.

'I have been making blocks to build. I have already built a house in Ebrekrom. Someone stays there as a caretaker. I have also started one at Bekyeman so God willing this year when I harvest, I [will] build that one.'

(Interview: 52-year-old female farmer, Abrokope)

Building houses with cocoa monies was common in the life histories of the elders interviewed.

5 Seniors recounting their life histories recalled readily the hard times of the 1970s. They appreciated the reforms and improvement brought in by President Rawlings from the mid-1980s onwards.

6 A luxury is something that someone can live without. For generations, people have lived without a phone, radio and TV, fridge and fan.

'I didn't attend school so the only thing I know is cocoa farming. Cocoa farming has helped me to build a house. I have also used it to take care of the children's education. I also bought a car using income from the cocoa.'

(Interview: 64-year-old elder, Abrokope)

Schooling was another major and much-felt demand on household cash. Some said paying for schooling was the first call on their cash.

'The school fees are even more [than cash spent on the house]; we deduct the school fees before anything else. So if we realise we cannot get enough, we spend it on school fees and leave the house.'

(Interview: 25-year-old male farmer, Antobia)

'There is no profit that we are making. By the time you sell the cocoa, you would have used the money to sort out bills and debts. You have to eat, the children have to pay school fees, and you have to give them feeding money. In a month just calculate the amount involved.'

(Interview: 50-year-old male farmer, Juaboso Nkwanta)

'I used it to assist them through their school and trade apprenticeship before they all stood on their feet and are now married ... Taking children through school is not a joke. Now I can only thank God that I have been able to take care of all my children, it is God's doing so I give Him praise.'

(Interview: 52-year-old female farmer, Abrokope)

The other major drawdown in cash commonly mentioned was medical bills.

'Because of the health of the children, I couldn't invest any money in business. The same was last year. All the money went into paying medical bills and taking care of the home. The whole of this year I sprayed the farm once. I didn't have money to buy the pesticides. And last year too I sprayed just twice because my child fell sick seriously and I spent a lot of money on hospital bills and medications. So, if not for that, I would have sprayed the farm a number of times ... I cannot buy fertiliser because I don't have money. The small child fell sick and was hospitalized. He even had blood transfusion and that cost me a lot. So I don't have money.'

(Interview: 33-year-old female farmer, Juaboso Nkwanta)

'Another thing I must say is that my late husband suffered a stroke for seven years before his eventual death. As a result we spent a lot of money taking care of him and his medical bills.'

(Interview: 54-year-old female farmer, Abrokope)

'I am suffering from high blood pressure and diabetes and it is getting worse by the day ... So life is now very difficult for us.'

(Interview: 58-year-old female farmer, Antobia)

Medical bills were typically incurred to treat sick children, and to deal with diseases of later life. Few of the latter cases seemed to have been cured, with those affected then less able to work.

3.2.2 Shortage of labour

When elders recounted how they got started as cocoa farmers, they told us how hard they and their spouse had had to work to clear forest and to plant. Lacking cash, they had made extraordinary efforts to plant their farms.

'I did the clearing of the forestland [2.4ha] myself. At that time [1976] there was no source of money per say. I didn't hire labour. I depended on my energy. I climbed trees and cut down trees. I cleared the forestland to cultivate the cocoa. At that time there was limited labour sources. There was no herbicides to even spray the forest. There was also no money to use to hire labour in case you find any. It was my own labour.'

(Interview: 87-year-old farmer, Antobia)

Later in life, they grew old, or became sick (see 3.2.1) and could work much less, if at all, on their farms. The cocoa farm was then either handed over to a caretaker, or else labour had to be hired.

For example, two elderly female cocoa farmers, aged 58 and 65 years in Antobia, told us how at one point they were farming tens of acres of cocoa. But by 2019, both were aging, one was infirm herself, and both had older husbands who were sick and unable to work. With the children long having left for their own farms and jobs, and with little income to pay for labour, their farms had fallen into disuse, with just some food crops being grown.

Shortage of labour mainly affected elderly farmers who could not work themselves, and some young

households where the adults with young children struggled to find the time to produce and to maintain the household, but had little cash to hire in help.

3.2.3 Misfortune

Some farmers had been unlucky: illness and accidents had stopped them from working, and medical bills for themselves or their family had been high. Their stories are heart-breaking.

'In the past, I used to apply chemicals on the farm. But nowadays I don't do that often. Since I fell sick, I am not even able to walk far. So when my son is around, that is when he goes to help me with those things. The whole of this year the farm was sprayed once.

The truth is that the money is coming from the farm. And now that the farm is very weedy and I don't have money to hire labour, it means the money coming from there is reducing. I asked the man to help me clear the weeds, but he disappointed me because I don't have money to pay him immediately. Meanwhile the money will be coming from that same farm. Even if you ask someone to go and spray the chemicals on the cocoa, because of how weedy the farm is, the person will not be willing to go. So, unless I get someone to clear the farm, I cannot apply the chemicals. It is not easy.

I don't know why things have gone this way for me. It is terrible. I had a child who was even selling second-hand clothing. He was involved in an accident and died. It is sad. If I show you my past photos, you will be surprised to see me this way. Sometimes what to eat is even a challenge. But once we have life there is hope.'

(Interview: 68-year-old female farmer, Juaboso Nkwanta)

3.2.4 Credit

Farmers sometimes were able to get credit, mainly from input dealers and from purchasing clerks buying cocoa, who would advance funds on the understanding that the beans would later be sold to them. Such loans are usually limited to the amount needed to buy chemicals. Because purchasing clerks for the buying companies look to attract farmers, small loans are one way to do so.

For the clerks this entails risks. More than one clerk can be found in each village, all competing for farmers. It is easy for a farmer to take a loan from one clerk, then sell to another to avoid repayment.

Although loans from purchasing clerks are quite frequently mentioned in interviews, the survey showed that they are not so common. Just 7 per cent of farmers said they got inputs on credit and 13 per cent reported cash loans from clerks. Gifts at season end were more common, with 23 per cent reporting them. Cash bonuses had been paid to 12 per cent of farmers.

For most farmers, then, working capital came from two sources. One was simply the cash flow from their cocoa earnings retained to pay for inputs and labour in the next season. One farmer budgeted for this:

'You divide the money in three parts, one for children's school [fees], one for cocoa and the other for house upkeep. As I have already indicated, one part of the money is invested in the shop. Two of them have completed secondary school so I have bought Okada [a commercial motorbike] for one, then the last is upkeep, and I put some aside for medicine and labour for the next season.'

(Interview: 56-year-old male farmer, Abrokofe)

The other source was earnings from other businesses, such as small-scale trading, a schoolteacher salary, or artisan earnings.

3.2.5 Arrangements that reduce need for capital

With limited capital circulating, farmers had several ways to defer payments until they had delivered the harvest. For inputs, some got credit from buyers and dealers, as above.

For labour, some gangs – often of young migrants – would weed or harvest on piece rates, taking payment only after the harvest. Few reports were seen to suggest that the trust of the labourers was not repaid when farmers had their cocoa earnings. Indeed, when a gang returned after harvest, community leaders spread the word asking that farmers cancel their debts.

Farmers could also appoint caretakers to farm all or a part of their cocoa groves as sharecroppers. The landlord was expected to provide inputs while the sharecropper provided the labour. At harvest, the proceeds were split one third to sharecropper, two-thirds to landlord (*abusa*). This arrangement, long described in detail in studies of cocoa farming in Ghana, was not that common in Juaboso: just 9 per cent of farmers said they had a caretaker.

Although caretakers would seem ideal for farmers unable to work who struggle to pay for labour, caretakers were harder to find than in the past. Fewer young male migrants come from the north of Ghana, because northerners increasingly look for informal jobs

in cities, and some are still in education. Those that do come to Sefwi look askance at taking on farms that are variously small, fragmented, poorly maintained and with diseased trees. They might not earn much from caretaking such farms, compared to other options, such as working in labour gangs.

3.2.6 Is cocoa profitable in Juaboso?

Finally, was cocoa a profitable option in 2019 in Juaboso? Using typical labour inputs, chemical costs, and yields, a model of a cocoa farm on a 30-year cycle can be set up to estimate returns to land and household labour. A complication for cocoa is that inputs and

Table 3.2 Gross margin for a median cocoa farm in Juaboso

Key parameters per hectare
Inputs
Tools, e.g. machetes: US\$20 a year
Cocoa seedlings, 1,300: @ US\$0.09
Food crops seeds and planting material, first four years until cocoa matures: US\$315 a year
Tree seedlings to plant for shade: US\$27
Agro-chemicals, e.g. fertiliser, fungicide, insecticide: US\$130 a year at first, rising to US\$192 a year at peak
Labour
To establish cocoa seedlings and plantains, 117 days
To plant food crops, 27 days a year, first four years
To harvest food crops, 95 days year, first four years
To weed, prune, apply chemicals to cocoa, 21 days a year
To harvest cocoa pods, break them, ferment and dry, 18 days a year
Labour cost if hired by day: US\$5.45 a day
Outputs
Food crops, first four years: US\$2,790 a year
Cocoa beans, dried: starts in year five at 144kg, rising to 700kg at peak after 20 years
Price paid for dried beans: US\$0.94/kg
Value of shade trees, harvested after 30 years: US\$762
Time and discounting
Cocoa lasts 30 years before it needs to be replanting.
Time discounted at 5% a year
Returns, discounted over 30 years
Annual equivalent input costs: US\$245
Annual equivalent labour: 76 days
Annual equivalent labour costs: US\$413
Annual equivalent returns: US\$1,007
Equivalent return to labour: US\$10.06 a day

Note: Annual equivalents computed by discounting the annual amounts at 5% a year (cumulative) through time, summing them, and dividing the sum by 30, the number of years for the analysis. Full calculation can be obtained from the authors.

Source: Author's own, using data from field work in Juaboso in late 2019 and Nunoo (2015) for data on inputs and yields, including for food crops grown in first four years in Sefwi.

yields vary through time. To allow comparison as an annual equivalent, time was discounted at 5 per cent a year – so that income in year two would be discounted by 5 per cent to make it comparable to having the income today (Table 3.2).

The median farmer made US\$350/ha a year, subtracting costs of inputs and labour from the value of the beans harvested. This was equivalent to US\$11 for every day worked on the farm. If, then, a household had two adults working for 150 days each on their cocoa farm, they would earn US\$3,300 – less than US\$10 a day for the entire household.

Much depends on how productive the farm is. If yields could be raised by 25 per cent, returns would rise more than proportionately, by 72 per cent. Would it pay farmers to invest more if they could harvest more? Perhaps not: if 50 per cent were spent on inputs, labour or both, and yields rose by 25 per cent, then margins would fall by 22 per cent.

That said, extension officers were more upbeat, commenting that while old cocoa groves subject to pests and disease might yield as little as three (64kg) bags of dried beans per acre [475 kg/ha], replanting with well managed hybrids might see the yields rise to 8–10 bags an acre [1,265–1,580kg/ha]. Such a large increase in yields would more than repay very large increases in cultivation costs.

In the analysis reported here, yields peak in year 21 at 700kg/ha (4.5 bags per acre). Trial plots of farmer land can yield 2t/ha (13 bags per acre), if well managed. If we factor in a 2.85 times rise in yields, and imagine that costs of cultivation including labour time might double,⁷ then margins rise by no less than 345 per cent – making the annual equivalent return to cocoa around US\$1,500/ha, and the return to labour of US\$20/day.

The difference between what median farmers achieve and what is possible, however, is large. Yet this represents an opportunity, if obstacles can be overcome.

7 This may well overstate the necessary increase in labour.

4 CONCLUSIONS

Cocoa farmers in Juaboso were once able to generate decent returns from their cocoa without managing their trees intensively. Elders told us that in the past they could build new and better homes, and that some could even buy cars with their cocoa incomes. In the last 20 years, however, trees have aged while pests and disease have built up on their farms. In the past, farmers could abandon old cocoa groves and open new ones in virgin forest, but that option is no longer possible.

If cocoa farmers are to earn enough to keep them out of poverty, they must intensify their cultivation to raise productivity of land and labour. But to do so, they face stiff technical and economic challenges.

Technically, farmers need better and reliable advice. While Ghana's cocoa researchers have been able to develop a response to most problems, the farmers need better education and experimentation in addition to input support that make these innovations work. The main exception has been swollen shoot, for which the remedy of felling, burning and sterilising the soil is drastic and not guaranteed to prevent new outbreaks of the virus either.

Farmers are also understandably confused over changing recommendations – such as new advice to retain (or replant) shade trees, and to change insecticides and fungicides as pests build resistance. To make things worse, the profusion of commercially marketed chemicals on the market, advertised with dubious claims and some of dubious quality, further bewilder farmers.

Economising on public extension is a false economy: farmers appreciate face-to-face advice rather than radio messages or pamphlets. Guidance has never been more needed than in today's trying circumstances.

COCOBOD has provided valued services to cocoa farmers, supplying quality chemicals and undertaking mass spraying. But from our interviews, it seems that few farmers now receive this support, and that what support is on offer is allocated to political supporters of the governing party. COCOBOD services therefore need to be urgently depoliticised. That may seem a tall order, but Ghana has done this in the past, when COCOBOD was reformed in the 1980s and 1990s. Lessons from the past, from the 1970s when Ghana's leaders nearly killed the golden goose of cocoa with dire consequences for the economy, have to be relearned. Ghana's cocoa should be a centre of excellence and a source of national pride.

Economically, two things stand out. One is the need to get more working and investment capital into the value chain and down to farmers. Improving access to formal finance in rural areas has proved difficult the world over, but one bright spark is value chain finance, where the high transactions costs of lending can be much reduced through interlinked transactions in inputs and cocoa sales. It has to be possible to devise ways to inject finance into the cocoa chain, probably through purchasing clerks, to create a sustained increase in farmers' access to capital.

The other need is for social protection for those who suffer the misfortune of serious illness and accidents, and for those where old age has finally stopped them from working. Can this be done through some mutual fund, perhaps funded by a levy on cocoa exports? Or can private insurance be introduced, perhaps with some public subsidy? Farmers' views on these possibilities would be interesting to investigate.

If progress can be made towards overcoming these challenges, the future of cocoa can be as bright as it has been so often in the past.

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