A living income for smallholder commodity farmers and protected forests and biodiversity: how can the private and public sectors contribute?

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Interventions and policies in the cocoa, tea and coffee sectors have failed to ensure that all smallholder commodity farmers earn more than the $1.90 World Bank poverty line or a living income, and they have not halted deforestation. Commodity farming is strongly associated with deforestation, in spite of interventions. For more than 50% of the cocoa and tea farmers in our datasets, household income would need to double in order for them to earn a living income. For those farmers, farming will never be a primary pathway out of poverty.

In this paper, we explore data and the literature to propose approaches towards creating significant impacts on the income earned by commodity farmers and their household members, and towards protecting both forests and biodiversity. Our key messages are as follows:

- **A minority of smallholder commodity farmers earn or could earn a living income from primary commodity production.** For many farmers primary agricultural production of global commodities will never be a pathway out of poverty because of small farm sizes and low productivity levels.
- **Price increases** at scale can play an important role, but require supply management to offer stable long-term income impact without negative impact on forests and biodiversity.
- **A tailored approach is needed.** Smallholder commodity farmers who cannot earn more than the living income need alternatives, such as **employment opportunities,** so that they can move out of agriculture when land reform is implemented.
- Farmers remaining in agriculture should have the opportunity to increase farm sizes through appropriately implemented **land reform.**
- **Such farmers** should obtain support in **land use change** if they are situated in areas affected strongly by climate change. Such support should take into account the entire farm, not the commodity field only.
- In identifying the farmers who will or will not be lifted out of poverty by agriculture-based interventions, swift and effective decisions can be made on **where and how to invest time and funds.** In this way, policies and programmes can be implemented more cost-effectively, farmer's frustrations can be avoided, as well as any time and costs associated with non-adoption.
- Policies and interventions must take into account contextual and personal factors which can influence **farmers' behaviour.** People in rural areas should be listened to about their aspirations, needs and opportunities.
- **Forest and biodiversity protection** works best with multiple simultaneous interventions tackling all drivers of deforestation, including a strong role of the local population, sharing of information (data) and ultimately a concerted action between public and private stakeholders from different sectors, in order to prevent any shifting of the problem to some other sector or place.
- **For designing effective and efficient interventions,** findings should be shared between countries and across commodities on what works and also what failed to work. This includes the sharing of data and methodologies in order to avoid too much data being collected too many times, with too many farmers being interviewed too often, to satisfy the needs of various buyers and implementers.

1 Interventions to lift smallholder commodity farmers out of poverty have failed and have not halted deforestation – what now?

Interventions in cocoa, tea, coffee and oil palm sectors generally have resulted neither in lifting smallholder farmers out of poverty nor in forest and biodiversity protection.

Smallholder farmers in commodity[i] value chains such as cocoa, tea, coffee and oil palm have received numerous interventions from private sectors for food and agribusiness traders, processors and manufacturers, as well as public sector agencies in the past two decades aiming to improve their incomes and lift them out of poverty.

It is a huge challenge to lift farmers out of poverty

Interventions have ranged from training, to voluntary sustainability certification and the provision of free or subsidised inputs, to the support of farmer groups, to community-level provision of infrastructure, such as school buildings, medical centres and access to potable water. However, most interventions have had limited, mixed or no impact on household incomes[ii]. Despite those interventions, in the majority of commodity farm households, incomes per capita are below living income standards[1]. In Figure 1, we show examples from our research that support this finding for important cocoa and tea producing countries[2].

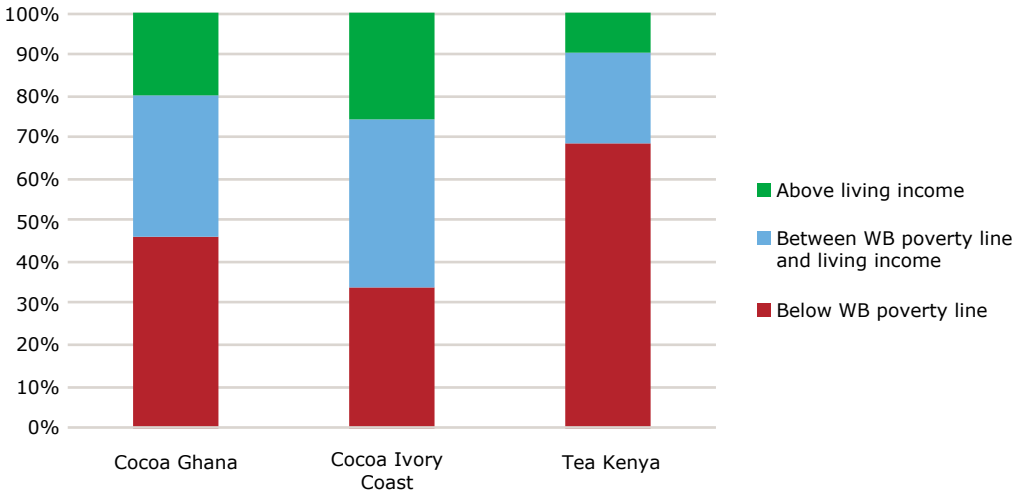

Figure 1 Percentage of smallholder commodity farmers above and below the $1.90 World Bank poverty line and living income standards
Source: Ghana: Waarts et al., 2014 (N = 311), Côte d'Ivoire: Ingram et al., 2018 (N = 362), Kenya: Waarts et al., 2015 (N = 439).

1 See Appendix 1 for how the poverty line and living income line were calculated.

2 WUR was granted permission to use the confidential data from two cocoa studies for this paper. See Appendix 1 for more information including a disclaimer.

For more than 50% of the cocoa and tea farmers in our datasets, household income would need to double in order for them to earn a living income.
It is a huge challenge to lift farmers out of poverty: about half of the cocoa and tea farmers we interviewed would need to double their income in order to earn more than the living income line (Figure 2)[iii], a benchmark income level which is more and more often set as a goal by both the public and private sectors[iv]. These challenges lead to the question of whether and how such farmers can be supported to earn a living income. This is the first question that will be addressed in this paper.

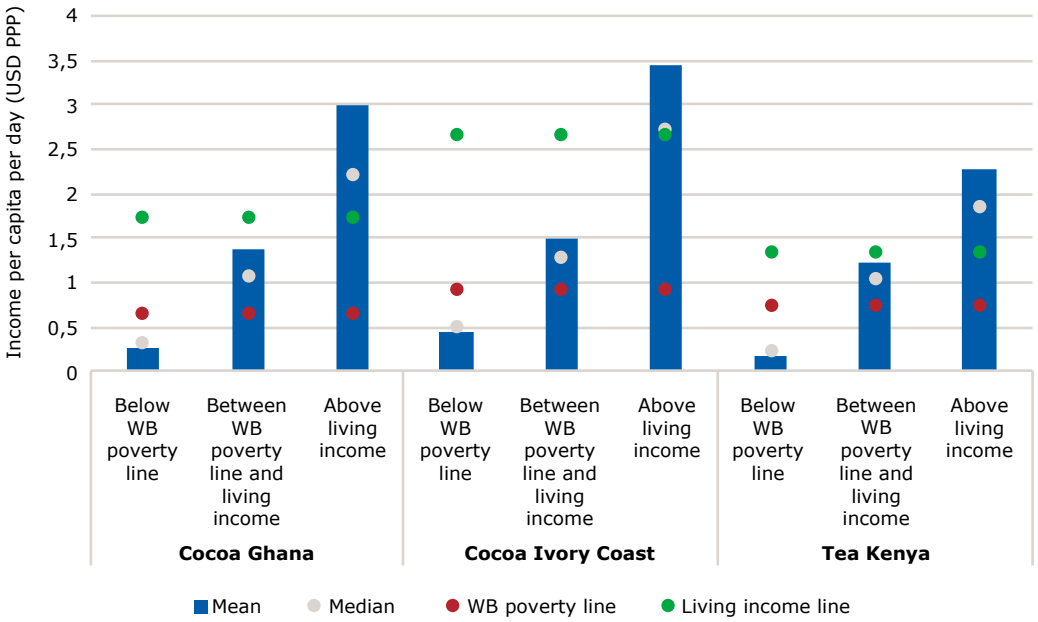

Figure 2 Income earned per household member per day (USD Purchasing Power Parity)[3]
Source: Ghana: Waarts et al., 2014 (N = 311), Côte d'Ivoire: Ingram et al., 2018 (N = 362), Kenya: Waarts et al., 2015 (N = 439).

Commodity farming is strongly associated with deforestation and biodiversity loss, despite interventions.
A large body of research shows that commodity farms have often been created in forested areas or previously forested areas[v]. These agro-ecological areas are suitable for growing commodity tree crops, as their wild ancestors originated from forests. Population increases and the fertility of forest soils have led farmers to convert forested areas to farms in order to sustain their families and to satisfy the increasing demand for commodities. This expansion, combined with a general lack of investment in already cultivated fields, is strongly associated with land degradation, biodiversity loss and deforestation[vi]. Reforestation or compensation measures have had limited success in halting or mitigating these impacts[vii].

Based on the literature and the data from our cocoa and tea research, we propose approaches for significantly impacting household incomes, as well as the protection of forests and biodiversity.
In this paper, we present information on smallholder cocoa farmers in Ghana and Côte d'Ivoire, as well as smallholder tea farmers in Kenya, in order to assess whether and how such farmers can be better supported (Section 2). Through a literature review that focuses on overview studies and systematic reviews, we investigate why past interventions have not had the expected effects, an investigation that reveals contextual and personal factors which influence farmer behaviour (Section 3); we also draw conclusions about how best to address drivers for deforestation (Section 4). Finally, we present and reflect on strategies for impacting smallholder commodity farmer incomes (Section 5), and we conclude with recommendations for the public and private sector (governments and businesses) and NGOs on both increasing farmer incomes and protecting forests and biodiversity (Section 6). Finally, we present a research agenda for transformational science to facilitate smallholder farmer sustainable development (Section 7).

3 For comparison, the monthly living income line per family was converted to a daily living income per household member.

2 There is no business case for lifting the poorest farmers out of poverty

Even when farmers' incomes increase, many remain poor.
Interventions aimed at income enhancement and lifting farmers out of poverty are often based on the assumption that the latter should be attainable through said interventions. However, for many farmers this is an unachievable goal due to the conditions in which they live. Even if farmers' incomes from cash crops were to directly increase – for example, through increased farm gate prices – we observe that small farm sizes and low productivity levels lead to only a few farmers moving to another income group. Figure 3 shows that even if farm gate prices for tea were to increase by 50%, only 6% of farmers would shift into the group of farmers earning more than the living income line (see Figure 1 for baseline figures)[4]. Such price increases, moreover, are not expected, and if increases were not properly managed, they could lead to unwanted market effects, such as large increases in volumes produced, putting pressure back on price levels.

We observe that only few farmers move to another income group

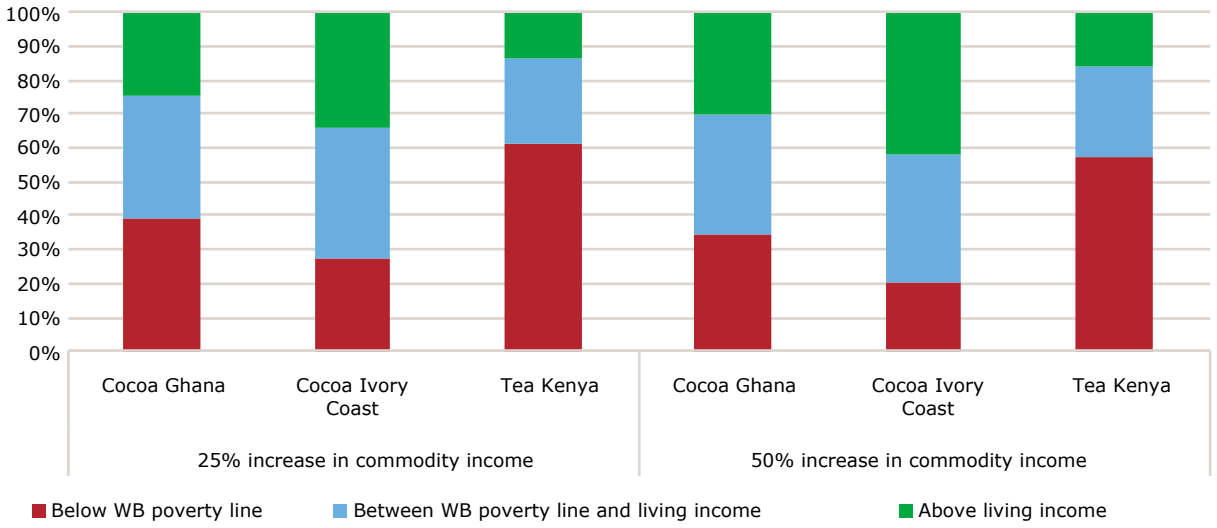

Figure 3: The effects of a 25 and 50% increase in income from cocoa (Ghana and Ivory Coast) and tea (Kenya) in obtaining a living income
Source: Ghana: Waarts et al., 2014 (N = 311), Côte d'Ivoire: Ingram et al., 2018 (N = 362), Kenya: Waarts et al., 2015 (N = 439).

A recent political deal between the governments of Côte d'Ivoire and Ghana requires chocolate companies to pay a living income differential of $0.40 per kilogram ($400/tonne) on all 2020/2021 season cocoa contracts[viii], on top of the market price. The ICCO daily price was $2408/tonne on 7 November 2019[ix]. At such a price, the price increase would constitute 17%. Any increase in smallholder farmers' incomes is a step in the right direction since they are often poor, but even under the assumption that the full premium ends up with the farmers, it would not help most out of poverty. An increase per kilogram will yield the largest benefits for farmers in higher income groups, as they produce larger volumes. Based upon our data, a $0.40 increase per kilogram would yield approximately a $205 increase in yearly income for farmers earning less than the poverty line in Ghana and a $360 increase in Côte d'Ivoire. In addition, such an increase would positively affect the yearly income of farmers earning more than the living income standard in Ghana by $832, and in Côte d'Ivoire by $1707[5]. For our analyses on the usefulness of this living income differential, see Section 5.

The fact that smallholder farmer household incomes have often not increased is the result of relatively intractable farmer characteristics, such as farm size, in combination with low productivity levels.
Cocoa and tea farm sizes are generally small, and with the exception of Ghana, they are much smaller among smallholder farmers earning less than the living income than they are among farmers earning more than the living income (Figure 4). We find that the farm sizes for farmers

4 See for more information on how the living income is calculated in Appendix 1.
5 In these calculations, it is assumed that the $400/tonne living income differential would end up totally in the farm gate price.

in the tea sector in Kenya are particularly small, while inheritance and a growing population drive down the mean farm size even further[x]. Farm sizes for cocoa are larger, but the returns of these larger plots in terms of income earned are often similar to the returns of tea farmers farming smaller plots of land. Even if there is a possibility to increase a commodity's productivity or to produce a more profitable crop on (part of) the land, these can only lead to marginal increases in income, as total volumes produced will remain small. Thus, the income earning potential of small plots is limited. We find that the low incomes of the poorest farmers are explained by low productivity levels in combination with small farm sizes.

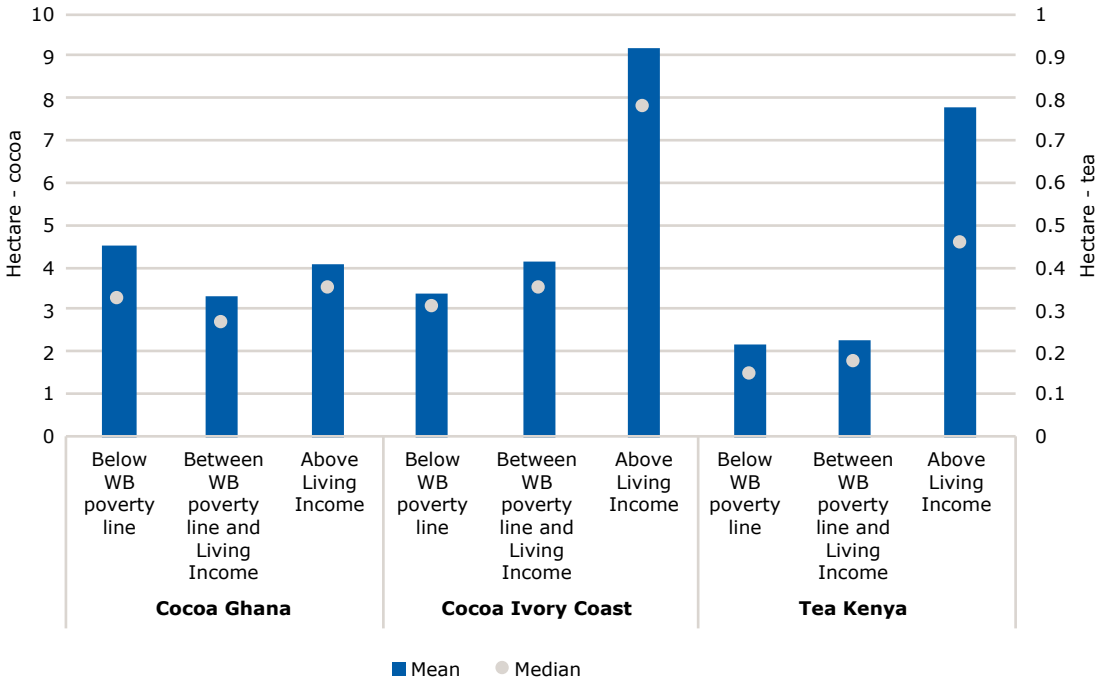

Figure 4: Cocoa and tea farm size in hectares by income group
Source: Ghana: Waarts et al., 2014 (N = 311), Côte d'Ivoire: Ingram et al., 2018 (N = 362), Kenya: Waarts et al., 2015 (N = 439).

Low average productivity levels prevail, not having significantly improved in decades, despite interventions.

Productivity levels for smallholder farmers are generally far below maximum achievable levels (Figure 5). Only very few farmers achieve high levels of productivity. On the one hand, this indicates the potential to increase farmer productivity. On the other hand, the literature and data show that average productivity per hectare has not signifcantly improved in decades, despite interventions[xi]. Our evaluations show that it is difficult to significantly increase farmer productivity since various factors influence farmers' investments. Interventions in cocoa in Ghana and Côte d'Ivoire outcomes were mixed and generally modest[xii]. In Kenya, we found that tea farmer participation in farmer field schools did affect productivity, but adoption levels remain low and generally productivity levels remain far below the maximum achievable level[xiii]. In all three countries, farmers in the lowest income group have the lowest levels of productivity.

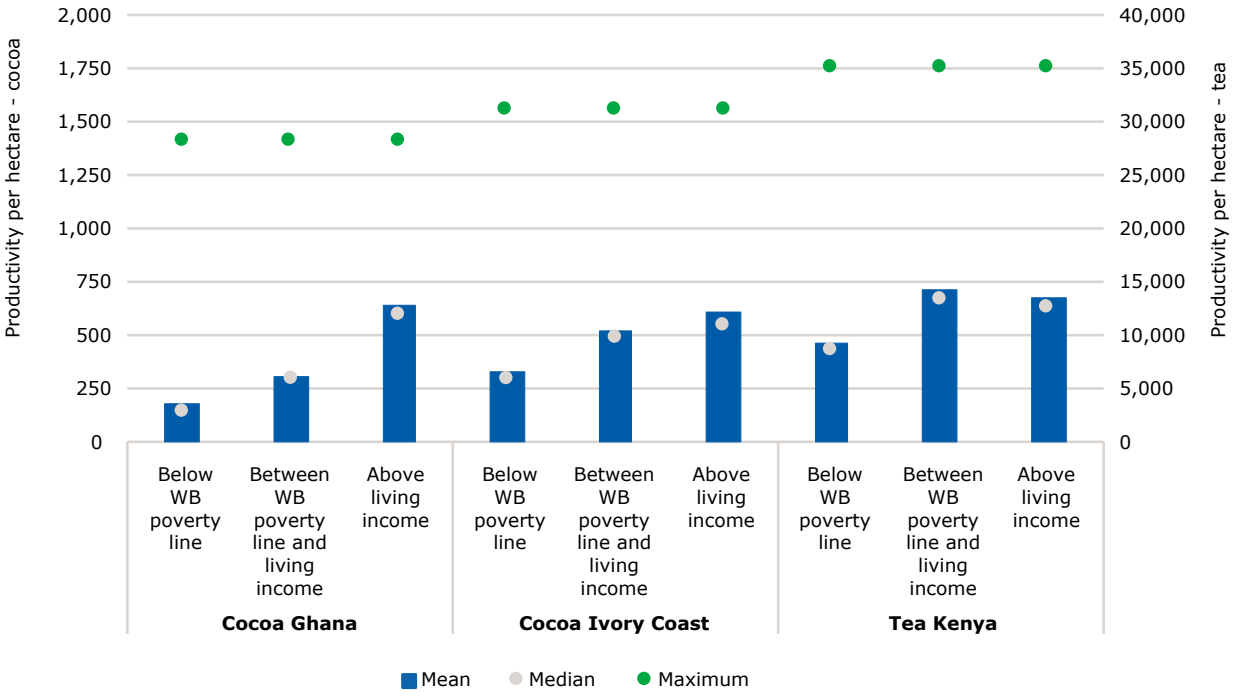

Figure 5: Productivity: kilogram per hectare per sector by income group
Source: Ghana: Waarts et al., 2014 (N = 311), Côte d'Ivoire: Ingram et al., 2018 (N = 362), Kenya: Waarts et al., 2015 (N = 439). The maximum productivity was established in these studies based on feedback from agronomists in the areas we studied.

Farmers have more land than just for cocoa and tea. Farmers do have other land available besides tea or cocoa, indicating that one must consider the entire farming system instead of the cocoa and tea fields only if one is to accurately assess how to best support the farmers. However, such additional land parcels are not often sufficient for generating substantial income (Figure 6). Small farm sizes, combined with challenges in acquiring and enlarging farm size, as well as encroachment upon forested land, are barriers for farmers to earn more.

Farmers are quite dependent on commodity incomes, leaving little room for income diversification. Income diversification can be an important way to improve farmer resilience. In our cocoa studies, a large proportion of farmer income is earned y producing the commodity (about 80% in Ghana, 90% in Côte d'Ivoire and 70% in Kenya, Figure 6). In particular in our study, cocoa farmers in Côte d'Ivoire have very few alternatives other than cocoa production to generate income, leaving them vulnerable to climatic and price fluctuations.

Another study indicates that cocoa farmers in Côte d'Ivoire are dependent on cocoa for 66% of their income and farmers in Ghana 61%.[xiv] . Many farmers are thus very dependent on cocoa production for earning their income. The lack of options for diversification may have different causes: the household may not have excess labour or land available to invest in on- farm or off-farm income generation, or other income opportunities may simply not be available.

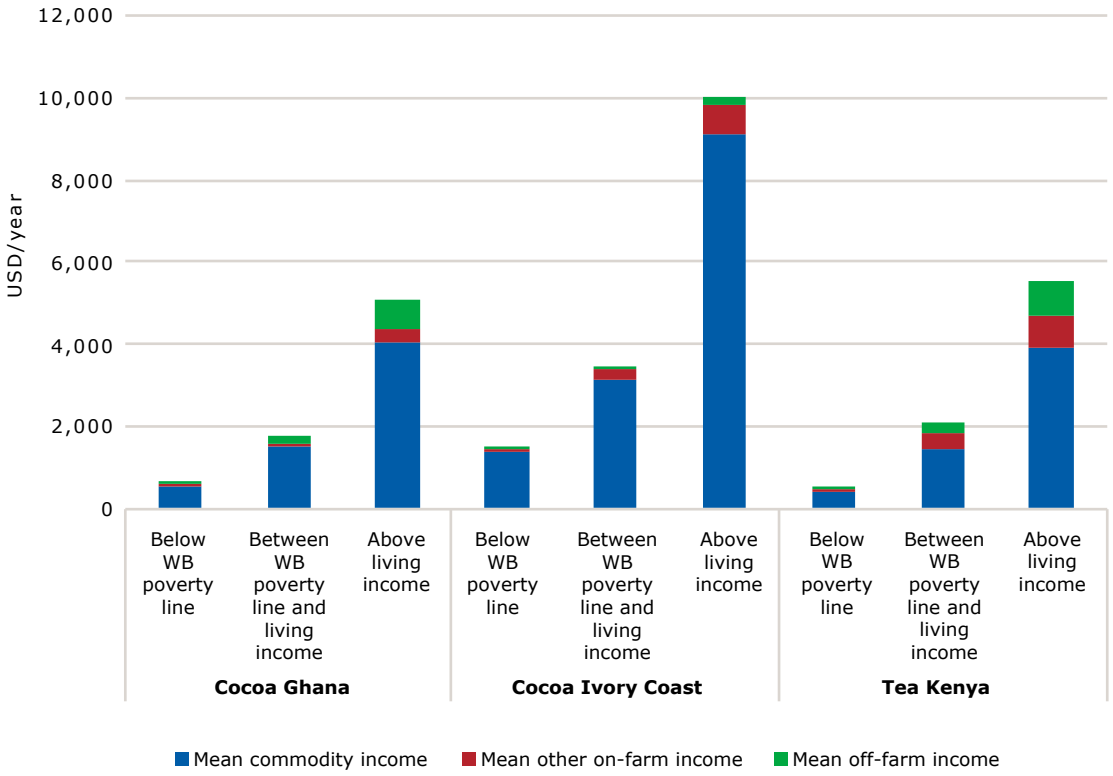

Figure 6: Yearly household income in USD by income group
Source: Ghana: Waarts et al., 2014 (N = 311), Côte d'Ivoire: Ingram et al., 2018 (N = 362), Kenya: Waarts et al., 2015 (N = 439).

There is no business case for lifting the poorest farmers out of poverty.
Productivity levels, combined with small farm sizes of smallholder farmers earning less than the World Bank poverty line, suggest that there is no business case of increasing income levels such that all farmers earn more than the living income lines. Not only are farmers in the lowest income group the most vulnerable to shocks, they also have very limited opportunities to increase productivity and diversify. Moreover, even if opportunities were more available, such famers still likely would not be lifted out of poverty, especially in Côte d'Ivoire and Kenya, where the lowest-income farmers have significantly smaller farms than those in other income groups.

Improving farmers' productivity has not been and will not be enough to lift them out of poverty

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3 Contextual and personal factors to be addressed in policies and interventions to be able to influence farmers' behaviour, increase farmer incomes and protect forests and biodiversity

Contextual and personal factors impede farmers from changing farm management practices that could increase household incomes and protect forests and biodiversity. Our research, confirmed by the literature shows that, even if farmers adopt new farm management practices, many farmers do not adopt the recommended practices[xv]. Furthermore, if farmers do adopt new practices, they rarely adopt all recommended practices[xvi].

Required investments present financial risks for farmers, while farmers often lack the means to invest.
Studies have shown that farmers are often resistant to change, or dis-adopt after initially adopting new technologies[xvii]. This is due to different reasons which can be roughly divided into four categories, see next page.

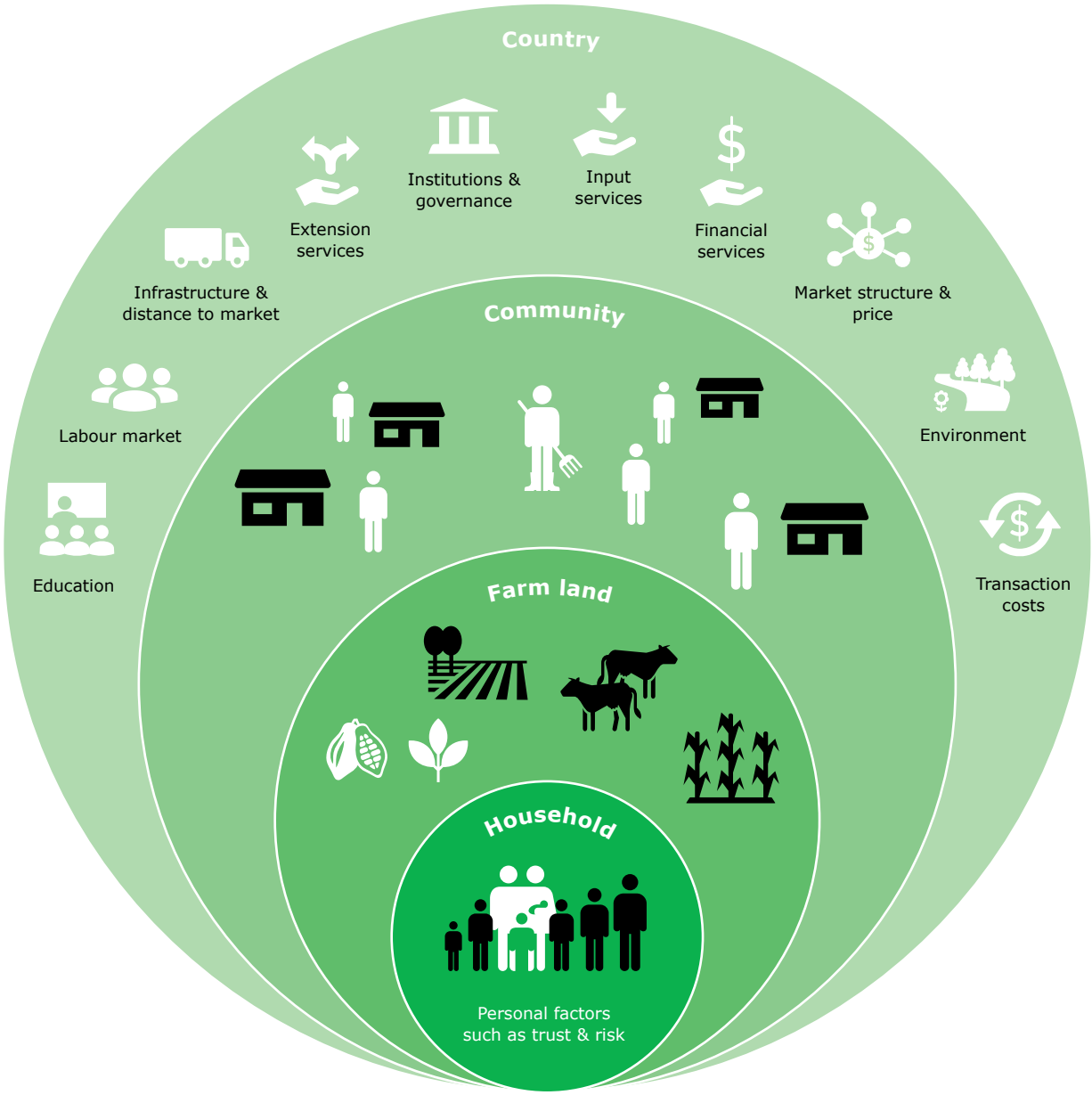


Figure 7: Contextual and personal factors influencing smallholder commodity farmer behaviour

1 Inability to afford investment

Smallholder farmers may resist technological innovations, given that required investments often present financial risks and even losses in the short term, while smallholder farmers often lack a credit basis for financial investment[xviii]. Farmers often cannot afford recommended inputs (including hired labour) or spend their often scarcely available cash on other living expenses, such as school fees or food. In addition to financial investments, improved farming practices usually require substantive additional household labour requirements which make them unattractive[xix].

2 Investment benefits not guaranteed

Future benefits are not guaranteed. Farmers may decide not to adopt new practices because those practices might not lead to significant income increase, for instance when farming small parcels of land, or when inferior planting material will not respond to improved practices[xx]. Adoption of technology only leads to increased agricultural productivity under specific circumstances and conditions which cannot be broadly recreated[xxi]. Farmers base their motivation and effort level on their expectations of the new practice or technology, and if they experience that the extra effort does not meet their expectations, they will decrease their effort levels in the next season.[xxii]

3 Failing markets prompt constraints

Failing markets often lead to adoption constraints. Inputs such as fertiliser, crop protection products and hired labour are often not available – or they are available but not at the right time. In addition, quality of inputs cannot be assessed by farmers. The asymmetry of information about quality of inputs increases the risks for farmers to invest in seeds or fertiliser of insufficient quality[xxiii].

4 Interventions are often not tailored to aspirations, needs and opportunities

Finally, interventions often are not tailored to farmers' aspirations, needs and opportunities—moreover, they are implemented from a technocratic perspective. They hardly consider personal factors that determine the motivation to adopt new farming practices. For example, new practices may conflict with social norms. In Burkina Faso, for instance, crop livestock integration is a technology that has clear benefits and improves status for crop farmers because livestock is a sign of wealth. However, crop livestock integration is seen as a failure by transhumant[6] livestock herders, as it forces them to work the land, which is considered a last resort for those who cannot live anymore off of their herds (Slingerland, 2000). Social networks and norms can have a strong impact on technology adoption decisions[xxiv].

Hence, understanding both the contextual and personal drivers of technology adoption behaviour is of utmost importance in designing effective interventions for smallholder farmers in order to support them to adopt good farming practices, while also aiming towards earning a living income and preserving biodiversity.

Figure 8: Detailed personal factors influencing smallholder commodity farmer behaviour

6 'Transhumance is the regular movement of herds between fixed points to exploit seasonal availability of Pastures' (FAO, 2001)

4 To protect forests and biodiversity, all drivers of deforestation should be addressed simultaneously

Smallholder commodity production is connected to deforestation, but increasingly, large-scale industrial agriculture for domestic urban consumption and exports are drivers of deforestation.
Globally, 27% of all forest disturbances result from commodity-driven deforestation[xxv]. However, the common view that growing populations of shifting cultivators and smallholders are the main drivers of deforestation has been false, as large-scale industrial agriculture for domestic urban consumption and agricultural exports is increasingly the primary driver of tropical deforestation[xxvi]. In Côte d'Ivoire, our studies showed that between 40 and 58% of cocoa farms had been cleared from primary forest, and 25 to 33% established on fallow land, with farms on average 21 years old[xxvii].

Deforestation, environmental and land degradation attributed to smallholder farmers is driven by many factors.
Deforestation worldwide is an important cause of greenhouse gas emissions contributing to climate change, and it can create a local loss of ecosystem services and natural capital. However, smallholders convert forests to agricultural land (to expand farmland or compensate for decreasing productivity on existing farms) and degrade forests through unsustainable exploitation, such as for timber, fuel, foods and medicines for subsistence use and incomes. These local benefits can be weighed against the costs of access and social and institutional barriers that determine people's use of and impact on a resource[xxviii].

The evidence base on the most effective measures to stop deforestation is still weak and scattered

These impacts change over time, as well. There has been a tendency to identify 'universal' drivers of deforestation (or what may stop it). Population, wealth (or conversely poverty) and market access are considered major drivers of forest loss[xxix].

There are many new commitments to stop deforestation – but these are often blind to multiple drivers, failing to address them or addressing outcomes instead of causes.
By 2018, over 450 commodity traders and retailers had committed to voluntary sustainability certification, made individual corporate commitments and programmes and signed pledges and regional and international public sector agreements[7] to reduce or eliminate the deforestation caused by their commodity value chains[xxx]. However, many of these commitments fail to consider that the dynamics of forest loss and recovery are driven by many political and socio-economic contexts and forces, interacting at global to local levels and over time[xxxi]. These interactions mean that interventions to mitigate deforestation by smallholder farmers can play out very differently, depending on local (historical) contexts. Even actively policed boundaries are easily encroached when other factors allow or encourage it, when access to managed forests is misused[xxxii] or when land ownership claims overlap[xxxiii]. Similarly, payments for ecosystem services can be captured by elites[xxxiv], leaving poor smallholders even more dependent on forest resources. The evidence base on the most effective measures to stop deforestation is still weak and scattered. What works or not is very much context dependent.

Improved farm productivity in fields close to forest areas does not necessarily reduce pressure on forests.
Many studies indicate that in addition to local yield increases, measures to prevent agricultural encroachment into forests are essential[xxxv]. Productivity improvement can encourage deforestation when commodities have elastic demand on the short term (i.e. when supply increases, their prices do not decrease)[xxxvi], situations that are common in cocoa, palm oil, soy and timber, but also in local charcoal and wood fuel value chains. Additionally, creating economic opportunities through improved productivity can attract migrants, which further contributes to forest encroachment[xxxvii]. When farmers are capital- and/or labour-constrained, productivity intensification can release labour and allow farmers to expand cultivated farm areas.

Protected areas – when well-managed – can reduce deforestation, but often do not stop forest conversion.
While well-managed protected areas can reduce deforestation[xxxviii], protected multiple-use areas appear more successful in reducing forest loss. These approaches focus on improving yields and sustainability of smallholder production in combination with inclusive landscape

7 The Consumer Goods Forum (CGF) pledge to zero net deforestation 2010, New York Declaration on Forests 2014, Amsterdam Declaration towards Eliminating deforestation from agricultural commodity chains with European countries 2015, Cocoa and Forests Initiative 2017, European Commission 2019 Communication to step up action against deforestation and to restore forests (EU 2019).

approaches protecting forests, while also taking into account the local context and needs for regulated forest access and use. Such approaches are likely the most successful for stopping or reducing forest degradation and deforestation[xxxix].

Various interventions tested for restoration, but the role of smallholders in restoration is unclear.
While there are cases of forest restoration, efforts to implement restoration promises generally have been slow to gain traction, with most restoration taking place outside of natural forests, and the role of smallholders in restoration is unclear[xl]. Collaborative interventions include encouraging diverse agroforestry systems, sustainable agricultural intensification, promoting the use of degraded lands, cash-for-work programmes, incentivised grants and loans to smallholders while adjusting or removing perverse incentives from subsidies and, lastly, establishing national forest restoration funds[xli].

The most effective means of addressing the causes of deforestation appears to be multiple simultaneous interventions.
Evidence concerning the most effective solutions to stop commodity-driven deforestation suggests the importance of several initiatives implemented simultaneously: strong enforcement of forest protection laws; support of continued forest management by local people, including legal rights; payments for ecosystem services (PES) that increase the economic value of forests to local people, while reinforcing their intrinsic motivation to protect the forest; and timely national action, rather than lengthy international agreements[xlii]. Stopping PES runs the risk of resuming deforestation behaviour—or worse. Without monetary value, the forest may suddenly become worthless, whereas before PES was established, forests' multiple intrinsic, social and economic values became 'forgotten' or 'overruled' by PES monetary value. Kerr et al (2017) clearly shows that incentives that undermine intrinsic sources of motivation are able to crowd-out targeted behaviour, while incentives that reinforce intrinsic sources of motivation can crowd it in.

Policies to reduce soy-related deforestation in the Brazilian Amazon appeared successful, but deforestation increased in the Cerrado

Multi-stakeholder collaboration is needed taking into account leakage and spill-over effects of interventions.
The implementation of multiple and simultaneous interventions requires multi-stakeholder collaboration. As many of the compliance mechanisms associated with implementing zero deforestation initiatives are costly, these may be overwhelming or inaccessible for smallholder farmers[xliii]. This should be addressed. Land use policy change furthermore needs to take account of leakage[8] and spill-over effects of interventions. For example, policies to reduce soy-related deforestation in the Brazilian Amazon appeared successful, but deforestation increased in the Cerrado[xliv]. Additionally, high compliance costs in regions where zero deforestation commitments are implemented could result in a loss of competitive advantage, encouraging further leakage to other localities[xlv].

Such collaborations should include appropriate baselines, monitoring and evaluations.
Appropriate baselines are needed in order to compare the results of interventions in landscapes where different communities, ethnic groups or land uses occur. Especially for landscapes with different commodities and where organisations implement different programmes, the overall effect on deforestation may be assessed, but the effects of specific interventions are difficult to untangle. Reporting on the progress of zero deforestation initiatives is scarce[xlvi], and on-the-ground impacts that can be attributed to these initiatives are limited at best. The New York Forest Declaration five-year assessment reported few positive results and slow progress[xlvii]. As baselines and monitoring activities often go beyond what are perceived as private sector activities and spheres of influence, partnerships with public sector, civil society, research organisations and service-providing organisations—such as the World Resources Institute's Global Forest Watch and the Sustainability Consortium (TSC) (Curtis et al 2018)—are essential in enabling the tracking of impact of zero deforestation initiatives, if implemented properly[xlviii].

8 Leakage: the 'net increase of greenhouse-gas emissions in an area outside the project resulting from the [project] activity' (Schwarze et al., 2002). It occurs 'whenever the spatial scale of intervention is inferior to the full scale of the targeted problem' (Wunder, 2008). This definition also applies to deforestation itself next to for greenhouse-gas emissions resulting from deforestation.

5 Structural change is essential for all smallholder commodity farmers to earn a living income

One highly important structural change is land reform, to ensure that farm sizes increase.
Our research shows that often, farm sizes in cocoa and tea producing countries are much smaller than so-called 'sustainable farm sizes', i.e. farm sizes needed to earn a living income[xlix]. Increasing farm size is a path worth exploring. However, this is often not an option, as most land is already occupied and buying land is costly. Labour requirements to create new farms are expensive and have led to different share cropping arrangements between farmers and workers, where a proportion of the harvest or land is shared, known as abunu, abusa and abuna[l]. Farmers may start by receiving a small piece of land in return for their labour. Thus, increasing farm land can typically only happen in forested areas, which are often formally owned by the government. Also, inheritance laws lead to land fragmentation. To increase farm sizes therefore, a large transition is needed, in which one segment of farmers would increase their farm sizes and another segment of farmers would stop their farming altogether, consequently seeking employment opportunities outside of agriculture. Lessons for this transition can be learned from historical examples of agricultural land reform processes in Europe and elsewhere. Scaling up smallholder farming requires the deep involvement of public sector, civil society and private sector players[li].

Land reform requires adequate employment opportunities for farmers moving out of agriculture.
While land reform poses opportunities to increase farmer income for some, it also poses a challenge for other farmers who can no longer grow cocoa or tea. In order to create space for larger farms that can generate a higher income, other farmers need to find employment elsewhere. Some farmers can continue in the agricultural sector, either as employees of larger farmers or elsewhere in the agricultural value chain, in processing, trading or service activities. As farm sizes increase and farmer revenues increase, more investment in added value activities in the value chain is possible, thereby generating employment for farmers that had to quit farming. Other employment opportunities could be found outside of agriculture, mainly in larger towns and cities. Already now, we understand that many young people in rural areas of developing countries leave the countryside since they no longer see a future in farming. This is presents significant challenges that governments and cities are already trying to address.

Structural changes are not new in rural development thinking, but broader policies are needed, and multiple stakeholders should collaborate to implement them.
Even in the 1970s and 1980s, similar changes were proposed, such as the 'integrated rural development policies' which were also focused on moving away from small-scale agriculture. They strongly suggested increasing local agro-processing in order to, among other things, create more local employment opportunities[lii]. An important lesson learned from these policies was that they were less effective when scaled up to the national level, as this no longer allows communities to mobilise their own resources for development or for real strengthening of the development of local public sector agencies[liii]. Some major differences between then and now include the movement away from rural thinking towards urban development and job creation. More important is the change in responsibilities from the public sector only to a shared collaboration between the public and the private.

Price increases lead to short-term benefits for farmers, but increases could have negative long-term effects on the market, which could lead again to pressure on prices.
Price interventions in global markers often have limited effects when they are only applied at the country or regional level. If prices are raised by individual country policies, buyers of cocoa and tea can purchase cocoa and tea in other countries instead, where prices are lower. Moreover, raising cocoa and tea prices will lead to more farmers growing them and spur existing farmers to increase production. This puts more pressure on forests for land expansion. If no policies are implemented to mitigate such effects, total volume produced will increase, creating national and global surpluses. This may lead to farmers not being able to sell their cocoa, thereby reducing their incomes and causing market prices to fall again. An example here is the Brazilian coffee sector where 'at various times during the last century, (1906, the 1930s and the early 1970s) the coffee giant had to destroy many millions of bags of green coffee [] to prevent a glut in the market'[liv].

The living income differential in Ghana and Côte d'Ivoire seems to be a good solution, but could it also backfire?
The recent living income premium (called 'living income differential') set by Ghana and Côte d'Ivoire is intended to help increase incomes of farmers[lv]. As both countries together are responsible for two-thirds of global cocoa production, this premium may in the short term have no

effects on cocoa sales. But in the long term, effects as described in the previous paragraph could materialise. This development is likely to inspire buyers to see whether they could buy their cocoa for a lower price elsewhere. This may also increase the global market price for cocoa to which farmers in other countries respond by planting more cocoa. Such demand and price increase could spike cocoa production and sales in for instance Brazil and Indonesia, with severe repercussions:

- lower cocoa sales for Ghanaian and Ivorian farmers, leading to income decreases which could counteract earlier increases
- massive unsold cocoa stocks at public sector level in Ghana and Côte d'Ivoire, leading to pressure on public sector budgets because farmers are paid while the cocoa cannot be exported.

So, without other policies in place to address such volume and budget challenges, price levels established by the public sector are bound to have negative effects.

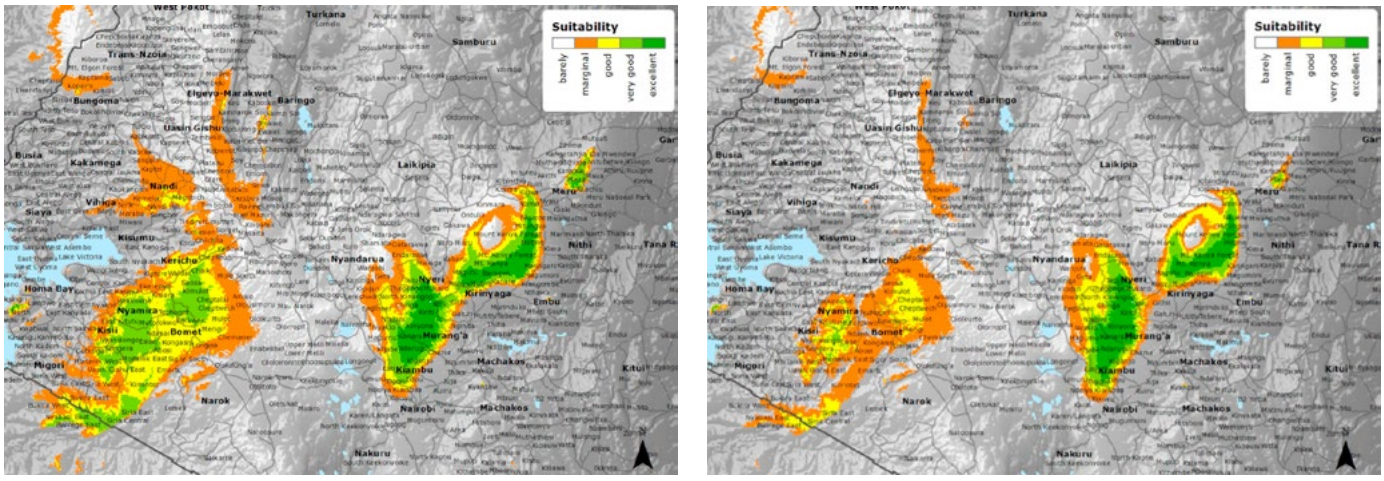
A precondition for increasing prices without creating negative effects is a system of international supply management, led by producing countries.

Since the cessation of international cocoa agreements in the mid-1980s, among which included export quotas, beans have been traded internationally in a free market. This resulted in a period of low prices throughout the 1990s. To cope with the collapse of prices and with a value-sharing scheme that is considered unfair, Koning and Jongeneel suggested in 2008 the creation of a 'cocoa OPEC' among the main producing countries. The idea was 'parked' as prices of raw materials including cocoa increased between 2008 and 2015. However, in response to the recent price fall and with the voluntarism of the African public sectors, whose economies were directly affected, the creation of an 'OPEC for cocoa' is explicitly mentioned in the declaration of the last conference of the International Cocoa Organisation (ICCO, April 2018). The World Bank, in its latest report on Ghana (2018), also stresses the need to strengthen cooperation between Ghana and Côte d'Ivoire as prerequisite to gaining more market power. If such international supply management system is developed, it should be led by producing countries, who involve farmers and their organisations, include production controls in a fair and efficient way, and prevent countries from free riding[lvi]. For a 10-step action plan to implement this, see Koning & Jongeneel (2006), and Koning & Jongeneel (2008)[lvii].

Policies should consider climate change forecasts, as it is expected by 2050 that in many regions it will be difficult to produce tea, cocoa and coffee.

Recent studies show that climate change is expected to make large parts of cocoa and tea and coffee growing areas much less suitable for growing these crops[lviii]. In some areas, growing these crops will no longer be possible without far-reaching adaptation activities. To address these issues at farm-level, farmers can plant improved, more climate-resilient varieties or develop infrastructures for irrigation. However, these strategies often require substantial investments, which many smallholder farmers do not have readily available. Irrigation infrastructure also goes beyond farm scale, as it requires fair and wise management of scarce water resources, not only between farmers, but also between farming and other sectors. Predicted climate impacts on cocoa and tea productivity therefore also require regional or landscape approaches which design policies that address all the consequences of climate change for one area.

In some areas, growing these crops will no longer be possible without far-reaching adaptation activities



Prediction on suitability of tea growing areas (2020 and 2050)
Source: Managua (2011).

This requires supporting farmers in affected areas to change land use entirely in order for them to earn a living income, by actors needing to provide different services to the farmers than in the past.
In areas affected by climate change, farmers can be supported in diversifying their income-generating activities to complement the income from tea or cocoa, or they can be facilitated in shifting from cocoa and tea as their main source of income to other crops or income-generating activities. Interventions to address climate change should more often facilitate the latter instead of keeping farmers in the production of crops which their land will no longer be suitable for in the future. By considering projections for the future, the public and private sector try not only to lift farmers out of their poverty, but also make sure they stay out of poverty. This requires that the public sector and service deliverers work differently; tea and cocoa cooperatives would support their farmers in producing other crops/ livestock, providing technical assistance and inputs not only for cocoa and tea, and facilitate farmers in marketing the new products. Thus, public sector agencies, service deliverers and buyers implementing programmes with the farmers would need to diversify their support as well.

Diversification can contribute to income, resilience and improved nutrition, but is not suitable for all farmers.
Diversification can help farmer to increase their total income, while improving their resilience by reducing their reliance on a crop. Moreover, diversification can help farmers increase the diversity in their diets, contributing to greater balance and nutrition. Earning additional income through diversification is not always possible for all farmers, however. This is only possible when there is a market for these products or activities. This can prove difficult in remote, sparsely populated and relatively inaccessible rural areas. Market development should be supported alongside supporting farmer diversity, focusing on improvements in nutrition, in addition to increasing incomes. Moreover, many cocoa and tea farmers have small farm sizes, which limits the land available to diversify their income. Finally, many cocoa and tea farmers lack the resources to invest in developing new economic activities; therefore, income diversification is more suitable for farmers with enough assets.

Pineapple field next to tea field: Some tea farmers in Kenya have uprooted their tea bushes because they can earn more from pineapple. Photo: Yuca Waarts

6 What public and private sectors can do: conclusions and recommendations for lifting smallholder commodity farmers out of poverty and protecting forests and biodiversity

The poorest smallholder commodity farmers need different policies for earning a living income than relatively better-off farmers.

For the poorest farmers to earn a living income, manifold increases in income would be required, which is not feasible given farmers' situation in terms of land size and productivity levels, not to mention given how the market currently operates. We identify the structural changes that can facilitate increases in income of the poorest commodity producers:

1 Land reform policies should seek to increase farm sizes. This is impossible without farmers moving out of agriculture, who need to be properly supported to find alternative income sources. The land reform process should ensure that no human rights are violated. And should address inheritance laws.
2 Land reform policies should be informed by climate change forecasts (as in some areas tea or cocoa may not grow anymore), urbanisation and other demographic trends.
3 Price increases seem a viable option, and could lead to income increases for farmers, but they also could have negative effects on the market over time, leading to buyers changing sourcing countries and surpluses, putting pressure on market prices yet again. Also, price increases on their own are not enough to lift the poorest farmers out of poverty. Price increases thus must go hand in hand with land reform policies.
4 A precondition for increasing prices without creating negative effects is a system of international supply management led by producing countries. Furthermore, farmers and their organisations should be involved in this system, which should include production controls in a fair and efficient way and prevent countries from free riding. For a 10-step action plan to implement this system, see Koning & Jongeneel, 2006, and Koning & Jongeneel, 2008[lix].

Support in productivity increase and on-farm diversification can be useful for relatively better off farmers under certain conditions.

Interventions to increase commodity productivity, along with support of on-farm diversification focused on income increase and food security, can be useful in some cases, but only under the following circumstances:

1 The intervention targets the right group (farmers who earn enough to invest, and have a large enough farm size).
2 The aspirations, needs, opportunities and behavioural drivers of farmers are taken into account via a farming systems approach that does not focus solely on commodity production.
3 The intervention should be informed by climate change forecasts and market developments in order to ensure the intervention is 'future proof'. This could mean that farmers are supported to change their land use entirely to continue earning an income in the long run. Such land use changes should be informed by possibilities in marketing the produce.

In addition to the above conditions for success, land reform and price increases can also help to improve incomes of these farmers.

To protect forests and biodiversity, all causes of deforestation need to be addressed simultaneously through multi-stakeholder collaboration.

By all accounts, the most effective strategy for responding to all causes of deforestation is multiple interventions at once. Such interventions should be implemented through multi-stakeholder collaboration, including conducting appropriate baselines and taking into account leakage and spill-over effects.

By all accounts, the most effective strategy for responding to all causes of deforestation is multiple interventions at once

Learning from each other: sharing positive and unsuccessful experiences data and methodologies to design effective and efficient interventions.

For designing effective and efficient interventions, findings should be shared between countries and across commodities on what works and also what failed to work. This includes the sharing of data and methodologies in order to avoid too much data being collected too many times, with too many farmers being interviewed too often, to satisfy the needs of various buyers and implementers. Much data has been collected in the past but has remained confidential. We call on the private and public sectors as well as on NGOs and business platforms to find a way to share data and methodologies without jeopardising business and public interests. A good example is the Cocoa Soils Initiative, https://cocoasoils.org/.

Please find detailed steps that we propose to be undertaken for smallholder commodity farmers to earn a living income and for forest and biodiversity protection in Appendix 2.

7 Research agenda to support structural transformation: a need for transformational science to facilitate smallholder farmer sustainable development

How can the private and public sectors collaborate more effectively with academics to lift smallholder farmers in commodity sectors out of poverty and support forest protection/reforestation?

A research agenda to positively transform smallholder commodity farming

Farming system research acknowledging community and landscape scales
The dramatic change from the common private sector data collection focus on individual commodity purchases means that we should take a farming and household system approach. This is to understand why and how farmers make choices for different cash and subsistence crops, livestock and on and off farm activities and land uses – and, by extension, the tradeoffs between different crops and business models. This change fits with a living income approach, acknowledges the role of labor and technologies, and it seeks to provide data that can support efforts to increase total disposable income as well as food and nutrition security. This information can also help us understand the implications of how interventions that focus on deforestation and environmental degradation have an impact.

Better understanding of farmer's aspirations, assets and capacities
Better understanding the combination of farmer's aspirations, needs, knowledge, assets and capacities is of utmost importance. This is a change from the current practice of 'sending messages' through interventions, towards listening to farmer's household and individual members changing needs and how farmers can benefit from the data they help generate. This implies a focus on contextually applied recommended agricultural practices rather than meeting (externally set) standards.

Pathways to transforming farming systems, markets and landscapes
We must investigate and understand what it takes to (further) develop and diversify smallholder commodity products, markets, and processing facilities such that more added-value remains in the country of origin and with farmers and labourers in commodity value chains. It is additionally important to grasp the motives of farmers to expand in forested areas and the political reality driving such expansion. Trade-offs and implications of maintaining the value of sensitive and high-risk and high conservation value landscapes must be fully accounted for, in response to zero deforestation concerns and initiatives.

New research models focusing on commodity farmers and sectors are needed.
To meet the challenges addressed in this paper, the questions asked by scientists, private and public sector organisations and other stakeholders need to be critically reviewed, in addition to the fundamental ways that science is conducted, how scientific outputs are produced and, last but not least, for whom. Different models of conducting and disseminating research inform the sectors and value chains in which smallholder commodity farmers operate, ranging from academic to in-house corporate to origin state research. These different models (see Appendix 3) result in scientific outputs accessible to different users in very different formats. As the commissioners of scientific research vary, each model functions according to different agendas often meeting different aims, covering different geographic and political scales. There are two clear disadvantages of these parallel, multiple models of science.

One disadvantage is that despite the decades of research into smallholder commodities such as tea, coffee and cocoa, scientific knowledge has not effectively reached farmers, or wider farm and ecosystem products and services, in a way that could substantially change their position in these commodity value chains. Science has focused on and benefited other actors in smallholder commodity value chains, particularly those commissioning, funding and consuming the products. Second is that the lack of significant changes in livelihood indicators such as incomes and degradation in many environmental indicators (trees on farms, forest cover, soil and water quality), strongly points towards ineffectiveness when gauging how scientific knowledge and research models have impacted smallholder farmers.

Future research approaches should address the complex make-up of smallholders.
Most of the publicly accessible research is deeply divided by language, sector and geography, thereby hindering cross-regional and cross-commodity sectoral learning and exchange. This is despite many actors conducting science work on multiple commodities. Currently, most research is predominantly structured according to disciplines.

By contrast, highly complex challenges with many trade-offs require more inter- and multi-disciplinary approaches, where the vast body of crop production research is integrated with economics, politics, livelihoods (incomes, health, labour etc.), communication, innovation and technology.

A research agenda for inclusive, resilient smallholder commodity value chains.

Taking these issues into account, the cocoa sector created a consensus on societally relevant research needs[lx]. Building on this history, we propose a research agenda that addresses knowledge gaps in order to positively transform smallholder commodity farming (see the box above). This agenda requires taking an integrated, multidisciplinary, international and collaborative approach to research. This could take a more co-designed approach to design, implement and disseminate research. This entails developing collaborative research models investigating options and approaches to funding, generating and ownership of data and results between farmers, farmer's organisations, traders, manufacturers, researchers and other stakeholders. It also means engaging smallholder farmers and origin country public sector agencies in the co-design of research, and in making co-generated knowledge outputs much more available, if they are to adequately respond to the issues addressed in this paper. By engaging with public sector agencies, additionality is created, even in so-called weak states[lxi]. Equally, voluntary sustainability standard systems largely implemented by the private sector have increasingly realised the benefits of collaborating with NGOS and public sector authorities – initially as trainers as in Côte d'Ivoire in the cocoa sector, but increasingly as partners. These private voluntary certification schemes have sparked reactions by origin country public sectors claiming back sovereignty over their territory and the welfare of their inhabitants, the commodity producing smallholders. The joint action by Ghana and Côte d'Ivoire to create a living income differential is one example. The mandatory and gradually rolled-out certification schemes recently introduced for palm oil cultivation by public sector organisations in Indonesia and Malaysia is another example. A third is the Mozambican national biofuel certification in response to EU biofuel certification[lxii].

Appendix 1: Methodology

Literature review
The literature review conducted for writing this paper focused on overview studies and systematic reviews and was based on WUR researchers' knowledge of the literature; we did not conduct a systematic review of all literature for writing this paper.

Literature and primary data from Wageningen UR studies are presented in this paper:

- **Cocoa Ghana:** Data collected for impact evaluation studies financed and commissioned by Solidaridad and UTZ Certified (Waarts et al. 2015). The year about which we present the figures in this paper is 2014. WUR was granted permission to use the confidential data from this study for this paper. The opinions expressed in this publication are those of the authors. They do not purport to reflect the opinions or views of the commissioners of this study. The designations employed in this publication and the presentation of material therein do not imply the expression of any opinion whatsoever on the part of the commissioners.
- **Cocoa in Côte d'Ivoire:** Data collected for and impact evaluation studies financed and commissioned by Solidaridad, UTZ Certified, Cargill, IDH and Nestlé (Ingram et al. 2014, 2018). The year about which we present the figures in this paper is 2017. WUR was granted permission to use the confidential data from this study for this paper. The opinions expressed in this publication are those of the authors. They do not purport to reflect the opinions or views of the commissioners of this study. The designations employed in this publication and the presentation of material therein do not imply the expression of any opinion whatsoever on the part of the commissioners.
- **Tea in Kenya:** Data collected for an impact evaluation study financed and commissioned by KTDA, IDH and Unilever (Waarts et al. 2012, 2014, 2016, 2017). The year about which we present the figures in this paper is 2015

Way of calculating what percentage of farmers is placed in which income group.
Group 1: Consists of farmers who earn less than the World Bank poverty line of 1,90 USD per person per day. This excludes farmers who, with a 10% increase in total household income earn the same or more than the World Bank poverty line of 1,90 USD per person per day.
Group 2: Farmers who earn minimally as much as the World Bank poverty line of 1,90 USD per person per day, and maximally below the living income benchmark. This includes farmers normally placed in group 1, but who, with a 10% increase in total household income earn the same or more than the World Bank poverty line of 1,90 USD per person per day.
Group 3: Farmers who earn the same or more than the living income benchmark per person per day.

Living income benchmark calculations
For each country, household incomes were converted to match the living income benchmark:

- Ghana: Smith, S. and D. Sarpong. (2018). Living Income Report: Rural Ghana. Retrieved from https://cocoainitiative.org/wp-content/uploads/2018/12/LIVING-INCOME-REPORT-FOR-GHANA.pdf
- Cocoa Côte d'Ivoire: Tyszler, M., R. Bymolt, and A. Laven (2018). Analysis of the income gap of cocoa producing households in Côte d'Ivoire. Retrieved from https://docs.wixstatic.com/ugd/0c5ab3_fc3386a-550b94a898c7757ee13ab59e6.pdf
- Kenya: Anker, R. and M. Anker (2015). Living Wage Report Kenya: with a focus on rural Mount Kenya Area. Retrieved from https://www.isealalliance.org/sites/default/files/resource/2017-12/Kenya_Living_Wage_Benchmark_Report.pdf

The monthly living income benchmarks were converted to the year of each dataset using the changes over time in the consumer price index. The living income benchmark is based upon a country specific average family size (6 in Côte d'Ivoire, 5 in Ghana, 5.5 in Kenya). Therefore, yearly household income from each of the datasets was adjusted only for the period: it was divided by 12 to change the data from yearly to monthly income. For comparison with the World Bank poverty line, the monthly living income line per family was converted to a daily living income per household member. By doing so, we treated adults and children in the households in the same way, not correcting for male or female equivalent FTE values.

Poverty line benchmark calculations
For each country, household incomes were converted to match the poverty line of $1.90 per person per day. This poverty line was set in 2011, and was adjusted to the year of the data using the difference in time using the consumer price index. The yearly household level income data was converted to daily income by dividing by 365, and then divided by the number of household members.

Appendix 2: detailed steps to be undertaken for smallholder commodity farmers to earn a living income and for forest and biodiversity protection

Action	Approach	Involved stakeholders
Land reform	• Start a land reform process to create new land use policies, which leads to farmers to move out of agriculture to make it possible for remaining farmers to earn a living income. Such a process should be inclusive, discussing needs and possibilities with the affected population. And should address inheritance laws. • Provide alternative income earning opportunities for people moving out of agriculture by for instance establishing arrangements so they can become absentee land owners. Ensure that human rights are not violated in this process. • In creating new land use policies, consider climate change forecasts and demographic trends such as urbanisation, and forest and biodiversity protection targets. • Investigate what alternative livelihoods could be if expected climate change effects materialise, including conducting land suitability analyses, and studying the feasibility of new market/supply chains. • Learn from similar land reforms processes and effects in Europe. • Next to land use policies, such land reform process should also lead to policies for protecting forests and biodiversity considering the lessons learned in this paper.	• The public sectors in origin countries are in the driver's seat of land reform processes. • The private sector to support the origin country public sector to implement such land reforms as they are an important stakeholder for the origin country (export revenues), and they can also continue sourcing from the country without being accused of violating human rights. • EU public sector organisations to support origin public sector organisations in learning about land reform policies implemented in the past.
Influencing the market and farm gate price	• Governments to establish the market price for a commodity together, in collaboration with farmers and their organisations, but only if they can avoid surpluses in the production of the commodity. • Quota systems could be used, but the question is based on what criteria it will be decided who get what quota, as quotas are generally exclusive, not inclusive. Would non-cocoa producing countries still have the possibility to produce cocoa? Lessons could be learned on whether an OPEC is possible for cocoa based on the 10-step plan developed by Koning and Jongeneel (2006 and 2008). • Buyers to close long-term contracts with sustainability performance criteria connected to higher prices for a commodity. However, the performance criteria should be possible to achieve by the farmers without them taking all the risk.	• Public sector organisations in origin countries • The private sector to find creative ways in the value chain together, e.g. by reducing cost, to optimise the price paid to smallholder farmers. • Consumers should (be enticed to) pay more for chocolate.
Capacity development of remaining commodity producing farmers to increase productivity and quality and increase incomes	• Support remaining farmers in climate change adaptation (e.g. drought resistant clones), and enhancing productivity and quality through training and input supply, etc. • This support should be done while considering the whole farming system and contextual and personal factors to optimise the possibility to influence farmers and households to change their behaviour and have an impact. This support should include finding ways how to overcome a period with less income due to replanting bushes/trees with new clones, without the farmers to take all the risk.	• Companies can support farmers from which they source--especially when farmer unions have a voice. • Whole farming system approach does not seem to suit commodity buyers but it may be needed for them to continuing sourcing cocoa or tea.
Forest and biodiversity protection	• Address multiple drivers of deforestation/biodiversity loss simultaneously. • Properly implemented multi-stakeholder collaboration, including conducting baselines and considering leakage and spill-over effects.	• The public sector in origins together with the private sector and NGOs.
Learning from each other: sharing positive and unsuccessful experience and data and methodologies	• Sharing learnings between countries and across commodities of what works and also what failed to work. • Sharing data and methodologies in order to avoid too much data to be collected multiple times and too many farmers to be interviewed too often.	• The private sector, the public sector, standard setting bodies, NGOs. • Universities: a good example is the Cocoa Soils Initiative: https://cocoasoils.org/

Appendix 3: Science models used in smallholder farming research

Characteristics	Science model				
	Academic research	In-house corporate	Stakeholder	Origin state	International research
Research commissioners & funders	Internal according to individual preferences and departmental focus Responding to calls for projects from international and national trade, research and government organisations, stakeholders & private sector funders Contract research to private sector	Internal led by corporate policies and sector-wide agreements and practices In public-private-state partnership programmes	Internal led by organisational policies and for (international) NGOs and CSOs, member based In public-private-state partnership projects	Internal led by national policies from state agencies, In public-private-state partnership projects/	Internal led by organisational policies Responding to calls for projects from international and national organisations, stakeholders and private sector
Research agents	Universities, research institutes	Internally in-company and/or with universities and research institutes, consultants and NGOs	Internally in-company and/or with universities and research institutes, consultants and NGOs	State organisations, universities and research institutes	Universities and research institutes consultants, NGOs
Objectives	Fill knowledge gaps. Research outputs in terms of scientific papers and recognition. Agenda setting and arbiter function distinguishing between 'facts' and 'fiction', 'opinions and beliefs'	Maintain supply base at reasonable costs and keep consumers happy by addressing their concerns	Depend on NGO either agenda setting, blame and shame, or developing good practices with environmental (deforestation) or social goals (human rights, smallholder welfare, child labour)	Guarantee income for state from the sector as it contributes a lot to the economy	Public concerns such as climate change, deforestation and smallholder welfare
Focus	Theoretical and applied research on any aspect of cocoa and chocolate production, processing, marketing and politics	Applied, mainly activities in value chains of major commissioning manufacturing companies, in response to consumer concerns	Mainly applied research on key issues in commodity production, processing, marketing and politics	Mainly applied research on production, processing, market, development and extension activities taking place within national domain	Applied and some theoretical research on any aspect of commodity production, processing, marketing and politics
Methodologies used	Scientific Three types (i) to four-year thesis studies (ii) medium term projects (iii) long-term, multi-year primary data generation at plot, farm, farmer, market and landscape level	Scientific and quasi-scientific Increasingly using multiple year, big data collected from farmers and farms Short- and medium-term research to further secure supply & CSR projects	Scientific methods, often published without detailed methodology Mainly medium to long-term research (and development) programmes/projects	Scientific and quasi-scientific Sometimes published without detailed methodology	Scientific and quasi-scientific Sometimes published without detailed methodology Mainly medium to long-term research (and development) projects
Typical end-users	Academics, Sometimes private sector, CSO/NGO and policymakers	Large-scale private sector	Companies, stakeholders, academics and farmer organisations	Extension agents, government authorities and agencies	Companies, farmer organisations, cocoa sector service providers, academics and government agencies
Scale of research	Local, national, transnational	Local and transnational	Local, national, transnational	Local and national	Local, national, transnational
Modes of access to research results	Theses in libraries (digital and hard copy), publications in academic journals (majority in paid access, increasingly number in open access journals)	Majority in internal corporate reports often concerns competitively sensitive information and some academic publications	Reports on websites, generally publicly available	Reports, on websites, some publicly available, some materials for farmer organisations and service providers	Reports on websites, generally publicly available, some materials for farmer organisations and service providers
Language	English, some French, some Spanish	National language, English	Majority English translations	National language	English, some French
Examples. This list is not meant to be complete	CIRAD, WUR, Trinidad, KIT, University of Reading, etc	Mars, Olam, Cargill, etc.	OXFAM, Voice Network, IDH, WCF, ICCO, Swisscontact, GIZ.	COCBOD, National Indonesia Palm Oil Institute, etc.	CGIAR, IITA, CIAT, EFI, Agrinatura, etc.

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Endnotes

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