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Briefing

# Securing the position of smallholders in zero-deforestation supply chains

An assessment of the potential impact of the EU Deforestation-free supply chains Regulation on smallholder farms

Institute for European Environmental Policy





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## INTRODUCTION

Over 80 million hectares of biodiversity-rich primary forest – approximately the size of Germany and Spain combined – have been destroyed since 1990. The main pressure of tropical deforestation and forest degradation has been agricultural expansion, most prominently driven by large-scale agricultural production of soybeans, palm oil and cattle, in addition to local subsistence farming<sup>1</sup>.

Although primarily occurring outside its borders, it has been found that European demand for goods and services is responsible for 10% of global deforestation between 1990 and 2008<sup>2</sup>.

Indirect deforestation remains one of the EU's greatest challenges regarding progress towards achieving the Sustainable Development Goals (SDGs), specifically those related to agriculture, dietary habits, biodiversity and climate action<sup>3</sup>.

The time for the EU to act and minimise its share of global deforestation is now. The Deforestation-free supply chains Regulation is vital to begin address the global spillovers of the EU's unsustainable consumption patterns and achieve the SDGs.

Under the European Green Deal, the European Commission put forward a proposal aimed at minimising the import and sale of products that have contributed to global deforestation on the EU market<sup>4</sup>. The proposal currently covers commodities at risk of embedded deforestation, namely cattle, cocoa, coffee, palm oil, soybeans, and wood, while the European Parliament's position proposes broadening the scope to include swine, sheep, goat and poultry, as well as maize and rubber<sup>5</sup>.

The effectiveness of the proposal will be determined by the Commission's ability to withstand lobbying efforts to water-down the proposal and create of loopholes for certain producers. The current proposal would introduce due diligence requirements on operators placing these commodities, and some of their derived products on the EU market, while a benchmarking system would determine

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<sup>1</sup> FAO. (2020). State of the World's Forests. [Link](#).

<sup>2</sup> Cuyper, D., Geerken, T., Gorissen, L., Lust, A., Peters, G., Karstensen, J., Prieler, S., Fisher, G., Hizsnyik, E. & Van Velthuisen, H. (2013). The impact of EU consumption on deforestation: Comprehensive analysis of the impact of EU consumption on deforestation. [Link](#).

<sup>3</sup> Lafortune, G., Cortés Puch, M., Mosnier, A., Fuller, G., Diaz, M., Riccaboni, A., Kloeke-Lesch, A., Zachariadis, T., Carli, E. Oger, A., (2021). Europe Sustainable Development Report 2021: Transforming the European Union to achieve the Sustainable Development Goals. SDSN, SDSN Europe and IEEP. France: Paris. [Link](#).

<sup>4</sup> European Commission. (17 Nov 2021). Proposal for a regulation on deforestation-free products. [Link](#).

<sup>5</sup> European Parliament. (13 Sept 2022). Climate change: new rules for companies to help limit global deforestation. [Link](#).

whether a country presents a low-, medium- or high risk of embedded deforestation in the production of these products.

Operators in low-risk countries are expected to have simplified due diligence duties, while those in high-risk countries would face enhanced scrutiny. The environmental objectives of the Deforestation-free supply chains Regulation are clear, however, the social implications risk impacting smaller farms disproportionately. The European Economic and Social Committee, NGOs and MEPs have called on the Commission's impact assessment to consider the impact of the Regulation on smallholders producing the targeted commodities<sup>6</sup>.

Indeed, smallholders supply a significant share of global production of some of the targeted commodities. It is estimated that worldwide, coffee smallholders supply around 60% of global coffee<sup>7</sup>, while cocoa smallholders supply 80 to 95% of global cocoa production<sup>8</sup>. However, for other commodities such as soybeans, the share of smallholder output in global production is rather negligible<sup>9</sup>.

This briefing aims to provide the reader with a base understanding on what kind of farms are considered smallholders and why policy debates around smallholders are often left with ambiguous conclusions (due to a lack of data). Then based on the available literature and data, this briefing estimates how many smallholders could be impacted by the Deforestation-free supply chains Regulation. Finally, this briefing presents a set of recommendations to ensure that smallholders are both not disproportionately impacted and are able to reap benefits associated with the Regulation.

This briefing assesses the potential impact of the EU Deforestation-free supply chains Regulation on smallholder farms. Section 1 discusses the issues related to the definition and the data gaps related to smallholders. Section 2 maps out the number of potentially affected smallholders in the EU's main trade partners for targeted commodities. Section 3 presents potential benefits of the Regulation to smallholders, as well as mitigation measures to ensure smallholders reap these benefits. Annex 1 provides succinct case studies on the number of smallholders in medium- to high-risk of deforestation countries, while Annex 2 provides a literature review of the impacts of existing zero-deforestation commitments on smallholders.

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<sup>6</sup> European Economic and Social Committee. (2022). Minimising the risk of deforestation and forest degradation associated with products placed on the EU market. [Link](#).

<sup>7</sup> Rushton, D. (2019). Map of the Month: Bringing smallholder coffee farmers out of poverty. [Link](#).

<sup>8</sup> Varied estimates of share of smallholder production in global production of cocoa, from 80-90% (see UNCTAD, 2016. [Link](#)) to 95% of global production (see German Initiative on Sustainable Cocoa, [link](#)).

<sup>9</sup> There is no data on share of smallholder in total production of commodity data, however literature indicates that smallholders do not typically produce cash crops such as soy (with the exception of China and India). For example, in Brazil <0.1% of smallholders produce soy (see Buainain, A. M., & Garcia, J. R. [Link](#)).

## 1. DEFINING AND DOCUMENTING SMALLHOLDERS

Several definitions for “smallholder farms” exist throughout the literature. Some classifications are based on the size of the landholding, smallholders being characterised by farms either less than 2 hectares or less than 10 hectares<sup>10</sup>. However, smallholder farms can also be defined as farms that are operated by a family unit, employing their own labour or as farms that mainly conduct subsistence farming for themselves and/or their local community<sup>11</sup>.

For example, the Brazilian agricultural census of 2017 estimated that 1,66 million farms in the northeast region were *minifundia* defined as “a holding whose size does not allow the subsistence of a family.” However, the term minifundia is not exclusive to farms smaller than 2 hectares, as in some sub-regions of the northeast even farms of 5 hectares are insufficient to ensure a farm household lives above the poverty line<sup>12</sup>. The absence of a one-size-fits-all definition of what a smallholder farm is hampers not only political debate but also documentation efforts, as definitions of smallholder farms differ between countries and regions<sup>13,14,15</sup>.

The most widely applied definition when discussing smallholders is the FAO’s definition of a landholding size of 2 hectares or less<sup>16</sup>. Research estimates that 84% of total global farms are small farms of less than 2 hectares in size, totalling approximately 510 million farms<sup>17</sup>. However, the authors map out a few issues with data collection on smallholders, such as:

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<sup>10</sup> Rapsomanikis, G. (2015). The economic lives of smallholder farmers; analysis based on household data from 9 countries. FAO. [Link](#).

<sup>11</sup> Buainain, A. M. & Garcia, J. R. (2018). Roles and challenges of Brazilian smallholding agriculture. *Revista agroalimentaria*, 24(46), 71-87. [Link](#).

<sup>12</sup> Buainain, A. M., & Garcia, J. R. (2018). Roles and challenges of Brazilian small holding agriculture. *Revista agroalimentaria*, 24(46), 71-87. [Link](#).

<sup>13</sup> Herrera, G., Brito de Costa, R., Moraes, P.M & Fonseca Mendes, D.R. (2017). Smallholder farming in Brazil: An overview of 2014. *African Journal of Agricultural Research*. [Link](#).

<sup>14</sup> Golam, A.A., Ngah, I. & Applanaidu, S.D. (2018) Agricultural transformation in Malaysia: role of smallholders & area development. [Link](#).

<sup>15</sup> Purnawan, E., Brunori, G. & Prosperi, P. (2020). Small Family Farms: A Perspective from Indonesia, Challenges and Investment. [Link](#).

<sup>16</sup> Rapsomanikis, G. (2015). Economic lives of smallholder farmers – An analysis based on household data from nine countries. FAO. [Link](#).

<sup>17</sup> Lowder, S., Sánchez, M.V. & Bertini, R. (2021). Which farms feed the world and has farmland become more concentrated? *World Development*, Vol. 142. [Link](#).



- **A lack of up-to-date agricultural census data**, e.g., latest data on farms in Ghana from a 1970 agricultural survey.
- **Discrepancies in the documentation of smallholder farms**, e.g., differences in farm sizes reported or reported inconsistently (<1 hectare, between 1-4 hectares, <2 hectares, <5 hectares, ...)
- **No or limited data availability** on the labour, commodity production, farm type of smallholder farms.

This briefing's assessment of how many smallholders could be impacted by the Regulation faces the same issues. Therefore, certain assumptions and decisions regarding data collection and calculations were necessary to provide an estimate of the number of smallholders potentially impacted by the Regulation.





## 2. SCOPE OF SMALLHOLDERS LIKELY AFFECTED BY THE REGULATION

This section assesses the scope of smallholders that could potentially fall under the Deforestation-free supply chains Regulation. Firstly, it is essential to understand the nature of smallholder farms, i.e., which regions have a large concentration of smallholders, and what crops are smallholders farming. Secondly, not all smallholders producing commodities targeted by the Regulation, are supplying these commodities to the EU. Therefore, it would be incorrect to assume that all smallholders producing, beef, cocoa, coffee, palm oil and/or soybeans would be affected by the Regulation. That is why, lastly, this assessment concentrates on the countries that are the main exporters to the EU of the targeted commodities.

### 2.1 Geographical spread and crop diversity of smallholders

Lowder et al. (2016) concludes that the share of smallholder farms (less than 2 hectares) is greater in low-income, lower-middle-income and upper-middle-income countries (the latter category being skewed due to China being classified as an upper-middle-income country)<sup>18</sup>. These findings hold, as another study by Herrero et al. (2017) confirms that smallholder agricultural activity makes up a larger share of total agricultural output in regions such as **China, India, Southeast Asia and Sub-Saharan Africa**<sup>19</sup>.

Although the share of smallholders of less than 2 hectares active in Central and South America are not as high as in the other regions previously mentioned, these regions do require specific attention due to the greater risk of deforestation in forests with high concentrations of biodiversity<sup>20</sup>.

**Most smallholders conduct subsistence farming, and therefore mainly produce consumption crops** as opposed to cash crops<sup>21</sup>. While the species of crops grown by smallholders can differ between regions, (Ricciardi et al, 2018) found that worldwide, smallholder farms of less than 2 hectares mainly produce cereals, accounting for about 90% of crops produced by smallholders, followed by roots and tubers, accounting for around 7% of total crop outputs from smallholder farms<sup>22</sup>.

<sup>18</sup> Lowder, S., Scoet, J. & Raney, T. (2016). The Number, Size, and Distribution of Farms, Smallholder Farms, and Family Farms Worldwide. *World Development*, Vol. 87. [Link](#).

<sup>19</sup> Herrero, M., et al. (2017). Farming and the geography of nutrient production for human use: a transdisciplinary analysis. *The Lancet Planetary Health*, Vol. 1(1). [Link](#).

<sup>20</sup> Ibid.

<sup>21</sup> Ibid.

<sup>22</sup> Ricciardi, V., Ramankutty, N., Mehrabi, Z., Jarvis, L. & Chookolingo, B. (2018). How much of the world's food do smallholders produce? *Global Food Security*, Vol. 17. [Link](#).

**Therefore, the Deforestation-free supply chains Regulation will likely not affect 97% of the 510 million smallholders worldwide**, because they do not produce the commodities covered by the Regulation, around 15 million smallholders.

Indeed, it is estimated that smallholders, particularly those in sub-Saharan Africa, Southeast Asia, and South Asia, supply around 30% of local demand for commodities<sup>23</sup>, and tend to farm a greater variety of crops for private or local consumption such as cereals, vegetables, fruits, pulses, and livestock<sup>24</sup>.

In contrast, as farm size increases, crop diversity typically decreases and skews towards crops that are cultivated with mechanised techniques such as sugar and oil crops<sup>25</sup>. Therefore, the available literature indicates that most smallholders produce consumption crops<sup>26</sup> (outside the scope of the Regulation) and conduct subsistence farming or produce for their local communities<sup>27</sup>. Therefore, this section of the assessment concludes that it is likely that only a limited share of the 510 million smallholder farms worldwide would be impacted by the Regulation.

## 2.2 Commodity sourcing by the EU

To better understand the scope of smallholders potentially impacted by the Regulation it is critical to understand which regions are supplying the targeted commodities to the EU. The trade data shows that the EU is sourcing most of its demand for beef, coffee, cocoa, palm oil, soy, and wood from **Argentina, Brazil, Uruguay, USA, UK, Cote d'Ivoire, Ghana, Vietnam, Indonesia, Malaysia**, Russia, Belarus, and Norway<sup>28</sup>. Therefore, it is most likely that smallholders in the bolded countries – with a medium to high risk of embedded deforestation – would be affected by the Deforestation-free supply chains Regulation.

This briefing conducted a country-level assessment of the number of smallholders in the listed countries with a medium to high risk of embedded deforestation. However, due to data issues as discussed above, some national agricultural

<sup>23</sup> Ibid.

<sup>24</sup> Herrero, M., et al. (2017). Farming and the geography of nutrient production for human use: a transdisciplinary analysis. The Lancet Planetary Health, Vol. 1(1). [Link](#).

<sup>25</sup> Ricciardi, V., Ramankutty, N., Mehrabi, Z., Jarvis, L. & Chookolingo, B. (2018). How much of the world's food do smallholders produce? Global Food Security, Vol. 17. [Link](#).

<sup>26</sup> Herrero, M., et al. (2017). Farming and the geography of nutrient production for human use: a transdisciplinary analysis. The Lancet Planetary Health, Vol. 1(1). [Link](#).

<sup>27</sup> Ibid.

<sup>28</sup> European Commission. (2021). Commission Staff Working Document Impact Assessment minimising the risk of deforestation and forest degradation associated with products placed on the EU market. [Link](#).



census reports did not provide a comprehensive overview of the number of smallholders, their land size and/or their agricultural activities.

Therefore, to estimate the number of smallholders potentially affected by the Regulation, this assessment made some assumptions to facilitate the calculation. Firstly, the definition used to collect smallholder data and construct the following tables was that of farms of “less than 5 hectares” in size. Although the smallholder definition of “less than 2 hectares” is more widely applied, the data on farms smaller than 2 hectares was less complete than for farms less than 5 hectares and data accuracy was a key aspect for this assessment. Secondly, in Tables 1 and 2, countries whose figures are in italics were calculated by the authors because there was no data on the number of smallholder farms, with explanation of the calculations provided in the footnotes.

Lastly, for Argentina, Brazil, and Uruguay there was no available data on the number or share of smallholders producing beef, soy, and/or coffee. The available literature of each of these countries does not indicate the share of smallholders under 5 hectares in Argentina, Brazil, and/or Uruguay producing these commodities, however it does confirm that smallholders in Central and South America typically grow consumption crops as opposed to cash crops<sup>29</sup>. Moreover, the literature indicates that most of the operators producing these coffee and soy do so at a large-scale, i.e., more than 5 hectares<sup>30</sup>.

In order to estimate the number of commodity-producing smallholders for Argentina, Brazil and Uruguay, their share of production must be estimated based on the literature. For soy in Brazil, less than 0.5% of smallholders under 5 hectares farms soybean<sup>31</sup>. It is also estimated that approximately 38,000 Brazilian small farming households rely on coffee as their main source of income<sup>32</sup>, or 2% of all Brazilian smallholders. For beef, there are no good estimates to gauge the number of smallholders farming cattle. Depending on the breed of cattle, the minimum requirement for pasture will quickly exceed the smallholder definition used here (under 5 hectares). For illustrative purposes, it is estimated that 5% of smallholders in South America farm cattle.

In Table 1, the number of commodity-producing smallholders for Argentina, Brazil and Uruguay are extrapolated based on the above literature, i.e., less than 0.5% produce soybean, around 2% produce coffee, and 5% farm cattle.

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<sup>29</sup> See Annex 1 for case studies on Argentina, Brazil, & Uruguay which provides a better view on smallholder farming.

<sup>30</sup> E.g., <0.5% of farms smaller than 5 hectares produce soybean. Instead, they mainly produce beans and cassava. See Buainain, A. M., & Garcia, J. R. (2018). Roles and challenges of Brazilian small holding agriculture. *Revista agroalimentaria*, 24(46), 71-87.

<sup>31</sup> Buainain, A. M., & Garcia, J. R. (2018). Roles and challenges of Brazilian small holding agriculture. *Revista agroalimentaria*, 24(46), 71-87.

<sup>32</sup> Volsi, B., Telles, T. S., Caldarelli, C. E., & Camara, M. R. G. D. (2019). The dynamics of coffee production in Brazil. *PloS one*, 14(7), e0219742. [Link](#).

**These “share of commodity production” choices are not a perfect estimation of reality, and therefore, the resulting figures must be interpreted with nuance.** Table 1 below presents per country, the number of smallholders in total and per commodity.

**Table 1: Smallholders per country and smallholders per commodity**

Country	Total number of smallholders (<5 ha)	Commodity-producing smallholders	Commodity
<b>Argentina</b>	40,957	2,252	No data on number of smallholders producing beef, soy, and/or coffee. <i>Italic figures were calculated as 20% of total smallholders.</i>
<b>Brazil</b>	1,893,346	<i>142,134</i>	
<b>Uruguay</b>	6,260	<i>313</i>	
<b>Côte d'Ivoire</b>	845,340	2,000,000 <sup>33</sup>	Cocoa producers
<b>Ghana</b>	<i>5,780,000</i> <sup>34</sup>		
<b>Indonesia</b>	26,100,000	2,600,000	Palm oil producers
<b>Malaysia</b>	<i>480,353</i> <sup>35</sup>	<i>480,353</i>	
<b>Vietnam</b>	10,409,640	572,160	Coffee producers
<b>Total</b>		5,799,260	

**Note:** The 1<sup>st</sup> column lists the countries identified as a major exporter to the EU and being at high risk of embedded deforestation. The 2<sup>nd</sup> column presents the number of smallholders of less than 5 hectares for each country, some of these figures were approximated from official reports (see Annex 1). The 3<sup>rd</sup> column presents the number of smallholders producing the targeted commodity indicated in the 4<sup>th</sup> column.

**The Deforestation-free supply chains Regulation could affect approximately 5.8 million smallholders** in the EU's main trade partner countries with medium- to high risk of embedded deforestation.

<sup>33</sup> Côte d'Ivoire & Ghana are considered together as there is no exact data for the number of cocoa smallholders in each country.

<sup>34</sup> The only data available for Ghana was the number of total farms and the estimated share of farms between 2 and 5 hectares, and the number of farms under 2 hectares. The authors calculated the number of smallholders based on this data (see Annex).

<sup>35</sup> There was no agricultural census report for Malaysia that provided information on smallholder farms. Therefore, the authors consulted data from reports on the production of palm oil, estimating that the number of independent palm oil smallholders equalled 260,353 farms, and the number of organised palm oil smallholders of less than 5 hectares totalled 220,000 smallholders (see Annex).



The above estimates were calculated under the following assumptions:

- All smallholders export their commodity production to the EU. This is not the case as smallholders typically consume what they produce or supply to their local communities. In this context, “5.8 million smallholders” is an overestimation.
- It does not account for any commodities sourced by the EU from smallholders in other countries. This assessment was limited to the selected countries due to their prominence in EU trade and the time constraint to deliver the calculations. In this context, “5.8 million smallholders” does not capture the total number of smallholders in other countries that may supply to the EU.
- It does not have accurate and/or up-to-date information on the number of smallholders both per country and per commodity. In some cases the authors extrapolated figures from the available data, see Annex 1 for each country for the data sources and/or calculations.

Table 2 presents the number of smallholders potentially supplying their output to the EU per commodity. The percentages on the share of imports of commodities in the third column originate from the Commission SWD Impact Assessment of the Regulation<sup>36</sup>. Based on each country’s commodity share of exports to the EU, the final column estimates the share of smallholders that could potentially supply that commodity to the EU.

**Table 2: Estimation of number of smallholders supplying to the EU per commodity**

Country	Export commodity	Number of commodity-producing smallholders	Share of EU imports of commodity	Number of smallholders exporting to the Eu
<b>Argentina</b>	Beef	2,252	6%	123
	Soy		23%	47
<b>Brazil</b>	Beef	94,667	21%	19,880
	Coffee	38,000	30%	11,400
	Soy	9,467	39%	3,692
<b>Uruguay</b>	Beef	313	5%	16

<sup>36</sup> European Commission. (2021). Commission Staff Working Document Impact Assessment minimising the risk of deforestation and forest degradation associated with products placed on the EU market. Pg 60. [Link](#).

<b>Côte d'Ivoire</b>	Cocoa	2,000,000	44%	1,200,000
<b>Ghana</b>	Cocoa		16%	
<b>Indonesia</b>	Palm oil	2,600,000	54%	1,404,000
<b>Malaysia</b>	Palm oil	480,353	24%	115,285
<b>Vietnam</b>	Coffee	572,160	23%	131,597
<b>Total</b>		5,799,260		2,886,040

**Note:** The figures on the number of smallholders exporting to the EU, presented in the last column, were calculated by multiplying the number of smallholders from [country] producing [commodity] with that country's share of EU imports of [commodity].

It is estimated that **approximately 2,8 million smallholders could supply their output to the EU**. However, as mentioned, this estimate is based on assumptions listed below, paired with the best available literature. However, accurate data remains scarce and therefore, the illustrative use of this figure must be nuanced.

The above estimates were calculated under the following assumptions, and building on the assumptions listed under Table 1:

- That the number of smallholders supplying to the EU is proportional with the share of EU imports of a specific commodity. This is not an accurate manner to estimate the number of smallholders supplying to the EU, however there is no available data to estimate this number more accurately.
- Based on the scarcity of data, these estimates do not distinguish between smallholders producing none of the targeted commodities, smallholders producing only one commodity or smallholders producing several of the targeted commodities.

A better estimate would rely on expert (field) data which requires a great network and resources to gather and assess, more than what is possible under this assessment. It is most likely that the number of smallholders affected by the Regulation is overestimated, as literature and data show that the vast majority of smallholders (97%) typically do not produce the commodities covered by the Regulation, in addition to the assumptions made in the calculations.



## Discussion of the results

Table 2 provides an estimation of smallholders per commodity, per country that could be impacted by the Regulation. Not all countries' smallholders would be impacted equally. For example, the small share of soy-producing smallholders is not surprising as literature indicates that smallholders in the countries from which the EU imports soybeans, typically do not grow soybeans, and rather conduct subsistence farming.

The Regulation risks impacting a larger share of smallholders producing cocoa, coffee and palm oil in Côte d'Ivoire, Ghana, Indonesia and Vietnam. Moreover, cocoa, coffee and palm oil have the benefit of existing certification schemes, which have boosted smallholder production of these commodities.

This briefing estimates that approximately 2,8 million smallholders could fall under the Regulation. However, for reasons stated above, this is most likely an overestimation. The share of smallholders potentially affected by the Regulation equals less than 1% of total smallholder farms worldwide. Therefore, it is worth considering whether the benefits of including smallholders in the scope of the Regulation exceed the benefits of exempting them.

If smallholders are exempt from the Regulation, then the European Commission will need to decide which definition of smallholder it wishes to exempt. As presented above, incomplete data and information will complicate this decision, which will likely not be solved by the time the European Commission must decide whether to exempt smallholders or not.

Considering the number of smallholders affected by the Regulation outside the EU, it is the opinion of the authors that smallholders should not be exempt from the Regulation. Exemption would require efforts to both define and map out smallholders in a fair manner, as well as the establishment of a monitoring mechanism for exemption. Moreover, the exemption of smallholders could risk opening up loopholes to the Regulation, that could be exploited through unregulated and unfair sourcing from smallholders.

### 3. MAXIMISING ENVIRONMENTAL AND SOCIAL BENEFITS

Where smallholders make up a larger share of global production of a commodity, they have a substantial impact on the outcome of environmental ambitions. This is currently the case with cocoa, coffee and palm oil producing smallholders, as described above. Smallholders have opportunities to profit from inclusion in the Regulation, by for example, preventing their exclusion from global markets, or being pushed in the informal sector. Yet, these benefits can only materialise when sufficient supporting measures are put in place to assist smallholders, both financially and structurally.

The lessons learned from zero-deforestation commitments (ZDC), in the form of private certification schemes, national actions and commitments by global corporations, provide a picture of the potential benefits as well as issues smallholders face with the implementation of additional requirements.

This section summarises research and experiences with existing schemes and commitments in describing smallholders' relation to the EU Regulation. First, it highlights potential benefits of smallholders' inclusion into ZDCs. Then, key concerns from experiences with ZDCs are assessed, leading to policy recommendations on mitigation measures. For an in-depth review of several existing certification systems and commodity supply chains consult Annex 1.

#### 3.1 Potential benefits for smallholders' inclusion in the Regulation

The Regulation will not impact all smallholders equally. Based on the assessment above, the share of smallholders in the production of cocoa, coffee, and palm oil is more significant than for other commodities. Given the number of smallholders working in these commodity chains, which are at risk of embedded deforestation, ensuring their participation in ZDC schemes accelerates the transition to deforestation-free commodity chains, and should therefore be of great consideration.

Smallholders from the cocoa and palm oil industry have expressed that the EU Regulation has the potential to reduce the supply chains complexity. For example, Ivorian cocoa farmers see traceability of cocoa production as key to both sustainability and improving livelihoods<sup>37</sup>.

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<sup>37</sup> Ivorian farmers' organisations (2022) Letter to the European Council and the European Parliament - Support for the geolocation requirement in the draft EU regulation on deforestation free supply chains. [Link](#).

Potential benefits to accrued to smallholders from their inclusion in the Regulation include:

- Reducing supply chain complexities
- Advancing equitable payment benefits
- Accelerating national infrastructure extension

The Regulation's traceability requirement could incentivise simplified supply chains by reducing complexities and decreasing the number of middlemen<sup>38</sup>. Smallholders benefit from less complex supply chains and middlemen, as it allows them to receive a larger **share of the profit**. Thus, the traceability requirement could lead to a strengthening of the smallholders' market capacity and their position in the supply chain.

The Regulation could contribute to increasing the livelihood of smallholders, by improving the reliability of receiving sustainability premiums and the set commodity price<sup>39</sup>. Smallholders frequently experience issues with receiving payments and perceive the **advancements of digital services** as a step towards a more stable system. By creating an access to a digitalised system, the requirements for traceability should bring positive changes, including the implementation of electronic payments to producers for secure and reliable payments<sup>40,41</sup>. Moreover, the geolocation of farms with digitalised services could not only provide better information on land tenure, and locating farmers into one cooperative, it could also lead to a boost in national mapping and monitoring of farms<sup>42</sup>.

The expectation to move to more digitalised system includes the design and implementation of **national programmes and systems**. For example, the West African cocoa industry's national monitoring systems are still under development, and therefore, a large section of the cocoa production would not yet be able to comply with the Regulation. Regardless, West African cocoa industry hopes that the Regulation may accelerate the roll-out of the national monitoring systems by

<sup>38</sup> Aid Environment (2022) EU Deforestation Regulation: Will the traceability requirement hold smallholder producers back? [Link](#).

<sup>39</sup> Ibid.

<sup>40</sup> Ivorian farmers' organisations (2022) Letter to the European Council and the European Parliament - Support for the geolocation requirement in the draft EU regulation on deforestation free supply chains. [Link](#).

<sup>41</sup> European Parliament (2022) Draft report on the proposal for a regulation of the European Parliament and of the Council on Making available on the Union market as well as export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010 (COM(2021)0706 – C9-0430/2021 – 2021/0366(COD)). [Link](#).

<sup>42</sup> Ivorian farmers' organisations (2022) Letter to the European Council and the European Parliament - Support for the geolocation requirement in the draft EU regulation on deforestation free supply chains. [Link](#).



the time the Regulation enters into force<sup>43</sup>. The development of nationally mandated systems could create an effective enabling environment through government partnerships and the inclusion of stakeholders in its conception.

The market exclusion of smallholders due to increased costs becomes less likely when targeted assistance is provided in the form of infrastructure and/or resources. In addition to the benefits listed above, literature on existing ZDCs and zero-deforestation cooperatives find additional positive impacts on smallholders such as **knowledge building, social capital and spillovers of standards**.

Zero-deforestation standards and commitments contribute to knowledge building and social capital by bringing together well-connected communities, giving local actors greater recognition, and providing opportunities to share resources<sup>44</sup>. Moreover, it is found that even non-participant farms have adopted ZDC practices and standards, expanding the reach and effectiveness of ZDCs<sup>45,46</sup>.

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<sup>43</sup> European Cocoa Association (2022) Position Paper on the proposed EU Regulation on Deforestation and Forest degradation. [Link](#).

<sup>44</sup> For palm oil production: Apriani, E., Kim, Y. S., Fisher, L. A., & Baral, H. (2020). Non-state certification of smallholders for sustainable palm oil in Sumatra, Indonesia. *Land Use Policy*, 99, 105112. [Link](#). For coffee production: Rueda, X., & Lambin, E. F. (2013). Responding to Globalization: Impacts of Certification on Colombian Small-Scale Coffee Growers. *Ecology and Society*, 18(3). [Link](#).

<sup>45</sup> Rueda, X., & Lambin, E. F. (2013). Responding to Globalization: Impacts of Certification on Colombian Small-Scale Coffee Growers. *Ecology and Society*, 18(3). [Link](#)

<sup>46</sup> Zimmerer, K. S., E. F. B. Lambin, and S. J. Vanek. 2018. Smallholder telecoupling and potential sustainability. *Ecology and Society* 23 (1):30. [Link](#).

### 3.2 Key concerns for smallholders - experiences from zero-deforestation commitments

The Regulation has been criticised for burdening smallholders, including with the **costs and the timeframe to comply**. In order to create guided support to achieve inclusion and benefits for smallholders from the Regulation, it is integral to understand what producers may be faced with. The following section summarises burdens and issues felt by smallholders in both gaining and retaining a status of certification or compliance in the context of existing ZDC requirements, relevant to the EU's Regulation.

The implementation of sustainability requirements comes with **additional costs and specific skillsets** from the actors along the supply chain. For smallholders, this can be perceived as a burden, especially due to the barriers they face when accessing financing, advancing skills or providing legal proof for compliance. In non-certification systems, including the EU's proposed Regulation requirements, these incurred costs may be referred to as transitional costs. These costs occurring both pre-certification and as a certified producer act as additional barriers to market entry for smallholders<sup>47</sup> (see *Annex 2 – Literature review Zero-Deforestation*), such as

- **Pre-requisites of owning capital and equipment**, often not held by smallholders.
- **Administrative fees** for obtaining legal documentation (e.g., land tenure, land ownership, record book etc.), both for financial reasons and options to acquire right documentation.
- **Skills, trainings and updates of production methods** create financial burdens through a need of partaking in targeted courses.
- **Running costs** can increase for certified smallholders with initial income loss, as well costs for audits, with premiums not always outweighing the financial inputs.

While ZDC certified smallholders have found the impacts of ZDCs to be more manageable, **independent smallholders** are at risk of being disproportionately impacted by ZDCs. For example, **traceability** of independent smallholders is said to present a greater challenge compared to their certified counterparts. Independent smallholders, typically on the poorer end of the farming community, require additional technical and financial support to mitigate negative impacts<sup>48</sup>.

<sup>47</sup> Lambin, E.F., Gibbs, H.K., Heilmayr, R. et al. (2018) The role of supply-chain initiatives in reducing deforestation. *Nature Climate Change* 8, 109–116. [Link](#); Rueda, X., & Lambin, E. F. (2013). Responding to Globalization: Impacts of Certification on Colombian Small-Scale Coffee Growers. *Ecology and Society*, 18(3). [Link](#).

<sup>48</sup> Pirard, R., Gnych, S., Pacheco, P., Lawry, S. (2015) Zero-deforestation commitments in Indonesia: Governance challenges. Center for International Forestry Research. [Link](#).

For a more detailed assessment of ZDCs, see Annex 2 - Private certification schemes.

### 3.3 Policy recommendations

Without measures to safeguard smallholders, ZDCs risk marginalising smallholders, leading to market fragmentation and a push towards the informal sector in higher-risk commodity chains, as well as continued deforestation. Efforts must be undertaken to establish an environment in which smallholders can balance the potential benefits of the Regulation with the potentially incurred costs and capacity issues.

Ensuring the participation of smallholders in the Regulation, contingent on additional support, reduces the risk of loopholes within the Regulation contributing to continued deforestation, and instead accelerates the development of deforestation-free commodity supply chains.

The following recommendations aim to provide targeted support to ensure smallholders can both retain market access as well as maintain their values and improve their livelihoods. The recommendations in green boxes relate specifically to the EU Deforestation-free supply chains Regulation. The recommendations entail financial and technical support, enhancing monitoring capacities and encouraging national frameworks. It is essential to underline the need for targeted support to reach both certified and independent smallholders equally, and consider the adaptation of these measures to the needs of women farmers.

#### Financial support and supply-chain mechanisms

- **Favourable and transparent contract terms, improved access to financial services, price premiums and price stabilisation mechanisms** are important financial measures to support smallholders<sup>49,50,51</sup>.
- **Preference for group certification** to minimise burden from additional costs and risk (pre-certification requirements) for individual farmers see Annex 2 – Private certification schemes).
- **Targeted funds by private certification schemes can help to overcome financial risks, as well as government initiatives.** National and subnational governments may offer financial support to smallholders in transition times. Costs of certification (administrative costs, trainings and direct certification

<sup>49</sup> Lambin, E.F., Gibbs, H.K., Heilmayr, R. et al. (2018) The role of supply-chain initiatives in reducing deforestation. *Nature Climate Change* 8, 109–116. [Link](#).

<sup>50</sup> Pirard, R., Gnych, S., Pacheco, P., Lawry, S. (2015) Zero-deforestation commitments in Indonesia: Governance challenges. Center for International Forestry Research. [Link](#).

<sup>51</sup> Indonesian CSOs Joint Statement on the European Union Due Diligence Regulation Proposal. (2022). [Link](#).



fees) for smallholders are often mediated by NGOs, which should receive support and acknowledgement by government bodies.

- **Preferential sourcing** by companies can ensure an inclusive and reliable market for smallholders and help secure their income (see Annex 2 - Direct supply chains of global corporations).
- Cost- and risk-sharing of certification along the value chain to mitigate impacts on smallholders coordinated by institutional mechanisms. The range of value chain actors include processors, traders, financial institutions, retailers, manufacturers of goods. Sharing the burden is justified by all stakeholders benefiting from a sustainably produced commodity (see Annex 2 - Private certification schemes).

### Recommendations for the EU Regulation – Finance and supply chains

- Propose the **preference of** to both minimise financial burden for individual smallholders to be compliant and facilitate monitoring efforts.
- A mandatory minimum percentage to support preferential sourcing from smallholders for specific commodity supply chains<sup>52,53</sup>.
- **Require operators to take reasonable efforts to support compliance of suppliers, including smallholders**<sup>54</sup>. This could include encouraging long-term relationships with suppliers/smallholders to tackle non-compliance, with disengagement as a last resort<sup>55,56</sup>, and a requirement for operators to report annually on steps taken to support suppliers, including smallholders.

<sup>52</sup> Indonesian CSOs Joint Statement on the European Union Due Diligence Regulation Proposal. (2022). [Link](#).

<sup>53</sup> Joint Statement of Palm Oil Sector Organisations on the Proposal for a Regulation on Deforestation-free Products. (2022) [Link](#).

<sup>54</sup> Fern. (2021). EU Regulation on deforestation-free products: What's in the new proposal and what does it mean. [Link](#).

<sup>55</sup> Tropenbos. (2022). Recommendations for a smallholder-inclusive EU Regulation on deforestation-free products. [Link](#).

<sup>56</sup> European Parliament. (2022). Draft report on the proposal for a regulation of the European Parliament and of the Council on Making available on the Union market as well as export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010 (COM(2021)0706 – C9-0430/2021 – 2021/0366(COD)). [Link](#).

### Material and technical input support

- **Supporting access to agricultural inputs, technical assistance and required trainings**, adapted to local contexts to take all smallholders, including independent ones, on board to comply with the commitments.
- **Pre-certification assistance** can encompass legal aid to obtain the correct documents for certification and compliance. It must be assured that assistance reaches all smallholders, also those in rural areas (See Annex 2 -Private certification schemes).

### Recommendations for the EU Regulation – Material and technical input

- **Provide financial and technical support (targeted guidance)** to smallholders and transfer of technology and trainings provided by the operators or the European Commission to meet requirements<sup>57,58,59</sup>.
- **Provide support to smallholder producer organisations to acquire digital equipment, with targeted preparation for geolocation requirements**, as well as training to manage software systems<sup>60</sup>. The integration of independent smallholders in such support mechanisms is key to ensure their market inclusion and prevent large producers from becoming the favoured source of commodities.
- **Design and implement sector-specific information requirements and guidance** (e.g., in the form of secondary legislation) to retain smallholder engagement<sup>61</sup>.

<sup>57</sup> Indonesian CSOs Joint Statement on the European Union Due Diligence Regulation Proposal. (2022). [Link](#).

<sup>58</sup> (2022) Cocoa Coalition joint position paper - The proposed EU regulation on deforestation. [Link](#).

<sup>59</sup> European Parliament (2022) Draft report on the proposal for a regulation of the European Parliament and of the Council on Making available on the Union market as well as export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010 (COM(2021)0706 – C9-0430/2021 – 2021/0366(COD)). [Link](#).

<sup>60</sup> Fairtrade (2022) Fairtrade position and recommendations on deforestation regulation. [Link](#).

<sup>61</sup> (2022) Joint Statement of Cross-commodity Sector Organisations to EU Council Presidency on the Proposal for a Regulation on Deforestation-free Products. [Link](#).

### Building monitoring capacities for traceability requirements

- The development of **nationally mandated systems** can create an effective enabling environment through government partnerships, the inclusion of stakeholders in its conception.
- Ensuring **data ownership** by the smallholders or their producer organisations<sup>62</sup>.

#### Recommendations for the EU Regulation – Monitoring capacities

- **Providing a sufficient timeframe to build up systems and infrastructure**, i.e., extending the implementation period for the Regulation, to allow smallholders to adapt and ensure their market access<sup>63,64,65</sup>. This could also include a **time-bound grace period** for smallholders who have deforested legally.
- Changes suggested to the geolocation requirement<sup>66</sup>, including geolocation of the 'production area' from which a cooperative is sourcing (rather than individual farms).
- Changes to the traceability requirement, such as initially accepting traceability to the mill, to better include smallholders with the perspective of phasing out traceability to mill to favour traceability to plantation<sup>67</sup>.

<sup>62</sup> Fairtrade (2022) Fairtrade position and recommendations on deforestation regulation. [Link](#).

<sup>63</sup> European Cocoa Association (2022) Position Paper on the proposed EU Regulation on Deforestation and Forest degradation. [Link](#).

<sup>64</sup> Euractiv (2022) COCERAL, FEDIOL, and FEFAC Welcome Stronger EU Partnerships with Producing Countries in ENVI Report on EU Deforestation-free Commodities Regulation but Regret Traceability Provisions. [Link](#).

<sup>65</sup> (2022) Indonesian CSOs Joint Statement on the European Union Due Diligence Regulation Proposal [Link](#).

<sup>66</sup> Although note support for retaining the geolocation requirement (e.g. Cocoa Coalition joint position paper (2022)[link](#); Ivorian farmers' organisations (2022) [link](#)

<sup>67</sup> (2022) Joint Statement of Palm Oil Sector Organisations on the Proposal for a Regulation on Deforestation-free Products. [Link](#).



### Frameworks by national governments

- **Implementing legal frameworks, disclosure, and reporting requirements** as well as independent reviews and support of the work by NGOs provides options to expand traceability and accountability.
- Smallholder income losses can be compensated by national governments, if necessary.
- **Update rural land use planning systems at the national level.** These land use planning systems are integral to achieving ZDCs and challenge both stakeholders due to their complexity, and smallholders by acting as an extra transaction cost (see Annex 2 - National certification systems).
- **Ensure democratic and transparent participation and implementation of ZDCs.** An effective ZDC requires the input of all stakeholders, including smallholders, as well as implementation independent from individual companies' influence<sup>68</sup>. Policies should furthermore not only aim for zero-deforestation but also sustainable agriculture overall, food and energy security, social inclusion, and well-being of the population<sup>69</sup>.

### Recommendations for the EU Regulation – Frameworks by national governments

- **Long-term cooperation** between the EU and producing countries<sup>70</sup>, including through development of Forest Partnerships.
- **A systematic assessment** (see Article 32<sup>71</sup>) of the impact of the Regulation on farmers, including smallholders and indigenous people.
- **Better involvement of civil society in these impact assessments.** The availability of environmental data is typically lagged, so CSOs are well placed to inform national governments and the European Commission on impacts of the Regulation on farmers.

<sup>68</sup> Austin, K. G., Heilmayr, R., Benedict, J. J., Burns, D. N., Eggen, M., Grantham, H., Greenbury, A., Hill, J. K., Jenkins, C. N., Luskin, M. S., Manurung, T., Rasmussen, L. V., Rosoman, G., Rudorff, B., Satar, M., Smith, C., & Carlson, K. M. (2021) Mapping and Monitoring Zero-Deforestation Commitments. *BioScience*, 71(10), 1079–1090. [Link](#).

<sup>69</sup> Pirard, R., Gnych, S., Pacheco, P., Lawry, S. (2015) Zero-deforestation commitments in Indonesia: Governance challenges. Center for International Forestry Research. [Link](#).

<sup>70</sup> (2022) Joint Statement of Palm Oil Sector Organisations on the Proposal for a Regulation on Deforestation-free Products. [Link](#).

<sup>71</sup> European Council. (2022). Draft Regulation of the European Parliament and of the Council on the making available on the Union market as well as export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010. Pg 75. [Link](#).

## Annex 1 Smallholder country case studies

For brevity, this section focuses on country level data of smallholders for the main producers of the targeted commodities, which also make up a significant share of EU imports, i.e., Argentina, Brazil, Uruguay, Cote d'Ivoire, Ghana, Indonesia, Malaysia, and Vietnam.

### Argentina

The table<sup>72</sup> below provides an overview of the total number of farms in Argentina, as well as the number of smallholder farms both under 5 hectares and under 10 hectares, accompanied by their share in the country's land use<sup>73</sup>. Although farms under 10 hectares make up a fifth of total farms in Argentina, they only account for 0.16% of total land use.

Size (hectares)	Number of farms	Share (%)	Area (hectares)	Share (%)
< 5	40,957	13.7%	105,895	0.06%
< 10	63,621	21.3%	283,868	0.16%
Total	297,425	100%	174,808,564	100%

Although the share of smallholder farming in total land use is negligible, it is not clear whether Argentinian smallholders are producing the commodities targeted by the Regulation and whether they export their production to the EU. Moreover, the definition of a smallholder farm in Argentina is a farm size of less than 200 hectares<sup>74</sup>. And the 2002 agricultural census data confirms that average farm size is 500 hectares<sup>75</sup>.

One paper details the evolution of agricultural output for small farmers (< 200 hectares) in the Pampa region, which saw an increase in soy production, with a decrease in cattle rearing and other crops such as sunflower and sorghum<sup>76</sup>. Argentina's soy supply chain is dominated by large international companies, which dominate the production capacity of each stage of the supply chain<sup>77</sup>. However, Argentinian soy is not being imported by the EU, rather Argentinian beef.

<sup>72</sup> The number and area of farms smaller than 10 hectares is calculated cumulatively to include farms smaller than 5 hectares.

<sup>73</sup> Berdegú, J. A., & Fuentealba, R. (2011, January). Latin America: The state of smallholders in agriculture. In IFAD conference on new directions for smallholder agriculture (Vol. 24, p. 25). [Link](#).

<sup>74</sup> Gras, C. (2009). Changing patterns in family farming: the case of the pampa region, Argentina. *Journal of Agrarian Change*, 9(3), 345-364. [Link](#).

<sup>75</sup> Berdegú, J. A., & Fuentealba, R. (2011, January). Latin America: The state of smallholders in agriculture. In IFAD conference on new directions for smallholder agriculture (Vol. 24, p. 25). [Link](#).

<sup>76</sup> Gras, C. (2009). Changing patterns in family farming: the case of the pampa region, Argentina. *Journal of Agrarian Change*, 9(3), 345-364. [Link](#).

<sup>77</sup> Cabezas, S., Bellfield, H., Lafortune, G., Streck, C. & Hermann, B. (2019). Towards more sustainability in the soy supply chain: How can EU actors support zero deforestation and SDG efforts? [Link](#).

Another study claims that most of Argentina's beef production supplies the domestic demand<sup>78</sup>, due to Argentina having the second highest beef consumption per capita in the world<sup>79</sup>. A survey of small-scale Argentinian farmers showed that farmers in the non-Pampean regions mostly farm livestock<sup>80</sup>. However, it is unclear exactly how many smallholders in Argentina produce beef due to data unavailability and the definition of smallholder farms in Argentina (i.e., < 200 hectares).

Due to general literature on smallholder farming and trends within Argentina, it is possible that if smallholders (< 2 or 10 hectares) farm livestock, that this output primarily supplies the local community food demand, and rather that livestock farming for international trade is conducted by large-scale farms.

## Brazil

The table<sup>81</sup> below provides an overview of the total number of farms in Brazil, as well as the number of smallholder farms both under 2 hectares, under 5 hectares, and under 10 hectares, accompanied by their share in the country's land use<sup>82</sup>. Farms under 2 hectares make up a fifth of total farms in Brazil but only account for 0.25% of total land use. In turn, farms smaller than 10 hectares made up half of total farms but only occupy just over 2% of total farmland<sup>83</sup>.

Size (hectares)	Number of farms	Share (%)	Area (hectares)	Share (%)
< 2	1,075,921	21.2%	870,833	0.25%
< 5	1,893,346	37.3%	3,422,440	0.98%
< 10	2,543,778	50.1%	7,989,114	2.28%
Total	5,072,152	100%	350,253,329	100%

The definition of a smallholder farm in Brazil is not clear cut as the government makes a greater distinction between family farms and large-scale farms. Family farms in Brazil are farms managed by the owner and their family, serving as the household's main source of income, and typically smaller than four fiscal modules

<sup>78</sup> McConnell, M. & Mathews, K.H. (2008) Global market opportunities drive beef production decisions in Argentina and Uruguay. (No. 1490-2016-127386, pp. 22-27).

<sup>79</sup> Fischer, C. G., & Bilencia, D. (2020). Can we produce more beef without increasing its environmental impact? Argentina as a case study. *Perspectives in Ecology and Conservation*, 18(1), 1-11. [Link](#).

<sup>80</sup> Mastrangelo, M.E., Sun, Z., Seghezzo L. & Müller, D. Survey-based modelling of land-use intensity in agricultural frontiers of the Argentine dry Chaco. *Land Use Policy*, 88 (2019), Article 104183, 10.1016/j.landusepol.2019.104183

<sup>81</sup> The number and area of farms smaller than 5 and 10 hectares is calculated cumulatively to include, respectively, farms smaller than 2 and 5 hectares.

<sup>82</sup> Buainain, A. M., & Garcia, J. R. (2018). Roles and challenges of Brazilian small holding agriculture. *Revista agroalimentaria*, 24(46), 71-87. [Link](#).

<sup>83</sup> Ibid.



(a module ranging from 5 to 110 hectares)<sup>84</sup>. The average size of a farm in Brazil is above 50 hectares<sup>85</sup>.

While family farms make up a significant share of agricultural production, subsistence farming makes up more than a fifth of total landholdings. The 2017 agricultural census estimated that 1,66 million farms in the northeast region were minifundia which is defined as “a holding whose size does not allow the subsistence of a family.” However, the term minifundia is not exclusive to farms smaller than 2 hectares, as in some sub-regions of the northeast even farms of 5 ha are insufficient to place the farm household above the poverty line<sup>86</sup>. So, while farms smaller than 2 hectares make up a fifth of total Brazilian farms, it is unlikely that many of these farms produce an excess output to be traded internationally.

The EU imports soybeans, coffee and beef from Brazil. Data from the 2006 Brazilian agricultural census estimated that farms under 2 hectares were responsible for <0.1% of soybean production, while farms between 2 and 10 hectares were responsible for 1.6% of total Brazilian soybean production. In contrast, farms larger than 100 hectares were responsible for 82% of total soybean production<sup>87</sup>. Indeed, 90% of Brazilian soy is produced by large agribusinesses<sup>88</sup>.

Instead, the 2006 census concludes that farms smaller than 2 hectares mainly produce cassava, green beans and black-eyed beans<sup>89</sup>, which is in line with literature on smallholder farms consisting mainly of subsistence farming and supplying production to their local communities.

Brazil is a global player in the production of coffee, the production of which is mainly concentrated in the southeast region of Brazil. It is estimated that coffee production serves as a primary source of income for 38,000 small farming households<sup>90</sup>. On average family farms in the southeast region of Brazil cultivate 2.5 to 5 hectares of coffee<sup>91</sup>, however it is not clear how large these family farms

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<sup>84</sup> Herrera, G., Brito de Costa, R., Moraes, P.M & Fonseca Mendes, D.R. (2017). Smallholder farming in Brazil: An overview of 2014. *African Journal of Agricultural Research*. [Link](#).

<sup>85</sup> Buainain, A. M., & Garcia, J. R. (2018). Roles and challenges of Brazilian small holding agriculture. *Revista agroalimentaria*, 24(46), 71-87. [Link](#).

<sup>86</sup> Buainain, A. M., & Garcia, J. R. (2018). Roles and challenges of Brazilian small holding agriculture. *Revista agroalimentaria*, 24(46), 71-87. [Link](#).

<sup>87</sup> Ibid.

<sup>88</sup> Cabezas, S., Bellfield, H., Lafortune, G., Streck, C. & Hermann, B. (2019). Towards more sustainability in the soy supply chain: How can EU actors support zero deforestation and SDG efforts? [Link](#).

<sup>89</sup> Buainain, A. M., & Garcia, J. R. (2018). Roles and challenges of Brazilian small holding agriculture. *Revista agroalimentaria*, 24(46), 71-87. [Link](#).

<sup>90</sup> Volsi, B., Telles, T. S., Caldarelli, C. E., & Camara, M. R. G. D. (2019). The dynamics of coffee production in Brazil. *PloS one*, 14(7), e0219742. [Link](#).

<sup>91</sup> Marcolan AL, Ramalho AR, Mendes AM, Teixeira CAD, Fernandes CF, Costa JMN, Vieira Júnior JR, Oliveira SJM, Veneziano W. Cultivo dos cafeeiros conilon e robusta para Rondônia. Porto Velho: Embrapa Rondônia; 2009. Portuguese. [Link](#).

are and if they produce other crops, thus exceeding a smallholder size of 5 to 10 hectares.

The extent of smallholder cattle farming in Brazil is also not extensively documented. Cattle farming is considered an economically viable activity for “small” producers (< 100 hectares), especially in the north region of Brazil, with a trend of converting forest and cropland to pastureland<sup>92</sup>. Although small-scale producers of beef may not have easy market access to the international market. It is estimated that up to two-thirds of small-scale producers sell their cattle to large-scale slaughterhouses, as opposed to trading directly internationally<sup>93</sup>. Yet, due to a lack of granular data, it is difficult to estimate the share of farms smaller than 2 or 10 hectares that farm cattle.

One study on smallholders selling timber indicated that from a survey the mean lot size was 83 hectares. Among informal sellers, i.e., those squatting on plots of land, the mean lot size was 8 hectares<sup>94</sup>. Another study cites a 1996 survey found that the mean farm size of farms in the Rondônia region was 76 hectares<sup>95</sup>

## Uruguay

The table<sup>96</sup> below provides an overview of the total number of farms in Uruguay, as well as the number of smallholder farms between 1 and 4 hectares, and under 10 hectares, accompanied by their share in the country’s land use, as provided by the latest agricultural census of Uruguay (2000)<sup>97</sup>. The 2000 census concludes that farms smaller than 2 hectares equal less than 4% of total farms, while farms between 1 and 4 hectares make up a tenth of total farms and account for 0,10% of total agricultural land use. Farms smaller than 10 hectares make up a fifth of total farms and take up 0,40% of total agricultural land.

Size (hectares)	Number of farms	Share (%)	Area (hectares)	Share (%)
1 to 4	6,260	11%	17,000	0.10%
< 10	13,346	23%	65,000	0.40%
Total	57,131	100%	16,420,000	100%

<sup>92</sup> Pereira, R., Simmons, C., Walker, R. (2016). Smallholders, Agrarian Reform, and Globalization in the Brazilian Amazon: Cattle versus the Environment. *Land*, 5, 24. [Link](#).

<sup>93</sup> Ibid.

<sup>94</sup> Amacher, G., Merry, F. & Bowman, M. (2009). Smallholder timber sale decisions on the Amazon frontier. *Ecological Economics*, 68(6), pp. 1787-1796. [Link](#).

<sup>95</sup> Vosti, S., Muñoz Braz, E., Carpentier, C., d'Oliveira, M. Witcover, J. (2003). Rights to forest products, Deforestation and Smallholder Income: Evidence from the Western Brazilian Amazon. *World Development*, 31(11), pp. 1889-1901. [Link](#).

<sup>96</sup> The number and area of farms smaller than 10 hectares is calculated cumulatively to include farms between 1 and 4 hectares.

<sup>97</sup> Berdegue, J. A., & Fuentealba, R. (2011, January). Latin America: The state of smallholders in agriculture. In IFAD conference on new directions for smallholder agriculture (Vol. 24, p. 25). [Link](#).

Uruguay's main export commodity to the EU is beef. However, unlike Argentina which mainly produces beef for its domestic market, Uruguay exported 80% of its beef production in 2008 to trade partners such as the US and the EU<sup>98</sup>. Considering the minimum required pastureland needed per livestock unit, it is unlikely that a large share of the 6,000 smallholders between 1- and 4-hectares export beef to the EU.

### Côte d'Ivoire

Cote d'Ivoire and Ghana are the world's largest cocoa producers, accounting for 90% of West Africa's cocoa production, with an estimated 1,8-2 million cocoa smallholders in these countries<sup>99</sup>.

The table below provides an overview of the total number of farms in Côte d'Ivoire, as well as the number of smallholder farms smaller than 1 hectare, 2 hectares and 10 hectares, accompanied by their share in the country's land use, as provided by the latest agricultural census of Côte d'Ivoire (2001) <sup>100</sup>. Smallholder farms of less than 2 hectares made up 56% of total farms and cultivated 10% of total agricultural land. The average farm is estimated to be 3.9 hectares.

Size (hectares)	Number of farms	Share (%)	Area (hectares)	Share (%)
< 1	470,433	42%	202,483	4.6%
< 2	629,366	56%	438,476	10%
< 5	845,340	75%	1,110,930	25%
< 10	993,856	89%	2,078,045	48%
Total	1,117,667	100%	4,351,663	100%

As the world's largest producer of cocoa, many farms/plantations are geared towards growing cocoa, which typically occurs on plots between 1.75 and 5 hectares, with average farm is estimated to be 3.9 hectares<sup>101</sup>. This is confirmed by recent research, which concludes that cocoa is on average cultivated on plots of 4.17 hectares, with most households reporting farms between 2 to 5 hectares<sup>102</sup>.

<sup>98</sup> McConnell, M. & Mathews, K.H. (2008). Global market opportunities drive beef production decisions in Argentina and Uruguay. (No. 1490-2016-127386, pp. 22-27).

<sup>99</sup> Schulte, I., Landholm, D.M., Bakhtary, H., Czaplicki Cabezas, S., Siantidis, S., Manirajah, and S.M., Streck, C. (2020). Supporting Smallholder Farmers for a Sustainable Cocoa Sector. Climate Focus. [Link](#).

<sup>100</sup> Ritchie, H & Roser M. (2021). Farm Size. Our World in Data. [Link](#).

<sup>101</sup> Cappelle, J. (2009). Towards a Sustainable Cocoa Chain. Oxfam research report. [Link](#).

<sup>102</sup> Ritchie, H & Roser M. (2021). Farm Size. Our World in Data. [Link](#).

## Ghana

Recent agricultural data on Ghana is difficult to locate as the last agricultural census took place in the 1970s. The only data available was on the total number of farms, the total agricultural land use<sup>103</sup>, and the share of farms smaller than 2 and 5 hectares<sup>104</sup>.

The table below provides an overview of the total number of farms in Ghana, as well as the share of smallholder farms smaller than 2 hectares and 5 hectares based on a survey of smallholder farms. To provide an estimated number of farms, the available data was extrapolated by multiplying the total number of farms with the share of smallholder farms. Then to calculate the estimated smallholder land use area, the number of farms was multiplied by the average farm size per size category. The percentage share of land use was calculated by dividing the smallholder farm size area by the total agricultural area.

Size (hectares)	Number of farms	Share (%)	Area (hectares)	Share (%)
< 2	3,604,000	53%	5,338,000	40%
< 5	5,780,000	85%	12,342,000	90%
Total	6,800,000	100%	13,600,000	100%

About 60% of all farms in the country are less than 1.2 hectares in size, 25% are between 1.2 to 2.0 hectares, with only 15 % above 2.0 hectares. The mean farm size is less than 1.6 hectares. Small-size and medium-size farms of up to 10.0 hectares account for 95 % of the cultivated land (SRID, 2001)<sup>105</sup>.

Farms under 2 hectares typically grow maize, cassava, and plantains, while cocoa makes up a larger share of the crop mix in small farms in the forest as opposed to the coast or the savanna. However, mostly cocoa is grown on plantations larger than 5 hectares in forest area. 16% of smallholders in the forest area have farms larger than 5 hectares, and the average farm size of a smallholder in the forest area is 3.1 hectares<sup>106</sup>.

## Malaysia

Data on total number of farms and smallholders in Malaysia is difficult to obtain, however some information on palm oil smallholders was available. To note, the

<sup>103</sup> Ministry of Food and Agriculture Statistics, Research and Information Directorate (SRID). (2016). Agriculture in Ghana – Facts and figures. [Link](#).

<sup>104</sup> Chamberlin, J. (2007). Defining smallholder agriculture in Ghana: who are smallholders, what do they do and how are they linked with markets? Ghana Strategy Support Program (GSSP), Background paper No. GSSP 0006. [Link](#).

<sup>105</sup> FAO. (n.d.). Ghana at a glance. [Link](#).

<sup>106</sup> Chamberlin, J. (2007). Defining smallholder agriculture in Ghana: who are smallholders, what do they do and how are they linked with markets? Ghana Strategy Support Program (GSSP), Background paper No. GSSP 0006. [Link](#).



definition of a smallholder in Malaysia is typically a farm of less than 40 hectares<sup>107</sup>.

The table below presents the number of **smallholders producing palm oil**. The number of smallholder farms was calculated based on studies citing the number organised and independent palm oil smallholders (these smallholders are typically smaller than 5 hectares, more info below). Data on the total land use of palm oil was available, as well as the share under control of smallholders<sup>108</sup>, however the total number of farms producing palm oil was not readily available.

Size (hectares)	Number of farms	Share (%)	Area (hectares)	Share (%)
< 5	480,353	N/A	1,778,000	30.6%
Total	N/A	N/A	5,800,000	100%

In 2015, Malaysia supplied 39% of world's palm oil<sup>109</sup>, and palm oil was grown on 5.8 million hectares of agricultural land (>75%)<sup>110</sup>. In 2019, private estates cultivated 61% of total land use dedicated to palm oil production. Smallholders made up a third of total land used for palm oil production, i.e., organised smallholders cultivate 16.6% of total land use and 16.7% by independent smallholders. The remainder on the palm cropland is in control of the government<sup>111</sup>.

One study found that the **number of independent smallholders** producing palm oil totalled 260,353 farms on just under 1 million hectares in 2019<sup>112</sup>. This calculation of smallholders is based on the definition of a smallholder farm being less than 40 hectares, however one study shows that the average size of an independent palm oil smallholder farm was 3.9 hectares<sup>113</sup>.

The **number of organised smallholders** is also not as clear. The MSPO reports that 541 clusters of organised smallholders holding 778,000 hectares are certified. The MSPO Trace database indicates that there are just over 220 thousand smallholders of less than 5 hectares registered<sup>114</sup>.

<sup>107</sup> Golam, A.A., Ngah, I. & Applanaidu, S.D. (2018) Agricultural transformation in Malaysia: The role of smallholders and area development. [Link](#).

<sup>108</sup> Rahman, S. (2020). Malaysian Independent oil palm smallholders and their struggle to survive 2020. ISEAS Yusof Ishak Institute. [Link](#).

<sup>109</sup> Golam, A.A., Ngah, I. & Applanaidu, S.D. (2018) [Link](#), and Kushairi, A. et al. (2019). Oil palm economic performance in Malaysia and R&D progress in 2018, [link](#).

<sup>110</sup> Ibid.

<sup>111</sup> Rahman, S. (2020). Malaysian Independent oil palm smallholders and their struggle to survive 2020. ISEAS Yusof Ishak Institute. [Link](#).

<sup>112</sup> Ibid.

<sup>113</sup> Senawi, R., Rahman, N., Mansor, N. & Kuntom, A. (2019). Transformation of oil palm independent smallholders through Malaysian Sustainable Palm Oil. Journal of Oil Palm Research. <https://doi.org/10.21894/jopr.2019.0038>

<sup>114</sup> <https://mspotrace.org.my>

Taking the sources of the number of smallholders, both independent and organised, that are typically under 5 hectares, this assessment concludes that around 480 thousand palm oil smallholders could be impacted by the Regulation.

## Indonesia

The table below provides an overview of the total number of farms in Indonesia, as well as the number and share of smallholder farms smaller than 0.5 hectare, 2 hectares and 10 hectares<sup>115</sup>. The land use area of smallholder farms was extrapolated by taking the total area and multiplying it by the share of smallholders, then multiplying it by the average farm size of the smallholder category. Note that these calculations are solely indicative and are not based on actual area data.

Size (hectares)	Number of farms	Share (%)	Area (hectares)	Share (%)
< 0.5	16,257,430	59%	9,189,250	14.7%
< 2	24,678,268	89%	18,690,000	30%
< 10	27,595,058	99%	39,249,000	63%
Total	27,682,117	100%	62,300,000	100%

Smallholders make up the vast majority of farms in Indonesia, where the average farm size is 0.8 hectares<sup>116</sup>. According to the Indonesian Ministry of Agriculture, the around 2.6 million smallholders operated around 6 million hectares, producing over 16.7 million tonnes of palm oil in 2021. The average size of a smallholder plantation is 2.3 hectares. In comparison, private estates operated on 8.4 million hectares and produced 30.7 million tonnes of palm oil<sup>117</sup>.

As confirmed by the literature review on smallholder farm characteristics, a small number of smallholders produce cash crops and rather tend to grow consumption crops. According to the data from the Indonesian Ministry of Agriculture, 2.6 million smallholders produce palm oil, which is around 10% of all farms under 2 hectares.

## Vietnam

The table below provides an overview of the total number of farms in Vietnam, as well as the number and share of smallholder farms smaller than 0.5 hectare, 2

<sup>115</sup> Purnawan, E., Brunori, G. & Prosperi, P. (2020). Small Family Farms: A Perspective from Indonesia, Challenges and Investment. [Link](#).

<sup>116</sup> Ritchie, H & Roser M. (2021). Farm Size. Our World in Data. [Link](#).

<sup>117</sup> Directorate General of Estate Crops (2019) Statistical of national leading estate crops commodity. [Link](#).

hectares and 10 hectares<sup>118</sup>. It is estimated that the average smallholder farm is 0.32 hectares<sup>119</sup>.

Size (hectares)	Number of farms	Share (%)	Area (hectares)	Share (%)
< 1	9,077,029	85%	N/A	N/A
< 2	10,135,167	95%	N/A	N/A
< 10	10,684,114	99.9%	N/A	N/A
Total	10,689,753	100%	12,296,170	100%

The main Vietnamese commodity imported to the EU is coffee, however Vietnam is also a top global producer of cashews, pepper, cassava, rice, rubber, and tea<sup>120</sup>.

Considering the importance of smallholder coffee production, the **table below presents the number of smallholders producing coffee in Vietnam, as well as their land use approximated from 2011 Agrocensus percentages**<sup>121</sup>.

Size (hectares)	Number of farms	Share (%)	Area (hectares)	Share (%)
< 2	572,160	71.4%	647,281	N/A
> 2	67,840	28.6%	N/A	N/A
Total	640,000	100%	N/A	100%

The Agrocensus reports that in 2011, Vietnam counted 640 thousand coffee smallholders. The census did not report a detailed breakdown of landholding size for coffee producers, however it did report that 71.4% of coffee producers owned a farm smaller than 2 hectares.

The Agrocensus did not report on the total land use of coffee producers, so the total coffee land use was not provided, however the area of smallholders under 2 hectares was calculated by extrapolating the number of smallholders and their average farm size.

<sup>118</sup> Ritchie, H & Roser M. (2021). Farm Size. Our World in Data. [Link](#).

<sup>119</sup> Rapsomanikis, G. (2015). The economic lives of smallholder farmers – An analysis based on household data from nine countries. FAO. [Link](#).

<sup>120</sup> World Bank Group. (2016). Transforming Vietnamese Agriculture: Gaining More from Less. Vietnam Development Report 2016. Hong Duc Publishing House, Hanoi. [Link](#).

<sup>121</sup> General Statistics Office. (2012). Results of the 2011 rural, agricultural and fishery census. Statistical Publishing House. [Link](#).

## Annex 2 Literature review Zero-Deforestation

Zero-deforestation commodities are gaining more popularity in high-income and developing countries<sup>122</sup>. Steps to Zero-Deforestation Commitments (ZDC) started with the REDD+ initiatives for national regulatory frameworks, before the private sector started implementing strategies of their own. In order to also achieve commitments from the Sustainable Development Goals (SDGs), tending to the needs and capacities of smallholders is vital<sup>123</sup>. The importance of transparency, clearly defined goals and accountability is key.

Land allocations and household-level capital of smallholders are minor compared to predominant land systems<sup>124</sup>. The literature makes a distinction between **independent smallholders and those working under contracts**. It is said the implementation of ZDC is more straightforward under a contractual structure for greater control, capacity and compliance. Less integrated smallholders are said to be more likely to use practices that benefit the ecosystem and its diversity<sup>125</sup>. Small producers have distinct needs for support, as the commitments against deforestation have an impact on the activities of smaller producers, both positive and negative.

### Amazon-soy moratorium

The Amazon-Soy Moratorium was established in 2006 and aims to ensure deforestation-free soy production. The criterium is to not use land of primary forest that was cleared after 2008. The commitments were renewed indefinitely in 2016, and have shown success in reducing deforestation in the Amazon<sup>126</sup>. The GTS (soy working group) is the coordinating body together with the private sector, the Bank of Brazil and the private sector. It was the **first voluntary zero-deforestation agreement in the tropics**<sup>127</sup>, and easily monitored and suited for large areas, but could also only shift the patterns of clearing land without fully halting deforestation<sup>128</sup>.

<sup>122</sup> Austin, K. G., Heilmayr, R., Benedict, J. J., Burns, D. N., Eggen, M., Grantham, H., Greenbury, A., Hill, J. K., Jenkins, C. N., Luskin, M. S., Manurung, T., Rasmussen, L. V., Rosoman, G., Rudorff, B., Satar, M., Smith, C., & Carlson, K. M. (2021). Mapping and Monitoring Zero-Deforestation Commitments. *BioScience*, 71(10), 1079–1090. [Link](#).

<sup>123</sup> Zimmerer, K. S., E. F. B. Lambin, and S. J. Vanek. 2018. Smallholder telecoupling and potential sustainability. *Ecology and Society* 23 (1):30. [Link](#).

<sup>124</sup> Ibid.

<sup>125</sup> Pirard, R., Gnych, S., Pacheco, P., Lawry, S. (2015) Zero-deforestation commitments in Indonesia: Governance challenges. Center for International Forestry Research. [Link](#).

<sup>126</sup> Zu Ermgassen, E. K. H. J., Ayre, B., Godar, J., Bastos Lima, M. G., Bauch, S., Garrett, R., Green, J., Lathuillière, M. J., Löfgren, P., MacFarquhar, C., Meyfroidt, P., Suavet, C., West, C., & Gardner, T. (2020). Using supply chain data to monitor zero deforestation commitments: an assessment of progress in the Brazilian soy sector. *Environmental Research Letters*, 15(3), 035003. [Link](#).

<sup>127</sup> Gibbs, H. K., Rausch, L., Munger, J., Schelly, I., Morton, D. C., Noojipady, P., Soares-Filho, B., Barreto, P., Micol, L., & Walker, N. F. (2015). Brazil's Soy Moratorium. *Science*, 347(6220), 377–378. [Link](#).

<sup>128</sup> Lambin, E.F., Gibbs, H.K., Heilmayr, R. et al. (2018) The role of supply-chain initiatives in reducing deforestation. *Nature Climate Change* 8, 109–116. [Link](#).



Less effort identified to stop deforestation in Brazil's Cerrado, where soy is a factor for 22% of annual clearing in the biome<sup>129</sup>. In a global biodiversity hotspot, more efforts similar to the Amazon region are required to halt deforestation, however political will is lacking to expand the Soy Moratorium<sup>130</sup>.

Farmers must be identified in the Rural Environmental Registry (CAR – Cadastro Ambiental Rural). It's been identified that this **self-declared land registry**, due to it not being public, does not provide a good level of transparency and options to verify information<sup>131</sup>. It has been identified that 12% of soy produce exports from properties which are not registered with CAR are headed to the European Union, in comparison to 40% which go to China<sup>132</sup>. The **monitoring system PRODES** is said to be an integral part to the success of the program<sup>133</sup>. On the other hand, it's been identified that the monitoring mechanisms is not able to recognize deforestation at farm level, but is a streamlined system with rules that are simple to comply with<sup>134,135</sup>.

In Brazil, a distinction is rather made between family farms and larger farm, as outlined in the data analysis, whereby family farms serve as main income for **families vary in size – but can typically be larger than 2ha** (see Brazil smallholder assessment). Large scale commodity production focus on beef and soy, while small-scale family farms tend to be more diversified and produce for the domestic markets, which are more stable than export markets<sup>136</sup>. These farms may not necessarily produce soybeans, or may not export them. Consequently, literature on the impact of the moratorium on Brazilian smallholders is sparse.

The moratorium uses a **system of sanctions/market penalties to ensure compliance** with ZD. Producers are not paid a price premium for compliance, as in other schemes. As such, the actors in the value chain are left with the opportunity costs<sup>137</sup>. A higher production costs is burdensome for small

<sup>129</sup> Rausch, L. L., & Gibbs, H. K. (2021). The Low Opportunity Costs of the Amazon Soy Moratorium. *Frontiers in Forests and Global Change*, 4. [Link](#).

<sup>130</sup> Soterroni, A. C., Ramos, F. M., Mosnier, A., Fargione, J., Andrade, P. R., Baumgarten, L., Pirker, J., Obersteiner, M., Kraxner, F., Câmara, G., Carvalho, A. X. Y., & Polasky, S. (2019). Expanding the Soy Moratorium to Brazil's Cerrado. *Science Advances*, 5(7). [Link](#).

<sup>131</sup> Ferguson, B., Sekula, J., Szabó, I. (2020) Technology Solutions for Supply Chain Traceability in the Brazilian Amazon: Opportunities for the Financial Sector. Igarape Institute. [Link](#).

<sup>132</sup> Ibid.

<sup>133</sup> Austin, K. G., Heilmayr, R., Benedict, J. J., Burns, D. N., Eggen, M., Grantham, H., Greenbury, A., Hill, J. K., Jenkins, C. N., Luskin, M. S., Manurung, T., Rasmussen, L. V., Rosoman, G., Rudorff, B., Satar, M., Smith, C., & Carlson, K. M. (2021). Mapping and Monitoring Zero-Deforestation Commitments. *BioScience*, 71(10), 1079–1090. [Link](#)

<sup>134</sup> Gibbs, H. K., Rausch, L., Munger, J., Schelly, I., Morton, D. C., Noojipady, P., Soares-Filho, B., Barreto, P., Micol, L., & Walker, N. F. (2015). Brazil's Soy Moratorium. *Science*, 347(6220), 377–378. [Link](#).

<sup>135</sup> Ferguson, B., Sekula, J., Szabó, I. (2020) Technology Solutions for Supply Chain Traceability in the Brazilian Amazon: Opportunities for the Financial Sector. Igarape Institute. [Link](#).

<sup>136</sup> Wittman, H., Chappell, M. J., Abson, D. J., Kerr, R. B., Blesh, J., Hanspach, J., Perfecto, I., & Fischer, J. (2016) A social–ecological perspective on harmonizing food security and biodiversity conservation. *Regional Environmental Change*, 17(5), 1291–1301. [Link](#).

<sup>137</sup> Lambin, E.F., Gibbs, H.K., Heilmayr, R. et al. (2018) The role of supply-chain initiatives in reducing deforestation. *Nature Clim Change* 8, 109–116. [Link](#).

producers, who must bear the costs of the transition themselves. Farmers can receive compensation for conservation actions by Brazil's government to balance income losses.

### Private certification schemes

Private certification systems for zero-deforestation are driven by advantages of market access and reputation. With either a focus on one commodity, a specific production method or a region, private schemes are often transnational and multistakeholder bodies. They remain voluntary for producers to join, and compliance is assured with third-party attestation, with the aim to increase market access and product margins. Within private certification schemes, the impact on smallholders in the commodity chain of palm oil and coffee are well documented and researched.

#### *Palm Oil Production*

The transnational certification by the Round Table for Sustainable Palm Oil (RSPO) operates in Indonesia, Malaysia, Thailand and Ghana, and was founded in 2004. A considerable amount of literature is available on producers of palm oil in Indonesia and Malaysia, therefore it lends itself to exemplify the impact on smallholders. However, the RSPO defines smallholders as farmers with an area of 50 hectares or less, which is considerably larger than smallholders in other situations.

The RPSO does not have a zero-deforestation policy. Growers must adhere to the RSPO Principles and Criteria (P&R), whereby certified plantations cannot be established on cleared primary forest (after 2005) and at the expense of high conservation value. Another approach was added in 2018 for certification, namely the High Carbon Stock Approach. In research on the effectiveness of ZDC with third-party certification, Carlson et.al. (2017) found that the certification has the potential to reduce deforestation in the palm oil sector by 33%, a similar outcome to studies on the coffee, timber and logging sectors<sup>138</sup>.

**A distinction is made between scheme smallholders and independent smallholders.** Research on ZDC in Indonesia found that when smallholders are working under contracts (nucleus-plasma model), rather than in independent and semi-independent work units, the impact is better to manage<sup>139</sup>. Smallholders in private schemes under such contracts are tied to and given supervision by the mills that process the palm plants. Understanding the impact on independent

<sup>138</sup> Carlson, K. M., Heilmayr, R., Gibbs, H. K., Noojipady, P., Burns, D. N., Morton, D. C., Walker, N. F., Paoli, G. D., & Kremen, C. (2017). Effect of oil palm sustainability certification on deforestation and fire in Indonesia. *Proceedings of the National Academy of Sciences*, 115(1), 121–126. [Link](#).

<sup>139</sup> Pirard, R., Gnych, S., Pacheco, P., Lawry, S. (2015) Zero-deforestation commitments in Indonesia: Governance challenges. Center for International Forestry Research. [Link](#).

smallholders is no less important, as they cultivate 17% of the cultivated palm oil area in Indonesia<sup>140</sup>.

Independent smallholders in both Indonesia and Malaysia are rarely organized in cooperatives, which acts as a further barrier to certification and government and corporate support<sup>141</sup>. By comparison, 'scheme' smallholders are typically better supported and organised, and in Malaysia are represented by the Federal Land Development Authority<sup>142</sup>. Independent smallholders are likely to find sustainable palm oil certification prohibitively expensive<sup>143</sup>, and their slow inclusion in the certification process risks them being excluded from company supply chains<sup>144</sup>. Only a small proportion of Indonesia's independent smallholders have obtained RSPO certification<sup>145</sup>. Similarly, farmers are likely to struggle to meet mandatory smallholder requirements of Indonesia's ISPO certification standard, which require them to prove land ownership and good agricultural practices<sup>146</sup>.

According to the Indonesian ministry of agriculture, the around 2.3 million smallholders operated around 6 million hectares of palm oil plantations in in 2019<sup>147</sup>. Similarly in Malaysia, around 40% of palm oil plantations run by independent and organized smallholders on 986,331 million hectares, smallholders are defined as owning 40 hectares of land or less<sup>148</sup>.

Tracing the products of independent smallholders is said to present a greater challenge. **Independent smallholders, mostly on the poorer end of the farming community, require greater technical and financial support to be able to join certification schemes.** Otherwise, ZDC could lead to further marginalization, market fragmentation and continued deforestation<sup>149</sup>.

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<sup>140</sup> Apriani, E., Kim, Y. S., Fisher, L. A., & Baral, H. (2020b). Non-state certification of smallholders for sustainable palm oil in Sumatra, Indonesia. *Land Use Policy*, 99, 105112. [Link](#).

<sup>141</sup> Bakhtary, H., Matson, E., Mikulcak, F., Streck, C. and Thomson, A. 2020. Company progress in engaging smallholders to implement zero- deforestation commitments in cocoa and palm oil.

<sup>142</sup> Ibid.

<sup>143</sup> Suhada, T., Bagja, B. & Saleh, S. (2018). Smallholder farmers are key to making the palm oil industry sustainable. World Resources Institute. [Link](#).

<sup>144</sup> Bakhtary, H., Matson, E., Mikulcak, F., Streck, C. and Thomson, A. 2020. Company progress in engaging smallholders to implement zero- deforestation commitments in cocoa and palm oil.

<sup>145</sup> Brandi, C. et al. Sustainability Standards for Palm Oil: Challenges for Smallholder Certification Under the RSPO. *J. Environ. Dev.* 24, 292–314 (2015).

<sup>146</sup> Nicholas Jong, H. Indonesia aims for sustainability certification for oil palm smallholders. *Indonesian Forests, Indonesian Palm Oil* (2020).

<sup>147</sup> Directorate General of Estate Crops (2019) Statistical of national leading estate crops commodity. [Link](#).

<sup>148</sup> Rahman, S. (2020) Malaysian Independent Oil Palm Smallholders and their Struggle to Survive 2020. Yusof ishak institute. [Link](#).

<sup>149</sup> Pirard, R., Gnych, S., Pacheco, P., Lawry, S. (2015) Zero-deforestation commitments in Indonesia: Governance challenges. Center for International Forestry Research. [Link](#).

The issue of the costs of certification was the subject of a 2018 study on smallholders in RSPO certification through a case study of a group certification<sup>150</sup>. The research covered both pre-certification cost and average financial costs and benefits. It was found that requirements for certification are said to pose issue specifically for smallholders in terms of **access to financing and skills** needed, and smallholders should be made aware of these in order to facilitate assistance to overcome barriers.

For pre-certification, farmers need to expect costs for documentation, trainings, and the certification itself. The cost related to obtain legal documents for certification (land ownership certificate, business permit, record books and statement of capability) was 38.5% in the study<sup>151</sup>. Similarly in Malaysia, **providing proof of land tenure is said to be the main obstacle to certification for smallholders**, and the government's assistance for certification often does not reach farmers in the most rural areas of Malaysia<sup>152</sup>.

Furthermore, **smallholders need to acquire skills on enhanced management practices and keeping records of their land**, which add to the costs. The study found the trainings to make up 35.3% of the pre-certification costs. In this case, the farmer was required to pay an equivalent of EUR 86 per hectare or EUR 188 per farmer for receiving certification, and in the first year of certification would have an 8% loss of net income per hectare.

The **support from local NGOs is often central for the producers to continue their participation in the scheme** (providing trainings on administration and agricultural practices, obtaining legal documents for certification, financial support for pre-certification costs)<sup>153</sup>. Smallholders supported by NGOs were found to not be aware of the additional costs of certification that were mediated by intermediate actors with funding from NGOs.

After certification, the running costs of management and inputs increased by 78.1%, and periodic reviews are an additional cost factor<sup>154,155</sup>. While the increased farm yields did not outweigh the costs, farmers were exempt from taxes, interests and rent<sup>156</sup>. The barriers for smallholders to acquire certification from the RSPO are said to be mirrored in the limited number of smallholders certified:

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<sup>150</sup> Hutabarat, S., Slingerland, M., Rietberg, P., & Dries, L. (2018). Costs and benefits of certification of independent oil palm smallholders in Indonesia. *International Food and Agribusiness Management Review*, 21(6), 681–700. [Link](#).

<sup>151</sup> Ibid.

<sup>152</sup> Rahman, S. (2020) Malaysian Independent Oil Palm Smallholders and their Struggle to Survive 2020. Yusof Ishak institute. [Link](#).

<sup>153</sup> Apriani, E., Kim, Y. S., Fisher, L. A., & Baral, H. (2020b). Non-state certification of smallholders for sustainable palm oil in Sumatra, Indonesia. *Land Use Policy*, 99, 105112. [Link](#).

<sup>154</sup> Ibid.

<sup>155</sup> Hutabarat, S., Slingerland, M., Rietberg, P., & Dries, L. (2018). Costs and benefits of certification of independent oil palm smallholders in Indonesia. *International Food and Agribusiness Management Review*, 21(6), 681–700. [Link](#).

<sup>156</sup> Ibid.

159,859 in 2022 (combined independent and scheme smallholders)<sup>157</sup>, out of more than 2.3 million smallholder palm oil farmers in Indonesia.

The RSPO has set up measures to lower risks for smallholders via **funding provision and guidance for group certification**. To overcome financial issues, smallholders can make use of the RSPO Smallholder Support Fund. In the case of Indonesia, the risks posed to smallholders in the private certification scheme should be mediated by government initiatives, where the legalization of production by smallholders and improved practices used by them are a goal (Sustainable Palm Oil Initiative by the Ministry of Agriculture and the UNDP)<sup>158</sup>.

### *Coffee production*

For the commodity of coffee, a multitude of certification schemes operate globally, including Rainforest Alliance/UTZ and Fair Trade. Coffee certification for fair trade and sustainability received attention in the 1980s, and the **livelihoods of smallholders** were at the centre.

Rainforest Alliance's 2020 Certification Programme, replacing existing UTZ and Rainforest Alliance programmes, sets out a zero-deforestation policy and prohibits the destruction of national ecosystems, with 2014 as the baseline year. Before the merger, UTZ had a zero-deforestation policy since 2008, and Rainforest Alliance prohibited destruction of High Conservation Value areas since 2005<sup>159</sup>.

The impact of certification schemes on smallholders is often assessed by their economic benefit, which is however dependent on price development<sup>160</sup>. Farmers in certification schemes tend to receive a premium for their sustainable production, and a minimum price paid for the products. The latter contributes to the stability of incomes in global markets, as well as providing opportunities for long-term investments, and resilience for future market trends<sup>161,162</sup>.

On the price premium, studies on coffee smallholders in Central American countries, however, did not find a positive change in income due to the cost of the farming approach. Higher incomes are more likely to occur due to higher yields, whereby it is suggested to consider management practices more than price premiums in certification schemes<sup>163</sup>.

<sup>157</sup> RPSO (2022) Smallholders in numbers [website] Accessed 2 August 2022. [Link](#).

<sup>158</sup> Pirard, R., Gnych, S., Pacheco, P., Lawry, S. (2015) Zero-deforestation commitments in Indonesia: Governance challenges. Center for International Forestry Research. [Link](#).

<sup>159</sup> Rainforest Alliance (2020) What's in Our 2020 Certification Program? Deforestation. [Link](#).

<sup>160</sup> Rueda, X., & Lambin, E. F. (2013). Responding to Globalization: Impacts of Certification on Colombian Small-Scale Coffee Growers. *Ecology and Society*, 18(3). [Link](#).

<sup>161</sup> Negash, R. (2016) Impact of Fair-Trade Coffee Certification on Smallholder Producers: Review Paper. *Global Journal of Management and Business Research*, 16 (5). [Link](#).

<sup>162</sup> Rueda, X., & Lambin, E. F. (2013). Responding to Globalization: Impacts of Certification on Colombian Small-Scale Coffee Growers. *Ecology and Society*, 18(3). [Link](#).

<sup>163</sup> Barham, B. L., & Weber, J. G. (2012) The Economic Sustainability of Certified Coffee: Recent Evidence from Mexico and Peru. *World Development*, 40(6), 1269–1279. [Link](#).



Comparable issues with insignificant price premiums but also hampered access to credit and information was documented for coffee growers in Ethiopia<sup>164</sup>. Coffee growers must expect costs of audits and extension services fees<sup>165</sup>. Due to costs, a study on Brazil found a preference for group certification among coffee growers to access the certification market<sup>166</sup>. However, the smallholders participating in group certification are those with the highest production; the smallest farms, with low productivity and low access to resources and technology, may be excluded from such groups and thus from certification<sup>167</sup>.

In a study by UTZ, certification on UTZ farms was found to have mixed results; while one study in Kenya found that farmers obtained higher prices for their coffee due to good agricultural practices implemented by the scheme, another study in Vietnam found that certified farmers did not receive a significantly higher price<sup>168</sup>. Bray & Neilson (2017) reviewed the impacts of coffee certification schemes on the livelihoods of smallholders and found that while there were overall more positive than negative impacts, the number of studies that found neutral or mixed impacts was the greatest<sup>169</sup>. As an example, differences in profits between certified and uncertified coffee farmers in Indonesia were found to be insignificant<sup>170</sup>.

Evaluation of **impact on smallholders includes positive changes concerning non-financial matter of development and strengthening livelihoods**. Hereby producer groups provide community support, **smallholders receive trainings and develop entrepreneurial skills**<sup>171</sup>. Research on coffee growers in Colombia demonstrated how smallholders received more reliable information and knowledge within the certification system, receiving more targeted and frequent appointments with extension services who promote techniques. It was found that Colombian coffee smallholders were not left behind by certification, due to the support by the Colombian Coffee Growers Federation<sup>172</sup>. Thanks to the organisation, many farmers had been working with low-cost and environmentally

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<sup>164</sup> Negash, R.(2016) Impact of Fair-Trade Coffee Certification on Smallholder Producers: Review Paper. Global Journal of Management and Business Research, 16 (5). [Link](#).

<sup>165</sup> Rueda, X., & Lambin, E. F. (2013). Responding to Globalization: Impacts of Certification on Colombian Small-Scale Coffee Growers. Ecology and Society, 18(3). [Link](#).

<sup>166</sup> Pinto et al., 2014 Group certification supports an increase in the diversity of sustainable agriculture network-rainforest alliance certified coffee producers in Brazil. Ecological Economics 107:59-64.

<sup>167</sup> Ibid.

<sup>168</sup> UTZ. 2014. UTZ Certified Impact Report January 2014. Combining results from 24 external impact studies and data from UTZ Certified

<sup>169</sup> Bray, J.G. & Neilson. 2017. Reviewing the impacts of coffee certification programmes on smallholder livelihoods. International Journal of Biodiversity Science, Ecosystem Services & Management, Vol. 13, No. 1, 216-232.

<sup>170</sup> Glasbergen. P. 2018. Smallholders do not eat certificates. Ecological Economics 147: 243-252.

<sup>171</sup> Negash, R.(2016) Impact of Fair-Trade Coffee Certification on Smallholder Producers: Review Paper. Global Journal of Management and Business Research, 16 (5). [Link](#).

<sup>172</sup> Rueda, X., & Lambin, E. F. (2013). Responding to Globalization: Impacts of Certification on Colombian Small-Scale Coffee Growers. Ecology and Society, 18(3). [Link](#).

friendly technologies, making the change to compliance with the standards less costly.

### National certification systems

A growing number of national governments and subnational governments have committed themselves to halting deforestation, through the New York Declaration on Forests, INDCs with reference to the forest sector and REDD+ schemes. Certification on ZD from companies/private schemes tend to correspond to national commitments. Often national commitments are joined by companies to build private-public partnerships around sustainability commitments.

Examples of countries with national commitments against deforestation include Indonesia Sustainable Palm Oil (ISPO), the Malaysian Sustainable Palm Oil (MSPO), Colombia (National Zero Deforestation Agreements), cross-border in Ghana and Côte d'Ivoire (Cocoa and Forest Initiative) and the African Palm Oil Initiative (APOI).

#### *Cocoa and Forest Initiative*

For the production of cocoa, a commodity which is produced overwhelmingly by smallholders in, with 1.6-2 million farmers in Ghana and Côte d'Ivoire<sup>173</sup>. The Cocoa and Forest Initiative (CFI) aims to address deforestation, the livelihoods of smallholders and community engagement. Initiated by World Cocoa Foundation (WCF), the Sustainable Trade Initiative (IDH), and the Prince of Wales' International Sustainability Unit, the CFI was signed by the governments of Côte d'Ivoire and Ghana, and 35 companies, which treat 85% of global cocoa production<sup>174</sup>. The agreement, a combination of national target and scope setting with company pledges, between the government, companies and NGOs is seen as unique, with concrete measures against deforestation and clear responsibilities for both companies and the governments<sup>175</sup>.

Looking into the outcomes for cocoa smallholders, a study which interviewed farmers in Ghana found that the economic or material benefits of commitments, here to climate-smart cocoa, do not reach all farmers equally. In particular those who live in **remote rural areas benefit less from extension services**, and noted that more farmers should directly participate in initiatives for greater success. Regarding the national capacities to contribute, a functional system to monitor

<sup>173</sup> Kroeger, Alan; Koenig, Simon; Thomson, Ashley; Streck, Charlotte with contributions from Weiner, Paul-Harvey and Bakhtary, Haseeb (2017) Forest- and Climate-Smart Cocoa in Côte d'Ivoire and Ghana, Aligning Stakeholders to Support Smallholders in Deforestation-Free Cocoa. World Bank, Washington, DC. [Link](#).

<sup>174</sup> WCF. (2020). World Cocoa Foundation: Cocoa & Forests Initiative. World Cocoa Found. [Link](#).

<sup>175</sup> Slavin, T. (2018) Deadline 2020: 'We won't end deforestation through certification schemes,' brands admit. Reuters [website] Accessed on 9 August 2022. [Link](#).

compliance and verification with direct and indirect suppliers is lacking in both countries, as well as maps on protected areas within the countries<sup>176</sup>.

### *National Zero Deforestation Agreements - Colombia*

In the Amazon region, deforestation is most widespread in Colombia. Deforestation through illegal logging, fires etc. is both caused by large-scale actors and small-scale campesinos (rural populace)<sup>177</sup>. To counteract this development, Colombia's national zero deforestation agreements were put on the table. After national commitments from 2009, public-private deforestation agreements with leadership from the government were put in place, for the palm oil, beef, dairy and cocoa supply chains. The commitments are clearly set in regional plans, national strategies and laws, and forest monitoring systems allow for results-based financing. In this model, the government plays a critical role in setting the framework for the commitments and initiatives, so that the uptake as well as external financing and expertise is supported<sup>178</sup>.

Colombia's productive land is unequally distributed, where the percentage of farmers working with farms of less than 5 hectares is 70%, but a vast area of land (74%) is operated by a handful of producers<sup>179</sup>. Government policies and rural reforms should work to support smallholders, and not favour larger agro-industrial actors. Furthermore, rural land use planning systems, integral to achieving ZDCs, challenge stakeholders due to their complexity and thereby the extra transaction cost for smaller producers.

### *ISPO and MSPO*

In the commodity chain of palm oil, national governments have taken up certification schemes for environmental and social protection, including Malaysia (Malaysian Sustainable Palm Oil (MSPO). and Indonesia (Indonesian Sustainable Palm Oil (ISPO)). The ISPO is a mandatory scheme since 2020 for all farmers, plantation estates and smallholders (excluding independent smallholders), with a transition period for smallholders until 2025. National and subnational governments offer financial support to smallholders during the transition<sup>180</sup>.

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<sup>176</sup> Carodenuto, S., & Buluran, M. (2021). The effect of supply chain position on zero-deforestation commitments: evidence from the cocoa industry. *Journal of Environmental Policy & Planning*, 23(6), 716–731. [Link](#).

<sup>177</sup> Furumo, P. R., & Lambin, E. F. (2020). Scaling up zero-deforestation initiatives through public-private partnerships: A look inside post-conflict Colombia. *Global Environmental Change*, 62, 102055. [Link](#).

<sup>178</sup> Rueda, X., & Lambin, E. F. (2013). Responding to Globalization: Impacts of Certification on Colombian Small-Scale Coffee Growers. *Ecology and Society*, 18(3). [Link](#).

<sup>179</sup> Guereña, A. (2017) A snapshot of inequality: what the latest agricultural census reveals about land distribution in Colombia. Oxfam. [Link](#).

<sup>180</sup> Choiruzzad, S. A. B., Tyson, A., & Varkkey, H. (2021). The ambiguities of Indonesian Sustainable Palm Oil certification: internal incoherence, governance rescaling and state transformation. *Asia Europe Journal*, 19(2), 189–208. [Link](#).

MSPO is mandatory since 2020, and independent smallholders received assistance in receiving certification<sup>181</sup>.

Both national schemes are said to have framed 'sustainability' of palm oil to ensure competitiveness in markets where more stringent private schemes are less in demand, and the support of smallholders is vague<sup>182</sup>. The exports are thereby geared towards a different market in Asia, rather the markets of the EU and US. Picard et.al. (2015) state that the Indonesian government promotes its own standard over ZDC from the RSPO, questioning its legitimacy and seeing a threat to economic development through productive land management and the fear of smallholders being excluded from the market<sup>183</sup>. Instead of working with third-party certification and NGOs, like the RSPO, the national standards depend on internal processes in correspondence with national producers and trade associations.

#### *APOI*

The African Palm Oil Initiative (APOI) comprises commitments from eleven countries in central Africa, with the vision to protect the environment of the Congo Basin with certification for sustainable palm oil production. While most of the world's production of palm oil is focused on Indonesia and Malaysia, attention should be paid to expanding production in this region, with potential threats to the rainforest and biodiversity.

#### **Direct supply chains of global corporations**

Around 470 businesses have committed to various degrees of ZDC linked to the production of soy, timber, palm oil, cattle and pulp and paper. For these commitments to make a genuine impact, they must go beyond the goal of merely decreasing reputational risk<sup>184</sup>. Members to the Consumer Goods Forum (CGF) made a pledge for zero-deforestation. It was the first of its kind, calling for the elimination of deforestation in commodity supply chains by 2020<sup>185</sup>. According to the Supply Chain Initiative, only 6% of companies having made commitments have followed through with actions in relation to their suppliers and high-risk facilities<sup>186</sup>.

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<sup>181</sup> Yap, P., Rosdin, R., Abdul-Rahman, A. A. A., Omar, A. T., Mohamed, M. N., & Rahami, M. S. (2021). Malaysian Sustainable Palm Oil (MSPO) Certification Progress for Independent Smallholders in Malaysia. IOP Conference Series: Earth and Environmental Science, 736(1), 012071. [Link](#).

<sup>182</sup> Rahman, S. (2020) Malaysian Independent Oil Palm Smallholders and their Struggle to Survive 2020. Yusof ishak institute. [Link](#).

<sup>183</sup> Pirard, R., Gnych, S., Pacheco, P., Lawry, S. (2015) Zero-deforestation commitments in Indonesia: Governance challenges. Center for International Forestry Research. [Link](#).

<sup>184</sup> World Economic Forum (2017) Commodities and Forests Agenda 2020: Ten Priorities to Remove Tropical Deforestation from Commodity Supply Chains. [Link](#).

<sup>185</sup> The Consumer Goods Forum (2017) Implementing and scaling up the CGF Zero Net Deforestation Commitment. [Link](#).

<sup>186</sup> Slavin, T. (2018) Deadline 2020: 'We won't end deforestation through certification schemes,' brands admit. Reuters [website] Accessed on 9 August 2022. [Link](#)

Supply chain initiatives stemming from companies with ZDC exist in the form of company pledges and codes of conduct, for instance those made by Unilever, Cargill, Wilmar, McDonalds and others. In 2010, Unilever and Nestlé were the first companies to make ZDCs. The commitments of the international palm oil producer Wilmar apply to all its suppliers, going beyond its own plantations<sup>187</sup>. However, as a Greenpeace report found, Wilmar's commitment to zero-deforestation, no peat and no exploitation in their supply chain, the company still sources from suppliers which Greenpeace had identified as being responsible for rainforest clearance<sup>188</sup>. The other option companies may choose is a code of conduct, such as Unilever's Responsible Sourcing Policy, which sets rules for sourcing and production within a company. As the largest end-user of palm oil, the corporation struck an agreement with the district governments in Indonesia (Central Kalimantan) in 2015, whereby they would source from smallholders with a ZD policy<sup>189</sup>. Few other market signals of this sort to reward performance have been set<sup>190</sup>.

With a large share of commodities in zero-deforestation areas being controlled by international corporations, there is a chance for ZDC to take better effect and create a positive cascading effect. However, there is also concern for smallholders, where company commitments may further embed market positions of powerful actors over the support of smallholders and indigenous groups in accessing markets<sup>191</sup>.

Traceability, monitoring, and accountability are key in certifying direct global supply chain, and in tracking progress. Companies typically have accountability mechanisms in place; however, criteria and timelines may be vague with unclear implementation steps. As most commitments of this type are relatively recent, it is said that the evidence of their effectiveness is limited<sup>192</sup>. **A clear picture of traceability and monitoring would require larger participation by companies.** In 2019, less than a third of companies with commitments to zero deforestation were providing reports and monitoring data on their progress<sup>193</sup>.

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<sup>187</sup> Jopke P and Schoneveld GC. (2018) Corporate commitments to zero deforestation: An evaluation of externality problems and implementation gaps. Occasional Paper 181. Bogor, Indonesia: CIFOR. [Link](#).

<sup>188</sup> Greenpeace International (2018) The final countdown – now or never to reform the palm oil industry. [Link](#).

<sup>189</sup> Unilever (2021) How oil palm production can benefit people and planet [website] Accessed 8 August 2022. [Link](#).

<sup>190</sup> Seymour, F. J., Aurora, L., & Arif, J. (2020). The Jurisdictional Approach in Indonesia: Incentives, Actions, and Facilitating Connections. *Frontiers in Forests and Global Change*, 3. [Link](#).

<sup>191</sup> Lambin, E.F., Gibbs, H.K., Heilmayr, R. et al. (2018) The role of supply-chain initiatives in reducing deforestation. *Nature Climate Change* 8, 109–116. [Link](#).

<sup>192</sup> Ibid.

<sup>193</sup> Rothrock P, Weatherer L, Zwick S, Donofrio S, Hamrick K. (2019) Corporate Commitments to Zero deforestation: Company Progress on Commitments that Count. *Forest Trends*. [Link](#).





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