

Executive Summary

Working with farmers to respond to the climate crisis

Key findings from the technical paper
Carbon footprints and mitigation opportunities in Fairtrade supply chains





About this report

Here, we share findings and conclusions from a technical paper titled *Carbon footprints and mitigation opportunities in Fairtrade supply chains*. The paper investigates opportunities for reducing emissions and increasing carbon removals in key Fairtrade supply chains. It provides information needed to coordinate climate change mitigation and adaptation strategies, keeping farmers' wellbeing and livelihoods at the centre of this work.

Focusing on five Fairtrade certified commodities from specific countries, the technical paper aims to:

- Estimate the carbon footprint and provide a breakdown for each of the major stages in the supply chain
- Identify mitigation strategies that could be relevant to each commodity and country
- Assess the mitigation potential of these strategies and their broader agronomic, economic, environmental, and social impacts, both positive and negative
- Draw conclusions about how Fairtrade Foundation can develop climate programmes that deliver the best combination of mitigation and broader impacts for farmers, workers and their communities.

Why Fairtrade?

To make the changes needed to combat climate change, there needs to be strong, long-term relationships between farmers and their supply chains. That's where Fairtrade Foundation can help. Our expertise, experience and relationships mean we can help make sure millions of rural farmers and their families are part of climate solutions – both mitigation and adaptation.

For three decades, Fairtrade has been working with farmers and workers in low-income countries to achieve a fairer future through fairer prices and fair production standards and practices. Fairtrade certification, our best-known tool for bringing about change, is a critical step towards building resilient supply chains that improve economic, environmental and social outcomes for farmers and workers.

We are deepening our impact by delivering specialist climate programmes. These are co-funded by commercial partners, and institutional and private donors. We tackle deep-rooted inequalities and challenges, helping to bring about positive change for farmers, workers and their communities, as well as the environment.

Fairtrade Foundation's commercial partners are expanding their climate commitments to incorporate carbon mitigation along their supply chains. However, many Fairtrade certified supply chains contain large numbers of farmers who are both highly vulnerable to climate change and face significant challenges in

adapting their practices effectively. It's critical that the mitigation strategies Fairtrade Foundation promotes are not only carbon-focused but are designed to build resilience and achieve broader economic, environmental, and social objectives for farmers and workers.

to help achieve this, we set up the **Fairtrade Climate Programmes Facility (CPF).** One of the CPF's focus areas is to work with farmers and workers to use nature-based solutions on smallholder farms globally. The Fairtrade Climate Programmes Facility produced the technical paper summarised in this report.

The authors of **Carbon footprints and mitigation opportunities in Fairtrade supply chains** are:

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Contributions were also made by: Fairtrade Foundation Commodity Leads, Fairtrade International, Producer Networks (Fairtrade Africa and The Latin American and Caribbean Network of Fairtrade Small Producers and Workers (CLAC)), and Producer Organisations.

For a more detailed list of acknowledgements, please see the full technical paper.

How we produced the technical paper

There were three main steps to producing the technical paper:

1. Selecting the commodities and countries of origin

The research team chose five commodities from specific countries to assess, based on how vulnerable they are to climate change, how significant they are to Fairtrade, and how important they are to Fairtrade Foundation's commercial partners. They chose:

- Bananas from the Dominican Republic
- Coffee from Colombia
- Cocoa from Ghana
- Cocoa from Côte d'Ivoire
- Red roses from Kenya.



2. Estimating the carbon footprints for each commodity

Using specialist software called CarbonCloud, the research team estimated the carbon footprints of each commodity. They used information from Fairtrade about supply chain processes. CarbonCloud calculates carbon footprints using emissions factors, carbon sequestration factors, and $\mathrm{CO_2}$ e conversion factors. These are based on guidelines from the Intergovernmental Panel on Climate Change (IPCC), the United Nations body for assessing the science related to climate change.

Selecting and assessing mitigation strategies for each commodity

The research team used desk research to identify mitigation strategies for each commodity. They assessed the potential of each strategy by reviewing literature on reducing emissions and removing carbon. They considered the:

- Mitigation potential per hectare of agricultural land used for both reducing emissions and removing carbon
- Mitigation potential per kilogram of crop produced
- Potential area of land on which the strategies
 could be applied taking into account factors such
 as the total land area cultivated by farmers for each
 commodity, and any factors which could prevent or
 limit a strategy from being put in place

 Risk of 'reversal'. This is the risk that the emissions reductions or carbon removals could be reversed and carbon released back into the atmosphere. For example, if farmers plant trees which sequester carbon, there could be a risk that they cut them down and burn them as fuelwood, then do not replant them.

The research team then rated the potential for each mitigation strategy – very low, low, medium, or high – along with the reasons for the rating.

They also used desk research to identify the broader impacts of implementing each mitigation strategy.

They put these impacts into four categories:

- Agronomic
- Economic
- Environmental
- Social.

Glossary

Adaptation – Changing structures, practices, infrastructure and processes in ways which will limit damage and maximise any benefits from climate change.

Carbon sequestration – The process by which trees and plants absorb carbon dioxide, release the oxygen, and store the carbon.

CO₂e – The number of metric tonnes of CO2 emissions with the same global warming potential as one metric tonne of another greenhouse gas.

Carbon footprint – A measure of the amount of carbon dioxide released into the atmosphere as a result of the activities of a particular individual, organisation, or community.

Carbon stocks – The amount of carbon that has been sequestered from the atmosphere and is now stored within a given ecosystem.

Insetting – The financing of a climate protection project along a company's own supply chain, which reduces or sequesters emissions and has a positive impact on associated communities, landscapes or ecosystems.

Mitigation – An intervention to reduce the human impact on the climate system. It includes strategies to reduce greenhouse gas sources and emissions and enhancing greenhouse gas sinks.



Mitigation strategies:

What changes can be made to farming processes to help limit climate change?

The table below describes each category of mitigation that could be used to reduce emissions and remove carbon. The full technical paper provides a more detailed breakdown of strategies for each commodity.

Aside from reducing emissions and removing carbon, putting mitigation strategies in place can have a range of broader positive – and negative – impacts on farms,

farmers, workers and their environments. The research team analysed these impacts, categorising them as agronomic and economic, environmental and social. There's a summary in the tables below. The full technical paper provides a more detailed breakdown for each commodity.

Category of mitigation strategies		Description	
CO ₂	Sequestering carbon in soils	Sequestering carbon in soils involves capturing carbon dioxide (CO2) from the atmosphere and storing it in soil as organic carbon. This can be done using farming practices such as: adding prunings to the soil, mulching, and growing cover crops turning organic material from plants and animals into organic fertiliser or compost and adding it to the soil.	
	Sequestering carbon in trees on farmland	Sequestering carbon in trees involves planting trees on farmland together with the primary crop. These additional trees capture CO from the atmosphere and store the carbon in their trunks, leaves, roots and stems.	
	Reducing deforestation caused by converting forest to land for crops	When forests are cleared, they release greenhouse gases. There are many reasons for deforestation, however, for the purpose of the technical paper, the research team only looked at strategies to reduce the amount of forest that's converted for planting coffee, cocoa, bananas and red roses.	
FERTILISES	Reducing nitrogen fertiliser application	Applying fertilisers that contain nitrogen contributes directly to greenhouse gas emissions from soils and water on cropland. This is on top of emissions generated when producing and distributing the fertiliser. Reducing nitrogen fertiliser application involves reducing the overall quantity of nitrogen applied on farms, including both organic and inorganic fertiliser.	
	Switching to renewable energy sources and/or increasing energy efficiency	For the purpose of the technical paper, this mitigation strategy could apply to the agricultural production stage (for example, irrigation), post-harvest stage (for example, drying) or primary processing stage (for example, roasting) – as long as they are carried out by farmers or producer organisations.	

Carbon footprint estimates – and strategies to reduce them

1. Coffee from Colombia

Colombia produces high-quality, specialty coffee. It's usually grown on small farms by families who rely on coffee as their main source of income. In 2021, over 197,000 hectares (ha) of coffee production land in Colombia was Fairtrade certified, with 72,000 smallholder farmers producing around 240,000 metric tonnes (MT) of coffee. Of this, 36,100MT were sold on Fairtrade terms. This generated EUR 13.1m in Fairtrade Premium for farmers and workers.



Carbon footprint estimated by CarbonCloud:

- 1 kilogram (kg) of coffee beans produced in Colombia and roasted in Glasgow results in 13kg of CO₂ emissions.
- The agriculture stage of the supply chain causes 96% of these emissions. Though it is important to note that in the CarbonCloud model, the agricultural stage includes primary processing activities carried out on farms.

Mitigation opportunities

The research team found there are multiple opportunities for mitigation in the production stage of the coffee supply chain in Colombia. See table on page 9 for details. Although two of the assessed strategies achieved a low rating for mitigation potential, if they were implemented together they could make a stronger contribution to reducing emissions.



Coffee from Columbia

Mitigation	Mitigation	Broader impacts		
strategies	potential rating	Agronomic & Economic	Environmental	Social
Sequestering carbon in soils	Low	Soils with higher organic matter help increase productivity and offer resilience to adverse weather. This may also increase farmers' profits. Farmers may need to hire more workers to put new farming methods into practice.	Sequestering carbon in soils can support biodiversity by providing habitat and nutrients for a diverse range of soil organisms. Soils with higher organic matter show lower rates of leaching (the loss of plant nutrients). There's also less runoff of inorganic fertiliser and pesticides, which can pollute water. More fertile soil can help reduce runoff from farms during periods of heavy rainfall, lowering the risk of flooding and soil erosion.	Depending on social and cultural norms in a given area, additional farming tasks may fall on women, who are already expected to carry out the majority of domestic work. If new farming practices mean more workers are needed, there's a higher risk of farms using child labour.
Sequestering carbon in trees on farmland	High	If shade trees are well managed, they have the potential to increase coffee productivity. They can also make farms more resilient to adverse weather. Leaves can act as a mulch, increasing organic matter and nutrients in the soil. New products from trees can be sold, helping farmers diversify their incomes. High levels of carbon sequestration means there's potential for generating carbon credits. Farmers may need to hire more workers to put new farming methods into practice.	Trees can provide habitat and food for a variety of species, supporting biodiversity.	More trees could increase the risk of land grabs, especially if they have high value as timber. Equally trees could make land grabs less likely – additional trees can mark out boundaries more clearly, and make it a more complex and conspicuous process to seize the land. Additional farming tasks may fall on women, who are already expected to carry out the majority of domestic work. This strategy has the potential to improve women's empowerment, if women take the lead on growing trees and have ownership of the revenue they bring in.
Reducing nitrogen fertiliser application	Low	It's difficult to generalise about agronomic and economic impacts, but using less nitrogen fertiliser has the potential to reduce yields and profitability.	Reducing nitrogen fertiliser use may reduce runoff and leaching of nitrogen into surrounding ecosystems. This may reduce pollution of groundwater.	Using less fertiliser may reduce the amount of labour needed to apply it.

2. Cocoa from Ghana and Côte d'Ivoire

The cocoa sector is a vital part of the economies of Ghana and Côte d'Ivoire. It provides employment and income to millions of smallholder farmers. In 2021, 271,963 Fairtrade certified farmers in Côte d'Ivoire produced over 512,000MT of cocoa.

In Ghana, 104,456 Fairtrade certified farmers produced around 93,700MT. Cocoa farmers in both countries already have to navigate the challenges of low and declining productivity, pests and diseases, ageing trees, and low soil fertility. Climate change is making each of these challenges much worse.

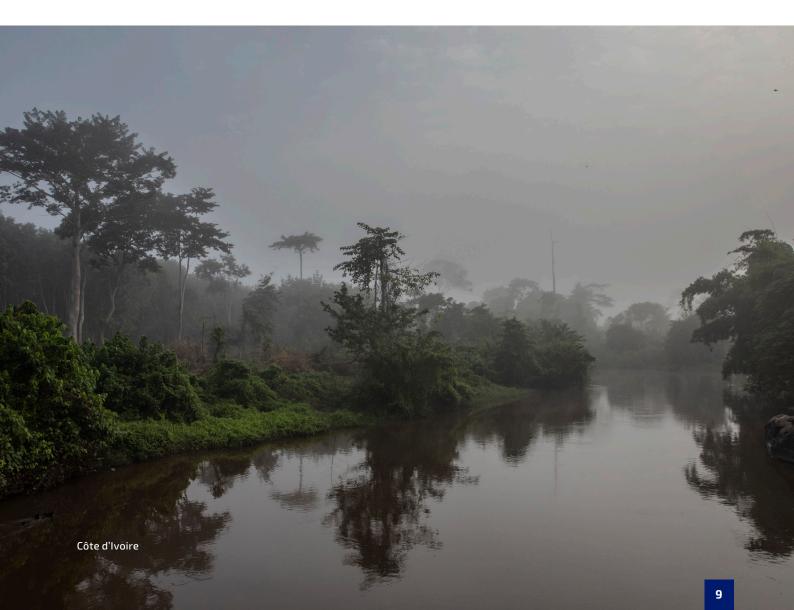


Carbon footprint estimated by CarbonCloud:

- 1kg of Ivorian cocoa beans exported to Europe results in 1.3kg of CO₂e emissions.
- The agriculture stage of the supply chain causes 68% of these emissions.
- 1kg of Ghanaian cocoa beans exported to Belgium results in 1.4kg of CO₂e emissions.
- The agriculture stage of the supply chain causes 73% of these emissions.

Mitigation opportunities

The research team found there are multiple opportunities for mitigation in the production stage of the cocoa supply chain in Ghana and Côte d'Ivoire. This is partly because cocoa production takes place over a large area of land, which increases the mitigation potential under the methodology used for this research. See table on page 11 for details.



Cocoa from Ghana and Côte d'Ivoire

Mitigation	Mitigation	Broader impacts		
strategies	potential rating	Agronomic & Economic	Environmental	Social
Sequestering carbon in soils	Low	Soils with higher organic matter help increase productivity and offer resilience to adverse weather. This may also increase farmers' profits. Farmers may need to hire more workers to put new farming methods into practice.	Sequestering carbon in soils can support biodiversity by providing habitat and nutrients for a diverse range of soil organisms. Soils with higher organic matter show lower rates of leaching (the loss of plant nutrients). There's also less runoff of inorganic fertiliser and pesticides, which can pollute water. More fertile soil reduces the need to clear forests to access fertile land. More fertile soil can help reduce runoff from farms during periods of heavy rainfall, lowering the risk of flooding and soil erosion.	Depending on the social and cultural norms in a given area, additional farming tasks may fall on women, who are already expected to carry out the majority of domestic work. If new farming practices mean more workers are needed, there's a higher risk of farms using child labour.
Sequestering carbon in trees on farmland	High	If shade trees are well managed, they have the potential to increase cocoa productivity. They can also make farms more resilient to adverse weather. Leaves can act as a mulch, increasing organic matter and nutrients in the soil. New products from trees can be sold, helping farmers diversify their incomes. High levels of carbon sequestration means there's potential for generating carbon credits. Farmers may need to hire more workers to put new farming methods into practice.	Trees can provide habitat and food for a variety of species, supporting biodiversity.	More trees could increase the risk of land grabs, especially if they have high value as timber. Equally trees could make land grabs less likely – additional trees can mark out boundaries more clearly, and make it a more complex and conspicuous process to seize the land. Additional farming tasks may fall on women, who are already expected to carry out the majority of domestic work. This strategy has the potential to improve women's empowerment, if women take the lead on growing trees and have ownership of the revenue they bring in.
Reducing deforestation caused by conversion of forest to cropland	Medium	Maintaining forests is critical for communities who depend on them for their livelihoods. Maintaining forests in areas where water can be captured reduces flooding from heavy rain, preventing its negative impacts on cocoa production. Maintaining forests can sustain other ecosystem services which support agriculture, such as pollination.	Reducing deforestation can play a major role in maintaining biodiversity. Maintaining forests in water catchment areas reduces flooding from heavy rain and its negative impact on surrounding ecosystems.	Maintaining forests is crucial to indigenous groups for social, cultural and religious reasons.

3. Bananas from the Dominican Republic

In the Dominican Republic, Fairtrade certified bananas are produced on both smallholder farms and large plantations with hired workers. In 2021, there were 1,769 Fairtrade certified smallholder farmers and 4,847 workers from Fairtrade certified plantations. Around 242,000MT of bananas were produced on 13,070ha of Fairtrade certified land. Of this, 85% was sold on Fairtrade terms, generating around EUR 9.56m in Fairtrade Premium for farmers and workers.



Carbon footprint estimated by CarbonCloud:

- 1kg of bananas from the Dominican Republic arriving in the UK results in 0.52kg of CO2e emissions.
- The agriculture stage of the supply chain causes 30% of these emissions.

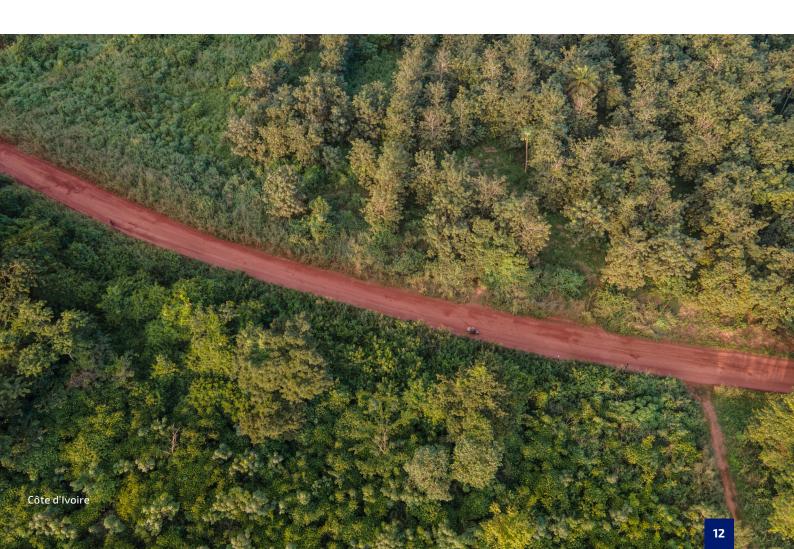
Mitigation opportunities

The research team found there are multiple opportunities for mitigation in the production stage of the banana supply chain in the Dominican Republic. See table below and page 13 for details. Although each mitigation strategy achieved a low rating individually, together they could make a significant contribution to reducing emissions.

Mitigation strategies	Mitigation potential rating	Broader impacts		
		Agronomic & Economic	Environmental	Social
Sequestering carbon in soils	Low	Soils with higher organic matter help increase productivity and offer resilience to adverse weather. This may also increase farmers' profits. Farmers may need to hire more workers to put new farming methods into practice.	Sequestering carbon in soils can support biodiversity by providing habitat and nutrients for a diverse range of soil organisms. Soils with higher organic matter show lower rates of leaching (the loss of plant nutrients). There's also less runoff of inorganic fertiliser and pesticides, which can pollute water. More fertile soil reduces the need to clear forests to access fertile land. More fertile soil can help reduce runoff from farms during periods of heavy rainfall, lowering the risk of flooding and soil erosion.	None identified
Sequestering carbon in trees on farmland	High	Trees may reduce impacts of heavy winds and intense rainfall on banana production Leaves can act as a mulch, increasing organic matter and nutrients in the soil. New products from trees can be sold, helping farmers diversify their incomes. High levels of carbon sequestration means there's potential for generating carbon credits. Farmers may need to hire more workers to put new farming methods into practice.	Trees can provide habitat and food for a variety of species, supporting biodiversity. Trees can reduce runoff from farms during heavy rain, lowering the risk of flooding and soil erosion.	More trees could increase the risk of land grabs, especially if they have high value as timber. Equally trees could make land grabs less likely – additional trees can mark out boundaries more clearly, and make it a more complex and conspicuous process to seize the land. Additional farming tasks may fall on women, who are already expected to carry out the majority of domestic work. This strategy has the potential to improve women's empowerment, if women take the lead on growing trees and have ownership of the revenue they bring in.

Bananas from the Dominican Republic

Mitigation strategies	Mitigation potential rating	Broader impacts		
		Agronomic & Economic	Environmental	Social
Reducing deforestation caused by conversion of forest to cropland	Medium	Maintaining forests in areas where water can be captured reduces flooding from heavy rain, preventing its negative impacts on banana production. Maintaining forests close to farms can reduce the intensity of wind damage to crops.	Reducing deforestation can play a major role in maintaining biodiversity. Maintaining forests in water catchment areas reduces flooding from heavy rain and its negative impact on surrounding ecosystems.	Maintaining forests is crucial to indigenous groups for social, cultural and religious reasons.
Reducing nitrogen fertiliser appliction	Low	It's difficult to generalise about agronomic and economic impacts, but using less nitrogen fertiliser has the potential to reduce yields and profitability.	Reducing nitrogen fertiliser use may reduce runoff and leaching of nitrogen into surrounding ecosystems.	May reduce the time farmers spend applying fertilisers.



4. Red Roses from Kenya

Fairtrade certified red roses from Kenya are produced by large farms with hired labour. In 2021, approximately 2.6bn stems were grown on 1,909ha of Fairtrade certified land. Around 20% of this production was sold on Fairtrade terms, generating over EUR 5.5m in Fairtrade Premium for 38,743 farmers and workers.



Carbon footprint estimated by CarbonCloud:

- 1kg of Kenyan red roses imported into London results in 11kg of CO2e emissions.
- The agriculture stage of the supply chain causes only 9% of these emissions.

Mitigation opportunities

Compared to the other commodities, there are less opportunities for mitigation in the production stage of the Kenyan red rose supply chain. See table below for details. This is partly because agroforestry (planting trees on farmland) is not a viable option as roses are produced in greenhouses. Also, most greenhouse gas emissions from the supply chain are caused by transportation rather than production.

Mitigation strategies	Mitigation potential rating	Broader impacts		
		Agronomic & Economic	Environmental	Social
Switching to renewable energy sources and/ or increasing energy efficiency	Low	Renewable energy has the potential to generate cost savings, over long timescales. Farmers may not be able to rely on renewable energy to always provide the amount of energy they need, when they need it.	It's important to consider that emissions are generated when installing, distributing and disposing of the energy efficient sources.	Switching could boost renewable energy businesses, and may mean communities in surrounding areas can also access renewable energy.

Five key takeaways



 There are a wide range of opportunities and strategies to reduce emissions and remove carbon in Fairtrade certified supply chains.

The exact potential for each mitigation strategy put in place will vary for each commodity and country of origin. This is due to many factors, from land size to labour force. But, if implemented effectively and at scale, a combination of strategies could significantly reduce emissions and increase carbon removals.

At Fairtrade, we already have strong relationships with farmers and workers, as well as the expertise and capacity to support them to adopt mitigation strategies. As well as contributing to national and global efforts to mitigate climate change, these strategies could:

- Support corporate insetting initiatives within supply chains, by reducing Scope 3
 emissions for businesses that buy these commodities, in fresh or processed forms.
- Generate carbon credits, which can be sold on voluntary carbon markets and create new sources of income for farmers.
- Achieve broader benefits to farmers, workers, and the environment, if planned and implemented effectively. These include agronomic and economic impacts, which can increase productivity and farmers' incomes, or help them adapt to climate change. For example, planting shade and fruit trees alongside coffee bushes can improve coffee yields and increase and diversify incomes, if managed effectively. The benefits also include broader environmental impacts particularly on deforestation and biodiversity as well as social impacts, such as improving worker safety and health, and empowering women.

The research also highlighted potential **negative impacts** – economic, environmental and social – which could result from implementing the mitigation strategies. For example, if new farming practices mean resource-poor smallholders need to utilise additional household labour, which could increase the risk of child labour being used.



Fairtrade Foundation's mitigation programmes should not just be carbon-focused. They must deliver multiple benefits for farmers, workers and their communities.

Mitigating climate change is an urgent priority and agriculture has a key role to play in both reducing greenhouse gas emissions and increasing carbon removals. However, implementing mitigation strategies takes time, effort, and often financial investment. It means that farmers, particularly those living in poverty, are unlikely to commit unless they can see clear benefits in doing so.

In some situations, the broader impacts of implementing mitigation strategies, such as increased productivity, higher or diversified incomes, may incentivise farmers to make changes. Payments from voluntary carbon markets also have the potential to incentivise farmers.

As well as making sure there are benefits and incentives for farmers, Fairtrade programmes and mitigation strategies should offer positive outcomes for workers and their communities.



3. Farmers must drive decision-making about which mitigation strategies to put in place.

It's crucial that businesses, farmers and Fairtrade all work collaboratively to select the mitigation strategies to implement. At the very least, farmers must see sufficient benefits to making the changes required. But they can also play a key role in choosing which strategies deliver the best combination of impacts and making difficult decisions about the benefits versus potentially negative impacts. In many cases, producer organisations can provide effective representation for large numbers of farmers, which can help make this engagement process more efficient.



4. Smallholder farmers need support to implement mitigation strategies successfully.

This research highlighted that the way a mitigation strategy is put in place can make a huge difference to how successful it is. For example, growing shade trees on cocoa farms has the potential to increase cocoa yields and sequester carbon. However, if this isn't managed well it can lead to too much shade and reduced yields. To put this mitigation strategy in place successfully, farmers need to have the necessary technical knowledge and practical skills. This is the case for many mitigation strategies and demonstrates the need to support farmers to make sure they can benefit from any change they make.

In many Fairtrade certified supply chains, farmers will need both technical and financial support to learn new skills and implement mitigation strategies effectively. Fairtrade has strong relationships with producer organisations and technical expertise in promoting sustainable agriculture, so is in a good position to provide this support directly or facilitate others to deliver it.



Models for engaging farmers in verified carbon projects need to be effective, equitable, and linked to a sound business case.

When designing projects that are verified to reduce or remove carbon, there are potential risks, rewards, and investments for all parties. However, power dynamics, inequalities and lack of information can leave smallholder farmers vulnerable to exploitation.

It's critical that partnership models divide roles, risks, rewards, and investments fairly and effectively. These also need to offer incentives for everyone involved, so they maintain their efforts throughout the project. Fairtrade Foundation is currently developing and piloting models which aim to deliver equitable, transparent and effective partnerships.

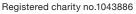


Find out more

To find out more about how Fairtrade Foundation supports producer-level mitigation and adaptation activities, please contact climateprogrammesfacility@fairtrade.org.uk

fairtrade.org.uk

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