



Costs and benefits of a hypothetical collaborative sustainability initiative in the UK pineapple industry

A case study



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Executive Summary

With global food supplies under pressure from factors including increasing population, environmental damage, poverty and climate change, there is an increasing need to support sustainable production and consumption. Following a roundtable discussion with various civil society, business and government representatives, the Fairtrade Foundation commissioned a case study to identify potential costs and benefits of collaboration on sustainability initiatives in food supply chains. This was intended to demonstrate generally how collaboration for sustainability purposes might be consistent with competition law.

When prices and production standards in supply chains are too low, they impact not only on human rights standards and the quality of life of the producer, but also lead to a lack of environmental sustainability in the supply chain, and a lack of future-proofing against the impacts of climate change. Collaboration between retailers for sustainability purposes could help to mitigate these potential risks for future continuity of supply, choice and cost for UK consumers.

This case study uses a social cost-benefit analysis (SCBA) to look at the effects on UK consumers of a hypothetical collaborative sustainability initiative in the retail market for fresh pineapples in the UK. The initiative would involve the retailers agreeing to a specific set of sustainable/ethical production standards and to pay a premium for sustainable/ethical pineapples to the producer, for an agreed share of their fresh pineapple purchases. The price for the consumer would not be set, thus retaining competition between retailers.

Potential benefits of the collaboration

Improved product quality

The collaboration will result in better quality produce being introduced onto the market, both in terms of objective features of the pineapples (e.g. physical and flavour quality) and subjective value (e.g. consumer perceptions associated with sustainable/ethical varieties).

More stable and resilient future market

By reducing risky agricultural practices such as monocropping, the collaboration is also likely to enable a more stable and resilient pineapple market in the long run, an impact which would have benefits not just for current fresh pineapple consumers but also for future consumers of pineapples.

Avoided climate change impacts through reduction in greenhouse gas emissions

By promoting more environmentally sustainable farming practices among pineapple producers, the collaboration could reduce negative environmental impacts, notably greenhouse gas emissions.

Additional potential benefits

There are also potential benefits which have not been quantified in the social cost-benefit model. Additional potential benefits to UK consumers include (1) increased choice of pineapple varieties due to more small-scale pineapple producers being better able to compete, (2) increased wellbeing through consumers being better able to make purchasing decisions that accord with their values and (3) potential health benefits for UK consumers through reduced use of hazardous agrochemicals in farming. These potential benefits, as well as social and environmental benefits for pineapple producer countries, are outlined in Annex 1 of the report.

Potential costs of the collaboration

Increased product price

Consumers who are currently in the affected market (that is, the market for the retail supply of fresh pineapples in the UK) are likely to face a higher price for those pineapples that are concerned by the collaboration.

Findings

Three alternative scenarios have been modelled to reflect varying levels of conservativeness in the assumptions made. In particular, the scenarios use different estimates for (1) the increased prices that sustainable/ethical pineapple consumers may face under the collaboration, and (2) the value of potential benefits of increased product quality under the collaboration (proxied using data on the premiums that consumers are willing to pay for such products over and above conventional alternatives).

	Conservative case	Moderate case	Optimistic case
Costs			
Increased product cost	£4,900,000	£2,500,000	£2,500,000
Benefits			
Improved product quality and choice	£4,900,000	£4,900,000	£12,300,000
More stable and resilient future market	£1,800,000	£1,800,000	£1,800,000

Reduction in greenhouse gas emissions	£100,000	£100,000	£100,000
Totals			
Benefit-cost ratio	1.4	2.7	5.6
Net benefit	£1,900,000	£4,200,000	£11,600,000

As seen in the table on the previous page, the benefit-cost ratio (benefits divided by costs) is greater than one and the net benefit (benefits minus costs) is positive in all the scenarios modelled. This would suggest that a collaboration designed in this way would improve consumer welfare, creating value that is greater than the cost to the consumer which arises from the collaboration.

1. Overview

1.1 Context

Given environmental, demographic and socioeconomic challenges such as population growth and climate change occurring in the United Kingdom (UK) and globally, there is an increasing need for more sustainable food production for the benefit of both the producers, and the consumers, who rely on food supply chains which span the globe. In today's interconnected world, the goods which are available on UK supermarket shelves are not isolated from conditions in producer countries on the other side of the earth.

In high-income countries such as the UK, year-round demand for produce that cannot be grown in the global north puts increasing pressure on local communities and environments in lower-income producer countries. Price pressure from large-scale buyers, who seek to minimise costs for their customers in order to gain a competitive advantage, is then pushed on to producers, who often must respond by cutting labour costs and environmental protection measures.

Some systems exist to encourage more sustainable and ethical produce by signalling to consumers that the produce they are buying has been grown under certain environmental and social conditions. However, in many cases, the reach achieved by sustainable/ethical production is still very low. This paper explores collaboration on sustainability issues within supply chains as a possible solution to this issue. Such collaboration has the potential to reduce risks to the environment and communities in producer countries, filter through supply chains and ultimately impact consumers.

Following a roundtable discussion with civil society, business and government representatives and a dialogue with the Competition and Markets Authority (CMA), the Fairtrade Foundation commissioned a case study to identify potential costs and benefits of a hypothetical collaborative sustainability initiative. We understand the Fairtrade Foundation intends that the case study will be used to demonstrate more generally how collaboration for sustainability purposes may be assessed as being consistent with competition law.

1.2 Methodology

We have used a cost-benefit analysis (CBA) approach for this case study as it is a common tool for economic appraisal and is a transparent method for comparing the costs and benefits over time of collaborating for sustainability purposes. In addition to focusing on the economic outcomes of a traditional CBA, we have expanded the analysis to look at wider environmental/social costs and benefits potentially arising from the collaboration. Three alternative scenarios are modelled to reflect varying levels of conservativeness in the



assumptions made. The following chapters describe the scope of the collaboration considered in this study, the potential impacts, and the results of the hypothetical social cost-benefit analysis (SCBA).

2. Scope of this case study

2.1 The supply chain

This case study SCBA looks at the **effects on UK consumers of a hypothetical collaborative sustainability initiative** in the retail market for **fresh pineapples¹ in the UK²** (the ‘relevant market’ or ‘affected market’). This particular supply chain has been chosen as the focus of the study for two primary reasons:

- (1) The UK is the world’s fifth largest importer of pineapples³ and there has been a significant rise in the popularity of pineapples, as evidenced by the fact that imports to the UK have more than quadrupled since 2001.
- (2) Collaboration on sustainability initiatives has the potential to tackle a number of problems in the pineapple supply chain, focusing particularly on the lack of sustainable production practices. These include economic and social issues for workers on pineapple plantations (e.g. low wages^{4 5}/unpaid overtime⁶, gender discrimination⁷, lack of bargaining rights and anti-union tactics^{8 9}) as well as environmental damage caused by hazardous pesticide use and monocropping (leading to groundwater contamination, erosion, deforestation and health problems

¹ Fresh pineapples in this case refer to those which are not further processed via cooking or canning. It can include fresh pineapples sold whole as well as fresh cut prepared pineapples. For simplicity in this study and due to data availability limitations, the case study focuses on fresh whole pineapples.

² In this case study, the retail supply of fresh pineapples in the UK as a whole, has been identified as the relevant market, which we consider to be a reasonable approach for present purposes. We consider the relevant market to include all fresh pineapples, including those grown using conventional agricultural practices as well as those grown under sustainable/ethical practices.

³ Pineapples, fresh or dried, The Observatory of Economic complexity, using UN COMTRADE data from 2014. Retrieved from: <http://atlas.media.mit.edu/en/profile/hs92/080430/>

⁴ ‘The sour taste of pineapples, working conditions in the pineapple industry’, International Labor Rights Forum, website article. Retrieved from: <http://old.laborrights.org/creating-a-sweatfree-world/sweatshops-in-the-fields/working-conditions-in-the-pineapple-industry>

⁵ ‘Pineapples from the Philippines’, Fairfood International website article. Retrieved from: <http://www.fairfood.org/project/pineapples-philippines/>

⁶ ‘The sour taste of pineapples, working conditions in the pineapple industry’ op. cit.

⁷ ‘The problem with pineapples’, Banana Link website article, <http://www.bananalink.org.uk/the-problem-with-pineapples>

⁸ ‘The sour taste of pineapples, working conditions in the pineapple industry’ op. cit.

⁹ ‘The problem with pineapples’ op. cit.

for local populations).^{10 11 12} These problems not only have costs for pineapple workers and local people in pineapple-growing regions but also threaten the long-term sustainability of pineapple supply for UK consumers (outlined in 3.2.2).

2.2 The hypothetical sustainability initiative

The hypothetical sustainability initiative which is outlined in this study is defined as a hypothetical horizontal collaboration between all major grocery retailers in the UK (the ‘collaboration’ or the ‘initiative’). We consider the major grocery retailers involved in the collaboration (the ‘retailers’ or the ‘parties’) to include *at least* the top eight grocery retailers in the UK in terms of share of retail supply of groceries in the UK.¹³

This initiative would involve the retailers agreeing to a set of buying conditions for the purchase of an agreed share of their fresh pineapple purchases. This agreement would require an explicit commitment from the retailers (as opposed to, for example, an optional industry standard). Each participating retailer would agree that 25% of pineapples purchased from Costa Rica¹⁴ would meet a set of agreed sustainable/ethical production standards. The sustainable/ethical pineapples concerned by this agreement would then be sold onto consumers in the UK and explicitly labelled so that consumers would be able to distinguish them from conventional pineapples. As part of the initiative, the parties would agree that the following measures will be taken by pineapple plantation owners at the production level of the supply chain:

- (1) Pineapple plantation workers would be paid a living wage.
- (2) Pineapple plantation owners would not engage in discriminatory hiring practices (e.g. gender discrimination).
- (3) Pineapple workers would be given rights to freedom of association and collective bargaining.

¹⁰ 'The problem with pineapples' op. cit

¹¹ 'The sour taste of pineapples, working conditions in the pineapple industry' op. cit.

¹² 'Sweet Fruit, Bitter Truth', Oxfam Deutschland, May 2016, p.3

<https://www.oxfam.de/system/files/20160531-oxfam-sweet-fruit-bitter-truth-en.pdf>

¹³ According to current grocery market share statistics, the top eight grocery retailers at present have a combined market share of just over 92% (Kantar Worldpanel Grocery Market Share data for Great Britain, <https://www.kantarworldpanel.com/en/grocery-market-share/great-britain>).

¹⁴ Due to data availability limitations, the benefits measured in the model are focused on pineapples grown in Costa Rica, though this is likely to be representative of the global picture, as Costa Rica is the largest pineapple growing region in the world and accounts for 73% of the UK's pineapple imports (see http://atlas.media.mit.edu/en/visualize/tree_map/hs92/import/gbr/show/080430/2015/ and <http://atlas.media.mit.edu/en/profile/hs92/080430/>).

- (4) Organic agricultural practices would be adopted (including a reduction or elimination of monoculture growing), and plantation owners would agree to reduce or eliminate the use of agrochemicals (i.e. pesticides and fertilizers) that are hazardous to the environment and/or the health of their workers and consumers.
- (5) Plantation owners would be required to meet certain physical quality, flavour quality and varietal selection standards for their pineapples (as agreed between the parties).

As part of the initiative, each retailer would also commit to conducting regular audits of the relevant pineapple plantations from which they were purchasing, to ensure that these conditions were being met. The retailers would also commit to paying a premium for sustainable/ethical pineapples (to be agreed between the parties) relative to conventional pineapples. The unit cost commitment to producers would reflect the costs of sustainable/ethical production and ensure the longer-term feasibility of the aims of the collaboration. Importantly, this commitment would *not* extend to the consumer price charged by retailers – retailers would still set prices independently.

As part of the initiative, there would be a commitment from all major grocery retailers in the UK, so that it may potentially cover approximately 25% of the relevant market as it is believed that such an arrangement is necessary to achieve the desired level of impact and to move beyond the current status quo. While sustainable/ethical pineapples such as Fairtrade pineapples do exist in the UK, they are not market-wide initiatives requiring broader commitment, and are thus limited in the reach they are able to achieve. Fairtrade pineapples currently account for only about 2% of the relevant market,¹⁵ despite the fact that they have been available in the UK since 2002. This may be due in part to the lack of incentive for grocery retailers to unilaterally supply a greater share of their pineapples at a Fairtrade (or similar sustainable/ethical) standard, for fear of losing market share to major competitors who do not make such commitments (since Fairtrade pineapples are generally sold at a higher price than other pineapples). By having the retailers commit to the sustainable/ethical standard for a significant share of their production, the collaboration moves a step beyond existing voluntary initiatives which, to date, have achieved sustainability for only a very small share of the UK pineapple market.

As the initiative would involve a commitment from all major retailers, the initiative also necessarily signals a commitment to producers that there will be sufficient sustained demand¹⁶ from their largest buyers in order to justify investment in transitioning to new agricultural production methods. With such a commitment from retailers, the costs of

¹⁵ Market share of Fairtrade from Nielsen data for the whole of 2016 (52 weeks up to 31/12/16).

¹⁶ The initiative is assumed to involve a commitment of five years (and is modelled as such in the cost-benefit analysis).

potentially significant adaptations to production are therefore less risky for producers to incur. Collaboration between fewer retailers or across a smaller share of the UK pineapple market would not be sufficient to achieve the initiative's aims.

Finally, while the sustainable/ethical pineapple when introduced into the market is likely to be priced higher than the conventional pineapple, the initiative would not involve any collaboration in relation to retail pricing to consumers. Retail pricing would remain entirely within the purview of each individual retailer. Competition between retailers in the affected market would put downward pressure on the price charged to consumers for the sustainable/ethical pineapple product.

We assume such price pressure to be present in our 'Moderate' and 'Optimistic' modelling scenarios (detailed in section 4 below) by considering that the increase in the retail price charged to consumers is equivalent to the sustainable/ethical premium paid by retailers to producers (i.e. the amount that sustainable/ethical pineapples cost to produce, over and above conventional pineapples).¹⁷

Our 'Conservative' modelling scenario, in contrast, assumes that such price pressure does not exist. Instead it models a case in which the increase in retail price in the affected market exceeds the (sustainable/ethical) premium that retailers pay to producers, but does not exceed the maximum additional cost that consumers are willing to incur for the sustainable/ethical pineapple, over the conventional pineapple. In other words, the retailer would pass on to the consumer the additional premium they have paid to producers, plus an extra amount over and above this added production cost. It is assumed that a retailer in this Conservative scenario would assess consumers' additional willingness to pay by independently undertaking a price exploration exercise to gauge consumer preference and then charge consumers at this level.

2.3 Research assumptions and limitations

Several research assumptions and limitations underpin this study. The key limitations are presented below.

- For simplicity and due to data availability limitations, this case study focuses on the retail market for fresh whole pineapples in the UK (i.e. not including pineapples which have been further processed via cooking or canning). We have identified the retail supply of fresh pineapples in the UK as the likely relevant market but have not undertaken a specific market definition test for the purpose of this study.

¹⁷ Note that, in these scenarios, retailers are still achieving a profit margin on the pineapples sold but are not making an *additional* margin on the premium paid to producers for sustainable/ethical pineapples.

- As this case study is hypothetical in nature, the potential benefits of the collaboration have not been empirically evidenced, and we have also assumed that a sufficient number of consumers in the affected market would be willing to pay the potentially higher retail price for sustainable/ethical pineapples, such that the stock made available through the collaboration can clear. Should this collaboration take place, further consumer research, including willingness to pay studies with consumers in the UK pineapple market, is recommended.
- There are various potential benefits arising from the collaboration which have not been quantified in the social cost-benefit model, due to limitations around scope and data availability. While these have been briefly outlined in Annex 1, they present possible areas for future study. Similarly, the study does not include potential impacts on conventional pineapple prices that could arise from the collaboration. This is another area that would merit further study, should the collaboration occur.
- The values of non-financial benefits included in the SCBA, such as improved product quality and avoided climate change impacts, have been put into monetary terms using financial proxies. Details of the valuations used for each benefit in the SCBA are outlined in Section 4.1 and in Annex 2.
- The social cost-benefit analysis has been modelled under three scenarios to reflect different assumptions regarding retailer behaviour and market competitiveness and their effect on retail prices charged to sustainable/ethical pineapple consumers under the collaboration. The specific assumptions made under each scenario are detailed in section 4.1.
- Due to a lack of data on the risk of pathogen-led ecological collapse resulting from the effects of pineapple monoculture, it has not been possible to precisely estimate the impacts of such an event on market prices and/or supply. Using available data, we have estimated the potential benefit of 'a more stable and resilient future pineapple market' based on historical incidence data on previous pathogen spreads in the banana market. We have also assumed that the UK-based demand for sustainable/ethical pineapples through the collaboration will be sufficient to mitigate the risk of such pathogen spread for the proportion of crop destined for UK markets.

3. Potential impacts of the collaboration

There are a number of potential impacts that could arise from the proposed collaboration. Although benefits are likely to be significant for pineapple plantation workers in the countries of production, the social cost-benefit model focuses on impacts in the affected market, i.e. the retail supply of fresh pineapples in the UK. The costs and benefits which have been considered in the social cost-benefit model are outlined in sections 3.1 and 3.2 below. In addition, not all potential impacts of the collaboration are quantified in the SCBA due to limitations around scope and data availability for this case study. These additional non-quantified impacts are listed in section 3.2.4 and described further in Annex 1.

3.1 Costs

As described above, the retailers would commit to paying a premium for the sustainable/ethical pineapples relative to conventional pineapples, as this would reflect the costs of sustainable/ethical production and ensure the feasibility of the initiative's aims in the longer term.¹⁸ This would result in the introduction of a new product into the market (i.e. the market for the retail supply of fresh pineapples in the UK), which is likely to be positioned at a higher price point than conventional pineapples.¹⁹ Consumers who are currently in the affected market are therefore likely to face a higher purchase price for pineapples that are supplied via the collaboration. Note that this higher price is optional as 75% of the market would not be subject to the collaboration – conventional pineapples will still be available should consumers wish to purchase them.

3.2 Benefits

3.2.1 Improved product quality

The introduction of sustainable/ethical pineapples into the market will offer greater product quality for consumers in the affected market. The collaboration will result in pineapples of better quality being made available, both in terms of objective features (for example, through the physical and flavour quality standards that producers committed to) and subjective value (for example, consumer perceptions associated with sustainable/ethical varieties).

¹⁸ It is anticipated that such an agreement is likely to result in increased costs for pineapple producers in the short term, as they would need to invest in increasing wages for their workers and also incur transition costs, such as investment in new, potentially more labour-intensive, farming techniques (in lieu of extensive agrochemical use). These costs would then be passed onto retailers through their commitment under the initiative.

¹⁹ As noted in section 2.2 above, the initiative would not involve any collaboration in relation to retail pricing to consumers.

As this improvement in product quality is a non-economic outcome (but is a critical component of consumer welfare), it is valued in the SCBA model using a monetary proxy. We use as a proxy the additional amount that consumers are willing to spend on sustainable/ethical pineapples over conventional pineapples, taking the view that this price difference fully represents the value that consumers place on improved product quality.

3.2.2 More stable and resilient future market

The collaboration is also likely to enable a more stable and resilient pineapple market in the long run, an impact that would have benefits not just for current fresh pineapple consumers (consumers currently in the affected market) but also for future consumers of pineapples. For example, the use of unsustainable farming practices such as monocropping threatens the long-term availability of supply. Since only a single species is grown at large scale, crops grown under such conditions are more vulnerable to disease and extreme weather events which have the potential to wipe out an entire species in an area.^{20 21 22} This vulnerability in turn threatens the future availability of supply as well as the ability for retailers to keep prices of pineapples at an affordable level in the long run. By attempting to address these sustainability issues in the present, the hypothetical collaboration has the potential to reduce the risk of future market collapse.

3.2.3 Avoided climate change impacts through reduction in greenhouse gas emissions

It is also anticipated that by promoting more environmentally sustainable farming practices among pineapple producers (such as by reducing the use of hazardous agrochemicals), the collaboration would reduce the negative environmental impacts created by large-scale agriculture. While some of the environmental benefits arising from the collaboration are local to pineapple growing regions (such as a reduction in groundwater contamination),

²⁰ Unsustainable monocropping was a contributing factor in the spread of Fusarium Wilt (Panama Disease), which destroyed much of the commercial banana crop in the mid-20th century. It has once again emerged in commercial crops during the past 25 years. See:

<http://www.fusariumwilt.org/index.php/en/about/>.

²¹ Monoculture practices have been a significant factor in the recent cluster of 'coffee rust' (*Hemileia vastatrix*) outbreaks in the Americas. See: <http://apsjournals.apsnet.org/doi/full/10.1094/PHYTO-04-15-0085-RVW>

²² As Fernando Ramirez, leading agronomist at IRET (the National University of Costa Rica's toxic substances institute) explains when discussing pineapple agriculture, "this is absolute monoculture, and that and the climate provide the perfect conditions for pests and diseases". See <http://www.theguardian.com/business/2010/oct/02/truth-about-pineapple-production>

others such as reduced greenhouse gas emissions arising from soil carbon sequestration²³ have global impact. The potential reduction in greenhouse gas emissions arising from the collaboration (valued in terms of carbon equivalents) has therefore been valued as a potential benefit in the model.

3.2.4 Additional potential benefits

Some additional potential benefits which have not been quantified in the social cost-benefit model are described in Annex 1. These potential benefits include:

- Additional benefits to UK consumers:
 - UK consumer choice.
 - UK consumer wellbeing.
 - UK consumer health/avoided healthcare costs for UK consumers.
- Benefits in pineapple producer countries:
 - Job creation in producer countries.
 - Improved working conditions in producer countries.
 - Reduced biodiversity loss.
 - Reduced agrochemical accumulation.
 - Reduction in soil leaching.
 - Improved ecosystem services provision (e.g. air and water quality, flood prevention, scenic amenities and biodiversity)²⁴ through better-functioning ecosystems.

²³ Studies have shown that organic farming has the potential to accumulate soil carbon (see <http://www.pnas.org/content/109/44/18226.full>) which in turn can offset increases in atmospheric carbon. See <http://www.sciencedirect.com/science/article/pii/S0016706104000266>.

²⁴ See <http://www.sciencedirect.com/science/article/pii/S0921800914000652>

4. Modelling scenarios, results, conclusion

This section outlines the three different scenarios modelled in the hypothetical together with the results and conclusions of the analysis. The three alternatives have been modelled to reflect varying levels of conservativeness in the assumptions made with regard to the value of (1) potential increased costs and (2) potential increased product quality for sustainable/ethical consumers in the affected market.

An outline of the approach taken for each scenario is described below, while further details of the specific methodology and data sources used to calculate benefits and costs are provided in Annex 2.

4.1 Modelling scenarios

The hypothetical case study was modelled under the three scenarios outlined below, to provide a range for the potential benefit-cost ratio (BCR) and net benefits arising from the collaboration. Estimates for the annual impact of each benefit and cost were projected and streamed over a non-specific five year period, and discounted at the UK Treasury standard social discount rate of 3.5%²⁵ for each scenario. The three scenarios are referred to as the Conservative case, the Moderate case and the Optimistic case.

These scenarios used different estimates for (1) the cost of the sustainable/ethical pineapples to consumers and (2) the premiums that consumers are willing to pay for these goods based on their perceived value (used as a proxy in the model to value the benefit of improved product quality to those consumers in the affected market who purchase sustainable/ethical pineapples).

4.1.1 The Conservative case

In the Conservative case, the retail price increase for the sustainable/ethical pineapple over the conventional pineapple is assumed to be the same as the premium that consumers are willing to pay (i.e. the proxy for the value of improved quality in the model). This means that consumers are willing to pay only what they are actually paying and do not perceive any additional value to the sustainable/ethical pineapple beyond this cost. The assumption here is that retailers have conducted some form of price exploration to determine the optimal price they are able to charge before consumers would no longer be willing to pay for the sustainable/ethical pineapples. In the model, this value is set at £0.10 per pineapple,

²⁵ HM Treasury Green Book, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf

based on the 'optimal price increase' determined through consumer research conducted on Fairtrade products, which are assumed to be comparable to the sustainable/ethical product produced under this collaboration.²⁶

4.1.2 The Moderate case

In the Moderate case, the premium that consumers are willing to pay is still assumed to be the 'optimal price increase' value used in the Conservative case (£0.10), but the increase in retail price paid for the sustainable/ethical pineapple is assumed to be equal to the Fairtrade price premium paid by retailers to producers (£0.05).²⁷ This means that the retailers are passing on to consumers the full price premium paid to producers but are retaining no additional margin on this premium. The assumption here is that sufficient competition remains in the market for the retail supply of sustainable/ethical pineapples to put downward pressure on the price charged by retailers to consumers.

4.1.3 The Optimistic case

In the Optimistic case, the premium consumers are willing to pay is assumed to be similar to the actual additional price paid for Fairtrade or organic pineapples in Europe.²⁸ The assumption here is that Fairtrade or organic pineapples are similar enough to the sustainable/ethical pineapple product proposed under this collaboration that UK pineapple consumers would act similarly to European consumers. As this figure (50%) is significantly higher than the 10% 'optimal price increase' from Fairtrade consumer research (used in the Conservative and Moderate cases), we have applied only half this price premium to the conventional pineapple price, resulting in a willingness-to-pay of £0.25 per pineapple for sustainable/ethical pineapple consumers in this scenario. In this case, the actual price increase faced by consumers remains equal to the price premium paid by retailers to producers for the sustainable/ethical pineapples (i.e. £0.05, the same as the Moderate case).

²⁶ Independent consumer research (April 2015 – unpublished) for Fairtrade International found that a 10% increase on regular (i.e. non-Fairtrade) prices was an optimal price increase. Recent market research conducted for this study found a current average price of £1.00 per pineapple for conventional pineapples. Thus, a £0.10 (10% of £1.00) premium has been adopted as a consumer willingness-to-pay value for sustainable/ethical pineapples, and therefore a proxy for the value of improved product quality.

²⁷ We use the Fairtrade price premium of approximately £0.05 per pineapple as a proxy for the increased amount that retailers would pay to producers under the collaboration.

²⁸ The Centre for the Promotion of Imports from developing countries (known as the CBI), an agency of the Netherlands Ministry of Foreign Affairs, provides average estimates of the premium in consumer prices for Organic pineapples and Fair trade pineapples. See: <https://www.cbi.eu/market-information/fresh-fruit-vegetables/pineapple/europe/>.

Details of how costs and benefits are calculated in the model under each scenario are outlined in Table 1 below.

Table 1 – Approach to calculating costs and benefits

	Conservative case	Moderate case	Optimistic case
Costs			
Increased product cost	Willingness to pay a premium on the regular price for Fairtrade goods in the UK – retailers undergo price exploration to find suitable price point (£0.10) X Estimated number of sustainable/ethical pineapples consumed	Premium paid to producers for sustainable/ethical pineapples – retail price increase assumed to be equal to marginal cost increase faced by retailers (£0.05) X Estimated number of sustainable/ethical pineapples consumed	Premium paid to producers for sustainable/ethical pineapples – retail price increase assumed to be equal to marginal cost increase faced by retailers (£0.05) X Estimated number of sustainable/ethical pineapples consumed
Benefits			
Improved product quality	Willingness to pay a premium on the regular price for Fairtrade goods in the UK (£0.10) X Estimated number of sustainable/ethical pineapples consumed	Willingness to pay a premium on the regular price for Fairtrade goods in the UK (£0.10) X Estimated number of sustainable/ethical pineapples consumed	Willingness to pay a premium on the regular price for organic/Fairtrade pineapples – assumed to be equivalent to half of the actual price premium paid for organic/Fairtrade pineapples in Europe (£0.25) X Estimated number of sustainable/ethical pineapples consumed
More stable and resilient future market	Assumed annual probability of a market collapse of a monocrop produced good due to a regional pathogen (%) X Value of UK pineapple imports (£) X Costa Rica's contribution to UK pineapple imports (%) ²⁹	Assumed annual probability of a market collapse of a monocrop produced good due to a regional pathogen (%) X Value of UK pineapple imports (£) X	Assumed annual probability of a market collapse of a monocrop produced good due to a regional pathogen (%) X Value of UK pineapple imports (£) X Costa Rica's contribution to UK pineapple imports (%)

²⁹ Note that due to data availability limitations, the benefits measured in the model relate to pineapples grown in Costa Rica, though this is likely to be representative of the global picture, as

		Costa Rica's contribution to UK pineapple imports (%)	
Reduction in greenhouse gas emissions	Non-traded value of carbon (£) X Estimated annual tonnes of carbon saved through more environmentally friendly agriculture (tCO ₂ e)	Non-traded value of carbon (£) X Estimated annual tonnes of carbon saved through more environmentally friendly agriculture (tCO ₂ e)	Non-traded value of carbon (£) X Estimated annual tonnes of carbon saved through more environmentally friendly agriculture (tCO ₂ e)
Note: X = multiplied by			

4.2 Results

In all scenarios the benefit-cost ratio (benefits divided by costs) is greater than one, and the net benefit (benefits minus costs) is positive. This would suggest that a collaboration designed in this way would improve consumer welfare, creating value greater than the overall cost to consumers arising from the collaboration. The results show that even in the Conservative case, benefits exceed costs by a multiple of 1.4, increasing to a multiple of 5.6 with more optimistic assumptions. The findings are summarized in Table 2 below.

Table 2 – Findings from the hypothetical case study (figures in five year net present value)

	Conservative case	Moderate case	Optimistic case
Costs			
Increased product cost	£4,900,000	£2,500,000	£2,500,000
Benefits			
Improved product quality and choice	£4,900,000	£4,900,000	£12,300,000
More stable and resilient future market	£1,800,000	£1,800,000	£1,800,000
Reduction in greenhouse gas emissions	£100,000	£100,000	£100,000
Totals			
Benefit-cost ratio	1.4	2.7	5.6
Net benefit	£1,900,000	£4,200,000	£11,600,000

Costa Rica is the largest pineapple growing region in the world and accounts for 73% of the UK's pineapple imports.

If we take a more narrowly defined view of consumer welfare to focus *only* on consumers in the affected market who bear the costs of the collaboration (i.e. including only the benefit of ‘improved product quality’ in the model), the benefits are *at least* equivalent to costs (i.e. increase in retail price) in the conservative scenario and greater than costs in the moderate and optimistic scenarios. Table 3 below presents the BCR and net benefits in this case where quality improvements are the only benefit measured.

Table 3 – Findings from the hypothetical case study (only the benefit of ‘improved product quality’ is included; figures in five year net present value)

	Conservative case	Moderate case	Optimistic case
Benefit-cost ratio	1.0	1.9	4.9
Net benefit	£0 (breakeven)	£2,400,000	£9,700,000

4.3 Conclusion

The case study benefit-cost ratios demonstrate that even with conservative assumptions, the collaboration would lead to a benefit-cost ratio greater than one when taking a wider view of consumer welfare, and at least one when taking a more narrow view of consumer welfare. Even if the initiative leads to higher prices for sustainable/ethical pineapple consumers, this cost is counterweighed by benefits accruing to both the sustainable/ethical pineapple consumers and the consumers who do not bear the costs of the collaboration. This shows that a collaboration on sustainability initiatives would directly benefit consumers.

Once the additional non-quantified benefits are considered,³⁰ the total benefits from the collaboration would further increase to include additional benefits to UK consumers as well as benefits in producer countries. As such, it is clear that this hypothetical case of collaboration to achieve sustainability could be justified both in terms of direct benefits to consumers currently in the affected market, and wider welfare gains that could be achieved through collaboration.

³⁰ See Annex 1.

Annex 1 – Additional potential benefits not quantified in SCBA

There are a number of potential benefits resulting from the collaboration which have not been quantified in the social cost-benefit model, due to limitations around scope and data availability for this study. These potential benefits have been outlined below and are possible areas for further investigation.

Additional benefits to UK consumers

UK consumer choice

By increasing the value paid for sustainable and ethical produce, more small-scale pineapple producers may be able to compete in the UK market. The collaboration may therefore lead to the introduction of new differentiated pineapple varieties to the affected market, thus improving consumer welfare through increased product choice.

UK consumer wellbeing

Greater sustainable/ethical choice within the pineapple market better enables consumers to make purchase decisions that accord with their values. If people value sustainable/ethical characteristics such as pro-environmental production methods and fair treatment of farm workers, being able to support these values through consumer decisions will improve their personal well-being.

UK consumer health/avoided healthcare costs for UK consumers

Within the scope of the collaboration, producers agree to reduce the use of hazardous agrochemicals. This is already a standard of organic production, and organic foods have been shown to contain higher concentrations of antioxidants and lower pesticide residues than non-organic foods. The increased adoption of sustainable farming practices under the collaboration therefore has the potential to create health benefits for consumers who purchase the new sustainable/ethical pineapple.

Benefits in producer countries

Job creation in producer countries

As sustainable/ethical agriculture is less reliant on farm machinery and more dependent on labour, the demand for farm workers will increase in producer countries. This job creation will provide income for additional workers, improving their wellbeing and also benefitting the communities where their wages are likely to be spent. Since labour is likely to be local,

whereas specialised farming machinery is likely to be imported from further afield, more money will circulate within local economies. There will be additional benefits to the state in reduced social support requirements and increased tax revenues.

Improved working conditions in producer countries

The production of sustainable/ethical pineapples will create better working conditions as a requirement. By paying at a better rate, increasing safety, and allowing freedom of association and collective bargaining rights, the working conditions for farm labourers will improve, and will likely include better working hours and benefits. This will lead to improved well-being for the workers themselves, which is likely also to improve their relationships with their family and friends and lead to more cohesive communities in general. It is possible that these improved conditions will also lead to a demand for improved working conditions in other associated industries (for example, for people working on nearby plantations).

Improved communities in producer countries

The movement towards the production of sustainable/ethical pineapples will improve community cohesion as inequalities are reduced and local economies are bolstered. A reduction in environmental harm at local level will also improve the living conditions in local communities and can reduce the social pressures brought on by a loss of space and resources.

Reduced biodiversity loss

A reduction in large-scale monoculture will reduce the pressure to deforest land and strip fields of their biodiversity in favour of single crop harvesting. While it may be the case that as much, or more, total land area is required for sustainable/ethical pineapple production, the land use would not be as intensive, nor would it damage the environment as much, and as such would reduce losses in biodiversity.

Reduced agrochemical accumulation

As conventional pineapple production relies heavily on pesticides and fertilisers, a movement away from dependence on chemicals and towards more sustainable/ethical production methods will reduce the accumulation of these chemicals in the biosphere. As pesticides and fertilisers can be harmful in high concentrations (such as through groundwater contamination), reducing their presence can benefit animals and the environment, as well as human health.

Reduction in soil leaching

Conventional pineapple production, through monocropping, strips soils of naturally occurring minerals and nutrients in favour of the application of agrochemical fertilizers,

pesticides and industrial irrigation. Over time, this damages the productivity of soil and its ability to regenerate; eventually the soil can become sterile, reducing its ability to support future agricultural use. The production of sustainable/ethical pineapples takes account of the needs of the environment and works to maintain resources such as natural soil productivity through sustainable cultivation methods, ensuring that the soil is capable of supporting production sustainably into the future.

Improved ecosystem services provision through better functioning ecosystems

Ecosystem services are the provisioning, regulating and cultural services provided to humans by the environment. They support much of human culture and the economy and are critical to human life. A well-functioning natural environment is better able to provide ecosystem services and can do so sustainably. Human activities that infringe on or damage ecosystem functioning can significantly reduce the level of provision of these services.

Monoculture and other industrial-scale agricultural practices can greatly damage, or even eliminate, ecosystem service provision in their environments. As the production of sustainable/ethical pineapples requires more sustainable and environmentally sound approaches, ecosystem functioning is better able to remain intact and maintain a healthy provision of ecosystem services.

Annex 2 – Approach to calculating benefits and costs

This annex details the approach used to calculate benefits and costs included in the SCBA model. Due to data availability limitations, the benefits measured in the model are focused on pineapples grown in Costa Rica, though this is likely to be representative of the global picture, as Costa Rica is the largest pineapple growing region in the world, and accounts for 73% of pineapple imports to the UK. The modelling is conducted for a non-specific five year period, meaning benefits and costs accrue over a five year term.

Calculating benefits

Improved product quality

As described in the scenarios outlined in section 4, the benefit to the consumer from increased product quality is valued using the additional amount that consumers are willing to pay for the sustainable/ethical pineapple over and above what they would pay for the conventional pineapple. We assume that a material number of consumers in the affected market would be willing to pay a higher retail price for the sustainable/ethical pineapple variety. The SCBA model specifically assumes that a sufficient number of pineapple consumers are willing to pay this higher retail price, such that the stock of 25% sustainable/ethical pineapples can clear³¹

The total benefit of improved product quality is calculated by combining this additional willingness-to-pay value with the total estimated number of sustainable/ethical pineapples consumed in a year. The total quantity of all pineapples in the affected market is based on UK government statistics on tonnage of pineapple imports up to 2015 (the most up-to-date data available).³² As import quantities have changed considerably since the mid-1990s and the model is hypothetical and non-time-specific, the quantity used is an average of the past 20 years of imports data (a conservative approach).

In order to convert tonnage to number of pineapples in the affected market, an average weight of pineapples of 1500g was assumed, based on the median size quoted by the Food

³¹ This assumption could be confirmed through conducting research on consumers in the affected market. Note that the current Fairtrade market share in the UK banana market is nearly 40%. While other market factors may be at play in the banana market, it is believed that *at least* this level of demand may be achieved for sustainable/ethical pineapples in the future. We have chosen 25% as a more conservative initial target for this study.

³² DEFRA (2016), *Horticulture Statistics 2015*, ONS (Office for National Statistics). Retrieved from: <https://www.gov.uk/government/statistics/horticulture-statistics-2015>

and Agricultural Organization standards.³³ The total number of sustainable/ethical pineapples consumed was then calculated by multiplying the total number of pineapples in the affected market by the target purchase share of sustainable/ethical pineapples under the collaboration. As the model is focused on pineapples grown in Costa Rica, this figure was then multiplied by the share of the UK's pineapple imports which come from Costa Rica.³⁴ Finally, the price premium is multiplied by the quantity of sustainable/ethical pineapples to calculate the overall benefit of the improved quality, for those UK consumers in the affected market who bear the costs of collaboration.

More stable and resilient future market

We assess the value of a more stable and resilient future market by calculating the reduced risk (i.e. avoided loss) of a major contraction of the affected market due to ecological collapse. This is estimated as the annual probability of pathogen-led collapse due to monocropping. We assume that UK-based demand for sustainable/ethical pineapples through the collaboration will be sufficient to mitigate the risk of such pathogen spread for the proportion of crop that is destined for UK markets.

Based on knowledge of the historic banana market dating back to the late 19th century, there is evidence that monoculture can lead to a more rapid spread of pathogens, which runs the risk of eradicating large portions of a crop, as happened to the Gros Michel varietal in the 1950s.³⁵ Given that this event occurred at least once in the 20th century and there is evidence of another strain starting to affect current banana crops, we assume that this pattern equates to at least a 1 in 100 year occurrence, or an annual probability of 1%, that a widespread pathogenic infection will lead to major crop failure, and a temporary collapse in the export market for that crop.

As Costa Rica produces 73% of the pineapples sold in the UK market,³⁶ we assume that a major pathogenic incident affecting pineapple crops within Costa Rica would temporarily collapse the UK pineapple market. The probability of a major pathogenic incident is applied to Costa Rica's share of the UK pineapple market (where the total UK pineapple market is

³³ Standard for Pineapples, CODEX STAN 182-1993, Codex Alimentarius. Retrieved from: http://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FStandards%252FCODEX%2B182-1993%252FCXS_182e.pdf

³⁴ 'Where does the United Kingdom import pineapples fresh or dried from (2015)?' OEC. Retrieved from: http://atlas.media.mit.edu/en/visualize/tree_map/hs92/import/gbr/show/080430/2015/

³⁵ Source: <http://www.fusariumwilt.org/index.php/en/about/>

³⁶ 'Where does the United Kingdom import pineapples fresh or dried from (2015)?' op. cit.

estimated using the 20-year average value, based on UK government statistics) to give an annual avoided cost (i.e. benefit) of a more stable and resilient future market.

Avoided climate change impacts through reduction in greenhouse gas emissions

To estimate avoided climate change impacts through reduced greenhouse gas (GHG) emissions, we first determined what the potential GHG emissions savings would be if Costa Rica converted all land currently used for pineapple production, over to sustainable/ethical production. Based on Worldbank figures,³⁷ 11% of Costa Rica's total land is arable land or used for permanent crops, and 7% of this land is used for cultivating pineapples.

The source profiles a case study for Coffee NAMA, a project covering 93,000 ha, which finds that carbon emission reductions of 120,000tCO₂e are possible, through using more environmentally-focused approaches to agriculture. This equates to 1.29 tCO₂e/ha, a figure that we adapted for the model by multiplying it by the total land used for pineapple cultivation in Costa Rica.

The result is the total potential carbon emission reduction, if all pineapple production methods became more environmentally-focused. To find the proportion of this that would be realised if UK retailers set a purchase target for sustainable/ethical pineapples, we applied the 7.1% share of Costa Rica's pineapple exports destined for UK markets³⁸ to the target purchase share of sustainable/ethical pineapples in the collaboration (25%).

The total carbon emissions reduction was valued using the UK government guidance on valuation of energy use and greenhouse gas emissions.³⁹ Non-traded values have been used to incorporate more accurately the social value associated with reduced GHG emissions, though the 'low' non-traded estimate has been adopted to be conservative.

Calculating costs

Costs in the model are defined as the increase in retail price paid by consumers when purchasing sustainable/ethical pineapples rather than conventional pineapples. This is a cost

³⁷ World Bank, CIAT, CATIE (2014), 'Climate-Smart Agriculture in Costa Rica' CSA Country Profiles for Latin America Series, Washington, D.C. The World Bank Group. Retrieved from:

<http://sdwebx.worldbank.org/climateportal/doc/agricultureProfiles/CSA-in-Costa-Rica.pdf>

³⁸ 'Where does the United Kingdom import pineapples fresh or dried from (2015)?' OEC op. cit

³⁹ Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal, Department for Business, Energy and Industrial Strategy, 15 March, 2017. Retrieved from:

<https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal>

for consumers who choose to purchase the sustainable/ethical pineapple when it is introduced into the affected market.

Cost per year is calculated in the model by combining (1) unit cost increases faced by sustainable/ethical consumers with (2) the total estimated number of sustainable/ethical pineapples consumed in a year. The total quantity of all pineapples in the affected market is based on UK government statistics on tonnage of pineapple imports up to 2015 (the most up-to-date data available).⁴⁰ As import quantities have changed considerably since the mid-1990s and the model is hypothetical and non-time-specific, the quantity used is an average of the past 20 years of imports data (a conservative approach).

In order to convert tonnage to number of pineapples in the affected market, an average weight of pineapples of 1500g was assumed based on the median size quoted by the Food and Agricultural Organization standards.⁴¹ The total number of sustainable/ethical pineapples consumed was then calculated by multiplying the total number of pineapples in the affected market by the target purchase share of sustainable/ethical pineapples under the collaboration. As the model is focused on pineapples grown in Costa Rica, this figure was then multiplied by the share of the UK's pineapple imports which come from Costa Rica.⁴²

Finally, the unit cost increase was multiplied by the quantity of sustainable/ethical pineapples to calculate the overall cost to those UK consumers in the affected market who will bear the costs of collaboration.

⁴⁰ DEFRA (2016), *Horticulture Statistics 2015*, ONS (Office for National Statistics). op. cit.

⁴¹ Standard for Pineapples, CODEX STAN 182-1993, Codex Alimentarius. op. cit

⁴² 'Where does the United Kingdom import pineapples fresh or dried from (2015)?' OEC op. cit