Fresh Insights

Number 9

Fair Miles? Weighing environmental and social impacts of fresh produce exports from Sub-Saharan Africa to the UK (summary)

Edited by James MacGregor and Bill Vorley

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1. Introduction

The food supply chain (FSC) has evolved into a complex system in which there can be many different options for producing, sourcing, distributing and marketing each food product. For example, there are numerous ways in which vegetables can be cultivated, packaged, processed and moved from farm or market garden to the household of the consumer. Produce can be sourced locally, nationally or imported; packaged and stored in numerous ways; and purchased at a supermarket, greengrocer, outdoor market or through a home-delivery fruit and vegetable box scheme. The consumer, as well as policy-maker, is often unaware of the environmental and social impacts associated with different choices and the extent to which this impact can vary for seemingly identical produce. There has been a shift in interest in recent years to the provenance of food, with labelling making origin more explicit.

The concept of 'food miles' presents an argument to buy goods which have travelled the shortest distance from farm to table, and to discriminate against long-haul transportation, especially air-freighted goods. The long-distance transport of food is associated with additional emissions due to increased transportation coupled with greater packaging, as well as negative impacts on local rural communities, and a disconnection between the public and food and farming. 'Food miles' encapsulates (and is at the vanguard) of the climate change debate. In light of growing international concern over the speed and scale of climate change, the concept of food miles has captured public attention and apparently is changing some consumer's behaviour, although only around one-third of shoppers know of the concept.

Nowhere are UK consumers more persistently engaged with rural Africa than through food consumption choices. The implications of the food miles debate are considerable. Much high-value produce from Africa, especially flowers and horticulture, are air-freighted, and are being singled out as the epitome of unsustainable consumption. But from a development and poverty reduction angle, the inclusion of sub-Saharan Africa in these high-value markets has been a success story.

What is clear is that decisions – of consumers, of policy makers, and of the food chain businesses – should be based on good information. If environmental harm is to be weighed against developmental gains, it is essential that (1) the degree of that harm is quantified and put into context of other food choices, (2) the degree of harm is put into context of Africa's current use of 'ecological space', and (3) the degree of development gain is quantified, to demonstrate whether this trade really benefits those living in poverty.

The objective of this research was to understand better the significance and impact of the UK's consumption of fresh fruits and vegetables (FFV) in sub-Saharan Africa (SSA). DFID has commissioned studies into the environmental and social aspects of the international horticulture trade between African countries and the UK, as a sub-project of the 'Small-scale producers and agrifood standards' programme (DFID project AG3815). IIED commissioned four sub-studies on energy, water, and ecological space.

This paper summarises four commissioned studies on weighing environmental and social impacts of fresh produce exports from sub-Saharan Africa to the UK:

- *Sub-Saharan African horticultural exports to the UK and climate change: a literature review* by Zoë Lelah Wangler (Fresh Insights 2)

- *Virtual water: a case study of green beans and flowers exported to the UK from Africa* by Stuart Orr and Ashok Chapagain (Fresh Insights 3)

- *A life cycle analysis of UK supermaket imported green beans from Kenya* by Andrew Jones (Fresh Insights 4)

- *Ecological space and a low-carbon future: crafting space for equitable economic development in Africa* by James MacGregor (Fresh Insights 8).

2. FFV from Africa in context

A wide range of fresh fruit and vegetables are imported to the UK from sub-Saharan African countries (here north of South Africa) for consumption by UK residents. The UK imports of FFV from SSA accounted for a declared value of over £200 million in 2005. The UK is consuming more produce today from Africa than ever before, and the quantity is growing. For example, consumption of green beans has been increasing at 2.2 per cent per annum since 1990. Forty per cent of all air freighted FFV imports to the UK are from SSA. Poor African countries rely on the UK market to support their domestic industry and on air freight - Kenya air freights over 90 per cent of its exported green beans to the UK.

Kenya is a good example of how local economic development follows export horticulture development. Kenya was the first SSA country to develop systems in which high-value horticulture is exported to the UK. A full 70 per cent of green beans (of exportable quality) produced in Kenya are exported to the UK. This business is perceived as a success, and a number of other countries have followed and are now competing, though 87 per cent of UK imports of green beans come from only five African countries.

Competitive advantages change with seasons as the EU winter precludes field cultivation of many products. Supermarkets and apparently consumers demand year-round produce. There is evidence that fresh produce without seasonal smoothing of supply would not be carried by supermarkets or would be promoted less vigorously.

3. UK aviation in context

In the UK, passenger flights account for 90 per cent of carbon emissions from air transport (28Mt/year) with international freight accounting for 5 per cent. The UK is a global leader in aviation, employing over 100,000 people in the UK. Although emissions from aviation are not included under the Kyoto Protocol, estimates suggest that by 2050 all of the UK's per capita carbon emissions profile will be taken up by aviation, allowing zero emissions from other industries. Aviation ranks alongside telecommunications as one of the two great drivers of our ever more global world economy. Yet, it is an industry that will experience only incremental improvements for the foreseeable future, but also one where huge technological breakthroughs are unlikely. The new generation of aircraft now on the drawing board will still be in service in another 40 years' time. And that has important environmental implications.

4. Discussion

Environmentally, air freighted produce usually scores poorly compared with locally-grown produce.

Air-freight has the highest global warming potential of all modes of transport for FFV. To illustrate, one kilogram of blueberries could be responsible for:

- 28 kg of CO2e (carbon dioxide equivalents) if air-freighted from New Zealand
- 0.1 kg of CO2e if shipped from New Zealand in a large bulk carrier
- 0.1 kg of CO2e if transported in an articulated lorry from southern Spain.

Air freight is a significant contributor to food transport emissions in the UK. All modes of transport of food from Africa are growing fast with freight transported in dedicated cargo planes growing faster than freight in the bellyhold of passenger aircraft. Only 1.5 per cent of imported fruits and vegetables arrive in air transportation but that portion produces 50 per cent of all emissions from fruit and vegetable transportation (excluding consumer travel). Air freight is energy-inefficient when comparing the calorific content of vegetables and the energy used when transporting them by flight; each green bean calorie flown from Kenya requires 60 calories of fuel to transport it.

For most products that can be grown outside of greenhouses and without heating, flying FFV from Africa to the UK has a larger environmental footprint than producing nearer to the UK. Air freight has the highest global warming potential of any other stages of the life cycle of horticultural produce. Carbon emissions from import of FFV from SSA (air and sea) are between 279,000 and 686,000 tonnes. An air-freighted kilogram of green beans from SSA to the UK compares with 177 sea-freighted kilograms of green beans, in terms of carbon emission equivalence. Production productivity with respect to energy is similar: despite differences in mechanisation and horticultural methods, energy consumption to the farm gate of UK and Kenyan green beans is similar: 0.8-1.4 MJ/kg and 0.7-1.7 MJ/kg respectively.

Transport of green beans by sea would result in a significant saving in energy, being about 1.7MJ/kg. This does not occur at the moment, but modified atmosphere packing is being considered by certain industry participants. This figure does not include the extra energy that might be needed for successful MAP and moisture/ temperature control at sea.

This study comissioned a life cycle analysis (LCA) methodology to compare UK and Kenyan energy use to the farmgate and UK port of entry respectively. The inventory in an LCA can contain up to 51 environmental criteria, including energy carriers (eight categories), air emissions (13 categories), water emissions (14 categories) and soil emissions (16 categories) as well as solid wastes. Life cycle analysis takes the food miles trade-offs debate further still by comparing interactions not just *between* transport and production but *among* several different life cycle stages. In other words it highlights the fact that interactions are not bilateral but multilateral.

When the energy consumption in transporting beans from Kenya to the UK by plane is included, the difference between the two supply chains becomes considerable. Energy

use is 12 to 13 times greater when beans are sourced in Kenya rather than the UK, a difference of 57-59 MJ/kg of beans (Table 1). In context, the energy consumed when exporting a kilogram of vegetables from Kenya to Northern Europe by plane is greater than that used to produce, package, process and distribute all of the food and drink consumed by one UK consumer in a day.

Table 1: Comparison of selected impacts of production of green beans in Kenya and the UK for sale in the UK (per kg):

Criteria	Kenya	UK
Food miles	4500 miles	<100 miles
Energy – transport	58 MJ/kg	<5 MJ/kg
Energy – production	1.7 MJ/kg	1.1 MJ/kg
Water	5.4m^3/kg	N/a
Employment (direct and indirect)	1 virtual job per 175kg	N/a
Social	1 virtual livelihoods per 35kg	N/a

Socially, air-freighted produce from SSA to the UK provides considerable direct benefits to poor rural economies. Over one million people in rural Africa are supported by the FFV exports to the UK.

There are an estimated 50-60,000 small-scale producers who grow produce that is consumed in the UK, an estimated 50-60,000 employees on larger farms that grow produce that is consumed in the UK, and an estimated 100-120,000 employed in support services for these producers and employees. In total, there are an estimated 1-1.5 million people whose livelihoods depend on the supply chain linking production on African soil and consumption in the UK. UK consumers spend at least one million pounds per day on FFV from SSA, with at least £400 million spent at retail on export horticulture from SSA during 2005.

Air freight of FFV from SSA accounts for less than 0.1 per cent of total carbon emissions from transport of UK fruits and vegetables

In the big picture, the environmental cost of international food transport is trivial compared with UK domestic food miles. Moreover, air freight is the only possible mode of transport for some highly perishable produce where no other infrastructure exists.

Table 2 illustrates that currently the carbon load of transporting FFV to consumption is less than 1 per cent of transport emissions from the UK consumption of fruit and vegetables, and less than half of one percent if the allocation of carbon splits overseas transport with the production country. Of this, air freight accounts for 0.2 per cent, of which 40 per cent is from SSA – hence a maximum of approximately 0.1 per cent of total UK emissions.

Table 2: Transport emissions from the UK consumption of fruit and vegetables (estimate)

Transport stage	% UK emissions
UK road transport	0.1
Overseas road and sea	0.2
Overseas air	0.2
UK car shopping travel	0.1
TOTAL	**0.6**

Source: Garnett, 2006:35

From a development perspective, air freight of FFV from SSA is a relatively very efficient 'investment' by the UK in allocating its carbon emissions

Putting the information from Table 2 in another way, 0.1 per cent of the UK's GHG emissions from FFV transportation help to financially support 1 million rural Africans. From a development perspective, this is an attractive and efficient 'investment' by the UK in utilising its carbon emissions particularly when compared to the efficiency of the remaining 99.9 per cent that is supporting 60 million UK residents. The UK needs to reduce emissions to 450kg/capita. Cutting out international trade in horticulture would in theory be a start. Yet, the remaining 99.9 per cent of carbon would still need to be reduced.

The majority of FFV imports to the UK are carried in the bellyhold of passenger aircraft (at least 60 per cent according to Garnett, 2006), and the rest in dedicated freight. Freight plane flight-paths, and even some passenger flights, do not fly direct UK-Kenya, but are routed in triangles, making allocation of the energy component complex. The justification for the flights' existence is unclear, and the driver is not necessarily FFV exports to UK.

For countries with high levels of 'carbon credit', there is potential to use some of this excess ecological space to reduce poverty, eg through export horticulture

'Ecological space' is the individualised (per capita) right to natural resources for utilisation such as energy, food, land and water. One of the commissioned briefing papers focused on ecological space from the perspective of individual and national 'rights' to access carbon dioxide emissions. The concept of 'equitable ecological space' translates well into 'per capita carbon dioxide emissions' and the 'per capita right to emit carbon dioxide'.

The Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) recognises the need for equity and non-restrictive economic development for developing countries in the transition to a low-carbon future. These elements of the Convention are not operationalised.

There is currently global inequality in how the utilisation of ecological space is distributed. The global per capita average is 3.6 tonnes of carbon, the UK average is 9.2 tonnes, and the African average is 1 tonne, although this is inequitably distributed and is heavily weighted towards oil-rich countries. Only two African countries, Libya and South

Africa, have higher emissions than the global average. The gap between the highest and lowest emitters (including many African nations) is increasing.

There is also inequality of impact and adaptive capacities of climate change. Many African countries are feeling the force of the impacts of climate change, the root causes of which were produced in developed countries. Poorer countries have fewer disposable financial resources to commit to adapting to the impacts of climate change.

Under current calculations for a sustainable carbon future, equitable ecological space per capita is 1.8 tonnes. This represents the estimated absorptive capacity of natural carbon sinks, both land and sea. Currently these carbon sinks are absorbing roughly half of the anthropogenic emissions of CO_2. Yet this per capita space is falling owing to a projected warmer climate, which will accelerate decay of carbon in soils, and projected population increases.

There is a strong relationship between the level of industrial economic development of a country and its carbon emissions. To this end, without transfers of cleaner technology from developed countries to African countries, it is likely that future ecological space utilisation in Africa will be far higher.

For those countries with high levels of 'carbon credit', there is potential to use some of this excess ecological space to reduce poverty and increase low-carbon economic growth and development. Export horticulture is one of the few genuine opportunities for developing countries to use their excess ecological space in ways that have direct and indirect benefits that reach into poor rural areas. Moreover, there is projected future growth in export horticulture from existing and emerging producer countries in Africa, owing to tourism, economic development and more socially conscious procurement patterns in all industries.

At present, emissions from aviation are not included in national emissions calculations because there is no agreed methodology for allocation. Some advocate splitting 50-50 between departure and arrival countries. Others suggest using passenger/cargo final destinations to avoid presenting a misleading picture owing to transit issues, entrepots and locations of hub airports. If the carbon emissions from importing FFV from Africa to the UK were allocated entirely to the UK's emissions budget, they would account for an extra 0.2 per cent of total emissions for the UK. Per capita emissions would rise to 9.22 tonnes (512 per cent of natural carbon sink capacity). But if they were allocated entirely to Kenya's emissions budget, they would account for an extra 4.8 per cent of total emissions for Kenya. Per capita emissions would rise to 0.42 tonnes (23 per cent of natural carbon sink capacity). The big difference is that UK is in ecological debt and Kenya in ecological credit, with the space to invest this.

Further research is needed to comprehend the actual drivers of aviation expansion on routes to developing countries.

There is no firm evidence or consensus that by UK consumers not eating imported FFV, fewer planes will fly today or into the future. FFV imports are growing by an estimated 6 per cent per annum over 1996-2004. Passenger volumes inbound and outbound from the UK are currently growing by 4-6 per cent per annum (Visit Britain, 2006; ONS, 2006). Dedicated freight is increasing by an estimated 6 per cent per annum (Boeing, 2004).

Anecdotal evidence suggests that expanding flower exports from a country are a key initial driver for other exports, including FFV. The relationship (be it symbiotic, complementary or competitive) between passenger flights and freight flights is unclear in the context of FFV exports from SSA to the UK. Research on the incentives to increase passenger and freight flights is needed.

Food imports to the UK have other environmental implications for producer countries. Singular comparisons do not necessarily help us to generate good policy

A study on environmental costs of international horticulture trade between African countries and the UK was commissioned, with a focus on 'embedded water'. The study uses the evaporative virtual water content (EVWC) of green beans and flowers. The 'virtual' water content of a product is the volume of water used to produce a product – that amount of water transpired by the crop to reach harvest – measured at the place where the product was actually produced. The adjective 'virtual' refers to the fact that most of the water used in production is not visible in the end product. Indeed, the real water content of products is generally negligible if compared to the virtual water content. To illustrate, it roughly takes $1000m^3$ (one million litres) of water to produce a tonne of wheat. If a country imports 1 million tonnes of wheat then it is said to be 'virtually' importing 1 billion m^3 (1 km^3) of water.

Taking into account the global withdrawal and rain for agriculture, annual use of water by crops per annum has been estimated at 5,400 km^3. It has further been estimated that 16 per cent of water used by crops is not for domestic consumption but for export.

Worldwide, water availability ranges in scarcity and the pricing mechanism ranges in its ability to sanction unsustainable use.

It is estimated that annually, the UK 'uses' 189 million m^3 of African water as a result of the import of green beans and 19 million m^3 of water from all over the world as a result of flower imports. In total the consumption of Kenyan beans and roses to the UK accounts for evaporating 73 million m^3 of water, the largest part of which is from 'blue' water resources, ie that water found in rivers, lakes, reservoirs, ponds and aquifers. Each rose stem on sale in the UK produced in Kenya represents 2.7 litres of blue water that was evaporated for its production and 1.3 litres of polluted water in Kenya. To place in context, this volume is equal to about $2.5m^3$ (2,500 litres) per capita per year in Kenya. Consider that Kenya is classified as a 'chronically water scarce' country with a limited natural freshwater endowment of only 647 m^3 per capita. This is projected to fall to 245 m^3 per capita by the year 2025.

The data on virtual water indicates that production of green beans from Africa to the UK uses the equivalent amount of water to supply 13 million Kenyan people for one year. But this does not help with national water resource management in Kenya since in potable water-poor countries, the chief problem tends to be infrastructure; the water used for agriculture is not diverting from the population – indeed, in Kenya, the two are distant. Moreover, the social footprint, the embedded labour and livelihoods associated with the trade remain poorly understood.

Singular comparisons do not necessarily help us to generate good policy. All environmental and social aspects need to be analysed, and trade-offs made. This is key

when considering that large volumes of virtual water are used to produce one unit of green beans. Other indicators are needed to provide context and to guide policy development – virtual labour, virtual livelihoods, virtual oil, land, etc. Indeed, the originator of the virtual water concept no longer advocates its use as anything other than a ‘useful concept for political discussion’; virtual water does not help water resources management.

‘Food miles’ has limited utility as a sustainability indicator

From a climate change perspective, a focus on food miles is appropriate as long as it can lead to reduced environmental impact for the entire life cycle of food products consumed in the UK. Food miles are blind to the social and economic benefits associated with trade in food, especially from developing countries. This reduces their utility as a standard for sustainable development decision-making. For instance, while virtual water in green bean production appears high, Kenya trades a range of products (imports thirsty rice, exports even thirstier beef) for which the relative virtual water content is unknown and yet necessary as a comparison to galvanise support for its utility in developing better national water resources management tools.

5. Policy and research recommendations

5.1 Options for joined-up policy approaches to climate change issues across government with DfT, DEFRA, DTI, HMT

IIED suggests that DFID specifically address the following:

1. Care in the use of 'food miles' as a sustainable development indicator in government policy in the light of:

- Pro-poor benefits: evident development benefits of trade with rural Africa
- Fallible standard: food miles or the distance that a product has travelled is not a universally applicable standard
- Incomplete environmental standard: the studies here have shown that energy, water and labour are all parts of a solution. Currently, food miles provides a partial indicator of environmental concerns.
- Driver of change: it remains unclear if food export is a driver of increased transport or a fortunate result of expanded transport infrastructure or tourism or expansion in another associated economic sector/ activity.
- The UK government policy having to pull in several different ways and being left open to criticism.

IIED suggests that further research is needed to address the full range of issues concerning the food system and its environmental impact (see below) and using this evidence to refine the food miles agenda.

2. Care in 'contraction and convergence' analysis, taking into account:

- the need to incorporate space for development in Africa
- whether other UK government departments are supporting this
- technology transfer capacity and incentives

3. Application of 'development test' analysis to allocation options for aviation, considering economic development, equity, development imperatives in developing countries and mitigation measures that enable ecological space to be calculated fairly, and the opportunities to trade in unused space to be fully exploited, working through the IPCC, UNFCCC etc.

4. Expanding the food miles concept to 'fair miles'. Options for expanding the food miles concept in ways that are equitable, enable trade, work with business, etc should be investigated within the government and corresponding research commissioned to support this.

5. Carry out a full social assessment of the UK consumption footprint for FFV in Africa as a pilot for examining the UK/EU/global footprint for other products. Research from this project indicates that over one million rural livelihoods are supported in some way through UK consumption of FFV. This static number needs to be better understood as do the keys for increasing this number and the risks inherent in upgrading or developing this trade. The participants and the sphere of supporting influence that they

provide needs to be identified, and the areas where targeted assistance will increase opportunities for providing sustainable benefits also need to be identified.

6. Further research to understand the actual drivers of aviation expansion on routes to developing countries, articularly into:

- The significance of FFV as a driver of more flights
- The relationship between passenger and freight flights
- The development benefits that 'cascade' from promoting and supporting initial FFV exports as a catalyst for export trades, upgrading and developing opportunities and as a driver for rural economic development.

7. Further research into sea transportation for FFV from Africa. Currently, there are indications that the technology is being piloted by the private sector for specific products on certain routes. The key issues that would need to be addressed here are:

- Development benefits of sea transportation – on the type of opportunities that an increase in sea transport would bring to developing countries. These might be higher prices, greater demand, access to more markets and market segments or provide the opposite.
- Environmental benefits – particularly on refrigeration and storage, which are missing from our calculations here.
- Economics of sea transportation for a range of FFV is required to inform business incentives and direct DFID and government policy.

8. Low-carbon economic development. DFID is investing in mitigation and adaptation worldwide and should consider:

- Assisting SSA FFV producers to demonstrate the low-energy and carbon intensity of their products – possibly by undertaking LCAs.
- Complementing DFID's strategy to promote pro-poor economic development with a holistic approach to economic development, that is both low carbon and has a low environmental impact
- Promoting those aspects of a low-carbon future that present current opportunities for developing countries – such as biofuels – and supporting sustainable pathways to managing the development of these opportunities (Dufey, 2006).

9. Establish a baseline for the full range of a country's ecological constraints. Environmental impacts are complex, interlinked and locally-specific. In order to generate useful government policy, a baseline of the full range of environmental impacts in a country is necessary. A country might be water-stressed and yet produce flowers for export. Local factors such as geography, malarial zones, and infrastructure need to be incorporated in this story, as do the trade-offs between water used for export and its alternative uses for agriculture, environmental benefits, etc.

10. Development of better private voluntary standards that work for environment and development. DFID should work with business and reputable research organisations to investigate the possibilities for a more cohesive offering from the UK on win-wins for sustainable development in Africa. DFID should also work with the global standards-setters on incorporating meaningful and practical options for achieving tangible and inclusive environmental and social goals.

5.2 Closer work with the private sector

IIED considers that close working alliances with the private sector are key to ensuring that future developments in the food procurement system are equitable and promote sustainable development. It is clear that the private sector responds to conspicuous incentives in the market and is likely to respond favourably to environmental policy interventions and future incentives mechanisms that promote equity, fairness and sustainable livelihoods in Africa.

The food retail sector has already responded to incentives to avoid climate change and reduce food miles, often through efficiency savings within their supply chains. Wal-Mart set out ambitious environmental targets for itself last year, which included improving the efficiency of Wal-Mart's fleet of more than 7,000 trucks by 25 per cent by 2008. Marks and Spencer uses a system that breaks down ISO14001 into different stages that suppliers need to meet. Sainsburys has a target of 90 per cent of domestically-sourced food. Safeway (now Morrisons) developed a system to reduce its food miles and energy consumption, including a switch from road to rail.

The food sector in the UK sees a business case for 'fairer food miles' for a range of reasons:

- The highest potential growth in markets is in developing countries
- Many UK supermarkets have invested considerable resources in securing stable supply chains for year-round produce from African producers
- Some UK supermarkets are expanding their operations in African countries and will be aiming to increasingly link up production and consumption across their empires
- Efficiency savings are key to streamlined supply chains and there is increasing interest in sea freight pilot studies
- There is evidence that high-value FFV are relatively price inelastic (at current price ranges) and turn decent profits. A significant proportion of these products are air-freighted from developing countries.
- Highest quality and low prices typify fresh food supplies from African countries which in turn mean large potential profit margins.
- Risks exist throughout the retailer product range. Other products are sourced internationally but current labelling laws dictate that labels of origin denote the 'last location of considerable processing'.

DFID must ensure its future policies and decisions are submitted to a low-carbon as well as a development test.

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