Background paper for the

Competitive Commercial Agriculture in Sub–Saharan Africa
(CCAA) Study

ALL-AFRICA REVIEW OF
EXPERIENCES WITH COMMERCIAL
AGRICULTURE

Environmental Impacts

Michael Stockbridge

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COMPETITIVE COMMERCIAL AGRICULTURE IN AFRICA: ENVIRONMENTAL IMPACTS

Michael Stockbridge

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1 SUSTAINABLE AGRICULTURAL INTENSIFICATION

This chapter summarises the findings of a literature review relating to the environmental impacts of commercial agriculture in Africa. As noted in the conclusion to the previous chapter, environmental change is an inevitable outcome of economic growth and development. Economic activity, such as commercial agricultural production, qualitatively transforms the physical environment within which it takes place – that is inevitable. The amount of harm it does to the environment depends upon technology and the value one attaches to different aspects of the environment. When assessing the environmental impact of commercial agriculture, one also needs to take account of the environmental effects of agriculture in the absence of commercialisation. For example, the localised damage caused by commercial agriculture may be warranted if the latter eliminates damage elsewhere by allowing agricultural output to be produced on a smaller area of land.

The environmental impact of cash crops and export crops in Sub-Saharan Africa needs to be understood in the context of wider environmental problems relating to agriculture, most of which stem from the unsustainable practices associated with the low-productivity subsistence agriculture practiced by smallholders and livestock producers.

As Reardon et al (1998) point out, the main environmental problems in rural Africa relate to population pressure on natural resources and include:

- soil erosion and loss of soil fertility as smallholders seek to intensify production by adding labour to existing agricultural land without corresponding increases in capital (chemical inputs, organic matter, equipment, land conservation infrastructure)
- loss of biodiversity and the damage of natural ecosystems as smallholders seek to extensify agriculture production by clearing forests and expanding into fragile ecosystems

It is estimated, for example, that the largest cause of deforestation in Africa are slash-and-burn farmers, followed by commercial farmers, loggers, livestock herders and refugees from civil disturbances, in that order (Roper 1999).

Poverty is the main cause of current patterns of environmental degradation in the rural parts of Sub-Saharan Africa. To escape from poverty the rural poor face two options. Either they must find remunerative livelihoods outside of agriculture, or they must adopt technologies that will allow them to intensify agriculture in a sustainable way. However, in much of rural Africa the prospects for both are often fairly limited.

According to Weight and Kelly (1999) the sustainable intensification of agriculture requires a combination of agro-ecological practices (eg no-till, cover crops, rotations, agroforestry) and increased use of chemical fertilisers. “[F]ertilizers are recommended as the primary nutrient input and organic materials are recommended as "amendments" to fertilizers. This recommendation is based on the fact that large quantities of organic material are required to deliver a nutrient load equivalent to fertilizers. Such large quantities are required due to the low concentrations of nutrients in organic matter. It is difficult for farmers to obtain such large quantities of organic materials due to competition from non-agricultural uses (fuel, fodder, construction, etc.). Also, there are declining rates of biological cover in SSA.” (Weight and Kelly, 1999, p.v)
Sustainable intensification is costly and is only viable if agriculture operates on a commercial footing thereby generating the revenues that are needed for investment in inputs. Whilst incomes generated by employment in the rural non-farm economy might help finance the necessary investment in inputs, the linkages between agriculture and the rural non-farm economy usually means that poor performance and low incomes in the former translates into equally poor performance and low incomes in the latter.


High value export crops clearly do have the potential to generate the cash needed for sustainable intensification, at least when grown in an appropriate agro-ecological environment with the support of efficient marketing institutions and other requisite agricultural services. This does not mean that it is export crops per se that are needed. Domestically consumed food crops could serve the same function if the farmgate price were high enough and predictable enough to warrant the investment in sustainable farm technologies. However, in much of sub-Saharan Africa this is not currently the case. Throughout much of Sub-Saharan Africa, sustainable intensification via food crops is financially unviable due to high domestic transport costs, poor marketing infrastructure and competition from cheap food imports. Indeed, it has been suggested that the most damaging environmental impact of export crops has been an indirect one – that by diverting land and resources, including public spending, away from food crops, excessive focus on export crops has forced subsistence smallholders to farm marginal land with little access to inputs, leading to soil erosion and declining soil fertility (Korvenoja 1993).

The remainder of this chapter summarises the main environmental impacts associated with specific commodities. Discussion of the general experience with these commodities worldwide draws heavily on Clay (2003). Experience in Sub-Saharan Africa also draws on Clay as well as on other literature where this is available.

2 FOOD STAPLES

The main environmental impact of staple food production in Sub-Saharan Africa – the loss of biodiversity and natural habitats and the erosion and degradation of soils – has already been discussed in the previous section. Assuming that rapid population growth and the associated growth in the demand for food are unavoidable, the lack of commercialisation in the production of food staples (rather than the presence of it) is perhaps the biggest threat to the environment in Sub-Saharan Africa at present. For example, in relation to maize production Clay suggests that, in terms of the soil erosion per kilo of output, commercially produced hybrid maize causes less soil erosion than low yielding seed varieties produced on highly erodible land for subsistence purposes.

The production of maize and other cereals has increased rapidly in Sub-Saharan in recent decades in response to the rapidly growing population (see chapter on food staples). However, almost all of the increase has occurred through expanding the cultivated area rather than through increasing yields. Because of this rapid expansion in the area under maize, the greatest impact of maize on natural habitats globally is to be found in Central and Southern Africa (Clay 2003).

Other staple food crops also create environmental problems. “In the Rift Valley of Eastern Africa….. land is increasingly being converted to crops such as sorghum, millet, and irrigated rice. These are now the most cultivated crops in Malawi. Habitat conversion for cultivation drastically changes the composition of the local flora and fauna. The farming activities of rural people throughout this region are destroying and fragmenting large areas of natural habitat. This is the most important conservation issue in the area and sorghum is right in the middle of it” (Clay 2003, p.439-440).
Sorghum, millet, and cassava are fairly drought resistant crops that can survive in dry regions where water is scarce and soils are relatively poor. Because of this they are often grown as a subsistence crop in some of the world’s poorest regions. Again, it is the lack of inputs and modern technologies that are causing the environmental problems. Fallow periods are being shortened and cultivation is spreading into increasingly marginal areas where soils are especially fragile and vulnerable to erosion. Cassava, for example, does not provide good ground cover and because little else will grow on the soils in which it has been planted, soil erosion is big problem that continues long after the plant has been harvested. Poor farmers do not have the capital to invest in fertiliser and soil conservation and the land onto which cassava production expands often has high biodiversity value.

Needless to say the intensification of production through the increased use of inorganic fertilisers and other agrochemicals can come with its own set of environmental problems. In Asia the intensification of rice production is linked to various environmental problems, many of which are caused by the technologies associated with the green revolution. For example, pesticides and synthetic fertilisers have greatly reduced the biodiversity in Asian rice paddies and polluted streams, rivers and groundwater as a result of runoff from the fields. Pesticides are argued to be one of the most environmentally damaging features of rice production (Witte et al. 1993). In addition to the damage they cause to ecological systems they are also harmful to the health of farmers and agricultural workers. 

Ironically, the overuse of synthetic fertilisers in irrigated rice production is also linked to the degradation of soil fertility. “[T]he repeated and increasing use of synthetic fertilizers also alters the microbial balance that converts organic matter and dissolved minerals in the soil into forms that the rice plant can use. Over time, the reliance of farmers on synthetic fertilizers tends to lead not only to a slow degradation of soil fertility but also to a reduced ability of the soil to absorb chemical inputs” (Clay 2003, p.398).

The environmental problems associated with excessive fertiliser use are found in many intensive farming systems. So too are the problems associated with irrigation that often accompanies intensive farming. The dams used to control and store water are notorious for the damage they do to natural habitats and biodiversity; the build up of silt behind them can prevent valuable nutrients from flowing downstream; and irrigation systems can lead to the salinization of cropland that reduces soil fertility and can ultimately lead to the abandonment of agricultural land. Irrigation places heavy demands on water resources and competes with alternative uses, such as domestic and industrial uses and its use by natural ecosystems. Poorly managed irrigation can lead to inefficient and wasteful use of scarce water resources.

Whilst the scenario described above clearly does not apply to much of Sub-Saharan agriculture, where the main environmental problems have more to do with a lack of irrigation and insufficient use of modern inputs, there clearly are lessons to be learn from other parts of the world about some of the particular environmental problems associated with agricultural intensification and how to avoid or minimise them. One should also not forget that by increasing the yields of staple food crops the green revolutions of the 20th century reduced the pressure to convert natural habitats into agricultural land. This inevitably came at some environmental cost, but arguably a lower one, than might have been borne if the green revolution had not taken place.

3 LIVESTOCK

The maintenance of livestock utilises about two thirds of the world’s agricultural land. “Globally, the largest environmental impact of agriculture in general is the use of land for pasture. More pasture is used for cattle than all other domesticated animals and crops combined. In addition, cattle… are one of the most significant contributors to water pollution, and are a major source of greenhouse gas emissions. … processing cattle into meat, meat by-products, and leather is a major source of pollution in many countries” (Clay 2003, p. 474).
The clearing of land to create pasture for livestock obviously has a major impact on natural habitats and biodiversity as much native flora and fauna eliminated in the process. The most important example of this can be found in the Amazon rainforests where huge areas of forest have been cleared to make way for cattle ranches. About 80% of the land cleared in the Brazilian Amazon is for cattle ranching – far less than for timber (Mertens et al 2002).

In Sub-Saharan Africa, the environmental impact of livestock production, like food crop production, is closely linked to poverty. Livestock often provide poor people with one of the few economic opportunities that they have, especially in environments where the soils are too poor for producing crops or where producers do not have the capital to invest in more sustainable production systems. Pastoralists operating under extensive grazing systems are amongst the poorest people in the world.

Damage to natural ecosystems caused by extensive livestock production usually occurs where growth in the human population increases the number of cattle being grazed on a given areas of land or causes migration onto ecologically more fragile pastures. The resultant overgrazing reduces natural vegetation and damages the soil structure, leading to soil erosion and reductions in biodiversity. This is especially problematic in hilly and mountainous areas. Soil erosion in watershed areas can also have negative effects downstream such as increased incidences of flooding and the siltation of waterways.

How damaging livestock in Sub-Saharan Africa are to the environment is an empirical question to which there are no simple answers. Some of the evidence is summarised in the box below.

<table>
<thead>
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<th>The environmental impact of livestock in Sub-Saharan Africa</th>
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| “The impact of livestock on the environment in Africa varies strongly according to amount of rainfall. In arid and semi-arid areas (less than 20 inches of rainfall per year), grazing and browsing of livestock can result in competition with wildlife seeking food and water but also may make habitats more attractive to other species. Migratory pastoralists affect biodiversity by collecting wood and building settlements. Still, the nutrient patches left behind in old livestock corrals may enhance wildlife habitat rather than degrade it. In areas of Africa that receive moderate rainfall (20 to 60 inches), livestock populations are moderate to high, and their impacts on the environment can be extensive, through grazing and by allowing farmers to plow more land. In the rainforests of Africa (more than 60 inches of annual rainfall), unlike South America, there are currently few livestock, and the disease constraints on production are strong. As a result, impacts are low (although this may change in the future).

The savannas of East Africa support the greatest diversity of migrating wildlife on Earth. Pastoralists, their livestock, and wildlife have coexisted on these savannas for three millennia. Recently, however, wildlife populations have declined rapidly in many areas outside of national parks and reserves, but this is only partly because of livestock activities. In eastern Uganda, wildlife has almost disappeared because of the influx of firearms during changes in government and the ensuing poaching. In northern Kenya, poaching has been rampant, but water development (for both livestock and people) is also a culprit. In Tanzania, the competition between wildlife and livestock is less intense because human population is low. Nonetheless, the spread of cultivation is excluding wildlife from certain areas.

High concentrations of livestock around settlements or water points can exclude wildlife from habitats and resources crucial for their survival. Severely denuded “sacrifice areas” around livestock watering points contain few plant species and thus few resources to support other fauna. In arid northern Kenya, wildlife avoid concentrations of people and livestock around watering points. The endangered Grevy's zebra is particularly affected. Mares and foals walk long distances between widely separated grazing areas and water sources because of competition with pastoral livestock herds. Wildlife populations are also smaller around occupied settlements, presumably because of competition with settlement holdings of livestock..
Interventions to increase livestock production, such as fences for disease control, can also affect biodiversity. In Botswana, disease-free cattle are crucial to the economic well-being of the cattle industry. To protect this important economic activity, the veterinary department constructed stout fences to prevent the spread of disease. Thousands of Kalahari wildebeest and hartebeest died during the drought of the early 1980s, partially because veterinary fences blocked their migration in search of water. On the other hand, these same fences can protect wildlife from the expansion of farmlands and from poachers.

New evidence shows that, contrary to expectations, pastoral settlement practices may enrich rather than deplete rangeland biodiversity. In southern Africa, patches of nutrient-rich acacia woodland can be found in the middle of nutrient-poor savanna. Wildlife prefer these patches, and scientists speculate that they used to be Tswana cattle corrals. In East Africa, pastoralists leave behind piles of nutrients from livestock when they move seasonally to find new pastures. These nutrient hot spots are visible on the landscape for decades and often provide ideal conditions for tree regeneration… In southern Kenya, wildlife and livestock prefer these old settlement sites because of the nutrient-rich grasses they foster. Settlements also open up woodland habitats so a wider range of species can use these landscapes. Old settlements probably also contribute to the diversity of plants, birds, and insects within the system.

The impact of livestock use on biodiversity in Africa is neither universally negative nor universally positive. In more intensively used areas (near water points, settlements, and fenced areas), livestock production can have strong negative impacts on a variety of species. The most pronounced impacts probably occur with expansion of agriculture into little-used forests and woodlands. In these instances, larger or more sensitive species will be most affected, and smaller or less fragile species will persist alongside people and their livestock."


4 HORTICULTURE

The environmental impact of export-orientated horticultural production has some parallels with the issues discussed earlier in relation to the intensification of the staple food sector. Increasing the intensity with which water, fertiliser and pesticides are applied may allow the land to yield higher volumes and/or higher value per hectare, but also comes with attendant environmental problems. As noted in the horticulture chapter, high value fresh produce requires intensive pest and disease control using hazardous agro-chemicals which can contaminate local ecosystems and can be very harmful to agricultural workers and consumers if not used carefully. It is concern for both workers and consumers that has increasingly put pressure on producers to apply strict environmental and ethical codes to their production processes. Much of this pressure has come from legislators and big retailers in importing countries.

The potential conflict between the export of highly profitable horticultural commodities and environmental conservation is clearly illustrated by the production of cut flowers on the shores of Lake Naivasha in Kenya where an internationally valued wetland ecosystem has come under threat (Becht et al 2006). Over exploitation of water resources by the flower growers has been held responsible for falling water levels, whilst a growing population on the lake shore (some of whom have been drawn there in search of employment) has led to deforestation, pollution, and pressure on wildlife as a result of fishing and hunting. However, since 2000 considerable effort has been devoted to achieving more sustainable management of resources, especially water. The process seems to have been relatively successful. It has been facilitated by effective cooperation between key stakeholders, notably those represented by two influential associations - a growers association and another longer established association representing ‘conservation’.
The Lake Naivasha example and Kenyan horticulture more generally demonstrate that there is always an environmental cost to commercial agricultural production, if one compares it with an alternative in which the land is left in its pristine state. However, in a country such as Kenya that is not really a realistic alternative. Subsistence agriculture is a more likely alternative, but, with increasing population densities, that can also cause serious environmental degradation. Indeed one should consider the possibility that commercial horticulture production might actually help to avert some environmental problems – either in the immediate vicinity of production or further afield – by offering employment and income generating opportunities to the rural poor who might otherwise be forced to mine natural resources in fragile ecosystems through subsistence farming, charcoal burning, livestock grazing, hunting and gathering etc. Horticultural production is a fairly labour intensive activity and although in Sub-Saharan Africa production is increasingly shifting from smallholder farms to estates, the sector’s contribution to employment creation and poverty reduction is, according to Humphrey et al (2004), a significant one – at least in relation to the Kenyan experience. It is possible, therefore, that there are indirect environmental benefits associated with export horticulture as well as costs. Comparing costs and benefits is a complex process that requires assumptions about realistic alternative land use options and the labour intensity of alternative technologies, as well as about the direct impact that different technologies have on the immediate environment.

5 TEA

Tea is a high value crop that thrives on acid upland soils that are poorly suited to other crops. In terms of its environmental impact tea has advantages over other crops grown in these zones, such as coffee or food crops. It is usually produced on terraces which combined with the ground cover provided by tea plants results in relatively good soil and water conservation. Although terracing is costly to construct, it is more affordable for high value cash crops such as tea than for lower value food crops. In Kenya terracing is mandatory for anyone wishing to obtain a license to produce tea, but it is less evident on land devoted to low value food crops (Ovuka 2000).

Tea plants are deep rooted crops which is why they provide good protection against soil erosion once tea is well established. However, when it is being planted or replanted the soil is vulnerable to erosion. A study of the effects of tea, rubber, and coconut plantations on soil erosion in Sri Lanka found that tea that is being replanted on steep slopes had the highest erosion rates, whereas well-established tea had relatively low erosion rates (UNESCAP 2002).

Tea production typically takes place in upland forest regions that are especially rich in biodiversity. Much of the land that is now planted with tea was once tropical forests. Indeed the main environmental impact of tea can be said to be the loss of biodiversity resulting from converting natural forests into tea plantations or smallholder tea plots (Clay 2003). This has occurred on quite a large scale in Kenya and Uganda in the past. In addition to the direct environmental impact of clearing natural habitats for tea production there are also the indirect effects arising from the development of tea in a given area. Jobs and income generating opportunities draw in new settlers with the attendant risks of encroachment into surrounding forests. As noted in the chapter on tea, concerns of this sort were expressed in relation to CDC’s investments in the East Usambaras, a fragile mountainous region of Tanzania. Although tea was not new to the area, the programme to rehabilitate and further develop tea production in the East Usambaras was viewed by environmentalists as a threat to what was considered an area of special ecological interest.

Another cause of deforestation in tea producing areas is the use of wood for drying the tea leaves. For example, in Kenya the tea factories of the KTDA have contributed to deforestation in some places in order to fuel this process. This is not however an inevitable outcome. Other fuels such as oil and gas can be used in the drying process and timber can be harvested more sustainably. In Uganda the Rwenzori Highlands Tea Company has made big efforts to develop fuel wood plantations rather than cutting down natural forests (see chapter on tea). In other respects tea processing activities do not cause major environmental problems and Sri Lanka tea processing has
been categorised as “low polluting” by Sri Lanka’s Central Environmental Authority (UNESCAP 2002).

As with other intensive forms of agriculture there are the usual environmental risks associated with excessive fertiliser and pesticide use. The main external input requirement is nitrogenous fertiliser, which needs to be applied in higher doses than for most other crops. This is because it is the nitrogen bearing leaves that are removed when harvesting tea. Pests and diseases, however, represent less of a threat to tea than to other commercial crops in Sub-Saharan and although tea productivity can benefit from the use of herbicides, it is not economically viable on smallholder plots (Carr 1993).

6 COTTON

The main environmental impact associated with cotton production is the exceptionally heavy use that is made of pesticides and water (Clay 2003). Although, as with most other crops, habitat conversion can be a significant feature of cotton production, the damage caused to the environment and human health by pesticides and the environmental stresses caused by irrigation are what stand out most in this sub-sector.

“Globally, cotton accounts for 11 percent of all pesticides used each year, even though the area of production is only 2.4 percent of the world’s arable land. With regard to the subset of insecticides, cotton producers use 25 percent of all insecticides used each year. In developing countries, estimates suggest that half of the total pesticides used on all crops are applied to cotton. Forty-six insecticides and acaricides (compounds used to control mites and ticks) compromise 90 percent of the total volume of all pesticides used on cotton. Five of these are classified as extremely hazardous, eight as highly hazardous, and twenty are moderately hazardous” (Clay 2003 p. 292 citing Soth 1999).

It is cotton’s susceptibility to large numbers of pests which accounts for the heavy use that is made of pesticides. Agricultural workers are at high risk from the toxic effects of spraying pesticides. Studies suggest that as many as 20,000 people die each year from pesticides used in the cotton sector and a further 3 million are poisoned (IISD/WWF 1997).

As noted in the chapter on cotton, levels of pesticide use in Sub-Saharan Africa have yet to reach the high levels observed in other parts of the world, although pesticide use and the associated health risks to workers is still very high compared to most other commodities. The chapter on cotton highlights a number of studies which draw attention to the high incidence of pesticide-related illness amongst cotton growers in Southern Africa (Maumbe and Swinton 2003; Horsley and Weisenfeld 2005). Often it is women that suffer the most as they are the ones that do much of the spraying.

Cotton production puts considerable pressure on water resources, not only in terms of the pollution created by pesticides, but also because of the water requirements of the crop itself. It is estimated that more than half of the world’s irrigated land is devoted to cotton production and that cotton uses more water than any other agricultural commodity, requiring 550 to 950 litres per square metre planted or 7,000 to 29,000 litres for each kilogram of cotton produced (Soth 1999). In many parts of the world salinisation caused by irrigated cotton production is a major environmental problem that degrades the soil and has led to the abandonment of large areas of agricultural land. According to one study of six major cotton-producing countries, between 12-36% of the irrigated area has been damaged by salinisation (Dinar 1998).

In Sub-Saharan Africa irrigation is much less developed than in other cotton producing regions and as a result the associated problems are less widespread. Nevertheless, experience elsewhere in the world points to the environmental risks associated with the expansion of irrigated cotton production. These and other environmental problems can be reduced by better management of water resources, by more cautious and discriminating use and handling of pesticides, and by the development and adoption of more disease resistant seed varieties. However, the environmental damage done by cotton production is not something that can be eliminated altogether.
7 TOBACCO

Two harmful effects stand out in relation to tobacco. The most obvious one is the harm it does to the health of consumers. Whilst tobacco consumption is falling in the rich countries, the market for tobacco in the developing world is growing and with it too the associated risks to human health.

On the production side, the most significant environmental impact relates to deforestation caused by the huge demand for wood used in drying and curing tobacco. It is estimated that tobacco production accounts for 5 percent of Africa’s total deforestation (Geist 1999), for 12 percent of deforestation in Southern Africa (Clay 2003) and for 20 percent of deforestation in Malawi (Geist 1999).

In southern Africa 200,000 hectares of forest are cut down each year for tobacco production. The majority of this (69%) is used as fuel, whilst the remainder (15%) is used for constructing barns and racks, including those used for air cured tobacco which does not require fuel. It is estimated that where wood is used as the fuel for curing tobacco, 19.9 cubic metres of it are used to cure one metric tonne of tobacco (Clay 2003).

In Malawi, Tanzania and Zimbabwe the deforestation caused by tobacco production is especially serious (Geist 1999) and is not only a threat to biodiversity, but also to the sustainable production of tobacco itself. Wood shortages as a result of deforestation in the main tobacco producing areas are threatening both the volume and quality of output. In Malawi, where the problem is probably greatest, the quality of tobacco is being affected by shortages of poles and thatch for proper construction of curing barns (Jaffee 2003).

In addition to the problems of deforestation there are the usual problems associated with the use of agrochemicals. Tobacco is prone to many pests and diseases, but inappropriate use of pesticides can be harmful to the health of both workers and the environment. “Tobacco is a demanding crop that depletes soil nutrients faster than many other crops. This is particularly problematic where soils are already characterised by low nutrient content. When tobacco is cultivated on the same land repeatedly with minimal rotation with other crops, there is a tendency for the soil to become exhausted and for crop pests to become endemic. This is why continuous tobacco cultivation requires ever increasing inputs of pesticides and chemical fertilisers.” (Clay 2003, p.361)

One of the constraints to promoting more sustainable tobacco production is the relatively small amount of research devoted to the subject. The lack of research can, according to Clay, be attributed to tobacco’s reputation as “a crop that ultimately kills its consumers”.

8 SUGAR

Due to the scale of production and associated land clearance in tropical forests and coastal wetland areas it is “quite likely that the production of sugarcane has caused a greater loss of biodiversity on the planet than any other single agricultural crop” (Clay 2003, p.166). Much of this loss occurred in the distant colonial past when islands and coastal areas in the tropics were first exploited for sugar production. In Sub-Saharan Africa sugar production has generally been developed more recently and much of it takes place away from coastal areas, in landlocked countries such as Zimbabwe, Malawi, Zambia and Swaziland (see sugar chapter), and in regions that are ecologically less vulnerable.

The impact of sugar on biodiversity in Sub-Saharan Africa depends upon where it has been grown¹. In Southern Africa, from Tanzania southwards, cane is grown as an irrigated crop in dry savannah

¹ African experience based on Geoff Tyler’s notes
and bushland areas that are used by commercial and smallholders for cattle grazing but are too dry for most food crops. Central and Southern Africa has enormous areas of the kind of land and there is no evidence to suggest that the sugar industry has caused any loss of biodiversity on a national or regional level. Sugar production in this region has taken advantage of the abundant year-round sunshine, which helps maximise yields, although this comes at the cost of low rainfall and the need for irrigation. The land cleared for sugar cane production would have helped to sustain the wildlife typical of these regions, however, the introduction of sugar would not have been a threat to species survival as there is usually plenty of other land to support the wildlife. The sugar industry in Swaziland, for example, is all based on land formerly used for cattle ranching and there are a number of wildlife reserves close to the Simunye sugar estate and factory.

In Kenya, Uganda and West Africa cane is normally grown as a rainfed crop in areas with higher rainfall than those used for sugar production in Southern Africa. The land occupied by sugar would therefore have been a bit richer in terms of fauna and flora, prior to conversion – but probably still savannah land rather than rainforest, as it must not be too rainy for sugar. By and large, these sugar growing regions are more densely populated than those in Southern Africa were prior to the introduction of sugar. As a consequence the competition for land is more likely to be between sugar and subsistence food crops rather than between sugar and virgin bush. Moreover, it is the production of subsistence food crops and not sugar that poses the greatest threat to natural habitats in these regions, as sugar production occupies just a small fraction of the area used for subsistence farming.

As far as other environmental impacts are concerned, sugar production poses all of the normal risks associated with intensive agriculture and some additional ones arising from factory processing. At the farm level the risks include soil erosion, unsafe and wasteful use of fertilisers and pesticides, as well as air pollution caused by the practice of burning cane prior to harvest. At the factory level there are challenges associated with the disposal of waste products, which in the case of sugar have a particularly high Biological Oxygen Demand (BOD). When this effluent finds its way into local water courses it can cause serious harm to fish and other wildlife, as well as being detrimental to people whose livelihoods depend on local ecosystems. Modern methods are available to keep control pollution from sugar production, but these are not always used, and there are occasional accidents, such as one in Thailand where a sugar factory waste-water storage dam burst, releasing huge volumes of high BOD waste into a river and killing off all the fish.

9 CASHEW

In comparison to other crops the production of cashew is environmentally fairly benign. It is usually grown by smallholders rather than on plantations and has not involved large scale habitat conversion of the sort associated with other commodities such as tea or sugar. Cashew also requires relatively few external inputs. In most production areas little use is made of pesticides; weed control is achieved by allowing livestock to graze beneath the trees rather than through the use of herbicides; and fertiliser use is limited to urea rock phosphate and muriate of potash during initial planting, with little if any fertiliser being applied in subsequent years (Clay 2003).

The establishment of cashew plantations and farms can, however, have a negative impact on the environment because of their tolerance of conditions which other agricultural crops find it hard to cope with, such as those found in the drier, more fragile, ecological zones. Cashew allows these areas to be cultivated when they might otherwise be left to nature. These areas include coastal areas of East Africa as well as interior areas of Southern Africa where cashew production has been established by smallholders (Clay 2003).

On the other hand cashew provides a nutritionally rich source of food for some wildlife and so in some areas its introduction may have environmental benefits as well as costs.
10 OILCROPS

The environmental impact associated with the production of oilcrops varies according to the type of oilcrop under consideration and the way it is produced. Clearing tropical forests to establish large monocrop plantations causes serious losses in biodiversity and natural habitat and throughout much of the world is the main environmental impact associated with palm oil.

“In Africa oil palm has been a subsistence crop for generations. As such it tends to be an agroforestry crop that is interplanted with other cash and subsistence crops. In most cases, this type of production does not have a large impact on biodiversity. More recently the establishment of vast monocrop oil palm plantations in Asia and Latin America, as well as in West Africa itself, threatens vast tracts of tropical forest with high conservation value” (Clay 2003, p. 218). As always when clearing forest to establish plantations the risk of soil erosion in the early stages of establishment is high.

The main use of pesticides in oil palm production is to control rats which come to feed on the oil palm seeds. The poisons used to eliminate the rats often kill other wildlife. However, integrated pest management can help control the rat population without the use of poisons. Relatively little use is made of other pesticides, and herbicides are mainly used whilst the plantation is being established. Fertiliser requirements are also relatively low compared to other crops.

As a leguminous plant with nitrogen fixing properties groundnuts are another oilseed crop that has relatively low requirements for artificial fertilisers. In Sub-Saharan Africa it is primarily a smallholder crop that provides resource-poor farmers with a cheap source of protein and a cheap source of soil fertility when grown in rotation with other crops. Compared with other crops its impact on the natural environment is relatively benign. However, it can be harmful to human and animal health when contaminated with aflatoxins produced by the Aspergillus flavus fungus that thrives in harvested peanuts due to poor drying and storage in warm, moist environments. Aflatoxin contamination is a major problem for peanut production in Sub-Saharan Africa.

11 CONCLUSION

This chapter has discussed some of the main environmental issues associated with different agricultural commodities in Sub-Saharan Africa. Some of these commodities – tea, sugar, cotton, and tobacco, for example – are grown almost exclusively for commercial purposes. Others are produced for both subsistence and commercial purposes. Whether commercialised production per se is more harmful to the environment than subsistence production is a complex question that depends upon the level of analysis. When assessing environmental impacts one needs to make the distinction between ‘before and after’ on the one hand and ‘with and without’, on the other. One needs to consider what would happen in areas of commercial production in the absence of commercial crops and the revenues and jobs provided by them.

For example, in more densely populated regions, such as the highlands of Kenya, one has to offset the damage done by commercialised production against the damage that might otherwise be done by subsistence farming. That said, when commercial crops are introduced into sparsely populated, undeveloped regions the associated development clearly does pose a risk to the local environment, especially when it is an ecological fragile one that is rich in biodiversity. Agriculturally driven development leads to improved infrastructure, such as roads and transport and new economic opportunities. These can lead to an influx of migrants which if not carefully planned for can exert considerable pressures on the local environment.

However, it is important not to look at the commercialisation of agricultural production in one location, in isolation from events in the wider economy. The use of resources, whether land, labour or capital, in one location can affect the use of resources elsewhere. Increasing the productivity and the value added on one piece of land can reduce pressure on land elsewhere, either in the immediate
locality or further afield. These effects are hard to measure or quantify, but need to be taken into account when assessing the overall impact of agricultural commercialisation in a particular country or region.

With respect to individual commodities it is important to understand the potential environmental impacts associated with them and ways of minimising them. When allocating public resources in support of individual commodities, a whole range of environmental and non-environmental factors need to be considered when making decisions about which commodities to prioritise and what sort of research and development programmes to finance. It has not been possible within the scope of this study to provide a detailed comparative analysis of the environmental factors relating to individual commodities and how they vary by location and technology, although it is hoped that a flavour of some of the most salient problems has been provided. A more thorough review of environmental impacts on a commodity by commodity basis and how they can be minimised can be found in Clay (2003).

Commercial agricultural production obviously does have environmental impacts, especially when natural habitats have to be cleared for production to take place. The artificial inputs used in commercial agricultural production can reduce soil biodiversity; they pollute waterways, often killing flora and fauna that live in them or depend upon them; and they pose a serious threat to human health if not used carefully. However, set against that, one needs to recognise that subsistence agriculture in the context of a rapidly growing population can lead to even faster destruction of natural habitats. Moreover, whilst pollution from fertilisers and agrochemicals is not a problem in subsistence agriculture, the depletion of soil fertility is, and so, too, is the damage to human health caused by malnutrition and poverty, both which are endemic amongst populations that depend upon subsistence agriculture.

**BIBLIOGRAHY AND REFERENCES**


