Integrated Assessment of Trade-Related Policies and Biological Diversity in the Agricultural Sector in Uganda

The potential impacts of the EU-ACP Economic Partnership Agreement: A case study in the horticulture sector

Summary

1 Introduction

The integrated assessment (IA) in Uganda focused on the horticulture sector, which includes fresh fruits and vegetables (FFV), as well as cut flowers. It examined the impact of the sector's trade-related developments on indicators of sustainability and, in particular, on biodiversity. Both FFV and cut flowers are non-traditional exports from Uganda. Farmers traditionally sold their produce to local markets. However, during the late 1980s, horticultural production in Uganda intensified and farmers began to target export markets. This diversification was a result of the economic strategies implemented by the Government of Uganda. These strategies resulted in structural changes in Uganda's export sector and the emergence and growth of non-traditional exports such as fish/fish products, floriculture, horticulture, spices, hides and skins, and honey. The non-traditional exports have grown to become more important than traditional exports such as coffee, cotton, tobacco and tea. By virtue of its membership in the Africa, Caribbean and Pacific (ACP) group of countries, traditional trade preferences with the European Union (EU) have allowed Uganda to successfully exploit markets in Europe, in particular.

The contribution of non-traditional exports (dominated by agricultural products) to the country's export earnings increased from 14 per cent in 1990 to over 62 per cent in 2005. Horticulture is one of the fastest growing sectors in Uganda and it employs a large number of people. It is listed as one of Uganda's strategic exports in the Uganda Strategic Exports Programme. Horticulture exports are worth US$35 million per year. The monetary value of FFV and cut flowers has been increasing steadily since 2003

These subsectors of the horticulture industry have significant linkages with the country's biodiversity resources, both directly through the volume of commodity exports and indirectly through changes in land use, water and energy use and the application of agrochemicals. Increasing production for export could also have impacts on agro-biodiversity and the protection of genetic material for future generations.

2 The context of the integrated assessment

2.1 Biodiversity in Uganda

Uganda is located in the zone where the East African savannah and the West African rain forests overlap. The country has a wealth of natural ecosystems and one of the highest levels of biodiversity in Africa. Over half of the continent's bird species live in Uganda. The country is Africa's second most diverse in terms of mammals, after the Democratic Republic of Congo; it

ranks ninth in the world in terms of numbers of mammal species. It is also rich in aquatic resources.

It is estimated that biodiversity loss in Uganda generally occurs at a rate of around one per cent per year. Loss of biodiversity is often associated with changes in land use. Limited assessments of specific agro-ecosystems suggest that biodiversity is being lost at a rate as high as 50 per cent per decade.

In Uganda, over 80 per cent of the population relies on the country's natural resource base, including biodiversity, for their livelihood. As the human population continues to grow (estimated at 28 million in 2009), these resources are being lost at an alarming rate. In 2006, it was estimated that Uganda lost 72 000 hectares of forest. Between 2005 and 2006, encroachments on forest reserves increased from 180 000 to 220 000 (an increase of approximately 22 per cent). Loss of forests and habitats lead to increased rates of biodiversity loss and has both economic and social consequences. Communities that depend on the forests lose their livelihoods. The loss of forests and habitats also leads to the loss of environmental services, such as the ability of forests to sequester carbon (one hectare of forest is estimated to absorb about 550 tonnes of carbon dioxide.)

The need to conserve biodiversity is articulated in Uganda's constitution and national legislation, as well as through international commitments under the UN Convention on Biological Diversity. Uganda has made considerable efforts to conserve biodiversity *in situ* through the establishment of protected areas, such as national parks, wildlife reserves, forest reserves and wetlands. The country has also begun to track the genetic base of populations of both wild and domestic species.

However, little attention has been paid to the influence of trade on biodiversity, in general, and on agro-biodiversity, in particular. Increasing trade in agricultural products is likely to have an impact on biodiversity outside protected areas, especially in agro-ecosystems. Agro-biodiversity is essential to satisfy basic human needs for food and livelihood security. Loss of agro-biodiversity would therefore have impact on people's livelihoods and the environment due to loss of associated ecosystem services. These services include the diverse range of organisms in agricultural production systems that contribute to nutrient recycling, pollination, pest and disease regulations, erosion control, maintenance of hydrological cycle, maintenance and enhancement of local wildlife and habitat in their landscape as well as climate regulation and carbon sequestration.

2.2 The horticulture sector in Uganda

Uganda is currently the second largest producer of FFV in sub-Saharan Africa, producing around 1.1 million tonnes per year. In 2004, this amounted to approximately one per cent of global production. Over 40 per cent of production is still undertaken by smallholders, suggesting there is room for the sector to increase production and aggressively target commercial markets overseas. Most of Uganda's FFVs are exported to the EU, in particular to Belgium and the Netherlands. Uganda is a long distance from the EU market and its export volumes are too low

for it to benefit from economies of scale. Despite the costs of shipping, organic agriculture has grown in value from US$7.7 million in 2005 to US$22.5 million in 2008.

Because of the price premiums offered by organic agriculture the sector presents good prospects for future growth. Between 2004 and 2007, the country's exports of organic agricultural goods grew by an average annual rate of 67 per cent. Uganda has Africa's highest number of smallholder farmers (206 803) engaged in organic agriculture and a relatively high level of its farm land area under organic cultivation (88 439 hectares or 0.71 per cent of farm land). Neighbouring countries rank much lower in terms of farm land being used for organic production: Kenya (3 307 hectares), Ethiopia (2 601 hectares) and Tanzania (23 732 hectares).

As much as 95 per cent of the flowers grown in Uganda are exported, primarily to the EU. In the sector, 70 per cent of the flowers grown in Uganda are the small-headed varieties of roses that are high yielding and well suited to the country's climate. The price they command in export markets, however, is lower than the price for so-called large-headed roses.

Overall, Uganda's horticulture sector is challenged by the long distance to markets, poor infrastructure and a general lack of access to credit. The country's agricultural exports remain competitive because of the favourable growing climate and abundance of low-cost labour. In addition, they benefit from trade preferences and a stable market provided by the EU. For exports to increase, access to markets must be improved. Investment is also necessary to upgrade equipment and infrastructure. Ugandan farmers require improved cold-chain handling, transport and storage facilities in order to keep up with European demand in terms of both quality and quantity.

Environmental stewardship and the conservation of biodiversity are critical to ensure sustainable production and trade in horticultural products. An environment that is degraded is compromised in its ability to provide the necessary supports and raw materials for future horticultural production.

2.3 Trade-related policy: the Economic Partnership Agreement

Uganda is a member of several trading arrangements: the World Trade Organisation (WTO), the East Africa Community (EAC) and the Common Market for East and Southern Africa (COMESA). Uganda is also a member of the ACP group of countries. As such, its trading relations with the EU have been governed by successive Lomé Conventions, which granted ACP countries non-reciprocal trade preferences in the European market. The EU is Uganda's second most important market and accounts for 24.3 per cent of exports. COMESA member countries, which are Uganda's largest export market, account for 37 per cent of exports.

In 2000, the Lomé Convention (IV) was replaced by the Cotonou Agreement. This set the stage for the eventual removal of these preferences which are incompatible with the WTO. The new trading relationship between the EU and ACP countries is to be governed by reciprocal, non-discriminatory Economic Partnership Agreements (EPA) that affect trade in most products.

Since 2000, EU and ACP stakeholders have been discussing EPA provisions and in November 2007, Uganda signed an interim EPA with the EU. During the discussions, much concern was expressed about the potential impact of the EPA on the environment and natural resources, including biodiversity resources.

3 The integrated assessment

The IA was designed to provide insight into the potential social, economic environmental impacts of the EPA on Uganda's horticulture sector, looking specifically at impacts on biodiversity. For this, the IA examined potential scenarios describing Uganda's export-oriented production of FFV and cut flowers. This was done to highlight the linkages between trade, national strategies and biodiversity, and to provide a basis for incorporating principles of sustainable development into decision making processes.

The fundamental links between agriculture and biodiversity are complex and diverse. Agricultural production depends on rich and diverse ecosystems, and production activities have direct effects on biodiversity. To increase output, farmers must put more land into production and/or intensify production processes (such as through monoculture or agrochemical use). Changing patterns of trade-related activity that affect trends in the level of production and production processes can have an impact on biodiversity in several ways. It can threaten biodiversity through habitat destruction, pollution and increased pressure on resources, including water and energy. It can encourage the introduction of invasive alien species, monoculture production and the commercialisation of genetic resources.

3.1 The process

The government agency responsible for coordinating and supervising the project was the National Environment Management Authority (NEMA), which is the principal government agency for the management of the environment mandated to coordinate, supervise and monitor all activities in the field of environment. The Uganda's Economic Policy Research Centre (EPRC) implemented the project on behalf of Government of Uganda. Several stakeholders were identified as being vital to the success of the project. These included a wide range of government ministries and departments, research institutions, non-governmental organisations (NGOs), civil society, policy advocates, and business representatives from the private sector.

The country core project team included technical officers from NEMA, the private sector, the Ministry of Tourism, Trade and Industry (MTTI), and EPRC. The Project Steering Committee (PSC) was established in April 2007 to oversee and guide the implementation of the project. The PSC was composed of 15 representatives from several government departments, universities, and included representatives from the private sector and from NGOs.

The project was launched at a workshop on 29 May 2007. The stakeholders involved in the launch of the project included members of the PSC, government representatives, and representatives of research institutes, NGOs, the Technical Committee on Biodiversity, development partners, and representatives from the private sector and from the media.

A Capacity Building Workshop followed the launch, on 30-31 May 2007, to create an understanding about the project among the stakeholders that would be consulted during the national review workshops. Key issues identified for consideration in the IA at the workshop were land for the horticulture and flower sectors, pollution and loss of ecosystem services, market access, use of chemicals, health and well-being of workers, stakeholders likely to be negatively impacted by the horticulture and floriculture sectors, livelihood improvement, and food security. Several additional meetings were held during the course of the project including four PSC meetings and three national stakeholder consultations. Further, the core project team attended three International Review Meetings, which were organized by UNEP and held in Geneva.

3.2 Methodology

The IA methodology employed a four-stage process. First, it identified relevant economic, social and environmental issues associated with the sector in order to guide the development of indicators. Second, it determined a baseline. Third, it developed scenarios and policy options to be assessed. And finally, it analyzed the situation and made policy recommendations. Data for the IA was collected through stakeholder consultations and interviews, as well as reviews of existing literature and references. Key issues identified by the research include: land requirements for FFV and cut flower production, pollution and loss of ecosystem services, market access, the use of agrochemicals, worker health and welfare, 'livelihood' issues and food security. Table 1 presents the key indicators identified in the IA relating to agro-biodiversity and trade.

Table 1: Indicators and framework for the IA

Economic indicators (in US dollars)	**Environmental indicators**	**Biodiversity indicators**	**Social indicators**
Imports from EU	Area under flowers (ha)	Rate of biodiversity loss	Number of employees
Exports to EU	Area under vegetables (ha)	Number of indigenous crops traded	Number of female employees
Trade balance with EU	Water litres/tonne of flowers exported (million cubic metres)	Area of land used (ha)	Occupational health
Value of exported flowers	Megawatts of energy used	Fertilizer usage (tonnes)	Average annual wage in US$
Value of exported fruits and vegetable	Agrochemicals used (tonnes/year)		

The IA examined three different future scenarios for trade in Uganda's horticulture sector.

1. ***Business as usual.*** This scenario represents the *status quo*. It is based on an assumption that, with or without an EPA, both the rate of growth in the horticulture sector and the rate of growth in exports of horticultural goods will not change. Under this scenario, the value of flower exports would rise at a rate of 1.6 per cent per year and the volume would decline by one per cent per year. The value of exports of FFV would decline at a rate of 1.2 per cent per year while the volume would rise at a rate of 7.3 per cent per year.

2. ***Leading edge.*** This scenario represents a growth rate for trade in horticultural goods with the EU of 20.6 per cent between 2009 and 2025. It is based on the assumption that, under the EPA, Uganda will increase its trade with the EU by becoming as competitive as other countries in the region, such as Kenya and Ethiopia.

3. ***Matching the best.*** This scenario uses growth rates in exports to the EU of 28.3 per cent for FFV and 19.7 per cent for cut flowers. In the immediate future, it assumes trade policy in the horticulture sector will allow Uganda to match its best annual export performance to the EU during the past five years (as measured by rate of growth). For FFV, peak performance was achieved in 2006-2007 when Uganda's exports grew at a rate of 28.3 per cent in value and 43 per cent in volume. For cut flowers, peak performance was achieved in 2003-2004 when exports grew at a rate of 19.7 per cent in value and eight per cent in volume.

The scenarios were analyzed using a simplified regression model (covering the period from 2009 to 2025) and a root-cause analysis with a simple framework to identify the underlying reasons for economic, environmental, social and institutional problems, as well as their associated actors and opportunities. Data limitations prevented the use of a robust cost-benefit analysis. For each scenario, the projected change in land use became the starting point for considering specific environmental and biodiversity impacts. The relative intensity of land use was seen as the most important factor having subsequent impacts on environmental resources, and particularly biodiversity.

3.3 Findings

The IA showed that both the *leading edge* and *matching the best* scenarios offer a realistic opportunity for expansion in Uganda's horticulture sector. Findings varied between cut flowers and FFV. Based on the analysis, cautious growth was recommended for the former and aggressive growth for the latter.

3.3.1 Fresh fruits and vegetables

Economic impacts. The IA suggests that there is a potential for high levels of growth in the FFV sector. The *matching the best* scenario projected high rates of growth in the volume of exports. The *leading the best* scenario estimated relatively low levels of growth for both the volume and value of exports. Here figures amounted to roughly one-third of what was projected in the *matching the best* scenario. Under the *business as usual* scenario, the exports of FFV would decline.

With regard to the EU market, the greatest expansion observed for FFV was achieved by moving to more sustainable organic production. Organic production was projected to rise by 5 per cent, 10 per cent, and 20 per cent under the *business as usual*, *leading edge*, and *matching the best* scenarios, respectively. These levels are much closer to the growth projected under the *leading edge* scenario. The analysis suggests that while the *matching the best* scenario represented an optimistic set of objectives, the *leading edge* scenario might be more readily achievable, and deliver comparable benefits.

Environmental impacts. Projected growth in volume and value of FFV under the *matching the best* scenario is likely to come with a large expansion in land area under production. The *matching the best* scenario projected that land under commercial production would increase by five-fold between 2009 and 2025. By 2025, it is estimated that four million hectares would be under cultivation for FFV. Uganda has a relatively large production base for its FFV and the high levels of growth in volume projected in the *matching the best scenario* could be met without the addition of a large amount of new inputs.

The conversion of large areas of land to the commercial cultivation of FFV, as envisioned under the *matching the best* scenario, would increase the likelihood that the affected communities would abandon current production patterns, including crop rotation cycles, for more commercially oriented approaches. Trade with the EU currently focuses on specific kinds of FFV that are commercially viable, including beans, peas, onions, okra, cabbage, carrots and tomatoes. Increased trade could lead to further specialisation in a narrow set of agricultural products, which would lead to a loss of crop biodiversity in Uganda. A stronger focus on commercially viable produce for export could also distort otherwise stable farming systems, which rely on a wide variety of FFV, including local varieties and cash crops. The commercialization of small farms could also disrupt crop rotation cycles, which encourage recycling of soil nutrients between fibrous and tap-rooted crop systems and nitrogen fixing crops and disrupt pest cycles in traditional farming systems. This means that beyond the loss of biodiversity, soil nutrient cycles, and ultimately food security, would be threatened.

The *leading edge* scenario projected a 50-fold increase in land area under commercial production (from 8 000 hectares to over 550 000 hectares) and a 20-fold increase in water consumption associated with commercial production. The IA suggests that this scenario is more readily achievable in terms of investment than the other scenarios, as it offers the prospect of improved economic performance in a sector with a large number of participants.

The IA also suggests that investment in the FFV subsector would benefit from a greater focus on the higher value market. The subsector is limited by low levels of production. Two plausible growth paths exist. The *matching the best* scenario, driven by higher prices and increased productivity, would lead to a more sustainable environment and improved biodiversity resources. The *leading edge* scenario is based on increased productivity. The levels of growth in FFV that are reflected in the *matching the best* and *leading edge* scenarios are likely to come from exports of organic agriculture.

Social impacts. There was limited data available to undertake a comprehensive analysis of the social impacts of the three scenarios in the FFV subsector. The authors made the assumption that results would be similar to those in the flower subsector, which projected a large increase in employment and aggregate wages under the *leading edge* scenario, a smaller increase under the *matching the best scenario*, and a significant decline under the *business as usual* scenario.

The IA did make note of the fact that the resource poor and rural population in Uganda, and even middle-income consumers, often find it difficult to purchase exotic vegetables from local markets because of their high price and rely instead on traditional vegetables to accompany the staple foods (such as maize, cassava, sweet potatoes, bananas, millet, sorghum and yams). The

local market for FFV is therefore relatively undeveloped, which suggests that it might be a challenge to access the investment necessary to pursue quality improvements.

3.3.2 Cut flowers

Economic impacts. The analysis of the three scenarios showed considerable increases in both the volume and value of exports of cut flowers under the *leading edge* and *matching the best* scenarios and a decline in growth under the *business as usual* scenario. The *leading edge* scenario projected the highest rates of growth: an annual increase of 20.6 per cent in both by value and volume of exports. The *matching the best* scenario projected an annual growth rate of 19.7 per cent in the value and 8 per cent in the volume of exports.

The *matching the best* scenario was based on sustained increases in price and projected growth in value at a higher rate than growth in volume. A higher rate of growth in value could only be achieved if cut flower prices continue to increase over the 17-year period used in the model. This is unlikely. The viability of the scenario was also premised on an increase in the production and sale of higher-value, large-headed flowers. Uganda's flower industry could benefit from a greater focus on higher-value products but the market for such flowers must first be developed. The *matching the best* scenario is attractive because it offers the lowest levels of distortion in terms of additional cost factors, such as investment, land use and resources, compared to export earnings.

The *leading edge* scenario provided a more realistic future scenario for growth in the cut flower subsector. Its projections were based on growth in volume through the intensification and/or extensification of flower production. The *leading edge* scenario would require considerably more land to be put under production than other options such as the *matching the best* scenario. The *leading edge* scenario also presumed that, under the EPA, Ugandan subsector would become competitive with producers in Kenya and Ethiopia.

Environmental impacts. The starting point for considering specific environmental and biodiversity impacts was the projected change in each scenario in terms of land use, which leads to subsequent impacts on other environmental resources, particularly biodiversity. At present, the cut flower industry is relatively resource intensive with respect to land, energy, water and agrochemical use. Rose farms consume up to 50 000 litres of water per hectare per day. In Uganda, a 180-hectare flower farm uses about 9 million cubic metres of water per hectare per day.

The *business as usual* scenario projected a three-fold increase in the amount of land under cultivation (from 180 hectares to 600 hectares) between 2009 and 2025, with the use of fertilizers, water, and the consumption of electricity increasing by similar proportions. The *leading edge* scenario projected a 25-fold increase in land under production (from 180 hectares to just under 4 500 hectares) and proportional increases in fertiliser and energy use. Fertilizer use was projected to rise from less than one tonne per day to nearly 20 tonnes per day, and electricity use would increase from around 17 MWH to over 300 MWH, between 2009 and 2025. The IA suggests that the increased value of exports under this scenario is expected to outweigh the increase in costs associated with an increase in inputs. In the *matching the best* scenario, land

under production is expected to expand four-fold and electricity and fertiliser use are expected to increase three-fold.

Social impacts. The flower industry currently employs over 6 000 people of which 85 per cent are women, mainly working in unskilled and clerical positions. Roughly 90 per cent of the employees rely entirely on their jobs working on rose farms, with no supplementary income. Wage levels are relatively low. Manual porters earn US$2 per day (US$528 per year based on 264 days) while low-level supervisors earn around US$1 000 per year. Most spending is directed towards housing, food and education. Women earn the bulk of the wage bill in the rose industry, but are paid less than men because their work is confined to unskilled tasks. This means that some of the resources gained from the wage bill could be earmarked to increase the pay of the workers in the sector and provide resources for safety equipment, rather than to hire more workers and pay them poorly.

The analysis of the three scenarios with respect to employment and wages showed that the *leading edge* scenario projected a 20-fold increase in employment and aggregate wages while the *matching the best* scenario projected a three-fold increase. The *business as usual* scenario projected a 15-fold decline in aggregate wages and employment. These results point to the need for an aggressive growth strategy to maximize social benefits. Maintaining the *status quo* in the flower industry is likely to lead to a reduction in the performance on social indicators. The advantage gained from growth within the sector is the increased benefits of expansion of the corporate flower industry, which would enable flower entrepreneurs to invest more in their human resources.

The IA also raised concerns about impacts of trade liberalization on occupational health and safety issues. Several of the flower companies visited showed a high level of concern for the health and safety of their workers, particularly with respect to the use of chemicals and pesticides. Most chemicals used on the farms are hazardous and several measures are typically in place to avoid accidents. However, performance assessments undertaken by the Ministry of Labour Gender and Social Development indicated that while many flower producers have codes of practice, implementing the codes has proved to be a challenge.

3.4 Conclusions

The economic analysis under the IA indicates that even from its most recent economic or trade performance, as under the *matching the best* scenario, Uganda has been competitive enough to make substantial gains in terms of trade with the EU. The *leading edge* scenario, on the other hand, would put Uganda in a strongly competitive position as it begins to compete for the EU market with other EAC, COMESA and ACP countries. From a social perspective, the *leading edge* scenario would lead to a faster increase in employment opportunities and wages. However, in terms of poverty reduction and expansion of Uganda's export revenues over the long term, and taking into account economic, trade, and environmental factors raised in the scenarios, the country would maximize gains if the *matching the best* scenario were to be adopted. While volumes in the flower sector are limited by the size of the market, there is a considerable opportunity to expand in the FFV industry.

Stress on the environment and biodiversity are likely to come about as a result of increased intensification in both the FFV and the flower industries, which will require the use of additional inputs (water, energy, fertilizer and land). For water use, the analysis suggests that increased productivity will be achieved under the *leading edge* or *matching the best* scenarios. For the commercial estates, the concerns are associated with the sustainability of volumes of abstraction, which also has a social element in that it affects the water quantity or quality available for local communities. There will be a need to establish whether an ecosystem service is being protected by one group or another and whether the group should be compensated. There is also a need to ensure that the ecosystem service continues to be provided sustainably, and if this is not the case, to see if an alternative can be provided. One of the alternatives is considering the efficiency of the production technology and promoting technologies that encourage the efficient use of water (such as treatment, recycling or re-use).

Electricity use is likely to expand under all of the scenarios. The direct proportionality of production and electricity use can be countered with more efficient technology. The more intensive systems, such as those proposed in the *leading edge* or *matching the best* scenarios could use bio-fuels as an alternative fuel source. However, bio-fuel use (as well as the increased use of heavy fuel generators for electricity) poses significant concerns for the environment and bio-fuels would compete for land area with food crops as well as the horticultural export crops.

The concerns over land use encompass all the other environmental threats. Yet, there are specific land-use concerns raised in the *matching the best* scenario, such as transformation of other ecosystems. For sustainability to be realized the preferred scenario should not lead to conversion of other ecosystem into horticulture farmland. On the other hand, where opportunities exists to restore degraded fields, the *matching the best* scenario provides an opportunity to enhance degraded arable lands, particularly in the driest areas of the country. Alternatives should be identified where expansion threatens forest, wetland, and grassland ecosystems.

For FFV, the IA suggests that the preferred scenario for the future is the *leading edge* scenario since it proposes a realistic growth path where rates of growth can consistently be achieved. In addition, sustainable markets (especially organic horticulture) offer the best opportunity for accessing the EU market. From a social perspective, the smallholder FFV production systems could lead to improved welfare effects. However, the IA also points out several requirements for institutional changes, particularly administrative changes to the National Trade Policy in the post-EPA period. Of the three scenarios discussed, the IA suggests that expansion under the *leading edge* and the *matching the best* scenarios will only be possible if opportunities presented by organic agriculture are explored.

The optimal path for future trade policy in the FFV subsector would be to pursue policies consistent with previous best performances that promote an aggressive growth strategy. Uganda is one of the world's leading producers of FFV and already has a competitive edge in organic agriculture production, which offers substantial market premiums. Uganda has the largest number of smallholder farmers engaged in organic agriculture and the second largest area of estate land under organic agriculture. Increasing land area under organic production will enhance biodiversity benefits. There may also be an opportunity to establish a system of payments for ecosystem services (especially for watersheds) where the rights of resource users can be

determined. A comprehensive organic agriculture policy should also be developed and supported by legislative and administrative structures.

In the flower industry, the findings indicate that a strategy for growth is necessary to maximise the economic and social benefits of the cut flower subsector. The *matching the best* scenario offers the least distortion in terms of additional investment, increased land area, and increased use of resources, relative to export earnings. Investment directed toward the flower industry would benefit from a greater focus on higher-value products. However, the IA suggests that future trade policy should take a cautious approach to growth in the flower industry. Aggressive growth would require high levels of external inputs, which are expensive and are likely to threaten the environment and have negative impacts on biodiversity. Such growth would lead to excessive water abstraction, and competition for wetlands as both a source of water and as a natural means of treating effluents. This would lead to loss of wetland biodiversity. Many communities near flower farms are also engaged in agriculture and the potential loss of pollinators is significant. There are additional concerns over pollution of fresh water systems. Moreover, the IA suggests a cautious approach because the potential for mitigation of harmful inputs is low as few sustainable inputs are available for substitution.

3.5 Challenges

Several institutional concerns limit opportunities for growth in horticulture exports. These include: costly certifications, limited market access, lack of exporter and producer associations, supply side constraints, lack of a well-developed local market and information gaps. Many FFV exporters are not certified in order to comply with EU market standards because they cannot afford the certification fees. Developing a domestic certification (UGANDAGAP) equivalent to the EU standard (EUROGAP) could help address this challenge.

There are additional challenges facing exporters of FFV to the EU. Several traders operate without formal contracts with buyers. Most exporters of FFV produce on a small scale and have difficulties increasing volume to meet market demands. The domestic market for FFV and cut flowers is poorly developed and offers a limited fallback position for exporters. When producers and exporters invest in produce handling systems, such as cold-chain storage, they must ensure that their operating costs can be covered by market prices for exports.

4 Policy recommendations

The projections related to economic growth and trade in the horticulture sector will have an impact on the environment and biodiversity in different ways, with land use being the most significant among them. More trade will likely lead to an increase in the use of agrochemicals. Increased trade in horticultural exports may force smallholders and subsistence farmers to convert their land into commercial horticulture production units. The effects might include: i) an increase in pollution of water systems and health concerns among farm workers, ii) the risk of food insecurity (if farmers stop growing staple food crops), iii) the conversion of fragile ecosystems (such as wetlands, lakeshores or riverbanks) into agricultural land, and iv) loss of local species and genetic diversity. Large-scale conversion of land and loss of biomass will lead

to increased greenhouse gas emissions. Trade could also accelerate the introduction of alien species and genetically modified organisms.

From a social perspective, concerns include the occupational health of workers, the equitability of wages and other gender-related issues and the potential loss of property rights. An equitable social strategy for the future of the horticulture sector should increase educational opportunities for farmers and employment opportunities, especially for women. The strategy should also ensure equitable income levels, rationalise rural-urban migration, integrate different social groups and promote sustainable production.

The findings of the IA can help Uganda plan a strategy for trade and development in the context of the EPA, which exploits opportunities for higher revenues that could be achieved by adopting more sustainable production techniques. Such techniques would help to secure lasting economic, environmental and social benefits and avoid biodiversity loss. The recommendations in the IA address some of the challenges facing the horticulture sector and promote the move towards sustainable production practices. They are directed at the Government of Uganda, the private sector and the European Union.

Recommendations for the Government of Uganda

1. Under the auspices of the EPA, pursue an aggressive trade expansion policy with the EU.

2. Address issues affecting low productivity; increase levels of production by improving research, innovation and technology development and transfers, as well as easing access to capital.

3. Integrate a synthesis of the linkages between biodiversity and trade into the operations of government in areas such as agriculture, energy, lands, the environment and natural resources and other relevant sectors.

4. Undertake capacity building for the valuation and monitoring of trade-related impacts on the economy, the environment, ecosystem services and social welfare.

5. Conduct research to quantify the costs and benefits of certification, as well as the effects of pollution on ecosystem services and biodiversity components, especially species and habitats. This effort should include a study on the potential impact of the flower subsector on pollinators.

Recommendations for private sector

1. Encourage all producers (smallholders and large operators) to promote the export of horticultural goods. This might include better training, institutionalizing operations (by forming cooperatives or incorporating companies), offering trade concessions and improving access to inputs, capital and information.

2. Companies exporting horticultural goods should practise social responsibility in the communities where they operate and invest in the restoration and maintenance of the ecosystems that sustain their operations.

3. The horticulture industry should use technologies that ensure the efficient use of resources, such as water, energy, fertilizers and land, and that encourage environmental conservation.

Recommendations for the EU

1. Support capacity building to monitor the impacts of climate change on biodiversity and implement activities to mitigate any adverse impacts on it, through technical and financial assistance. Climate change is but one of several factors that is likely to exacerbate the loss of biodiversity, increase the risk of floods and droughts, reduce the reliability of hydropower and biomass production and affect agricultural productivity and land use.

2. The EU and other trading partners (which operate under the WTO umbrella) should recognise and support efforts by Ugandan farmers and other actors to conserve the integrity of the country's biodiversity. The EU and other trading partners should support Uganda's efforts to develop policies to conserve biodiversity and protect intellectual property rights.

3. Support the Government of Uganda in its efforts to develop and increase trade with the EU by investing in infrastructure, research, technology and human resources in those sectors, such as agriculture, that make positive contributions to the country's trade balance.

4. Support a valuation of Uganda's ecosystems and biodiversity resources, to inform future policy and investment decisions.