

Responsible Alternative Fibers: Assessment Methodology 2014



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RESPONSIBLE ALTERNATIVE FIBERS: ASSESSMENT METHODOLOGY (RAFAM)

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INTRODUCTION

The Responsible Alternative Fibers Assessment Methodology (RAFAM) is a tool designed by World Wildlife Fund (WWF) to assess the major environmental and social issues associated with production of unconventional plants grown as feedstock for pulp and paper applications. WWF created RAFAM as an outgrowth of gaps in analysis identified during reviews of Life Cycle Assessments (LCA).

The RAFAM was designed to be a near-exhaustive list of impact areas not captured under a LCA to help investors and producers understand the breadth of potential risks and manage uncertainties. As traditional LCAs do not account for many common environmental and social impacts, issues highlighted in this methodology can be used in conjunction with LCA analyses and help inform discussions on commodity evaluations. While it may be difficult to answer many of the questions in this methodology, the ability of respondents to answer each question provides an indication of the level of uncertainty for potential impacts.

The WWF Alternative Fiber Team consisted of experts from the Forest, Conservation Science and Research & Development divisions at WWF who developed the tool according to best known science and current certification standards. This screening methodology should be applied prior to significant investment in a particular crop – before planting and/or procurement – to best mitigate potential environmental and social impacts.

The parameters examine potential impacts at the operation and landscape levels for potential alternative fiber crops. Since there is interest in multiple alternative fiber crops, the assessment methodology was not designed to be crop or species specific. As RAFAM was created to give a broad overview of major environmental and social considerations that would apply to any location and species, any potential alternative fiber feedstock can be assessed – including agricultural residues and purpose grown fibers. The method identifies key parameters that should be considered for production sites of alternative fibers in the United States or anywhere around the world.

BACKGROUND ON ALTERNATIVE FIBERS

There is revived interest in alternative fibers among both companies and consumers. These fibers are being explored as alternatives to paper and solid wood products made from trees. They include both purpose grown and agricultural residue crops such as moso bamboo, kenaf, wheat straw, bagasse and others. In theory, these alternative fibers could complement wood fiber from responsible forest sources, taking pressure off of natural forests, in some cases utilizing other agricultural residue, and contributing to future industrial fiber supply.

Responsible alternative fiber sources could play an important role in healthy, diverse and multi-functional forest landscapes that are compatible with biodiversity conservation and human needs. Additionally, the production of alternative fibers could contribute to economic growth and generate employment.

However, there are growing concerns around the development of alternative fibers because of their potential “unintended consequences”. For example, poor site selection and management could create the need for additional water use, cause pollution from excess chemical or fertilizer use, and even result in the conversion of natural forests. If a non-native species is selected for alternative fiber development it could become invasive, displace native species, or host invasive pests. Without significant research on potential impacts, the use of alternative fibers could cause controversy by impacting ecosystems and people.

By developing this feedstock screening methodology WWF begins to map these questions around the adoption of environmentally appropriate, socially beneficial, and economically viable practices in the development of alternative fibers.

IDEAL ALTERNATIVE FIBER FEEDSTOCK GOALS

The Alternative Fiber Team defined what producing an ideal alternative fiber feedstock would entail. This definition created the foundation for the methodology, allowing further exploration into what requirements would be needed to meet the definition and drive measures of success. While identifying and mitigating every risk in the methodology may not be possible, this definition of an ideal feedstock can be used as an aspirational benchmark to help operations produce alternative natural fibers responsibly.

An ideal alternative fiber feedstock is one that:

- Is derived from a renewable feedstock that was selected to: improve production compared with traditional sources (including the greenhouse gas footprint), minimize spread of unwanted species, and provide for environmental and economic resilience under a changing climate and other future conditions; and
- Is produced on land selected to minimize negative impacts and enhance biodiversity wherever possible by balancing biodiversity conservation between the site and the landscape (e.g. costs from direct habitat loss vs. feedstock intensification), and on land selected after careful consideration of implications for neighboring communities (including free, prior, and informed consent and collaborative operation design and management with local people and/or indigenous communities where appropriate); and
- Is produced in a way that minimizes overall resource use and on-site and downstream negative impacts to people and nature (e.g. agrochemicals, soil, water, air quality and waste); and
- Is produced in a way that maintains or improves the function of ecosystem services and the social and economic conditions in producing communities, while not adversely impacting food or water security and affordability; and
- Is legally sourced and produced in a safe and healthy way for workers and surrounding communities that respects human and labor rights; and
- Is produced under a precautionary approach that includes proper evaluation of and attention to environmental and social risks, utilizes small-scale pilot studies to identify risks wherever possible, selects sites and fiber species to minimize impacts, and continually monitors and adapts management approaches as necessary.

ISSUE AREAS

The definition of ideal alternative fibers presents a complex set of attributes that necessitates addressing multiple concerns for each potential feedstock. The team identified the following issue areas for assessment based on previous work in forestry, landscape ecology, biofuels, bioplastics and an extensive alternative fiber literature and interview review.

List of Issue Areas			
Environmental: Site Inventory	Environmental: Ecological Integrity	Environmental: Impacts	Social & Political
Land Use Change	Protected Areas	Ecosystem Services	Legal Compliance
Pesticide Use	High Conservation Value (HCV) Areas	Greenhouse Gas Emmissions	Land and Resource Tenure
Fertilizer Use	Landscape Scale Biodiversity	Air Quality	Human Rights
Crop Yield & Production Capacity	Site-Level Biodiversity	Soil Health	Labor Rights
Co-Products & Waste	Species of Concern	Water Quality	Worker Health & Safety
Water Use	Invasiveness		Food Security
			Water Security

HOW TO USE THE ASSESSMENT METHODOLOGY

The methodology consists of two parts. The first part includes 24 initial screening questions at the issue-area level where answers are “yes” “no” or “unknown”. A response of “yes” or “unknown” at the issue-area level indicates that the respondent either knows that this issue area will impact the operation or is unsure of how this issue area impacts the operation. The second part of the method, where respondents are directed after answering “yes” or “unknown”, provides information on the importance of that issue area, additional open-ended screening questions to identify areas of uncertainty, general strategies to mitigate risk, and external resources with guidance on the appropriate tools, methods or data sources more deeply analyze potential areas of concern.

	1. Initial Screening Questions	2. Additional Guidance Section
Format	General questions for each of the 24 most important environmental & social issues Response—YES/NO/UNKNOWN	Additional key questions under each issue area Response—Open-ended
Respondent	Product Design, CSR, R&D, Procurement	In-house researchers or external consultants depending on the in-house expertise in each issue area
Method	All NO's = Proceed with Caution Any YES's OR UNKNOWN's = See Additional Guidance	<ul style="list-style-type: none"> • Answer the key questions to identify risk • Use the external resources to inform answers to these questions • Once risks are understood, consider the general guidance on strategies to mitigate risk and delve back into the external resources to create tailored risk management strategies
Level of Uncertainty	If decisions are based off of just the initial Screening with desktop data, there is a HIGH level of uncertainty	<p>If decisions are based off of the initial screening and the additional guidance section, the level of uncertainty can be LOW: however, the level of uncertainty is dependent on data quality. Elements of data quality and expertise that decrease uncertainty:</p> <ul style="list-style-type: none"> • Source reliability (data verification) • Completeness (representative data) • Temporal differences (recent data) • Geographical or technological differences (data from same places, processes, or conditions)

Together the initial screening questions and additional guidance sections guide respondents through a precautionary approach toward investing in or producing alternative fibers. The initial screening method includes a list of the most important questions to ask before investing, growing, or sourcing a particular alternative fiber. These questions cover the most salient environmental and social issues related to crop production such as impacts on species of concern, crop invasiveness, impact on food security, etc. Since the method is not location or species specific – it needs to be adapted to the particular crop and region under consideration. The team recognizes that no single formula and description of indicators can be applied globally to every crop, but the methodology is designed to be an initial screening of key issues with global reach.

The initial screening method requires the user to first identify each potential fiber crop, current sourcing regions, and potential sourcing regions. Once this information is obtained, the initial screening questions can be applied. The questions are to be answered with either a YES, NO, or UNKNOWN response.

After answering each question, a response should be recorded:

- A NO response indicates that the user is certain that the issue is not a concern. **A response should be scored as NO only if the respondent possesses perfect background knowledge of the issue area and the issue has already been addressed for the operation. If there is any uncertainty, a respondent should read the Additional Guidance note associated with that question to ensure that they are aware of all potential impacts. When using the methodology, it should be necessary for respondents to scan all of the Additional Guidance notes to ensure that they understand the complex set of issues inherent in each question.**
- A YES response indicates that the user is aware of the issue and that the issue has already been addressed for the operation.
- An UNKNOWN response indicates that the user is unsure of the impacts and more information is needed.

An assessment of entirely NO responses indicates that development of the alternative fiber is free of most foreseeable issues and the user can proceed with caution in the operation. However, the user must keep in mind that new information and circumstances may alter the results of the initial screening, so caution should still be taken along every step of operation development and management.

If the survey results in any YES or UNKNOWN responses, those issues will need to be analyzed further. Additional information can then be found in the Additional Guidance Section.

The Additional Guidance section of the document takes each issue area and provides information on the overall importance of that issue, key additional questions to consider, suggested baseline next steps, and external resources for deeper assessment and to inform answers to the additional questions. Within each of the Issue Areas, we include recommendations for operation design, management, and monitoring to minimize social and environmental risks. In addition to those general recommendations, WWF sought to connect this tool to other systems already existing in sustainable agriculture and forestry by providing external resources that can be used to refine risk evaluation and implement sustainable and responsible production.

ADDITIONAL CONSIDERATIONS FOR RISK MITIGATION

The RAFAM is a decision making tool for assessing risk and understanding the tradeoffs across various operations. The methodology can be used to identify risk and general strategies for risk mitigation, but operations are still responsible for identifying tailored strategies that best manage, measure, and improve production over time. Fortunately there are many of these management programs in the form of certifications, roundtables, standards and Best Management Practices (BMPs) for a number of crops in consideration today as alternative fibers. For those harvest feedstocks sourced globally, WWF recommends the use of Roundtable on Sustainable Palm Oil (RSPO) for palm oil, Round Table for Responsible Soy (RTRS) for sustainable soy, Bonsucro for Sugarcane, and the Forest Stewardship Council (FSC) for tree-based products. Furthermore, the RAFAM only analyzes production and does not examine risks from processing or other stages; therefore, operations must examine the product lifecycle to mitigate all environmental and social impacts.

Excellent water management is important for all crops and regions. WWF recommends the following options to address water management and risk mitigation: firstly, employ mitigation responses suggested in the Water Risk Filter by inputting data into the tool and identify mitigation responses that correspond to the specific crop and basin risks. Although this solution provides just one-off solutions and is not a holistic response, WWF would recommend it as a first step followed by full water stewardship activities to mitigate substantial water risks. <http://waterriskfilter.panda.org/MitigationTools.aspx>

Second, WWF recommends the implementation of the Alliance for Water Stewardship (AWS) International Water Stewardship Standard. The AWS standard is a step-wise approach to mitigating water risk, and is designed to work in any industry or geography. The standard overlaps with governmental regulations required in that region, all crop production standards, and ISO standard etc. It is designed to address current and future risk for water management. <http://www.allianceforwaterstewardship.org/what-we-do.html#water-stewardship-standard>

ALTERNATIVE FIBERS ASSESSMENT: INITIAL SCREENING

Step 1: Identify a particular crop, current producing region(s), and potential regions for new production.

Step 2: Answer the questions below for each potential crop and site. Enter your rationale for selecting no, yes, or unknown in the box below each question.

ENVIRONMENTAL CONSIDERATIONS: SITE INVENTORY

Land Use Change

Does the establishment of the fiber crop at the proposed production site(s) require any land use change (e.g., natural/plantation forest to agriculture, access routes, development associated with the site)? (The answer should always be yes except when assessing some agricultural residues of existing crops.)

Pesticide Use

Does fiber crop production require herbicide/pesticide use with chemicals that could negatively impact the surrounding habitat, soil, species diversity, water supply or quality?

Fertilizer Use

Does fiber crop production require the use of nutrient fertilizers that could negatively impact the surrounding habitat, soil, species diversity, water supply or quality?

Crop Yield and Production Capacity

Do you need a plan to manage your crop sustainably, ensure long-term production, and identify downstream capacity?

Co-Products and Waste

Will the operation produce co-products or waste?

Water Use

Will fiber crop production require utilization of water from a water stressed area OR irrigation management?

ENVIRONMENTAL CONSIDERATIONS: ECOLOGICAL INTEGRITY

Protected Areas

Will the production of the fiber crop negatively impact any protected areas in the region?

High Conservation Value (HCV) Areas

Do critical ecosystems or High Conservation Value habitats (HCV) exist in the region proposed for crop production and could they be negatively impacted by fiber crop development?

Landscape Scale Biodiversity

Will the production of the fiber crop potentially negatively impact biodiversity at the landscape scale? (e.g., Changes resulting from habitat loss or degradation, impeding dispersal or migration, producing competition with native species or acting as hosts to competitors, etc.)

Site-Level Biodiversity

Will the production of the fiber crop negatively impact biodiversity in the operation site?

Species of Concern

Do any species of special concern utilize the site or are endemic to the region at any phase of their life cycle and will the production of the fiber crop negatively impact these species at any point in their life cycle? (e.g. Endangered species on national or the IUCN red list of endangered species.)

Invasiveness

Is the proposed fiber crop new to the region, known to be invasive, has the potential to host invasive species, or has the potential to spread to unwanted regions?

ENVIRONMENTAL CONSIDERATIONS: IMPACTS

Ecosystem Services

Will the production of this fiber crop potentially negatively impact local or regional ecosystem services? (e.g., carbon storage, water quality or availability, aesthetic value, tourism value, etc.)

Greenhouse Gas Emissions

Do the production, use, and disposal of the fiber crop result in a carbon positive (>0) footprint including biogenic emissions?

Air Quality

In the management of this fiber crop are air pollution emissions (outside of greenhouse gas impacts) a known problem? (e.g. from burning)

Soil Health

Will local soil conditions be significantly altered and negatively impacted by the production of this crop?

Water Quality

Will agricultural runoff from fiber crop production negatively impact the quality of ground or surface water in the area?

SOCIAL & POLITICAL CONSIDERATIONS

Legal Compliance

Does the production of this fiber crop infringe upon any local, regional, or national laws? (e.g., is it illegal to grow, sell, or export this fiber crop)

Land and Resource Tenure

Will a legal, secure, and uncontested title and/or permit be obtained for the land necessary for the production of the fiber crop? (Note that customary land rights are a legitimate, competing title that must be respected.)

Human Rights

Will production of this fiber crop infringe upon the basic human rights of local men and women including indigenous communities? (e.g. the right to Free, Prior, and Informed Consent)

Labor Rights

Will production of this fiber crop infringe upon the labor rights of workers? (e.g. forced labor infringes upon the right to a dignified minimum wage, discrimination may infringe upon the right to free association, etc.)

Worker Health & Safety

Will production of this fiber crop infringe upon any Occupational Health and Safety (OHS) regulations? (e.g. negatively affect worker health or safety through pesticide use)

Food Security

Will the establishment of this fiber crop displace food sources or the resources needed to produce them?

Water Security

Will the establishment of this fiber crop impair the quality and/ or quantity of surface and/or ground water resources used by local and regional communities?

Step 3: The following section of the document is entitled “Additional Guidance” and includes further information on each of these issue areas. You can click on the section titles in this initial screening section to jump to the appropriate additional guidance section. These sections articulate the importance of the issue, outline key questions to assess uncertainties (expanding on the screening questions), and list external resources that could be used to conduct further assessments for that issue and inform answers to the key questions. The Additional Guidance section of the document should be used for any screening response that needs further assessment (responses of YES or UNKNOWN). **A response should have been scored as NO only if the respondent possesses perfect background knowledge of the issue area and the issue has already been addressed for the operation. If there was any uncertainty, respondents should have read the Additional Guidance note associated with that question to ensure that they are aware of all potential impacts. It should have been necessary for respondents to scan all of the Additional Guidance notes to ensure that they understand the complex set of issues inherent in each question.**

ADDITIONAL GUIDANCE

ENVIRONMENTAL CONSIDERATIONS: SITE INVENTORY

LAND USE CHANGE

Initial Screening Question: Does the establishment of the fiber crop at the proposed production site(s) require any land use change (e.g., natural/plantation forest to agriculture, access routes, development associated with the site)? (The answer should always be yes except when assessing some agricultural residues of existing crops.)



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IMPORTANCE

The operation site must not include the conversion of any natural habitats such as forests, woodlands, grasslands, peat lands, or other wetlands as part of the production area. Site selection is important as it can have a significant impact on the ability of the operation to achieve climate change goals and mitigate environmental impacts. Many of the criticisms of fiber plantation expansion are related to large land conversions of areas rich in biodiversity that act as valuable carbon sinks. Land use change has put countries such as Indonesia among the highest carbon emitters in the world as vast extensions of tropical rainforest have been cleared for producing pulp and palm oil, rich carbon sinks such as peat lands have been drained, and many species have been driven towards extinction from habitat loss.

Marginal Lands: Marginal lands are defined as underutilized or idle agricultural lands that have economic production potential and require minimal conversion for establishing a new crop. The best case scenario to reduce impacts on the environment and to food production would be to promote projects on these marginal lands. A marginal lands approach would limit the food displacement issue both locally and globally, reduce pressure on existing natural habitats, minimize biodiversity loss, and most likely result in land conversion that could be positive from a carbon sequestration standpoint. However, the term “marginal” land is wholly perspectival, and these lands may harbor biodiversity or provide social or cultural value that is not readily evident to the operation manager (e.g. have settlers or play a role as a wildlife migratory corridor or protected zone). Careful consideration of multiple perspectives (both human and wildlife) is necessary prior to establishment of an operation on these lands.

Indirect Land Use Change (ILUC): Increased production of alternative fiber feedstocks can lead to land use changes in areas other than the production area. For example, if the fiber production area includes lands previously used for food production or collection of other resources by local people these activities will be displaced to a new area. In addition to ILUC emitting more greenhouse gases than may be accounted for in the fiber product, ILUC has the potential to generate the same negative environmental and social impacts as direct land use changes. In regions near protected areas, high conservation value habitats, or species of concern, it is particularly important to consider the impacts of ILUC. The operation may successfully buffer these areas from site-level land use change impacts in alternative fiber production, but ILUC may cause degradation of these habitats regardless. It is the responsibility of operation managers to not only consider impacts of direct land use change, but also ILUC when selecting a site and managing an operation. Consulting with relevant stakeholders is necessary to minimize risk and identify the best land use plan for the region.

ADDITIONAL SCREENING QUESTIONS

- 1. Does the establishment of this crop require the conversion of natural ecosystems, critical natural habitats, or carbon sinks to crop land?**

- 2. Does the establishment of this crop require the conversion of natural ecosystems, critical natural habitats, or carbon sinks to crop land? *Natural systems may include: forests, peat lands, wetlands, grasslands, and others where conversion is from one ecosystem type to a more intensively managed land use***

- 3. Would the production of this crop maintain the current use of the land or represent an improved use of that land? *Ex: Use marginal or degraded lands***

4. Will this operation require the draining of wetlands or altering hydrological regimes, or is irrigation planned for this crop?

5. Will production of this crop include development of access roads and other transportation infrastructure?

6. What would be the impacts of more intense production on ecosystem function and local livelihoods?

- 7. Would the post-change land use add net long term social or environmental value to the community that was not available before land conversion? *To identify potential values to the community it is necessary to engage them (see the additional guidance sections on human rights and land and resource tenure)***

- 8. Does consultation with local stakeholders adequately assess and mitigate impacts associated with direct and indirect land use change in a process of free, prior, and informed consent?**

- 9. Is production likely to cause indirect land use changes in the region, and are these indirect land use changes likely to cause negative impacts in other issue areas? *Particularly important to consider protected areas, high conservation value areas, and species of concern***

10. If demand increases for this crop in the future resulting in an expansion of production, what is the likelihood of intensification becoming problematic for ecosystem function or local livelihoods?

GENERAL GUIDANCE TO MITIGATE RISK

Refer to the additional guidance notes on protected areas, high conservation value areas, landscape scale biodiversity, site-level biodiversity, species of concern, invasive species, ecosystem services, and water quality if natural habitats are near land conversion. Also refer to the social guidance notes on food security and water security in all instances.

Design:

- When considering options for development, avoid conversion of natural habitats, target underutilized agricultural lands first, and consider any potential ecological or cultural significance before developing marginal lands.
- Consider potential impacts from indirect land use change and consult with local stakeholders to identify a regional land use plan that minimizes potential impacts.
- Assess the suitability of utilizing marginal lands by examining soil quality and identifying if areas with excellent soils would be better left for food production (see food security guidance notes).
- Plan infrastructure development to ensure that sensitive areas (buffer zones, riparian areas, protected areas, wetlands, and fragments of natural habitats) remain intact and are not subject to traffic and increased human pressure.

Management:

- Ensure that management strategies prevent degradation of natural habitats though indirect effects of land conversion associated with the other indicators described in these guidance notes (e.g. watershed-level impacts, pollution transmission, and invasive species).
- Have a contingency plan to expand buffer zones around converted lands if monitoring of indirect effects reveals that neighboring habitats or species are being impacted.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of impacts from land conversion.
- Examine potential indirect land use changes in other regions that result from a land conversion.
- Assess potential land use change impacts as part of a detailed biodiversity assessment.

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT

1. NatureServe Vista

<http://www.natureserve.org/conservation-tools/data-maps-tools/natureserve-vista>

Create, implement, and monitor land use scenarios to evaluate social and environmental impacts (GIS extension).

2. InVEST—Habitat Quality: Biodiversity

http://ncp-dev.stanford.edu/~dataportal/invest-releases/documentation/current_release/habitat_quality.html

Combine information on land use and land use change with other threats to model the extent and degradation of different habitat types along with the status of biodiversity.

3. WWF Smart Infrastructure Planner

<http://www.worldwildlife.org/publications/smart-infrastructure-planner-beta>

The Smart Infrastructure Planner (SIP) is a GIS toolkit that allows GIS practitioners to evaluate the compatibility of proposed infrastructure and land use developments with essential requirements for the conservation of wildlife and their habitat in a landscape context.

4. Global Forest Watch

<http://www.globalforestwatch.org>

Real time satellite monitoring of deforestation.

5. Low Indirect Impact Biofuel (LIIB) Methodology

<http://www.wri.org/our-work/project/global-forest-watch>

Used by the Roundtable on Sustainable Biofuels standard as a screening tool and developed in partnership with WWF, this methodology screens biofuel crops for their risk in causing indirect land use change.

6. Three Approaches to Measuring ILUC

<http://www.pbl.nl/en/publications/2010/Are-models-suitable-for-determining-ILUC-factors>

Global Agroeconomic Equilibrium Models: Use complex (non-linear) equilibrium model for predicting lands affected by a LUC. Causal Descriptive Approach: Use simplified (linear) equilibrium model for predicting lands affected by a LUC. Chain of Cause and Effect Approach: By assumption there is only one marginal product affected by a change.

7. See additional guidance notes for resources related to impact areas of environmental concern:

- Protected Areas
- High Conservation Value Areas
- Landscape Scale Biodiversity
- Site-Level Biodiversity
- Species of Concern
- Invasive Species
- Ecosystem Services
- Water Quality

8. See additional guidance notes for resources related to impact areas of social concern:

- Food Security
- Water Security

RETURN TO INITIAL SCREENING QUESTIONS

PESTICIDE USE

Initial Screening Question: Does fiber crop production require herbicide/pesticide use with chemicals that could negatively impact the surrounding habitat, soil, species diversity, water supply or quality?



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IMPORTANCE

Agrichemical use can have multiple impacts on the environment, the health and well-being of workers, as well as the local community. These chemicals can be particularly dangerous when farmers are forced to use more applications of increasingly toxic chemicals to reach the same levels of biologic control.

Pesticides can contaminate soil, water, and other vegetation. Heavy treatment of soil with pesticides can cause populations of beneficial microorganisms to decline. This decline results in a loss of soil fertility, as there are no longer enough microorganisms to hold nutrients. Plants dependent on soil nutrient availability will be impacted and these negative effects of degradation can resonate throughout the ecosystem. Runoff into water sources will also impact biodiversity through aquatic pathways, and pesticide residues can travel substantial distances through the air to damage neighboring terrestrial vegetation and wildlife. Pesticides have been linked to dramatic declines in honeybee, frog, and bat populations along with a variety of other species.

Workers and local communities experience negative impacts from pesticide use along with the ecosystem. Pesticides can contaminate surface and ground drinking water sources and transfer carcinogens, mutagens, and reproductive toxins to human and wildlife populations. Higher rates of prostate, ovarian, and skin cancer are associated with workers who apply pesticides. As pesticides travel through both air and waterways, health impacts are not limited to workers. Children and pregnant women are particularly vulnerable to the buildup of toxins. Those exposed to pesticides in utero or during early developmental periods face higher incidences of birth defects, neurodevelopmental delays, cognitive impairment, childhood brain cancers, Autism Spectrum Disorders, and other problems. In adults, negative impacts to reproductive health are common and include falling sperm counts, declines in testosterone levels, earlier puberty in girls, and fewer males being born.

ADDITIONAL SCREENING QUESTIONS

1. **Are chemicals used for pest management on crops in this region?** *Consider the historical use of pest management chemicals including their amount, timing and method (per hectare)*

2. **Is the crop being established in the area for the first time and will the introduction of the crop cause an increase in need for pesticide use in the area?**

3. **Are activities being done to reduce the amount of pesticides used? Consider pest confirmation before application, parasitic insects, or other examples of Integrated Pest Management**

4. **Are any of the pesticides being used classified as either 1A or 1B on the World Health Organization pesticide classification system and is the production of this crop compliant with World Bank Operational Policy OP 4.09? See the policy in additional resource #1**

5. **Are there future risks for ecosystem function and local people that would increase the need for or impact from regulated pesticide use?** Consider *pesticide resistance and mutation, new pests, possibility for pests to be carriers for other destructive factors etc.*

6. **Will mitigation activities be put in place to reduce future risks of increased pesticide use?**

GENERAL GUIDANCE TO MITIGATE RISK:

Given the technical nature of pest control and the potential impacts these products may have on workers and the environment, it is important to have adequate technical support in terms of reviewing crop condition, making control recommendations, and ensuring worker compliance in implementation (see additional guidance on worker health and safety). Appropriate selection of crop protection products, precise application methodologies, and timely field monitoring can greatly reduce chemical applications. If pesticides are used near a water body, also refer to the additional guidance notes on water quality and water security.

Design:

- Prior to pesticide application, identify physical, mechanical, or biological means that could be used as an alternative to pesticides.
- Use no hazardous agrochemicals listed as Classification I or II in the World Health Organization's Recommended Classification of Pesticides by Hazard.
- Review pesticides for their relevant legal registrations and for toxicity and environmental persistence.
- Select products based on toxicity for workers, potential impacts to aquatic and terrestrial organisms, and overall efficacy.
- Select a site for chemical storage where the facility can be supervised with controlled access.
- Avoid storing chemicals at sites located near water courses or water sources, where the flood risk is high, or near local populations or migrant worker dormitories.
- Build chemical storage facilities that are adequately ventilated, have floors and shelving of impermeable materials, and are not used for any other storage purpose.

Management:

- Perform soil and foliar analysis prior to any application, and utilize a plant nutrition expert to make the application recommendation.
- Verify that the site abides by World Bank Pest Management and EPA (EPCRA) Hazardous Chemical Storage Reporting Requirements.
- Assess and manage potential impacts of chemical run-off on local communities.
- Communicate chemical risks and mitigation measures to local communities under a process of free, prior, and informed consent (see additional guidance on human rights).
- Ensure agrochemicals are prepared and applied by appropriately trained personnel with suitable protective gear and in accordance with the law and producer guidelines—and not by children or pregnant or lactating women (see additional guidance on worker health and safety).
- Keep records of all pesticide applications.

Monitoring :

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of pesticide use impacts on the environment, community, and worker health and safety (impacts may change due to site expansion, changes in crop management, worker turnover etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT

1. World Bank OP 4.09—Pest Management

<http://go.worldbank.org/QNORFLUFR0>

World Bank policy on agricultural pest management, pest management in public health, and criteria for pesticide selection and use.

2. World Health Organization—Recommended Classification of Pesticides by Hazard

http://www.who.int/ipcs/publications/pesticides_hazard/en/

Classification system for pesticides based on their risk to human health where 1A is defined as “Extremely Hazardous” and 1B is defined as “Highly Hazardous”.

3. EPA Emergency Planning and Community Right-to-Know Act (EPCRA) Hazardous Chemical Storage Reporting Requirements

http://www.epa.gov/oem/content/epcra/epcra_storage.htm

Requirements for hazardous chemical storage in the workplace under the U.S. Environmental Protection Agency.

4. Globally Harmonized System of Classification & Labelling Chemicals (GHS)

http://www.unece.org/trans/danger/publi/ghs/ghs_rev00/00files_e.html

Established by the United Nations, the system bridges international differences between documenting and communication hazardous chemicals to help ensure the safe use of chemicals throughout the product life cycle.

5. See additional guidance notes for resources related to impact areas of concern:

- Water Quality
- Water Security
- Human Rights
- Worker Health and Safety

RETURN TO INITIAL SCREENING QUESTIONS

FERTILIZER USE

Initial Screening Question: Does fiber crop production require the use of nutrient fertilizers that could negatively impact the surrounding habitat, soil, species diversity, water supply or quality?



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IMPORTANCE

Synthetic chemical fertilizer use is a factor that may have multiple impacts on the environment, the health and well-being of the workers, as well as the local community. Impacts include GHG emissions, eutrophication, financial burdens on smallholders, and others. Even the use of natural fertilizers (e.g. manure) must be properly managed. Importantly, if the crop is a nitrogen fixer, fertilizer use and the monitoring of soil health will need to address potential impacts.

ADDITIONAL SCREENING QUESTIONS

1. **Is the crop being established in the area for the first time and will the introduction of the crop cause an increase in the need for fertilizers in the area?**

2. **Do nutrient management systems exist for the production of this crop that allow for quantitative monitoring? Consider the amount, timing and method (per hectare)**

3. **Are activities being done to effectively reduce the amount of synthetic nutrients used?** *Consider crop rotation, buffer zones, no-till practices, replacing chemicals with compost, etc.*

4. **Are there future risks to surrounding ecosystem function and local people that would increase the need for or impact from nutrient use?** *Consider climate change, soil organic carbon content, soil structure and precipitation changes, soil health*

5. **How will mitigation activities be put in place to reduce future risks of increased nutrient use?**

GENERAL GUIDANCE TO MITIGATE RISK

Given the technical nature of fertilizer control and the potential impacts these products may have on workers and the environment, it is important to have adequate technical support in terms of reviewing crop condition, making control recommendations, and ensuring worker compliance in implementation (see additional guidance on worker health and safety). Appropriate selection of crop protection products, precise application methodologies, and timely field monitoring can greatly reduce chemical applications. If fertilizers are used in an operation near a water body, also refer to the additional guidance notes on water quality and water security.

Design:

- Review fertilizers for their relevant legal registrations and for their toxicity and environmental persistence to select products based on toxicity for workers, potential impacts to aquatic and terrestrial organisms, and overall efficacy.
- Select a site for chemical storage where the facility can be supervised with controlled access.
- Avoid storing chemicals at sites located near water courses or water sources, where the flood risk is high, or near local populations or migrant worker dormitories.
- Build chemical storage facilities that are adequately ventilated, have floors and shelving of impermeable materials (double containment), and are not used for any other storage purpose.

Management:

- Perform soil and foliar analysis prior to any application, and utilize a plant nutrition expert to make the application recommendation.
- Assess and manage potential impacts of chemical run-off on local communities and engage communities in a discussion on potential impacts.
- Ensure agrochemicals are prepared and applied by appropriately trained personnel with suitable protective gear and in accordance with the law and producer guidelines—and not by children or pregnant or lactating women (see additional guidance on worker health and safety).
- Keep records of all fertilizer applications.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of fertilizer use impacts on the environment, community, and worker health and safety (impacts may change due to site expansion, changes in crop management, worker turnover, etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT

1. IFA Fertilizer Best Management Practices (FBMP)

<http://www.fertilizer.org/HomePage/SUSTAINABILITY/Fertilizer-Best-Management-Practices>
Resource for best practices by crop, nutrient, and country/region.

2. See additional guidance notes for resources related to impact areas of concern:

- Water Quality
- Water Security
- Worker Health and Safety

RETURN TO INITIAL SCREENING QUESTIONS

CROP YIELD AND PRODUCTION CAPACITY

Initial Screening Question: Do you need a plan to manage your crop sustainably, ensure long-term production, and identify downstream capacity?



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IMPORTANCE

Sustainable Yield: Long-term crop productivity is important and management practices should be selected to generate economic benefits without compromising environmental and social performance. Higher yields can be achieved through the use of the best available science and technology, as well as good management practices, such as species selection and appropriate tillage and harvest techniques. With impending threats from climate change and other environmental events, it is also important to consider the resiliency of the fiber source during feedstock selection.

Capacity: While the issue of existing capacity may seem obvious, there are operations that have been planned and brought to bear that did not contemplate downstream capacity and did not fully visualize the impact transportation would have on the overall economics and carbon footprint of the operation.

ADDITIONAL SCREENING QUESTIONS

1. Does the operation adhere to national and international management recommendations and best management practices for sustained yield?

2. How do operation yields compare to global, national, and/or local averages?

3. Does the operation have a plan to optimize yield while minimizing agrochemical inputs?

4. Has the operation reviewed downstream processing capacity and ensured there will be available processing capacity in the future? *If downstream processing capacity does not exist, the operation can consider establishment of a local processing plant to benefit the local community and minimize greenhouse gas emissions; however, site selection for a local plant should be based on the environmental and social considerations outlined in this assessment methodology.*

5. Does the operation have a reliable, financially and ecologically viable plan to transport feedstocks for processing? *An ecologically viable plan would consider the carbon footprint of transport scenarios*

6. What is the storage life of the feedstock before processing?

7. Would the production of this crop maintain fair market prices for local crops?

8. Is the selected crop resilient to environmental stochasticity? *Consider impact from climate change as well as changing temperature, precipitation, and fire regimes, soil acidification, and spread of diseases and pests*

9. Does the selected crop reproduce clonally or is it frequently planted in a genetic monoculture? *Some crops may have little genetic diversity making them more vulnerable to crop loss from a single event*

GENERAL GUIDANCE TO MITIGATE RISK

Design:

- Ensure that products are not harvested at levels above sustainable yields.
- Review downstream processing capacity to ensure that facilities exist, they have the capacity to handle projected volumes, and transport to these facilities from the proposed production operation is financially and environmentally viable.

Management:

- Regularly monitor and evaluate key economic performance indicators like yields, revenues, and costs and take measures as necessary for improvement.
- Make summaries of management plans, along with social and environmental impact assessments, publicly available.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of crop management and sustainability (impacts may change due to site expansion, changes in crop management, etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT

1. WWF Smart Infrastructure Planner

<http://worldwildlife.org/publications/smart-infrastructure-planner-beta>

The Smart Infrastructure Planner (SIP) is a GIS toolkit that allows GIS practitioners to evaluate the compatibility of proposed infrastructure and land use developments with essential requirements for the conservation of wildlife and their habitat in a landscape context. It is compatible with ArcGIS versions 10 and 9.3.

2. WWF Environmental and Social Safeguards Policies and Procedures

<http://www.worldwildlife.org/publications/wwf-environmental-and-social-safeguards-policies-and-procedures>

Provides guidance on conducting environmental and social impact assessments. It covers involuntary displacement, indigenous peoples, human rights, and gender integration and should be used in conjunction with industry assessments of workers right and workers health and safety.

3. United States Department of Agriculture Foreign Agricultural Databases

<http://www.fas.usda.gov/data>

These databases include data on production, supply, and distribution for the U.S. and key producers as well as historical data and analyses of issues affecting agricultural production.

4. Food and Agriculture Organization of the United Nations – FAOSTAT Database

<http://faostat.fao.org/>

This database includes information on production and trade of food and agricultural commodities. It also includes information for the forestry sector and global statistics on food security.

RETURN TO INITIAL SCREENING QUESTIONS

CO-PRODUCTS AND WASTE

Initial Screening Question: Will the operation produce co-products or waste?



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IMPORTANCE

Feedstock production sites generate many different types of co-products and waste products that can be used to generate electricity or other products. Co-products are products that are produced during production of a primary product and whose use has an independent value either for the operation or another user, while waste products do not have value and their disposal must be paid for by the operation. Products that have high nutritional value and can be used as animal feed or other products, or as soil amendments to improve structure and characteristics of the soil can be considered co-products. Identifying avenues to utilize materials as co-products instead of disposing of them can provide many environmental and economic benefits.

For example, the production of electricity with these co-products can reduce the overall energy inputs into the process, thereby impacting the environmental profile of the process. Therefore, in order to maximize environmental benefits, it is important that these co-products and processes are incorporated into the processing model. In many cases, these benefits are needed to make the overall carbon balance negative. Cogeneration at the processing mill represents an important opportunity for feedstock production and is a viable technology for many crops.

ADDITIONAL SCREENING QUESTIONS

- 1. If the alternative natural fiber source is a co-product, has an analysis been done to assess the environmental and social benefits for other utilizations or end-uses? Take into account environmental considerations such as soil benefits, as well as important local uses such as fodder or fuel**

- 2. If co-products are produced in the operation, has the operation created a strategy to incorporate them into sustainable operation management?**

3. Has the operation optimized the use of resources to minimize waste and associated negative impacts?

4. Has the operation assessed waste streams and developed a strategy to store and dispose of waste in environmentally and socially responsible ways? Consider impacts to water quality, water quantity, soil health, human health, the resource needs of local people, etc.

GENERAL GUIDANCE TO MITIGATE RISK

If the alternative natural fiber is a co-product that is providing a valuable ecosystem service or social value, then it should not be diverted for other uses and result in removal of those benefits. Refer to the guidance notes on Water Quality to ensure the compliance of waste streams.

Design:

- Dispose of hazardous, biological, and other waste in compliance with local and international regulations.
- Manage on-site waste disposal to reduce risks to the community and the environment.
- Select a site for waste disposal/septic systems that is not located near water courses or water sources, not in a location where flood risk is high, and is located where the facility can be supervised with controlled access.
- Minimize the use of open waste dumps and open waste burning.
- Ensure that off-site waste disposal does not have negative community or environmental impacts.

Management:

- Utilize appropriate water treatment systems for wastewater before discharge into natural water sources.
- Ensure sewage systems adequately treat sewage and do not contaminate ground or surface water.
- Whenever possible, utilize co products in site management to increase sustainability of the operation.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of impacts from waste management (impacts may change due to site expansion, changes in crop management, etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT**1. EPA Guidelines for Agricultural Waste**

<http://www.epa.gov/oecaagct/twas.html>

Description of regulations for different waste types and relevant environmental considerations.

RETURN TO INITIAL SCREENING QUESTIONS

WATER USE

Initial Screening Question: Will fiber crop production require utilization of water from a water stressed area OR irrigation management?



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IMPORTANCE

Agriculture is responsible for about 70% of water withdrawn (rivers, lakes, groundwater) and used by human populations. Expansion of agricultural landscapes will add pressure to this finite resource. The efficiency of water use in agriculture is highly variable and subject to waste due to inadequate or non-existing management systems and inefficient irrigation systems. The key to efficient irrigation is having an appropriate management system that enables the user to monitor crop water needs as well as efficient water application systems that accurately apply water in a timely fashion. By utilizing smart irrigation methods, water applications can be greatly reduced, thus reducing runoff, emissions, and energy requirements, while still meeting the crop water requirement.

Blue water footprint: Volume of surface and groundwater consumed as a result of the production of a good or service. Consumption refers to the volume of freshwater used and then evaporated or incorporated into a product. It also includes water abstracted from surface or groundwater in a catchment and returned to another catchment or the sea. It is the amount of water abstracted from groundwater or surface water that does not return to the catchment from which it was withdrawn.

Green water footprint: Volume of rainwater consumed during the production process. This is particularly relevant for agricultural and forestry products (products based on crops or wood), where it refers to the total rainwater evapotranspiration (from fields and plantations) plus the water incorporated into the harvested crop or wood.

ADDITIONAL SCREENING QUESTIONS

1. **Are there regulatory agencies that address and enforce water management at a watershed or catchment level or for quantity and quality at a holistic level?** *Consider both surface and groundwater*

2. Is the operation participating in the management of water at a catchment level and/or linking operation water management into the catchment-level plan?

3. According to the Water Footprint Network Water Scarcity Maps, is this watershed a water stressed area?

4. According to ClimaScope or Atlas Aqueduct, is this watershed at risk for decreased availability in the future? *Ex: Decreased rainfall, increased consumption, etc.*

5. According to the Water Footprint Network, what is the blue water footprint (m³/ton) of this crop?

6. If using irrigation (Blue) water do you have the appropriate permits for withdrawal of this water?

This refers to WFN Blue water

7. Does the crop's growing season overlap with the region's blue water stressed months?

8. According to the Water Footprint Network, what is the green water footprint (m³/ton) of this crop?

GENERAL GUIDANCE TO MITIGATE RISK

Managers should assess water needs and inventory local water resources to demonstrate that water quantity needs can be met in the long term. Assessments need to be conducted regardless of water source: groundwater (blue), surface water (blue), or rain water (green). This evaluation is critical in water-scarce regions, and water extraction should not deprive downstream users of this scarce resource or impact biodiversity. For all water management data, managers should use the best available information including peer reviewed work. (I.e. Water Footprint Network data or peer reviewed data at a more granular level).

Design:

- Mitigate risk by assessing operations with the Water Risk Filter and implementing the AWS International Water Stewardship Standard (see external resources).
- Assess water resource requirements, taking into consideration crop needs, soil field capacity, hydrological conditions, precipitation distribution, downstream human and environmental needs and uses, and impacts water use will have on the watershed and regional ecology.
- Conduct an Environmental Flow, or eFlow, assessment to ensure water use is sustainable on a catchment level.

Management:

- Minimize the use of water in irrigation by monitoring soil type, soil moisture, and evapotranspiration to measure when and how much water to apply.
- Monitor aquifers and natural bodies of water to ensure that they are adequately recharged and that their use for agricultural is not altering the natural hydrologic regime.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of impacts to water quantity (impacts may change due to site expansion, changes in crop management, etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT

1. Water Risk Filter

<http://waterriskfilter.panda.org/MitigationTools.aspx>

Tool to assess water risks for any industry and country. It can be used annually to monitor risk changes.

2. AWS Water Stewardship Standard

<http://www.allianceforwaterstewardship.org/>

Use the standard to identify strategies to mitigate risks after identifying them with the Water Risk Filter. The standard is ISEAL-compliant and can be applied internationally to mitigate water risks, address water challenges on a catchment level, and employ responsible stewardship techniques.

3. Water Footprint Network

<http://www.waterfootprint.org/?page=files/home>

Platform to link organizations interested in understanding and managing their water footprint. The organization provides free information access and toolkits.

4. Water Footprint Network Water Scarcity Maps

<http://www.waterfootprint.org/?page=files/WaterStat-WaterScarcity>

Global map of monthly blue water scarcity for the world's major river basins with data from 1996 to 2005.

5. Water4Biz WBCSD Report

<http://www.wbcd.org/work-program/sector-projects/water/water4biz.aspx>

Refer to this report as a source for additional resources and to complete a decision tree that identifies the tool that is most appropriate for a given situation.

RETURN TO INITIAL SCREENING QUESTIONS

ENVIRONMENTAL CONSIDERATIONS: ECOLOGICAL INTEGRITY

PROTECTED AREAS

Initial Screening Question: Will the production of the fiber crop negatively impact any protected areas in the region?



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IMPORTANCE

Protected Areas are sites designated for preservation by national or international laws and treaties because of their natural or cultural significance. Under no circumstances should production take place within a recognized or proposed protected area. In addition, production adjacent or near to the boundaries of the protected area may have impacts on biodiversity within and is strongly discouraged. Protected areas in a particular region may be identified by consulting the external resources listed below.

ADDITIONAL SCREENING QUESTIONS

- 1. Will the production area be in close proximity (upstream, adjacent, or near) to any protected areas or areas designated as environmentally important by national legislation or international conventions? See additional resources #1,3,4, and 7 to identify protected areas**

2. If the production area is close to (but not adjacent to) the protected area, are there possibilities that the production area would:

a) Impact species migrations to and from the protected area?

b) Impact dispersal and breeding of species within to outside the protected area?

c) Impact habitat connectivity between the protected area and other natural habitat in the landscape?

d) Produce edge effects (such as from increased light) to impact vegetation and/or species habitat use close to the edge of the park?

e) Introduce invasive species, either directly (through introduction of new plants that will outcompete native plants) or indirectly (inadvertently carried in via vehicles and people)?

f) Cause increased direct human impact on park (such as from workers collecting natural products within the protected area)?

3. Will aquatic areas within the production area or downstream be adequately buffered and protected from agricultural activities?

GENERAL GUIDANCE TO MITIGATE RISK

Under no circumstances should managers accept development of any operation within a prescribed buffer zone or within a protected area. Proposed production areas directly adjacent to a protected area or within close proximity (as per the second metric question above), should be moved to a new site. If an operation is in close proximity to a protected or other environmentally sensitive area but has a low risk of affecting protected area resources, local management should exert its influence with the local community and any potential outgrowers so that the protected areas, their biodiversity and ecosystem benefits, will remain in place and viable. Managers must be able to prevent or minimize indirect impacts to protected areas that are part of the landscape matrix or share a watershed with the production site.

Design:

- Select the operation site so that it does not impact the integrity of protected areas in any way.
- Retain or establish a natural buffer zone around the operation that includes protection for riparian zones and preferentially utilizes natural vegetation.
- Carefully consider placement and construction of operation infrastructure (e.g. If housing is required, it should not be located near protected area buffer zones and sensitive areas, or near any protected areas, as the inhabitants will also exert pressure on these areas).
- Plan road and transportation infrastructure to ensure that sensitive areas (protected areas, buffer zones, riparian areas, wetlands, and fragments of natural habitats) remain intact and are not exposed to traffic, increased human pressure, and invasive species.

Management:

- Utilize best management practices to mitigate regional impacts on protected areas and their supporting landscapes (e.g. integrated pest management, stream management zones, etc.).
- Ensure that management strategies prevent degradation of protected areas through indirect effects associated with the other indicators described in these guidance notes (e.g. watershed-level impacts, pollution transmission, edge effects, species migrations, and invasive species).
- Have a contingency plan to expand natural buffer zones around protected areas if monitoring of indirect effects reveals that protected areas are being impacted.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of impacts on protected areas (impacts may change due to site expansion, changes in crop management, etc.).
- Confirm that operation monitoring includes a reassessment of protected areas in the region, as boundaries may change and new protected areas may be established over time.
- Assess potential impacts as part of a detailed biodiversity assessment.

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT

1. United Nations Environment Program World Database on Protected Areas (WDPA)

<http://protectedplanet.net/>

Data on existing protected areas and internationally important areas can be obtained from WDPA, but national ministries may have more accurate or current information on existing protected areas, as well as information on planned or proposed protected areas.

2. World Bank Natural Habitats Operational Policy

<http://go.worldbank.org/GIFQKJA130>

Policy prohibits bank support for projects which would lead to the significant loss or degradation of any 'Critical Natural Habitats' that are legally protected, officially proposed for protection, or unprotected but of known high conservation value.

3. UNESCO World Heritage Sites

<http://whc.unesco.org/en/list>

Cultural and natural heritage sites around the world considered to be of outstanding value to humanity as defined by United Nations Educational, Scientific, and Cultural Organization (UNESCO) convention. These sites are also included in the WDPA, though the UNESCO WHS database may be more up-to-date for these sites.

4. RAMSAR Wetlands Site Database

<http://ramsar.wetlands.org/>

RAMSAR Wetland convention created an intergovernmental treaty that embodies the commitments of its member countries to maintain the ecological character of their Wetlands of International Importance and to plan for the "wise use", or sustainable use, of all of the wetlands in their territories. These sites are also included in the WDPA, though the UNESCO WHS database may be more up-to-date for these sites.

5. USGS National Gap Analysis Program – Protected Areas Data Portal

<http://ramsar.wetlands.org/>

National geodatabase for protected areas in the continental United States.

6. The Integrated Biodiversity Assessment Tool (IBAT)

<https://www.ibatforbusiness.org/login>

Identifies key biodiversity areas from databases maintained by the World Biodiversity Database, Birdlife International, UNEP World Conservation Monitoring Center, and Conservation International as well as Protected Areas from the World Database of Protected Areas.

7. National and Local Jurisdiction Databases

These are probably the best source of protected area data and should always be checked in the region where site selection is occurring.

RETURN TO INITIAL SCREENING QUESTIONS

HIGH CONSERVATION VALUE AREAS (HCV)

Initial Screening Question: Do critical ecosystems or High Conservation Value habitats (HCV) exist in the region proposed for crop production and could they be negatively impacted by fiber crop development?



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IMPORTANCE

High Conservation Value (HCV) areas are defined as natural habitats where values are considered to be of outstanding significance or critical importance. The HCV concept was originally developed by the Forest Stewardship Council (FSC) to help define forest areas of outstanding and critical importance – High Conservation Value Forests (HCVF) – for use in forest management certification.

A High Conservation Value area is simply the area (e.g. forest, grassland, watershed, or landscape-level ecosystem) where these values are found, or, more precisely, the area that needs to be appropriately managed in order to maintain or enhance the identified values. Identifying the areas where these values occur is therefore the essential first step in developing appropriate management for them.

HCV areas are defined as follows:

- HCV1: areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g., endemism, endangered species)
- HCV2: areas containing globally, regionally or nationally significant large landscape natural habitats, contained within, or containing, the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.
- HCV3: areas that are in or contain rare, threatened or endangered ecosystems.
- HCV4: areas that provide basic services of nature in critical situations (e.g., watershed protection, erosion control).
- HCV5: areas fundamental to meeting basic needs of local communities (e.g., subsistence, health).
- HCV6: areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in co-operation with such local communities)."

<http://www.hcvnetwork.org/about-hcvf/the-six-high-conservation-values>

ADDITIONAL SCREENING QUESTIONS

1. Was the operation site selected after a regional HCV assessment to minimize potential impacts to HCV areas?

- 2. Have all six types of HCV habitats been identified nearby the operation? See additional resources # 1-3 to identify HCV habitats**

- 3. Were relevant stakeholders engaged in the process to identify HCV4-6? Including local and/or indigenous communities and minorities or traditionally marginalized groups (e.g. women)**

- 4. Will HCV areas nearby the operation be adequately buffered and protected?**

- 5. Will natural wetlands or peat lands be protected from operation activities and not drained?**

GENERAL GUIDANCE TO MITIGATE RISK

Under no circumstances should managers accept development of any operation within a prescribed buffer zone or production coming from a high conservation value area. HCV assessments should occur on two levels: the regional level to inform site selection and the local level once sites have been selected to mitigate management impacts. Managers should begin by utilizing the HCV Toolkits to assess the conservation values of potential sites and surrounding areas. If an operation is in close proximity to a high conservation value area, local management should exert its influence with the local community and any potential outgrowers so that the areas will remain in place and viable. Managers must also be able to prevent or minimize indirect impacts to high conservation value areas, including those in a shared watershed.

Design:

- At the landscape or watershed scale, identify high conservation value areas using the HCV Toolkits.
- Select operation sites after regional HCV identification to mitigate potential impacts to these areas. Do not propose sites in HCV areas.
- After operation sites have been identified, conduct a second more-detailed HCV assessment of local and neighboring HCV areas to mitigate impacts to these habitats.
- Retain or establish a natural buffer zone around the operation that includes protection for riparian zones and preferentially utilizes natural vegetation.
- Carefully consider placement and construction of operation infrastructure (e.g. If housing is required, it should not be located near protected area buffer zones and sensitive areas, nor near any protected areas, as the inhabitants will also exert pressure on these areas).
- Plan road and transportation infrastructure to ensure that sensitive areas (protected areas, buffer zones, riparian areas, wetlands, and fragments of natural habitats) remain intact and are not exposed to traffic, increased human pressure, and invasive species.
- Retain natural wetlands or peat lands in unchanged conditions without draining.

Management:

- Utilize best management practices to mitigate regional impacts on HCV areas (e.g. integrated pest management).
- Ensure that management strategies prevent degradation of HCV areas through indirect effects associated with the other indicators described in these guidance notes (e.g. watershed-level impacts, pollution transmission, and invasive species).
- Have a contingency plan to expand buffer zones if monitoring of indirect effects reveals that HCV areas are being impacted.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of impacts on HCV areas (impacts may change due to site expansion, changes in crop management, etc.).
- Confirm that operation monitoring includes a reassessment of HCV areas in the region, as boundaries may change and new HCV areas may be established over time.
- Assess potential impacts as part of a detailed biodiversity assessment.

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT

1. The High Conservation Value Resource Network

<http://www.hcvnetwork.org/>

The High Conservation Value (HCV) approach is a tool for responsible land management and sourcing. The Resource Network is a member-based organization that promotes the approach, ensures consistency in the application of the approach, and provides a forum for communication across stakeholders.

2. HCV Toolkit

<http://www.hcvnetwork.org/practical-support/the-hcv-toolkit-global-home>

The Global Toolkit was developed by ProForest for the WWF-Ikea Cooperation on Forest Projects and provides guidance on HCV definitions and the development of HCV National Interpretations. The toolkit focuses on how to manage and monitor HCV areas.

3. HCV Resource Network Common Guidance on HCV Identification

http://www.hcvnetwork.org/resources/folder.2006-09-29.6584228415/2013_cgidentification_highres

The guidance paper reviews best practices for identifying HCV habitats. It provides instruction on how to assess each of the six habitat types along with case studies that include sample indicators.

RETURN TO INITIAL SCREENING QUESTIONS

LANDSCAPE SCALE BIODIVERSITY

Initial Screening Question: Will the production of the fiber crop potentially negatively impact biodiversity at the landscape scale? (e.g., Changes resulting from habitat loss or degradation, impeding dispersal or migration, producing competition with native species or acting as hosts to competitors, etc.)



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IMPORTANCE

While land conversion has clear and direct risks to biodiversity on site, feedstock production may also threaten species and habitats in the surrounding area. Each site is a small important piece connected to the larger ecosystem, watershed, or landscape and can be critical to the perpetuation of wildlife populations.

Mismanaging development of an area may imperil a population of species, impact whole communities, or disrupt whole ecosystem processes. These impacts can be multiplied if other development projects are occurring in the area or if the operation will result in major changes to habitat connectivity. It is necessary to identify any protected areas, species of special concern, high conservation value, and additional priority places for biodiversity conservation to assess indirect landscape impacts.

ADDITIONAL SCREENING QUESTIONS

Priority Areas:

1. Will the operation negatively affect (directly or indirectly) any areas that are identified as priorities for biodiversity conservation, such as those identified through landscape-scale conservation value mapping?

2. Will the operation indirectly affect terrestrial biodiversity by creating or improving human access to areas that were previously inaccessible or especially remote?

3. Will the proposed operation affect aquatic biodiversity by connecting, disconnecting, or otherwise impacting previously unconnected drainage networks?

4. Will the operation displace or facilitate human activity in other areas in the larger landscape/ watershed where there may be areas defined as biodiversity priority areas?

5. Will nearby aquatic habitats nearby be adequately buffered and protected from agricultural activities?

Management Plan:

6. Has a management plan for biodiversity management at all levels been created to reduce and avoid adverse effects? *These will include species, habitat, ecosystem, landscape, and watershed levels*

Disturbance Regimes:

7. Will development of the site disrupt natural large scale disturbance regimes important for the integrity of the landscape and biodiversity of the ecosystem? *Consider flooding, fire, etc.*

Downstream Effects:

8. Will terrestrial or aquatic habitat conversion negatively impact downstream species and ecosystems?

Food Chain:

9. Will the development of the site disrupt the food web of the region's ecosystem?

Predator Pressure:

10. Will development of the site fragment the landscape in a way that threatens to reduce biodiversity through heightened predator pressure or disease introduction?

Invasive Introduction:

11. Will any non-native species or genetically modified organisms be introduced in the area because of the operation?

Water Abstraction:

12. Will the operation potentially affect any downstream ecosystems through water abstraction?

Habitat:

13. Does your crop land provide habitat for native fauna that may temporarily use the site or live in close proximity? Ex. Pollinators, birds, aquatic species in the watershed, etc.

Breeding Habitat:

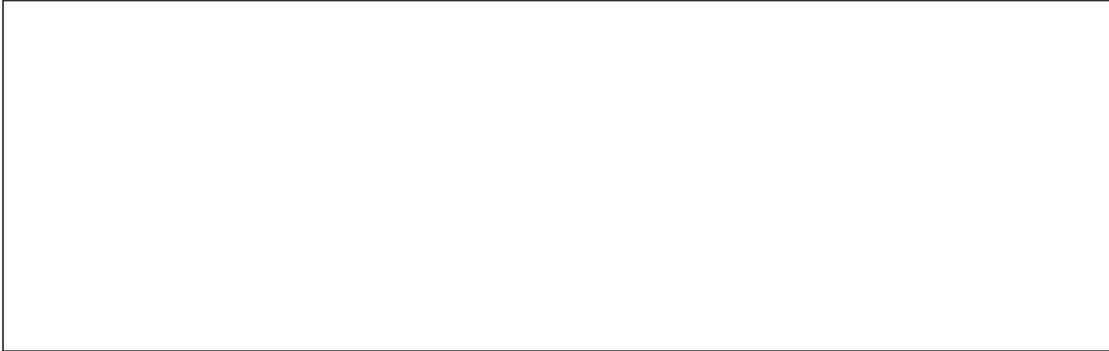
14. Will significant breeding habitat be degraded (by any of the above direct issues) or lost due to development of the site?

Migratory Pathways:

15. Will the operation negatively impact (by any of the above direct issues) the migratory pathways of any species of special concern?

Edge Effects:

16. Will the operation produce edge effects to impact vegetation and/or species habitat use adjacent to the production area? Consider increased light impacts



GENERAL GUIDANCE TO MITIGATE RISK

Under no circumstances should managers accept practices that threaten landscape scale biodiversity including practices that result from improved transportation infrastructure to and from the production area (e.g. bushmeat hunting, resource harvesting). Managers must be able to prevent or minimize indirect impacts to landscape scale biodiversity, including impacts to species in a shared watershed. Local management should exert its influence with the local community and any potential outgrowers to minimize impacts on landscape scale biodiversity. Additionally, managers should aspire to protect and restore biodiversity wherever possible as part of a regional land use plan.

Design:

- Do not select sites in areas that will impact species populations, ecosystems, or ecosystem (pollination, migration, etc.) and evolutionary processes (genetic diversity, dispersal for breeding, etc.) in the landscape.
- Retain or establish a natural buffer zone around the operation that includes protection for riparian zones and preferentially utilizes natural vegetation.
- Carefully consider placement and construction of operation infrastructure (e.g. If housing is required, it should not be located near protected area buffer zones and sensitive areas, or near any protected areas, as the inhabitants will also exert pressure on these areas).
- Plan road and transportation infrastructure to ensure that sensitive areas (protected areas, buffer zones, riparian areas, wetlands, and fragments of natural habitats) remain intact and are not exposed to traffic, increased human pressure, and invasive species.
- Support local communities with the design of measures to avoid human-wildlife conflict brought about from encroachment near natural habitats (e.g. improved domestic animal housing, early warning systems for animals approaching crop fields).

Management:

- Utilize best management practices to mitigate regional impacts to landscape scale biodiversity (e.g. integrated pest management).
- Ensure that management strategies prevent impacts to landscape scale biodiversity through indirect effects associated with the other indicators described in these guidance notes (e.g. watershed-level impacts, pollution transmission, and invasive species).
- Have a contingency plan to expand operation buffer zones if monitoring of indirect effects reveals that landscape scale biodiversity is being impacted.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of impacts on landscape scale biodiversity (impacts may change due to site expansion, changes in crop management, etc.).
- Confirm that operation monitoring includes a reassessment of landscape scale biodiversity at the regional level, as changes after the initial biodiversity assessment may occur.

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT

1. WWF Smart Infrastructure Planner

<http://worldwildlife.org/publications/smart-infrastructure-planner-beta>

The Smart Infrastructure Planner (SIP) is a GIS toolkit that allows GIS practitioners to evaluate the compatibility of proposed infrastructure and land use developments with essential requirements for the conservation of wildlife and their habitat in a landscape context.

2. Systematic Conservation Planning for Ecoregions

<http://www.conservationgateway.org/ConservationPlanning/SettingPriorities/EcoregionalAssessment/Pages/ecoregional-assessment.aspx>

This is a process used to identify areas in a landscape of high ecological importance. The Nature Conservancy hosts an Ecoregional Assessment online that has information for many regions already available. If information isn't available, systematic conservation planning should occur based on the status of biodiversity, habitat condition, threats, and socio-political conditions in collaboration with local conservation groups or universities.

3. Biodiversity Risk & Opportunity Assessment (BROA)

<http://www.wbcscd.org/eco4biz2013.aspx>

Identify impacts of business operations on biodiversity from a landscape approach, prioritize risks, and produce action and monitoring plans. Described in the Eco4Biz report (see below).

4. Business and Biodiversity Offsets Program (BBOP)

<http://www.wbcscd.org/eco4biz2013.aspx>

Developed by Forest Trends and the Wildlife Conservation Society as a set of principles, guidance, and a standard for best practice biodiversity offsets. Described in the Eco4Biz report (see below).

5. The Integrated Biodiversity Assessment Tool (IBAT)

<https://www.ibatforbusiness.org/login>

Identifies key biodiversity areas from databases maintained by the World Biodiversity Database, Birdlife International, UNEP World Conservation Monitoring Center, and Conservation International as well as Protected Areas from the World Database of Protected Areas.

6. Wallace Initiative

<http://wallaceinitiative.org/>

This map includes global data on species distributions that can be overlaid with data from current and future climate scenarios.

7. Eco4Biz WBCSD Report

<http://www.wbcscd.org/eco4biz2013.aspx>

Refer to this report as a source for additional tools.

RETURN TO INITIAL SCREENING QUESTIONS

SITE-LEVEL BIODIVERSITY

Initial Screening Question: Will the production of the fiber crop negatively impact biodiversity in the operation site?



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IMPORTANCE

Site-level biodiversity contributes to landscape scale biodiversity, but is distinctly defined as species that spend the majority of their time within the operation site for the purposes of this methodology. In some cases, such as if the site serves as an important migratory corridor, mimicking natural habitat structures with species in the site can be integral to the survival of largely external species' populations.

Changes to land cover and management activities pose direct threats to site-level biodiversity. As each site is an important piece connected to the larger ecosystem, watershed, and landscape, site-level impacts can quickly multiply in a multiple-land-use matrix. While changes in management practices will have direct impacts on site-level biodiversity, it is still possible for operations to provide valuable habitat for local biodiversity. Species of plants, invertebrates (pollinators or other insects), birds, mammals, reptiles and amphibians, fish, or microorganisms including soil biota can occupy the operation site.

Agricultural Biodiversity: According to the Food and Agriculture Organization of the United Nations, agricultural biodiversity includes 'the variety and variability of ecosystems, animals, plants, and microorganisms, at the genetic, species, and ecosystem levels, which are necessary to sustain human life as well as the key functions of ecosystems'. The perpetuation of agricultural biodiversity is necessary to ensure the resilience of agricultural systems and provide access to food resources for local and/or indigenous people. Given the risks posed by food insecurity (see additional guidance on food security) and the potential for climate change and other uncertainties to threaten agricultural biodiversity, maintaining this diversity is vital to safeguard productive ecosystems.

Agroforestry: Biodiversity is fostered by agro-ecosystems that are rich in plant diversity and incorporate a complex forest structure. Plantations that maintain a semblance of the natural vegetation structure can be better at avoiding biodiversity loss. Systems with a complex structure are also more resilient to pests, disease, extreme weather events, and can incorporate income diversification to protect against volatile economic conditions. Agroforestry, the intentional integration of trees or shrubs into crop systems, can provide these benefits.

ADDITIONAL SCREENING QUESTIONS

- 1. Does the site represent a high level of irreplaceability in the landscape?** *Sites are irreplaceable because they are needed to attain an explicit conservation goal; a site can be irreplaceable because it is a rare or easily damaged habitat type (e.g. peat lands, wetlands, riparian areas), or because populations of a species of concern use that locality for a substantial or critical part of their lifecycle*

- 2. Has the operation selected best management practices to minimize impacts on site level biodiversity, including agricultural biodiversity?** *See description of agricultural biodiversity above*

- 3. Does the operation mimic the natural vegetation structure of the community wherever possible?** *Is not limited to stand diversity, and can include agroforestry or niche diversification*

GENERAL GUIDANCE TO MITIGATE RISK

As the continued prevalence of site-level biodiversity is dependent on changes to land cover and management practices, refer to the additional guidance notes on Land Use Change, Pesticide Use, Fertilizer Use, Waste Management, and Water Use for guidance on best practices.

Design:

- Maintain or mimic the natural vegetation structure whenever possible (e.g. utilize agroforestry or create heterogeneous landscapes).
- Protect riparian zones in or around the site and preferentially utilize natural vegetation to restore fragile areas.
- Carefully consider placement and construction of operation infrastructure to minimize impacts to sensitive areas (riparian areas, wetlands, fragments of natural habitats).
- Plan road and transportation infrastructure to ensure that sensitive areas (riparian areas, wetlands, and fragments of natural habitats) are exposed to minimal human pressure.

Management:

- Utilize best management practices to mitigate impacts to site-level biodiversity (e.g. integrated pest management).
- Ensure that management strategies prevent impacts to site-level biodiversity through indirect effects associated with the other indicators described in these guidance notes (e.g. pollution and invasive species).

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of impacts on site-level biodiversity (impacts may change due to site expansion, changes in crop management, etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT

1. WWF Smart Infrastructure Planner

<http://worldwildlife.org/publications/smart-infrastructure-planner-beta>

The Smart Infrastructure Planner (SIP) is a GIS toolkit that allows GIS practitioners to evaluate the compatibility of proposed infrastructure and land use developments with essential requirements for the conservation of wildlife and their habitat in a landscape context.

2. InVEST – Habitat Quality: Biodiversity

http://www.naturalcapitalproject.org/models/habitat_quality.html

Combine information on land use and land use change with other threats to model the extent and degradation of different habitat types along with the status of biodiversity.

3. FAO Overview of Agricultural Biodiversity

<http://www.fao.org/agriculture/crops/thematic-sitemap/theme/compendium/tools-guidelines/what-is-agricultural-biodiversity/en/>

Overview of the definition of agricultural biodiversity with links to management strategies.

4. USDA Agroforestry Farming Systems

<http://www.usda.gov/wps/portal/usda/usdahome?contentidonly=true&contentid=agroforestry.html>

Factsheet on the definition of agroforestry in the U.S. and descriptions of different farming systems.

RETURN TO INITIAL SCREENING QUESTIONS

SPECIES OF CONCERN

Initial Screening Question: Do any species of special concern utilize the site or are endemic to the region at any phase of their life cycle and will the production of the fiber crop negatively impact these species at any point in their life cycle? (e.g. Endangered species on national or the IUCN red list of endangered species.)



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IMPORTANCE

Production should not negatively impact (directly or indirectly) the perpetuation of populations of any species of special concern. Species of concern can be identified by the databases listed in the external resources (IUCN red list, CITES list, etc.). On the IUCN red list, species that are listed as critically endangered, endangered, or vulnerable are of particular concern. It is also important to note that countries, and sometimes jurisdictions within countries, often list their own species of special concern.

Production may threaten specific species and their habitats through direct and indirect pathways. Direct impacts may occur if a species inhabits the operation site, if the site is located in its migration or dispersal pathway, or if the area is used for reproduction. Additionally, species of concern occurring in close proximity to the operation site may be at indirect risk from threats emanating from the site.

The operation may exploit the species itself, the resources a species depends on, or the environmental processes a species needs to survive. Edge effects, created by development of an operation site adjacent to natural habitat, can affect habitat quality, while other production activities may introduce species that can change habitat function or outcompete species of concern. Downstream aquatic species of concern may be affected if an operation alters hydrology or water quality (through erosion and sediment load), or introduces agrochemical pollution (See the additional guidance notes on water quality and water quantity). Indirect effects can also occur if activities currently in the operation area are displaced elsewhere. (e.g. food production, resource harvesting, cultural activities). Displaced activities can inadvertently put pressure on habitats important to species of concern even if the operation intentionally left these sites undeveloped.

ADDITIONAL SCREENING QUESTIONS

Direct & Indirect Impacts:

1. Do any species of special concern use the operation site or adjacent areas? If unknown, is there a possibility that species of concern use the habitat under consideration for development? If so, answer the following . . . See additional resources # 2,3,4, and 6 to identify species of concern

Physical Refuge:

- a. Will development of the site result in habitat conversion or fragmentation resulting in a major loss of physical refuge for any species of special concern?

Disturbance Regimes:

- b. Will development of the site disrupt natural disturbance regimes that species of special concern rely on? Consider flooding, fire, etc.

Food Chain:

- c. Will the development of the site result in a major loss of basic ecological processes that support the food chain of species of special concern?

Predator Pressure:

- d. Will development of the site fragment the landscape in a way that exposes any species of special concern to heightened predator pressure or disease introduction?

Invasive Introduction:

- e. Could any non-native species or genetically modified organisms known to harm the species of concern or their habitat be introduced in the area because of the operation?

Water Abstraction:

- f. Will the operation potentially affect any species of special concern through water abstraction?

Nocturnal Species:

- g. Will species of concern be negatively impacted through operation development or operation such as night production effect on nocturnal species?

Breeding Habitat:

- h. Will significant breeding habitat be degraded (by any of the above direct issues) or lost due to development of the site?

Migratory Pathways:

- i. Will the operation negatively impact (by any of the above direct issues) the migratory pathways of any species of special concern?

Edge Effects:

- j. Could edge effects caused by the operation lead to direct loss or deterioration of habitat required by the species of concern?

Human Presence:

- k. **Could noise or light pollution at the operation site impact use of adjacent habitat by the species of concern?**

Downstream Effects:

- l. **Will habitat conversion negatively impact (by any of the above direct issues) any species of special concern, especially aquatic species, downstream?**

Regional Populations:

- m. **Will any of the above issues negatively affect the genetic diversity of metapopulations of species of concern by impacting connectivity or dispersal?**

GENERAL GUIDANCE TO MITIGATE RISK

Under no circumstances should managers accept development of practices that threaten species of concern, including those resulting from improved transportation infrastructure (e.g. bushmeat hunting, resource harvesting). If an operation is in close proximity to species of concern, local management should exert its influence with the community and any potential outgrowers to minimize impacts on these species. Managers must be able to prevent or minimize indirect impacts to species of concern that are part of the landscape matrix or share a watershed with the production site.

Design:

- Select the operation site so that it does not impact the persistence of species of concern in the landscape in any way.
- Retain or establish a natural buffer zone around the operation that includes protection for riparian zones and preferentially utilizes natural vegetation.
- Carefully consider placement and construction of operation infrastructure (e.g. If housing is required, it should not be located near operation buffer zones and sensitive areas, nor near any protected areas, as the inhabitants will also exert pressure on these areas).
- Plan road and transportation infrastructure to ensure that sensitive areas (protected areas, buffer zones, riparian areas, wetlands, and fragments of natural habitats) remain intact and are not exposed to traffic, increased human pressure, and invasive species.

Management:

- Utilize best management practices to mitigate regional impacts to species of concern (e.g. integrated pest management).
- Ensure that management strategies prevent impacts to species of concern through indirect effects associated with the other indicators described in these guidance notes (e.g. watershed-level impacts, pollution transmission, and invasive species).
- Have a contingency plan to expand buffer zones if monitoring of indirect effects reveals that species of concern are being impacted.
- Take measures against illegal or inappropriate hunting, fishing, or collecting of species of concern or their dependencies.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of impacts on species of concern in the broader landscape (impacts may change due to site expansion, changes in crop management, etc.).
- Confirm that operation monitoring includes a reassessment of species of concern in the region, as changes in status of the initial species of concern as well as other species may occur.
- Assess potential impacts as part of a detailed biodiversity assessment.

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT

1. The Integrated Biodiversity Assessment Tool (IBAT)

<https://www.ibatforbusiness.org/login>

Identifies key biodiversity areas from databases maintained by the World Biodiversity Database, Birdlife International, UNEP World Conservation Monitoring Center, and Conservation International as well as Protected Areas from the World Database of Protected Areas.

2. IUCN Red List

<http://www.redlist.org>

International Union for Conservation of Nature and Natural Resources list of globally threatened species. Additionally national and local lists of species of concern and local endemics should be consulted - these can often be found in the country or jurisdiction of interest's ministry of environment or equivalent.

3. CITES List

<http://www.cites.org/>

The Convention on International Trade in Endangered Species of Wild Fauna and Flora database includes species that are protected under CITES legislation because of population declines from overexploitation in international trade.

4. U.S. FWS Endangered Species List

<http://www.fws.gov/endangered/>

Database of species protected under the U.S. Endangered Species Act. This protection is not limited to species native to the United States.

5. Convention on Migratory Species

<http://www.cms.int/>

An intergovernmental treaty concluded under UNEP specializing in the conservation of migratory species, their habitats and migration routes.

6. Alliance for Zero Extinction Database

<http://www.zeroextinction.org/>

Database of endangered species and their associated habitats. This list includes habitats that are the single remaining refuge for species that will become extinct if that habitat is destroyed.

RETURN TO INITIAL SCREENING QUESTIONS

INVASIVENESS

Initial Screening Question: Is the proposed fiber crop new to the region, known to be invasive, has the potential to host invasive species, or has the potential to spread to unwanted regions?



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IMPORTANCE

Invasive species can have severe negative impacts on local biodiversity, scenic beauty and livelihoods. These species have the potential to displace native species, alter native habitats, change ecosystem productivity, change soil composition, and even cause local extinctions. Native species are frequently unprepared to deal with invasive species that can outcompete them for resources and, oftentimes, spread rapidly in the absence of local predators or other control mechanisms.

These environmental impacts of invasive species can also have negative implications for local people who depend on natural resources for their livelihoods. Once an invasive species has become established it can be exorbitantly expensive or even impossible to remove. The best strategy for management is to prevent the spread of invasive species before they can become a problem.

Fortunately, it is possible to mitigate much of the risk associated with crop invasiveness from many alternative natural fibers by implementing best management practices and continually monitoring potentially invasive species. Even if a species is native to a region, it is still important to take these management steps to reduce the risk of unwanted spread.

ADDITIONAL SCREENING QUESTIONS

- 1. Will the operation require the introduction of non-native species either as a crop, cover crop, or beneficial organism?**

2. **Are there life-history traits of the selected crop that would make it prone to expansion?** *Ex: Rapid reproduction, long-lived seed banks, lack of predators or pests, wide habitat tolerance, etc.*

3. **Does the introduction of this species present any concerns regarding the ability of this species to propagate to the detriment of local biodiversity?**

4. **Does this crop have the potential to act as a host for invasive species?** *Ex: Commensalists or parasites*

5. **Will the operation increase access and/or activity, to areas that were previously inaccessible or lacking infrastructure?** *Ex: Build roads, trains, facilitate movement on river networks*

6. Will the operation require the use of genetically modified organisms (GMOs), which could invade neighboring lands and cause any of the impacts listed below?

- **Reduced landscape-level diversity**
- **Asexual transfer of antibiotic resistance genes to micro-organisms**
- **Spread of herbicide resistance genes**
- **Increased resistance of target pests/enemies of target pests**
- **Changes to crop structural integrity**
- **Dispersal of transgenes to wild or weed populations**
- **Reduced biodiversity of organisms dependent on flowers and fruits**
- **Reduced adaptability to environmental stress and/or changes to interactions with other organisms**
- **Contamination of other crops during transport or transformation**

GMO definition: organism in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination (see additional resource #2)

GENERAL GUIDANCE TO MITIGATE RISK

Precautions should be taken if production of the crop requires the introduction of non-native species, either as crop, cover crop, or beneficial organism. A comprehensive risk assessment needs to be carried out if the introduction of any species could spread and impact local and native biodiversity (see the Weed Risk Assessment Tool below). As assessments for invasive species are known to garner different results, multiple risk assessments should be utilized and the results averaged. Local alternatives should be fully evaluated prior to any introductions and relevant local and international authorities should be consulted. Managers must also be able to prevent or minimize indirect impacts to local species and habitats, including those species in a shared watershed.

Design:

- Apply the precautionary principle to crop selection.
- Do not plant crops that carry a significant risk of invasiveness or act as hosts to non-native species that would affect the native biota of the region if risks cannot be managed.
- Retain or establish a buffer zone around the operation, include protections to minimize the spread of invasive or other unwanted species by waterways.
- Plan road and transportation infrastructure to mitigate the risk of development assisting in the propagation of invasive or other unwanted species, as well as contamination of other commodities during transport.

Management:

- Utilize best management practices to mitigate regional impacts from invasive or unwanted species (e.g. physical barriers, pruning).
- Have a contingency plan to expand buffer zones if monitoring of invasive or unwanted species reveals

that surrounding species and habitats are being impacted, or to eradicate production of the crop altogether if the risk becomes significant.

- Have a contingency plan to minimize the spread of a potentially invasive or unwanted crop after a disturbance event (e.g. severe weather, fire).

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of invasive or unwanted species impacts (impacts may change due to site expansion, changes in crop management, etc.).
- Confirm that operation monitoring includes species-specific strategies to minimize risk of expansion and actions to take if a crop or organism facilitated by land-use change spreads to neighboring areas.

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT

1. FAO International Plant Protection Convention

<https://www.ippc.int/>

Guidelines for risk assessments for plants as well as for beneficial organisms in order to evaluate the risks for invasive species.

2. WWF Position Statement on Genetically Modified Organisms

http://awsassets.panda.org/downloads/wwf_position_statement_on_gmos_december_2012.pdf

WWF International position on the use of GMOs. WWF does not promote or endorse the use of GMOs; applies a precautionary approach to the introduction of GMOs; and advocates the retention of non-GMO options for all relevant commodities.

3. The Nature Conservancy Invasive Plant Management Decision Analysis Tool

http://www.imapinvasives.org/IPMDAT_v1.1_06-30-11.pdf

Tool to identify if an invasive plant management strategy is likely to be effective.

4. Weed Risk Assessment Tool

<http://www.hear.org/wra/tncflwra/>

Developed originally as the Australia/New Zealand Weed Risk Assessment model, this tool was later applied to Florida by The Nature Conservancy. Assessments for the invasibility of 274 crops in Florida conditions can be found at the site. Managers can conduct weed assessments specific to a location by applying the questionnaire to a crops of interest. This assessment is one tool to assess the invasive potential of a crop. Its results should be averaged against those of other tools as they are known to give variable results.

5. Global Invasive Species Database

<http://www.issg.org/database/welcome/>

A list of invasive species by country that is managed by the Invasive Species Specialist Group of the IUCN. This list should not preclude research into the local invasiveness of an individual crop.

6. CAB International

<http://www.cabi.org/isc/>

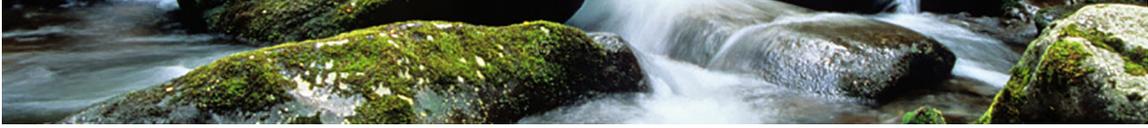
Invasive species encyclopedia with datasheets for over 1,500 species. Also includes information sorted by country.

RETURN TO INITIAL SCREENING QUESTIONS

ENVIRONMENTAL CONSIDERATIONS: IMPACTS

ECOSYSTEM SERVICES

Initial Screening Question: Will the production of this fiber crop potentially negatively impact local or regional ecosystem services? (e.g., carbon storage, water quality or availability, aesthetic value, tourism value, etc.)



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IMPORTANCE

Human beings benefit from multi-dimensional resources that are supplied by nature. Nature provides society with ecosystem services such as water and air purification, pest and disease control, primary food production and cultural and spiritual inspiration. Cultivating alternative sources of fiber may interrupt an ecosystem's self-regulatory process and even disrupt natural ecosystem function. For example, the demand for water from fiber crops may pose threats to other species in that ecosystem and cause degraded living conditions, migration, or even the extinction of those species. Similarly, pesticides may cause damage to other species populations.

Although producing alternative sources of fiber may impair some ecosystem services, production can benefit other ecosystem services. Balancing the potential threats and impacts to ecosystem services is vital when making decisions about fiber production (e.g. bamboo providing soil stability in riparian areas or sequestering carbon). Quantitative tools and methods will be required to assess the full impact of feedstocks on ecosystem services. See the additional resources for many tools to assess ecosystem services.

ADDITIONAL SCREENING QUESTIONS

1. **Will the proposed crop displace natural perennial vegetation?** *Generally, any shift of native perennial vegetation to an exotic monoculture results in substantial loss in ecosystem services*

2. **Will the proposed crop be a perennial or an annual variety?** *Generally, perennial crops have less of a negative impact on ecosystem services than annual monocultures*

- 3. What are the direct and indirect ecosystem services currently provided by this area?** *Ex: Water yield, water quality, soil retention, carbon storage in vegetation and soil, air quality, food, fuel, fiber production, pest regulation, disease regulation, persistence of pollinators, recreation (hunting and fishing, wildlife viewing) and associated tourism, biodiversity conservation/loss, and other cultural and aesthetic services*

- 4. Will the production of this crop disrupt access to these services or disturb the underlying ecological processes required to provide the ecosystem services identified above?**

- 5. Have relevant beneficiaries of the ecosystem services in the area been identified and engaged in order to identify their concerns?**

6. Are there existing Payment for Ecosystem Services, (PES) schemes either in the region or for the crop that are relevant and can be replicated; and/or, are there other incentivizing mechanisms that can be jointly implemented with relevant government agencies or non-profits?

GENERAL GUIDANCE TO MITIGATE RISK

Management should exert its influence with the local community and any potential outgrowers to minimize impacts on ecosystem services. Managers must also be able to prevent or minimize indirect impacts to ecosystem services, including those on a water-shed level.

Design:

- Ensure that site does not significantly impact ecosystem services to people. Use the Natural Capital Project InVEST tool and/or similar tools to map and quantify the biophysical and economic value of changes in ecosystem service provisioning.
- Identify relevant beneficiaries of potentially disrupted ecosystem services in order to discuss their concerns.
- Plan infrastructure development to ensure that negative impacts on ecosystem services of sensitive areas (buffer zones, riparian areas, protected areas, wetlands, and fragments of natural habitats) are minimized.

Management:

- Ensure that management strategies prevent impacts to ecosystem services though indirect effects associated with the other indicators described in these guidance notes (e.g. watershed-level impacts, pollution transmission, and invasive species).
- Investigate the potential role of Payment for Ecosystem Service (PES) schemes or other incentives for the community.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of impacts on ecosystem services (impacts may change due to site expansion, changes in crop management, etc.).
- Confirm that operation monitoring includes a reassessment of ecosystem services in the region, as changes in status of the initial assessment may occur.

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT

1. Eco4Biz WBCSD Report

<http://www.wbcscd.org/eco4biz2013.aspx>

Refer to this report as a source for additional tools and to complete a decision tree that identifies the ecosystem service valuation tool that is most appropriate for a given situation.

2. Natural Capital Project InVEST Tool

<http://www.naturalcapitalproject.org/>

Suite of software models to value ecosystem services that quantify results in both environmental (e.g. water flow) and social (e.g. currency) terms.

3. Corporate Ecosystem Services Review (ESR)

<http://www.wbcsd.org/eco4biz2013.aspx>

A tool for business managers to assess risk resulting from ecosystem service impacts. Described in the Eco4Biz report (see above).

4. Ecosystem Services Review in Impact Assessment (ESR for IA)

<http://www.wbcsd.org/eco4biz2013.aspx>

Identify ecosystem impacts that affect the livelihoods or well-being of local people and provide project management guidance. Described in the Eco4Biz report (see above).

5. Guide to Corporate Ecosystem Valuation (CEV)

<http://www.wbcsd.org/eco4biz2013.aspx>

How to carry out an ecosystem valuation in a corporate context. Described in the Eco4Biz report (see above).

RETURN TO INITIAL SCREENING QUESTIONS

GREENHOUSE GAS EMISSIONS

Initial Screening Question: Do the production, use, and disposal of the fiber crop result in a carbon positive (>0) footprint including biogenic emissions?



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IMPORTANCE

Crop production practices contribute to greenhouse gas (GHG) emissions. Practices such as pre-harvest burning, soil tillage, excessive nitrogen applications, fertilizer use, energy use, transportation, processing inputs, irrigation and land use change are all elements that must be considered as they impact emissions and, therefore, operation viability. Ideally the combined lifecycle impacts of an alternative fiber will be neutral or negative from a carbon standpoint. Achieving at least carbon neutrality within the scope of production is an indication of the potential for success downstream in carbon reductions.

Aside from the non-biogenic emissions that are derived from fossil fuels, biogenic emissions are particularly important in alternative fiber development. Carbon emitted from land use changes or crop management, including soil emissions, must be accounted for. These emissions should take into account the foregone growth after a land use change event and acknowledge that there will be a carbon payback period based on the selected crop management practices.

ADDITIONAL SCREENING QUESTIONS

- 1. Are the combined biogenic and abiotic (fossil) GHG emissions from production of this fiber negative, neutral or positive? See the additional resources for GHG accounting tools and consider climate, soil condition, agricultural practices, and upstream fertilizer impacts**

- 2. Were industry average data used in the GHG assessment, or data specific to the site? Assumptions can create probable over- or under-estimations**

3. **Have emissions estimations accounted for indirect land use changes (ILUC) that would result from production?** *For example, consider conversion of habitat to agricultural lands to counteract local food insecurity (see the additional guidance on land use change for more description)*

4. **Have emissions estimations accounted for transport of fibers for processing, and was transport designed to minimize emissions?**

GENERAL GUIDANCE TO MITIGATE RISK

An assessment needs to be performed by a qualified assessor to demonstrate that the operation is feasible and is carbon negative (including emissions from direct and indirect land use change). This assessment could take the form of an operation feasibility study and life cycle GHG assessment. If the GHG assessment is completed using industry average data or broad assumptions, there is an inherent risk in moving forward with the chosen crop. Industry average data can be acceptable for country of origin; however, it may not be representative of the local conditions. For non-conventional crops (i.e. those not previously grown in region or for that purpose or industrially grown), experimental or small scale data can be used instead of industrially validated peer reviewed data.

Design:

- Identify and consistently use a methodology for greenhouse gas accounting in order to ensure a dependable assessment of GHG emissions.
- Conduct an operation feasibility and GHG life cycle assessment with qualified assessors to fully document not only the economic viability of the overall operation, but also evaluate the GHG balance from both the production of the crop as well as the downstream processing, taking into account factors such as direct and indirect land conversion, agricultural inputs, energy requirements, transportation, end use, by-product use, and waste streams.
- Account for and report biogenic CO₂ uptake and emissions separately from non-biogenic uptake and emissions as per the GHG Protocol or upcoming ISO 14067 standards in a transparent and in a well-documented manner.

Management:

- Base overall product decisions on all life cycle emissions not just cradle to gate.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of GHG emissions (impacts may change due to site expansion, changes in crop management, etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT**1. World Resources Institute GHG Protocol**

<http://www.ghgprotocol.org/>

International accounting tool for governments and businesses to manage GHG emissions.

2. USDA Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory

<http://rmpportal.net/groups/csa/library-1/usda-quantifying-greenhouse-gas-fluxes-in-agriculture-and-forestry-methods-for-entity-scale-inventory/view>

Report detailing methods for quantifying changes in GHG emissions and carbon storage for land management and conservation.

3. USAID Carbon Calculator

<http://www.afolucarbon.org/>

Estimates the carbon dioxide benefits and climate impacts of agriculture, forestry, and other land use programs worldwide.

4. UNFCCC Reporting Rules

http://unfccc.int/national_reports/annex_i_ghg_inventories/reporting_requirements/items/2759.php

The United Nations standardized requirements for reporting national GHG inventories.

5. ISO 14067

http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=59521

International standard designed to increase transparency in quantifying and reporting carbon dioxide emissions over the entire lifecycle of products and services.

6. Roundtable on Sustainable Biomaterials (RSB) Greenhouse Gas Calculator

<http://rsb.org/activities-and-projects/greenhouse-gas-calculation/>

A lifecycle GHG calculator for biomaterials developed as part of the RSB certification system.

7. EPA Greenhouse Gas Reporting Program

<http://www.epa.gov/ghgreporting/>

Public database of GHG data for industries in the United States.

8. WWF Report: Assessing Risks to Forest Cover and Carbon Stocks

http://awsassets.panda.org/downloads/fin_tools_report__web_version.pdf

A systematic comparison of carbon accounting tools, and tools for identifying areas for crops that would be a low risk of deforestation.

9. Cool Farm Tool

<http://www.coolfarmtool.org/>

Free greenhouse gas calculator to measure the carbon footprint of crop and livestock products.

RETURN TO INITIAL SCREENING QUESTIONS

AIR QUALITY

Initial Screening Question: In the management of this fiber crop are air pollution emissions (outside of greenhouse gas impacts) a known problem? (e.g. from burning)



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IMPORTANCE

Air quality emissions can be divided into two areas: land preparation and pre-harvest practices. In land preparation, emissions occur if forested land or peat lands are utilized (e.g., methane emissions from raining peat bogs). These concerns were previously discussed in the Land Use Change section.

This section refers to the use of fire as part of an operational practice in harvesting or for clearing old crops or vegetation as part of a replanting process. Burning practices can act as a major source of carbon emissions and should be accounted for in a GHG analysis. It should be noted that the burning of biomass as part of an agricultural process has also been tied to public health concerns and has interrupted the use of public roads and airports.

ADDITIONAL SCREENING QUESTIONS

- 1. Will this operation use fire in land clearing or crop management that can negatively impact environmental or human health?**

- 2. Are there available alternatives to fire use in crop management or infrastructure development?**

GENERAL GUIDANCE TO MITIGATE RISK:

Managers should minimize the use of fire in pre-harvest and land clearing practices.

Design:

- Reduce the use of fire in all activities, particularly in areas with air-quality concerns (areas with a high air quality index – AQI).
- If fire is necessary, ensure that burns are planned in scope and timing to minimize air quality impacts to the local community.

Management:

- Ensure that part of the management plan includes provisions for worker training and safety in fire management and actions to take if fire is mismanaged.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of fire and its impacts on the environment and community (impacts may change due to site expansion, changes in crop management, etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT:

1. Air Now

<http://www.airnow.gov/>

Current Air Quality Index (AQI) data for the United States from the EPA. Also provides links to data sources for air quality in other nations.

2. Air Now – International

<http://www.airnow.gov/index.cfm?action=airnow.intlpartners>

Also managed by the EPA (see above), the worldwide Air Quality Index data. International data is not published directly on the website like the US data, but can be accessed by contacting the EPA.

RETURN TO INITIAL SCREENING QUESTIONS

SOIL HEALTH

Initial Screening Question: Will local soil conditions be significantly altered and negatively impacted by the production of this crop?



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IMPORTANCE

Soil Erosion: Loss of topsoil is a key threat to sustainable agriculture. Globally, soils are being lost at an alarming rate, and the loss of soil organic matter is currently one of the greatest sources of carbon emissions.

Topography: At the operation level, the topographic characteristics of the selected site can have great impacts on soil health in a number of areas, from soil erosion and agrichemical and water runoff, to mechanization of key practices, such as planting and harvesting. In some crops, a high slope prohibits the use of mechanized harvesting and makes pre-harvest burning a preferred practice despite impacts on carbon, soil health and air quality. Additionally, the downstream impacts of soil erosion and runoff can be critical on aquatic zones, transporting sediment and agrichemicals into sensitive aquatic environments.

ADDITIONAL SCREENING QUESTIONS

1. What is the current soil condition for the region in question?

2. If the operation is using a crop residue, will the removal rate cause damage to soil quality or the erosion rate?

3. **Are there best soil management practices utilized in this region for production of this crop?** *Ex: No till practices, soil amendments, frequency of soil tests, use of compost, etc.* **Answer next question only if you answered Yes to this question.**

4. **Is there a certification or standard in place that incentivizes adherence to these soil management practices?**

5. **Does the local community have access to soil best management practices and expertise for that region?** **Answer next two questions only if you answered No to this question.**

6. **Have you identified consultants or training programs that can be brought into the region to educate farmers on better soil management practices?**

- 7. Have you identified a system that can incentivize adherence to good soil management practices and reduce crop production impacts on soil health?**

- 8. Taking into consideration the climate, soil, topography and land use to produce this crop in this region, what is this potential to increase or decrease the soil health including nutrient levels?**

- 9. Taking into consideration the climate, soil, topography and land use to produce this crop in this region, what is this potential to cause erosion or soil loss?**

- 10. If the crop is a nitrogen-fixer, have impacts to soil health been considered?**

GENERAL GUIDANCE TO MITIGATE RISK:

Engage in management best practices that include soil conservation methods to limit wind and water erosion, tillage practices that retain soil nutrients, and soil amendments that minimize toxin accumulation.

Design:

- Utilize a topographical map and take topographical characteristics into consideration during site design by avoiding development on steep slopes.
- Assess erosion potential based on soil type, crop type, agricultural practices, and climatic conditions.
- Ensure that fertilizers or other chemicals are not applied at the expense of long-term soil productivity.
- Ensure that the net benefit of the new land use is not worse on soil condition than the old land use.

Management:

- Mitigate erosion and topographical issues through terracing, contour planting, sediment traps, conservation and no till sowing, buffer zones, and the use of vegetative ground covers.
- Reincorporate organic matter, crop stubble, or organic process waste to increase soil carbon.
- Create a management plan around the maintenance and improvement of soil organic content.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of impacts to soil health (impacts may change due to site expansion, changes in crop management, etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT:

1. USDA Natural Resources Conservation Service's Soil Quality/Soil Health Assessment Tools

<http://soils.usda.gov/sqi/assessment/assessment.html>

Resources and guidelines on how to assess biological, chemical, and physical soil properties.

2. FAO Visual Soil Assessment Field Guide

<http://www.fao.org/docrep/010/i0007e/i0007e00.HTM>

Soil quality assessment methodology for different crop categories.

3. Harmonized World Soil Database

<http://webarchive.iiasa.ac.at/Research/LUC/External-World-soil-database/HTML/>

FAO database with global information on organic carbon, pH, water storage capacity, soil depth, cation exchange capacity, clay fraction, total exchangeable nutrients, lime and gypsum contents, sodium exchange percentage, salinity, textural class, and granulometry.

4. InPaC-S: Participatory Knowledge Integration on Indicators of Soil Quality

<http://www.worldagroforestry.org/downloads/publications/PDFs/B17459.PDF>

A methodological guide from the World Agroforestry Centre (ICRAF), the Brazilian Agricultural Research Corporation (Embrapa), and the International Center for Tropical Agriculture (CIAT) to amalgamate local farmer analyses and scientific assessments of soil quality.

5. FAO Guidelines for Soil Description

ftp://ftp.fao.org/agl/agll/docs/guide1_soil_descr.pdf

Internationally accepted guidelines for soil description and summary of developments in soil information systems and soil classification.

RETURN TO INITIAL SCREENING QUESTIONS

WATER QUALITY

Initial Screening Question: Will agricultural runoff from fiber crop production negatively impact the quality of ground or surface water in the area?



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IMPORTANCE

Agricultural practices can intensify erosion process and increase the input of sediment, nutrients, pathogens, pesticides, metals, and salts into nearby water sources. Sedimentation that occurs when soil is washed off fields can damage sources of drinking water, block the sunlight needed by aquatic plants, and clog the gills of fish or larvae. These sediments are often attached to other damaging particles (fertilizers, pesticides, or heavy metals) that can create additional negative impacts to water quality. Pesticides in particular can poison wildlife, contaminate food sources, and destroy animal habitats.

Eutrophication: Eutrophication occurs from excess nutrient runoff and creates algal blooms that deplete oxygen from water sources. Excess nutrients in drinking water are a human health concern and, for example, can cause a fatal disease in infants known as methemoglobinemia. Agricultural runoff, leaking septic systems, sewage discharges, or eroded stream banks can cause nutrient buildup and initiate eutrophication.

Grey Water Footprint: The grey water footprint of a product is an indicator of freshwater pollution that can be associated with the production of a product over its full supply chain. It is defined as the volume of freshwater that is required to assimilate the load of pollutants based on natural background concentrations and existing ambient water quality standards. It is calculated as the volume of water that is required to dilute pollutants to such an extent that the quality of the water remains above agreed water quality standards.

ADDITIONAL SCREENING QUESTIONS

1. Is this watershed already stressed by water pollution?

2. Does this crop historically require mitigation activities due to overall negative impacts on water pollution *Ex: Eutrophication, acidification, ecotoxicity, etc.*

3. Is downstream treatment providing adequate processing to provide potable water for human consumption? *Look to World Health Organization data for presence of functioning water treatment facilities*

4. According to the Water Footprint Network, what is the grey water footprint of this crop?

GENERAL GUIDANCE TO MITIGATE RISK:

Managers should assess water needs and inventory local water resources to demonstrate that water quality needs can be met in the long term. Evaluation is critical in water-scarce regions, and water extraction should not deprive downstream users of this scarce resource nor impact biodiversity. For all water management data, managers should use the best available information including peer reviewed work. (i.e. WFN data or best resource peer reviewed at a more granular level (journal articles for specific crops in specific regions).

Design:

- Mitigate risk by assessing operations with the Water Risk Filter and implementing the AWS Water Stewardship Standard (linked below).
- Evaluate water quality to ensure the water is not contaminated and is of sufficient quality for crop needs.
- Create buffer zones to minimize contamination risk and soil erosion impacts.

Management:

- Monitor aquifers and natural bodies of water to ensure that water quality is not being compromised.
- Evaluate discharge water from any onsite processing facilities to monitor impacts, ensure compliance with national legal standards, and compliance with the World Bank Pollution and Abatement Handbook.
- Control erosion by limiting harvest along stream buffers, and by using native species to restore unstable riparian areas.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of impacts to water quality (impacts may change due to site expansion, changes in crop management, etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT:**1. Water Risk Filter**

<http://waterriskfilter.panda.org/MitigationTools.aspx>

Tool to assess water risks for any industry and country. It can be used annually to monitor risk changes.

2. AWS Water Stewardship Standard

<http://www.allianceforwaterstewardship.org/>

Use the standard to identify strategies to mitigate risks after identifying them with the Water Risk Filter. The standard is ISEAL-compliant and can be applied internationally to mitigate water risks, address water challenges on a catchment level, and employ responsible stewardship techniques.

3. Water Footprint Network

<http://www.waterfootprint.org/?page=files/home>

Platform to link organizations interested in understanding and managing their water footprint. The organization provides free information access and toolkits.

4. Water Footprint Network Water Scarcity Maps

<http://www.waterfootprint.org/?page=files/WaterStat-WaterScarcity>

Global map of monthly blue water scarcity for the world's major river basins with data from 1996 to 2005.

5. Water4Biz WBCSD Report

<http://www.wbcd.org/work-program/sector-projects/water/water4biz.aspx>

Refer to this report as a source for additional resources and to complete a decision tree that identifies the tool that is most appropriate for a given situation.

RETURN TO INITIAL SCREENING QUESTIONS

SOCIAL & POLITICAL CONSIDERATIONS

LEGAL COMPLIANCE

Initial Screening Question: Does the production of this fiber crop infringe upon any local, regional, or national laws? e.g., is it illegal to grow, sell, or export this fiber crop



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IMPORTANCE

Cultivating crops as an alternative fiber source requires land and labor which may pose legal issues. If the land is not legally designated for use as agricultural land, it is not compliant with local zoning laws. In addition, because of the urbanization progress of many developing countries and regions, the intended agricultural land may not comply with the current and future land use plans for that given area.

Potential legality issues in regards to labor practices also need to be taken into consideration when planning to acquire or utilize land for feedstock crops. Issues in sourcing, minority rights, and appropriate resettlement and economic displacement policies exist in many countries, especially developing countries where a large amount of feedstock crops and commodities come from.

ADDITIONAL SCREENING QUESTIONS

1. Is production compliant with international, national, and local laws regarding zoning and land use plans?

2. Is production compliant with international and local laws, regarding water, air, and soil emissions?

3. **Is production compliant with the World Bank resettlement and economic displacement policies, including Operational Policy on Indigenous People 4.10 and Involuntary Resettlement 4.12? See additional resources # 2 and 3 for the policies**

4. **Is local governance of production in accordance with Minority Rights in International Law? See additional resource # 4**

5. **Do you have internal company processes in place to address future changes in the legal and regulatory landscape and a mechanism to audit the supplier to ensure continued compliance?**

GENERAL GUIDANCE TO MITIGATE RISK

Legality is a complicated issue. The variation in business and agricultural practices along with regionally specific legal concerns makes it necessary to lead a complete study on land and labor issues before beginning investments. Additionally, further assurance that all the products are produced/harvested and traded in compliance with all applicable local, national, and ratified international laws and regulations is vital. The operation should look as close to farm level as possible for compliance and work with producers to include audits or third party reviews.

Design:

- Ensure that all applicable and legally prescribed taxes, fees, or other charges are paid.
- Ensure compliance with all relevant local, national, and international regulations.
- Ensure compliance with any applicable anti-corruption legislation and mitigate potential avenues for corruption to undermine legality, and commit in writing not to offer or receive bribes or engage in any other forms of corruption.

Management:

- Ensure consensus from all relevant stakeholders under a process of free, prior, and informed consent and do not develop the operation with major disapproval from any stakeholders (important for ensuring legality of land acquisitions – see Land and Resource Tenure guidance notes). Relevant stakeholders include the local government, local and/or indigenous communities, and vulnerable and/or marginal populations within the communities, such as women.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of legal compliance (compliance may change due to new regulations).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT:

1. World Bank Resettlement and Economic Displacement Policies

<http://www.worldbank.org/en/topic/socialdevelopment>

Involuntary displacement occurs when the decision of moving is made and imposed by an external agent and when there is no possibility to stay. Involuntary displacement can be caused by environmental degradation, natural disasters, conflicts or development projects. It is associated with loss of housing, shelter, income, land, livelihoods, assets, access to resources and services, among others. Displacement affects not only those physically displaced but also the resident population (people who are not directly affected and thus do not move but feel the impact of losing their neighbors and resources) as well as the host population (those who receive displaced persons and could be positively or adversely affected by this situation).

Resettlement is a process to assist the displaced persons to replace their housing, assets, livelihoods, land, access to resources and services and to restore their socioeconomic and cultural conditions. In addition to development-induced displacement, the Bank also works on the other causes of displacement, such as natural disasters, climate change and conflict.

2. World Bank Involuntary Resettlement 4.12

<http://go.worldbank.org/GM0OEIY580>

To address involuntary resettlement caused by Bank-financed development projects. The main objective of the policy is to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts.

3. World Bank Operational Policy on Indigenous People 4.10

<http://go.worldbank.org/TE769PDWN0>

This policy contributes to the Bank's mission of poverty reduction and sustainable development by ensuring that the development process fully respects the dignity, human rights, economies, and cultures of Indigenous Peoples. For all projects that are proposed for Bank financing and affect Indigenous Peoples, the Bank requires the borrower to engage in a process of free, prior, and informed consultation.

4. Minority Rights: International Standards and Guidance for Implementation

http://www.ohchr.org/Documents/Publications/MinorityRights_en.pdf

This United Nations' policy pays attention to issues such as the recognition of minorities' existence, their rights to non-discrimination and equality, the promotion of multicultural and intercultural education, the promotion of their participation in all aspects of public life, etc.

5. Convention on Combating Bribery of Foreign Public Officials in International Business Transactions

http://www.oecd.org/daf/anti-bribery/ConvCombatBribery_ENG.pdf

An Organization for Economic Co-operation and Development (OECD) convention that criminalizes bribery of foreign public officials. It applies to the 34 OECD member countries as well as six non-member countries (Argentina, Brazil, Bulgaria, Colombia, Russia, and South Africa) that have adopted the convention.

6. UN Convention Against Corruption

<http://www.unodc.org/unodc/en/treaties/CAC/>

First global, legally-binding corruption agreement in 2003 from Resolution 58/4 that is currently signed by 140 nations.

RETURN TO INITIAL SCREENING

LAND AND RESOURCE TENURE

Initial Screening Question: Will a legal, secure, and uncontested title and/or permit be obtained for the land necessary for the production of the fiber crop? (Note that customary land rights are a legitimate, competing title that must be respected.)



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IMPORTANCE

In order to ensure the well-being of local people and/or indigenous communities, the land acquisition process must include free, prior, and informed consent with participation and support by all stakeholders involved, especially those claiming customary rights in the affected area. Ongoing conflict or uncertainty over land and resource tenure can seriously undermine the viability and, therefore, the sustainability of the operation, as well as the operation's ability to contribute to poverty reduction.

ADDITIONAL SCREENING QUESTIONS

1. **Do local people and/or indigenous communities have a legal title or customary use or access rights for the proposed land?**

2. **Have local people and/or indigenous communities been consulted about the intended land use and had appropriate time and opportunities to provide input?** *Note that 'consulting' includes providing information along with initiating a two-way dialogue*

3. Is there evidence of transparent negotiations between all stakeholders under a process of free, prior, and informed consent?

4. In addition to complying with the requirements for displacement situations stipulated in the World Bank resettlement and economic displacement policies, including Operational Policy on Indigenous People 4.10 and Involuntary Resettlement 4.12, does the operation cover:

- **Displacement that occurs in the operation area prior to, or in anticipation of, involvement in an operation area; and**
- **Temporary displacement or lost access to assets or resources; and**
- **The involuntary restriction of access to resources that local and/or indigenous people depend upon other than those in legally designated parks and protected areas; and**
- **Displacement that occurs because of an operation's adverse impacts on the environment or natural resources that local and/or indigenous people depend upon; and**
- **Indirect social and economic impacts or impacts on all human rights, despite the fact that addressing these can be critical to mitigating the risk of impoverishment, and failing to address them will place the burden of these impacts on those displaced; and**
- **Resettlement that is voluntary in nature but nonetheless, requires measures to safeguard against impoverishment and other adverse impacts and to maximize development benefits?**

5. **If a land acquisition or resettlement plan was agreed upon by the local community and/ or indigenous people under a process of free, prior, and informed consent, is there fair compensation to all stakeholders? Consider how compensation can effectively reach marginalized groups (e.g. women)**

GENERAL GUIDANCE TO MITIGATE RISK:

If there are significant unresolved disputes (including customary tenure) over the land or if there is no credible evidence that the land was acquired and/or allocated in an open and transparent fashion, then the operation should not be approved. The operation should look as close to farm level as possible for compliance and work with producers to include audits or third party reviews. Land and resource tenure that has been obtained in violation of any anticorruption or bribery regulations is invalid. Consent that has been obtained from a representative that does not represent the views of affected communities or does not have the authority to speak for them is invalid.

Design:

- Ensure compliance with all relevant local, national, and international regulations, including but not limited to respecting indigenous and local people's rights.
- Ensure compliance with the World Bank resettlement and economic displacement policies, especially Operational Policy on Indigenous People 4.10 and Involuntary Resettlement 4.12, and the United Nations Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries, and Forests in the Context of National Food Security (VGGTs).
- Ensure compliance with any applicable anti-corruption legislation and mitigate potential avenues for corruption to undermine legal land and resource tenure.

Management:

- Ensure consensus from all relevant stakeholders, including the local government and local people and/or indigenous communities, and do not develop the operation with disapproval from any stakeholders.
- Establish a culturally appropriate and accessible negotiation system to resolve disputes over land and resource tenure, including customary rights, as part of the process of free, prior, and informed consent.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of land and resource tenure (compliance may change due to new regulations or resettlements).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT:

1. World Bank Resettlement and Economic Displacement Policies

<http://www.worldbank.org/en/topic/socialdevelopment>

Involuntary displacement occurs when the decision of moving is made and imposed by an external agent and when there is no possibility to stay. Involuntary displacement can be caused by environmental

degradation, natural disasters, conflicts or development projects. It is associated with loss of housing, shelter, income, land, livelihoods, assets, access to resources and services, among others. Displacement affects not only those physically displaced but also the resident population (people who are not directly affected and thus do not move but feel the impact of losing their neighbors and resources) as well as the host population (those who receive displaced persons and could be positively or adversely affected by this situation).

Resettlement is a process to assist the displaced persons to replace their housing, assets, livelihoods, land, access to resources and services and to restore their socioeconomic and cultural conditions. In addition to development-induced displacement, the Bank also works on the other causes of displacement, such as natural disasters, climate change and conflict.

2. World Bank Involuntary Resettlement 4.12

<http://go.worldbank.org/GM0OEIY580>

To address involuntary resettlement caused by Bank-financed development projects. The main objective of the policy is to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts.

3. The Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security

<http://www.fao.org/nr/tenure/voluntary-guidelines/en/>

Promote secure tenure rights and equitable access to land, fisheries and forests as a means of eradicating hunger and poverty, supporting sustainable development and enhancing the environment. The Guidelines were developed through collaboration under the United Nations and are endorsed by the Committee on World Food Security.

4. World Bank Operational Policy on Indigenous People 4.10

<http://go.worldbank.org/TE769PDWN0>

This policy contributes to the Bank's mission of poverty reduction and sustainable development by ensuring that the development process fully respects the dignity, human rights, economies, and cultures of Indigenous Peoples. For all projects that are proposed for Bank financing and affect Indigenous Peoples, the Bank requires the borrower to engage in a process of free, prior, and informed consultation.

5. Minority Rights: International Standards and Guidance for Implementation

http://www.ohchr.org/Documents/Publications/MinorityRights_en.pdf

This United Nations' policy pays attention to issues such as the recognition of minorities' existence, their rights to non-discrimination and equality, the promotion of multicultural and intercultural education, the promotion of their participation in all aspects of public life, etc.

6. UN Declaration on the Rights of Indigenous Peoples

<http://undesadspd.org/IndigenousPeoples/DeclarationontheRightsofIndigenousPeoples.aspx>

Sets out the rights of indigenous peoples in reference to their rights to culture, identity, language, employment, health, education and other issues

7. Convention on Combating Bribery of Foreign Public Officials in International Business Transactions

http://www.oecd.org/daf/anti-bribery/ConvCombatBribery_ENG.pdf

An Organization for Economic Co-operation and Development (OECD) convention that criminalizes bribery of foreign public officials. It applies to the 34 OECD member countries as well as six non-member countries (Argentina, Brazil, Bulgaria, Colombia, Russia, and South Africa) that have adopted the convention.

8. UN Convention Against Corruption

<http://www.unodc.org/unodc/en/treaties/CAC/>

First global, legally-binding corruption agreement in 2003 from Resolution 58/4 that is currently signed by 140 nations.

RETURN TO INITIAL SCREENING QUESTIONS

HUMAN RIGHTS

Initial Screening Question: Will production of this fiber crop infringe upon the basic human rights of local men and women including indigenous communities? e.g. the right to Free, Prior, and Informed Consent



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IMPORTANCE

Evaluating compliance with human rights is not an easy task, even in the best of circumstances. Many of the issues are not necessarily specific to just one workplace or industry, but may be a reflection of national circumstances. NGOs and others should be consulted, as they can provide valuable input into this assessment and can help highlight key concerns that one may have with regard to regional practices that may affect the relevant industry. Many of these issues are extremely complicated, and for this reason, seeking someone with social safeguards and inclusion, including gender integration, expertise to lead these research and development processes is strongly recommended.

The development or expansion of alternative fiber crop operations increases the risk of violating the rights of local communities, landholders, indigenous cultures and communities, and subsistence farmers. Local communities (including indigenous peoples) describe those who live in the areas where the crop feedstock is produced. When commercial crop production enters a new area it can encroach upon a land or territory that might be under tribal or customary ownership and/or displace available ecosystem resources and services historically used as part of the commons. For example, utilizing water to cultivate crops may deprive the local community from using it as drinking source.

In addition, developing land for feedstock crops can also flag social and cultural concerns. As excerpted from WWF's 2050 Criteria it is imperative that, 'the rights of local people are respected, which can be assessed by: demonstrated and no-contested rights to utilize the land and recognition of and respect for other legal or customary rights; negotiations with indigenous people based on FPIC (Free, Prior, and informed Consent); as well as other potential measures. Issues of gender representation, representation of traditionally marginalized groups, health and clean water, resource diversion and scarcity, ecosystem services, and potential impacts on livelihoods and smallholders, are considered and structured into consultations. Engagement and dispute resolution processes and instances are fully transparent'.

World Wildlife Fund. The 2050 Criteria: Guide to Responsible Investment in Agricultural, Forest, and Seafood Commodities. Report, 2012

ADDITIONAL SCREENING QUESTIONS

1. **Was there or will there be Free, Prior and informed Consent (FPIC) process conducted before changing the use of this land?** *Note that it is critical that someone with social safeguards and inclusion, including gender integration, expertise lead the FPIC process. See additional resource # 2*

2. **Will or does the production site meet ILO Convention 169 – Indigenous and Tribal People Convention, Convention concerning indigenous and tribal peoples in Independent Countries?**

3. **Would the production of this crop have a negative impact on the cultural heritage or respect of indigenous rights for local people and/or indigenous communities?** *Consult UNESCO World Heritage Sites, but also engage local communities to identify culturally-important areas that may not be formally protected. (e.g. ritual or burial sites, sacred forests, etc.)*

4. **Would the production of this crop result in physical or livelihoods displacement for local people and/or indigenous communities?** *Ex: Forced migration or barriers to traditional subsistence or income strategies See additional resource # 6*

5. **Would the production of this crop have a negative impact on the access to material or immaterial resources that local and/or indigenous communities use, access, or control?** *Ex: Community (identity and cohesion), human (education, capacity, and innovation), and financial capital*

6. **Would the production of this crop maintain or improve the holistic well-being, including the sustainability of livelihood, of local and/or indigenous communities?**

7. **Are there potential impacts from production that would negatively affect the safe & healthy living conditions for local people and/or indigenous communities?** *Ex: Pollution through effluent, air emissions, or affecting drinking water*

8. **Would the production of this crop provide local employment for local people and/or indigenous communities preferentially?**

GENERAL GUIDANCE TO MITIGATE RISK:

Design:

- Comply with the Universal Declaration on Human Rights.
- Ensure that all consultations with local people and/or indigenous communities are conducted under an accessible FPIC process appropriate to the local culture and language(s) with representation from both men and women.
- Ensure compliance with the World Bank resettlement and economic displacement policies, including Operational Policy on Indigenous People 4.10 and Involuntary Resettlement 4.12.
- Favor providing employment opportunities to local people and/or indigenous community members.

Management:

- Ensure that operation activities do not infringe on local rights, cultural heritage, or local economic activities.
- Engage with community stakeholders on a continuous basis before and during operation development, implementation, monitoring, and evaluation.
- Establish a culturally appropriate negotiation system to resolve disputes as part of the FPIC process, accessible in the language(s) spoken by both men and women in the local and/or indigenous communities.

Monitoring:

- Confirm that the operation includes a rigorous plan for the ongoing monitoring and evaluation the proposed crop production strategy, including committed funding to understand its impacts on local people and/or indigenous communities (impacts may change due to site expansion, changes in crop management, worker turnover, etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT:

1. Universal Declaration on Human Rights SA8000 Standard

<http://www.un.org/en/documents/udhr/index.shtml>

All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood. The remaining resources in this section relate to how to implement the UDHR in the context of alternative fibers.

2. Guidelines on Free, Prior and informed Consent (FPIC)

http://www.unredd.net/index.php?option=com_docman&task=cat_view&gid=1333&Itemid=53

Indigenous people's right to free, prior and informed consent (FPIC) has been recognized by United Nations. This guidelines and corresponding UN-REDD program is obliged to promote respect for the local and indigenous communities. Based on these guidelines, indigenous peoples should be guaranteed the collective right to give or withhold their free, prior and informed consent to relevant activities that take place in or otherwise impact their lands, territories and resources.

3. WWF Free, Prior and Informed Consent and REDD+: Guidelines and Resources

http://wwf.panda.org/about_our_earth/all_publications/?214094/Free-Prior-and-Informed-Consent-and-REDD--Guidelines-and-Resources

This working paper presents resources and guidelines for the concept of free, prior and informed consent (FPIC) as related to REDD+. It provides an example of implementing FPIC in a forest setting.

4. ILO Convention 169 Indigenous and Tribal Peoples Convention, 1989

http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO:12100:P12100_INSTRUMENT_ID:312314:NO

Convention concerning Indigenous and Tribal Peoples in Independent Countries.

5. UNESCO World Heritage Sites

<http://whc.unesco.org/en/list>

Cultural and natural heritage sites around the world considered to be of outstanding value to humanity as defined by United Nations Educational, Scientific, Cultural Organization (UNESCO) convention.

6. World Bank Resettlement and Economic Displacement Policies

<http://www.worldbank.org/en/topic/socialdevelopment>

Involuntary displacement occurs when the decision of moving is made and imposed by an external agent and when there is no possibility to stay. Involuntary displacement can be caused by environmental degradation, natural disasters, conflicts or development projects. It is associated with loss of housing, shelter, income, land, livelihoods, assets, access to resources and services, among others. Displacement affects not only those physically displaced but also the resident population (people who are not directly affected and thus do not move but feel the impact of losing their neighbors and resources) as well as the host population (those who receive displaced persons and could be positively or adversely affected by this situation).

Resettlement is a process to assist the displaced persons to replace their housing, assets, livelihoods, land, access to resources and services and to restore their socioeconomic and cultural conditions.

In addition to development-induced displacement, the Bank also works on the other causes of displacement, such as natural disasters, climate change and conflict.

7. World Bank Operational Involuntary Resettlement 4.12

<http://go.worldbank.org/GM0OEIY580>

This policy contributes to the Bank's mission of poverty reduction and sustainable development by ensuring that the development process fully respects the dignity, human rights, economies, and cultures of Indigenous Peoples. For all projects that are proposed for Bank financing and affect Indigenous Peoples, the Bank requires the borrower to engage in a process of free, prior, and informed consultation.

8. Minority Rights: International Standards and Guidance for Implementation

http://www.ohchr.org/Documents/Publications/MinorityRights_en.pdf

This United Nations' policy pays attention to issues such as the recognition of minorities' existence, their rights to non-discrimination and equality, the promotion of multicultural and intercultural education, the promotion of their participation in all aspects of public life, etc.

9. The Convention on the Elimination of All Forms of Discrimination Against Women

<http://www.un.org/womenwatch/daw/cedaw/text/econvention.htm>

The convention defines what constitutes discrimination against women and sets up an agenda for national action to end such discrimination.

10. United Nations Women’s Empowerment Principles

http://www.unglobalcompact.org/issues/human_rights/equality_means_business.html

Guidance to companies on how to empower women in the workplace, marketplace and community. They are the result of a collaboration between the United Nations Global Compact and the United Nations Entity for Gender Equality and the Empowerment of Women (UN Women) and are adapted from the Calvert Women’s Principles.

11. UN Declaration on the Rights of Indigenous Peoples

<http://undesadspd.org/IndigenousPeoples/DeclarationontheRightsofIndigenousPeoples.aspx>

Sets out the rights of indigenous peoples in reference to their rights to culture, identity, language, employment, health, education and other issues

12. World Bank Operational Policy on Indigenous People 4.10

<http://go.worldbank.org/TE769PDWN0>

This policy contributes to the Bank’s mission of poverty reduction and sustainable development by ensuring that the development process fully respects the dignity, human rights, economies, and cultures of Indigenous Peoples. For all projects that are proposed for Bank financing and affect Indigenous Peoples, the Bank requires the borrower to engage in a process of free, prior, and informed consultation.

13. WWF Global Environmental Facility Environmental and Social Safeguards Policies and Procedures

http://assets.worldwildlife.org/publications/566/files/original/ESI_Manual_2.pdf?1366682198

Provides guidance on conducting environmental and social impact assessments. It covers involuntary displacement, indigenous peoples, human rights, and gender integration and should be used in conjunction with industry assessments of workers right and workers health and safety.

14. WWF the 2050 Criteria

http://wwf.panda.org/what_we_do/how_we_work/businesses/transforming_markets/solutions/commodity_financing/2050_criteria/

World Wildlife Fund (WWF) developed these criteria to address the widespread insufficiency of food, fiber, and bioenergy to meet the needs of human society. A rapidly growing global population, accelerating consumption, dietary shifts, climate change and other factors are driving unprecedented price volatility, resource shortages, and other risks in soft commodity supply chains. The 2050 Criteria seeks to untangle this complexity. Providing distilled guidance based on leading industry practice, The 2050 Criteria is designed to serve as a field guide for investors to access mainstream agricultural, forest, and seafood commodities in a responsible manner.

RETURN TO INITIAL SCREENING QUESTIONS

LABOR RIGHTS

Initial Screening Question: Will production of this fiber crop infringe upon the labor rights of workers? e.g. forced labor infringes upon the right to a dignified minimum wage, discrimination may infringe upon the right to free association, etc.



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IMPORTANCE

Evaluating compliance with labor rights is not an easy task, even in the best of circumstances. Many of the issues are not necessarily specific to just one workplace or industry, but may be a reflection of national circumstances. Relevant NGO's and other experts should be consulted, as they can provide valuable input into this assessment and can help highlight key concerns that one may have with regard to workplace practices in a particular region or industry. Many of these issues are extremely complicated, and for this reason, seeking appropriate guidance is recommended.

While the labor issues are an area where WWF has limited expertise, and these issues go beyond the environmental impacts associated with production, this is an area that any credible sustainability evaluation must include in the overall evaluation. Depending on the labor scenario, there may be additional environmental concerns. For instance, if crop labor is seasonal, the work force may encroach in environmentally sensitive areas during their idle period. Labor rights and risks, including unintended environmental consequences, need to be evaluated and understood.

ADDITIONAL SCREENING QUESTIONS

1. Does current production of this crop meet the following labor rights standards?
 - a) Child Labor and Protection of Young Workers: **ILO Conventions 138 and 182, Recommendation 146, United Nations Convention on Rights of the Child**
 - b) Forced and Bonded Labor: **ILO Conventions 29 and 105**
 - c) Freedom of Association: **ILO Conventions 87, 11 and 98**
 - d) Equal Pay and Discrimination: **ILO Conventions 100 and 111**
 - e) Universal Declaration on Human Rights **SA8000 Standard**

See additional resources for policy definitions

2. Will the operation rely on locally available labor, or require migrant labor?

3. Are the labor requirements subject to significant seasonal variations, whereby a significant proportion of the labor force will be idle? *Negative effects could be mitigated if the operation uses the local labor force in the off-season to avoid seasonal migration*

4. Will the operation increase long-term employment (not through site establishment alone) or, through substitution, reduce employment in the region in the long run? *Substitution refers to immigration*

5. Do or will all workers, including those employed by subcontractors, have contracts?

- 6. Will the operation accommodate worker composition by either supporting local labor when available or enabling a migrant work force, if necessary? Note that migration for labor, especially seasonal agricultural labor, is often dominated by men and correlated by higher levels of sexually transmitted diseases in the community**

- 7. What steps has the operation taken to address gender roles and risks in the workplace, including zero tolerance for sexual harassment?**

- 8. Is the local social infrastructure sufficient to address the needs of the labor force and their families, and has the operation facilitated better access to social infrastructure for employees? Ex: Adequate, accessible, and affordable healthcare, education, housing, etc.**

9. Are the working hours and wages in line with local regulation, the collective bargaining agreement, and sector norms?

10. Will the operation use contractors to avoid providing social benefits?

11. If the operation plans to purchase small volumes of fiber from large numbers of producers, are the producers being offered a fair price?

12. Are there robust formal mechanisms in place to address grievances?

GENERAL GUIDANCE TO MITIGATE RISK:

Regardless of the labor needs the operation must be in full compliance, at minimum, with local and international labor law, core labor standards defined by the International Labor Organization (ILO), and the Universal Declaration of Human Rights. Should these conditions not be met, the operation should not be approved.

Design:

- At a bare minimum, comply with the Universal Declaration on Human Rights as well as local, national, and international labor regulations and voluntary standards including ILO Conventions and the Social Accountability International SA 8000 Standard (listed below).
- Look as close to farm level as possible for compliance with labor regulations and work with producers to include in labor codes along with audits or a third party review.
- Favor providing employment opportunities to women and men from local and/or indigenous communities.
- Avoid having seasonality in crop production to minimize the need for migrant workers.

Management:

- Establish a culturally appropriate and accessible negotiation system to resolve labor disputes as part of the process of free, prior, and informed consent.
- Continually monitor compliance with labor standards including those related to child labor, forced or bonded labor, freedom of association, discrimination (based on sex, gender, pregnancy, race, religion, political opinion, or other protected classes), minimum wage, working hours, conditions for migrant workers, and use of subcontracted workers or workers on short-term contracts to avoid social benefits.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of labor rights (impacts may change due to site expansion, changes in crop management, etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT:

Beyond the relevant international treaties and guidance documents, listed below are potential third party organizations who could verify labor standard practices or provide guidance on acceptable policies: Human Rights Watch, International Labor Conference's Committee on the Application of Standards (part of United Nations' International Labor Organization), International Labor Rights Forum, Institute for Global Labor and Human Rights, Fair Food Standards Council, Worker Rights Consortium, Fair Labor Association.

1. Universal Declaration on Human Rights SA8000 Standard

<http://www.un.org/en/documents/udhr/index.shtml>

All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood.

2. Social Accountability International SA 8000 Standard

<http://www.sa-intl.org/index.cfm?fuseaction=Page.ViewPage&PageID=937>

Definitions of labor rights issues:

- *Child Labor*: No use or support of child labor; policies and written procedures for remediation of children found to be working in situation; provide adequate financial and other support to enable such children to attend school; and employment of young workers conditional.
- *Forced and Compulsory Labor*: No use or support for forced or compulsory labor; no required 'deposits' - financial or otherwise; no withholding salary, benefits, property or documents to force personnel to continue work; personnel right to leave premises after workday; personnel free to terminate their employment; and no use nor support for human trafficking.
- *Health and Safety*: Provide a safe and healthy workplace; prevent potential occupational accidents; appoint senior manager to ensure Occupational Safety and Health (OSH); instruction on OSH for all personnel; system to detect, avoid, respond to risks; record all accidents; provide personal protection

equipment and medical attention in event of work-related injury; remove, reduce risks to new and expectant mothers; hygiene- toilet, potable water, sanitary food storage; decent dormitories- clean, safe, meet basic needs; and worker right to remove from imminent danger.

- *Freedom of Association and Right to Collective Bargaining*: Respect the right to form and join trade unions and bargain collectively. All personnel are free to: organize trade unions of their choice; and bargain collectively with their employer. A company shall: respect right to organize unions & bargain collectively; not interfere in workers' organizations or collective bargaining; inform personnel of these rights & freedom from retaliation; where law restricts rights, allow workers freely elect representatives; ensure no discrimination against personnel engaged in worker organizations; and ensure representatives access to workers at the workplace.
- *Discrimination*: No discrimination based on race, national or social origin, caste, birth, religion, disability, gender, sexual orientation, union membership, political opinions and age. No discrimination in hiring, remuneration, access to training, promotion, termination, and retirement. No interference with exercise of personnel tenets or practices; prohibition of threatening, abusive, exploitative, coercive behavior at workplace or company facilities; no pregnancy or virginity tests under any circumstances.
- *Disciplinary Practices*: Treat all personnel with dignity and respect; zero tolerance of corporal punishment, mental or physical abuse of personnel; no harsh or inhumane treatment.
- *Working Hours*: Compliance with laws & industry standards; normal workweek, not including overtime, shall not exceed 48 hours; 1 day off following every 6 consecutive work days, with some exceptions; overtime is voluntary, not regular, not more than 12 hours per week; required overtime only if negotiated in CBA.
- *Remuneration*: Respect right of personnel to living wage; all workers paid at least legal minimum wage; wages sufficient to meet basic needs & provide discretionary income; deductions not for disciplinary purposes, with some exceptions; wages and benefits clearly communicated to workers; paid in convenient manner – cash or check form; overtime paid at premium rate; prohibited use of labor-only contracting, short-term contracts, false apprenticeship schemes to avoid legal obligations to personnel.
- *Management Systems*: Facilities seeking to gain and maintain certification must go beyond simple compliance to integrate the standard into their management systems and practices.

3. ILO (International Labor Organization)

http://www.ilo.org/dyn/normlex/en/f?p=1000:12000:2948000572381400:::P12000_INSTRUMENT_SORT:4

Promotes social justice and internationally recognized human and labor rights by promoting rights at work, encouraging decent employment opportunities, enhancing social protection, and strengthening dialogue on work-related issues.

4. Child Labor and Protection of Young Workers: ILO Conventions 138 and 182, Recommendation 146

ILO Conventions 182 Worst Forms of Child Labor Convention, 1999

http://www.ilo.org/dyn/normlex/en/f?p=1000:12100:0::NO::P12100_INSTRUMENT_ID:312327

- *Basis of #182*: A child is anyone under the age of 18. For the purposes of this Convention, the term the worst forms of child labor comprises:
 - All forms of slavery or practices similar to slavery, such as the sale and trafficking of children, debt bondage and serfdom and forced or compulsory labor, including forced or compulsory recruitment of children for use in armed conflict;
 - The use, procuring or offering of a child for prostitution, for the production of pornography or for pornographic performances;
 - The use, procuring or offering of a child for illicit activities, in particular for the production and trafficking of drugs as defined in the relevant international treaties;
 - •Work which, by its nature or the circumstances in which it is carried out, is likely to harm the health, safety or morals of children.

ILO Convention 138 Minimum Age Convention, 1973

http://www.ilo.org/dyn/normlex/en/f?p=1000:12100:0::NO::P12100_INSTRUMENT_ID:312283

- *Basis of #138*: Convention concerning Minimum Age for Admission to Employment. ILO Recommendation 146 Minimum Age Recommendation, 1973
http://www.ilo.org/dyn/normlex/en/f?p=1000:12100:0::NO::P12100_INSTRUMENT_ID:312484
- *Basis of R#146*: To ensure the success of the national policy provided for in Article 1 of the Minimum Age Convention, 1973, high priority should be given to planning for and meeting the needs of children and youth in national development policies and programs and to the progressive extension of the inter-related measures necessary to provide the best possible conditions of physical and mental growth for children and young persons.

5. **Child Labor: United Nations Convention on Rights of the Child**

<http://www.ohchr.org/en/professionalinterest/pages/crc.aspx>

UN articles protecting children below the age of eighteen years unless under the law applicable to the child, majority is attained earlier.

6. **Forced and Bonded Labor: ILO Conventions 29 and 105**

ILO Convention 105 Abolition of Forced Labor Convention, 1957

http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO:12100:P12100_INSTRUMENT_ID:312250:NO

- *Basis of #105*: Convention concerning the Abolition of Forced Labor

ILO Convention 29 Forced Labor Convention, 1930

http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO:12100:P12100_INSTRUMENT_ID:312174:NO

- For the purposes of this Convention the term forced or compulsory labor shall mean all work or service which is exacted from any person under the menace of any penalty and for which the said person has not offered himself voluntarily. This includes withholding wages or passports, or charging excessive or unreasonable fees for goods and services.

7. **Freedom of Association: ILO Conventions 87, 11 and 98**

ILO Convention 98 Right to Organize and Collective Bargaining Convention, 1949

http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO:12100:P12100_INSTRUMENT_ID:312243:NO

- *Basis of #98*: Workers shall enjoy adequate protection against acts of anti-union discrimination in respect of their employment. Such protection shall apply more particularly in respect of acts calculated to:
 - Make the employment of a worker subject to the condition that he shall not join a union or shall relinquish trade union membership;
 - Cause the dismissal of or otherwise prejudice a worker by reason of union membership or because of participation in union activities outside working hours or, with the consent of the employer, within working hours.

ILO Convention 87 Freedom of Association and Protection of the Right to Organize Convention, 1948

http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO:12100:P12100_INSTRUMENT_ID:312232:NO

And/or

ILO Convention 11 Right of Association (Agriculture) Convention, 1921

http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO:12100:P12100_INSTRUMENT_ID:312156:NO

8. **Equal Pay and Discrimination: ILO Conventions 100 and 111**

ILO Convention 100 Equal Remuneration Convention, 1951

http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO:12100:P12100_INSTRUMENT_ID:312245:NO

- *Basis of #100*: For the purpose of this Convention: The term remuneration includes the ordinary, basic or minimum wage or salary and any additional emoluments whatsoever payable directly or indirectly, whether in cash or in kind, by the employer to the worker and arising out of the worker's employment; The term equal remuneration for men and women workers for work of equal value refers to rates of remuneration established without discrimination based on sex.

ILO Convention 111 Discrimination (Employment and Occupation) Convention, 1958

http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO:12100:P12100_INSTRUMENT_ID:312256:NO

- *Basis of #111:* For the purpose of this Convention the term discrimination includes:
 - Any distinction, exclusion or preference made on the basis of race, color, sex, religion, political opinion, national extraction or social origin, which has the effect of nullifying or impairing equality of opportunity or treatment in employment or occupation.
 - Such other distinction, exclusion or preference which has the effect of nullifying or impairing equality of opportunity or treatment in employment or occupation as may be determined by the Member concerned after consultation with representative employers' and workers' organizations, where such exist, and with other appropriate bodies.
 - Any distinction, exclusion or preference in respect of a particular job based on the inherent requirements thereof shall not be deemed to be discrimination.
 - For the purpose of this Convention the terms employment and occupation include access to vocational training, access to employment and to particular occupations, and terms and conditions of employment.

9. United Nations Women's Empowerment Principles

http://www.unglobalcompact.org/issues/human_rights/equality_means_business.html

Guidance to companies on how to empower women in the workplace, marketplace and community. They are the result of a collaboration between the United Nations Global Compact and the United Nations Entity for Gender Equality and the Empowerment of Women (UN Women) and are adapted from the Calvert Women's Principles.

10. Fair Labor Association

<http://www.fairlabor.org/>

A collaboration between global stakeholders dedicated to protecting workers' rights that facilitates communication and transparency between stakeholder groups. Also provides a mechanism to address labor rights violations through a complaint process.

11. Human Rights Watch

<http://www.hrw.org/>

NGO focusing on targeted advocacy to provide international attention on human rights violations

12. Institute for Global Labor and Human Rights

<http://www.globallabourrights.org/>

NGO that uses research, education, and public campaigns to rally support in the United States for international labor rights issues

13. Fair Food Standards Council

<http://fairfoodstandards.org/index.html>

The Council oversees implementation of the Fair Food Program, a campaign to affirm the human rights of tomato workers and improve their working conditions.

14. Fair Trade USA

<http://fairtradeusa.org/>

An example of best practices for social and labor issues for certified products with standards for smallholders and large farms with employees.

15. Worker Rights Consortium

<http://www.workersrights.org/>

International labor rights monitoring organization (focused on factories). They conduct independent investigations and issue public reports.

RETURN TO INITIAL SCREENING QUESTIONS

WORKER HEALTH & SAFETY

Initial Screening Question: Will production of this fiber crop infringe upon any Occupational Health and Safety (OHS) regulations? e.g. negatively affect worker health or safety through pesticide use



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IMPORTANCE

Agriculture ranks as one of the most hazardous industries. Workers can be exposed to toxic chemicals, heavy machinery, and the work itself in many cases is physically demanding. These potential risks may increase when the business and agricultural practices occur in developing countries and regions where local laws may have relatively lower health and safety standards for such occupations.

As previously noted, pesticides are dangerous for all workers, but pregnant women and children are particularly vulnerable to the build-up of toxins. Higher rates of prostate, ovarian, and skin cancer are associated with workers who apply pesticides. As pesticides travel through both air and waterways, those exposed in utero or during early developmental periods face higher incidences of birth defects, neurodevelopmental delays, cognitive impairment, childhood brain cancers, Autism Spectrum Disorders, and other problems. In adults, negative impacts to reproductive health are common and include falling sperm counts, declines in testosterone levels, earlier puberty in girls, and fewer males being born.

ADDITIONAL SCREENING QUESTIONS

1. **Will production comply with ILO Convention 184 – regarding Safety and Health in Agriculture Convention? See additional resources for regulatory definitions**

2. **Does the production of this crop pose potential worker safety issues? Ex: High agrochemical use, hazardous or unregulated harvesting practices, unsafe working conditions, etc.**

3. Will the harvesting and processing of this crop be mechanized or done by hand?

4. Are there worker safety training programs in place that are appropriate to the capacity level, language, culture, and gender of the workers? *To ensure training appropriateness, a desk if not field study will be required to understand cultural norms of the working population, level of education, gender distribution and history of compliance with pesticide regulations (if possible).*

5. In those cases where workers handle pesticides or other agrochemicals, is there a program for regular medical testing and monitoring?

6. Do local, national, or international regulations include requirements for training, handling, and equipment use in pesticide application?

- 7. Are workers informed of the risks posed by any chemicals with which they may come in contact, and trained in mitigating these risks? Includes access to material safety data sheets**

- 8. Are workers provided with appropriate and functioning personal protection equipment, and is there regular monitoring to ensure that they use it?**

- 9. What are the conditions of worker facilities, and do they include sufficient access to potable water and sanitation?**

- 10. Is medical care accessible to the work force in this region and does the operation have first aid equipment on site and emergency plans in place?**

11. Are there health and safety committees in the workplace, that include worker representatives chosen by their peers, to regularly review working conditions with other employees and their representatives to improve their safety?

12. Does the operation have a health and safety officer who proactively monitors accidents and investigates the causes?

13. Is medical care appropriate to the workplace risks (above), including reproductive health services, and is the care affordable and accessible to the work force in this region? *If not, the operation should improve access to or affordability of appropriate care.*

14. Is there active political unrest in the region?

GENERAL GUIDANCE TO MITIGATE RISK:

Design:

- Comply with ILO Convention 184.
- Look as close to farm level as possible for compliance with regulations and work with producers to include in labor codes along with audits or a third party review.
- Minimize the use of agrochemicals and take appropriate steps for worker safety (see the Pesticide Use and Fertilizer Use guidance notes).
- Evaluate potentially hazardous labor practices before operation implementation.
- Evaluate local political conditions and determine if the environment threatens the health or safety of workers.

Management:

- Provide a safety training program for workers along with necessary personal protective equipment.
- Include information about worker risks from pesticides during training and incentivize women to come forward when they are pregnant to protect the company, themselves, and their children. (Incentives could include human resource policies that allow them to play non-pesticide handling roles during pregnancy and ensure their employment after pregnancy).
- Proactively reduce accident risk through risk assessments, accident investigations, and seeking worker input into process improvement.
- Establish a culturally appropriate and accessible negotiation system to resolve worker disputes as part of the process of free, prior, and informed consent.
- Provide compensations to workers for occupational injuries.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of worker health and safety (impacts may change due to site expansion, changes in crop management, etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT:

1. ILO Convention 184

http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID:312329

This convention specifically addresses safety and health issues for workers and operations in the agriculture sector.

RETURN TO INITIAL SCREENING QUESTIONS

FOOD SECURITY

Initial Screening Question: Will the establishment of this fiber crop displace food sources or the resources needed to produce them?



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IMPORTANCE:

The UN's Food and Agricultural Organization defines the four main dimensions of food security as availability of food, access to food, ability to utilize diverse food sources, and stability of these aspects over time. The right to food, rooted in the Universal Declaration of Human Rights, defines food as a fundamental human right and emphasizes the obligation of governments to ensure that citizens can feed themselves in a dignified manner. Sufficient production is not enough if poverty or inequalities prevent access to food. Stability of supply and access requires appropriate infrastructure, institutions and policies to reduce variability and risks. Utilization encompasses food safety, quality and nutrition. Additionally, it is important for local and/or indigenous people to be able to enact their rights to food sovereignty by defining policies that are ecologically, socially, economically, and culturally appropriate to their unique circumstances.

Currently the alternative fiber industry is relatively small such that its impact on food security is negligible. However, if the alternative fiber industry experiences large growth it may complicate food security. For example, purposely growing alternative fiber crops such as bamboo may displace land needed to produce food to meet the growing nutritional needs of local, regional, and global populations. Additionally utilizing agricultural residues as a pulp and paper feedstock may also affect food security. For example by using wheat straw for paper production, the meat industry could experience a decrease in feed supply potentially increasing meat prices. Straw residues may also be left in agricultural fields as mulch and fertilizer. If unsustainable amounts are removed to meet the demand of the alternative fiber industry field fertility could be reduced potentially decreasing food yields.

To avoid issues of food insecurity precautionary measures need to be established. Large scale use of purpose grown crops and agricultural residues for paper production may put an extra burden on food insecure areas. Furthermore, the food displacement may directly lead to increased land use and elevated prices for all agricultural sectors due to the intrinsic intertwined relations in the agricultural commodity market.

Although it is critical to identify the impact of food displacement, understanding the implications of food displacement can be extremely complicated, and the cause and effect may not be readily apparent or may be difficult to identify especially at a local level. This is an issue that requires assessment and ongoing understanding of crop conversion implications and the cause and effect of the changes. For purposes of this assessment, local and regional changes are incorporated, but policy makers should be aware that the implications/impacts of these changes extend far beyond one locality. This is an area that requires a careful assessment and evaluation prior to making a decision.

ADDITIONAL SCREENING QUESTIONS

1. **Is the region identified for crop production on the FAO Low Income Countries with a Food Deficit List?**

2. **Does the transfer of land for increased production or intensification create a food security issue directly or indirectly?** *Directly - Land previously used for food is moved to fiber production*
Indirectly – Land previously used for a non-food crop is moved to fiber production, and land previously used for food is moved to production of the displaced non-food crop

3. **Is the particular crop an agricultural residue and is it used a major source of livestock feed for communities in this area?** [FAO Database](#)

4. Is the particular crop an agricultural residue and is it used as a major source of fertilizer/mulch in this area? [FAO Database](#)

5. Does the particular crop require irrigation and might it be in competition with water resources for other irrigated food crops?

6. Does the particular crop require inputs, such as fertilizer or pesticides, and might it change market dynamics for farmers growing food who also need access to these inputs?

GENERAL GUIDANCE TO MITIGATE RISK:

Crop establishment should not displace local food crop land, negatively impact local or regional food availability, or food prices.

Design:

- Evaluate local food security (see below toolkits) to determine if proposed operation sites are in a food insecure region.
- If the operation is in a food insecure region, consider selecting a different operation site.
- Ensure compliance with the United Nations Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries, and Forests in the Context of National Food Security (VGGTs).

Management:

- Establish a culturally appropriate and accessible negotiation system to resolve food security disputes with the local community, and make sure that women, children, indigenous and other marginalized or vulnerable people are part of the process of free, prior, and informed consent.
- Minimize food insecurity in the region by providing opportunities for local employment with fair wages and labor standards and by purchasing goods and services from the community.
- Engage in sound crop management practices (crop rotation, intercropping, set-asides) to ensure long-term agricultural viability of the land.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of impacts to food security (impacts may change due to site expansion, changes in crop management, etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT:

1. Food and Agriculture Organization Food Security Indicators

<http://www.fao.org/economic/ess/ess-fs/ess-fadata/en/#.UvUQIPIdV2A>
Database of global indicators to measure food security.

2. Food and Agriculture Organization of United Nations

<http://www.fao.org/home/en/>

FAO Low Income Countries with a Food Deficit List

Follow the progress of Ballard, T.J., Kepple, A.W. & Cafiero, C. 2013. The food insecurity experience scale: development of a global standard for monitoring hunger worldwide. Technical Paper. Rome, FAO. (available at <http://www.fao.org/economic/ess/ess-fs/voices/en/>); Results will eventually be hosted by Gallup.

3. The Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security

<http://www.fao.org/nr/tenure/voluntary-guidelines/en/>

Promote secure tenure rights and equitable access to land, fisheries and forests as a means of eradicating hunger and poverty, supporting sustainable development and enhancing the environment.

The Guidelines were developed through collaboration under the United Nations and are endorsed by the Committee on World Food Security.

4. IPC Acute Food Insecurity Reference Table for Household Groups

<ftp://ftp.fao.org/docrep/fao/010/i0275e/i0275e00.pdf>

The IPC is a tool for food security analysis and decision-support. The table is a standardized scale that integrates food security, nutrition, and livelihood information into a common classification of the severity of acute food insecurity outcomes, and can be used to highlight priority areas and populations in need of emergency response that have been identified based on food security analysis.

5. USDA Community Food Security Assessment Toolkit

http://www.ers.usda.gov/publications/efan-electronic-publications-from-the-food-assistance-nutrition-research-program/efan02013.aspx#.UnKs8_mmhI4

This toolkit was designed to be used by both nonprofit organizations and business. It includes resources to profile general community characteristics, food resource accessibility, food availability and affordability, and community food production resources.

6. FAO Bioenergy and Food Security Tool

<http://www.fao.org/energy/befs/operator-tool/en/>

Assesses the potential risks and benefits to food security. **The tool was designed for biofuels.

RETURN TO INITIAL SCREENING QUESTIONS

WATER SECURITY

Initial Screening Question: Will the establishment of this fiber crop impair the quality and/ or quantity of surface and/or ground water resources used by local and regional communities?



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IMPORTANCE

Water quantity effect on security – The agriculture sector is responsible for about 70% of the water withdrawn (rivers, lakes, groundwater) and used by human populations. Expansion of an agricultural landscape or establishing a new site will add pressure to this finite resource. This added pressure may be particularly problematic in water stressed areas where local and regional communities need water for other uses. Some of these issues may be ameliorated through proper management; however, particular caution needs to be taken in these water stressed areas.

Water quality effect on security – Water quality on site and downstream is also important in order to make sure agricultural runoff is not contaminating water sources that are being used for other human needs in the watershed. This is particularly important if the crop is being grown in a country or region without water treatment plants, however runoff from agricultural activities can impair the recreational or cultural uses of water sources as well.

ADDITIONAL SCREENING QUESTIONS

1. According to the Water Footprint Network, is this watershed a water stressed area?

2. Does the production of the crop reduce the availability of water for other agricultural needs especially production of food crops and livestock? Include downstream impacts

3. **Does the production of the crop reduce the availability of water for basic domestic human needs?** *Ex: drinking, hygiene/sanitation, cooking, other downstream impacts, etc.*

4. **Does agricultural runoff impair the capability for communities in the watershed to secure clean water for basic domestic human needs?** *Ex: drinking, bathing cooking, other downstream impacts, etc.*

5. **Has a stakeholder analysis and consultation been completed to understand the water access needs of the local population including the needs of marginalized or vulnerable people?**
Marginalized groups may include women, children, or indigenous people

GENERAL GUIDANCE TO MITIGATE RISK:

Crop establishment should not displace local water needs, negatively impact local or regional water availability, or limit water access. Consider whether your crop will have enough water, but also how crop management will operate in a situation where half the population doesn't have access to safe drinking water. This consideration places the issue in context of a future with growing water insecurity and will help indicate whether the crop will be grown in an area ripe for water conflict/reputational risk. For all water management data, the best available information including peer reviewed work should be used. For example Water Footprint Network data or best resource peer reviewed at a more granular level (journal articles for specific crops in specific regions).

Design:

- Demonstrate that water needs can be met for local communities in the short and long term.
- Mitigate risk by assessing operations with the Water Risk Filter and implementing the AWS Water Stewardship Standard (linked below).
- Assess water resource requirements, taking into consideration crop needs, soil field capacity, hydrological conditions, precipitation distribution, downstream human and environmental needs and uses, and impacts water use will have on the watershed and regional ecology.
- Conduct an Environmental Flow or eFlow assessment to ensure water use is sustainable on a catchment level.

Management:

- Monitor aquifers and natural bodies of water to ensure that they are adequately being recharged, that their quality is not being compromised, and that their use for agricultural purposes is not altering the natural hydrologic regime.
- Establish a culturally appropriate and accessible negotiation system to resolve water security disputes with the local community, and make sure that women, children, indigenous and other marginalized or vulnerable people are part of the process of free, prior, and informed consent.
- See the guidance notes on Water Quantity and Water Quality to minimize negative impacts to water resources.

Monitoring:

- Confirm that the operation includes a rigorous plan and committed funding for the ongoing monitoring and evaluation of impacts to water security (impacts may change due to site expansion, changes in crop management, etc.).

ADDITIONAL RESOURCES TO INFORM RISK ASSESSMENT:

1. Water Risk Filter

<http://waterriskfilter.panda.org/MitigationTools.aspx>

Tool to assess water risks for any industry and country. It can be used annually to monitor risk changes.

2. AWS Water Stewardship Standard

<http://www.allianceforwaterstewardship.org/>

Use the standard to identify strategies to mitigate risks after identifying them with the Water Risk Filter. The standard is ISEAL-compliant and can be applied internationally to mitigate water risks, address water challenges on a catchment level, and employ responsible stewardship techniques.

3. Water Footprint Network

<http://www.waterfootprint.org/?page=files/home>

Platform to link organizations interested in understanding and managing their water footprint. The organization provides free information access and toolkits.

4. Water Footprint Network Water Scarcity Maps

<http://www.waterfootprint.org/?page=files/WaterStat-WaterScarcity>

Global map of monthly blue water scarcity for the world's major river basins with data from 1996 to 2005.

5. Water4Biz WBCSD Report

<http://www.wbcd.org/work-program/sector-projects/water/water4biz.aspx>

Refer to this report as a source for additional resources and to complete a decision tree that identifies the tool that is most appropriate for a given situation.

RETURN TO INITIAL SCREENING QUESTIONS

REFERENCES

- AirNow, 2014. Air Quality Index, <http://www.airnow.gov/>, June 24, 2014.
- A. J. Hansen, R. DeFries, (2007). Ecological mechanisms linking protected areas to surrounding lands. *Ecological Applications* 17, 974.
- Angelini, L. G., Ceccarini, L., Nasso, N., & Bonari, E. (2009). Comparison of *Arundo donax* L. and *Miscanthus x giganteus* in a long-term field experiment in Central Italy: Analysis of productive characteristics and energy balance. *Biomass and Bioenergy*, 33(4), 635–643. doi:10.1016/j.biombioe.2008.10.005
- Anwar, M., Liu, D., Macadam, I., Kelly, G., (2013). Adapting agriculture to climate change: a review. *Theoretical and Applied Climatology* 113, 225-245.
- Atchison, J. E. (1996). Twenty-five years of global progress in nonwood plant fiber repulping, 79(10), 87–95.
- AWS, 2014. Alliance for Water Stewardship International Water Stewardship Standard, <http://www.allianceforwaterstewardship.org/>, June 24, 2014.
- AZE, 2014. Alliance for Zero Extinction Database, <http://www.zeroextinction.org/>, June 24, 2014.
- Bhardwaj, H. L., Webber, C. L., & Sakamoto, G. S. (2005). Cultivation of kenaf and sunn hemp in the mid-Atlantic United States. *Industrial Crops and Products*, 22(2), 151–155. doi:10.1016/j.indcrop.2004.08.002
- Binod, P., Sindhu, R., Singhanian, R. R., Vikram, S., Devi, L., Nagalakshmi, S., ... Pandey, A. (2010). Bioethanol production from rice straw: An overview. *Bioresource technology*, 101(13), 4767–74. doi:10.1016/j.biortech.2009.10.079
- CABI, 2014. Invasive Species Compendium, <http://www.cabi.org/isc/>, June 24, 2014.
- CFI, 2014. Cool Farm Tool, <http://www.coolfarmtool.org/>, June 24, 2014.
- Chandra, M. (1998). Use of nonwood plant fibers for pulp and paper industry in Asia: Potential in China By use of nonwood plant fibers for pulp and paper industry in Asia: Potential in China
- CITES, 2014. Convention on International Trade in Endangered Species of Wild Fauna and Flora, <http://www.cites.org/>, June 24, 2014.
- Cleuren, H. M., & Henkemans, A. B. (2003). Development of the bamboo sector in Ecuador: harnessing the potential of *Guadua angustifolia*. *Journal of Bamboo and Rattan*, 2(2), 179–188. doi:10.1163/156915903322320784
- CMS, 2014. Convention on the Conservation of Migratory Species of Wild Animals, <http://www.cms.int/>, June 24, 2014.
- Cordeiro, N., Belgacem, M., Torres, I., & Moura, J. C. V. (2004). Chemical composition and pulping of banana pseudo-stems. *Industrial Crops and Products*, 19(2), 147–154. doi:10.1016/j.indcrop.2003.09.001
- C. R. Margules, R. L. Pressey, (2000). Systematic conservation planning. *Nature* 405, 243.
- C. R. Groves, D. B. Jensen, L. L. Valutis, K. H. Redford, M. L. Shaffer et al., (2002). Planning for Biodiversity Conservation: Putting Conservation Science into Practice. *BioScience* 52, 499.
- Ecofys, EPFL, & WWF, 2012. Low Indirect Impact Biofuel (LIIB) methodology, <http://rsb.org/pdfs/working-and-expertGroups/II-EG/12-09-03-LIIB-methodology-Version0-July2012.pdf>, June 24, 2014.
- EPA, 2012. Guidelines for Agricultural Waste, <http://www.epa.gov/oecaagct/twas.html>, June 24, 2014.
- EPA, 2014. EOCRA Sections 311-312, http://www.epa.gov/oem/content/epcra/epcra_storage.htm, June 24, 2014.
- EPA, 2014. Greenhouse Gas Reporting Program, <http://www.epa.gov/ghgreporting/>, June 24, 2014.
- Fair Food Standards Council, 2014. Fair Food Program, <http://fairfoodstandards.org/index.html>, June 24, 2014.
- Fair Trade USA, 2014. Fair Trade USA, <http://fairtradeusa.org/>, June 24, 2014.
- FAO, 2006. Guidelines for Soil Description, ftp://ftp.fao.org/agl/agll/docs/guide1_soil_descr.pdf, June 24, 2014.
- FAO, 2008. Integrated Food Security Phase Classification (IPC) Technical Manual, <ftp://ftp.fao.org/docrep/fao/010/i0275e/i0275e00.pdf>, June 24, 2014.
- FAO, 2008. Visual Soil Assessment (VSA) Field Guides, <http://www.fao.org/docrep/010/i0007e/i0007e00.HTM>, June 24, 2014.

- FAO, 2013. Food Security Indicators, <http://www.fao.org/economic/ess/ess-fs/ess-fadata/en/#.U6smxflDVyx>, June 24, 2014.
- FAO, 2014. About the Voluntary Guidelines on the Responsible Governance of Tenure, <http://www.fao.org/nr/tenure/voluntary-guidelines/en/>, June 24, 2014.
- FAO, 2014. Food and Agriculture Organization of the United Nations FAOSTAT database, <http://faostat.fao.org/>, June 24, 2014.
- FAO, 2014. Operator Level Food Security Assessment Tool – Version Two, <http://www.fao.org/energy/befs/operator-tool/en/>, June 24, 2014.
- FAO, 2014. What is Agricultural Biodiversity?, <http://www.fao.org/agriculture/crops/thematic-sitemap/theme/compendium/tools-guidelines/what-is-agricultural-biodiversity/en/>, June 24, 2014.
- FAO/IIASA/ISRIC/ISSCAS/JRC, 2012. Harmonized World Soil Database (version 1.2), <http://webarchive.iiasa.ac.at/Research/LUC/External-World-soil-database/HTML/>, June 24, 2014.
- Fike, W. (1990). The Rise and Fall of Kenaf as a Fiber Crop in North Carolina. In *Advances in New Crops* (pp. 297–299).
- FLA, 2012. Fair Labor Association, <http://www.fairlabor.org/>, June 24, 2014.
- Fortenbery, T. R., & Bennett, M. (2004). Opportunities for Commercial Hemp Production. *Review of Agricultural Economies*, 26(1), 97–117.
- Freidberg, S., (2013). Calculating sustainability in supply chain capitalism. *Economy and Society* 42, 571–596.
- GHG Protocol, 2012. The Greenhouse Gas Protocol, <http://www.ghgprotocol.org/>, June 24, 2014.
- González-García, S., Hospido, a., Feijoo, G., & Moreira, M. T. (2010). Life cycle assessment of raw materials for non-wood pulp mills: Hemp and flax. *Resources, Conservation and Recycling*, 54(11), 923–930. doi:10.1016/j.resconrec.2010.01.011
- Hansen, A.J., DeFries, R., (2007). Ecological mechanisms linking protected areas to surrounding lands. *Ecological Applications* 17, 974–988.
- Haughton, A.J., Bond, A.J., Lovett, A.A., Dockerty, T., Sünnenberg, G., et al., (2009). A novel, integrated approach to assessing social, economic and environmental implications of changing rural land-use: a case study of perennial biomass crops. *Journal of Applied Ecology* 46, 315–322.
- HCV Resource Network, 2013. Common Guidance for the Identification of High Conservation Values, http://www.hcvnetwork.org/resources/folder.2006-09-29.6584228415/2013_cgidentification_highres, June 24, 2014.
- HCV Resource Network, 2014a. HCV Toolkits, <http://www.hcvnetwork.org/practical-support/the-hcv-toolkit-global-home>, June 24, 2014.
- HCV Resource Network, 2014b. High Conservation Value Resource Network, <http://www.hcvnetwork.org/>, June 24, 2014.
- Human Rights Watch, 2014. Human Rights Watch, <http://www.hrw.org/>, June 24, 2014.
- Hunt, R.G., Franklin, W.E., (1996). LCA: How it came about. *The International Journal of Life Cycle Assessment* 1, 4–7.
- IBAT, 2014. Integrated Biodiversity Assessment Tool, <https://www.ibatforbusiness.org/login>, June 24, 2014.
- ICRAF, Embrapa, and CIAT, 2012. InPaC-S: Participatory Knowledge Integration on Indicators of Soil Quality, <http://www.worldagroforestry.org/downloads/publications/PDFs/B17459.PDF>, June 24, 2014.
- IFIA, 2014. International Fertilizer Industry Association, http://www.unece.org/trans/danger/publi/ghs/ghs_rev00/00files_e.html, June 24, 2014.
- ILO, 2012. ILO Conventions, http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12000:0::NO::P12000_INSTRUMENT_SORT:4, June 24, 2014.
- ILO, 2012. C169- Indigenous and Tribal Peoples Convention, http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID:312314m, June 24, 2014.
- Institute for Global Labour and Human Rights, 2014. Institute for Global Labour and Human Rights, <http://www.globallabourrights.org/>, June 24, 2014.
- IPCC, 2012. Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change, eds C.B. Field, V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, M. P.M., Cambridge, UK and New York, NY, USA.

- IPPC, 2014. International Plant Protection Convention, <https://www.ippc.int/>, June 24, 2014.
- ISO, 2013. ISO/TS 14067:2013, http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=59521, June 24, 2014.
- ISSG, 2014. Global Invasive Species Database, <http://www.issg.org/database/welcome/>, June 24, 2014.
- IUCN, 2014. International Union for Conservation of Nature and Natural Resources - Red List, <http://www.iucnredlist.org/>, June 24, 2014.
- Kadam, K. L., Forrest, L. H., & Jacobson, W. A. (2000). Rice straw as a lignocellulosic resource: collection, processing, transportation, and environmental aspects. *Biomass and Bioenergy*, 18(5), 369–389. doi:10.1016/S0961-9534(00)00005-2
- Koh, L.P., Levang, P., Ghazoul, J., (2009). Designer landscapes for sustainable biofuels. *Trends in Ecology & Evolution* 24, 431-438.
- Lobovikov, Maxim, Paudel, Shyam Piazza, Marco, Hong Ren, Wu, J. (2005). *World Bamboo Resources* (p. 87). Rome, Italy.
- Lonsdale, W.M., FitzGibbon, F., (2011). The known unknowns—managing the invasion risk from biofuels. *Current Opinion in Environmental Sustainability* 3, 31-35.
- Mack, R. N. (2008). Evaluating the Credits and Debits of a Proposed Biofuel Species: Giant Reed (*Arundo donax*). *Weed Science*, 56(6), 883–888. doi:10.1614/WS-08-078.1
- Mariani, C., Cabrini, R., Danin, a., Piffanelli, P., Fricano, a., Gomarasca, S., ... Soave, C. (2010). Origin, diffusion and reproduction of the giant reed (*Arundo donax* L.): a promising weedy energy crop. *Annals of Applied Biology*, 157(2), 191–202. doi:10.1111/j.1744-7348.2010.00419.x
- Mazhari Mousavi, S. M., Hosseini, S. Z., Resalati, H., Mahdavi, S., & Rasooly Garmaroody, E. (2013). Papermaking potential of rapeseed straw, a new agricultural-based fiber source. *Journal of Cleaner Production*, 52, 420–424. doi:10.1016/j.jclepro.2013.02.016
- Mclaughlin, S. P. (2013). Properties of paper made from fibers of *Hesperaloe funifera* (Agavaceae) 1, 54(2), 192–196.
- Milà i Canals, L., Bauer, C., Depestele, J., Dubreuil, A., Freiermuth Knuchel, R., et al., (2007). Key elements in framework for land use impact assessment within LCA. *The International Journal of Life Cycle Assessment* 12, 5-15.
- Miles, L., Dunning, E., Doswald, N., Osti, M., 2010. A safer bet for REDD+: Review of the evidence on the relationship between biodiversity and the resilience of forest carbon stocks. Working paper v2., In *Multiple Benefits Series*. ed. U.-R. Programme. UNEP World Conservation Monitoring Centre, Cambridge, U.K.
- Mooney, H.A., Hobbs, R.J., 2000. *Invasive Species in a Changing World*. Island Press, Washington, DC, U.S.A.
- Natural Capital Project, 2014. *Integrated Valuation of Environmental Services and Tradeoffs (InVEST)*, Palo Alto, CA, USA.
- NatureServe, 2014. *NatureServe Vista: Decision Support for Better Planning*, <http://www.natureserve.org/conservation-tools/data-maps-tools/natureserve-vista>, June 24, 2014.
- NCASI and USDA Forest Service, 2014. *The Carbon Online Estimator (COLE)*.
- OECD, 2011. *Convention on Combating Bribery of Foreign Public Officials in International Business Transactions*, http://www.oecd.org/daf/anti-bribery/ConvCombatBribery_ENG.pdf, June 24, 2014.
- Of, E., Time, H., Of, C., & On, K. (2010). Evaluation of harvesting time effects and cultivars of kenaf on papermaking, 5, 1268–1280.
- OHCHR, 2014. *Convention on the Rights of the Child*, <http://www.ohchr.org/en/professionalinterest/pages/crc.aspx>, June 24, 2014.
- Patanè, C., & Cosentino, S. L. (2013). Yield, water use and radiation use efficiencies of kenaf (*Hibiscus cannabinus* L.) under reduced water and nitrogen soil availability in a semi-arid Mediterranean area. *European Journal of Agronomy*, 46, 53–62. doi:10.1016/j.eja.2012.12.002
- PBL (Netherlands Environmental Assessment Agency), 2010. Are models suitable for determining ILUC factors?, <http://www.pbl.nl/en/publications/2010/Are-models-suitable-for-determining-ILUC-factors>, June 24, 2014.
- Pereira, P. H. F., Jacobus, C., Cioffi, M. O. H., Mulinari, R., & Luz, M. Da. (2011). Sugarcane bagasse pulping and bleaching: thermal and chemical characterization, 6(2005), 2471–2482.

- Pilgrim, J.D., Brownlie, S., Ekstrom, J.M.M., Gardner, T.A., von Hase, A., et al., (2013). A process for assessing the offsetability of biodiversity impacts. *Conservation Letters* 6, 376-384.
- Ramsar and Wetlands International, 2013. Ramsar Sites Database, <http://ramsar.wetlands.org/>, June 24, 2014.
- Reddy, N., & Yang, Y. (2005). Biofibers from agricultural byproducts for industrial applications. *Trends in biotechnology*, 23(1), 22–7. doi:10.1016/j.tibtech.2004.11.002
- Rejmanek, M., Richardson, D.M., (1996). What attributes make some plant species more invasive? *Ecology* 77, 1655-1661.
- Ricciardi, A., (2013). Invasive Species, In *Ecological Systems*. ed. R. Leemans, pp. 161-178
- Richardson, D.M., Pysek, P., Rejmanek, M., Barbour, M.G., Panetta, F.D., et al., (2000). Naturalization and invasion of alien plants: concepts and definitions. *Diversity & Distributions* 6, 93.
- RSB, 2014. Roundtable on Sustainable Biomaterials Greenhouse Gas Calculator, <http://rsb.org/activities-and-projects/greenhouse-gas-calculation/>, August 14, 2014.
- SAI, 2012. SA8000 Standard, <http://www.sa-intl.org/index.cfm?fuseaction=Page.ViewPage&PageID=937>, June 24, 2014.
- Saravana Bavan, D., & Mohan Kumar, G. (2010). Potential use of natural fiber composite materials in India. *Journal of Reinforced Plastics and Composites*, 29(24), 3600–3613. doi:10.1177/0731684410381151
- Schroth, G., da Fonseca, G.A.B., Harvey, C.A., Gascon, C., Vasconcelos, H.L., et al., (2004). *Agroforestry and Biodiversity Conservation in Tropical Landscapes*. Island Press, Washington, DC, U.S.A.
- Song, X., Zhou, G., Jiang, H., Yu, S., Fu, J., Li, W., ... Peng, C., (2011). Carbon sequestration by Chinese bamboo forests and their ecological benefits: assessment of potential, problems, and future challenges. *Environmental Reviews*, 19(NA), 418–428. doi:10.1139/a11-015
- Spencer, D. F., Liow, P.-S., Chan, W. K., Ksander, G. G., & Getsinger, K. D. (2006). Estimating *Arundo donax* shoot biomass. *Aquatic Botany*, 84(3), 272–276. doi:10.1016/j.aquabot.2005.11.004
- Stricker, J. A., Prine, G. M., & Riddle, T. C. (2006). Kenaf - A Possible New Crop for Central Florida 1, (Figure 1).
- The Worker Rights Consortium, 2007. Worker Rights Consortium, <http://www.workersrights.org/>, June 24, 2014.
- Thomas, V.M., Liu, W., (2013). Assessment of Alternative Fibers for Pulp Production. Public Version. Prepared for Kimberly-Clark Corporation. Georgia Institute of Technology.
- TNC, 2010. Weed Risk Assessments for Florida, <http://www.hear.org/wra/tncflwra/>, June 24, 2014.
- TNC, 2010. Ecoregional Assessment, <http://www.conservationgateway.org/ConservationPlanning/SettingPriorities/EcoregionalAssessment/Pages/ecoregional-assessment.aspx>, June 24, 2014.
- TNC, 2011. An Invasive Plant Management Decision Analysis Tool, http://www.imapinvasives.org/IPMDAT_v1.1_06-30-11.pdf, June 24, 2014.
- UN Global Compact, 2013. Women's Empowerment Principles, http://www.unglobalcompact.org/issues/human_rights/equality_means_business.html, June 24, 2014.
- United Nations, 2003. Globally Harmonized System of Classification and Labelling of Chemicals (GHS), http://www.unece.org/trans/danger/publi/ghs/ghs_rev00/00files_e.html, June 24, 2014.
- United Nations, 2009. Convention on the Elimination of All Forms of Discrimination Against Women, <http://www.un.org/womenwatch/daw/cedaw/text/econvention.htm>, June 24, 2014.
- United Nations, 2010. Minority Rights: International Standards and Guidance for Implementation, http://www.ohchr.org/Documents/Publications/MinorityRights_en.pdf, June 24, 2014.
- United Nations, 2014. The Universal Declaration of Human Rights, <http://www.un.org/en/documents/udhr/index.shtml>, June 24, 2014.
- UNESCO, 2014. World Heritage List, <http://whc.unesco.org/en/listm>, June 24, 2014.
- UNFCCC, 2014. United Nations Framework Convention on Climate Change Reporting Requirements, http://unfccc.int/national_reports/annex_i_ghg_inventories/reporting_requirements/items/2759.php, June 24, 2014.
- UNDESA, 2014. Declaration on the Rights of Indigenous Peoples, <http://undesadspd.org/IndigenousPeoples/DeclarationontheRightsofIndigenousPeoples.aspx>, June 24, 2014.

- UNODC, 2014. United Nations Convention Against Corruption, <http://www.unodc.org/unodc/en/treaties/CAC/>, June 24, 2014.
- UN-REDD, 2014. UN-REDD Programme FPIC Guidelines, http://www.unredd.net/index.php?option=com_docman&task=cat_view&gid=1333&Itemid=53, June 24, 2014.
- USAID, 2014. United States Agency for International Development's Agriculture, Forestry, and Other Land Use Carbon Calculator, <http://www.afolucarbon.org/>, June 24, 2014.
- USDA, 2012. Community Food Security Assessment Toolkit. http://www.ers.usda.gov/publications/efan-electronic-publications-from-the-food-assistance-nutrition-research-program/efan02013.aspx#.U6snj_IdVyx, June 24, 2014.
- USDA, 2013. Agroforestry, <http://www.usda.gov/wps/portal/usda/usdahome?contentidonly=true&contentid=agroforestry.html>, June 24, 2014.
- USDA, 2014. Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory, <http://rmpportal.net/groups/csa/library-1/usda-quantifying-greenhouse-gas-fluxes-in-agriculture-and-forestry-methods-for-entity-scale-inventory/view>, August 14, 2014.
- USDA, 2014. Soil Health Assessment, <http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/assessment/>, June 24, 2014.
- USDA, 2014. United States Department of Agriculture Foreign Agricultural Service Databases, <http://www.fas.usda.gov/data>, June 24, 2014.
- USFWS, 2014. United States Fish & Wildlife Service Endangered Species Database, <http://www.fws.gov/angered/>, June 24, 2014.
- USGS, 2014. National Gap Analysis Program (GAP) Protected Areas Data Portal, <http://gapanalysis.usgs.gov/padus/m>, June 24, 2014.
- van der Werf, G.R., Morton, D.C., DeFries, R.S., Olivier, J.G.J., Kasibhatla, P.S., et al., (2009). CO₂ emissions from forest loss. *Nature Geosci* 2, 737-738.
- Ververis, C., Georghiou, K., Christodoulakis, N., Santas, P., & Santas, R. (2004). Fiber dimensions, lignin and cellulose content of various plant materials and their suitability for paper production. *Industrial Crops and Products*, 19(3), 245–254. doi:10.1016/j.indcrop.2003.10.006
- Wallace Initiative, 2014. Wallace Initiative, <http://wallaceinitiative.org/>, June 24, 2014.
- WDPA, 2010. World Database on Protected Areas, <http://protectedplanet.net/>, June 24, 2014.
- Wilson, F.D, Menzel, M. (2013). Kenaf (*Hibiscus cannabinus*), Roselle (*Hibiscus sabdariffa*). *Economic Botany*, 18(1), 80–91.
- WFN, 2014a. Water Footprint Network, <http://www.waterfootprint.org/?page=files/home>, June 24, 2014.
- WFN, 2014b. Water Footprint Network WaterStat database, <http://www.waterfootprint.org/?page=files/WaterStat-WaterScarcity>, June 24, 2014.
- WHO, 2009. The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification, http://www.who.int/ipcs/publications/pesticides_hazard/en/, June 24, 2014.
- World Bank, 1998. Operational Policy 4.09 – Pest Management, <http://go.worldbank.org/QNORFLUFR0>, June 24, 2014.
- World Bank, 2001. Operational Policy 4.04 – Natural Habitats, <http://go.worldbank.org/GIFQKJA130>, June 24, 2014.
- World Bank, 2013. Operational Policy 4.10 – Indigenous Peoples, <http://go.worldbank.org/TE769PDWN0>, June 24, 2014.
- World Bank, 2013. Operational Policy 4.12 – Involuntary Resettlement, <http://go.worldbank.org/GM0OEIY580>, June 24, 2014.
- World Business Council for Sustainable Development (WBCSD), 2013. ECO4Biz: Ecosystem Services and Biodiversity Tools for Business Decision Making, <http://www.wbcd.org/eco4biz2013.aspx>, June 24, 2014.
- World Business Council for Sustainable Development (WBCSD), 2013. Water4Biz: Initiatives Guiding Sustainable Water Management in the Private Sector, <http://www.wbcd.org/work-program/sector-projects/water/water4biz.aspx>, June 24, 2014.
- WRI, 2013. Aqueduct Water Risk Atlas, <http://www.wri.org/our-work/project/aqueduct>, June 24, 2014.

- WRI, 2014. Global Forest Watch, <http://www.globalforestwatch.org/>, June 24, 2014.
- WWF, 2012. Smart Infrastructure Planner, <http://www.worldwildlife.org/publications/smart-infrastructure-planner-beta>, June 24, 2014.
- WWF, 2012. The 2050 Criteria, http://wwf.panda.org/what_we_do/how_we_work/businesses/transforming_markets/solutions/commodity_financing/2050_criteria/, June 24, 2014.
- WWF, 2012. WWF's Position on Genetically Modified Organisms (GMOs), http://awsassets.panda.org/downloads/wwf_position_statement_on_gmos_december_2012.pdf, June 24, 2014.
- WWF, 2013. Assessing Risks to Forest Cover and Carbon Stocks: A Review of Tools and Approaches to Compare Business-As-Usual to REDD+ Scenarios, http://awsassets.panda.org/downloads/fin_tools_report__web_version.pdf, June 24, 2014.
- WWF, 2013. WWF Environmental and Social Safeguards Policies and Procedures, <http://www.worldwildlife.org/publications/wwf-environmental-and-social-safeguards-policies-and-procedures>, June 24, 2014.
- WWF, 2014. Free, Prior, and Informed Consent and REDD+: Guidelines and Resources, http://wwf.panda.org/about_our_earth/all_publications/?214094/Free-Prior-and-Informed-Consent-and-REDD--Guidelines-and-Resources, June 24, 2014.
- WWF, 2014. The Water Risk Filter, <http://waterriskfilter.panda.org/>, June 24, 2014.
- Zhao, Guanglei, Lai, Ronald, Greschik, Thomas, Li, X. (2010). Replacement of softwood kraft pulp with ecf-bleached bamboo kraft pulp in fine paper. *Bioresources.com*, 5(3), 1733–1744.
- Zhao-hua, L. I., Denich, M., & Borsch, T. (2005). Growth behavior of *Phyllostachys nigra* var. *henonis* (Bambusoideae) in Central China, 16(3), 163–168.



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