# Methodology for the Assessment of Bioplastic Feedstocks

Bioplastic Feedstock Alliance

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## Introduction

The Bioplastic Feedstock Alliance is a multi-stakeholder working group dedicated to a sustainable vision for biobased plastics. Through informed science, collaboration, education, and innovation, the group strives to responsively guide the selection and harvesting of feedstocks for biobased plastics in order to encourage an economically prosperous and sustainable flow of materials, creating lasting value for present and future generations. For the sake of this tool, the BFA refers to a bioplastic as any plastic derived wholly or partially from biomass.

As we transition to a future economy no longer dependent on fossil-derived energy and raw materials for industrial production, issues related to food security, land competition, water, safe labor practices and overall environmental performance will become increasingly important. The World Wildlife Fund (WWF) supports the responsible management of these resources responding to increasing demands, regardless of the end use and providing a voice for conservation at the table. WWF engages on these issues using credible, science-based information and transparent multi-stakeholder initiatives.

WWF's role in the Bioplastic Feedstock Alliance (BFA) is in organizing thought leadership around these unknown and known variables in order to enable progress on decreasing our dependency on oil and increasing our conservation of the world's most precious places and species.

Over the past decade there has been an increase in the development of bioplastics technology and investment in infrastructure to bring solutions to scale. In a proactive approach, the BFA formed as a multi-stakeholder initiative to come to agreement on the broader impacts the industry could have and how to mitigate risks such as food security, land use change and resource scarcity for the bioplastic feedstocks. The main objective of the BFA is to develop a methodology for assessing feedstocks at the regional level (or as close to the source of production as possible) in order to secure a common understanding of sustainability considerations based on best known science. Having a broad set of views coming together from science based perspectives in agreeing on a methodology for assessment (both qualitative and quantitative) will help the industry drive positive change at scale.

Current membership within the BFA is supported by prominent consumer brand companies and a number of other scientific and academic institutions along with suppliers and producers participating in this sector. The credibility and transparency of the BFA as a multi stakeholder initiative is based on the many (and varied) organizations who are currently contributing to the work. With an overall goal of global adaption of this methodology, the BFA is open to additional participation for those organizations with interest, whether economically, environmentally or socially, in the bioplastics sector.

This document showcases the methodology agreed upon to provide guidance on how to assess risks and make more transparent decisions on a bioplastic feedstock in order to have a more positive impact on the environment, society and the economy. This tool will allow brands and producers to rate potential bioplastic feedstock solutions on a defined, qualitative scale on a series of criteria that are key to the expected environmental sustainability of the bioplastic feedstock and the region in which it is being produced by allowing the user to (i) compare different bioplastic feedstocks and different production systems across key criteria in terms of environmental and social sustainability; (ii) understand what kinds of changes to production systems would result in more sustainable production; and (iii) identify opportunities for management programs that would track progress and improve sustainability over time.

As has been learned with biofuels, there is no simple or single formula that can be applied globally to bioplastic feedstocks, but there are some common indicators of performance. Using the best available data, each feedstock needs to be evaluated at the most specific regional level possible taking into consideration not only the energy required to produce; agricultural chemical inputs; impacts on biodiversity, soil, air, and water; but also social issues regarding land use, labor, and food availability. The same feedstock grown in different regions or different feedstocks grown in the same region will provide different results due to regional agronomic variations - soil type, rainfall, input use, and cultivation techniques. Focusing on a standard set of key performance indicators will facilitate understanding the tradeoffs and risks that each of the crops may present within a given region. What is important is that the methodology is standardized and performance can be monitored.

## Scope

The scope of the work for the BFA is *land use change to initial processing*, where initial processing includes activities that directly affect the landscape where the feedstock is grown (for example: sugarcane mill operations would be considered initial processing if their operations, water use and discharges etc,. affect the area directly surrounding the cane growing operations). In making the decision about what plastic to use for a product, what it is made of, how it is made and how it contributes to impacts on the life cycle of a system needs to be done with a series of tools. This methodology provides an assessment tool for one piece of the system and needs to be considered as one tool in the toolbox. The BFA chose to address this piece of the system due to the lack of data and agreed upon tools, not because it was deemed more important or more valuable in the overall impact of a product. This tool does not take into consideration logistics beyond the farm level, manufacturing process, use or end of life. These were excluded due to the dilution that their inclusion would have created to the methodology in increasing its overall complexity. This methodology was designed and developed with the best known science at the time to the knowledge and judgment of BFA and is intended to be updated as more science becomes available.

## Process

The BFA agreed upon a set of Guiding Principles in order to set the tone for the premise of the work. These principles set the priorities under which the BFA would complete its work. It is under these principles, detailed below, that our methodology was developed.

### BFA Guiding Principles

1. Commitment to be credible and transparent
2. Maintain environmental responsibility and conservation of natural resources and biodiversity
3. Protect or enhance the health and welfare of farmers and their communities
4. Minimize adverse effects on global resources (ie. Food, land, water)
5. Actively engage multi stakeholders
6. Use of science based systems approach
7. Drive use of appropriate best practices in feedstock risk mitigation
8. Provide opportunity for innovation
9. Technology neutral
10. Global adoption linking theory to on the ground good agricultural practices

### Goals

The BFA began the process of developing the assessment tool by first determining what the ultimate goal of this tool would be, what that ideal solution could be. By setting this lofty standard, it provides the bioplastic industry with something tangible to strive for. This set of goals created the foundation for the methodology, allowing the further elucidation into what would be required to meet these goals in order to drive the measurement of success.

**<u>An optimal bioplastic feedstock is one that:</u>**

1. Is legally sourced, conforms to Universal Declaration of Human Rights (UDHR) and is produced in a safe and healthy way for workers and surrounding communities
2. Is one that is derived from renewable biomass whose production is sustainably managed
3. Does not adversely impact food security and affordability and maintains or improves social and economic conditions along with ecosystem services in producing communities
4. Does not result in destruction of critical ecosystems, loss of High Conservation Value (HCV) habitats or deforestation
5. Provides environmental benefits with minimal environmental impacts

### Indicators

Each of the above goals is complex and requires a number of aspects to be addressed in a feedstock. Within each of these goals it was important to determine what indicated success or failure against each of those goals. The BFA identified thirteen indicators for the goals.

| **Aggregated Indicator List – 13 Indicators** | |
|---|---|
| Biodiversity<br>Chemical Use: Nutrients & Pest Management<br>Co-Product and Waste Management<br>Cradle to Gate GHG<br>Ecosystem Services<br>Food Security<br>Labor Rights | Land Use Change Impacts<br>Legal Production<br>Local and/or Indigenous Communities<br>Occupational Health & Safety<br>Soil Management<br>Water Management |

The table below contains the 13 Indicators aligned with the 5 Goals.

| **1. Is legally sourced, conforms to UDHR and is produced in a safe and healthy way for workers and surrounding communities** |
|---|
| Chemical Use: Nutrients & Pest Management<br>Co-product and Waste Management<br>Labor Rights<br>Land Use Change Impacts<br>Legal Production<br>Occupational Health & Safety<br>Water Management |
| **2. Is one that is derived from renewable biomass whose production is sustainably managed** |
| Biodiversity<br>Chemical Use: Nutrients & Pest Management<br>Co-product and Waste Management<br>Cradle to Gate GHG<br>Land Use Change Impacts<br>Soil Management<br>Water Management |
| **3. Does not adversely impact food security or affordability and maintains or improves social and economic conditions along with ecosystem services in producing communities**** |
| ** Infrastructure and logistic impacts included |
| Ecosystem Services<br>Food Security/Affordability<br>Local and/or Indigenous Communities<br>Soil Management<br>Water Management |
| **4. Does not result in destruction of critical ecosystems, loss of HCV habitats or deforestation** |
| Biodiversity<br>Chemical Use: Nutrients & Pest Management<br>Land Use Change Impacts<br>Local and/or Indigenous Communities<br>Soil Management<br>Water Management |
| **5. Provides environmental benefits with minimal environmental impacts* **** |
| *Includes key impact categories: ecosystem services, biodiversity, water, air, soil and land use (direct and indirect)<br>** Infrastructure and logistic impacts included |
| Biodiversity<br>Chemical Use: Nutrients & Pest Management<br>Co-product and Waste Management<br>Cradle to Gate GHG<br>Land Use Change Impacts<br>Soil Management<br>Water Management |

Each of the above indicators in itself is complex and requires different assessment methods in order to consider the potential environmental, social and economic impacts that each feedstock could have on them. The depth to which any interested party can assess a feedstock depends on the amount of data they have for each of these indicators. In terms of 1st generation feedstocks, there is typically more data available; however in focusing out to 2nd and 3rd generation solutions, it is still important that the tool can help identify risks and opportunities for improvement. To accommodate the variability in data availability, the assessment tool has 3 tiers: Executive Level Screening, Survey and Assessment. The first tier requires the least amount of information and would be used to just screen out those feedstocks that are not viable at a high level while the second and third tiers provide more detailed in depth study to assess.

## The Method & Tiers

Each tier of the Method assumes a certain amount of information is available along with a level of expertise for assessment. As with all assessments, the BFA has also identified the risk at each tier if a final decision was to be based on much less information. Below is a table depicting the main differences between each tier of the methodology.

| | Executive Level Screening (ELS) | Survey | Assessment |
|---|---|---|---|
| FORMAT | ELS yes/no survey | 13 Indicator Datasheets | 3rd Party Assessment of 5 Key Indicators |
| WHO | Brands & Producers | Brands & Producers | 3rd Parties Determined |
| REQUIRED | High level understanding of qualitative impacts of feedstocks. | In depth qualitative data on all 13 indicators & metrics | BFA determines quantitative assessment methods for key indicators to put values on potential risk with higher quality data. |
| GATE | All Yes's =go<br>ANY No's =stop | Aggregate data into Scorecard and use percent goal achievement to determine best solution | Survey + Assessment = Best Possible Data for Decision |
| RISK LEVEL | If final decision is based off of just the ELS, the risk is HIGH that not all information is considered for decision. | If final decision is based off of Survey results, depending on identified risk and availability of information for datasheets, the risk is MODERATE to LOW that not all information is considered for decision. | If final decision is based off of Survey + the Assessment results, the risk is LOW that not all information is considered for decision. |

### Executive Level Screening

When an organization begins to investigate the many options for bioplastic feedstocks, there might be the desire to have some sort of litmus test for narrowing that list down to the most viable options for more in depth assessment. Due to the overall complexity of this type of choice and the potential for tradeoffs, there is no "Black List" of feedstocks. Any such list would be accurate only under a certain set of conditions and would not account for regional variation. To allow for a high level assessment of many feedstocks, the BFA developed the Executive Level Screening, at this tier; the user follows the screening at a high qualitative level in order to identify major risks. This GO (move onto Survey Tier)/NO GO (feedstock less viable) type screening should weed out those feedstocks without clear identified major risks and progresses them forwarded to the next tier of the Method.

### Executive Level Screening Instructions

The Executive Level Screening (ELS) was designed to act as a go/no go tool to help users decide which feedstocks should be screened further and pursued. In this tool, use the feedstocks currently under consideration and run each one through the ELS. This screening, although very high level, is still considered to provide input on extremely risky considerations. For best results, the use of background information and scientifically based responses will guide the user more accurately. At this step, if all questions are answered with "yes", then the user can move onto the second tier, Survey.. Some questions have a follow up question if the first response is a "No," if the follow up question result is a "Yes," then the tool considers that overall question as a "Yes." Using the ELS will help pare down the number of feedstocks in consideration for the Survey level by identifying what the BFA considers very extreme issues. The user may choose to override the ELS and move forward with feedstocks into the Survey level, this tool is meant to highlight issues early on and reduce the workload.

**Survey**
Once the user has identified the most viable options and regions in which they would be produced, they would use the Survey level of the Method. At the Survey level the user runs each feedstock/region through the 13 Indicator Datasheets. These datasheets have been developed to survey each indicator qualitatively and quantitatively when suitable and to clearly identify risks. The datasheets act as scorecards under each indicator and provide the user the opportunity to identify potential opportunities and impacts for each feedstock. Each metric in the datasheet is scored and this score was determined by the Digital Logic Method as a way to weigh the value of the metrics. Each indicator provides a list of mitigation activities recommended by the BFA. As this Method falls far up the value chain as a decision making tool, it does not provide the opportunity for measuring progress overtime. It does however identify existing management systems, standards and certification programs that do exist connecting this decision with existing sustainable agriculture practices.

**Digital Logic Method Process Description**
Digital Logic Method (DL) is a method to assign weighting values to properties of a solution or material in question when each property has different importance. Via pair-wise comparison between each property, a set of weighting factors can be determined based on different importance of each property. Therefore, we use this method to assign values to each metric question within each INDICATOR.

**Survey Scorecard**
At the completion of all 13 Indicator Datasheets, the scores are aggregated into the Survey Scorecard. This tool allows the user to syphon all the data they collected for each feedstock into a format that measures the feedstock's progress against each of the 5 Goals of the Methodology. Using the Indicators identified for each of these Goals previously and weighing them equally (10 pts available for each), the user can compare how each solution performs against each goal. The BFA has not set a bar for requirements at this stage. This is a decision making tool and the user is responsible for taking this information, the clear tradeoffs identified and the opportunities available for improvement of risks and coming to a conclusion that best aligns with their organizations mission.

**Survey Level Instructions**
The Survey has been set up as explained above in the form of 13 datasheets that allow the user to score each feedstock/regional pairing against the 13 Indicators then aggregate them all onto one scorecard to measure against the 5 goals set by the BFA for an ideal feedstock. The BFA advises that the user begins with the Ecosystem Services datasheet as it will help to identify key services impacted by the new feedstock for further assessment in other Indicators. Once all 13 are complete, the user should pull the scores into the Scorecard for assessment of each feedstock against the goals. It is at this point that the user will need to determine which feedstock and corresponding tradeoffs are chosen for production and further mitigation efforts. The Methodology is a decision making tool and not a management program. There are however many agricultural best management programs, certifications, standards and roundtables developed for measurement and improvement over time that are recommended below.

**Assessment Level Review**
Of the 13 indicators, there are a handful that stood out in complexity and importance. These indicators were identified as having an opportunity for a much more quantitative assessment providing the data and expertise for assessment was available. Food Security, Biodiversity, Ecosystem Services and Land Use Change Impacts all require a more rigorous approach in order to quantify the identified risks within the Survey Level. Once a user has identified the most viable solution via the Survey, they have the opportunity to complete a further deep dive on these 4 indicators to help increase transparency further for potential opportunities and risks. It is often valuable to work with a third party to do this assessment. This has the advantages of both lending credibility to the results, as well as providing the necessary expertise. By completing this additional level of review for these indicators, the user should have all the best science and data available when proceeding forward with a bioplastic feedstock solution.

**Production Management and Risk Mitigation**
This tool is a decision making methodology for assessing risk and understanding the tradeoffs across various feedstock opportunities. It is not a method for production management, measurement and improvement over time. There are however many of these management programs in the forms of certifications, roundtables, standards and Best Management Practices (BMPs) for a number of crops in consideration today. Within each of the Indicators we include

recommendations for next steps and opportunities for on the ground assessment, measurement and verification specific to their metrics. In addition to those recommendations, the BFA sought to connect this tool to other systems in sustainable agriculture.

The BFA recommends that for all feedstock material from the crops evaluated by the Field to Market Fieldprint Calculator (corn, soy, cotton, wheat, rice, potatoes, and eventually sugar beet & alfalfa) being sourced from the United States that the Fieldprint Calculator be used to evaluate a feedstock's fieldprint at the grower level as well as inform the development of subsequent mitigation and sustainable action plans. http://www.fieldtomarket.org/

Bonsucro is a multi-stakeholder standard setting organization for global sugarcane production. It is a metric based standard that does not prescribe practices to producers; however, it sets the bar for outcomes at the farm and milling level. Bonsucro's production standard is recognized by the European Union's Renewable Energy Directive. Additionally, Bonsucro is in the process of becoming a full member of ISEAL. The production standard addresses social, economic and environmental aspects of sugarcane farming and milling. The BFA recommends that the Bonsucro production standard and associated carbon metric tools be used when sourcing sugarcane derivatives for bioplastic feedstocks. http://www.bonsucro.com/

For those harvest feedstocks sourced globally, the BFA recommends the use of Roundtable on Sustainable Palm Oil (RSPO) for palm oil, Round Table for Responsible Soy (RTRS) for sustainable soy, and the Forest Stewardship Council (FSC) for tree based products. For other feedstocks, the Roundtable on Sustainable Biomaterials (RSB) is recommended. RSB is also a modular system, which recognizes other credible certification schemes, like Bonsucro. Using this modular function, it is possible to certify biomaterials through many stages of the supply chain with RSB.

Climate change is already directly impacting agriculture, and its impact is only expected to worsen in the future. Building resiliency into the system and adapting strategy to account for changing climate and increasing numbers of climate events will be key to maintaining a stable supply and mitigating the effects of shocks caused by extreme weather events. Diversification of feedstocks and growing locations are adaptation strategies that effectively build resiliency into the production system. More information about climate change adaptation can be found at www.flowingforward.org.

Excellent water management is important for all crops and regions and can be seen in each of the 5 Goals of this Methodology so the BFA recommends the following options for addressing water management and risk mitigation: First, employ mitigation responses suggested in the Water Risk Filter by inputting data into the tool which will identify mitigation responses that will correspond to the specific crop and basin risk. Although this solution provides just one-off solutions and is not a holistic response, the BFA would recommend this as a first step followed by full water stewardship activities to mitigate more substantial water risk. http://waterriskfilter.panda.org/MitigationTools.aspx

Second, the BFA would recommend the implementation of the AWS Standard (in Beta, finalization expected early 2014). The AWS is a step-wise approach to mitigating water risk, and is designed to work in any industry or geography. The AWS overlaps with governmental regulations required in that region, all crop production standard, and ISO standards etc. It is designed to address current and future risk for water management. In the AWS Appendix B (guidance for the AWS Standard) there is more guidance on how to comply with each step of the Standard along with references (tools and methodologies) and examples. http://www.allianceforwaterstewardship.org/what-we-do.html#water-stewardship-standard

Indirect Land Use Change (ILUC) as a part of overall Land Use Change (LUC) is reviewed at a very high level in this methodology. WWF, Ecofys and EPFL have developed a methodology to reduce ILUC called the Low Indirect Impact Biofuel (LIIB) Methodology. LIIB was designed to distinguish biofuels with a low risk of causing indirect impacts but can be used for all biomass production. It develops concepts proposed for mitigation of indirect land use change and other indirect impacts into a practical and cost effective methodology that can be used by policy makers and voluntary certification schemes that wish to stimulate production with low risk of unwanted indirect impacts. http://www.liib.org/

# Exercise Information

| | |
|---|---|
| **Feedstock Evaluated** | |
| **Geographical Boundary*** | |
| **Level of Data / Information** (Circle One)** | Local/ Production Site(s) Regional National |
| **State of Project (Circle One)** | Feedstock in Production OR Feedstock Being Considered |
| **Method Version** | |
| **Name of Reviewer** | |
| **Date** | |

*The geographical boundary is defined as the area where the crop is grown. Ideally, local data and information from an actual production site is used for this exercise, but that is not always available. For this exercise, indicate in this field where, to the best of your knowledge, the feedstock is or will be grown – be as specific as possible. Example 1: It is known that ethanol is being obtained from a specific mill – the geographical boundary is the mill's sourcing area. Example 2: It is unknown which mills are being sourced from, but they are all in Sao Paulo State. The geographical boundary is Sao Paulo State. A national geographic boundary may also be used, but will make some questions more difficult to answer and decrease the confidence of the results.

**Local data is more representative than regional data, which is more representative than national data. Therefore the most specific data available should be used when answering the screening questions and worksheets. In this field, indicate which level of data was used when making this evaluation. Generalize to the level of data used MOST OFTEN if necessary.

| **Comments:** |
|---|
| |

# BFA Executive Level Screening

**Step 1:** Identify crop and sourcing regions for particular crop

| **Step 2:** Review each Feedstock for the following questions | **Result** |
|---|---|
| **1.** Is this already a cultivated feedstock in these regions?<br>If no – Is the new feedstock known to be non-invasive? | Yes OR No<br>Yes OR No |
| **2.** In sourcing regions, can you legally source this feedstock? | Yes OR No |
| **3.** In the sourcing region can you obtain this feedstock from sources that adhere to labor and Operational Health & Safety (OHS) regulations? | Yes OR No |
| **4.** Identify key environmental problems with the feedstock. Key problems are those that cause a severe or major and lasting impact on the environment and that are known to occur. List them here or on an attached sheet. List mitigation systems / plans for each issue.<br>**Potential Environmental Issues (list for reference)**<br>• threatens/impacts local species and protected area (endangered species and local biodiversity) directly and indirectly (e.g. land use change)<br>• increases the need for toxic chemicals (pest or nutrition management)<br>• increases the overall carbon footprint (crop *per se* or its co-product or waste)<br>• impairs the local ecosystem services directly and indirectly (e.g. land use change)<br>• deteriorates the local soil conditions due to the plantation or poor soil management<br>• pollutes the local water resources<br>• utilizes water from already water stressed area<br>Are there mitigation systems that are / will be used to address all the identified environmental risks? **If even one risk is missing a mitigation plan or system than NO must be marked.** It is highly unlikely that there are zero key problems with a feedstock, but if this is the case, answer YES. | Yes OR No |
| **5.** List known social and economic issues associated with this feedstock.<br>**Potential Economic Issues (list for reference)**<br>• increasing the price of dietary staples in developing countries<br>• low wages and unfair prices for farmers and laborers<br>• import tariffs<br>• impact on local, incumbent plastics' technologies<br>• requires additional infrastructure investments<br>**Potential Social Issues (list for reference)**<br>• abuses to worker's rights including unhealthy working conditions and informal child labor<br>• policy targets that lead to human rights abuses<br>• impacts on land ownership and control<br>• processes used to acquire land<br>• impacts on social relationships (cooperation or conflict)<br>• livelihood activities displaced<br>• barriers to participation<br>• negative impacts on customary practices related to natural resource access or management<br>• impacts on food security<br>Are there mitigation systems in place that can address these economic and social issues? **If even one risk is missing a mitigation plan or system than NO must be marked.** | Yes OR No |
| **6.** Are there recognized crop management systems (ex. RSB, Bonsucro) in these regions?<br>If yes – Is the proposed production system compliant with or better than the recognized systems? | Yes OR No<br>Yes OR No |
| **7.** Can you verify that this region is not identified on the FAO Low Income Countries with a Food Deficit list? http://www.fao.org/countryprofiles/lifdc/en/<br>If no – Is it clear that this crop would not create food supply disruption or affect other ecosystem services? | Yes OR No<br>Yes OR No |
| **8.** Does or will the cultivation of this feedstock maintain or increase food affordability in the region? | Yes OR No |
| **9.** Is it clear that no critical ecosystems and high conservation value (HCV) habitats exist in the regions of crop cultivation?<br>If no – Is or will this crop be produced in a way which does not put any priority places at risk (direct and indirect)? | Yes OR No<br>Yes OR No |

| | | |
|---|---|---|
| **10.** Is there land in the region whose condition would be improved by the cultivation of this crop? | | Yes OR No |
| **SCORE** | The ELS is designed to allow a user to identify high level risks at a very qualitative level. A "Yes" for each of the ten questions indicates a higher likely hood of the particular feedstock as a viable solution and should be then considered for review at the BFA Survey level. A single "No" in itself may not be a reason to not move forward, however "Yes Answers" provide higher confidence in the solution moving forward. | |

| BFA Survey Level Screening | |
|---|---|
| **ECOSYSTEM SERVICES** | **GOALS: 3** |

## Why Is It Important:

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 agricultural products for the purposes of providing feedstocks for biofuel and bioplastics may interrupt the self-regulatory process and even disrupt the ability to do so from natural ecosystem. The demand for water from the growing agricultural products may pose threats to other species in that ecosystem which may cause degraded living conditions, migration, or even the extinction of those species in that given ecosystem. Similarly, pesticides may cause damage to other living species populations in that ecosystem. Those threats may change the dynamic of species within the ecosystem and decrease the populations of necessary species thereof, and thus lead to irreversible destructive situations for that given ecosystem and even the agricultural products cultivated as feedstocks.

Although cultivating agricultural products as feedstocks for bioplastics may impair the ecosystem services, they may also be able to benefit the ecosystem services. Many legumes, such as soybeans and peanuts, have the ability of fixing nitrogen from the atmosphere which can provide an input channel for introducing nutrition for soil and therefore the ecosystem. Excess nitrogen in the soil may also be harmful for plant life and other species in that ecosystem and cultivating agricultural crops as feedstocks for bioplastics should not impair the ecosystem services at that region. To assess the direct and indirect impacts of feedstocks, identifying what the ecosystem services provides in the area and who the potential beneficiaries are is necessary. Balancing the fact that some feedstocks can provide benefits for ecosystem services with the assurance of their total impact is vital. Quantitative tools and methods may be required to assess the full impact of feedstocks on ecosystem services.

| Metric | Result | Score | Comment | RISK? |
|---|---|---|---|---|
| What are the direct and indirect ecosystem services (ecological processes beneficial to people) currently provided by this area? For example, water yield, water quality, soil retention, soil carbon storage, GHG mitigation, air quality, food, fuel, fiber production, pest regulation, disease regulation, recreation (e.g., hunting and fishing, wildlife viewing), biodiversity conservation/loss, and other cultural and aesthetic services. Could be thought of as "services" and "dis-services" in lieu of baseline conditions. | List Services | N/A | | |
| **1.** Does or will the production of this feedstock disrupt access to ecosystem services identified above? **Answer questions 1A only if you answered YES to this question.** | Yes = 0<br>No = 3.80 | | | |
| **A.** Have relevant beneficiaries of these ecosystem services been identified and engaged in order to identify their concerns? | Yes= 1.87<br>No= 0 | | | |
| **2.** Is or will the feedstock displace natural perennial vegetation? (In general, any shift of native perennial vegetation to an exotic monoculture results in substantial loss in ecosystem services.) | Yes = 0<br>No = 1.82 | | | |
| **3.** Is or will the feedstock be a perennial or an annual variety? (In general, perennial crops have less of a negative impact on ecosystem services than annual monocultures.) | Perennial = 1.18<br>Annual = 0 | | | |
| **4.** Are there existing Payment for Ecosystem Services, (PES) schemes either in the region or for the crop that are relevant and are / will be replicated and/or other incentivizing mechanisms that will be jointly implemented with relevant government agencies and/or non-profits? | Yes = 1.51<br>No =0 | | | |
| **5.** Does the project include a rigorous plan and committed funding for the monitoring and evaluation of proposed feedstock production strategy on key target ecosystem services?<br>Adaptive management and cost-effectiveness of management decisions. | Yes = 1.69<br>No = 0 | | | |

| TOTAL SCORE | __ /10 Add up total metric scores.<br>(10 Pts. Possible for each indicator) |
|---|---|

| | |
|---|---|
| **IDENTIFIED RISKS** | If any of the metric scores highlight a risk it should be identified here. |

| | |
|---|---|
| **NEXT STEPS** | BFA recommends the use of the InVEST tool, Earth Genome Project tools, and/or similar tools to map and quantify the biophysical and economic value of changes in ecosystem service provision to get a more detailed understanding of the impacts from land-use change and the resultant tradeoffs to society.<br>Identify baseline services and known interactions with the crop. |

| BFA Survey Level Screening | |
|---|---|
| **BIODIVERSITY** | **GOALS: 2,4,5** |

## Why Is It Important:

While land conversion has clear and obvious risks to biodiversity, feedstock production may threaten species and habitats through additional direct and indirect pathways. Species of special concern may inhabit the project site, even if it has already been modified from its natural condition, or they may use the site as a migration or dispersal corridor. Development of the area for feedstocks may imperil populations of such species. Species and habitats occurring outside the project site may also be placed at risk from a number of threats emanating from it: construction and operation of the project may result in the exploitation of off-site natural resources (including species) by project laborers; activities currently in the project area may be displaced elsewhere, including nearby protected areas; invasive species may be introduced intentionally or accidentally and spread beyond the project site; new infrastructure (e.g., roads, canals) may open up previously inaccessible areas to settlement or exploitation; and downstream aquatic systems may be affected if a project alters hydrology or water quality (through erosion and sediment load), including the introduction of agrochemical pollution (water-related risks are detailed further). Many of these risks can be minimized through careful project design.

Under no circumstances should a feedstock expansion be permitted to take place within a recognized or proposed protected area or other critical natural habitats. Indirect impacts to protected areas in proximity to the project site or in a shared watershed may also occur. Potential impacts must be assessed as part of a detailed biodiversity assessment. Project design (e.g., the retention/establishment of buffer and riparian protection zones) and management (e.g., use of integrated pest management) may be able to prevent or minimize indirect impacts to protected areas.

Producing more does not automatically have to lead to a loss of biodiversity. In order to protect biodiversity and the quality of eco-systems in general we need to reallocate agriculture land. Two examples are given below:

The US Department of Agriculture (USDA) Conservation Reserve Program (CRP) was created in an effort to improve soil, water and wildlife resources by encouraging and paying farmers to plant long-term resource-conserving cover plants on some lands. Farmers can receive annual rental payments for planting permanent vegetation on their idle, highly erodible farmland. Contract duration is between 10 and 15 years.

In June 2001 another CRP program, called the Farmable Wetlands Pilot program was started to help restore the wetlands in Iowa, Minnesota, Montana, Nebraska, and North and South Dakota. Healthy wetlands provide numerous ecosystem benefits, including reduction in downstream flood damage potential, improved surface and groundwater quality, recharge of groundwater supplies and reduce nutrient (N and P) discharge to surface water.

| Metric | Result | Score | Comment | RISK? |
|---|---|---|---|---|
| **1.** Does or will feedstock cultivation directly affect or be in close proximity (follow local legislation, or if lacking consider areas upstream or adjacent to) to any protected areas or areas designated as environmentally important by national legislation or international conventions (e.g. Ramsar, World Heritage Sites)? | Yes = 0<br>No = 0.87 | | | |
| **2.** Does or will feedstock cultivation affect any areas identified as priorities for either biodiversity conservation or cultural importance by local community members (e.g. burial sites, sacred forests)? | Yes = 0<br>No = 1.05 | | | |
| **3.** Does or will the project increase access and/or activity, to areas that were previously inaccessible or lacking infrastructure? (e.g. build roads, trains, facilitate movements on river networks) | Yes = 0<br>No = 0.95 | | | |
| **4.** Does or will the feedstock cultivation land provide habitat for native fauna? (Ex. pollinators, birds, aquatic species) | Yes = 0.93<br>No = 0 | | | |
| **5.** Does or will feedstock cultivation or processing affect any terrestrial species of concern (critically endangered, endangered or vulnerable species per International Union for Conservation of Nature (IUCN) Red List); rare or threatened habitat types (details?); or nationally or internationally recognized biological priorities?<br>Consider the impacts of habitat conversion, disturbance, or fragmentation, including disruption or fragmentation or dispersal of migratory pathways and inclusion of species that are non-native (invasive or genetically modified organism (GMO)) to the larger region. | Yes = 0<br>No = 1.17 | | | |

| | | | | |
|---|---|---|---|---|
| Global threatened species are listed on: www.redlist.org; national/regional threatened species can be found in that country's ministry of environment or equivalent.<br>For threatened habitats, should refer to country-level guidance. | | | | |
| **6.** Does or will feedstock cultivation or processing affect any aquatic species of special concern (critically endangered, endangered or vulnerable species per IUCN Red List)?<br>Aquatic covers both salt and fresh water. Consider the impacts of downstream habitat conversion, disturbance, fragmentation, water abstraction or water pollution and inclusion of species that are non-native (invasive or GMO) to the larger region (ex. coral reef ecosystems). | Yes = 0<br>No = 1.16 | | | |
| **7.** Is there the potential for unintended negative consequences on natural resources (including animal species) in surrounding areas during project development or operation? (ex. night production effect on nocturnal species; introduction of humans as predators) | Yes = 0<br>No = 0.82 | | | |
| **8.** Does or will feedstock cultivation or processing require the draining of wetlands or altering hydrological regimes? (ex. peat bogs, brackish water) | Yes = 0<br>No = 1.17 | | | |
| **9.** Are or will aquatic systems within feedstock cultivation site be adequately buffered and protected from agricultural activities?<br>Detail buffer plans. | Yes = 0.97<br>No = 0 | | | |
| **10.** Did or will you create and implement a management plan for biodiversity management (species and habitat) to assure that those of special concern and existing ecosystems are not adversely affected? | Yes = 0.91<br>No = 0 | | | |

| | |
|---|---|
| **TOTAL SCORE** | __ /10 Add up total metric scores.<br>(10 Pts. Possible for each indicator) |

| | |
|---|---|
| **IDENTIFIED RISKS** | If any of the metric scores highlight a risk it should be identified here. |

| | |
|---|---|
| **NEXT STEPS** | Verify that the project includes a rigorous plan and committed funding for the monitoring and evaluation of proposed crop production strategy and its impacts on biodiversity. |

# BFA Survey Level Screening

## CHEMICAL USE: Nutrients & Pest Management

## GOALS: 1,2,4,5

### Why Is It Important:

Agrichemical 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. In the case of plant nutrition products, soil and foliar analysis should be performed prior to any application, and a plant nutrition expert should make the application recommendation. Agrochemicals can be properly used on site, judiciously and in a targeted fashion using available expertise. There should be no use of hazardous agrochemicals listed as Classification I or II in the World Health Organization's Recommended Classification of Pesticides by Hazard. Agrochemicals must be prepared and applied by trained personnel with appropriate protective gear and in accordance with the law and producer guidelines—and not by children or pregnant women. Potential impacts on local communities of chemical run-off and spraying must be assessed and managed.

In the case of pest control, a scouting program should exist to identify and monitor pest pressure, and physical, mechanical, or biological means should be part of the strategy to reduce pest pressure and/or habitat that is host to pests prior to any pesticide application. Pesticides should be reviewed for their relevant legal registrations and for their toxicity and environmental persistence. Criteria for selecting products should include reducing overall toxicity for both aquatic and terrestrial organisms as well as overall efficacy. Records of all applications should be maintained. Application technology should be appropriate and strive for accurate application, reduced drift, and increased safeguards against worker exposure. Strict adherence to worker safety practices and re-entry intervals is a must.

Given the technical nature of pest control and the potential impacts these products may have on workers and the environment, it is important that there be adequate technical support in terms of reviewing crop condition and making control recommendations. Appropriate selection of crop protection products, precise application methodologies, and timely field monitoring can greatly reduce chemical applications.

| Metric | Result | Score | Comment | RISK? |
|---|---|---|---|---|
| **Nutrient Management** | | | | |
| **1.** Are synthetic nutrients going to be used for this feedstock in this region?<br>**Answer questions 1A and 1B only if you answered Yes to this question.** | Yes = 0<br>No = 2.64 | | | |
| **A.** Are or will nutrient management systems be used for the production of this feedstock that allow for quantitative monitoring?<br>Explain nutrient management of crop incl. amount, timing and method (per hectare or acre). | Yes = 0.87<br>No = 0 | | | |
| **B.** Are or will there be t activities (crop rotation, buffer zones, no-till, replacing chemicals w/ compost etc) being done and considered effective to reduce the amount of synthetic nutrients used?<br>If yes, list activities in comment column. | Yes = 1.01<br>No = 0 | | | |
| **2.** Are there future risks for this area that would increase the need for or impact from nutrient use?<br>Consider major climate events, soil organic carbon content, soil structure related to compaction, depth of the top layer of soil related to erosion etc.<br>**Answer question 2A only if you answered Yes to this question.** | Yes = 0<br>No = 1.72 | | | |
| **A.** Will mitigation activities be put in place to reduce future risks of increased nutrient use? | No = 0<br>Yes = 0.87 | | | |
| **Pest Management** | | | | |
| **3.** Are regulated chemicals used for pest management on this feedstock in this region?<br>Regulated signifies requirements for training, handling, equipment etc. Use WHO Recommended Classification of Pesticides and Guidelines 2009 for guidance on chemicals.<br>**Answer questions 3A, 3B, and 3C only if you answered Yes to this question.** | Yes = 0<br>No = 3.01 | | | |

| | | | | |
|---|---|---|---|---|
| **A.** Are or will pest managements systems be used for this feedstock in this region that allow for quantitative monitoring?<br>Include historical use of pest management chemicals – amount, timing and method? (per hectare)<br>*NOTE: Verify that chemical quantities are not double counted for both nutrient and pest management. | Yes = 0.88<br>No = 0 | | | |
| **B.** Are or will there be activities (pest confirmation before application, parasitic insects or other examples of Integrated Pest Management (IPM)) being done to reduce the amount of regulated pesticides used?<br>If Yes, list activities. | Yes = 1.03<br>No = 0 | | | |
| **C.** Can you verify that none of the pesticides being used are classified as either 1A or 1B on the World Health Organization pesticide classification system in use for this feedstock and that the production of this feedstock compliant with World Bank Operational Policy OP 4.09?<br>See APPENDIX A for World Bank Operational Policy OP 4.09. | Yes = 1.10<br>No = 0 | | | |
| **4.** Are there future risks for this area that would increase the need for or impact from regulated pesticide use?<br>Consider pesticide resistance and mutation, new pests, possibility for pests to be carriers for other destructive factors etc.<br>**Answer question 4A only if you answered Yes to this question.** | Yes = 0<br>No = 1.74 | | | |
| **A.** Will mitigation activities be put in place to reduce future risks of increased pesticide use?<br>If yes, explain the activities.<br>Refer to NEXT STEPS for tools to plan mitigation activities. | Yes = 0.88<br>No = 0 | | | |

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|---|---|
| **TOTAL SCORE** | __ /10 Add up total metric scores.<br>(10 Pts. Possible for each indicator) |

| | |
|---|---|
| **IDENTIFIED RISKS** | If any of the metric scores highlight a risk it should be identified here. |

| | |
|---|---|
| **NEXT STEPS** | Verify that the project includes a rigorous plan and committed funding for the monitoring and evaluation of proposed crop production chemical use strategy and its impacts.<br>BFA recommends that the user verifies that site abides by EPA (EPCRA) Hazardous Chemical Storage Reporting Requirements.<br>See APPENDIX A for EPCRA explanation. |

# BFA Survey Level Screening

## Co-Product & Waste Management

## GOALS: 1,2,5

### Why Is It Important:

Feedstock processing sites generate many different types of co-products and waste products that can be used to generate electricity (bagasse in sugarcane, fiber and nutshell in palm oil), as waste products that have high nutritional values and can be used as animal feed or other products, or as soil amendments to improve structure and characteristics of the soil. Utilizing those co-products and waste 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. Cogeneration is a viable technology for many feedstocks. Currently, not all sites have the necessary cogeneration capacity to burn the crop's residue for electricity generation. Furthermore, the existing cogeneration is not universally efficient. For example, in 2008, Datagro (Datagro 2008) estimated that the typical sugarcane mill of Brazil that cogenerates electricity with bagasse utilizes 550 to 600 kg of low-pressure steam to crush one metric ton of sugarcane. More advanced technology uses between 380 and 420 kg of steam per metric ton of sugarcane (Datagro 2008). The implementation of this improved technology represents as much as a 36% increase in efficiency. Even with the development of new technology, the Brazilian situation is evolving so rapidly that the environmental profile of sugar cane is now updated more or less every two years. It is for this reason that it is important to address co-products for each situation being considered.

Besides considering a feedstocks carbon footprint as the one of the environmental indicators, there are additional environmental improvements to be made by using processing residues as agricultural inputs. In the case of sugarcane, the filter cake and vinasse (or stillage) can supplant the use of a significant amount of chemical fertilizer and urea which alleviate the burden of managing chemicals use. In Brazil, it is estimated that using vinasse and filter cake as soil amendments avoids the use of 1,449,010 metric tons of chemical fertilizers (Datagro 2008). Furthermore, in palm oil extraction mills, similar opportunities exist, and with efficient boilers, excess electricity can be produced for the national grid, and palm oil mill effluent (POME) can be used to generate methane gas for fuel or can also be applied in the field as a nutritional supplement.

Waste management systems for processing facilities should be reviewed. These systems should include all solid and liquid wastes, whether from a primary process or from a peripheral co-product process.

| Metric | Result | Score | Comment | RISK? |
|---|---|---|---|---|
| **1.** Does or will production and initial processing of this feedstock produce usable co-products that substitute current resource use for a net environmental benefit? (ex. Electricity generation)<br>List co-products and their uses, residues used as soil conditioners and stabilizers are considered co-products. | Yes = 2.00<br>No = 0 | | | |
| **2.** Does the proposed use of this feedstock increase the efficiency of the cropping system? (i.e. is the feedstock a waste product that will become a co-product, or a more efficient use of a current co-product?)<br>Verify that the proposed change is a net environmental benefit, consider whether the new use interferes with traditional uses such as fodder, local fuel, or soil conditioner. | Yes = 1.19<br>No = 0 | | | |
| **3.** Have you verified that the current or proposed rate of feedstock residue removal from the field does not have a negative impact on soil quality or stability?<br>The amount of residue that can be removed without negatively affecting soil is dependent on the feedstock and local conditions, including soil composition and geography. The optimal amount should be determined at the local level. If you are not removing crop residue from the field, answer YES. | Yes = 1.19<br>No = 0 | | | |
| **4.** Is biomass (any part of the feedstock or its residue) being disposed of instead of being utilized as a co-product?<br>Crop residue left on the field for soil stabilization and material that is re-incorporated into the cultivation process (i.e. soil conditioner etc.) should not be considered waste. | Yes = 0<br>No = 3.79 | | | |
| **5.** Have all waste flows been identified and a management plan for their proper disposal been implemented?<br>Consider not just biomass but all waste flows. List waste flows and their disposal methods. | Yes = 1.83<br>No = 0 | | | |

| | | | | |
|---|---|---|---|---|
| **A.** Are there negative environmental impacts associated with the waste disposal methods above?<br>Explain impacts. | Yes = 0<br>No = 2.26 | | | |

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| **TOTAL SCORE** | __ /10 Add up total metric scores. (10 Pts. Possible for each indicator) |

| | |
|---|---|
| **IDENTIFIED RISKS** | If any of the metric scores highlight a risk it should be identified here. |

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|---|---|
| **NEXT STEPS** | Verify that the project includes a rigorous plan and committed funding for the monitoring and evaluation of proposed crop production strategy and its impacts on co-product and waste management.<br>BFA recommends the application of the ISO 14044 methodology for dealing with multiple output processes to do a more complete assessment of the management of co-products and waste. |

| BFA Survey Level Screening | |
|---|---|
| **FOOD SECURITY** | **GOALS: 3** |

## Why Is It Important:

The World Food Summit of 1996 defined food security as existing "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life". Food security is often defined as including both physical and economic access to food that meets people's dietary needs as well as their food preferences. According to the World Health Organization, food security is built on three pillars:

- Food availability: sufficient quantities of food available on a consistent basis.
- Food access: having sufficient resources to obtain appropriate foods for a nutritious diet.
- Food use: appropriate use based on knowledge of basic nutrition and care, as well as adequate water and sanitation.

Food security is a complex sustainable development issue, linked to health through malnutrition, but also to sustainable economic development, environment, and trade. (WHO)

Today, the most widely used raw materials to produce bioplastics are sugar and starch. Although industry can transform many kinds of cellulosic based raw materials such as agricultural residues and woods into sugars at current stage of industrial development, bioplastics are mainly produced from 1st generation feedstocks such as corn, sugar cane and sugar beet. The first generation technology used should be considered as a critical bridging tool for the 2nd and 3rd generation technologies based on cellulosic and direct utilization of $CO_2$ in fermentation. Today the bioplastics industry is so small that its impact on food security is negligible. If the bioplastics industry is growing and keeps using food crops measures should be in place to secure food security. To avoid this competition with food it is of key importance to further develop and implement 2nd and 3rd generation technologies. Utilizing those commodities to produce bioplastics may steer food commodities from being consumed as food and/or feed for live stocks into feedstocks to produce bioplastics. Large scale use of food for bioplastics 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 understanding of crop conversion implications and the cause and effect of the changes. For purposes of the methodology, local and regional changes are contemplated, but policy makers should be aware that the implications/impacts of these changes extend far beyond local ones. This is an area that requires a careful assessment and evaluation prior to making a decision.

World Health Organization, Food Security, http://www.who.int/trade/glossary/story028/en/

| Metric | Result | Score | Comment | RISK? |
|---|---|---|---|---|
| **1.** Is this region identified on the FAO Low Income Countries with a Food Deficit list? http://www.fao.org/countryprofiles/lifdc/en/ | Yes = 0<br>No = 0.91 | | | |
| **2.** Is this particular feedstock a dietary staple for the communities in this area? (FAO stat database)<br>**Answer questions 2A, 2B, and 2C only if you answered Yes to this question.** | Yes = 0<br>No = 3.84 | | | |
| **A.** If it is a dietary staple, is the part of the crop used for bioplastics used for food consumption?<br>Identify portion used for bioplastic and portion used for food consumption. | Yes = 0<br>No = 1.06 | | | |
| **B.** Are there additional dietary staple crops being produced in this area besides this crop?<br>Identify additional dietary staples. | Yes = 0.87<br>No = 0 | | | |
| **C.** Is this feedstock a dietary staple and a part of a crop rotation typically and therefore not produced every season? | Yes = 0<br>No = 0.90 | | | |
| **3.** Does or will the increased demand on this feedstock affect food prices? | Yes = 0<br>No = 1.16 | | | |
| **4.** Does or will the transfer of land for increased production create a food security issue? (ie land previously used for food – moved to non-food production) | Yes = 0<br>No = 1.20 | | | |
| **5.** Over the past 5 years, how many instances have occurred where crop production fell more than 10% per capita? (question asked to understand potential for future events)<br>Identify crops affected. Is the feedstock being assessed at risk for these events? | ≤ 2 = 0.98<br>≥ 3 = 0 | | | |

| | | | | |
|---|---|---|---|---|
| **6.** Is there an option for additional crops from other regions or food stores to supplement the feedstock used for bioplastic?<br>This becomes a question of economics, available infrastructure and logistics. | Yes = 0.86<br>No = 0 | | | |
| **7.** Does or will increased production efficiencies from cultivation of this feedstock help to increase or maintain current food availability from this feedstock?<br>Consider if it is possible and achievable to divert this feedstock for food use in the event of a shortage as well as effects on regional land use. | Yes = 1.05<br>No = 0 | | | |

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| **TOTAL SCORE** | __ /10 Add up total metric scores.<br>(10 Pts. Possible for each indicator) |

| | |
|---|---|
| **IDENTIFIED RISKS** | If any of the metric scores highlight a risk it should be identified here. |

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|---|---|
| **NEXT STEPS** | Verify that the project includes a rigorous plan and committed funding for the monitoring and evaluation of proposed crop production strategy and its impacts on food security.<br>IPC Acute Food Insecurity Reference Table for Household Groups<br>http://www.fews.net/ml/en/info/pages/scale.aspx |

| BFA Survey Level Screening | |
|---|---|
| **CRADLE to GATE GHG** | **GOALS: 2 ,5** |

## Why Is It Important:

A methodology for greenhouse gas accounting needs to be identified and used consistently in order to ensure a dependable assessment of GHG emissions can be achieved, allowing for meaningful comparisons across feedstock production systems. This is a critical component for developing a consistent and meaningful metric.

Overall product decisions need to be based on all life cycle emissions not just cradle to gat. The scope of this methodology is only Cradle to Gate, it is important to consider this aspect of the survey as a piece of your overall life cycle assessment. A project feasibility and GHG life cycle assessment should be conducted by qualified assessors to fully document not only the economic viability of the overall project, but also evaluate the GHG balance from both the production of the biomass as well as the downstream processing, taking into account factors such as direct and indirect land conversion (to our best scientific knowledge), agricultural inputs, energy requirements, transportation, end use, by-product use, and waste streams. A rigorous and credible assessment determining the net GHG balance should be an essential aspect of all feedstock proposals. Without this assessment, the project's benefits are questionable.

Ideally the fertilizer, energy, transportation, processing inputs, and land use change impacts will be neutral or negative from a carbon standpoint. Clearly, achieving at least carbon neutrality within the scope of land use to farm gate is an indication of the potential for success downstream in carbon reductions. This will vary depending on the nature of the crop.

Crop production practices contribute to GHG emissions. Practices such as pre-harvest burning, soil tillage, excessive nitrogen applications, and irrigation are all elements that must be considered as they impact emissions and so project viability. Nitrogen use and GHG accounting need to be monitored closely.

| Metric | Result | Score | Comment | RISK? |
|---|---|---|---|---|
| Biogenic $CO_2$ uptake and emissions should be accounted for and reported 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. Whether using the GHG Protocol, IPCC's Global Warming Potential, or the ISO 14067 standard, consistency in the choice of methodology across feedstocks is a must for comparability. The user should identify the method of choice and provide transparency in assumptions by completing a meta data table (see attached). In certain cases this will lead to "negative" GHG values in a cradle-to-gate assessment reflecting environmental reality at that point in the life cycle. Users of cradle-to-gate data generated with this approach will subsequently be able to model true end-of-life fate and associated release of biogenic as well as non-biogenic carbon in the context of the intended application as well as with respect to regional specificities in terms of available infrastructure and technology for recovery and disposal.<br>Industry average data is acceptable for country of origin at this tier of the methodology; however, it may not be representative of the local conditions.<br>For non-conventional crops (feedstock not previously grown in region or for that purpose or industrially grown), the BFA recommends using experimental or small scale data vs. industrially validated peer reviewed data.<br>Functional Unit Definition: 1 kg of biomass<br>See APPENDIX A for ISO 14044 and ISO 14067 | | | | |
| **1.** After evaluating, are the combined biogenic and non-biogenic (fossil) GHG emissions for this crop negative, neutral or positive at the farm gate? Consider crop uptake of CO2 as well as fossil emissions from cultivation equipment, agricultural chemicals, etc. | Negative<br>Neutral<br>Positive | See score chart for worksheet score | | Industry Avg data use is an identified risk. |
| **2.** How representative is the data you are assessing? | Local Data<br>Regional Data<br>Country Data | | | |

**Scoring Table:** find the cell that represents your answers to questions 1 and 2 above. This is your score for the GHG worksheet.

| | Local Data | Regional Data | Country Level Data |
|---|---|---|---|
| **Negative** | 10 | 7.69 | 5.39 |
| **Neutral** | 7.32 | 5.01 | 2.70 |
| **Positive** | 0 | 0 | 0 |

| TOTAL SCORE | __ /10 Add up total metric scores.<br>(10 Pts. Possible for each indicator) |
|---|---|

| | |
|---|---|
| **IDENTIFIED RISKS** | If any of the metric scores highlight a risk it should be identified here. |

| | |
|---|---|
| **NEXT STEPS** | If the GHG assessment was completed using industry average data or broad assumptions, there is an inherent risk in moving forward with the chosen feedstock. Due to the limited scope of this Methodology, the information produced by this GHG Cradle to Gate assessment should be included and refined to contribute to the overall Life Cycle Assessment of the bioplastic product in consideration.<br>Links to the calculation methods and tools can be found here:<br>http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html<br>http://www.ghgprotocol.org/<br>http://www.iso.org/iso/catalogue_detail?csnumber=59521<br>NOTE Regarding Indirect Land Use Change (ILUC) – it was discussed and agreed that although there are many methods for measuring and assessing ILUC, there is not globally agreed method. It was the concern of the BFA is to commit to one before they are all scientifically vetted. In the mean time because we value the risk of ILUC, we still feel this needs to be qualitatively addresses in the methodology until a methodology for measuring it can be agreed upon. As this is a living document we will adjust the methodology as better science guides us. This qualitative assessment of ILUC will be included under the Land Use Change INDICATOR. |

Below is an example of a table that could be included with the feedstock LCA to help determine the fundamental building blocks of the LCA quickly and easily.

| | | | |
|---|---|---|---|
| **Primary product** | Bio-based PX from corn starch | **Functional Unit** | Mass, kg of PX |
| **Co-product(s)** | Bio-Based Gasoline | **System Boundary: (included unit processes)** | Cradle to Gate: Input material production (fertilizer, pesticide, fossil fuels, electricity, yeast, enzymes, chemicals), depreciable capital, transportation, agricultural production, PX production (liquefaction, hydrolysis, catalytic conversion, etc) |
| **Allocation avoidance method(s)** | Sub-division, system expansion | | |
| **Allocation method(s)** | Mass ratio, economic ratio | **Impact category metric(s)** | GHG Intensity: net mass g $CO_2$eq/kg of PX<br>$PM_{2.5}$ emissions: mass g $PM_{2.5}$/kg of PX |

| BFA Survey Level Screening | |
|---|---|
| **LABOR RIGHTS** | **GOALS: 1** |

## Why Is It Important:

Crop labor requirements, depending on the region and the crop, may vary considerably, from having labor needs on a full-year basis to having intensive seasonal needs for a short period, such as harvesting. Many crops for producing biofuels and bioplastics can be cultivated in the developing countries and regions. Brazil and Argentina, for example, are the main producers and exporters of agricultural commodities such as sugar cane and soybean. Some of these developing countries may have labor rights issues like child labor or forced and bonded labor. These issues can be more frequent in the case of agriculture work due to the relatively low requirement for workers' education and skill levels.

In the case of having high seasonal needs and poor labor availability locally, the producers must bring in migrant workers from other regions, and this also requires providing adequate housing, health facilities, education, etc. This may lead to substandard living conditions for workers and their families. The optimal scenario, from a social standpoint, is to have minor, if any, seasonality in the crop production, which allows for a full-time and stable labor force, and to have a labor force that is already living in the region. This scenario places fewer stresses on the local communities---from not having migrants and temporary workers to providing year-round employment.

The long-term sustainability of any agricultural venture must contemplate full compliance with local labor law and the Universal Declaration of Human Rights, at a minimum. 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. NGO's and others 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, and they should be consulted. Many of these issues are extremely complicated, and for this reason, seeking appropriate guidance is recommended.

| Metric | Result | Score | Comment | RISK? |
|---|---|---|---|---|
| **1.** Does or will the production of this crop meet the following labor right standards?<br>a) Child Labor: ILO Conventions 138 and 182, Recommendation 146<br>b) United Nations Convention on Rights of the Child<br>c) Slave and Bonded Labor: ILO Conventions 29 and 105<br>d) Freedom of Association: ILO Conventions 87, 11 and 98<br>e) Equal Pay and Discrimination: ILO Conventions 100 and 111<br>f) Universal Declaration on Human Rights<br>g) SA8000 Standard<br>(If this is for new production, score for likelihood of new site to comply)<br>See Appendix A Regulatory Definitions | Yes to All = 2.45<br><br>No To Any = 0 | | | |
| **2.** Will or does the project increase employment or, through substitution, reduce employment in the region?<br>(Referring to long term production employment not site establishment.) | Increase = 2.10<br>Neutral = 1.05<br>Reduce = 0 | | | |
| **3.** Do or will all workers including those employed by subcontractors have contracts? | Yes = 1.68<br>No = 0 | | | |
| **4.** Will or does the project accommodate worker composition by either supporting local labor when available or enabling a migrant work force if necessary? | Primarily Local = 1.82<br>Migrant w/Support = 1.82<br>Migrant w/o Support = 0 | | Need to define "support" | |
| **5.** Is the local social infrastructure sufficient to address the needs of the labor force (health care, education, housing, etc.)? | Yes = 1.95<br>No = 0 | | | |

| | |
|---|---|
| **TOTAL SCORE** | __ /10 Add up total metric scores.<br>(10 Pts. Possible for each indicator) |

| | |
|---|---|
| **IDENTIFIED RISKS** | If any of the metric scores highlight a risk it should be identified here. |

| | |
|---|---|
| **NEXT STEPS** | BFA recommends the user to look as close to farm level as possible for compliance and work with producers to include in labor codes along with audit or 3rd party review. Listed here are potential 3rd party organizations who could verify labor standard practices: Fair Labor Association, Human Rights Watch, International Labour Conference's Committee on the Application of Standards (part of United Nations' International Labour Organization), International Labor Rights Forum, Institute for Global Labour and Human Rights, Worldwide Responsible Accredited Production (WRAP), Student/Farmworker Alliance, Worker Rights Consortium |

## BFA Survey Level Screening

## LAND USE CHANGE IMPACTS | GOALS: 1,2,4,5

### Why Is It Important:

The selection of land for feedstock production can have significant impact on the ability to achieve the climate change goals of bioplastic production as well as the minimization of environmental and biodiversity impacts. Given the expansion of agricultural land use to meet biofuel and food and fiber production, enormous pressure has been placed on areas rich in biodiversity and of conservation value. By discounting these attributes, the expansion into a particular feedstock may negate any climate change benefit and, in fact, increases the likelihood of further climatic and environmental impacts. The project site must not include the conversion of any natural habitats such as forests, grasslands, peat lands, or other wetlands as part of the production area. As discussed in "Use of U.S. Croplands for Biofuels Increases Greenhouse Gases through Emissions from Land Use Change" by Timothy Searchinger, to reduce GHG emissions, the land use change must increase the carbon benefit of the land. "…to generate greenhouse benefits, the carbon generated on land to displace fossil fuels (the carbon uptake credit) must exceed the carbon storage and sequestration given up directly or indirectly by changing land uses (the emissions from land use change)."

Many of the criticisms of the biofuels expansion have to do with land use changes which lead to large land conversions of areas rich in biodiversity that act as valuable carbon sinks. This factor has put countries such as Indonesia among the highest carbon emitters in the world (Indonesia now ranking third) 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 due to lost habitat. Should a project require such land conversion, it should not be approved.

As summarized in the recent Gallagher Review: "…the balance of evidence shows a significant risk that current policies will lead to net greenhouse gas emissions and the loss of biodiversity through habitat destruction. This includes the effects arising from the conversion of grassland for cropland." It is for this reason that idle and marginal lands should be investigated for feedstock production. While the issue of defining degraded, abandoned, marginal, and idle land has been the topic of debate and discussion, for the purposes of this methodology, marginal lands are defined as underutilized or idle agricultural lands that have economic production potential and require minimal conversion for establishing the crop in question.

The best case scenario to reduce feedstock production impacts on biodiversity and food production would be to promote projects on underutilized agricultural lands that are currently not being used for any agricultural activity and are suitable for the feedstock crop in question. This approach would limit or negate the food displacement issue both locally and globally, reduce pressures on existing natural habitats, minimize biodiversity loss, and the land conversion would most likely be positive from a carbon sequestration standpoint. Many such lands may be perfectly adequate for feedstock production as some of the crops are tolerant of a wide range of soil types and conditions. Understanding previous land use and the suitability of the soils is critical in making a judgment.

While marginal lands may be attractive as their conversion does not represent major carbon emissions, it should be noted that these lands may harbor biodiversity or have social value, and these assessments need to be carried out. While there may be millions of available hectares of land that had previously been deforested and then left idle, these areas may have settlers or play a role as a wildlife migratory corridor or protected zone.

Searchinger, T, R Heimlich, RA Hought, F Dong, A Elobeid, J Fabiosa, S Tokgoz, D Hayes, and T H Yu. 2008 Use of US croplands for biofuels increases greenhouse gases through emissions from land-use change. Science, 1126, p 1238-1240
Gallagher, Ed, The Gallagher Review of the indirect effects of biofuels production, Executive Summary, Renewable Fuels Agency, page 9. July 2008
Joint International Workshop on High Nature Value Criteria and Potential for Sustainable Use of Degraded Lands, Paris, June 30-July 1, 2008: Issue Paper: Degraded Land and Sustainable Bioenergy Feedstock Production

| Metric | Result | Score | Comment | RISK? |
|---|---|---|---|---|
| **1.** Does the establishment of this feedstock require the conversion of natural ecosystems, critical natural habitats, or carbon sinks to crop land (e.g. forests, peat lands, wetlands, grasslands)? | Yes = 0<br>No = 3.06 | | | |
| **2.** Does or will the production of this feedstock maintain the current use of the land or represent an improved use of that land (ex. Using marginal or degraded lands)? | Yes = 2.43<br>No = 0 | | | |
| **3.** Reflecting on the above questions and identified impacts on Ecosystem Services Datasheet, if demand increases on this feedstock in the future, what is the likely hood of any of the identified impacts becoming problematic?<br>Identify issues. | Low = 2.46<br>High = 0 | | | |
| **4.** Does or will the post change land use add net long term social or environmental value to the community that was not available previously?<br>Identify added value. | Yes = 2.05<br>No = 0 | | | |

| | |
|---|---|
| **TOTAL SCORE** | __ /10 Add up total metric scores.<br>(10 Pts. Possible for each indicator) |

| | |
|---|---|
| **IDENTIFIED RISKS** | If any of the metric scores highlight a risk it should be identified here. |

| | |
|---|---|
| **NEXT STEPS** | Verify that the project includes a rigorous plan and committed funding for the monitoring and evaluation of proposed crop production strategy and its impacts on land use change. |

**NOTE Regarding Indirect Land Use Change (ILUC)** – The BFA membership discussed and agreed that although there are many methods for measuring and assessing ILUC, there is no globally agreed-upon method or one that is technically sophisticated enough. It was a concern of the BFA is to commit to one before they are all scientifically vetted. In the mean time because we value the risk of ILUC, we still feel this needs to be qualitatively addresses in the methodology until a methodology for measuring it can be agreed upon. As this is a living document and we will adjust the methodology as better science guides us. That said, if the user has the data and the capability to quantitatively assess ILUC, it should be assessed as thoroughly as possible.

| BFA Survey Level Screening | |
|---|---|
| **LEGAL PRODUCTION** | **GOALS: 1** |

**Why Is It Important:**

Cultivating crops for the use of feedstocks for biofuels and bioplastics requires land and labor which may potentially pose legal issues. The land being used may not be intended to be used as agricultural land; therefore, it is not compliant with the local zoning law. 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. Utilizing land to cultivate crops could also involve land acquisition. This process shall have general consensus from all the stakeholders, like the local government, nearby farmers, and people from local community. Business or agricultural practices should not continue with the major disproval from any of the stakeholders even if the practices per se comply with the local and national laws and plans.

Potential legality issues in regards to labor practices also need to be taken into consideration when planning to acquire or utilize land for feedstocks 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 feedstocks crops and commodities come from. Therefore, it is rather important to conduct a comprehensive study on them.

This is a complicated issue, the variation in business and agricultural practices along with those regionally specific legal concerns, makes it pivotal to lead a complete study on land and labor issues before the beginning of business and agricultural 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.

| Metric | Result | Score | Comment | RISK? |
|---|---|---|---|---|
| **1.** Is or will the feedstock production compliant with international and local laws, regarding zoning and land use plans? | Yes = 2.10<br>No = 0 | | | |
| **2.** Is or will the feedstock production compliant with international and local laws, regarding water, air, and soil emissions? | Yes = 2.25<br>No = 0 | | | |
| **3.** Is or will the feedstock production be compliant with the World Bank resettlement and economic displacement policies, including Operational Policy on Indigenous People 4.10 and Involuntary Resettlement 4.12?<br>See APPENDIX A for regulatory definitions and further guidance. | Yes = 2.02<br>No = 0 | | | |
| **4.** Is local governance of feedstock production in accordance with Minority Rights in International Law?<br>See APPENDIX A for regulatory definitions. | Yes = 2.08<br>No = 0 | | | |
| **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? Explain. | Yes = 1.56<br>No = 0 | | | |
| **TOTAL SCORE** | __ /10 Add up total metric scores.<br>(10 Pts. Possible for each indicator) | | | |

| | |
|---|---|
| **IDENTIFIED RISKS** | If any of the metric scores highlight a risk it should be identified here. |

| | |
|---|---|
| **NEXT STEPS** | Verify that the project includes a rigorous plan and committed funding for the monitoring and evaluation of proposed crop production strategy and its impacts on legality.<br>BFA recommends the user to look as close to farm level as possible for compliance and work with producers to include audits or 3rd party review. |

| BFA Survey Level Screening | |
|---|---|
| **LOCAL AND/OR INDIGENOUS PEOPLE** | **GOALS: 3,4** |

## Why Is It Important:

Local and/or Indigenous Communities describes the people who live in the areas where the crop feedstock is being produced. Sometimes when commercial production of a crop comes into a new area, it can displace available ecosystem resources or services that were historically used as part of the commons. For example, utilizing water to cultivate crops may deprive local community from using it as drinking source. In addition, developing land for feedstock crops may raise the concerns for social and cultural issues. As excerpted from the 2050 Criteria, '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'.

With the rapid expansion of many of the crops for feedstocks, the rights of local communities, landholders, indigenous cultures and communities, and subsistence farmers are at greater risk of being violated. In order to ensure the well-being of the local communities, the land acquisition process must include free, prior, and informed consultation with participation and support by all stakeholders involved. Ongoing conflict or uncertainty over land and resource tenure can seriously undermine the viability and, therefore, the sustainability of the project, as well as the project's ability to contribute to poverty reduction. If there is no credible evidence that the land and/or resources were acquired in an open and transparent fashion and if there are significant unresolved disputes over the land, the project should not be approved.

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

| Metric | Result | Score | Comment | RISK? |
|---|---|---|---|---|
| **1.** Does or will the production of this feedstock have a negative impact on the access to material (ex. physical resources) or immaterial (ex. Sense of community, innovation, intellectual capital) resources for local and/or indigenous communities? | Yes = 0<br>No = 1.12 | | | |
| **2.** Does or will the production of this feedstock result in delocalization or migration for local and/or indigenous communities?<br>Delocalization: To remove from a native or usual locality. | Yes = 0<br>No = 1.17 | | | |
| **3.** Does or will the production of this feedstock have a negative impact on the cultural heritage or respect of indigenous rights for local and/or indigenous communities? | Yes = 0<br>No = 1.11 | | | |
| **4.** Does or will the production of this feedstock provide local employment for local and/or indigenous communities? | Yes = 0.98<br>No = 0 | | | |
| **5.** Does or will the production of this feedstock maintain or improve the secure living conditions for local women and men including indigenous communities? | Yes = 1.11<br>No = 0 | | | |
| **6.** Does or will the production of this feedstock maintain fair market prices for local crops? | Yes = 0.99<br>No = 0 | | | |
| **7.** Are there potential impacts from production that will / do negatively affect the safe & healthy living conditions for local and /or indigenous communities? (ex. effluent, air emissions and pollution, drinking water) List potential impacts. | Yes = 0<br>No = 1.24 | | | |
| **8.** Was there or will there be Free, Prior and Informed Consent (FPIC) in changing the use of this land? (Whether or not it is specifically called FPIC, this is the principle that a community has the right to give or withhold its consent to proposed projects through participation and influence on decisions that may affect the lands they customarily own, occupy or otherwise use) | Yes = 1.22<br>No = 0 | | | |
| **9.** Will or does the production site meet ILO Convention 169 – Indigenous and Tribal People Convention, Convention concerning indigenous and tribal peoples in Independent Countries?<br>See APPENDIX A for ILO Convention 169 | Yes = 1.06<br>Unknown = 0<br>No = 0 | | | |

| **TOTAL SCORE** | __/10 Add up total metric scores.<br>(10 Pts. Possible for each indicator) |
|---|---|

| | |
|---|---|
| **IDENTIFIED RISKS** | If any of the metric scores highlight a risk it should be identified here. |

| | |
|---|---|
| **NEXT STEPS** | Verify that the project includes a rigorous plan and committed funding for the monitoring and evaluation of proposed crop production strategy and its impacts on local and indigenous communities. |

| BFA Survey Level Screening | | |
|---|---|---|
| **OCCUPATIONAL HEALTH & SAFETY** | | **GOALS: 1** |

## Why Is It Important:

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. The amount of agricultural chemicals used for cultivating feedstock crops should be considered as an important factor for occupational health. Additionally, business entities should evaluate whether the agricultural labor practices, such as harvesting and processing of crops, will pose any additional physical threats to workers. Whether those processes will involve heavy machinery and whether workers have been through safety training for machinery work are all essential queries that businesses and agricultural entities should ask before any production begins. In areas where heavy machinery is not applicable and hand harvesting is common, the operation shall also assess the overall physical impact of these practices on the human body. When the instability of the local political environment threatens the health and safety of the workers, it is necessary for businesses and agricultural entities to carefully evaluate the issues. Further evaluation may identify that the cultivation of feedstock crop may have the potential to stabilize the local community through increased employment and local infrastructure. The balance of the above implications of production is important in meeting the needs of the labor force.

Overall, it is critical that the operation have a comprehensive health and safety program that not only trains the workers on the health and safety aspects of their jobs, but also proactively seeks to reduce accident risk through risk assessments, investigation of causes of accidents, and seeking worker and labor representatives' input into process improvements that reduce worker risk.

| Metric | Result | Score | Comment | RISK? |
|---|---|---|---|---|
| **1.** Does the production of this feedstock pose potential worker safety issues? (high agro chemical use, low tech or unregulated harvesting practices, unsafe working conditions) | Yes = 0<br>No = 2.40 | | | |
| **2.** Will or does the harvesting and processing of this feedstock be mechanized or done by hand? | Hand = 0<br>Both = 0.69<br>Mech. = 1.38 | | | |
| **3.** Is there active political unrest in this area? | Yes = 0<br>No = 1.92 | | | |
| **4.** Is medical care accessible to the work force in this region? | Yes = 2.10<br>No = 0 | | | |
| **5.** Will or does production comply with ILO Convention 184 – regarding Safety and Health in Agriculture Convention? See APPENDIX for regulatory definitions | Yes = 2.19<br>No = 0 | | | |

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|---|---|
| **TOTAL SCORE** | __ /10 Add up total metric scores.<br>(10 Pts. Possible for each indicator) |

| | |
|---|---|
| **IDENTIFIED RISKS** | If any of the metric scores highlight a risk it should be identified here. |

| | |
|---|---|
| **NEXT STEPS** | BFA recommends that once the farm level production site is known that it is a requirement for the operation to have a comprehensive health and safety program that not only trains the workers on the health and safety aspects of their jobs, but also proactively seeks to reduce accident risk through risk assessments, investigation of causes of accidents, and seeking worker and labor representatives' input into process improvements that reduce worker risk. |

| BFA Survey Level Screening | |
|---|---|
| **SOIL MANAGEMENT** | **GOALS: 2,3,4,5** |

| **Why Is It Important:** |
|---|
| 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 emission. Methods to reduce and mitigate soil erosion include practices such as conservation and no till sowing, cover crops or groundcover, buffer zones, and sediment traps. Another key practice to mitigate soil erosion is the reincorporation of organic matter, crop stubble, or organic process waste. These practices increase soil carbon, providing a positive benefit in net carbon balance. An overall management plan should be developed around the maintenance and improvement of soil organic content. There is extensive research highlighting the productivity benefits of implementing these practices and the importance of soil organic matter. |

| Metric | Result | Score | Comment | RISK? |
|---|---|---|---|---|
| **1.** What is the current soil condition for the region in question?<br>Verify that the net benefit of the new use of land is better than the old use. | Underutilized and Degraded = 1.36<br>Healthy = 0.68<br>At risk = 0 | | | |
| **2.** Will / are soil management practices be utilized in this region for production of this feedstock? (ex. No Till, Soil Amendments, frequency of soil tests, use of compost) Detail the practices.<br>**Answer question 2A only if you answered Yes to this question.** | Yes = 1.33<br>No = 0 | | | |
| **A.** Is there a certification or standard in place that incentivizes adherence to these soil management practices? | Yes= 1.15<br>No = 0 | | | |
| **3.** Do the local producers have access to soil best management practices and expertise for that region?<br>**Answer question 3A only if you answered No to this question.** | Yes = 2.80<br>No = 0 | | | |
| **A.** If local practices or expertise are not available, can and will you bring that in to the region via consultant or training programs to educate farmers on better soil management practices? | Yes= 1.32<br>No= 0 | | | |
| **4.** Taking into consideration the climate, soil, topography and land use to produce this feedstock in this region, what is the potential to increase or decrease the soil health (ex. Erosion or added nutrients)? Explain. | Increase = 1.71<br>Neutral = 0.85<br>Decrease = 0 | | | |
| **5.** Can and will you install a system that incentivizes adherence to good soil management practices reducing feedstock production impacts on soil health? List activities. | Yes = 1.65<br>No = 0 | | | |

| | |
|---|---|
| **TOTAL SCORE** | __ /10 Add up total metric scores.<br>(10 Pts. Possible for each indicator) |

| | |
|---|---|
| **IDENTIFIED RISKS** | If any of the metric scores highlight a risk it should be identified here. |

| | |
|---|---|
| **NEXT STEPS** | Verify that the project includes a rigorous plan and committed funding for the monitoring and evaluation of proposed crop production strategy for soil management.<br>Find more information on soil management here:<br>http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/health/ |

# BFA Survey Level Screening

## WATER MANAGEMENT

## GOALS: 1,2,3,4,5

### Why Is It Important:

Agriculture is responsible for about 70% of the water withdrawn (rivers, lakes, groundwater) and used by human populations. Expansion of the agricultural landscape 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. A complete assessment of water resource requirements should be conducted, 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. This assessment needs to be conducted regardless of water source: groundwater (blue), surface water (blue), or rain water (green). Aquifers and natural bodies of water should be monitored to ensure that they are adequately being recharged and that their use for agricultural purposes is not altering the natural hydrologic regime. This evaluation is critical in water-scarce regions, and water extraction should not deprive downstream users of this scarce resource nor impact biodiversity.

Water quality should be evaluated in order to make sure the water is not contaminated and is of sufficient quality for crop needs. Water sources should be protected with buffer zones to avoid contamination risks and soil erosion impacts and to ensure the viability of the aquatic ecosystem. Water should be monitored routinely in order to assess water quality and identify any issues in a timely fashion.

Discharge water from processing facilities should also be evaluated in order to evaluate impacts the cultivation may have on water quality. Discharge water quality should meet, at a minimum, national legal standards, and be consistent with the World Bank Pollution and Abatement Handbook, which establishes wastewater management guidelines. A monitoring program should be in place, and discharge water treatment facilities should be in place if discharge water does not meet guidelines.

Consider whether your crop will have enough water but operates in a situation where half the population doesn't have access to safe drinking water, this gets to the context issue and will help indicate whether the crop will be grown in an area ripe for water conflict/reputational risk. For all water management data, you 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).

| Metric | Result | Score | Comment | RISK? |
|---|---|---|---|---|
| **Identify Watershed & Catchment:** | | | | |
| **Quantity & Governance** | | | | |
| **1.** According to the Water Footprint Network, what is the water footprint of this crop?$m^3$/ton<br>See definitions at the end of this datasheet<br>Use regional specific location, not country level. | Blue<br>Green<br>Grey | | Informing on final overall – not scored | |
| **2.** According to the Water Footprint Network, is this watershed a water stressed area? | Yes = 0<br>No = 1.12 | | | |
| **3.** Does the feedstock's growing season overlap with the region's blue water stressed months??<br>Use Water Footprint Network Water Scarcity Maps – See Appendix B | Yes = 0<br>No = 1.17 | | | |
| **4.** If using irrigation (Blue) water do you have the appropriate permits for withdrawal of this water? (This is referring to WFN Blue water)<br>If not using irrigation, ignore question and answer yes. | Yes = 0.86<br>No = 0 | | | |
| **5.** According to ClimaScope or Atlas Aqueduct, is this watershed at risk for decreased availability in the future? (i.e. decreased rainfall, increased consumption)<br>http://climascope.tyndall.ac.uk/Map/Details?mapid=39946&overlayid=0<br>http://aqueduct.wri.org/atlas<br>See Appendix B for Details | Yes = 0<br>No = 1.08 | | *Still determining best option, for time being use one for comparisons.<br>See instructions in Appendix. | |
| **6.** Are there regulatory agencies (ex. a government's "inspection branch") that address and enforce water management in the area for quantity and quality on a holistic level (surface and groundwater)? | Yes= 0.89<br>No=0 | | | |
| **7.** Are you participating in the management of water at a catchment level and/or linking your water management into the catchment level plan goals?<br>http://www.environment-agency.gov.uk/research/planning/131506.aspx<br>An Environmental Flow or eFlow assessment would be ideally included in a catchment level plan and could be used to ensure water use is within sustainable limits, | Yes = 0.93<br>No = 0 | | | |

| Water Quality (related to Grey Water) | | | | |
|---|---|---|---|---|
| **8.** Is this watershed already stressed by water pollution? | Yes=0<br>No= 1.07 | | | |
| **9.** Does this feedstock historically require mitigation activities due to overall negative impact on water pollution (eutrophication, acidification or ecotoxicity)? | Yes=0<br>No= 0.96 | | | |
| **10.** Use the WHO / UNICEFF Joint Monitoring program (JMP) for Water Supply and Sanitation Tool to determine if there is adequate access to drinking water and sanitation in the country of production. See Appendix B for Details | Both + = 0.88<br>1+/1- = 0.44<br>No=0 | | | |
| **11.** Will or does your feedstock land impact/impair local community's access to water or further contribute to over allocation from water basin? | Yes= 0<br>No= 1.05 | | | |

| | |
|---|---|
| **TOTAL SCORE** | __ /10 Add up total metric scores. (10 Pts. Possible for each indicator)<br>WFN Blue, Green and Grey values shown on final scorecard. |

| | |
|---|---|
| **IDENTIFIED RISKS** | If any of the metric scores highlight a risk it should be identified here. |

| | |
|---|---|
| **NEXT STEPS** | Verify that the project includes a rigorous plan and committed funding for the monitoring and evaluation of proposed crop production strategy for water management.<br><br>In general, the BFA would recommend the following options for addressing water management and risk mitigation:<br>First, employ mitigation responses suggested in the Water Risk Filter by inputting data into the tool which will identify mitigation responses that will correspond to the specific crop and basin risk. http://waterriskfilter.panda.org/MitigationTools.aspx<br>Although this solution provides just one-off solutions and is not a holistic response, the BFA would recommend this as a first step followed by full water stewardship activities to mitigate more substantial water risk.<br><br>Second, the BFA would recommend the implementation of the AWS Standard (in progress toward certification). The AWS is a step-wise approach to mitigating water risk, and is designed to work in any industry or geography.<br>http://www.allianceforwaterstewardship.org/what-we-do.html#water-stewardship-standard<br>The AWS overlaps with governmental regulations required in that region, all crop production standard, and ISO standards etc. It is designed to address current and future risk for water management. In the AWS Appendix B (guidance for the AWS Standard) there is more guidance on how to comply with each step of the Standard along with references (tools and methodologies) and examples. |

**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.
**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.

## APPENDIX A

### Regulation and Policy Definitions

***BIODIVERSITY***
**IUCN Red List of Threatened Species List**
www.redlist.org

***CHEMICAL USE***
**World Bank OP 4.09 - Pest Management**
http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTOPMANUAL/0,,contentMDK:20064720~menuPK:64701637~pagePK:64709096~piPK:64709108~theSitePK:502184,00.html
In assisting borrowers to manage pests that affect either agriculture or public health, the Bank supports a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides. In Bank-financed projects, the borrower addresses pest management issues in the context of the project's environmental assessment.

**WHO Recommended Classification of Pesticides by Hazard**
http://www.who.int/ipcs/publications/pesticides_hazard/en/
1A Defined as "Extremely Hazardous"
1B Defined as "Highly Hazardous"

**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
For any hazardous chemical used or stored in the workplace, facilities must maintain a material safety data sheet (MSDS), and submit the MSDSs (or a list of the chemicals) to their State Emergency Response Commission (SERC), Local Emergency Planning Committee (LEPC) and local fire department. Facilities must also report an annual inventory of these chemicals by March 1 of each year to their SERC, LEPC and local fire department. The information must be made available to the public.

***FOOD SECURITY***
**Food and Agriculture Organization of United Nations**
FAO Low Income Countries with a Food Deficit List
http://www.fao.org/countryprofiles/lifdc/en/
FAO Database
http://faostat.fao.org/site/291/default.aspx

**IPC Acute Food Insecurity Reference Table for Household Groups Link**
http://www.fews.net/ml/en/info/pages/scale.aspx

***CRADLE TO GATE GHG***
**ISO 14044:2006 Environment Management – Life Cycle Assessment – Requirements and Guidelines**
http://www.iso.org/iso/catalogue_detail?csnumber=38498
ISO 14044:2006 specifies requirements and provides guidelines for life cycle assessment (LCA) including: definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, relationship between the LCA phases, and conditions for use of value choices and optional elements.

**ISO/DIS 14067.2 Carbon Footprint of Products- Requirements and Guidelines for Quantification and Communication**
http://www.iso.org/iso/catalogue_detail?csnumber=59521

***LABOR RIGHTS***
**Child Labor: ILO Conventions 138 and 182, Recommendation 146**
ILO Convention 182 Worst Forms of Child Labour 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 programmes 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.

**United Nations Convention on Rights of the Child**
http://www.un.org/cyberschoolbus/humanrights/resources/child.asp (looking for better site still)
THIS DECLARATION OF THE RIGHTS OF THE CHILD to the end that he may have a happy childhood and enjoy for his own good and for the good of society the rights and freedoms herein set forth, and calls upon parents, upon men and women as individuals, and upon voluntary organizations, local authorities and national Governments to recognize these rights and strive for their observance by legislative and other measures progressively taken in accordance with the following principles…

**Slave 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 – this makes more sense than 20
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.

**Freedom of Association: ILO Conventions 87, 11 and 98**
ILO Convention 98 Right to Organise 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
One or both of these make more sense than #89.

**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:
(a) 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;
(b) 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.

**Universal Declaration on Human Rights**
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.

**ILO (International Labor Organization) Site:**
http://www.ilo.org/dyn/normlex/en/f?p=1000:12000:2948000572381400::::P12000_INSTRUMENT_SORT:4

**Social Accountability International SA 8000 Standard**
http://www.sa-intl.org/index.cfm?fuseaction=Page.ViewPage&PageID=937

1. *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.
2. *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.
3. *Health and Safety:* Provide a safe and healthy workplace; prevent potential occupational accidents; appoint senior manager to ensure 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.
4. *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.
5. *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.
6. *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.
7. *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.
8. *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.
9. *Management Systems:* Facilities seeking to gain and maintain certification must go beyond simple compliance to integrate the standard into their management systems and practices.

***LEGAL PRODUCTION***
**World Bank resettlement and economic displacement policies**

http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSOCIALDEVELOPMENT/EXTINVRES/0,,contentMDK:20486618~menuPK:1242235~pagePK:148956~piPK:216618~theSitePK:410235,00.html
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.

**Resettlement and Displacement Considerations NOT Covered in Regulations[1]:**

World Bank Resettlement and Economic Displacement Policies including World Bank Involuntary Resettlement 4.12 are useful; HOWEVER some potential impacts are not included and must be called out individually:

- It does not explicitly cover displacement that occurs in the project area prior to, or in anticipation of, company involvement in a project
- It does not explicitly cover temporary displacement or lost access to assets or resources
- It does not cover the involuntary restriction of access to resources that people depend upon other than those in legally designated parks and protected areas
- It does not cover displacement that occurs because of a project's adverse impacts on the environment or natural resources that people depend upon
- It does not cover indirect social and economic impacts, or indeed 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
- It does not cover resettlement that is voluntary in nature but nonetheless, requires measures to safeguard against impoverishment and other adverse impacts and to maximize development benefits

**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.

**Involuntary Resettlement 4.12**
http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTOPMANUAL/0,,contentMDK:20064610~menuPK:64701637~pagePK:64709096~piPK:64709108~theSitePK:502184,00.html
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. (see website above)

**Operational Policy on Indigenous People 4.10**
http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTOPMANUAL/0,,contentMDK:20553653~menuPK:4564185~pagePK:64709096~piPK:64709108~theSitePK:502184,00.html
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.

***LOCAL & INDIGENOUS COMMUNITIES***
**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

[1] Interview: Davidson, Sarah. Interview conducted by Zdilla, Katherine. World Wildlife Fund. April 15th, 2014.

**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 this 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.

**The 2050 Criteria**
awsassets.panda.org/downloads/the_2050_critera_report.pdf
World Wildlife Fund (WWF) developed this 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.

***OCCUPATIONAL HEALTH & SAFETY***
**ILO Convention 184 - Safety and Health in Agriculture Convention**
http://www.ilo.org/public/english/standards/relm/ilc/ilc89/pdf/c184.pdf
This series of manuals has been developed by International Labor Organization to help union affiliated representing agricultural workers to tackle health, safety, and environmental problems (HS&E).

**APPENDIX B**
**Water Management Tools**

**ClimaScope link**
http://climascope.tyndall.ac.uk/Map/Details?mapid=39946&overlayid=0

**Water Catchment link**
http://www.environment-agency.gov.uk/research/planning/131506.aspx

**WFN Water Scarcity Maps**
http://www.waterfootprint.org/?page=files/WaterStat-WaterScarcity

1. Download Monthly blue water scarcity map "Images (tiff)"
2. Look at months that cover crops growing season,
3. If the region you are growing in and the growing season have identified blue water scarcity (identified by colors yellow, orange and red) in ANY month of the growing season, answer "yes" for this metric.

**Watershed Risk Tools**

1. Climascope (crop specific but more complicated)
    a. Go to http://climascope.tyndall.ac.uk/Map/Details?mapid=39946&overlayid=0
    b. In upper right hand select "featured maps", then select "2C Ecomapper HadCM3"
    c. In another tab open http://ecocrop.fao.org/ecocrop/srv/en/cropFindForm
    d. Under plant name search for crop you are looking at (ex. Corn) – hit "search"
    e. Click "view" next to the desired crop, then "datasheet"
    f. From the data sheet you will pull the "optimal" min and max for rainfall and temperature
    g. Back in Climascope, you use these ranges to adjust the 4 layers (2 temp, 2 rain) on the map. Use the triangle slides on each of those 4 layers. Use temp range on temp slides (both) and do the same on the rainfall layers.
    h. Zoom into the area of the world you are considering and here is how you read it:
        i. You are looking at 2025 assuming a 2°C temp increase – there are two colors (blue is rainfall and red is temp) – where the blue is you have the right range of rainfall, where the red is you have the right temp range for your crop. Where they overlap is where you are ideally growing that crop. In areas where there is only blue, you have enough rainfall but not the right temperature (too hot or cold), where there is only red, you have the right temp but not enough rainfall.

2. Atlas, Aqueduct (not crop specific but is very data reliable)
    a. Go to http://aqueduct.wri.org/atlas
    b. In the upper left select "projected change"
    c. On the right side on the Current Conditions tab select "2025 – A1B"
    d. Zoom to the area of the world you are considering.
    e. Use the color of that area and the Legend on the right bottom corner to determine water stress in 2025.

**WHO / UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation**

1. Go to http://www.wssinfo.org/documents-links/documents/?tx_displaycontroller%5Bcategory%5D=&tx_displaycontroller%5Byear%5D=&tx_displaycontroller%5Bregion%5D=&tx_displaycontroller%5Bsearch_word%5D=&tx_displaycontroller%5Btype%5D=country_files
2. Under "Country List" tab scroll down to country being assessed
3. Select country and download Excel data file
4. Under the Excel tab "Trends_W" – Estimated Trends of Drinking Water Coverage
    a. Look at the "Rural" data and add up the percent of "other unimproved" and "surface water" in 2011 (or latest date).
        i. If it is greater than 50%, this country does not have majority access to quality drinking water and would not score (+) for this portion.
        ii. If it is less than 50%, this country does have majority access to quality drinking water and would score (+) for this portion.
5. Under the Excel tab "Trends_S" – Estimated Trends of Sanitation Coverage
    a. Look at the "Rural" data and add up the percent of "other unimproved" and "open defecation" in 2011 (or latest date).
        i. If it is greater than 25%, this country does not have adequate access to quality sanitation and would not score (+) for this portion.

ii. If it is less than 25%, this country does have adequate access to quality sanitation and would score (+) for this portion.

6. To determine the overall score for this question:
    a. If the region has adequate access to both drinking water and sanitation, it gets the most points.
    b. If the region has adequate access to either drinking water or sanitation and is lacking for the other, it gets half the points.
    c. If the region has adequate access to neither drinking water nor sanitation, it gets zero points.