

## FIELD TO MARKET STANDARD OPERATING PROCEDURE FOR REVISION AND DEVELOPMENT OF FIELDPRINT PLATFORM METRICS AND BENCHMARKS

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## FIELD TO MARKET VISION & MISSION

**Our Vision:** To champion solutions for tomorrow's safe, accessible, and nutritious food, fiber and fuel in thriving ecosystems.

**Our Mission**: To meet the agricultural challenge of the 21st century by providing collaborative leadership that is transparent; grounded in science; focused on outcomes; open to the full range of technology choices; and committed to creating opportunities across the agricultural supply chain for continuous improvements in productivity, environmental quality, and human well-being.

## 1.0 BACKGROUND

### 1.1 Field to Market

Field to Market: The Alliance for Sustainable Agriculture is a collaborative multi-stakeholder initiative comprised of a diverse group of organizations collaborating to design and implement a program to define, measure, and promote sustainability in U.S. agricultural production. The Alliance unites diverse stakeholders across the food and agriculture value chain to promote, define and measure the sustainability of food, feed, fuel and fiber for U.S. agriculture in an effort to maximize productivity while helping producers improve the management of their natural resources. Field to Market has developed a Supply Chain Sustainability Program to advance this mission by providing a measurement and benchmarking platform, resources for driving continuous improvement in environmental outcomes, and a verification program for documenting participation and progress.

Measurement and benchmarking are achieved through the Fieldprint<sup>®</sup> Platform, Field to Market's sustainability analytics engine that is available to users via web interface or through Qualified Data Management Partners (QMDPs). The Fieldprint<sup>®</sup> Platform enables producers to calculate eight sustainability metrics at the field level, and benchmark their performance relative to regional, state, and national benchmarks. This SOP describes the process for developing and revising the sustainability metrics.

#### **1.2 Sustainability Metrics and Benchmarks**

Field to Market has approved and adopted eight sustainability metrics. The metrics are designed to measure environmental impact of farm operations on: Biodiversity, Energy Use, Greenhouse Gas Emissions, Irrigation Water Use, Land Use, Soil Carbon, Soil Conservation and Water Quality. The documentation of specific metrics is available in a publicly available overview document (Fieldprint Platform Algorithms Synopsis). In addition, Field to Market posts all revisions for public comment, and makes available a listing of peer reviewed journal publications related to the metric development and use on our website

Each metric must also have appropriate benchmark values for comparison of individual field results to regional, state and national benchmarks – defined as five-year averages of performance in that region, as determined by available data from USDA or other available statistical resources, and the scientific literature. Three of the metrics (Biodiversity, Soil Carbon and Water Quality) are qualitative, directional indicators and therefore do not have benchmarks. When a metric is undergoing revision; the associated benchmark must also be reviewed and revised as necessary. If a new metric is developed, then an appropriate benchmark must also be considered at the same time. Benchmarking at the relevant scale brings clarity to the producer's status today while laying the ground work for future improvements on the farm.

The Metrics Committee of Field to Market considers revisions to the metrics and proposals for additional metrics and associated benchmarks on an ongoing basis in order to take into account advances in science and scientific tool development. All existing metrics will be reviewed on a rolling three-year basis by the Metrics Committee if no revision has otherwise occurred during that time. The review will consider any recent scientific advances or tool developments in order to ensure the metrics remain science-based. This review will also consider the overall utility of the Metric to users, including transparency, interpretation, ease of use and application to continuous improvement objectives. Changes made to the metrics and to the Fieldprint Platform will be reported to Field to Market membership in written documentation. The Metrics Committee will coordinate with the Data and Technology Director to establish protocols for version control of the Fieldprint Platform as metrics are revised. Metric documentation will be made publicly available through Field to Market reports and, wherever possible, in scientific journal publications. Specific metric implementation algorithms and code within the Fieldprint Platform are considered as intellectual property of Field to Market.

## 2.0 PURPOSE AND SCOPE

The purpose of this document is to establish the process by which metrics revisions are made and additional metrics are developed for the Fieldprint Platform. The process for considering new crops in the program is documented in the "Field to Market Standard Operating Procedure for Approval and Integration of New Crops into the Supply Chain Sustainability Program" (approved by the Board of Directors in February 2018). Technical documentation of how benchmarks are developed and revised with changes to both the crops and metrics in the program is available to Field to Market members through the Benchmark Database.

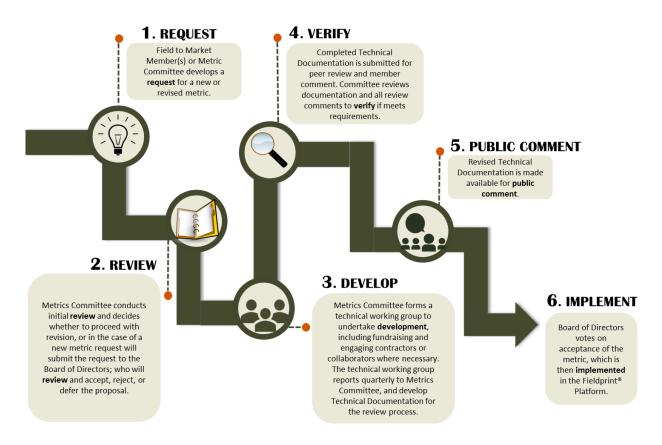
This document outlines the process for creating or revising metrics for existing crops in the Fieldprint Platform as well as establishment of benchmark values for the corresponding metric revisions. In the case of new metrics, new benchmarks for all crops would need to be developed in parallel with the metric. The Metrics Committee will consult with the Science Advisory Council for guidance on appropriate benchmarks for new metrics.

Metric revision and development need to be transparent, comprehensive, well documented, and science-based, in order to be endorsed by all Field to Market members. A standardized methodology and process flow (structure and coordination) is needed for developing future scientificallyderived metrics which may be recommended by Field to Market members. This documentation will drive consistency, greater reliability, improved data quality, and ultimately, integrity to the metrics.

## 3.0 METRIC DEVELOPMENT PROCESS AT A GLANCE

Establishing new and revising existing Fieldprint metrics is a six-step process, described below. Within the process, the Review step itself involves a series of reviews, feedback, and eventual approvals of submitted

metrics by Field to Market and designated reviewers. Technical reviews are used to determine if the metrics fulfill requirements, identify deficiencies or problems with the preliminary information, verify that appropriate benchmarks can be developed, suggest alternative approaches, communicate status, monitor any risk, and coordinate activities within multidisciplinary teams. A public comment period is included for the purposes of full transparency. This process will create a systematic approach in development and verification of metrics for Field to Market.



**Step 1 - Request:** Field to Market Member(s) or Metrics Committee develops a **request** for a new or revised metric

**Step 2 - Review:** Metrics Committee conducts initial **review** and makes a determination on whether to proceed with revision, or in the case of a new metric request will submit the request to the Board of Directors; in the case of a new metric, the Board of Directors conducts **review** and accepts, rejects, or defers the proposal.

**Step 3 - Develop:** Metrics Committee forms a technical working group to undertake **development**, including fundraising and engaging contractors or

collaborators where necessary. The technical working group reports quarterly to Metrics Committee and develop Technical Documentation for the review process.

**Step 4 - Verify:** Technical documentation submitted for peer review and member comment. Committee reviews documentation and all review comments to **verify** if meets requirements.

Step 5 - Public Comment: Documentation is made available for public comment

**Step 6 - Implementation:** Board of Directors votes on acceptance of the metric, which is then **implemented** by the Fieldprint Platform developer.

#### 3.1 Request for New or Updated Metrics and Benchmarks

Any Field to Market member can submit a request for either an update of an existing metric or development of a new metric and associated benchmarks (see Appendix A for template). The proposal should be submitted to the Metrics Committee for initial review of feasibility, alignment with existing metrics and metrics under active discussion, development, or revision, and a preliminary scoping of the level of effort required. After an initial evaluation, the Committee will either proceed with development (in the case of a metric revision) or submit the request and their evaluation to the Board of Directors (in the case of a new metric). Depending on the complexity of the metric and the expertise involved in the development of the proposal, the Science Advisory Council may be asked to submit an initial opinion to the Metrics Committee and Board of Directors on the proposal.

In the event that more than one proposal is received for a defined metric, or an additional proposal on the metric is anticipated, the Committee will evaluate each individually and provide the Board with initial assessment of feasibility of each of the options as well as any consequences or implications of the proposed approaches (Appendix B).

In addition, the Metrics Committee will undertake a rolling review of the existing metrics so that each metric is considered at least once every three years at a Committee meeting. The purpose of the review will be for the Committee to determine if the metric is: a) robust as-is, b) needs to be

reviewed in depth due to new scientific findings or c) needs to be updated based on more recent scientific findings or tool development. This review will consider scientific and technical developments, user feedback on applications of the metric, and alignment with other metrics, where appropriate. The Metrics Committee will establish the schedule and will coordinate the schedule with the technology update schedule for the Fieldprint Platform. At the beginning of the process, the Committee will inform the Field to Market membership of which metrics are being considered for review and solicit their feedback. The Metrics Committee itself can develop a metric revision request directly based on this review process.

At Step 1, a tracking sheet for the metric revision or development will be generated to record key decision points and provide a central listing of relevant meetings and materials; this will be maintained for the Metrics Committee on the Member Portal.

#### 3.2 Review of the Request

For metric revision requests outside of the three-year rolling review period, the Metrics Committee will take the lead on reviewing initial requests and recommending next steps. In the case of metric revisions requested by a member organization, the information gathered on the form in Appendix A will be used in this initial review. For metric revision decisions arising from the three year review period, and thus internal to the Committee, the initial decision will rely on information gathered from outside scientific experts and from surveys of user experience with the existing metric. The Committee may assign a subgroup composed of Committee members, subject matter experts from Field to Market member organizations, and independent academic experts to evaluate the metric in depth. Once sufficient information is gathered, the Committee will recommend concrete steps for a metric revision technical group or will recommend no revision. In the case of revision request arising from member organizations, and outside the regular three year cycle, the Metrics Committee will review the information provided according the Appendix A and make a recommendation on that basis.

In the case of new metrics, review and approval by the Board of Directors is required prior to a Metrics Committee recommendation or initiation of technical work. The Metrics Committee will review information provided in Appendix A, and gather any additional information needed to complete the responses in Appendix B. Both documents—the initial request and the Metrics Committee evaluation—will be provided to the Board of Directors for consideration.

Both the Metrics Committee and the Board of Directors will review relevant metric revision or new metric requests at their next scheduled meeting after the request is submitted.

In the event that more than one proposal is received for a metric, the Board may take the additional step of convening a sub-group of the Metrics Committee and/or one or more independent technical and scientific experts, in order to gather feedback and determine the best path forward, which should include consideration of any opportunities to design a collaborative development approach that harnesses the technical strengths and resources of multiple proposals into one revision or development process.

In all cases, the following criteria will be considered by the Metrics Committee in the initial review:

#### Feasibility of the metric:

- Availability of data and appropriate tools for development of metrics that are consistent with existing metrics, crops, production systems and geographies.
- Potential of the proposed metric to contribute to Field to Market goals
- Ability to create a credible metric based on the best available science and scientific tools and models.
- Transparency of the proposed approach and intellectual property, licensing, and operation and maintenance requirements
- For proposed metrics revisions, the scientific advance or other advantage that is represented by the proposed change.
- The proposed timeline for technical development, testing and verification of the new or revised metric and benchmarks.
- If an external tool is proposed, consideration of plans for operation, and maintenance.

#### **Resources required for development:**

• Availability of Field to Market staff, consultants, members and/or external expertise to contribute to the project.

- Identification of appropriate independent scientific experts to consult on metric credibility and ensure best available science and methods are considered.
- Requests must include an initial assessment of the degree to which changes to existing components of the Fieldprint Platform will be required, including any changes to input data requirements.

#### **3.3 Development Process for Metrics and Benchmarks**

Once a request has been approved by the Metrics Committee and, for a new metric, the Board of Directors, the proposing member organization or Metrics Committee can initiate development or revision of the metrics and associated benchmarks. At this point the Data & Technology Director should be notified of the proposal in order to provide the development team with feedback on process and timeline for any technical changes to be incorporated into the Fieldprint Platform.

If the metric development is led by a Field to Market member organization, they are expected to provide quarterly updates on progress to the Metrics Committee to ensure transparency. They are also expected to maintain open communication with the Committee and take into account feedback from members not directly engaged in the technical work. Where appropriate, they are encouraged to actively engage interested experts from Field to Market member organizations in the work.

If the Metrics Committee itself initiates development, a technical working group consisting of Committee members and additional outside experts will be formed and meet regularly on development progress, and where applicable to coordinate with the primary technical experts and/or contractors charged with development. This technical working group is also expected to report on progress at least quarterly to the full Committee. Depending on the complexity of the metric, and the state of scientific consensus, metric development may involve convening an external panel of independent scientific experts for discussion of the proposed approach or to participate in and inform development. The process of metric and benchmark revision and development should be transparent to all Field to Market members. Appropriate scientific experts from member organizations who express interest should be included in the process as members of the technical working group. Interested members should be invited to observe development.

Once technical development is complete, documentation will be provided to the full Metrics Committee for discussion. Once documentation has been submitted to Field to Market staff and the Metrics Committee co-chairs, a specific phone call or meeting will be scheduled with not less than four weeks for review of the document by Committee members. The Committee can request clarifications or additions to the documentation, with a timeline for revisions and reconsideration specified. The Committee will hold a vote on approval of the documentation following voting guidelines established in the Field to Market Bylaws for the Board of Directors – a majority of the voting eligible members of the Committee must approve to pass. In the event a majority is not in attendance at a meeting, a roll call vote may be held by email, or delayed to the next meeting with a majority present. Once a majority of the full Committee votes to approve the documentation, it will be submitted for peer review and member comment. Field to Market staff and Committee co-chairs will ensure that all Committee members have the opportunity to contribute to the evaluation by use of additional calls, meetings, or surveys, as needed.

The technical documentation must consist of: Background and Scientific Justification; Metric documentation; Metric test results; Benchmark Development considerations; and Implementation considerations.

#### **Background and Scientific Justification**

The documentation of the proposed changes must include a section that provides background on the rationale and utility to Field to Market membership of the new or revised metric. This section should also detail the scientific justification for the proposed change that outlines the scientific research and literature underlying the new or revised tools and algorithms. This should include discussion of how the new or revised metric incorporated best available science from the peer-reviewed literature, University extension reports, and other peer-reviewed reports (e.g. Intergovernmental Panel on Climate Change (IPCC) guidelines); how it relates to other technical approaches and tools in use, including metrics from aligned organizations (e.g. The Innovation Center for U.S. Dairy, The Sustainability Consortium); and how it can be applied to measure continuous improvement of an environmental outcome.

#### **Metric Documentation**

This section of the documentation should include references to data used and full documentation of the proposed algorithm or tool to a level that enables reproducibility. If an existing tool from the public domain is being adopted, this can consist of previous reports or existing web sites documenting the tool, with a specific documentation of how it is applied for Field to Market and inclusion of relevant pre-existing documentation.

#### **Metric Testing and Results**

The development process must also include performance and sensitivity testing of the new or revised algorithms by the metric development team, in collaboration with Field to Market staff and Fieldprint Platform developer. For changes to existing metrics, this will include:

- A comparison of Fieldprint outcomes between the old and new versions of the algorithm, using a set of test farm fields provided by Field to Market and derived from Fieldprint Projects or research farms. These tests are to ensure that the development team and Field to Market have a full understanding of how the revised metric may alter Fieldprint results.
- Comparison of results from these tests to the regional, state and national benchmarks for all crops for the metric and identification of any necessary revisions to benchmarks.
- 3) If the revised metric requires additional data inputs that were not previously collected from growers, then an additional test that evaluates the metric Fieldprint outcomes from earlier years along with expected new outcomes is required. This testing will be used to provide guidance to metric and Fieldprint Platform users on how to interpret continuous improvement for an outcome when the relevant metric has undergone revision during the time period of their project.

If a new metric is added:

- 1) An evaluation of the new metric over the test farm fields, including comparison to any available data at the field level.
- Additional tests of confidence in metric outcomes and comparisons to other relevant tools and metrics identified by the technical development team or members in the initial proposal evaluation stage.
- 3) Testing to ensure that any changes to other, existing Fieldprint metrics or outcomes is transparent and documented.

Once the development team has performed tests of the metric, the Fieldprint Platform developer and Technology Director will provide an assessment of the degree to which implementing the new metric may influence existing metrics and calculations. An initial assessment of the development effort and funding required will be made by the Technology Director. Full testing of necessary revisions to metrics will be conducted by the Fieldprint Platform developers after implementation to verify performance of the metric.

#### **Benchmark Development and Documentation**

For new metrics, benchmark values for the common benchmark levels at national, state and crop reporting district scales will need to be developed and documented by Field to Market staff and contractors. Additional Science Advisory Council and Metrics Committee participation may be called on during this process to ensure consistency with existing benchmarks. The documentation will address data required for benchmarks and an initial assessment of data availability.

For existing metrics, the revised version will be evaluated with the existing benchmark during the metric testing step. If revision of the benchmark is required to ensure consistency with the revised metric, then the documentation will outline required benchmark modifications and recommendations.

#### **User Guidelines**

Finally, the new and revised metric documentation should include guidelines for users including detailed instructions for any new data entry requirements. The final documentation of the revised metric will need to include an assessment of the improvements the metric revision brings for users in terms of accuracy and opportunities for improvement of metric scores.

#### 3.4 Verify Through Peer-Review

#### **Submit Metrics**

Once the technical development team has submitted documentation which has been reviewed and accepted by the Metrics Committee, as described above, the Metrics Committee will submit these materials to the Science and Research Director who will select two independent peer reviewers. Peer reviewers will be selected based on subject matter expertise and asked to provide their assessment within 6 weeks. During the peer review period, the metric documentation will also be made available in the Member Portal for comments by Field to Market members. Following receipt of the two peer reviews and any member comments, the technical work group will propose appropriate revisions to the documentation.

#### **Coordination of Review Process**

Field to Market staff who develop and administer program requirements will have procedures in place to safeguard impartiality and prevent conflicts of interest with Field to Market member organizations that aid in the development of the metrics. Reviewers are to be selected based on 1) scientific background and expertise, including relevant advanced degrees, active work in the relevant science and tool development, and recognition of expertise by the scientific community and 2) independence from the metric technical development process and member organizations.

#### **Peer Review**

The independent peer review process will engage two expert reviewers, at a minimum, with potential for additional reviews, if requested by the Metrics Committee or the Board of Directors. The expert reviewers will be selected for their expertise and ability to remain independent and objective while assessing the merits of the proposed metric. These critical scientific reviews are necessary to verify the requirements for new and revised metrics are complete and that it is scientifically valid and defensible. If conflicts of interest do arise with a metric reviewer or time considerations, Field to Market will select an alternate reviewer.

The peer reviewers will submit their comments to Field to Market staff for distribution to the full Committee for consideration. They will be requested to follow the guidance for peer review outlined in Appendix C. If submitted metrics do not pass these requirements, the reviewer will indicate deficiencies in the report. If a metric request requires revision, the technical development team may make corrections and re-submit the metric documentation. If corrected metrics are re-submitted, the reviewer will prepare a follow-up report indicating whether or not metric corrections are acceptable.

The reviewers will need to complete their work and provide their reports to the Metrics Committee within six weeks of receiving the submitted metric documentation. Reviewers will have an additional four weeks to complete an updated report if the technical development team makes corrections and re-submits the metric files. Following receipt of the final documentation, the Metrics Committee will review the reviewer comments, responses of the technical team in the documentation, and any other comments received, and vote on whether to send the documentation for public comment, or back to the technical team with additional comments.

Field to Market will maintain electronic copies of all metrics files, peerreview reports, and related documents for a period of five years. All documents will also be available to Field to Market members via the website.

To comply with verification requirements of the ISEAL program, a public comment period of not less than 30 days will be necessary for any new metrics or metrics revisions. This will occur after the primary and secondary expert reviews have been conducted, and before full implementation by the Fieldprint Platform developer is undertaken. Field to Market will issue a news release on the public web site announcing the public comment period and will request cross-posting of the announcement with relevant organizations weekly newsletters or announcements, including ISEAL, the Soil, Crop and Agronomy Societies of America and other Field to Market member organizations and scientific societies. The Metrics Committee and Field to Market staff will review any comments received and coordinate any revisions with the technical development team and Board of Directors, as necessary.

#### 3.6 Field to Market Board of Directors Approval

Following approval of the Metrics Committee and the completion of the public comment phase, all documents will be presented to the Board of Directors for final review and a vote on acceptance of the final metric.

#### **3.7 Implement Metrics**

Once metrics have been verified through the review process, they can be integrated into the Fieldprint Platform. Field to Market will take ownership for benchmarks, algorithms, and their corresponding (if applicable) maintenance in the Platform, including periodic review and updating. Field to Market intellectual property ownership ensures ongoing consistency and data updates and provides the benefit of the Field to Market brand. The metric documentation report will be used in a revision of the appropriate Fieldprint Platform documentation, demonstrations and user guide materials. All materials, including initial proposal, Metrics Committee reviews, full technical documentation, reviewer reports and public comments, will be archived and made available to Field to Market member organizations.

## 4.0 APPENDICES

# Appendix A: Material required in requests from member organizations for revision to a metric or consideration of a new metric

Requestor organization name: (request must be introduced by a current Field to Market member)	
Contact information:	Name:
	Phone: E-mail:
Other	E-mail:
supporting/endorsing	
members	
Metric Name	
Is this a current metric?	Yes/No
If yes, how is it	
currently	
implemented? Have deficiencies in the	
current metric been	
identified based on	
user experience?	
Is a benchmark revision necessary?	Yes/No
Benefit to membership of new or revised metric	What is the sustainability outcome improved or added to Field to Market tools?

Brief Scientific Justification (including reference to relevant literature)	
Expertise to be engaged:	
List the technical experts who will contribute to the technical development team, including plans for engaging with interested Field to Market members	
Data, tools and/or methodologies to be employed:	
Timeline for development: indicate anticipated delivery date of technical documentation, and any interim reporting (at least quarterly) to the Metrics Committee.	
Fieldprint Platform: Indicate whether funding and resources are available for implementation of the metric within the Fieldprint Platform,	

and any legal considerations.	
Suggested reviewers (suggest independent experts who will not be involved in primary development)	

# Appendix B: Metrics Committee Initial Evaluation Criteria Checklist for a New Metric

Field to Market Staff and Committee Members completing review	
	How does proposed metric development enhance or improve the capabilities of the Fieldprint Platform and Supply Chain Sustainability Program?
Technical Merit and Alignment	Does the proposal indicate appropriate data, tools and approaches for development?
	Is the proposed development using best available science and an approach appropriate to Field to Market?
	Are appropriate technical experts identified to engage in development?
Transparency	Does the process include sufficient opportunity for engagement by interested Field to Market members?
	To what extent does the approach rely on proprietary data and tools?
	Is the proposed timeline for technical development, testing and verification of the new or revised metric and benchmarks reasonable?
Implementation	Does the proposal include appropriate consideration of plans for operation, maintenance, and alignment with operational Field to Market tools, including consideration of intellectual property issues?
	What is the extent of proposed changes to existing components of the Fieldprint Platform that will be

required, including any changes to data collection requirements?		
	Are financial resources for development and implementation identified?	
Review group	Recommend to Board of Directors	
recommendation	Return to metric requestor for additional details (provide	
to full	list of specific questions)	
Committee	Decline to accept for further review or development	
Metrics	Yes/No	
Committee Vote		
Board of	Endorse for full development	
Directors	Return to metric requestor for additional details (provide list	
recommendation	of specific questions)	
	Decline to accept for further review or development	
Board of		
Directors Vote		

#### **Appendix C: Peer Review Guidance**

Reviewer organization			
name: Reviewer name and	Name:		
contact information:	Address:		
	Phone:		
	Email:		
Date received:	Indicate date received Metric for review		
Metric:	Name the metric under consideration		
Scientific Expertise and			
qualifications of Reviewer:			
Type of review:	Check one		
	New metric and benchmarks		
	Revision of existing metric and benchmark		
Elements to Consider			
•	-approved documentation has been provided		
2. Documentation properly supported by the scientific literature and			
represents current state of science 3. Appropriate published sources and available data have been used in			
development			
	ools have been referenced		
	c tools have been used appropriately, accounting		
for relative strengths a			
	ks have been developed for the 5-year rolling		
• • • • • •	icable); or, existing benchmarks have been		
	elevant, or sufficient information is provided to		
determine how benchmarks can be revised in accordance with the			
metric.			
<ol><li>Metric algorithm has been properly tested against Field to Market test locations, and full results provided.</li></ol>			
8. Results from Metric algorithm tests show robust and predictable			
performance across the range of crops and production systems targeted			
by the metric			
	ormation (data and guidance) for evaluating		
	nt between the previous and revised metric		
versions is provided			

10.	Metric is presented with enough detail to be scientifically
repro	oducible

11.	Metric is appropriate for the evaluation of continuous improvement
of sus	stainability outcomes.

Other comments:		

## 5.0 VERSION HISTORY

Version/Date	Change	Link
2.0	Updated to reflect changes in Field to Market Bylaws and clarify difference in process for new metrics	Current
1.0	Initial Publication – June 2015	Available on request