

**Summary of deliverables under the CIMMYT-ORNL subproject:
Approach to Stakeholder Engagement and Assessing Progress toward More
Sustainable Agricultural Landscapes**

ORNL WFO No. NFE-14-05140, USD\$108,333

International Maize and Wheat Improvement Center (CIMMYT)
CGIAR Research Program Maize and Wheat (CRP Maize and CRP Wheat)

August 2018-June 2020

Summary prepared by Keith L. Kline
30 December 2020

1. Eichler SE, Kline KL, Ortiz-Monasterio I, López-Ridaura S, Dale VH. (2020). Rapid appraisal of landscape sustainability indicators for Yaqui Valley, Mexico. *Environmental and Sustainability Indicators* 6: 100029. <https://doi.org/10.1016/j.indic.2020.100029>
2. Kline KL, Ramirez LF, Sum C, Lopez-Ridaura S, Dale VH. 2020. Enhancements to agriculture in Guatemala can reduce migration pressure. *Nature-Sustainability* 3(2), 74-76. doi.org/10.1038/s41893-020-0473-1. <https://www.nature.com/articles/s41893-020-0473-1> [Open access to read: <https://rdcu.be/b08LL>]
3. Dale VH, Kline KL, Lopez-Ridaura S, Eichler SE, Ortiz-Monasterio I, Ramirez LF (2020). Towards more sustainable agricultural landscapes: Lessons from Northwestern Mexico and the Western Highlands of Guatemala. *Futures* Vol. 24, Dec 2020 (Special Issue 'Health, Climate Change, and Poverty') doi: 10.1016/j.futures.2020.102647 <https://www.sciencedirect.com/science/article/pii/S0016328720301361>
4. Eichler Inwood SE, López-Ridaura S, Kline KL, Gérard B, Monsalve AG, Govaerts B, Dale VH. (2018) Assessing sustainability in agricultural landscapes: a review of approaches. *Environ. Rev.*, 26(3), 299–315. DOI: 10.1139/er-2017-0058.
5. Dale VH, Kline KL, Parish ES, Eichler SE. 2019. Engaging stakeholders to assess landscape sustainability. *Landscape Ecology* 34 (1199). <https://doi.org/10.1007/s10980-019-00848-1> (acknowledgments to CIMMYT-CRP)
6. Two formal Proposals were submitted in response to MSU Innovation Lab Calls, to support continuation of strategic elements of the *Buena Milpa* project.
 - a. AOI#3: Overcoming Barriers to Legume Utilization in the Highlands of Guatemala (CIMMYT, University of Tennessee, ICTA, CUNOC and others)
 - b. AOI#1: Fostering Milpa Resilience by Improving Soil and Human Health in Guatemala (University of Tennessee, CIMMYT, ICTA, CUNOC and others)

The proposals, submitted in March and July respectively, were not rejected but the review and approval process were not completed due to a decision by the US State Department to suspend all new work in Guatemala. The pandemic presents an additional barrier to the proposed work with stakeholders.

7. Presentations that acknowledge CIMMYT CRP support associated with this project, include examples below:
- a. 2020, Aug 6-8 Ecological Society of America, Annual Meeting) Kline et al., "Towards more resilient rural landscapes: Lessons learned from contrasting agricultural systems in Mexico and the Western Highlands of Guatemala" for symposium on Ecosystem Stability & Resilience. <https://eco.confex.com/eco/2020/meetingapp.cgi/Paper/87347>
 - b. 2020, May 12. Invited presentation to International Association of Landscape Ecologists of North America (IALE-NA), Annual Meeting: Towards more sustainable agricultural landscapes: Lessons from Northwestern Mexico & the Western Highlands of Guatemala. Dale et al. IALE-NA special session.
 - c. 2020, May 11. Invited presentation to International Association of Landscape Ecologists of North America (IALE-NA), Annual Meeting: Kline et al.: Enhancing traditional agricultural landscapes - lessons from the Guatemalan highlands. An Inter-active poster was also presented and discussed.
 - d. 2019, Nov 14. Invited keynote presentation: Challenges to measurement and attribution of changes in land use (cover & management). International conference on Climate Calculator 2050, Windsor, UK. Sponsored by UK Government BEIS, CLIMACT, Mott MacDonald, Imperial College London.
 - e. 2019, Oct 28. Approaches to engage stakeholders in FEWS-nexus challenges. 2019 US-China Joint Eco-Environmental Symposium – “Research and Innovation at the Nexus of Food, Energy and Water.” Kline et al. Sponsored by UT, NSF, NSFC (National Science Foundation-China), Nanjing University, Washington State University. Seattle WA
 - f. 2019, Oct 22. Sustainability research: Common goals & stakeholder perspectives on priorities. KL Kline. AIChE Sustainable Bioenergy Conference, Nashville TN.
 - g. 2019, March 5. Quantifying and Visualizing Progress Toward Bioenergy Sustainability. BETO 2019 Peer Review, Denver CO (Parish, Kline et al)
 - h. 2018, Aug 10. Kline and Dale. Meeting future needs for food, energy, water & nature: when & where does land matter? Ecological Society of America (ESA) Annual Meeting.

Final Report to CIMMYT on Completion of the Sub-grant Agreement with ORNL: Approach to Stakeholder Engagement and Assessing Progress toward More Sustainable Agricultural Landscapes

Prepared by Keith L. Kline (as submitted per agreement terms on 27 Dec 2019)

Status of planned deliverables and milestones

Table below reviews the completion status of each Deliverable and Milestone in the approved work plan. We also highlight a few other accomplishments that were completed and are additional to the planned activities.

The authorized project performance period ends December 31, 2019.

Summary of Deliverables (D1-D4) & Milestones (M1-M7); Due Dates & Status

See Work Plan approved by CIMMYT on 11/29/2018 for details of each item.

#	Description	Due	Status
D1	Work plan approved	30Dec18	Complete. Approved by CIMMYT 29 Nov following review on team conf. call and revisions
M1	Subaward in place for Dale & Eichler	30Dec18	Complete. Subcontract #: 4000167554-for services of Dr Dale and Dr Eichler, awarded 20Dec2018
M2	Resubmit ms #1 "Selecting Indicators..."	30Jan19	Complete. Paper1, "Selecting indicators for Yaqui Valley..." was revised, shared with CIMMYT, and resubmitted to Ecological Indicators journal in January. (In March this paper was rejected, apparently due to issues in communicating reviewer comments)
M3	Draft #2 "Analysis of indicators for Yaqui Valley..."	31Mar19	Complete. Draft of paper2, titled, "Rapid appraisal of landscape sustainability for Yaqui Valley Mexico" was shared with CIMMYT 31 March19.
D2	Status Report on papers in prep	31Mar19	Complete. Report on papers in preparation was shared with Updates and Kline email on 31 March 2019.
T1-T2	Site visits to Yaqui and Guatemala highlands	Aug 19	Complete: Visit to Guatemala (T2) was planned in coordination with CIMMYT and completed 8-15 July 2019. The Yaqui site visit (T1) was cancelled due to US Embassy travel restrictions.
M4	Draft report "practical indicators of sustainable ag landscapes"	30Aug19	Complete: The draft report on practical indicators on sustainable agricultural landscapes was prepared and distributed along with the August update report. The CIMMYT Technical Representative subsequently provided comments. The revised document was then integrated with the manuscript to be submitted to the journal <i>Environmental and Sustainability Indicators</i> .
D3	Report update on publication status of manuscripts 1, 2 & 3	30Sep19	Complete. Update reports were distributed to CIMMYT on Aug 30 th and Oct 10 th and the status of three planned and other additional publications associated with this project was reviewed with the CIMMYT Technical Representative.
M5	Synthesis for CIMMYT review: approaches for stakeholder engagement & lessons from case studies	30Oct19	Complete. The draft synthesis was shared with CIMMYT for comment as an attachment to the Aug 30 th Update Report. A revised draft was shared with CIMMYT on Oct 18. Preliminary comments were subsequently received from CIMMYT. The lead coauthors (Dale, Kline, Lopez-Ridaura) agreed to develop this paper for a Special Issue of the journal <i>Future</i> ; but agreed to focus efforts on this paper following the completion of the other papers in process (detailed below).
M6	Respond to review comments, revise and resubmit	30Nov19	Being completed in December. The review comments were not received by coauthors until Dec 16. Draft responses to reviewers' comments were distributed among coauthors including CIMMYT on Dec 19. The coauthors provided feedback to the lead author and the

	paper #2 for publication		paper is undergoing final revisions for resubmission by the end of December. Note that this paper now provides a consolidated synthesis of manuscript #1 on “Selecting Indicators,” Milestone #4 on “practical indicators” and the “rapid appraisal” method applied in Yaqui Valley. The revised paper, RAPID APPRAISAL USING LANDSCAPE SUSTAINABILITY INDICATORS FOR YAQUI VALLEY, MEXICO, integrating the components above, was submitted to the journal <i>Environmental and Sustainability Indicators</i> (Ms No. INDIC-D-19-00140). Thus, the paper being resubmitted now (end of Dec) consolidates the prior Manuscripts 1 and 2.
M7	Draft of manuscript # 3, “Approaches to engage stakeholders... lessons from Guatemala and Mexico case studies”	30Nov19	Complete. The initial draft of manuscript #3, titled ‘Engaging stakeholders to improve rural agricultural landscapes: lessons from Guatemala and Mexico,’ was distributed in August. The paper will be further developed by the team over the coming quarter in coordination with the CIMMYT Technical Representative. The manuscript will be submitted to a special issue in the journal <i>Future</i> . Work will proceed on this paper after finalizing the resubmission of papers #2 and #3 on Practical Indicators to the journal <i>Environmental and Sustainability Indicators</i> , and completing any work required for successful publication of the bonus paper in <i>Nature Sustainability</i> .
D4	Summary of accomplishments and proposal for future collaboration	15Dec19	Complete. Developing a proposal for future work became a priority earlier in the year due to the early termination of USAID work in Guatemala. Thus, in the months from Feb through August, the team worked intensively with CIMMYT on two proposals responding to calls from the MSU Innovation Lab, aiming to provide some additional funding to continue the work of <i>Buena Milpa</i> . The proposals were completed and submitted in March and July respectively; however, review and possible approvals were suspended due to a subsequent interpretation by USAID of suspended funding for work in Guatemala. The proposals should be adapted for other potential sources of funding. The other part of this deliverable, a “summary of accomplishments” is discussed under M7 above and is now integrated with ms #3, to be submitted next year to a Special Issue of the journal <i>Future</i> .
**	Additional manuscript targeting high-impact journal (Nature Sustainability)	Nov 2019	Bonus manuscript: Although not contemplated in the work plan, effort during the final quarter of the project was invested to complete a paper targeting a high impact journal. Over the past months, the team responded to review comments and completed revisions of a Comment, “Enhancements to agriculture in Guatemala can reduce migration pressure.” The paper was accepted by <i>Nature Sustainability</i> in December and the team expects to receive final proofs and publication details early next year.
**	Other publications	Dec 2019	(1) A paper acknowledging CIMMYT support was published in the journal <i>Landscape Ecology</i> : Dale VH, Kline KL, Parish ES, Eichler SE. 2019. Engaging stakeholders to assess landscape sustainability. <i>Landscape Ecology</i> 34 (1199). https://doi.org/10.1007/s10980-019-00848-1 . (2) A review of agricultural assessment approaches was published in late 2018: Eichler Inwood SE, López-Ridaura S, Kline KL, Gérard B, Monsalve AG, Govaerts B, Dale VH. (2018) Assessing sustainability in agricultural landscapes: a review of approaches. <i>Environ. Rev.</i> , 26(3), 299–315. DOI: 10.1139/er-2017-0058.

Notes on Table: The final report deliverable (D4), a proposal for future work, was met as reported earlier. Two proposals for follow-on work were developed and submitted in response to specific calls for proposals.

The summary of lessons learned to date about assessment of the sustainability of integrated agricultural systems while engaging stakeholders (M5), is being developed by the lead investigators (Dale, Kline) working closely with the CIMMYT technical director, Santiago Lopez-Ridaura. The lessons will be documented in manuscript #3, based on results from the case studies in Yaqui Valley and Guatemalan highlands.

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In summary, we are pleased to report that we have completed the planned work while exceeding some targets, including advanced preparation of two proposals for funding and an unplanned manuscript that was recently accepted by the journal Nature Sustainability (attached).

Other details on the work reported here and copies of prior deliverables and supporting documents were distributed with the Update Reports to CIMMYT submitted with emails from Keith Kline on 10 October, 30 August, 31 March and 22 January of 2019.

Please contact Keith Kline klinekl@ornl.gov and Virginia Dale vdale@utk.edu if you have any questions or would like additional information related to this final project completion report.

It has been a productive and stimulating collaboration with CIMMYT. We hope that the new year will offer additional opportunities to continue advancing more sustainable agricultural landscapes in the future.

Sincerely,

Keith Kline and Virginia Dale

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