

The Land Institute's International Initiative's Network Assessment

Interview Synthesis and Final Report

Interviews Conducted Nov-Dec 2022

The Development Practice

May 2023



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EXECUTIVE SUMMARY

In 2020, The Land Institute (TLI) established an International Initiative to coordinate and significantly expand their global programs and partnerships supporting perennial grain research and development. Over the next two years they worked on developing the Initiative's scope, potential partners, and next steps including this network assessment which was completed by The Development Practice in 2023. The assessment aimed to develop a more comprehensive understanding of existing global individuals, institutions, and initiatives working on perennial grains, as well as the role that the International Initiative might play in catalyzing the global network. It consists of two parts: (1) an electronic survey that collected responses from 162 perennial grain researchers and practitioners in 31 countries; and (2) nineteen follow-up interviews covering all regions to further understand the state of different international partnerships and initiatives.

Findings included identifying approximately a dozen loosely defined network "hubs" of research or collaboration organized around regions or crops ([Section III](#)). Common challenges to global collaboration were identified ([Section IV](#)), along with opportunities for programing and development ([Section V](#)). The assessment also explored the roles TLI has played in bringing together the global network, considering how the International Initiative can balance TLI's existing capacity and reputation for network leadership with a desire to build a strong, distributed network with localized leadership. Given the analysis of challenges, opportunities, and TLI's role, recommendations for five potential program areas where the International Initiative can provide strategic support emerged ([Section VI](#)):

1. **Regional Hub & Crop Network Development:** support regional hubs and global crop networks to develop more formal partnerships, programs, and funding streams.
2. **Global Research Agenda:** maintain a research and development framework to map the state of crop development initiatives around the world that helps the network identify gaps and opportunities.
3. **Resource Development:** support initiative members, hubs, and crop networks pursue funding and larger-scale grants for research, education, and overall coordination.
4. **Program Development:** facilitate and expand education, research, and partnership programs
5. **Convenings and Communications:** facilitate meetings and outreach to support network development, provide resources for advocacy, and keep all stakeholders informed of progress and opportunities.

As the International Initiative develops, these recommendations are meant to (1) provide a range of both short and long-term options for the consideration of all stakeholders; (2) facilitate further engagement around participatory program design so Initiative members can further detail objectives and action plans within relevant contexts; and (3) identify specific activities or projects where catalytic support from TLI can foster more strategic network growth.

Near term next steps have also been identified to launch the initiative more formally in 2023 including reporting on the network assessment findings and validating the recommendations; developing a network database and map for all partners to access; work with an initial set of partners to develop guidance around recognizing and supporting emerging hubs.

I. BACKGROUND¹ AND METHODOLOGY

TLI launched the planning phase of its International Initiative² in the fall of 2020 and announced Tim Crews as its Director in December of 2021. The Initiative sought to build on its long history of providing foundational knowledge for perennial grain development to international colleagues on six continents. Fifty-four international researchers or groups were already working with TLI to exchange data, plant materials, collaborate directly on programming, and/or as grantees. The Initiative generally characterized its activities around (1) education; (2) network outreach; (3) developing hubs; (4) institutional advising; (5) building research infrastructure; and (6) funding. The initiative aimed to foster new perennial grain crop development, intensify existing perennial grain cropping systems, and ensure global food security and ecosystem integrity through locally adapted, perennial agriculture systems.

Throughout 2022 Tim worked with TLI leadership and consultants to further scope out the initiative, partners, and next steps. To ground its efforts, the Initiative commissioned Luma Consulting and subsequently shifted to working with consultants with The Development Practice to assess the current international landscape of perennial grain research and development. This network assessment was designed to draw a more systematic and comprehensive understanding of the current scope of work, experiences, and aspirations of partners around the world involved in perennial grain research. The assessment consists of two parts:

1. an electronic survey of known stakeholders of perennial grain and cropping systems and
2. interviews of a selected subset of those stakeholders.

The electronic survey analysis was completed in November 2022 in the “Perennial Grains Survey Results” report. This report contains findings from the interviews which were conducted in November and December of 2022 as well as recommendations for the International Initiative to move forward. 28 individuals were asked to be part of the interviews. In the end 19 interviews were conducted with 23 individuals in 14 countries and 17 institutions. The interview list included both the Director of TLI’s International Initiative and a board member to ground the research in existing programming and priorities with some initial review of existing program documents.

Interviewees were initially recommended by TLI based on how active they had been in the past with connecting to the international community of perennial grain researchers and practitioners. Additional interviewees were selected based on survey results to try to ensure holistic coverage of geographies, crops, and institution types. Ultimately, interviews were conducted with participants representing seven emerging regional hubs³ as well as the global community. Quotes used within this report are attributed to the regions the respondents work from- they are not individually identified- and represent summarized transcriptions of interview responses. Quotes categorized as ‘global’ included those whose work supported multiple regions, rather than the place where they are based out of.

Interviews generally lasted 60 minutes and walked through a questionnaire that covered three key topic areas: (1) introduction to the interviewees’ work on perennial grains; (2) interviewees’ experience with

¹ Information adapted from [TLI International Initiative website](#) and interview with Tim Crews.

² Note that the name of the initiative was changed from New Roots International to the International Initiative in 2022.

³ Scandinavia (5 interviewees); Global (4); Western Europe (2); Asia (2); Fertile Crescent (2); South America (1); East Africa (1); UK (1). See Section IV for additional details on how interviewees and hubs were categorized.

international collaboration and emerging hubs; and (3) interviewees' perceptions of TLI's role. Questions were purposefully high-level so that a wide range of experiences could be captured. Interviews were conducted over zoom and recorded to facilitate note taking. Summarized notes of the interviews were shared with TLI and the questionnaire used is below in [Annex One](#).

II. PERENNIAL GRAIN HUB DEFINITION & INITIAL IDENTIFICATION

When the International Initiative launched in 2020, TLI started to think about hubs as a useful concept to talk about partnerships they were starting to see around regional research clusters. These emerging hubs could help organize interdisciplinary groups working in the same region to come together when it was useful. An initial definition of a perennial grain network hub was drafted: *“A network of researchers consisting of 3 or more individuals who are dedicating a meaningful part of their time and attention to advancing the development of diverse, perennial grain agriculture. The research agenda of a hub is decided by the hub members. This differentiates a hub from remote research stations that receive research directives from funders or institutions.”*⁴ With this definition TLI initially identified three existing hubs that had developed organically: (1) Scandinavia (focusing on kernza and perennial barley research); (2) East & Southeast Asia (focusing on perennial rice research); and (3) Western Europe (focusing on kernza research). In addition, TLI identified potentially emerging hubs in Argentina, Australia, Mexico, Palestine, Turkey, and Uganda.⁵

This definition has been discussed with partners, but not consistently recorded or implemented. Partners around the world tended to have slightly different conceptions of what a hub is as well as differing perceptions about whether they belonged to one. Given this reality, assessment interview questions sought to: (1) identify and validate different definitions of hubs; (2) identify emerging hubs as defined by potential hub members themselves; (3) confirm which individuals or institutions consider themselves members of hubs; and (4) understand the specific challenges regional partnerships faces in advancing perennial grain research and development. Additionally, follow-up questions tried to capture key collaborative projects that hub members are implementing and to understand how hubs initially came together, although this information was not comprehensively captured for all emerging hubs.

Interviewee responses generally validated TLI's original hub definition and helped capture different dimensions of the hub concept. Domestic and global partners at FAO, USDA, and TLI spoke about best practices from their experiences facilitating other hubs or communities (FAO's CactusNet hub; FAO's Food for Cities community of practice; TLI's KernzaCAP program and USDA work around sunflower and flax). All interviewees talked about what a strong hub might look like and further validated the following definitions and dimensions of a hub:

⁴ Draft 'Hub FAQ' from TLI's International Initiative, 2022.

⁵ 'NRI At a Glance' Presentation, TLI 2022.

Membership	requires at least 2 or more disciplines working together for more integrated initiatives (e.g., plant breeders, system modelers, agronomists, ecologists, social scientists, food scientists, etc.)
	May include commercial, industrial, government, farming practitioners, as well as researchers and academics
	draws partners and participation from across related research and farming movements, such as organic, regenerative, and conventional
	encourages a wide range of perspectives within the perennial grains system movement to support the broadest possible coalition of partners and diversity of thought
Operations	is organized around a specific perennial crop or regional geography
	has experience, reputation, and network to effectively champion the movement and grow hub membership both across and within disciplines
	mature hubs may operate according to common values determined by the hub members around collaboration norms, membership roles and responsibilities, and high-level, joint goals
	involves some sort of formal collaboration between hub partners, such as regional funding proposals, innovative partnerships, or strategic geographic coordination
Programs	serves as a repository for institutional knowledge and network connections that might otherwise be lost when funding ends, projects close, or researchers leave
	fosters the sharing of resources, specifically data and germplasm within the hub network

Beyond definitions, the interviewees also helped to validate initial classifications of geographic and crop-specific research collaborations that could begin to be classified as hubs (“emerging hubs”). The inclusion of domestic partners in the interviews means that some of the crop specific hubs do not have international partners listed. Additionally, because these hubs are self-reported, some individuals and institutions consider themselves members of multiple hubs across different geographies or crop initiatives. The ‘participating institution’ list is based on reporting from the interviewees and needs to be further validated with all partners listed. TLI is not listed as a partner institution in the table below although almost all emerging hubs listed considered them a key partner.

HUB	FOCUS	PARTICIPATING INSTITUTIONS
Emerging Regional⁶ Hubs		
Global	Policy and Programming	FAO, TLI, USDA
Scandinavia	Kernza, Intermediate Wheatgrass, Barley	University of Copenhagen; Swedish University of Agricultural Sciences; Lund University; Karlsberg Laboratories
Western Europe	Kernza (grain and forage), silphium.	ISARA; Gembloux Agro-Bio Tech at Liège Université; INRAE; University of Hohenheim; Nicolaus Copernicus University; Graz University of Technology
United Kingdom	Kernza; Herbiage; Ecosystem services	Cotswold Seeds; FarmEd; NIAB; University of York; Rothamsted Research
South America	Silphium	Museo Egidio Feruglio; CONICET
Asia & Australia	Rice, Kernza, Wheat	Yunnan University; University of Queensland; Thai Rice Institute; institutions in Myanmar, Laos, Vietnam, Bangladesh; Dept. Primary Industries, NSW, Australia
East Africa	Rice; Sorghum	National Agricultural Research Institute; ICRISTAT; Makerere University, Uganda
Fertile Crescent	Sainfoin, Kernza, Barley	Adana Science and Technology University; Birzeit University
Crop-Specific Networks		
Kernza	Agronomy for Production & Commercial Development	Kernza Alliance being spearheaded by TLI with partners in temperate latitudes or high altitudes worldwide
Rice	Local Variety Adaptation, Agronomy for Production, & Commercial Development	Yunnan University; University of Queensland; Thai Rice Institute; institutions in Myanmar, Laos, Vietnam, Bangladesh, Uganda, Ethiopia
Silphium	Basic Agronomy for Domestication (shattering; oil quality; harvesting; etc.)	USDA; Patagonia, Argentina, Germany, Manitoba, Canada, some international collaborators; North Dakota State University; University of Colorado; Northern Plains Sustainable Ag Society
Sorghum	Domestication (yield; regrowth; photosensitivity)	Uganda; Kenya; some support from global institutions at the UN and CGIAR center
Flax	Lewis Flax Domestication (shattering & blooming) & Commercial Development	University of Colorado; Rocky Mountain Lab and associated research institutions; University of Virginia; NDSU; USDA

⁶ Notes: 1- Other potential geographic hubs mentioned in interviews or surveys included Eastern Europe (Serbia, Croatia, Bulgaria, Hungary, Azerbaijan focused on Sainfoin, Kernza, Intermediate Wheatgrass, Barley); Central Asia; other South or Central American countries; survey respondents from these regions and countries either indicated that they were not available for follow-up interviews or that their work was still in very early stages; 2- NSW in Australia is working on sainfoin, wheat and sorghum (as are other partners), but do not appear to be collaborating significantly so are not included on this list. 3- North America is likely it's own regional hub with TLI as a lead partner, but needs additional consideration on labeling.

III. CHALLENGES TO HUB DEVELOPMENT

Interviewees were asked about the specific challenges they faced in their research and development work, as well as obstacles to broader collaboration – particularly in terms of further developing or expanding the emerging hubs identified above. Many interviewees talked about the need to attract new talent from more disciplines, to have better processes for exchanging plant material, to connect with more actors across value chains, and the need to bring perennial grains research into more mainstream discussions, publications, and conferences. While most interviewees are still focused on basic research, there was general discussion across geographies and crop-types about the need to connect with partners across the value chain – whether that was with seed multipliers, farmers, processors, or commercial actors. Discussion around value chains did not necessarily focus on immediate commercialization needs, but rather how early research could ensure that the needs of these stakeholders are being considered and, more generally, to broaden the movement in order to hasten progress on crop development.

In addition, many interviewees reported feeling siloed or cut off from the work of other organizations and institutions on perennial grain systems, and did not fully understand how their specific research complemented other projects or initiatives underway around the world. Many also discussed the need for longer funding timelines that better accommodate the production cycles of perennial grains and more large-scale funding opportunities for research across regions or ecologies. Challenges cited broadly fell into four categories around (1) funding timelines and scope, (2) people and managers, (3) informal partnerships, and (4) standards and research infrastructure.

Funding Timelines & Scope: Funding was the top challenge listed by 109 survey respondents on the electronic survey, while over half of the labs reported spending less than 50% of their time on perennial research – mostly due to limited funding. While in many ways, this is an obvious challenge, the interviews dug deeper into the funding modalities that are needed for perennial initiatives and partnerships. Collaboration between hub partners tends to be project-oriented or funding-based, such that hubs may become inactive, or partnerships may “fizzle out” once a project or funding stream ended. This was cited by partners working with the Scandinavian, UK, West European, and Asia & Oceania hub institutions. Large government grants were the most cited funding source, especially for partners in high-income countries - while foundation or philanthropy support was also cited. Most groups also cited receiving resources from TLI itself. Additionally, interviewees cited many challenges with the structure of funding with high overhead costs for university-based research, limited timelines that do not align to perennial research timelines, and restricted funds that do not leave resources or capacity for work focused on fostering partnerships and building broader programming with partners around the world.

“Because our funding is local, our focus tends to be increasingly local...if we’re doing plant breeding for varieties that will be adopted locally, we need support to identify where else in the world that breeding initiative might have value” (Oceania).

“Our overhead is enormous...so when you do get funding, you have to decide whether you want to hire a dedicated person or pay for all the other running costs... plus, most of the funds are restricted, so we’re limited in how we can use them.” (Scandinavia)

People & Managers: Other job responsibilities were the second most cited research challenge on the electronic survey (77), while an additional 29 respondents cited a lack of jobs, mentorship, and/or training opportunities as challenges. This points to problems of both existing stakeholders not having the capacity to take on hub facilitation and partnership development responsibilities as well as problems with

attracting new talent into perennial initiatives. Since hubs remain informal entities, this also limits the ability of partners to formally establish roles and have their responsibilities recognized. Given this reality, there is no dedicated personnel and very limited capacity for coordinating hub programs or activities, growing partnership networks, or coordinating regional research initiatives. This work remains dependent on individual interest and availability. One interviewee additionally cited that there are many researchers in the network that are so specialized in their specific work that it is hard to find individuals who can broadly promote interdisciplinary networks and to begin connecting with partners across the value chains. With limited people capacity (and funding), it is also difficult to attract and train new research talent through accredited field research, thesis development, or other trainings on perennial grain systems.

“We are actually only a relatively few plant geneticists and breeders working on these crops, and it’s a lot of pressure—we need so much more knowledge from all the other disciplines...We need many more people working on this” (Scandinavia).

“Funding can become available if you have the right people...it’s about having more people with sufficient experience and seniority to develop the hub further – people are very specialized and finding champions who can broadly speak to and promote the initiative is difficult” (Scandinavia).

“The international network needs to support promoters and pioneers, but it also needs to bring more people into the loop; it’s less about growing the community quantity, it’s about growing the community quality – having actors across the value chain” (Europe).

“More people are needed! Only 2-3 permanent people at our institution are investing in the topic –we need more people dedicated to working with farmers and offering on-going support and capture of knowledge” (Europe).

Informal Partnerships: The lack of formalized partnerships is an overarching challenge for hub development which further complicates fundraising and people recruitment efforts as partners cannot cite more formal relationships or programs that would give them more credibility for attracting top talent and funding. On a more technical level, interviewees mentioned how informal partnerships limit programing opportunities for students and complicate access to germplasm. Several interviewees cited that they could be running student exchange programs, providing support to research, and bringing researchers into projects if they had more formal agreements which would allow them to put the right management structures into place and get approvals from their organizations. Additionally, national germplasm agreements can make it difficult to share germplasm across institutions with only informal partnerships, and thus limit the ability of hub partners to develop regionally specific varieties using local germplasm.

“The hubs could be centers for transferring knowledge through some kind of formal teaching to researchers, students, and farmers interested in perennial grains; [but] right now, we can’t even invite other people to work with us because we... don’t really have an institutional supporter” (South America).

“By far our biggest issue is germplasm agreements and being able to move germplasm across countries; that’s just killing us right now” (Global programming partner).

“In some countries, it’s extremely hard to get government permission to introduce seed from China; likewise, China has a limited ability to bring in outside seed materials. That’s why formal partnerships are important because that can be the only way to exchange seeds or germplasm” (Asia).

Research Standardization & Infrastructure: Access to relevant research stations, equipment, and resources was the third most cited challenge from all survey respondents (31). Formalized partnerships for germplasm sharing would require support for understanding and navigating policy restrictions around sharing plant material as well as the legal frameworks of different countries and institutions for intellectual property rights. If partnership agreements for germplasm sharing can be established, then interviewees also cited a need for supporting infrastructure for identifying and tracking varieties that are being developed across the network. Any system for this would further need an agreed-upon standard for data collection to collate data across different research projects and partners. This is particularly important to justify stated yield potentials or expected environmental benefits of perennial grain systems.

“How will we get the primary rice materials? If we have a breeding program, then we’re going to need germplasm from all over the world... We need wild species of rice...we also need more modern rice varieties to get us closer to later generations in breeding research and genetics” (Asia).

“It’s important to be able to pull information from different sources or sectors...this is problematic when it comes to modeling because you have different pieces of information that are hard to knit together, and it becomes difficult to publish results” (Scandinavia).

By far our biggest issue is germplasm agreements and being able to move germplasm across countries; that’s just killing us right now. (Global)

IV. TLI’S ROLE AND OPPORTUNITIES

Interviewees were generally positive about the opportunities to address these challenges, and about TLI’s potential role in facilitating these opportunities. For example, many interviewees responded that TLI was in a strong position to build on its current role as a leader, facilitator, and matchmaker to act as a high-level movement coordinator – not to dictate the course of perennial grains research, but rather to facilitate a participatory dialogue around high-level research goals and strategies. These opportunities have been organized into five categories based on both what interviewees cited as needs for the network as well as how they envisioned TLI’s role: (1) formal hub development, (2) coordinate research, (3) support and expand the network, (4) communications, and (5) promoting shared values.

Support Hub Development: Interviewees almost universally felt there would be benefits in having more formally recognized hubs and that facilitating the growth of hubs was a clear next step for the International Initiative. There are many questions about what it may mean to formally recognize a hub, whether this would be a specific TLI designation, or something more about providing a platform for hubs to self-identify or register into. Whatever this recognition looks like, the benefits of doing so include bringing legitimacy to smaller or less well-known organizations; facilitating access to funding for more complex multi-institutional research projects; providing more opportunities for formal education and training exchanges between institutions and stakeholders; possible coordination of data management; and clearer lines of communication between stakeholders around the world. Many interviewees also highlighted the importance of potential coordinated collaboration, and opportunities for larger-scale funding facilitated through TLI. Smaller and less well-known institutions discussed the value that TLI’s reputation would bring to legitimizing their work in the eyes of funders, collaborators, or even their own institutions. For example, some interviewees mentioned the value of simply having a formal letter of partnership from TLI when applying for funds, or even the benefit of just having grant applications sent from TLI with a US postmark. Other interviewees needed a more formal partnership, for example one

where TLI acts as a co-applicant on grant proposals or signs a formal MOU. If appropriate, these are small gestures that could have a much larger impact on smaller network members' ability to unlock funding.

"while it's unfortunate that [we're] experiencing significant currency devaluation recently, it could be a good opportunity to do a lot of inexpensive research. We spent maybe \$1,000 to complete a perennial grain study, and when we finished it and the data came in, we got a lot of collaboration. It's so inexpensive to conduct research [here]... so it's a good place to house a regional hub." (Middle East)

"We need hubs in Africa, South Asia, Southeast Asia, and Latin America. If funders like BMGF or USAID put money into larger programs through Africa Rice or the Thai Rice Institute that could serve as regional hubs, then TLI could build the smaller, local "spokes" once the hubs are in place" (Oceania).

"We could literally just use some paperwork that formally links us to TLI – we just need something more formal; we need signs up at the lab to show our partnership...I have nothing to show partners for why they should invest their resources [into a larger center for perennial development]" (South America).

"if TLI could help with resource mobilization - help with proposals and grants - can bring attention to donors - joint proposals get much more interest from donors, doesn't need a huge role from TLI once the resources are secured" (Africa).

Coordinate and Document Research & Development: While perennial grain systems research has grown organically over time, many interviewees highlighted the need for a high-level framework where they could position their research within a broader movement. TLI was cited as the obvious (and perhaps only) institution that really has the capacity and mandate to play this role particularly around coordinating data and documenting germplasm development, providing a knowledge repository, and setting global goals beyond local initiatives. Interviewees consistently cited the various local barriers to perennial plant development and highlighted how important partnership with TLI's breeding program had been for their research. TLI has both the research and donor relationships to strategically disseminate plant material for local adaptation and available for exchange with network members.

"We're all working on small pieces of a larger whole, and we need someone to help make sense of that whole. TLI could use a participatory process to help us come together and define the overarching framework into which all our research goes." (Scandinavia).

"Because our funding is local, our focus tends to be increasingly local...if we're doing plant breeding for varieties that will be adopted locally, we need support to identify where else in the world that breeding initiative might have value; TLI could help us be more strategic" (Oceania).

"TLI is the most likely organization to be around 10 or 20 years down the line, working on these crops, so it's important that TLI continues...being the go-to institution with the know-how; you need to have someone who is dedicated to this in the long-term, so you don't lose knowledge because people retire" (Scandinavia).

Support & Expand the Network: Currently, TLI facilitates meetings and conferences within the perennial grain systems research community to foster connection and collaboration. Interviewees consistently remarked how important these meetings have been for building their professional networks, fostering collaborative research, and building regional or crop-specific knowledge hubs with peers. Similarly, interviewees cited TLI's critical role providing informal matchmaking for research partners with aligned goals, introducing new talent to potential research mentors, or simply providing a space (either through exchanges at TLI or at TLI-hosted meetings) for research partners to meet each other and spark new ideas. Some interviewees also highlighted opportunities for TLI to play a more active role in actively

matchmaking through a network map, formal exchange programs, or crop or discipline-specific meetings or dialogues.

“TLI has a lot of strength in branding and name recognition and has more capacity to attract bigger foundation donors and coordinate international funding opportunities. So TLI could take on large-scale funding and then foster partnerships with organizations that have funding or political barriers that make it difficult for them to work together...there’s an opportunity there and a need” (Global).

“It’s always useful when TLI has meetings or conferences to bring the perennial grains community together; New players and experienced players can meet and compare experiences across crops, geographies, and all sorts of things...that has been very valuable in the past” (Oceania).

“I’d like to highlight the value of meetings or conferences. Opportunities to get together are important (even though it’s extravagant and against the philosophy of reducing our climate footprint), but it is important to have meaningful connections and they do need to be in person. TLI meetings are always productive – something always good comes out of it” (Oceania)

Coordinate Strategic Communications: Interviewees recommended additional roles TLI could fill to help bring perennial grain research more into the mainstream. TLI has the highest visibility of any institution working in perennial grains systems and can lend that reputation to support a better understanding of current perennial grains research to the broader scientific, philanthropic, and industrial communities. Within this some interviewees identified concrete opportunities for TLI to support communications and publicity around perennial grain systems that could not only standardize strategic messaging across actors, but also to provide some customizable materials for individuals to use when presenting at conferences or meetings. This will not only streamline information into a consistent message that represents a diverse network of stakeholders using the movement’s articulated values, but also empowers other actors to represent the movement more broadly.

“It’s time to start bringing awareness of perennial grains to other stakeholders like industry, research, public consumers. TLI should be going to industry and donor conferences and presenting our work and getting it into the broader conversation” (Scandinavia).

“Something TLI could do is encourage existing conferences to have sessions on perennial grains to bring together people with specific interests, such as breeders or agronomists, etc. This brings new people into the network with new skills... having those opportunities with new people is critical” (Scandinavia).

“We need to attract commercial partners if we want to get these varieties released and into farmers’ fields” (Oceania).

“TLI is promoting these perennial grain crops, and I think that’s important because there’s a certain resistance to new things; not because they are bad, but just because they are new... it’s important to balance what is known about these crops... and to avoid polarization between annual and perennial researchers that’s not beneficial for anyone” (Scandinavia).

Promote Shared Values: Many interviewees commented on the tension between different values within the perennial grain systems movement and highlighted the need to articulate values that are largely assumed and sometimes not aligned. These included concerns about how to select and work with more traditional agri-businesses or commercial partners, balancing questions of ecological diversification and intensification, being committed to open-source data and germplasm, working with non-organic systems, and more. Interviewees identified the need for a process or platform to transparently develop and publicly

house these values. In this role, TLI could help facilitate a process to develop standard definitions or guidance for partners that would help each hub, individual member, or institutional partner define values for their own contexts and initiatives. This process would create transparency while allowing for individual or institutional differences and allow network members to know upfront whether potential partners share their values; for example, if a specific hub or partner will only work with organic producers, is in a region that bans GMOs, or is unwilling or unable to accept funding from certain types of commercial interests.

“For now, TLI is the source of the values and philosophy of perennial grain research, and they can keep that alive in a way that other partners might not be able to do” (Europe).

“We’re still making the same mistakes and only talking about the yield, but there are other values that are really important to understand during the process and we need to focus on those at the same time” (Scandinavia).

“One of the challenges I find in the advocacy space is that we have a habit of “branding” our approaches (e.g., organic farming, biodynamic, conventional farming etc.) and then different branches become siloed off and stop communicating with each other; if you’re trying to communicate across “brands” then the labels can become quite limiting. We need more advocacy that cuts across labels” (Oceania).

V. RECOMMENDATIONS FOR THE INTERNATIONAL INITIATIVE

Analysis of the background, opportunities, challenges, and TLI's current role point to five programming priorities for the International Initiative: (1) Regional Hub and Crop Network Development; (2) Global Research Agenda; (3) Resource Development; (4) Program Development; (5) Convenings and Communications. Under each area, there are specific activities that the International Initiative could develop over time and with partners to address the identified challenges and take advantage of the opportunities. For each program area there are considerations for near-term and longer-term projects that could be undertaken by the Initiative depending on how the network, its needs, and the necessary support resources develop.

Additionally, these recommendations consider TLI's current and possible future role in facilitating the international network. The International Initiative will look to leverage TLI's existing capacity and reputation to facilitate network development and more strategic collaboration, but ultimately will prioritize opportunities that allow other institutions to also become network leaders. This assessment recommends that TLI take the lead in facilitating the initial stages of network development in the immediate term, so that there is a foundation for building consensus and participatory program design on longer-term initiatives and investments. In the near-term, the International Initiative will remain a relatively small, strategic support unit that could take many development paths either within TLI itself or spun-out into a parallel structure with a larger scope and mandate.

1. Regional Hub & Crop Network Development: *help regional hubs and global crop networks develop more formal partnerships, programs, and funding streams.*

Regional hubs can provide a foundation for programming, fundraising, research coordination, and developing talent according to localized priorities, systems, and crops. Regional hubs might be for a single country (ie: UK; Ukraine), a group of countries (ie: Scandinavia; Uruguay and Argentina; Fertile Crescent), or possibly a larger global region (ie: East Asia; East Africa). Crop networks can provide a similar foundation

for global researchers and practitioners who are working towards the development of a specific crop. Crop networks might have a dedicated program working to systemically coordinate members such as KernzaCAP or they might be more informal networks where members sometimes collaborate such as with perennial rice development between China and Uganda with support from the US.

Emerging hubs identified in this assessment are at different levels of recognition, coordination, and collaboration and likely need different kinds of support to continue to develop. Given the different needs and status of these hubs, near-term support that the International Initiative might provide could include:

- A platform that publicly recognizes and provides information about hubs and crop networks
- Guidance for deepening local partnerships, creating institutional agreements, and bringing new partners into a hub or crop network
- Support for information exchange between members including convenings, list serves, and/or shared knowledge repositories
- Documentation or case study examples of how other hubs formed and what their activities are

In addition to these roles, the International Initiative will remain a connecting force in the global network, providing introductions and identifying possible collaborations between members. Longer-term programming could move towards formalizing some of the network partnership activities including direct support for managing Regional Hubs and Crop Networks. Activities might include:

- Cultivate emerging hubs with more formal programs, partnerships or funding which might include capacity support for identified hub leaders, commitments to help fund or manage priority activities, support for hub IT infrastructure for knowledge sharing, communications, and more.
- Regional 'hub and spoke' programming, with resources and guidance to develop local partnerships to further spread, test, and adapt varieties for their region.
- Directly funded hubs and networks through larger-scale institutional support.
- Network partnership activities that strengthen cross institutional relationships and help to target new partners that can be brought into the movement.

More coordinated and ambitious programming and standards in the long-term could include global or regional joint research facilities, plant material libraries, or centers for commercial processing or marketing of perennial grains. Larger-scale programming could also include the establishment Hub Development Programs for underserved regions or crops. A strategic framework for this kind of growth could be explored as both hubs and the International Initiative continue to develop.

2. Global Research Agenda: *maintain a research and development framework to map the state of crop development initiatives around the world that helps the network identify gaps and opportunities.*

A global research agenda facilitated by the International Initiative would not be prescriptive, but rather would document existing research initiatives so that initiative members can strategically identify global gaps, priorities, and opportunities for collaboration and exchange. A joint research framework could be identified and updated through a participatory process to include major value chain categories and crops. This could help build an understanding of where different crops are in their development process and the open research questions that need to be resolved to push forward this process. This would also provide critical framing and messaging for research partners to make the case for their work to universities, institutions, government counterparts, funders, and other key actors and gatekeepers. In the near-term

activities for this would include developing the framework, but also starting to build an infrastructure that would help initiative partners share resources and collaborate on similar projects:

- Developing a shared framework to track crop development status
- Standard infrastructure for data sharing:
 - standardized indicators and data collection methodology
 - shared database of evidence
- Standard infrastructure or processes for germplasm exchange
 - catalogue genetic material
 - resources for navigating local regulations for IP and exchange
- Strengthen partnerships with global research or policy partners - CGIAR and FAO initially- who facilitate global agricultural networks in general and could deepen their work on perennial grains

In the longer term if these initial sharing activities are successful, more significant infrastructure could be established. A developed global research agenda could facilitate local germplasm development or exchange opportunities, ensure a joint evidence base for variety performance and benefits, as well as identify the biggest priorities for different crop initiatives; ultimately allowing for research alignment and prioritization. Activities in the long-term could include:

- Shared framework used to assess critical research and development gaps and to determine strategic priorities
- Promote strategic partnerships and research initiatives to limit overlap in the networks
- Participatory program prioritization with network members reaching consensus on priority initiatives for their localities or for global crop networks
- Develop more standardized research and reporting mechanisms and decentralize institutional knowledge across more regional institutions and/or individual stakeholders

While TLI can help hubs and networks form and grow, longer term prospects for collaboration and shared resources would likely be driven by Initiative members and leaders themselves. Mature hubs or networks may decide to develop leadership or governance structures that would facilitate decision- making on further priorities, activities, and investments including possibly developing more substantial shared infrastructure and standards for data and genetic material sharing. A global center or regional centers focused on cataloging and housing genetic material and more rigorous standards for data could be developed if and when consensus emerged around how that should be managed.

3. Resource Development: *support network members, hubs, and crop initiatives pursue larger-scale grants for research, education, and overall coordination.*

How the International Initiative, hubs, and the network as a whole develops in the longer-term is highly dependent on funding and capacity of all partners. TLI remains best positioned to promote programs and research from across the network to donors, and the International Initiative can leverage TLI's reputation, relationships, and infrastructure to help network members apply for larger-scale grants from major donors. In the near term the Initiative could share fundraising resources with members and continue to cultivate donors and partnerships that benefit all members. Initial activities might include:

- Develop a fundraising toolkit with standard proposal language and examples, boilerplate language around research goals, budget and costing resources, and guidance around partnering with TLI to pursue grants
- Donor listings of potential funders including their research, programming, and geographic interest areas.
- Small grants for emerging network coordinators to spend time on facilitation, management, and grant writing for their own hubs, network, and program development
- Support members with more complex, multi-partner funding opportunities across geographies
- Support low- and middle- income country partners to secure funding and leverage their relatively low research costs for high impact, efficient investments

Longer-term support for resource development might include dedicated staff for proposal writing, as well as more dedicated funding for coordination and management of activities across the International Initiative Network. In tandem with the development of a global research agenda, regional hubs, and crop networks, resource development could also begin to identify priorities and longer-term strategies for larger-scale, more complex funding. Activities might include:

- Cultivate relationships with large foundation and institutional donors for general support grants to regional or global partners to manage network development, coordinate research agendas, and develop more complex programming.
 - Targeted partnerships for regional coordination, crop network expansion, or support for strategic research initiatives
- Development of a more sophisticated fundraising strategy with plans for cultivating of different categories of funders for different kinds of programming needs and activities

In the longer-term the International Initiative may also consider different funding needs for different kinds of hubs, crop initiatives, or geographies. More mature hubs likely need support for continued or expanding programs, while new regional hubs may need basic support for establishment and coordination. Similarly, there are key opportunities for small grants to institutions in low and middle-income countries to have a big impact on their ability to establish research or training programs that would be unaffordable in higher-income countries. A coordinated resource development strategy could help define these different needs and create specified resources to help partners fill them.

4. Program Development: *facilitate and expand education, research, and partnership programs*

Programs being coordinated with International Initiative members are mostly focused on partnerships for education and research. Many of these programs currently happen through limited grants or more organic network connections, so formalizing some of these programs could help secure more funding and ensure that they are accessible to all current and potential members. Initial programming around researcher exchanges could help build global crop networks and facilitate connections in regional hubs. As the Initiative develops, other programs or activities that could help catalyze local research may be identified for direct support. Initial activities might include:

- Expand and formalize match-making and research exchange programs that bring together researchers or students with similar research interests.
 - Leverage opportunities particularly for researchers from low-income countries to gain experience globally or to bring more programs to low-income countries where costs are low

- Support researchers and students with resources for developing publications and navigating the publishing process
- Webinar series that range from introducing the global strategy to specific topics like breeding cereals to intercropping perennial crops.
- Develop strategic global partnerships with other global or regional organizations who could support research programs and help develop programming areas around policy and commercialization
 - Consider how other partners in UN agencies, development banks, foundations, and possibly commercial associations could help the network grow
- Strategy Development for the International Initiative to consider how best to provide direct program support to members
- Help partners develop their own requirements, values, and systems for targeting and engaging with new partners and programs

In the longer-term, especially if the Initiative is successful in fundraising and expanding partnerships, then research programs could become more standardized with dedicated resources, and program areas could grow beyond TLI's core research mandate to look at commercial partnerships, policy engagement, and advocacy to promote perennial grains. Activities could include:

- Researcher or student grant and exchange programs with dedicated personnel and regular awards
 - Global and regional centers running programs for this with regional hubs having their own dedicated resources for local match-making
- Dedicated programming for policy and advocacy engagement, likely in partnership with UN partners and Regional Hubs
- Farmer grant programs to trial perennial grain varieties and help pave the way for larger-scale adoption.
- Commercial value chain partnerships and programs for commercialization of perennial grains as they gain policy approval and move past early-stage research.

In the longer-term more established global programming for research, education, and partnerships would help decentralize capacity, resources and knowledge across more institutions and individual stakeholders, strengthening regional hubs and global crop networks. As networks and hubs grow, the goal is for them to develop their own programs and agendas. Expanded programming into the value chain and policy spheres will also ensure that the perennial grain movement is poised to have impact at the systems level as more crops move past the research stage.

5. Convenings and Communications: *facilitate meetings and outreach that supports network development, provides resources for advocacy, and keeps all stakeholder types informed of progress.*

Almost without exception, all interviewees recommended that TLI continue to facilitate, and even increase the number of, meetings that build connections and spark new partnerships. The International Initiative could also establish more regular meetings and outreach materials to help members share their work more consistently and frequently. This would not only empower other partners to become ambassadors for perennial grain systems with consistent messaging but will also help cultivate diverse leadership beyond TLI's International Initiative team. Near-term activities could include:

- Host or co-host global convenings and regional meetings to bring International Initiative partners together and facilitate information sharing
- Develop standard presentations with information about the Initiative to help network members become ambassadors for the movement with their own outreach efforts.
 - Targeted presentations to different audience types (funders, commercial partners, farmers, research partners, etc.) to help explain the global scope of perennial grain research initiatives
- Target mainstream academic and industry conferences, encouraging hub members to present their work to new audiences and stakeholder types.
- Develop communications channels for the International Initiative to share information and resources with network members; might include list-servs, newsletters, dedicated information or data portals

In the longer-term some of these communications activities could be established into a persistent program that institutionalizes regular meetings, outreach resources, global platforms and overall support to network members in publicizing their work. Institutionalizing a communications team for the Initiative might include a dedicated facilitator, events planning, web master, and more. This can remain decentralized, possibly with network members taking on different roles with a stipend or could be formally part of a more mature global coordination unit that forms from the International Initiative.

VI. NEXT STEPS

While the above recommendations provide a range of possibilities around the directions that program areas develop into, there are more immediate next steps for the International Initiative to begin activities for each program area as part of a more formal launch in 2023. These include reporting on these network assessment findings and validating the recommendations with all stakeholders; developing a regularly refreshed network database and map for partners to access; recognizing and working with some emerging hubs to help them pilot more formalized partnerships and activities; develop an initial draft of a global research framework with consideration for intellectual property issues, and to have an initial convening with Initiative partners. Building from this assessment the International Initiative will continue the work of mapping and engaging with all perennial system partners to both grow and deepen the movement around the world.

Regional Hub & Crop Network Development: For regional hubs and crop networks identified in this assessment, the International Initiative will begin to publicly map and list them on the TLI website with relevant information about partners and research initiatives. This initial recognition can hopefully spark more engagement with both current and potential partners. All information will be validated with listed partners and recognized hubs might be requested to provide updated information. Initial regional hub and crop network recognition will come out of the development of a network database and map showing individual researchers, relevant institutions, research initiatives, existing partnerships, and other key information that was collected from the electronic survey results.

Global Research Agenda: Consider how the network mapping, survey, and other ongoing coordination projects can be turned into a research framework with a crop development status roadmap. The International Initiative and TLI has a whole will begin considering what kind of IP agreements and legal frameworks need to be considered for multi-partner crop development initiatives.

Resource Development: As the International Initiative more formally launches, it will continue the work of researching out to donors, pitching global program support, and helping network members connect to

funding opportunities as well as develop their own proposals. The network mapping work will begin to track different donors in the space and will likely do a more direct donor mapping in the coming months as well as begin putting together resources for a fundraising toolkit.

Program Development: The Initiative's first steps in program development will be around validating the activities proposed in this report. This dialogue could be facilitated through a series of in-person or virtual meetings to help develop high-level consensus on the Initiative's initial program priorities.

Convenings and Communications: An initial global convening for the International Initiative is being scoped for the end of 2024. Regional meetings with emerging hubs before then will also likely be organized, including with the Fertile Crescent in November 2023 and South American partners in March 2023.

ANNEX 1. INTERVIEW QUESTIONS

Section One: Introduction: *Review survey responses related to motivation and type of work prior to interview, use this opening to clarify those responses and establish a dialogue.*

1. How would you describe your work and its practical applications towards the development of perennial grains?
2. How do you hope your work might be used to transform current agricultural systems towards uptake of perennial systems?
 - a. What are the main barriers you see to achieving this uptake and transformation?
 - b. Given those barriers, what do you think the most important areas for continued research and/or investment are?

Section Two: International Collaboration: *TLI is working to develop and support perennial grain research hubs which are defined as a collaborative group of researchers focused on a common research agenda usually for similar crops or geographies.*

3. Do you currently see your work as part of an informal or formal research hub?
 - a. If YES:
 - i. Briefly describe the hub including key countries or regions, institutions, initiatives, people, research within it.
 - ii. Briefly describe how you came to be part of that hub and/or how it developed.
 - iii. What are the benefits you and/or your institutions get from it?
 - iv. What are the barriers that might exist to cultivating and expanding it?
 - b. If NO:
 - i. Is that by choice or because you don't have a network in your geography or specialty area?
 - ii. If there is a network that you are not participating in, why not?
 - iii. If there is not a network, do you see the value in developing one? Why do you think there isn't one in your geography?
 - iv. What would be needed to start one?

Section Three: TLI's Role: *How do different stakeholders see TLI's role in developing and/or continuing to support the international perennial grain community.*

4. Based on your previous work or collaborations with TLI, what value do you think they can bring to your work or network?
5. Based on this conversation, is there anything else about your work or partnerships that you think we should talk about? (and if you have any questions)