SeEdQUAL:
Delivering Genetic Gains in Farmers' Fields

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Proposal

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1. Introduction and context

This document provides a template for Proposals for CGIAR Initiatives, providing guidance on the elements and content anticipated. The purpose of the template is to provide CGIAR System Council funders and the Independent Science for Development Council with the information needed to inform their funding decisions around the Initiatives. The template is designed in light of the CGIAR 2030 Research and Innovation Strategy, reflecting the focus on partnerships, innovation systems and multiple SDG impacts from high-quality science, research and innovation. The template provides for assessment of CGIAR Initiatives against the features of CGIAR Initiatives laid out in the System Reference Group recommendations (Annex 1 of SC09.02), the ISDC Quality of Research for Development Criteria and the Eschborn Principles.

The Proposal template is based on that submitted to the System Council in 2020 (Document SC11.04a), and subsequently modified with the agreement of the CGIAR Executive Management Team and the Independent Science for Development Council, ensuring a fit to their needs. The template is current at the date of issue, taking into account all prior decisions of the System Council, System Board and CGIAR's Executive Management Team.

Summary table

Initiative name	*SeEdQUAL: Delivering Genetic Gains in Farmers' Fields*
Primary Action Area	*Genetic Initiatives*
Geographic scope	*Global*
Budget	*US$ 72,000,000*

General information

IDT Team:

Ian Barker, CGIAR	IDT Lead, WP4 Lead
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2. Context

2.1 Challenge statement

Smallholder farmers, especially women and disadvantaged groups, are particularly vulnerable to climate-related and other challenges, compromising their ability to meet their own food, nutrition, and income needs, much less contribute to local and national food security. More frequent and severe droughts and erratic rainfall due to climate change threaten agricultural production. Due to inadequate seed supply and delivery systems misaligned with user and market demand, smallholders use 'old' varieties or recycle seed, leaving them more vulnerable to pests and diseases[i]. Productivity varies by gender, with these challenges disproportionately affecting women[ii]. Until gender disparities in access to information, technologies, markets and other opportunities are addressed, efforts to realize agriculture's potential to sustainably achieve food, nutrition and income security will have limited impact.

With increasing population and climate pressure, inclusive and climate-smart intensification of food production is urgently needed for One CGIAR and partners to deliver in key Impact Areas—nutrition, poverty, gender, climate, and environment—and the second Sustainable Development Goal: Zero Hunger by 2030. Improved varieties, innovations, and approaches developed and promoted by CGIAR and partners have potential, when contextualized considering social, economic and political factors, to transform agri-food systems and reduce yield gaps, 'hunger months,' and other disparities. However, limited access to and use of affordable, quality seed of well adapted varieties with desired traits remains a bottleneck.

Achieving One CGIAR's goals requires a long-term, end-to-end investment in CGIAR breeding driven by market intelligence, supported by partnerships that deliver genetic gains equitably in farmers' fields. This requires enabling policy environments incentivizing varietal turnover and quality seed use[iii] and integrating and leveraging formal and informal seed systems to the benefit of all.

To this end, SeEdQUAL will build on decades of work on seed systems by CGIAR and partners, and leverage synergies as governments[iv], breeders, funders[v], and communities recognize the need to accelerate demand-driven seed system development and reach farmers at the last mile. Success hinges on better understanding and responding to seed user demands, including women and young farmers, and value chain actors specializing in niche markets with high potential. Seed systems that respond dynamically to such opportunities and deploy innovative methods (e.g., ICT tools) and aligned approaches (EGS production and policies) will increase and expand the benefits of seed access and use, especially for disadvantaged groups. SeEdQUAL, together with key innovation, delivery and scaling partners, will develop and promote new technology solutions, more effective business models, and policy reforms to create sustainable and inclusive seed systems.

2.2 Measurable 3-year (end-of-Initiative) outcomes

Seed companies and other seed multipliers providing quality seed of new improved varieties, from CGIAR and NARS networks, at greater scale, tailored to their needs and reaching 30MM beneficiaries (minimum 30% women) by 2024 (Hareau, 2021) thereby increasing varietal turnover and contributing to achieving genetic gains in farmers' fields.

Five foundation seed providers, adopting innovative and transformative models for accessing, multiplying and disseminating quality early generation seed (EGS) for the full range of target focus crops on prioritized market segments following economically sustainable business models, and supplying national research and extension systems (NARES), seed companies, farmer and community organizations, and rural entrepreneurs.

Robust seed policy implementation in 3 countries leading to: significant quantitative increase in EGS production/distribution relative to baseline values to be established by SeEdQUAL; qualitative reductions in time/effort required to release new varieties and produce quality seed; significant quantitative increase in regional seed market values relative to baseline values to be established by SeEdQUAL; and qualitative improvements in reach and impact of instruments to accelerate varietal turnover and increase seed demand.

Twenty priority National Agricultural Research System (NARS), and other seed sector partners using new metrics, and digital tools, for evaluating, promoting and tracking variety adoption, initiating the creation of a robust evidence base.

2.3 Learning from prior evaluations and impact assessments (IA)

- Studies confirm achieved and potential impact of CGIAR in 5 Impact Areas[vi] and 43% of varieties released in SSA since 1980 were related to CGIAR[vii], but adoption rates are mixed.
- For many reasons genetic gains are slow to reach farmers[viii]. In Africa, the area weighted mean adoption rate for modern varieties of 20 crops in 2014 was 35%, but the area weighted age of these varieties in farmers' fields was 14 years[ix] (8 years for RTB crops in a more recent study) with little evidence of rapid change.[x] In Asia, weighted age of varietal adoption was 17.7 years in 2014.[xi]
- Increasing adoption and varietal turnover requires unique considerations by crop group according to biophysical, social, and other factors, including market archetype[xii] and seed systems considerations[xiii][xiv]
- Weak enabling environments limit the value of and access to innovations for resource-poor farmers, traders and consumers.[xv]
- Policy design and implementation must be strengthened to respond to seed users and markets while increasing access, affordability, and quality, emphasizing improving EGS access, varietal release procedures, seed quality assurance systems, "smart" seed subsidies and bundled financial services, international seed trade, and engagement with smallholders and disadvantaged groups.[xvi]
- Key innovations and instruments can help reach unreached groups at scale through close coordination between formal and informal channels. [xvii] [xviii]
- CRP evaluations in 2020 recommended expanding partnerships with private sector and civil society, strengthening key policies and regulations and integrating social scientists into action research and develop incentives to encourage interdisciplinary systems, which informed SeEdQUAL Work Package approaches.[xix]

2.4 Priority-setting

Geographic and crop prioritization of SeEdQUAL is aligned with the Genetic Innovation (GI) Impact Area, drawing on the Accelerated Breeding Initiative (ABI), to be continually refined with Market Intelligence and Product Profile (MIPP) Initiative in collaboration with ABI and SeEdQUAL during implementation. GI pursues breeding in 24 food and fodder crops with diverse funding and

ongoing collaborations and impacts in Africa, Asia and Latin America. Across GI, resources will be aligned according to projected impact levels. Investments will target impacts to which breeding can contribute, considering the role of Resilient Agrifood Systems in solving the targeted problem, and will be aligned with clear, realistic impact pathways reaching intended beneficiaries, farmers or consumers. That is that (i) viable seed systems or dissemination approaches are in place or being put in place (SeEdQUAL); (ii) varieties are in-demand and will be used by the intended beneficiaries (MIPP); and (iii) in the case of nutrition, harvested produce will likely be consumed by at-risk populations and be bioavailable, drawing on evolving insights from HarvestPlus.

Current crop-specific breeding objectives and associated product profiles were informed by: national priorities; stakeholder feedback from NARES, seed companies and farmers; structured household surveys on requirements of men and women farmers; pest and disease surveys; climate change models; and/or impact estimates. By starting with specific problems to be addressed (e.g., poverty of smallholder farmers in Nigeria) to which breeding can contribute to the solution, MIPP's and ABI's will pursue one to two specific impacts per individual breeding pipeline, for well-defined target groups. The aim is for breeding pipelines collectively, across crops and regions, to make up the breeding portfolio that has the greatest total impact across the five Impact Areas. Emphasis will be on staple crops and legumes with multi-country importance in sub-Saharan Africa and South Asia where the greatest poverty and malnutrition occurs, while drawing on the CGIAR's global germplasm base and breeding activities.

SeEdQUAL will support priority crops and target areas put forth by ABI, while pursuing high-impact opportunities by leveraging strong seed delivery partners and aligning with RIIs. SeEdQUAL will further prioritize variety promotion and seed sector development activities to match seed sector partner and funder priorities, adding value to relevant bilateral projects. For example, in SSA, SeEdQUAL seeks to prioritize implementation in the Alliance for the Green Revolution in Africa (AGRA) "AGRA 11" countries (Ghana, Nigeria, Mali, Burkina Faso, Ethiopia, Kenya, Uganda, Rwanda, Tanzania, Malawi and Mozambique) which includes seven of the eight USAID *Feed the Future* countries. A similar prioritization will be undertaken for Asia, likely to include Bangladesh, India and Nepal.

At activity level, SeEdQUAL will continue to align with key partners priority setting, such as gaps to be identified by the AGRA-led *SeedSAT* initiative, analogous to the Crops to End Hunger (CtEH) Breeding Program Assessment Tool (BPAT) exercise that led to defining EiB and One CGIAR breeding needs.

2.5 Comparative advantage

SeEdQUAL's comparative advantage lies in the collective track-record, expertise and unique innovation, demand, and delivery partnerships spanning the One CGIAR global network. SeEdQUAL will draw on One CGIAR's value as a broker of networked actions, making greater use of research, development, and private sector partnerships to deliver results from high impact research and promising innovations. Through strong coordination and linkages with bilateral initiatives, SeEdQUAL will reduce duplication of efforts and build synergies. Complementary partnerships will be leveraged to ensure seed systems deliver the right seed at the right time to those who need it most. Variety adoption and seed producibility data will be collected and shared through feedback loops to One CGIAR breeding and market intelligence initiatives to ensure Initiatives are aligned, data-driven and responsive when making advancement decisions and testing new seed technologies.

SeEdQUAL will conduct collaborative variety development with NARES and will support NARES reliable production of quality-assured breeder seed by promoting innovative technologies for rapid multiplication of EGS to increase supply to alleviate a major bottleneck in availability and affordability of seed of new and improved varieties. SeEdQUAL leverages partners throughout seed systems including NARES, private sector partners, policy makers and others for scaling innovations and market access. Expert partners will provide capacity building and technical assistance to strengthen seed value chain actors, e.g., Bayer support for EGS production of cowpea, maize, millet, and soybean, and AGRA Center of Excellence in Seed Systems (CEiSS) for policy advocacy, support to seed companies and other transformative actions.

2.6 Participatory design process

SeEdQUAL draws on seminal studies conducted to guide One CGIAR reform, as well as internal and external consultations. The Crops to End Hunger (CtEH) Seeds Delivery Group, sponsored by SFSA and AGRA, commissioned a study to identify bottlenecks and examine the comparative advantage of One CGIAR in seed sector development. Global stakeholders representing different crops, regions, public and private sector actors, including seed companies, government seed regulators, and academics from the Global South were consulted, and in Spring 2021, the study was made available to internal design teams and external advisory groups to inform design of seed and linked initiatives within One CGIAR. The resulting whitepaper,[xx] was circulated by USAID in a webinar attracting 800 registrants and 400 participants. Feedback, including some critical feedback from CSOs engaged in seed sector development, was incorporated into the ongoing dialogue and initiative design.

The CGIAR Community of Excellence (COE) for Seed Systems Development an expert community designed to establish a forward-looking strategy to ensure that seed systems development fits into One CGIAR's agenda. The COE was created as a consultative forum under the aegis of the CGIAR Research Program on Policies, Institutions, and Markets (PIM), the Integrated Seed Sector Development in Africa (ISSD Africa) project, and the Netherlands-CGIAR Seed Systems Development research program, focused on Enabling and Scaling Genetic Improvement and Propagation Materials of Crops, Livestock and Fish, and draws in expertise from CGIAR programs, networks, and partners, including Wageningen UR and the Royal Tropical Institute (KIT), and the Dutch Research Council (NWO).

SeEdQUAL draws on the Toolbox for Working with Root, Tuber and Banana Seed Systems (Tools4SeedSystems), part of a CRP continuity exercise and followed with capacity development of seed system stakeholders in Ethiopia, Tanzania and Uganda. Country level actors demonstrated a demand for these tools supporting improved seed system design and implementation. This resulted in one major funder pledging support to establish a Center of Excellence for Innovation in VPC Seed Systems in Africa as part of SeEdQUAL.

Cocreation meetings with funders and stakeholders established coherence and additionality with parallel Initiatives like AGRA's CEiSS and *SeedSAT*, The Bill and Melinda Gates Foundation (BMGF) *1000 Farm* and *Image* projects, the African Development Bank TAAT Clearing House and USAID *Feed the Future Innovation Labs*. Discussions with SeedNL, the Netherlands Food Partnership and the Bayer Corporation revealed leverage points and opportunities incorporated into Initiative design. See Annex 1 – SeEdQUAL Partner Support Statements.

SeEdQUAL consulted with emerging One CGIAR Regional Integrated Initiatives (RIIs), offering support via 'seed offers' of adapted varieties, for use as an entry-points for crop-based activities.

Internal consultations with One CGIAR theory of change (TOC) consultants, Gender Platform, Scaling Readiness and SPIA teams informed Initiative design. SeEdQUAL's development team planned and budgeted for key seed-system and social scientists from across the One CGIAR to ensure effective implementation.

2.7 Projection of benefits

The projections below transparently estimate reasonable orders of magnitude for impacts which could arise as a result of the impact pathways set out in the Initiative's theories of change. Initiatives contribute to these impact pathways, along with other partners and stakeholders.

For each Impact Area, projections consider breadth (numbers reached), depth (expected intensity of effect per unit) and probability (a qualitative judgement reflecting the overall degree of certainty or uncertainty that the impact pathway will lead to the projected order of magnitude of impact).

Projections will be updated during delivery to help inform iterative, evidence-driven, dynamic management by Initiatives as they maximize their potential contribution to impact. Projected benefits are not delivery targets, as impact lies beyond CGIAR's sphere of control or influence.

Impacts of genetic innovations materialize when improved varieties are adopted by smallholder farmers, including women. All Initiatives in the **GI Science Action Area** jointly contribute to more efficient and faster development, release, dissemination, and adoption of improved, in-demand varieties through common impact pathways. Besides producing and delivering better quality seed to target beneficiaries in priority market segments, the proposed work aims at modernizing and transforming the genetic innovation system (Figure 1). Selected examples across all five Impact Areas show the aggregated projected benefits of all GI Initiatives working in collaboration and contributing at different stages along the impact pathways.

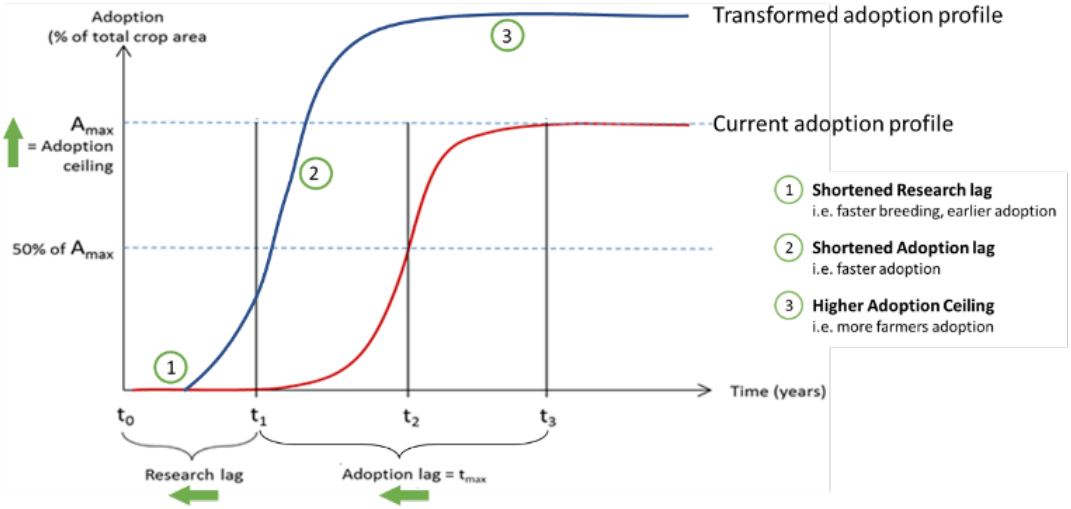


Figure 1. Impact of GI Initiatives on the adoption profile of genetic innovations

Market intelligence shortens the adoption lag and increases adoption levels as new varieties are targeted to specific market segments. This leads to faster and more complete replacement of existing varieties and accelerated varietal turnover. Investment in genebanks reduces the research lag by making germplasm available to breeding programs, reducing the search time and

cost for traits. In addition, potentially game-changing traits are preserved and made accessible, thus elevating future impact-levels. Development of improved varieties with producer/consumer-demanded traits improves livelihoods and food security. Modernized strategies and approaches accelerate breeding, thus reducing the research lag, and generating multiplier effects on the benefits from breeding and seed systems. Improved tools and services enable breeders to create more complex, multi-trait products that match desired product profiles. Modernizing enabling tools and services increase the speed of breeding, thus shortening the research lag and accelerating variety release. Efficient seed delivery accelerates and increases adoption as targeted products reach – even disadvantaged - farmers faster. Moreover, enabling access to high-quality, clean seed and planting material ensures the potential of genetic innovations is realized in farmers' fields.

Breadth	Depth	Probability
Impact Area: Nutrition, health & food security Impact Indicator: # people benefiting from relevant CGIAR innovations		
Higher yielding Vit A rich cassava: 19.5 million people (3.9 million HH) Orange-flesh sweetpotato: 14.8 million people (3.1 million HH)	**Significant**: 10% permanent impact on income; some DALYs saved.	**High certainty**: 50 – 80% expectation of achieving these impacts by 2030, at this point
TOTAL: > 23.1 million people (> 4.7 million HH)		
Impact Area: Poverty reduction, livelihoods & jobs Impact Indicator: # poor people benefiting from relevant CGIAR innovations		
Higher yielding rice: 12.3 million poor people (2.8 million poor HH) Stress tolerant maize: 24.5 million poor people (5.2 million poor HH) Higher yielding wheat: 10.0 million poor people (1.9 million poor HH)	**Significant** 10% permanent impact on income	**High certainty**: 50 – 80% expectation of achieving these impacts by 2030, at this point
TOTAL: > 42.6 million poor people (> **9.0 million poor HH)**		
Impact Area: Gender equality, youth & social inclusion Impact Indicator: # women benefiting from relevant CGIAR innovations		
High yielding fast cooking Beans: 1.8 million women producers > 3.4 million women in adopting HH Orange-flesh sweetpotato: 1.5 million women producers	**Significant**: 10% permanent impact on income	**High certainty**: 50 – 80% expectation of achieving these impacts by 2030, at this point
TOTAL: > 2.5 million women producers **> 3.4 million women/girls in all adopting HH**		
Impact Area: Climate adaptation & mitigation Impact Indicator: # people benefiting from climate-adapted innovations		
Stress tolerant maize: 69.9 million people (14.7 million HH)	**Significant**: 10% permanent impact on income	**High certainty**: 50 – 80% expectation of achieving these impacts by 2030, at this point
Impact Area: Environmental health & biodiversity Impact Indicator: # plant genetic accessions available and safely duplicated		

Aggregate increase to 2030: 15% (70,000 additional accessions become available)	Possibly **Lifesaving** (post 2030): avoiding deaths, disability; sizable income increase	**Very high certainty**: >80% expectation of achieving these impacts by 2030, at this point in the design process

1. Nutrition, health, and food security

 # People benefiting from relevant CGIAR innovations: Vitamin A deficiency affects 48% of children aged 6–59 months in SSA (Stevens et al., 2015). We project that the nutrition, health and food security status of about 23.1 million people (i.e., 4.7 million households) in 16 SSA countries will improve significantly through the adoption of yellow cassava varieties with high β-carotene (precursor of Vitamin A) content and high dry matter, and orange-flesh sweetpotatoes (OFSP) with high β-carotene and improved productivity (details in Annex). Benefits for adopting households arise through increased production, consumption, and sale of crops with higher nutritional value. The number of beneficiaries is projected using crop/country specific adoption profiles based on past evidence and expert estimates, secondary data on national crop production area (narrowed down to target domains), average household size, and crop area per HH. We did not include benefits arising for consumers when biofortified crops are sold. The combined total number of beneficiaries accounts for an estimated 80% overlap (HHs growing both cassava and sweetpotatoes) in 8 countries included in both projections. Projected impact is in the lower bound of high certainty, since dissemination and adoption of the varieties may challenge available seed systems and face market constraints in some countries.

2. Poverty reduction, livelihoods, and jobs

 # Poor people benefiting from relevant CGIAR innovations: By enabling poor smallholder households to achieve higher yields and hence 'living income', adoption of improved varieties of rice, wheat and maize is expected to significantly benefit 42.6 million poor people (9 million poor HH) by 2030 (details in Annex). While the GI initiatives have identified 12 priority crops for breeding, only three innovations (higher yielding rice in South and Southeast Asia[xxi] high yielding wheat in South Asia [xxii], and stress-tolerant maize in Sub-Saharan Africa[xxiii], [xxiv] are included in the projection. These varieties are at an advanced stage, almost ready to be released and benefits are expected to materialize soon and with high certainty. The number of poor people benefiting is estimated by multiplying the projected number of adopters by 2030 in each country with the poverty headcount ratio at national poverty lines (World Development Indicators, most recent year available). To avoid double-counting in the projected total number of beneficiaries, we accounted for the overlap, especially in the Indo-Gangetic Plain, where HHs frequently grow both rice and wheat[xxv], by reducing numbers accordingly.[xxvi], [xxvii]

3. Gender equality, youth, and social inclusion

Women benefiting from relevant CGIAR innovations: While approximately half of all beneficiaries of improved varieties are women, the GI initiatives focus on crops/traits explicitly aiming at improving women's livelihoods. Two examples are bean varieties with increased yield and reduced cooking time[xxviii],[xxix] and orange-flesh sweetpotato[xxx]. Women are benefiting from these varieties through different impact pathways: i) increase of income if grown as "women's cash crops"; ii) fast cooking (targeted 30% reduction) benefits women by freeing time, since collection of firewood and meal preparation are mostly conducted by women; and iii) health benefits for women and youth consumers. For our benefit projection, we focus on i) and ii) and follow the general steps outlined for indicators above, and then compute the share of women producers among all adopters (details in Annex). For the 'time saving' benefit, we assume one woman/girl benefits per adopting HH. Since most HH in SSA cultivate several crops, we use an 80% overlap for countries included in both crop projections. We project that at least 2.5 million

women producers and 3.4 million women/girls in adoption HH will benefit significantly and with high certainty from these two crops in the included 17 countries alone.

4. Climate adaptation and mitigation

 # People benefiting from climate-adapted innovations: The projection of beneficiaries from climate-adapted innovations is derived from the number of farmers in Sub-Saharan Africa adopting maize varieties tolerant to abiotic stress (details in Annex). Droughts have become an almost regular occurrence in SSA, severely reducing yields of many crops[xxxi]. Maize is an important staple crop in the region and the new drought and heat resistant varieties[xxxii], [xxxiii] Prasanna et al., 2021) achieve 20% higher yields under drought conditions[xxxiv]. This effect is on the upper end of the "significant" depth criteria in terms of % permanent increase in income. We assume an s-shaped logistic adoption function and use country-level rates of current adoption of improved varieties as adoption ceilings[xxxv], in some cased adjusted upward thanks to significant recent donor investment in the seed sector in target countries. With first adoption by farmers expected in 2022 and an estimated 10-year period to maximum adoption, we project that by 2030 about 14.7 million HH across the target domain will be adopting these improved varieties. This translates to at least 69.9 million persons benefiting from this climate-adapted innovation over the next 9 years.

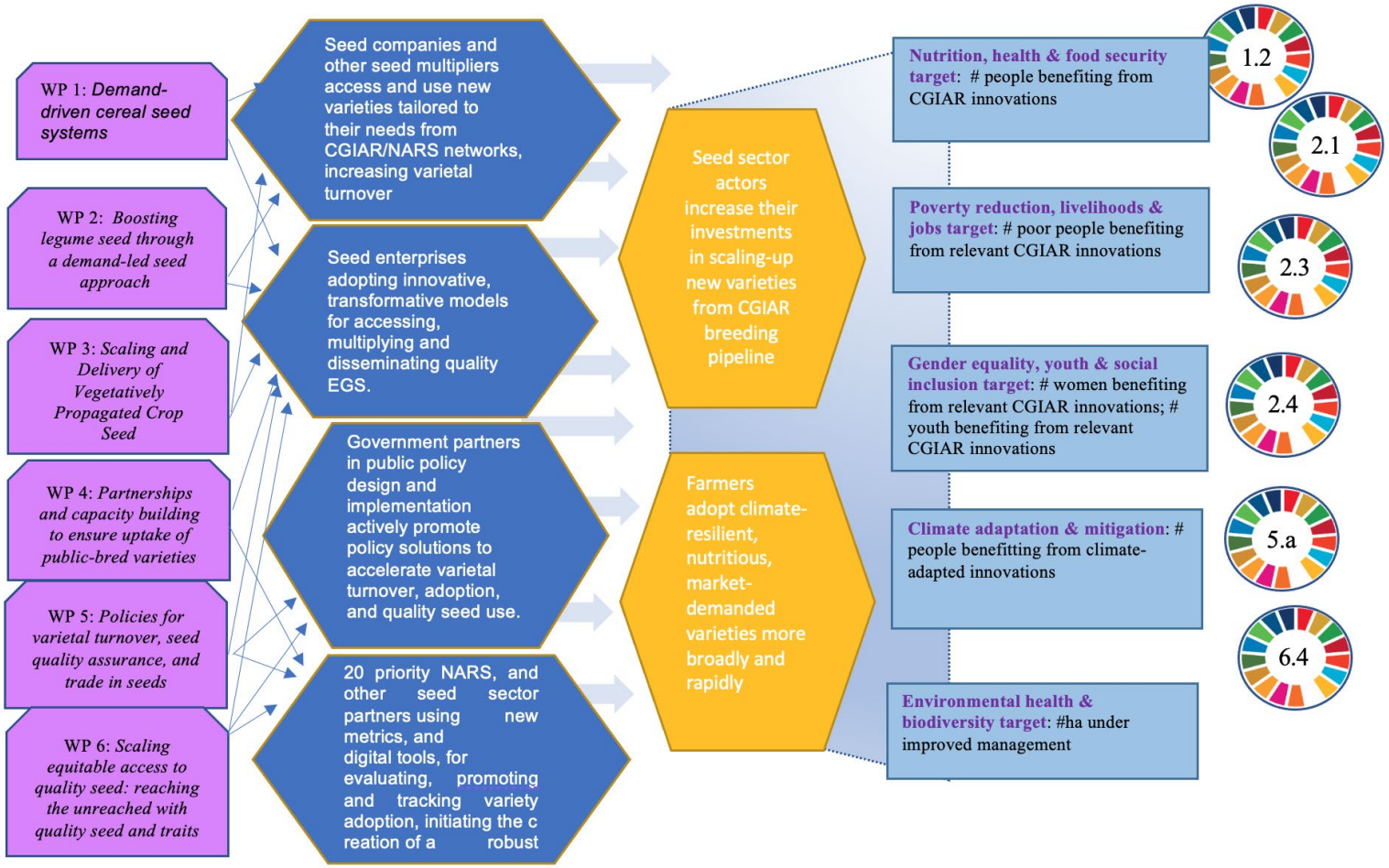
5. Environmental health and biodiversity

SeEdQUAL will contribute to Environmental health and biodiversity through dissemination of pest and disease resistant varieties, resulting in reduction in pesticide use, reducing environmental impact and risk to operators and consumers. For example, the widespread of CGIAR-bred late blight resistant potato varieties reduces the need for spraying with ecotoxic fungicides by 50% per season. Increases in productivity on an area basis may reduce pressure on marginal land. SeEdQUAL estimates 25% of varieties adopted will carry significant disease resistance, resulting in >1.39 million ha under improved management.

3. Research plans and associated theories of change (TOC)

3.1 Full Initiative TOC

3.1.1 Full Initiative TOC diagram - SeEdQUAL



3.1.2 Full Initiative TOC narrative

SeEdQUAL supports the delivery of seed of improved climate-resilient, market-preferred, and nutritious varieties of priority crops, embodying a high rate of genetic gain to farmers, ensuring that women and other disadvantaged groups get equitable access. In this sense, the initiative primarily supports the delivery of improved varieties from CG/NARS breeding networks and not the use of in-situ material, landraces and under-utilized crops. This important aspect of seed system development is promoted elsewhere within the One CGIAR R4D portfolio (RAFS).

Seed sector development is a complex and extensive area of work, and this proposal describes activities best suited to the comparative advantage of the One CGIAR vis-à-vis NARES, seed delivery and other development partners. Development outcomes, and ultimately impact, will largely be delivered through partnerships via aligned investments, including but not limited to, through the Crops to End Hunger (CtEH) Initiative. Many critical aspects of seed sector development, such as value-chain linkages, seed delivery partner capacity building, finance, and policy advocacy, will be undertaken by our partners and aligned initiatives (including One CGIAR Regionally Integrated Initiatives).

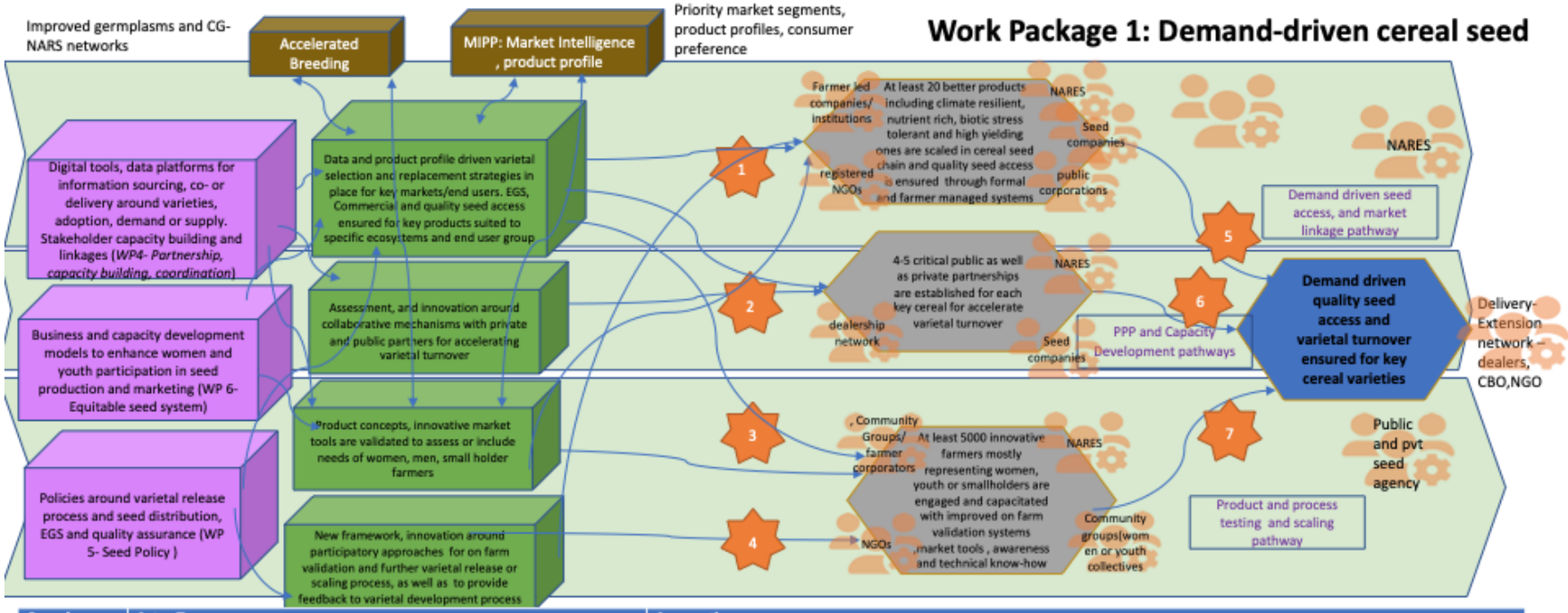
SeEdQUAL comprises six Work Packages. WPs 1-3 are the "engine-room" of SeEdQUAL, based around three principal crop archetypes requiring public support and investment. They will develop new EGS business models and undertake seed production research, alongside the evaluation and promotion of in-demand varieties emerging from breeding pipelines, in collaboration with and through NARES. Three cross-cutting WPs (4-6) will provide tools to manage and monitor variety advancement and adoption, coordinate capacity building, and build the evidence base for better seed policy and strategies for last-mile delivery to disadvantaged groups.

The causal logic driving impact and change is focus on fewer but better characterized and in-demand varieties will facilitate the hand-over of such varieties to seed delivery partners and ultimately farmers aligned to their wider societal context. More productive and cost-effective foundation seed production and business models will incentivize external investment in seed production, including critically, non-hybrid crops. Better seed policy advice, advocated by our development and industry body partners and implemented by national seed authorities, will lower the cost of business, thus incentivizing investment. Better targeted seed subsidies will drive varietal turnover and contribute to national policy agendas. Ultimately farmers will—if provided access, knowledge, finance and other risk-management tools-- adopt new varieties meeting their needs and increasing resilience to future climate and other shocks. The importance of farmer-based seed delivery systems, linked to quality input seed, is explicitly acknowledged and SeEdQUAL's seed sector development must work for all, ensuring a voice to farmers, especially women, at all stages of decision-making.

Lastly, seed-embedded technology, be it new traits, seed health or seed treatment, can and will be the "sharp-point of the spear" to deliver gains from One CGIAR breeding, agronomy and social science to farmers through our partners. These innovations, be they productivity, heat, drought tolerance, disease resistance or better nutrition will deliver on the One CGIAR reform agenda to improve livelihoods, nutrition, and resilience for smallholder farmers.

3.2 Work Package TOCs

3.2.1 WP1 diagram



Causal Linkage	Actor Type	Assumption
1	NARES, seed companies, public corporations, farmer-led companies/ institutions, registered NGOs	Key partners have capacity and unbiased intention to advance better (data /evidence driven) market driven products through their networks
2	NARES, seed companies, dealership network	Secondary data base and primary information on pros and cons of existing PPP mechanism is available with stakeholders and shared
3	NARES, community groups (women or youth collectives), NGOs	Product concepts are made available for key market segments by accelerated breeding group and market tools are available for validation
4	NARES, community groups/farmer cooperatives, NGOs	Profiling done(MIPP group) or available for key products to be validated, replacement targets known, specific groups and innovating testing and scaling models is designed for pilot
5	Seed firms/ public corporations, delivery –extension network (dealers, farmer group, NGOs)	Available material matches user preferences and needs
6	Private firms/public corporations, NARES , delivery –extension network	Appropriate incentives exist to engage actors and enabling policy exists
7	Community institutions, NGOs, NARES	Methods for inclusion are effectively scalable and enabling regulatory frame exist

3.2.2 Work Package research plans and TOCs

Work Package title	**Demand-driven cereal seed systems**
Work Package main focus and prioritization	This WP supports more effective delivery of genetic gains from One CGIAR cereal breeding (Accelerating Breeding Initiative). Work will support the capacity of governments, private sector, and nongovernmental organizations (NGOs) to deliver to smallholders productive, resilient, and preferred varieties by understanding mechanisms of effective and gender-responsive demand creation and delivery leading to quantifiable increases in the rate of adoption of new elite, climate-resilient varieties.
Work Package geographic scope (Global/Region/Country)	Global scope, but likely prioritization to primary impacts in specific regions, namely Asia (South and Southeast), Africa (East, Central and Western) and Latin America. Specific country x crop targets building on current investments (wheat: South Asia (India, Pakistan, Bangladesh, Nepal, Myanmar), Africa (Kenya, Ethiopia, Zambia), spillover to CWANA and Latin America; rice: South Asia (India, Bangladesh, Nepal), Southeast Asia (Vietnam, Laos, Indonesia), Africa (Kenya, Mozambique, Ethiopia, Uganda, Tanzania), Latin America (Mexico, Costa Rica, Nicaragua, Honduras, Panama, Colombia, Ecuador, Peru, Bolivia, Argentina, Paraguay. Uruguay, Brazil, Guyana); maize: South Asia (Bangladesh, India, Nepal), Africa (Kenya, Ethiopia, Uganda, Tanzania, Malawi, Mozambique, South Africa, Zimbabwe, Zambia, Nigeria, Ghana, Mali, Benin, Niger, Cameroon), Latin America (Mexico, Guatemala, Colombia, Ecuador, El Salvador, Haiti, Panama, Venezuela); sorghum & millet: East and Central Africa (Burkina Faso, Ethiopia, Ghana, Mali, Nigeria, Tanzania, Uganda)

The Science:

Research Question	**Scientific Methods**	**Key Outputs**
R1. How can 1CG and partners transform cereal seed delivery pathways for achieving greater impact at scale? • What gaps exist in current product availability, performance, and adoption scenarios for specific existing, emerging key market segments or specific ecosystems at the level of different stakeholders • How can varieties/products be pooled or grouped into desired subsets (segmented) for right market targeting, and further positioning. • What are critical bottlenecks for cereal delivery pathways to achieve greater impact and what are implications for 1CG and its partners? • What standardized methods can be developed or adopted to support cereal access efforts across the CG and national systems. What is the evidence of practices available for cross-learning or customization in cereals?	Cross-learnings to build technical evidence base for actional approaches at scale to build specific recommendations for 1CG cereals. • Secondary research, stakeholder consultation for Market and product profiling, are mapping for specialized products • Policy Linkage like' seed without the border' for inflow of germplasm/EGS of these products • Partnership with diverse NARES and Incentivizing/ Supporting Breeders for EGS maintenance and supply • Partnership for EGS use, commercial seed increase • Demand Creation activities (see R4) e.g., with input dealers, extension network, farmers including women collectives • Trainings and Capacity building programs • Development of gender friendly information or technical materials • Partnership with Community enterprise and seed entrepreneurs for seed	Improved technical knowledge and capacity for seed production. • Development of standardized documents mapping critical/ priority market segments for different specialized varieties with specific trait profiling, strengths, limitations and mapping the existing or emerging demand and product choices for same (country specific, crop specific repository developed) • Map of institutions and seed companies to strengthen the CG-NARES network, considering their capacity to test and disseminate seed. • Best practice manual and for seed increase at small and medium level of seed production. With seed production demonstrative plots planted and managed according to the manual. • Increased specialized product inflow / availability for testing, demand creation and positioning efforts across

• What are the key institutional and systemic gaps including domains of policy (existence of institution but also inter institutional linkages) around EGS seed provisioning, its diversification or decentralization; commercial or quality seed increase and use of specialized products, markets or ecosystems that are intended to be intervened. • What are the capacity, knowledge and information gaps regarding products, their seed production technicalities, sourcing, and targeted sale and how that can be addressed, especially targeting diverse end users including women farmers and small holders. What are the critical practical cereal seed system capacity development needs?	increased and enhanced adoption	key market segments/ ecosystems • EGS linkage and provisioning for specialized products established, diversified • Seed increase witnessed for specialized products in intervened region across commercial seed chain • Seed access and use increased for specialized products in farmer managed systems including women and small holders • Client friendly, gender friendly information, knowledge and skill building materials and trainings are made available for appropriate varietal selection, quality seed production and replacement.
How are collaborative mechanisms designed with private seed companies and NARES for transfer of new genetic material from cereal breeding programs in CGIAR, and which of these mechanisms have worked, for whom, and why?	• Analysis of current and recently used mechanisms from across CGIAR • Design framework for assessment of mechanisms across economic, legal, and administrative dimensions • Semi structured interviews with stakeholders (CGIAR, seed companies) • Dialogue roundtables with seed companies, breeding programs, legal scholars on licensing agreements and implications	• Detailed comparative analysis of current collaborative and administrative mechanisms for transfer of CGIAR germplasm. • Set of reports that provide an assessment of current design of collaborative mechanisms from an economic, legal, and administrative perspective • Proposal for innovation in design of mechanisms based on assessment of current mechanisms
What differences exist between women and men's demand for cereal varieties; to what extent do product profiles and available varieties match women's preferences; and what innovative approaches have potential to increase women's interest in, access to, and uptake of new cereal varieties?	• Mixed methods design that employs vignettes to assess women's and men's interests, needs and access to improved varieties • Farmer surveys that rank product concepts using video-based product descriptions • Field experiments to evaluate impacts of selected marketing tools on seed uptake by women and men	Greater accessibility and uptake of new cereal products to underreached populations: clearly defined entry points for targeting women and poor smallholders to access cereal seed system. • Two studies (E Africa, W Africa) that examine women's and men's interests, needs and access to improved varieties • Four studies that test 'product concepts' with women and men farmers to identify gender-based differences in demand for current and future products • Two field experiments (E Africa, W Africa) that test, with local seed companies, innovative marketing tools to

		reach women and poor farmers
What opportunities exist to improve testing processes (and related feedback loops) for accelerated uptake Of new cereal varieties, working with farmers, seed companies and others • Across 1CG cereals, how do we bring together knowledge of practical seed production (R2), mechanisms underpinning demand (R3) and knowledge of inclusive seed production pathways (R4) to optimize the design and scalability of on-farm validation and promotion? • How can we build on the concepts of participatory varietal selection in product advancement and post-release dissemination? • Can we apply digital tools to capture effective data from on-farm validation testing to provide a demand-side data metric return to breeding and testing networks? • Overall, how do we streamline 1CG cereal validation systems for new varieties in target regions, led by market and farmer demands under farmer field conditions.	Cross-cutting methods for multiple cereal species in target regions and traits to support participatory variety candidate selection and promotion.	New on farm testing models for testing and dissemination on varietal candidates from CGIAR-NARES networks. • Providing users and stakeholders with earlier access to, and participation in the process of product development, release and dissemination. • New pathway and framework established for advancing candidates into registration process, and post-release via participatory dissemination and use. • Understanding on the mechanisms to incorporate practical seed production, demand and gender into seed scaling.

The theory of change:

Improved cereal germplasm is a cornerstone of CGIAR impact, with strong evidence for delivering global benefits. Building on this, WP1 will address step-changes required to build unified, coordinated approaches to accelerating delivery of genetic gains to more farmers' fields.

WP1 engages with NARES to support their targets in delivering improved seed to 'last mile' producers. WP1 will examine current institutional arrangements and responsibilities, including licensing agreements, commercialization agreements, public-private partnership arrangements, and other mechanisms, assess where cereal seed systems target interventions at relevant stages. The TOC addresses demand with the expectation that the formal and/or private sector is charged with production and marketing of new varieties.

WP1 supports NARES development of new varieties feeding improved seed systems, including provision of appropriate subsets for release, EGS production, pure and commercial seed, along with capacity development support.

WP1's TOC addresses variance in farmers' needs for and sources of cereal seed by gender, wealth, and other sociodemographic factors. Women and disadvantaged farmers disproportionately rely on saved seeds or seeds from informal sources. Closing the gender

gap means improving women's and disadvantaged farmers' access to and uptake of quality seed, linked to improved knowledge of demand-drivers and alternatives to efforts of private businesses currently reaching better-off farmers. The extent to which gender-intentional, private sector seed distribution channels can broaden interest in, access to, and actual uptake of new varieties at scale by women will be determined.

WP1 will increase the number and geographical coverage of cereal on-farm testing for accelerating varietal turnover through innovative decentralized testing and ICT data capture tools with NARES, leveraging WP2 and WP3 expertise. Drawing on participatory selection, and incorporating scaling approaches, this will be integrated into a codesign process with seed sector stakeholders. Capacity development will enable design and implementation within a scaling-framework to ensure maximum impact.

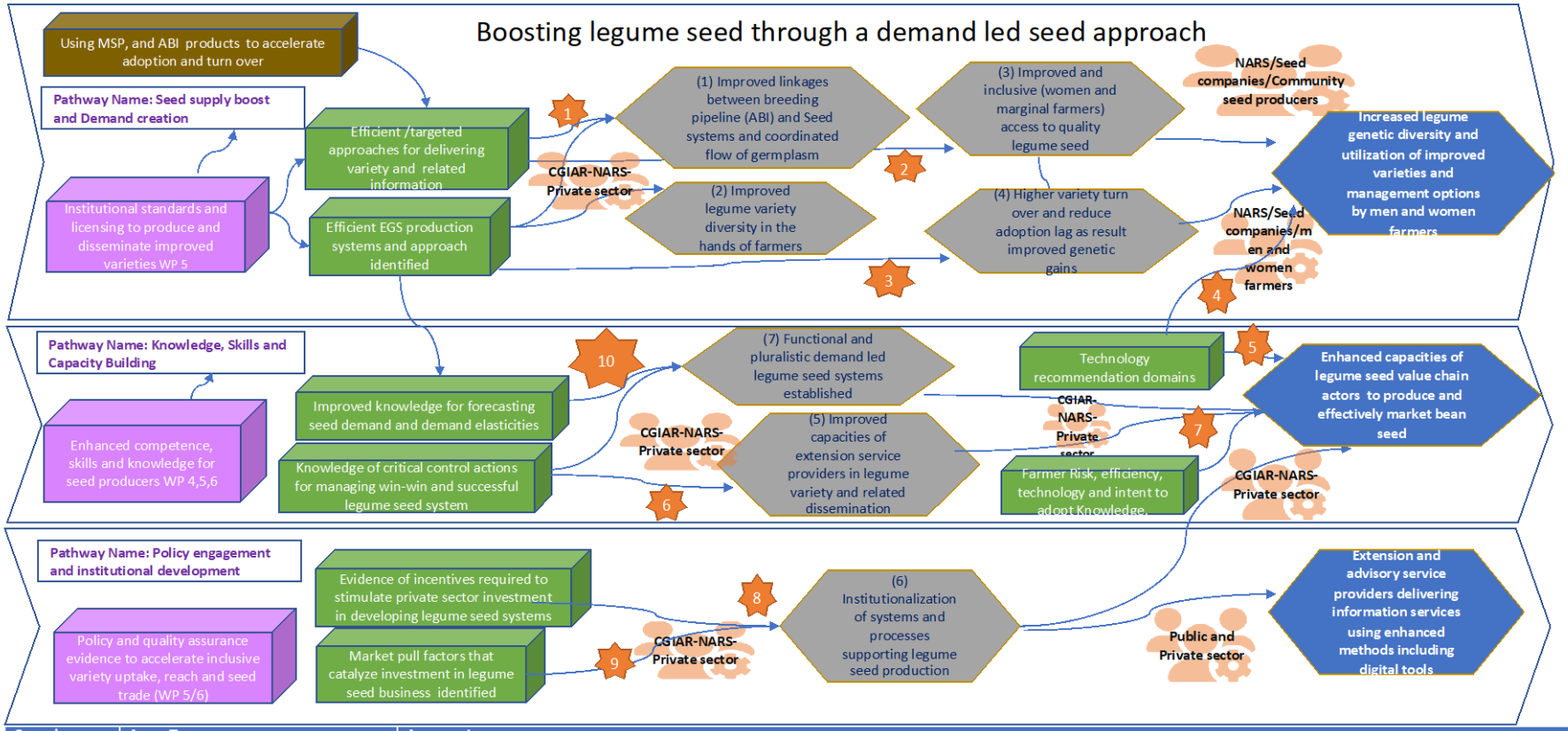
WP1 will provide users and stakeholders with earlier access to, and participation in product development, release and dissemination processes. Understanding of institutional arrangements, drivers of demand, improvements in practical seed production and novel scaling-led on-farm testing and dissemination will provide new pathways and framework for delivering improved varieties and sustained genetic gains into farmers' fields.

Demand partners include NARES as downstream users of 1CG cereal germplasm, seed businesses, and institutions promoting seed system development. Innovation partners include One CGIAR and NARES researchers, New Markets Lab, CONICET Argentina and private sector entities. Approaches will be scaling-oriented and co-created with seed sector and/or NARES partners. Scaling partners include breeding programs, sub-regional ag development bodies such as AGRA, scaling readiness practitioners within One CGIAR, and seed trade associations. WP1 links with ABI, and SeEdQUAL WP2, 3, 4, 5 and 6.

Key risks are highlighted in Table 7.3. The TOC assumes that GI Initiatives will be effectively coordinated, appropriately targeted and strongly supportive of cereal seed system actors. These assumptions can each be addressed through the development of strong proposals linking seamlessly with CGIAR ongoing bilateral/W3 seed system projects.

WP1 builds on progress achieved by cereal CRPs (WHEAT, RICE, MAIZE) and GLDC, and established cereal networks. It is also closely aligned to Accelerating Genetics Gains in Maize and Wheat, Accelerating Genetic Gains in Rice and Accelerated Varietal Improvement and Seed Delivery of Legumes and Cereals in Africa. Co-design of scaling approaches will be developed with SeEdQUAL WP6.

WP2 diagram



Causal linkage #	Actor Type	Assumption
1	Research (CGIAR and NARS , SMEs - Seed producers)	ABI's optimized/efficient breeding pipelines that are delivering the right varieties , linked to use, and users' feedback, will lead to increased return on investment from genetic innovations
2	Research (CGIAR, NARS and SMEs	Gains in efficiencies will lead to cost cutting, higher profits, and wider seed dissemination and use
3	Research (CGIAR, NARS and SMEs)	Consumer and farmer demanded varieties will incentive the value chain actors, create pull and incentive farmers to buy quality seed of improved varieties
4	Research (CGIAR, NARS and SMES)	Once impacts are sustained at scale among downstream actors will have their goals (ROI, Environmental, health, Farmer welfare) achieved.

Work Package 2 title	Boosting legume seed through a demand-led seed approach
Work Package main focus and prioritization	Through a multi-stakeholder approach, WP2 builds on the growing sector's grain legume demand. WP2 would strengthen the partnerships to have efficient, more predictable and demand led access to new varieties and complementary information. The WP2 will leverage market pull to address challenges in legume seed systems, and further incentivize private sector participation supported by variety business case development, diversified and efficient sources of early generation seed and capacity building of seed entrepreneurs to accelerate delivery of quality seed to farmers especially marginal farmers and women. This will result into accelerated legume variety turn and increased genetic gains to farmers.
Work Package geographic scope (Global/Region/Country)	Global

The Science:

Research Question	Scientific Methods	Key Outputs
How effective are various methods, such as use of specialized Information and communication technologies (ICT) and digital technologies, in delivering information on improved varieties, management, extension and advisory services	Cost Benefit Analysis (CBA) of various information sources in collaboration with users and ICT companies: using market prices or shadow pricing for non-market investments. Net Present Value (NPV) and Return on Investment (ROI)	Efficient /targeted approaches for delivering variety and complementary information. CBA, NPV and ROI of various information delivery methods.
How best to assess effective demand and demand elasticity for different bean varieties and seed classes.	Field assessment and aggregating historical data and assessments using various demand forecasting models: Trend projection, Sales force composite, Delphi method and Econometric projections. Demand elasticity analysis: Price Elasticity of Demand (PED), Demand system models: different parametrization Almost Ideal Demand System (AIDS)	Improved understanding of effective demand, including demand elasticities of seed of different legume crop varieties. Improved understanding of effective demand, including demand elasticities of seed of different legume crop varieties and classes. Modalities for strengthening demand imputed
Where and how can efficiency gains be made in production of EGS?	Cost benefit (CBA, NPV, ROI) of various EG seed production systems. Grain demand driven seed Road Maps, Profitability analysis, and Institutional analysis.	Efficient EGS production systems and approach identified. Case studies of the best production and supply business models.
What is the contribution of grain market (as a supply push and demand-pull factor) in legume seed systems and how to synchronize both grain and seed production?	In collaboration of MI IDT – value chain characterization and seed system analysis. Multi-Stakeholder partnership analysis (MSPA), Network Analysis and Mapping (NAM), Variety flow analysis, and seed Tracker (ST)	Market pull identification to catalyze investments in seed identified and widely shared Coherent stakeholder maps and linkages, Market pull factors that catalyze seed systems investment identified.
What incentives are needed to stimulate private sector investment in legume seed systems in a PPP setting.	Key informant study, historical data assessment and meta-analysis using available case studies. Framework for analyzing Institutional incentives (4-part model): Attributes, Incentives, interactions and outcomes.	Evidence of incentives (types and quantification) required to stimulate private sector investment in developing legume seed systems in an Ag PPP setting. Enabling policies and policy environment documented.

What are the main critical control actions for managing successful legume seed systems along the seed value chain?	Triangulating and analysis of data from Key informant studies and field assessment. Seed value chain analysis, and stakeholder mapping.	Knowledge of critical control actions for managing win-win and successful legume seed systems.

The theory of change:

Multi Stakeholder Platforms (MSPs) will be used within agricultural public-private partnership (PPP) settings to implement various interventions in the legume seed value chain. WP2 will facilitate establishment of legume aggregator-centered MSPs in partnership with private sector, NARES, and partner organizations. MSPs have proven efficient in delivering and fostering demand for seed of leguminous crops. They are, however, in their infancy in several countries and need more support. As support to the MSP, WP2 will develop variety business cases for private seed producers, including demand-led farmer/community-based seed producers to invest in legume seed (EGS, certified and quality declared seed) in partnership with grain traders. The aim is to co-create efficient and optimized public-private investments in seed systems. This will decentralize seed services supporting leguminous crop seed production to reduce operational costs, provide systems for accurately forecasting demand and supply and support avenues to advertise and create awareness to boost demand. This has potential to make private seed producers profitable. It will be prudent to evaluate the viability of decentralizing various services.

In support of a reliable supply of EGS of demanded varieties produced by NARES and private sector, WP2 will develop and deploy flexible licensing methods of new varieties to seed companies. This will be done partnership with WP5, AGRA and national seed authorities, and regional economic communities. This process will also involve de-risking private sector production and market services by supporting strategic variety demonstrations and providing variety profiles and information.

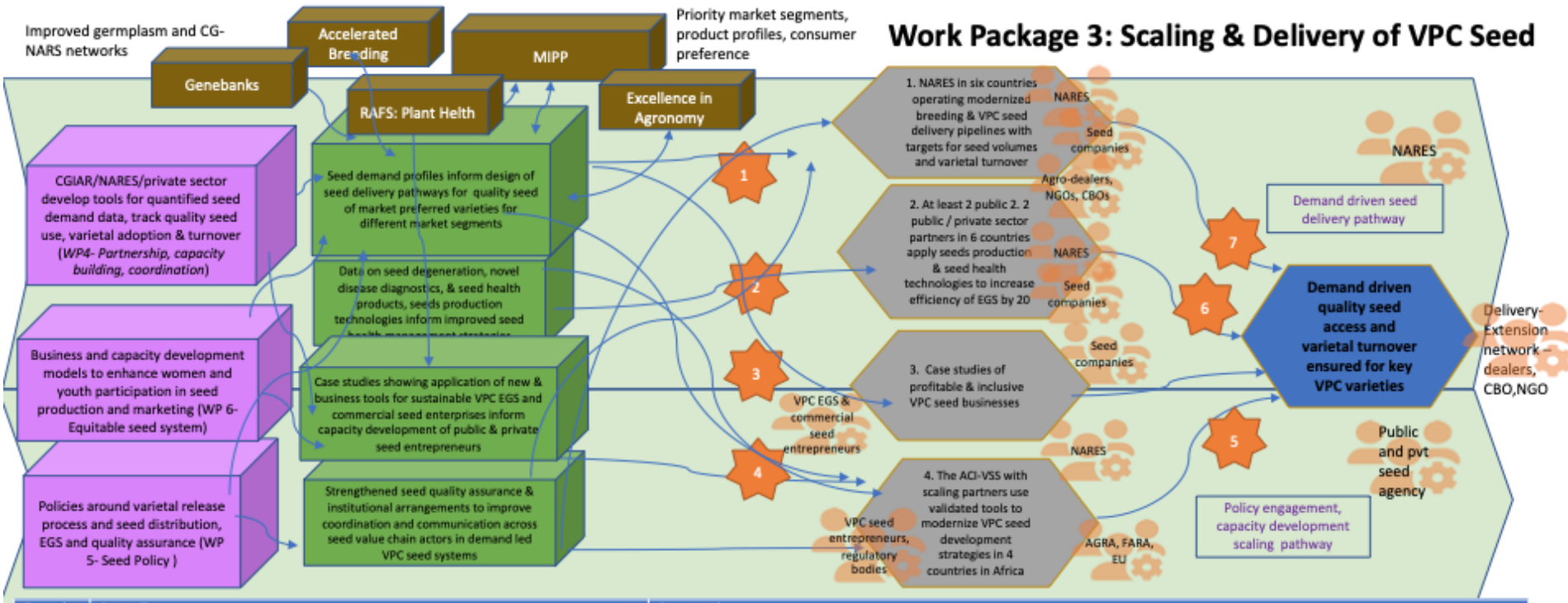
Further, WP2 will enhance knowledge and skills of seed producers and other seed value chain actors. For example, in some cases, there may be a need to support the development of guidelines for private seed inspection and certification at accessible and affordable levels.

Finally, by building collaborative relationships with national seed authorities, and linking with WP5, WP2 will help facilitate the institutionalization of systems supporting legume seed production, such as quality declared seed. National governments are already planning policies/frameworks supporting local seed businesses key to success of legume seed systems. Unified efforts are required to support this across partnering countries. For example, Uganda has QDS production already entrenched in its national seed policy. Similar initiatives are in fruition in Tanzania[xxxvi]. SeEdQUAL will replicate this model elsewhere.

Innovation partners include Feed the Future Legume Innovation Labs and NARES. Demand partners include seed entrepreneurs and grain traders. Scaling partners include AGRA, financial service providers boosting investment in the legume seed value chain, communications service providers raising awareness and demand, NARES extension services, development NGOs, and national seed authorities.

WP2 will link with WP4 to help ensure adoption data is captured via ICT and other methods, and WP5 to incorporate best practices for inclusive seed system development. WP2 will also link with ABI and MIPP providing feedback related to legume seed demand and maximize synergies with RIIs and other Initiatives with regional overlap.

WP3 Diagram



Causal Linkage	Actor Type	Assumption
1	CGIAR-NARES breeding networks, VPC seed entrepreneurs	Seed demand: defined in terms of varietal qualities and market segments; effective linkages with ABI; sufficient breeding capacity of NARES Appropriate characterisation of seed sourcing behaviour of different types of farmers; effective partnering with seed value chain stakeholders
2	CGIAR-NARES breeding & pathology networks, VPC seed entrepreneurs, regulatory bodies	Seed health management strategies: favourable cost/benefit analysis, readily adoptable by seed producers
3	Public & private sector partners	Novel EGS technologies: favourable cost/benefit analysis
4	National seed regulatory bodies; regional economic commissions	Policy enhancements. Strong linkages with national and regional bodies associated with seed policy and trade
5	National and continental VPC seed system stakeholders, VPC policy influencing institutions	ACI-VSS vision to modernise VPC seed systems: effective partnership with AGRA and partners in scaling
6	NARES and VPC seed entrepreneurs	Effective linkage with Plant Health Initiative (PHI) for seed health technologies. New EGS production technologies are cost effective. No new seed health threats that are not addressed by PHI
7	CGIAR-NARES breeding networks, VPC seed entrepreneurs	ABI is effective in partnering with NARES for new variety development. Strong linkages with Breeding Services, Enabling Traits and Market Intelligence Initiatives. Governments of target countries have favorable policies to development of modernized seed systems

Work Package 3 title	***WP3: Scaling and delivery of vegetatively propagated crop seed***
Work Package main focus and prioritization	Sustainable delivery of VPC seed at scale will be achieved through enhancing the efficiency of seed delivery pathways and ensuring effective targeting for different market segments and farmer preferences. WP3 research will develop and apply novel seed health technologies and phytosanitary measures to boost seed production and will design and validate business models for smallholder seed entrepreneurs. Scaling of digital and other seed system tools will build efficiencies at all levels of target seed systems. Expanded capacity development for seed entrepreneurship and a small and medium enterprise (SME) innovation hub will be delivered through an African Center of Excellence for Innovation in VPC Seed Systems.
Work Package geographic scope (Global/Region/Country)	Global – (Africa, Southeast Asia, Latin America)

The Science:

Research Question	Scientific Methods	Key Outputs
How do gender-based varietal preferences and acquisition behaviors by value chain actors impact market demand?	Small N exploratory case study (SN), Four-Square Method (FSM), Means-End Chain Analysis (MEC), Experimental Auctions (EA) incorporating gender analyses	**Seed demand profiles**; varietal change maps for VPCs; quantified demand data for specified varieties in target countries. Gender analyses of preferences for seed quality, characteristics and delivery.
How do biophysical and social factors influence efficiency and profitability of seed delivery pathways?	INA, ST, Seed Tracing (STg), SN, FSM, MEC and EA.	**Strengthened seed delivery** pathways described for varieties in priority regions or zones, including, for e.g., cassava starch value chains in South-East Asia and seed yam value chains in West Africa; descriptions of factors affecting seed delivery networks and interactions; efficient and inclusive models for seed delivery.
Where are the efficiency gains in breeding pipelines for seed production decisions to accelerate realization of genetic gains by smallholders?	Multi-Stakeholder Framework tool (MSF). Participation of commercial seed producers in on-farm testing of pre-release materials (Tricot).	**Modernized breeding pipeline models, defined hand-off points in product life cycle** for optimized seed delivery to specific product markets, including delivery to the 'last mile' for specific crop/country combinations. Examples: seed of varieties targeted for high quality cassava flour markets in Nigeria, and of virus-resistant orange-fleshed sweetpotato for food and nutrition security in East Africa.
What are the costs and benefits of technologies for EGS production?	Laboratory, screenhouse and field experimentation with: Semi-Autotrophic Hydroponics (SAH); Temporary Immersion Bioreactors (TIBs); macro-propagation; tissue culture; aeroponics; hydroponics; rooted apical cuttings, vine cuttings; minitubers; pencil cuttings. Cost-benefit analyses.	**More efficient EGS propagation methods;** cost-benefit analyses for EGS propagation methods; improved packaging for VPC seed.
Which are the best cost-effective, environmentally appropriate methods to reduce pathogen load, increase seed resilience and mitigate threats of climate change?	Impact Network Analysis (INA), Seed Tracker (ST), Integrated Seed Health (ISH) models, and Seed Regulatory Framework Analysis (SRFA). Biological seed health solutions. Cost analyses.	**Improved seed health management strategies**; novel biological products for boosting seed health; data on seed degeneration and vulnerability of newly released varieties

Research Question	Scientific Methods	Key Outputs
Which business models are sustainable for different crop x context scenarios that ensure equitable benefits for women and marginalized groups?	Sustainable EGS Business Analysis Tool (SEGSBAT). Other VPC seed business models.	**Case studies of profitable VPC businesses** in smallholder systems; new inclusive seed system business models.
What type of institutional arrangements are required for demand led VPC seed systems?	MSF, SRFA	**Strengthened communication and coordination across seed value chain acto**rs to deliver quality seed of market preferred varieties
What are the effects of emerging policies and regulatory frameworks on development and marketing of VPC seed, biodiversity in VPC cropping systems and implications for women and disadvantaged groups?	MSF, INA, ST, ISH, EA, SRFA, gender research methods	**Evidence to design and evaluate seed regulations and policies;** capacity development strategies for regulatory capacity for VPC seed systems; cost-effective models for national regulation of VPC seed quality; upgraded Seed Tracker for VPCs with functions to enhance seed marketing; novel software applications.

The theory of change:

Several NARES have targets for quantities of VPC seed to be delivered to farming communities. WP3's TOC assumes engagement with and support of NARES to enable them to achieve their targets in delivering improved seed of released varieties to 'last mile' producers. This will require strengthened institutional arrangements with assigned responsibilities. Many NARES are motivated to generate and deliver varieties matching requirements of VPC producers to meet increasing demands for business focused VPC seed system development, in line with national agricultural development strategies of countries that will be important SeEdQUAL partners.

NARES development of new varieties that will feed into modernized seed systems will be strengthened by participation in breeding networks established through the Enabling Traits Initiative and through contributions through to the MI Initiative on market and food preference varietal requirements, which will contribute to better-targeted variety development and delivery.

SeEdQUAL will help increase the number and geographical coverage of seed regulatory authorities facilitating sustainable VPC seed systems through scaling successful approaches like those piloted in Nigeria and Tanzania, and by lobbying governments by partnering with AGRA and other seed development champions. Messaging and awareness-raising on successful seed regulatory programs is expected to incentivize adoption of similar approaches in other countries.

Private sector VPC multipliers and distributors will be motivated to upgrade seed delivery investments through awareness-raising and capacity building on effective and profitable seed business models delivered through SeEdQUAL and via the ACSSI-VPC innovation hub. Systematic documentation and information-sharing will increase confidence amongst potential VPC multipliers about the income-generating potential of VPC seed businesses.

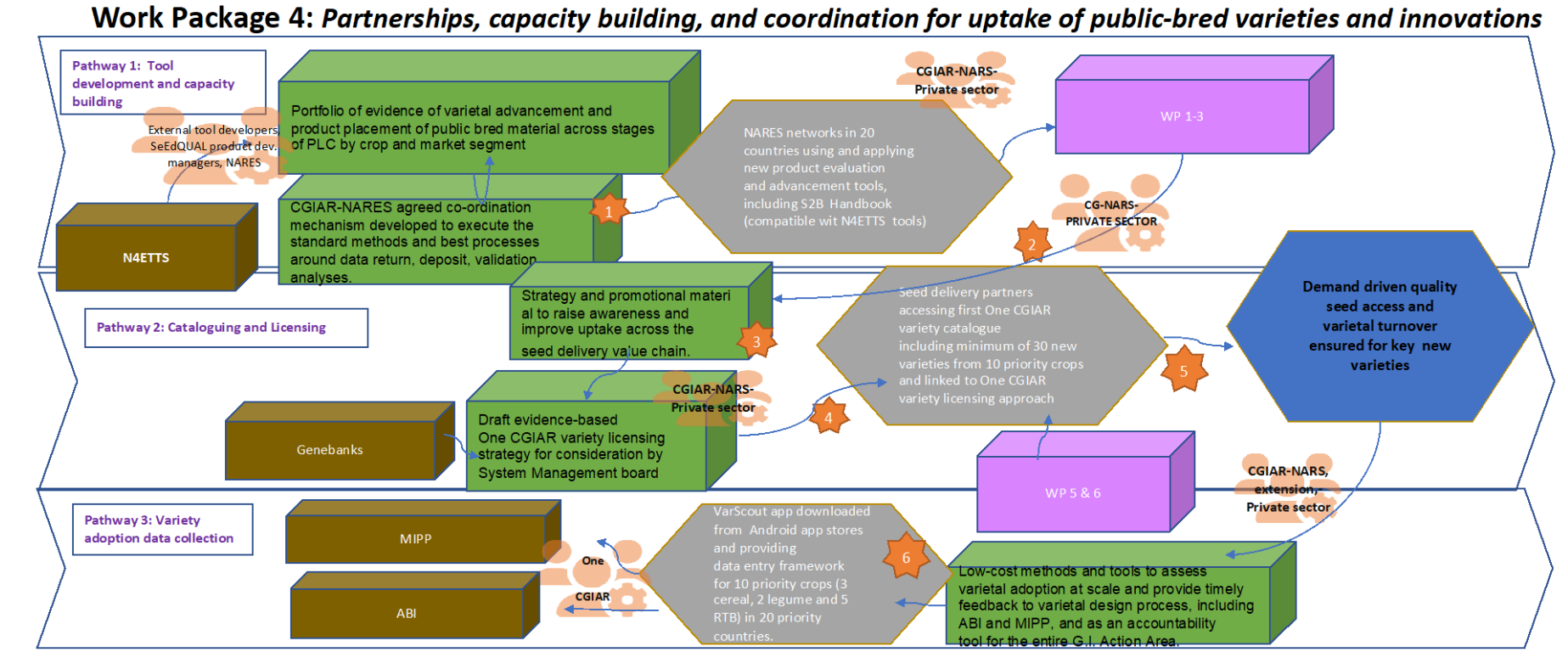
Demand partners include VPC seed entrepreneurs and businesses as well as institutions promoting sustainable seed system development. Innovation partners include One CGIAR researchers, NARES scientists, University of Florida, Wageningen UR, SeedNL, New Markets Lab, and private sector entities. Improved approaches for sustainable VPC seed delivery systems will be co-created with SMEs. Scaling partners include breeding programs, sub-

regional ag development bodies such as AGRA, scaling readiness practitioners within One CGIAR, national and regional organizations promoting seed health and regulation, as well as seed trade associations.

WP3 links with the One CGIAR Plant Health Initiative, and SeEdQUAL WP 4, 5 and 6. Key risks are highlighted in Table 7.3. The TOC assumes GI Initiatives will be effectively coordinated, appropriately targeted and strongly supportive of VPC seed system actors. These assumptions can each be addressed through the development of strong One CGIAR proposals which link seamlessly with ongoing bilateral/W3 seed system projects of the CGIAR.

WP3 will build on achievements of the RTB CRP in developing an innovation catalogue and applying the principles of scaling readiness. Scaling of tools and seed development approaches from WP3 will be achieved by working with the equitable scaling team of SeEdQUAL's WP6.

WP4 Diagram



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6	NARES, OneCG agronomists, extension workers, seed companies	Sufficient number of field and company-based staff use app to record varietal update to drive G.I. AA feedback loop and serve own data requirements from pooled data

Work Package 4 Title:	***Partnerships, capacity building, and coordination to ensure uptake of public-bred varieties and other innovations.***
Work Package main focus and prioritization	Technical assistance for NARES (including seed units) and foundation seed organizations in EGS production and on-farm demonstrations, working through specialist partners and aligned with other planned seed investments. Development, staffing of a dedicated new One CGIAR seed unit as recommended in the CtEH whitepaper. Tracking and reporting variety advancement and adoption in coordination with NARES and WP1-3. Licensing strategies. Positioning SeEdQUAL as a hub for tools, metrics, collection, and analysis of varietal release and adoption data, on-farm performance.
Work Package geographic scope (Global/Region/Country)	*Global* - High-level prioritization among crops and target regions will focus on the developing world. More specific research question will be assessed to support breeding pipelines relevant to regions with highest poverty incidence, particularly sub-Saharan Africa and South Asia, and where seed delivery partnerships are already present or can be quickly established. Emphasis will be placed on supporting key external seed sector development partners (e.g., AGRA in SSA) and will be influenced by their own geographic focus.

The Science:

Research Question	**Scientific Methods**	**Key Outputs**
To what extent does systematizing late-stage (PLC 6-8) product advancement (stage gated) following industry best guidelines significantly improve product advancement and varietal adoption for seeds from public-breeding programs emphasizing pro-poor traits?	Build capacity of CG and NARES partners in use of *Seeds2B Handbook* at scale (including building interoperability with data collection and biometrics tools (with N4ETT) Initiative)	Portfolio of evidence of late-stage varietal advancement and product placement of public bred material across stages of PLC by crop and market segment
Can accurate variety adoption data be collected in a cost effective and timely fashion via crowd-source ICT to complement other methods and can varietal adoption, data handling, analysis, and reporting across NARS be streamlined and effectively coordinated by SeEdQUAL?	Piloting AI-based image recognition to identify varieties accurately Comparative analysis between varietal adoption monitoring methods based on genetic fingerprinting (with IMAGE) or farmer recollection (VarScout) Co-ordinate use of methods, including ICT tools, for effective monitoring of varietal release and adoption, on-farm performance, use of web portals for sharing data (with MIPPI)	Low-cost methods and tools to assess varietal adoption at scale and provide timely feedback to varietal design, including ABI and MIPP, and as an accountability tool for the G.I. Action Area. SeEdQUAL positioned as hub for streamlined coordination and capacity building with/of NARES and WPs, including tools and methods for streamlined varietal adoption and performance data, data sharing, utilization, and reporting.
Would a unified One CGIAR approach to varietal licensing promote varietal uptake and investment in delivery of seeds of public bred varieties?	Compare evidence and examine trade-offs between exclusive, non-exclusive, and other licensing considerations across different crop archetypes (e.g., hybrids vs. non-hybrid crops) Examine opportunities for generating income for national program breeders and in-situ conversation through the voluntary ABS provisions of the international treaty in collaboration with Genebanks Initiative.	Evidence-based elements and options for a One CGIAR variety licensing strategy (with One-CG licensing/IPR teams) for consideration by System Management board Strategies for increasing revenues for national public breeding programs and in-situ and ex-situ conservation (with Genebanks).

To what extent can accurate cataloguing of emerging public-bred varieties including 'private sector value proposition' to smallholder farmers address asymmetry of information between breeders, delivery partners and end-use markets including farm-based seed producers.	Develop and test value proposition messaging/description for seed producers, smallholder farmers, and end-market including seed production benefits and risks in collaboration with MIPPI and TAAT Clearinghouse.	Strategy and promotional material to raise awareness and improve uptake across the seed delivery value chain.
What capacity building and coordination strategies are needed to address skill gaps and needs of SeEdQUAL NARES partners in applying best practice evaluations, accurate data collection, collation, analyses and what tools are needed to design and operationalize feedback loops to make available newly generated data to end users, farmers (men and women) and SMEs	Co-operative systems and methods developed through SeEdQUAL NARES workshops for utilization of standard best practice scientific methods for all types of data. Coordinate pilot deployment of new tools and train -NARES in effective use of reporting tools.	CGIAR-NARES agreed co-ordination mechanism developed for accurate data return, validation, and analyses. Plan developed for scaling successful mechanisms to other crops of SeEdQUAL Capacity developed as pilots with NARES to use One CGIAR data portals, web portals for open access of data to stakeholders.

The theory of change:

WP4 supports a unified approach to cataloguing publicly bred varieties to communicate the value proposition to smallholder farming systems, enabling flow of information between those generating varieties and those seeking new varieties. Well-described varieties, including data their value across One CGIAR Impact Areas and seed production characteristics, will stimulate interest and facilitate investment in dissemination.

Most SME and farmer-based seed delivery partners do not have access to their own breeding programs for the crops in One CGIAR breeding (except some hybrid cereals). They require information of what is becoming available, its value (in a marketing sense) and some certainty on intellectual property rights (IPR), which is often not uniformly or fully available from One CGIAR or NARES partners[xxxvii].

A common One CGIAR variety licensing strategy, accommodating differences in crop archetypes, will facilitate interest and investment in public-bred varieties by "downstream" seed delivery partners. Offering a transparent, fair, and equitable partnership tool and approach to engaging with both commercial and non-commercial seed delivery partners-whether directly or through NARES partners. Given legal certainty, seed delivery partners are likely to better invest in of publicly bred material and farmer-based seed producers will have the "freedom to operate" within regulated seed regimes. Licensing income for NARES to reinvest in breeding will provide a positive feedback loop in identifying successful breeding market research and strategies (including feedback required by MIPP), while generating resources for national programs. Income generated through contractual means to return to the voluntary ABS mechanism of the International Treaty (in collaboration with Genebanks) will support the aims of the Treaty and multilateral sharing of germplasm.

Evidence suggests that facilitating efficient handover of public-bred material to seed producers backed by improvements in seed sector business and policy environment, is critical in creating successful models for commercialization, which are naturally copied once a "tipping point" is achieved.

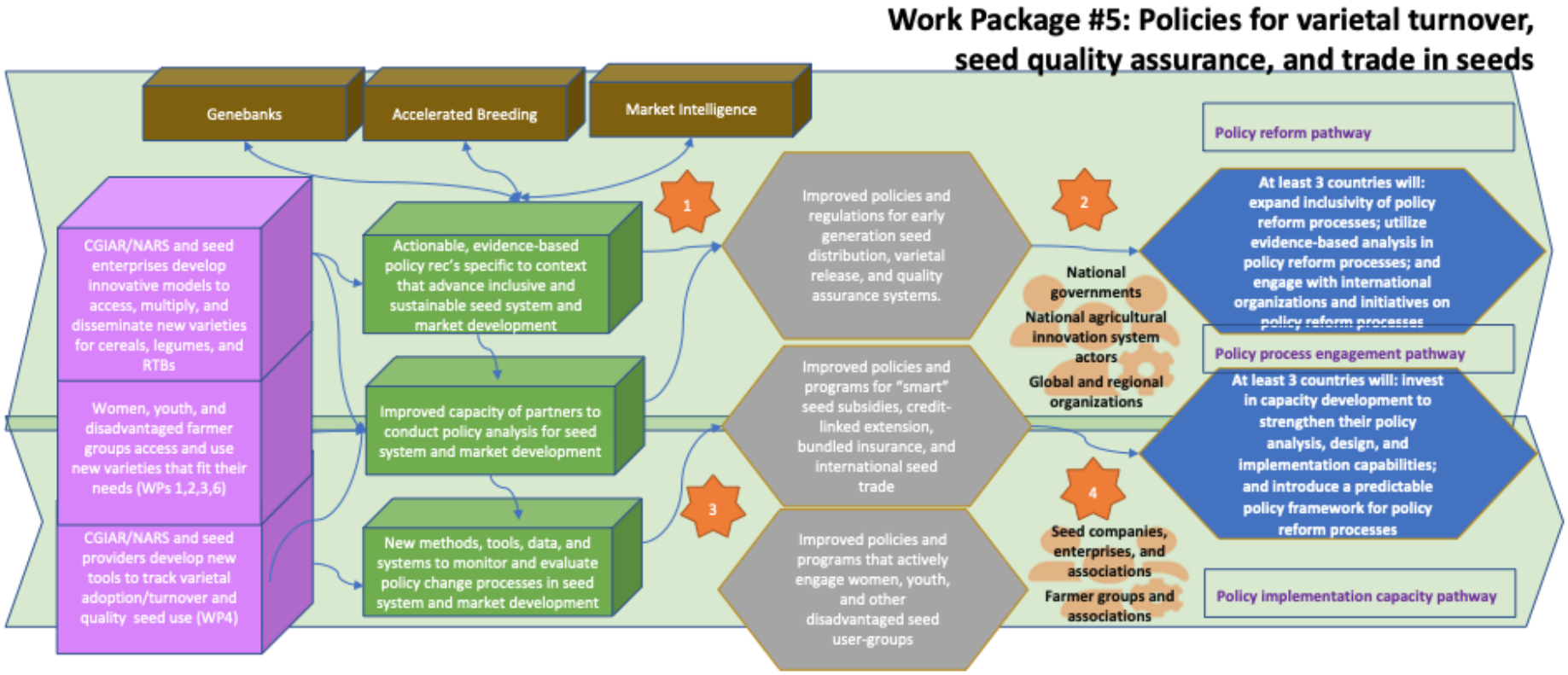
WP4 will roll out and scale late-stage variety advancement and product placement tools to One CGIAR and NARES partners. These tools will permit variety portfolio management and enable better targeting of resources by CG/NARES breeding teams.

WP 4 will pilot approaches via workshops and training to identify skill gaps and needs of NARES partners, providing tools to collect accurate data, collate, use reporting tools, securely warehoused in open access data portals to benefit farmers, researchers and end users. Outcomes will include agreed data sharing arrangements among NARES for feedback loops and utilization of standardized best practices and reporting tools.

Lastly, WP4 aims to innovate in more efficient variety adoption data collection, for use in MELIA and as an accountability tool and feedback loop across the G.I. Action Area, enabling recalibration of Initiatives. TOC assumptions are detailed in the TOC Diagram, and risks in Table 7.3. WP4 is designed to serve as a hub for streamlined coordination and capacity building with/of NARES and WPs, including tools and methods for streamlined varietal adoption and performance data, data sharing, utilization, and reporting

WP4 offers core innovations to be assessed for scaling and combined with other innovations from SeEdQUAL WPs and across Initiatives to form Innovation Packages.

WP5 Diagram



Causal linkage #	Actor Type	Assumption
1	CGIAR, NARs, and seed enterprises	Seed system actors are able to successfully design, test, and execute credible models to access, multiply, and disseminate new varieties
2	National governments (policymakers and their advisors)	Governments take decisions on policy reforms that are informed by evidence, and intervening political economy factors do not disrupt the policy design and implementation process
3	National agricultural innovation system actors; Global and regional organizations	NARS partners can credibly implement and sufficiently resource efforts to track varietal adoption/turnover and quality seed use.
4	Seed companies, farmer associations	Seed companies and farmer associations participate in an open and constructive manner in policy reform processes.

Work Package 5 Title:	***Policies for varietal turnover, seed quality assurance, and trade in seeds***
Work Package main focus and prioritization	Many countries face challenges in seed policy design and implementation, leading to insufficient delivery of genetic gains to farmers' fields and poor productivity, nutrition, and resilience outcomes. By leveraging global expertise and experience, this WP generates both the evidence and engagement necessary to advance efficient, sustainable, and inclusive seed markets. Expected outcomes include acceleration in rates of seed sector growth, varietal turnover, and quality seed use. These outcomes will result from improved policies for early generation seed distribution, varietal release, quality assurance systems, "smart" seed delivery mechanisms, international seed trade, and engagement with women, youth, and other disadvantaged seed user-groups.
Work Package geographic scope (Global/Region/Country)	Global

The Science:

Research Question	**Scientific Methods**	**Key Outputs**
What are the returns to exclusive vs. non-exclusive supply of EGS in seed access, equity, and market growth?	Policy and legal analysis using quantitative and qualitative data, drawing on methods tools and data from disciplines of applied economics, public policy, law, and other fields, with critical support from seed technologists, plant breeders, agronomists, and other biophysical sciences experts.	a. Actionable, evidence-based policy recommendations specific to context (e.g., crops, markets, and populations of interest) that advance inclusive and sustainable seed system and market development, including - Policy and regulatory recommendations to strengthen EGS production and distribution, varietal release processes, quality assurance systems, and seed trade to encourage inclusive seed sector growth. - Program and investment recommendations to expand smart input delivery, credit-linked extension, and other instruments to accelerate varietal turnover and deepen demand for quality seeds. - Policy, investment, and regulatory options to accelerate seed sector growth, promote formal and informal seed system integration, and support women and youth engagement and entrepreneurship. b. Improved capacity of partners to conduct policy analysis for seed system and market development. c. New methods, tools, data, and measurement systems for the monitoring and evaluation of
What are the potential returns to a reduction in varietal release rules and procedures?		
Does retirement of specific varieties from varietal release catalogues lead to increases in varietal turnover and yield outcomes?		
What are the relative costs, benefits, and risks to seed quality assurance systems according to the degree of centralized and external oversight and enforcement (e.g., truthful labeling vs. Seed certification vs. QDS?)	Legal and regulatory analysis; benefit-cost analysis	
Do digital quality assurance systems at point-of-sale (e.g., SMS-based e-verification systems) increase farmers' perceptions of seed quality and their willingness to purchase new varieties? Do these systems result in higher yields, outputs, or other outcomes for smallholder farmers?	Impact evaluation techniques drawn from experimental and behavioral economics	
Does the inclusion of crop index or other insurance instruments in varietal promotion programs or extension packages lead to greater varietal turnover among smallholders, women farmers, or other disadvantaged groups?		

Can crop, index or other insurance instruments be scaled nationally in an equitable and cost-effective manner?	As above, ex ante microsimulation techniques	policy change processes in seed system and market development. d. Evidence of significant contributions to policy change processes and outcomes for selected contexts
Does the listing (delisting) of specific varieties in seed subsidy programs lead to increases in varietal turnover and yield outcomes?		
Do social benefits of a (de)listing strategy exceed the costs of seed subsidy programs?		
Do agrodealer training programs, business development services, and credit instruments targeted to women and youth entrepreneurs lead to higher returns for their enterprises and other outcomes?	Impact evaluation drawn from experimental and behavioral economics	
Do projects aimed at formalizing and commercializing farmer-or cooperative-run seed production/marketing enterprises lead to increased access to new varieties, higher sales and revenues, and improved access to seeds and traits for smallholders, women, and disadvantaged groups?	Impact evaluation drawn from experimental and behavioral economics	

The theory of change:

WP5 will advance inclusive, sustainable seed systems and markets through the (a) generation of actionable evidence on country- and context-specific policy options; (b) communication and amplification of policy design and implementation options to key partners and stakeholders; and (c) development of local capacity to analyze, communicate and advocate for seed policy reforms.

Policy options will: (a) strengthen EGS production and distribution, varietal release processes, quality assurance systems, and international seed trade; (b) expand options for seed subsidy programs, credit/input-linked extension, bundled insurance, and other instruments to accelerate varietal adoption, turnover, and demand for quality seed, and (c) prioritize transformative approaches supporting women, youth, and disadvantaged groups. Policy options will lead to more sustainable, inclusive seed systems and market development, and contributions across CGIAR Impact Areas.

WP5 leverages the fact that target countries are pursuing seed sector policy reforms and have articulated a need for support in design and implementation. Likelihood for impact is increased if key conditions are fulfilled, including:

- Early engagement with actors in conceptualization, design and implementation of WP5 activities.
- Adequate resources aligned to actors' needs and contributions to WP5's activities and actions.
- Shared objectives and mutual benefit among actors' mandates and missions.

- Coordination with MIPP for generation and communication of evidence from social and economic sciences.
- Recognition of CGIAR's value proposition that strengthens actors' capacity to achieve outcomes.
- Opportunities to learn new methods of policy analysis and communication to advance partners' own objectives.

Demand partners: Ministries of agriculture charged with policy design and regulatory reforms; public agencies charged with policy implementation in research, extension, and regulatory matters; policy researchers, analysts, and advisors to government. **Innovation partners**: Global and regional organizations advancing seed policy reform agendas, e.g., AGRA, New Market Lab (NML), SeedNL Partnership, and Integrated Seed Sector Development (ISSD) Africa. Benchmarking initiatives including the Access to Seeds Index (ATSI), African Seed Access Index (TASAI), and Enabling the Business of Agriculture (EBA). **Scaling partners**: national governments and agricultural innovation system actors.

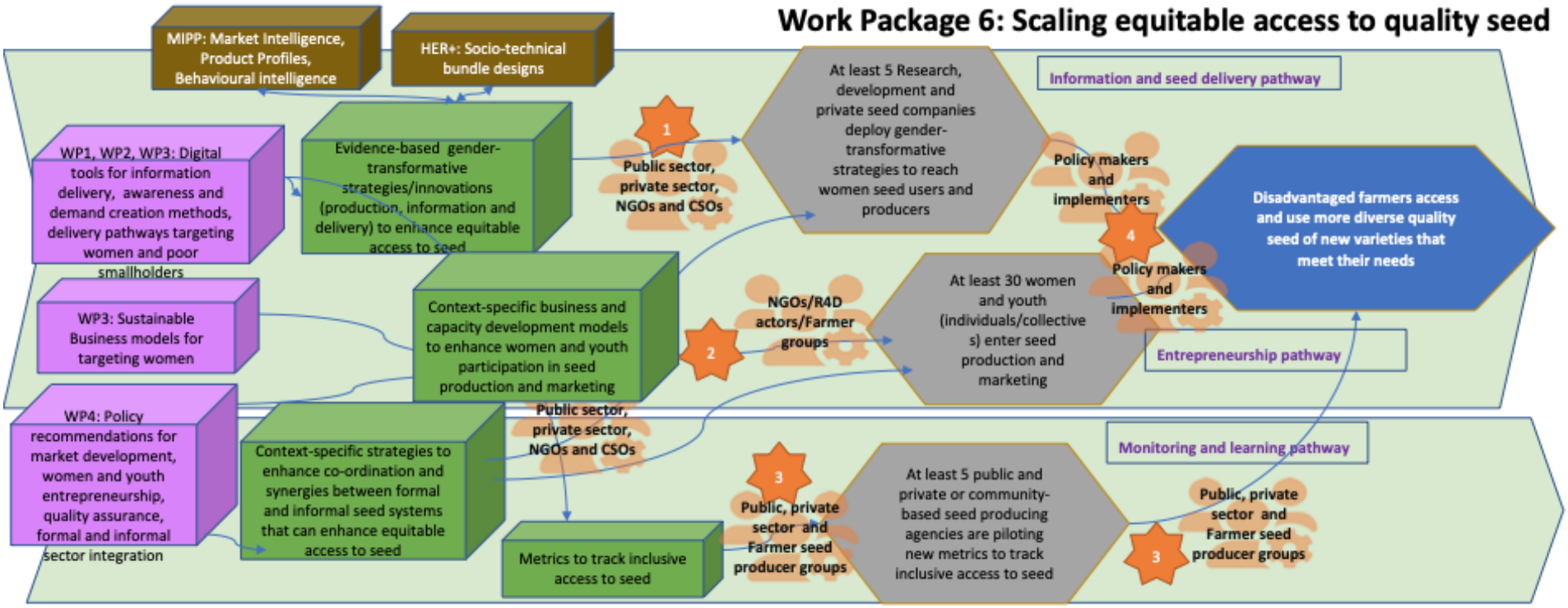
WP5 links with WP1, WP2, and WP3 to identify policy opportunities for sustainable seed sector growth; WP4 on mechanisms to accelerate delivery of genetic gains to farmers; and with WP6 and the CGIAR Gender Platform on transformative approaches prioritizing women, youth, and disadvantaged groups. WP5 will engage MIPP on policy interventions to lower marketing risks, reduce constraints for seed enterprises and barriers to entry and will support RIIs on engagement with governmental, civil society, and private sector stakeholders.

WP5 assumes policymakers represent society and that they are receptive to policy changes, which is not always the case. A risk for WP5 is failure of policymakers to consider policy reform options and take timely, evidence-driven decisions. Mitigation requires strong partnerships with policy advisors, think tanks, and advocacy groups, combined with communications strategies, to integrate evidence-based recommendations in policy-change processes.

WP5 supports innovation packages with policy guidance for inclusive seed sectors including options to accelerate adoption, turnover and increase demand for quality seed; transformative approaches supporting women, youth, and disadvantaged groups. These packages are intended to be at scale given that even small changes in policy can lead to large-scale impacts across markets, agroecologies, and populations.

Performance will be measured against objectively verifiable outcomes specified in the results framework.

WP6 Diagram



Causal linkage #	Actor Type	Assumption
1	Public, private, non-governmental and community/farmer managed seed producers	Convinced by the evidence that establishes the business potential for their enterprises through reaching the unreached, the actors will change their information, delivery pathways to reach women and the disadvantaged groups
2	NGOs/R4D actors/ Farmer Groups	The sustainable business models piloted produce convincing evidence to induce women and youth to engage in seed entrepreneurship and enabling policy and institutional environment is available.
3	Public, private, non-governmental and community/farmer managed seed producers	Convinced that measuring access to seed to the new customers and unreached groups motivates the seed producing agencies to track their delivery so they can increase their business and reach.
4	Policy makers and implementers	Policies and enabling environment to support for new production and delivery pathways for inclusive access are designed and implemented, including support to women and youth entrepreneurship, quality assurance mechanisms and, for coordination of formal and informal systems.

Work Package 6 Title	***Scaling equitable access to quality seed: reaching the unreached with quality seed and traits***
Work Package main focus and prioritization (max 100 words)	WP6 will identify and scale strategies for providing access to quality seeds for women and unreached groups. It supports seed production, information and seed delivery pathways that provide inclusive access, while addressing gender and social constraints and the digital divide. The WP promotes women and youth entrepreneurship in seed production and marketing, including financial and digital inclusion, technical and business skill development. The WP emphasizes coordination and synergies between the formal and informal sectors to serve seed users and producers from underserved groups. It contributes to a relatively new area of research in seed systems that is gaining ground.
Work Package geographic scope (Global/Region/Country)	*Direct intervention and scaling in in SSA and South Asia*

The Science:

Research Question	Scientific Methods	Key Outputs
What are the most effective strategies for providing access to OPV and VPC seeds for women and other unreached groups.	Systematic review on challenges, opportunities and what works and what does not for providing inclusive access to seed Participatory multi-stakeholder consultations for context-specific strategy development for testing	Evidence on barriers, opportunities and effective strategies to enhance equitable access synthesized and communicated Context-specific strategies/Innovations to pilot/scale identified
Which seed production, information and seed delivery pathways (digital and non-digital) provide inclusive seed access, while addressing constraining gender and social norms and, digital divide.	MultiStakeholder Framework Small N exploratory case study Seed tracing Gender responsive approaches to seed access Randomized Controlled Trials	Evidence-based gender transformative interventions designed and tested for inclusive access to seed Context-specific strategies/Innovations to pilot/scale identified
What are the most effective approaches and models for promoting women and youth entrepreneurship in seed production and marketing at different scales, including financial and digital inclusion, technical and business skills development?	Reach-Benefit-Empower-Transform Framework Gender responsive approaches - manual for seed companies Mixed methods research to track outputs and outcomes	Fit-for-purpose context-specific models at multiple scales to enhance the participation, capacity, and entrepreneurship in seed production and marketing by women and youth Context-specific strategies/Innovations to pilot/scale identified
Which approaches for promoting co-ordination and synergies between formal and informal sectors best serve seed users and producers from underserved/disadvantaged groups?	Multistakeholder framework Political economy analysis of seed provision Build on AGRA SeedSAT	Strategies to enhance synergies between the formal and community-based/farmer managed systems Context-specific strategies/Innovations to pilot/scale identified
What metrics and mechanisms are needed to track gendered and inclusive seed access?	Systematic review of available metrics Development of a framework and indicators to track inclusive access to seed Pilot testing of metrics Deployment of metrics	New metrics, methods and mechanisms to track inclusive access to seed expanding to crops key for smallholder livelihoods crops and including informal channels

The theory of change:

WP6 will generate evidence on the value of inclusive seed systems, along with new metrics for measuring inclusion to inform decision making by policymakers and private and public sector actors, which will create opportunities and benefits for women, youth, and disadvantaged groups across value chains while improving access to quality seed of improved varieties for these groups.

WP6 ensures smallholder men and women farmers are represented in multi-stakeholder processes to develop, implement, and evaluate processes and policies supporting women and youth entrepreneurship and integration of the formal and informal seed systems, resulting in more inclusive seed systems.

By quantifying cost-effectiveness and value addition of inclusive seed business models, WP6 provides public and private sector seed agencies with evidence and strategies for including varieties preferred by women and disadvantaged groups. These actors will be trained to use new evidence, tools, and approaches and adopt these innovations widely. NGOs, community-based organizations (CBOs), and farmer organizations will capitalize on strengthened technical, entrepreneurial, and marketing capacities that improve production and marketing of quality seed. Seed companies will link women and young seed entrepreneurs to supply chains and reach new customers with quality seed of new varieties.

Demand partners include national and international researchers, government agencies, NGOs, private sector, farmer organizations, and donors — who also provide avenues for scaling. SeEdQUAL will promote women's seed entrepreneurship, drawing on AGRA VALUE4HER and previous CGIAR initiatives. Innovation partners include benchmarking agencies and initiatives tracking access to seed, AGRA, financial organizations, and digital experts. Private and public sector stakeholders are expected to adopt new metrics tracking seed access, generating a robust evidence base on gender for initiatives like Data2X.

Partners' co-creation and implementation of activities and metrics will ensure farmer preferred varieties and traits enter seed systems and adoption rates and varietal replacement increase, leading to improved production and sustained economic and social impact.

WP6 links with WP1, WP2, and WP3 on priority crops/varieties and countries, and WP5 for development of supportive policies, integration of formal and informal systems, and embedding new metrics in government managed seed systems. WP6 links with MIPP to channel farmer preferred varieties through seed systems and with RIIs to scale inclusive models, as well as the CGIAR Gender Platform and HER+ Initiative on gender transformative strategies and promoting women and youth entrepreneurship.

WP6 assumes seed agencies will be convinced by evidence of business potential in reaching women and disadvantaged groups to be more inclusive and include their preferred varieties and crops. WP6 assumes piloted business models are lucrative and women and youth will engage and grow seed businesses. WP6 assumes seed producing agencies believe in the importance of reaching unreached groups and will adopt metrics to measure and manage results.

Mechanisms and metrics to promote and track inclusive seed access, and strategies for inclusive seed delivery, can be key components of innovation packages to be developed.

MEL will assess: whether entrepreneurial engagement in seed production creates new jobs and enhances incomes and agency for women and youth; whether use of metrics to track improved access to seed by women and unreached groups result in adoption of strategies for

demand creation and distribution of seed by seed producers and marketing/disseminating agencies; and, whether improved access to seed improves productivity and incomes for women and other unreached groups and contributes to women's empowerment.

4. Innovation Packages and Scaling Readiness Plan

4.1 Innovation Packages and Scaling Readiness Plan

SeEdQUAL will identify 3 core innovations which will form jointly with complementary innovations the basis for up to 5 innovation packages to be identified in the first business cycle. The innovation packages will prioritize core innovations overlapping the thematic areas of the Work Packages, such as quality seed, EGS, ICT, and policies targeting initially two regions (Asia and Africa) by the end of 2024. While core innovations are directly informed by SeEdQUAL, complementary innovations and the resulting innovation packages will be designed with other Initiatives or partners, for example a cross-Initiative Innovation Package might include promising innovations from Excellence in Agronomy, for example combining new varieties with an agronomic package. It is envisaged to measure scaling readiness by innovation readiness and innovation use indicators.[xxxviii] This assessment will allow for the identification of constraints to adoption and to scaling innovations, help designing scaling design strategies to achieve Initiative and CGIAR outcomes and impacts and ensure diverse innovation portfolio of innovations of different readiness levels. The Initiative requires light track technical backstopping and can be included in the second wave. Dedicated activities, deliverables, indicators, and budget are included in the Management Plan, MELIA and Budget Sections.

5. Impact statements

5.1 Nutrition, health and food security

Challenges and prioritization: Seed systems can influence food security by improving the availability, access, and use of improved varieties that increase productivity and resilience of food crops, which in turn may increase availability of nutritious food at lower prices. Further, improved incomes attained through higher yields from better quality varieties enables farming families to spend additional income on food and expand dietary diversity. In some cases, nutritional deficiencies can be addressed through promoting production and consumption of biofortified staple crops. SeEdQUAL activities will support the production of early generation high quality seed and availability of high-yielding, nutrition-rich ABI prioritized crop varieties like OSFP and Vit A Cassava.

Research questions: SeEdQUAL research questions seek to generate knowledge that will accelerate genetic gains in farmers' fields leading to improved food security and nutrition. Key research questions include: 1. How can seed production be best managed to meet the needs for EGS pure seed and quality commercial seed access (WP1)? 2. What drives farmers and value chain actors' intent to adopt and use seed of improved legume varieties (WP2)? 3. Do better functioning legume seed systems deliver an increased diversity of nutrient rich products (WP2)? 4. Where are the efficiency gains in breeding pipelines for seed production decisions to be found to accelerate realization of genetic gains by smallholders (WP3)?

Components of Work Packages: 1. Cross-learnings to build the technical evidence base for actionable approaches at scale to build specific recommendations for the identification of germplasm subsets for specific nutrition-related demands (WP1). Evidence of drivers for farmers` and value chain actors' intention to adopt and use improved legume variety seed and actual adoption (WP2). Improved understanding of the diversity of varieties by niche specificity and function, potential for genetic gains, and use of varieties used by farmers and other end users (WP2). Defined "hand-off" points in the product lifecycle for optimized seed delivery to specific product markets, including delivery to the "last-mile" (WP3).

Measuring performance and results: Enhanced practical availability and NARES seed capacity — evidence provided (WP1); Drivers of farmers' variety adoption identified and widely shared across legume value chains (WP2); Multi-Stakeholder Framework tool (MSF). Participation of commercial seed producers in on-farm testing of pre-release materials (Tricot) (WP3). SeEdQUAL estimates >1.28 million people (30% women) benefiting from CGIAR innovations (OFSP and Vit A Cassava) by 2024.

Partners: Innovation partners include ABI and NARES research partners. The key demand for more nutritious crop varieties comes from farmers and NARES and some SMEs, especially in support of national food policies. Scaling will be done utilizing promising approaches with cross learning involving ABI, NARES, and SME partners.

Human resources and capacity development of the Initiative team: In WP 1-4, existing expertise in product advancement of climate resilient varieties in cereals, legumes and root and tuber crops will be harnessed, capacity building will be through support and training both internally and NARES partners as per crop (WP1-3) and policy development (WP4). Cross learnings will be applied as relevant. WP 6 will develop knowledge required for access to climate-resilient varieties by women, youth and unreached farmers.

5.2 Poverty reduction, livelihoods and jobs

Challenges and prioritization: Limited access to seed of high-yielding and climate-resilient varieties, use of poor-quality seed, and limited varietal turnover and seed replacement erodes potential genetic gains for smallholder farmers. This leaves smallholders and other disadvantaged groups more vulnerable to climate shocks and stresses and contributes to reduced productivity and quality of their crops. This reduces their incomes and keeps them in poverty. Increasing access to, and use of, quality seed of market-demanded, climate-resilient, high-yielding varieties will help stabilize or enhance yields and consequently incomes. Evidence shows that supporting women and youth to become seed entrepreneurs empowers them economically. Developing viable business models for seed entrepreneurship targeting women and youth and their collectives will contribute to the creation of new jobs in seed value chains and expand livelihood options, increase incomes, and contribute to poverty reduction.

Research questions: SeEdQUAL research questions seek to generate knowledge that will contribute to accelerating the realization of genetic gains in farmers' fields, including those leading to poverty reduction, livelihoods and jobs, through providing access to seeds for poor and vulnerable smallholder farmers. Key research questions that deliver on this Impact Area focus on seed production, information and seed delivery pathways for demand creation and inclusive access (WP6, WP1), sustainable models and approaches for promoting women and youth entrepreneurship in seed production and marketing in informal settings (WP6, WP3), social benefits of a (de)listing strategy compared to the costs of seed subsidy programs, contribution of agro-dealer training programs, business development services, and credit instruments on returns of seed enterprises, and commercialization of farmer- or cooperative-run seed production/marketing enterprises for higher sales and revenues (WP5).

Components of Work Packages: 1. Seed production, information and seed delivery pathways for demand creation and inclusive access (WP6, WP1) 2. Sustainable seed business development models for women and youth (WP3, WP6). 3. Improved access to seeds and traits for smallholders, women, and other disadvantaged groups through formalizing and commercializing farmer-run or cooperative-run seed production/marketing enterprises (WP5). 4. Greater varietal turnover for smallholder farmers, women farmers, or other disadvantaged groups through inclusion of crop, index or other insurance instruments in varietal promotion programs or smallholder extension packages (WP5).

Measuring performance and results: 1. Number of sustainable seed enterprises established by women and youth and new jobs created as a part of these (WP 3,6). 2. Income from seed production and marketing (WP3, 6). Evidence of enhanced adoption of higher yielding and more productive varieties (WP4). SeEdQUAL estimates 23.1 million people (30% women) benefiting from CGIAR innovations (adopting new high-yielding rice and wheat varieties by 2024.

Partners: Innovation partners include ABI and NARES research partners. Key demand for more productive crop varieties comes from farmers and NARES and some SMEs, primarily from countries vulnerable to climate change. Scaling will be done utilizing promising and effective approaches with cross learning involving ABI, NARES, and SME partners.

Human resources and capacity development of Initiative team: Economists and social scientists constitute WP 5 and 6 teams with expertise to contribute to research, outputs and outcomes. Partnerships with national, local and advanced research organizations and universities will be nurtured to tap into additional expertise. We will aim to host research scholars and students to pursue their thesis work focused on relevant topics.

5.3 Gender equality, youth and social inclusion

Challenges and prioritization: Access to seed is highly contextual and complex and varies for people within and between households. It is influenced by access to and control over cash or credit, information and seed sources, mobility, and social networks. These are influenced by gender relations, economic and social status. OPVs and VPCs are not generally produced by the private sector, and government channels do not effectively reach smallholders and women. Thus, these groups recycle seed or rely on informal systems, which might not include improved varieties. This hinders adoption, holding vulnerable farmers in a cycle of low productivity and poverty. Women and youth seed entrepreneurship is economically empowering and improves access of diverse varieties for unreached groups.
Research questions: Key research questions focus on: seed production, information and delivery pathways for demand creation and inclusive access (WP6, WP1), approaches for promoting women and youth entrepreneurship in seed production and marketing (WP6, WP3), approaches for synergies between formal and informal sectors (WP6), metrics and mechanisms to track gendered and inclusive seed access (WP6), and assessments of the sensitivity and transformative potential of alternative policy options to the needs of gender, youth, and disadvantaged groups.

Components of Work Packages: 1. Seed production, information and delivery pathways for demand creation and inclusive access (WP6, WP1) 2. Sustainable business models for women and youth (WP3. WP6). 3. Improved access to seeds and traits for smallholders, women, and disadvantaged groups through commercializing farmer or cooperative seed enterprises (WP5). 4. Greater varietal turnover for smallholders, women, or disadvantaged groups through various instruments in varietal promotion programs or extension packages (WP5). 5. Influence of gender-based preferences and acquisition behaviors on market demand (WP3). 6. Policy options to accelerate the adoption, turnover, and demand for varieties that proactively respond to the needs and potentialities of women, youth, and disadvantaged groups. 6. Metrics and mechanisms to track inclusive seed access (WP6).

Measuring performance and results: 1. Availability of strategies for improving awareness, information and delivery pathways for seed to women, youth and disadvantaged groups (WP1,2,3,4,5,6); 2. Availability of business models, policy options, and strategic approaches for enhancing women and youth seed entrepreneurship as well as varietal adoption/turnover by women, youth, and disadvantaged groups (WP1,2,3,4,5,6); 3. New metrics to track inclusive access to seed (WP4,6). SeEdQUAL estimates >795,000 women benefiting from CGIAR innovations (adopting high-yielding, fast cooking common bean varieties) by 2024.

Partners: Key demand partners include local seed agencies. Innovation partners include SeedNL, AGRA CESS, NGOs, CBOs and women's collectives, AGRA VALUE4HER, social enterprises, financial organizations, seed companies to link women seed producers to supply chains, TASAI, Access to Seed Index to pilot metrics to track inclusive seed access, Digital Green for digital strategies, World Bank Africa and South Asia Gender Innovation Labs. Scaling Partners include AGRA CESS, local seed agencies, seed companies, TASAI, Access to Seeds Index and Data2X.

Human resources and capacity development of Initiative team: WP6 will include experts in gender, youth and social inclusion and contribute to other WPs. Partnerships with research organizations and universities will provide additional expertise. Research scholars and students will pursue research on relevant topics. Researchers and partners will take a course on gender in seed systems development.

5.4 Climate adaptation and mitigation

Challenges and prioritization: Countries face challenges to crop production with a projected loss of 1.3% economic growth and 10% crop yield for every 1^0C increase in temperature as shown in rice (RSIS report). High quality new and climate-resilient varieties do not reach farmers effectively. SeEdQUAL will prioritize product advancement of Tier 1 & 2 varieties developed by Accelerated Breeding Initiative (ABI). These varieties will have adaptation to variable seasonal durations and tolerances to drought (beans, cassava, cowpea, maize, millet, potato, rice, sorghum, sweet potato, wheat), heat (beans, chickpea, maize, potato, wheat) salinity and submergence (rice) and waterlogging (maize). SeEdQUAL will advance policy options to accelerate adoption, turnover, and demand for climate-resilient varieties.

Research questions: Key research questions that deliver on this Impact Area include: 1. Understanding cereals seed production management to support early generation seed (EGS) including in climate-resilient varieties of cereals for increased access (WP1). 2. Cost-effective methods to reduce pathogen load and increase seed/variety resilience in VPCs and for mitigation of climate change-associated threats (WP3). 3. Policy options to accelerate the adoption, turnover, and demand for varieties embodying climate-resilience traits identified in WP1-3, with emphasis on women, youth, and disadvantaged groups identified in WP6.

Components of Work Packages: 1. Understanding cereal seed production management for EGS, pure seed and access for climate-resilient varieties, and applying innovative methods to accelerate and incentivize demand for new climate-resilient varieties (WP1). 2. Understanding the climate risks farmers face and how efficient are they in producing legume seed and grain under variable environments including climate change conditions and field assessment/study to obtain data for empirical/econometric production and risk analysis (WP2). 3. Climate-smart seed production technologies for delivery of pest-, disease-, and drought-tolerant varieties (WP3). 4. Policies, programs, and regulations that accelerate the introduction, uptake, and turnover of varieties embodying climate-resilient traits.

Measuring performance and results: 1. Systems for testing climate-resilient varieties of different crops in priority countries and provide appropriate product profiles to farmers to ensure evidence-based choice (WP1,2,3). 2. Development of knowledge on demand for EGS of climate-resilient crops in priority locations and provide support to NARES partners in vulnerable countries as a priority (WP1,2,3). 3. Delivery of pest-, disease- and abiotic stress-tolerant varieties to NARES and SMEs, supporting access by farmers. 4. Climate-smart technologies and decision support tools and available to farmers (WP4). 5. Policy, program, and regulatory changes that contribute to the accelerated introduction, uptake, and turnover of varieties embodying climate-resilient traits. SeEdQUAL estimates >5 million people (30% women) benefiting from climate-adapted innovations (e.g., new climate-resilient maize varieties) by 2024.

Partners: Innovation partners include ABI and NARES research partners. Demand partners include farmers, NARES and some SMEs, primarily from climate-change-vulnerable countries. Scaling will be across ABI, NARES, SME partners, NGOs and CSOs.

Human resources and capacity development of Initiative team: In WP 1-4 existing expertise in product advancement of climate-resilient varieties will be harnessed, with capacity-building and training of internal staff and NARES partners as per crop (WP1,2, &3) and relevant policy development (WP4). WP5 will leverage expertise across One CGIAR and partners, and build capacity for evidence-creation, policy analysis, and strategic communication to policymakers. WP6 will enhance awareness and knowledge required to access and use climate-resilient varieties by women, youth and unreached farmers.

5.5 Environmental health and biodiversity

Challenges and prioritization: High-quality and high-yielding seeds allow for increased production without increased pressure on land, including forests, carbon sinks, buffer zones, and centers of biodiversity. Gains to environmental health can be realized with high-quality seeds embodying traits to reduce dependence on chemical inputs while enhancing soil microbiota. SeEdQUAL will improve availability, accessibility, and affordability of a wider range of varieties developed by ABI and positioned by MIPP so gains to environmental health are realized by farmers. SeEdQUAL will support EGS production and distribution with NARES, variety testing and promotion with private sector partners, and policy advocacy partners to accelerate adoption and turnover of traits to improve environmental health and biodiversity.

Research questions: Key research questions include: 1. Understanding cereal seed production management to support EGS to improve access to varieties with enhanced pest and disease resistance and tolerance, and climate resilience (WP1). 2. Cost-effective methods to reduce pathogen load and increase seed/variety resilience in VPCs and for mitigation of climate-change-associated threats (WP3). 3. Policy options to accelerate the adoption, turnover, and demand for varieties embodying climate-resilience traits identified in WP1-3, with emphasis on women, youth, and disadvantaged groups identified in WP6.

Components of Work Packages: 1. Understanding cereals seed production management for EGS, pure seed and access for climate resilient varieties, applying innovative methods to accelerate and incentivize demand for new climate-resilient varieties (WP1). 2. Understanding climate risks farmers face and how efficient are they in producing legume seed and grain under variable environments including climate change conditions and field assessment/study to obtain data for empirical/econometric production and risk analysis (WP2) 3. Climate smart seed production technologies for delivery of pest, disease, and drought tolerant varieties for wide adaptation (WP3). 4. VPC seed health: bioinoculants – environmentally friendly. Host plant resistance to reduce pesticide use (e.g., bacterial wilt & late blight in potato) (WP3). 5. Policy analyses and recommendations addressing synergies and tradeoffs between seed systems and market development, and environmental health and biodiversity conservation, in support of other WPs. 6. Enhancement of biodiversity through expanded pool of varieties and seed available via informal systems (WP6).

Measuring performance and results: 1. Systems for testing climate resilient varieties of different crops in priority countries and provide appropriate product profiles to farmers to ensure data driven evidence-based choice (WP1,2,3); 2. Improved knowledge on demand for EGS of climate resilient crops in relevant priority locations and countries and support to NARES partners in climate change vulnerable countries (WP1,2,3); 3. Delivery of pests, disease and abiotic stress tolerance varieties to NARES, supporting access by farmers through varieties released by NARES and SMES. 4. Climate smart technologies and decision support tools made available to farmers (WP4). 5. Policy, program, and regulatory changes contribute to accelerated introduction, uptake, and turnover of climate-resilient varieties. SeEdQUAL estimates >1.39 million ha under improved management (assuming 25% ha growing disease-resistant varieties) by 2024.

Partners: Innovation partners include ABI and NARES. Demand for stress-tolerant varieties comes from farmers, NARES, and SMEs primarily from vulnerable countries. Scaling will be done utilizing approaches with ABI, NARES, SME partners.

Human resources and capacity development of Initiative team: In WP1-4, existing expertise in product advancement of pest and disease resilient varieties in cereals, legumes and root and tuber crops will be harnessed and capacity built through training internally and among NARES partners and relevant policy development (WP4) Cross learnings will be

applied as relevant. WP5 will leverage expertise across One CGIAR and partners, and will build capacity for evidence-creation, policy analysis, and strategic communication to policymakers and other stakeholders. WP6 will develop knowledge required for access of pest and disease resilient varieties by women, youth and unreached farmers.

6. Monitoring, evaluation, learning and impact assessment (MELIA)

6.1 Result framework

CGIAR Impact Areas				
Nutrition, health and food security	**Poverty reduction, livelihoods and jobs**	**Gender equality, youth and social inclusion**	**Climate adaptation and mitigation**	**Environmental health and biodiversity**
Collective global 2030 targets				
The collective global 2030 targets are available centrally here to save space.				
Common impact indicators that your Initiative will contribute to and will be able to provide data towards (refer to page 5 of the Guidance for MELIA for selection of appropriate indicators)				
>1.28 million people (30% women) benefiting from CGIAR innovations (OFSP and Vit A Cassava)	23.1 million people (30% women) benefiting from CGIAR innovations (adopting new high-yielding rice and wheat varieties)	>795,000 women benefiting from CGIAR innovations (adopting high-yielding, fast cooking common bean varieties)	>5 million people (30% women) benefiting from climate-adapted innovations (e.g., new climate-resilient maize varieties)	TBD >1.39 million ha under improved management (assuming 25% ha growing disease-resistant varieties)
SDG targets				
2.1	1.2	2.3; 5.a	1.; 2.4; 3.1	2.4, 6.4

Action Area title: Genetic Innovation	
Action Area outcomes	**Action Area outcome indicators**
GI 5 - Cooperation and co-investment by CGIAR, public- and private-sector seed-system actors supports coordinated and effective research and investment in the sector	GIi 5.1 Number of genetic innovations commercialized through public/private sector cooperation agreements
	GIi 5.2 Number of public/private sector cooperation agreements
GI 6 - Seed-sector actors' investments pipelines are profitable and effective in scaling-up new varieties from CGIAR breeding	GIi 6.2 Production volumes of seed or clones by Seed system actors
GI 7 - Farmers have access to and use climate-resilient, nutritious, market-demanded crop varieties	GIi 7.1 Number of farmers who grow climate-smart crop varieties, disaggregated by gender
	GIi 7.2 Number of farmers who grow crop varieties with increased nutritional content, disaggregated by gender
ST & RAFS & GI 1 Women and youth are empowered to be more active in decision making in food, land and water systems	STRAFSGIi 1.3 Number of farmers who grow market intelligence-informed new crop varieties, disaggregated by gender and age.
	STRAFSGIi 1.4 Percentage of female headed farm households that use an improved crop variety

Initiative and Work Package outcomes, outputs and indicators											
Result type (outcome or output)	**Result**	**Indicator**	**Unit of measurement**	**Geographic scope**	**Data source**	**Data collection method**	**Frequency of data collection**	**Baseline value (outcome only)**	**Baseline year (outcome only)**	**Target value**	**Target year**
End of initiative Outcome 1	Seed companies and other seed multipliers providing quality	Production and adoption of quality seed of	#beneficiaries (persons); ha adopted;	Global	WPs 1-6	Imputed from adoption area (inc	ongoing	0	2022	30MM 5.6MM ha; tbc	2024

	seed of new improved varieties, from CGIAR and NARES networks, at greater scale, tailored to their needs and reaching 30 million beneficiaries (persons) by 2024 (Hareau, 2021) and thereby increasing varietal turnover and contributing to achieving genetic gains in farmers' fields.	new improved varieties	#partners adopting			VarScout app) and tri-angulated with EGS seed supply and surveys (as below) etc.					
WP1 outcome 1	Improved technical knowledge and capacity for cereal seed production.	Partner adoption of practice chang es	10 NARS &SMEs including QDS producers	Countries: 2 in SA, 1 in SEA, 2 in WCA, 2 in ESA, 2 in ECA, 1 in Lam	Reporting, primary field data	Field surveys, review of NARES reports	Annual	0	2022	2 partners per country (3% gain in seed)	2024
WP1 outcome 2	Detailed comparative analysis of current collaborative and administrative mechanisms for transfer of CGIAR germplasm.	Reporting providing an assessment of current design of collaborative mechanisms from an economic, legal, and administrative perspective	CGIAR cereal partners (5 crops)	Countries: 2 in SA, 1 in SEA, 2 in WCA, 2in ESA, 2 in ECA, 1 in Lam	Analysis and reporting	Semi structured interviews with stakeholder s. Dialogue roundtables with seed companies, breeding programs, legal scholars on	Analysis (2022), reporting and recom mendations (2023)	0	2023	5 crops analyze d	2024

						licensing agreements and implications					
WP1 outcome 3	Greater accessibility and uptake of new cereal products to underreached populations: clearly defined entry points for targeting women and poor smallholders to access cereal seed system.	Participation of women and poor smallholders	5 NARS & SMEs, including seed producers	Countries: 2 in WCA, 2 in ECA, 2 in ESA	Primary data	Mixed methods design, farmer surveys, field experiments	Analysis and surveys (2023), experimentation (2023-2024)	0	2022	5% increase in participation	2024
WP2 outcome 1	Enhanced capacities of legume seed value chain actors to produce and effectively market seed	Trend of number of seed value chain actors producers and marketers	NARS & SMEs including QDS producers	Countries: 7 WCA 10 in ESA	annual reports	Field surveys, review of NARES and SMEs' reports /Case studies	Annual	To be determined	2022	10 NARS and 30 SMEs	2024
WP2 outcome 2	Improved and inclusive (women and marginal SHF) access to quality legume seed	Number of SHF farmers disaggregated by gender and marginal farmers	Numbers of SHF	7 WCA 10 in ESA	Analysis and reporting	Annual reports and seed digital monitoring and evaluation reports	Annual	To be determined	2022	Up to 5 million SHFs (50% being women and 25% marginal farmers and 25% farmers in production	2024
WP2 Outcome 4	Functional pluralistic demand led legume seed	Number of diversified seed producers	SMEs including QDS producers	7 WCA 10 in ESA	Primary data from NARS and SEMs	Partners' reports	Season	To be determined	22	5 NARS and 15 SMEs/Q	2024

	systems established									DS producers	
WP2 Outcome 4	High variety turn over and reduced time between release and use (100 tons of seed) as results of genetic gains	Numbers of years	Number of years between release and use	6 ESA	Primary data from NARS and SMEs	Partners' Reports and seed digital monitoring and evaluation reports	Annual	To be determined	2022	5 years	2024
WP3 Outcome 1	Characterization and quantification of seed demand determined from gender-based varietal preferences and acquisition behaviors will result in increased varietal turnover	Varietal turnover rate	Percent	Countries: 2 in WCA, 2 in ECA, 1 in Lam, 1 in SEA	Seedqual reporting. Primary field data	Field surveys; Review of NARS reports; Seed Tracker	Seed Tracker in real-time. Field surveys 2022, 2024	No current data	2022	3% increase	2024
WP3 Outcome 2	Improved understanding of delivery pathways results in increased volumes, net profits, and geographical scale in VPC seed trade	Number of trade businesses; Profits	Number of businesses. Monetary estimates of profits	Countries: 2 in WCA, 2 in ECA, 1 in Lam, 1 in SEA	Business survey reports	Surveys of businesses	Business survey 2024 once	TBD	2022	2 per target country = 12	2024
WP3 Outcome 3	NARES will be operating modernized breeding and VPC seed delivery pipelines with specified targets for seed volumes and varietal turnover rates	Seed volumes; Seed beneficiaries. Cultivated area. Women beneficiaries	Numbers Ha	Countries: 2 in WCA, 2 in ECA, 1 in Lam, 1 in SEA	Ex-ante impact assessment	Collation of existing published data.	Ex-ante study 2022. Updated in 2024.	0	2022	TBD but e.g. > 600,000 beneficiaries each for OFSP seed and Vitamin A-rich cassava seed	2024

										>25,000 OFSP; >50,000 ha VitA cassava > 50% women beneficiaries	
WP4 Outcome 2	Seed delivery partners accessing first One CGIAR variety catalogue including minimum of 30 new varieties from 10 priority crops and linked to One CGIAR variety licensing approach	Organizations and individuals accessing One CGIAR variety catalogues	#organizations #individuals	Regional	Website	Web-crawler	continuous	0	2023	TBD	2024
WP6 Outcome 1	At least 5 research and development organizations and private seed companies deploy gender transformative strategies to reach women seed users and producers	Public, private and civil society organizations using new/refined strategies for seed and information dissemination	Number of organizations Number of new/refined strategies	SSA and S Asia	Seedqual reports	Targeted surveys	Annual	0	2022	5	2024
WP6 Outcome 4	Women, youth and disadvantaged socio-economic groups in 10 sites are able to access affordable, market-	Number of sites where Women, youth and other vulnerable groups	Number of geographical regions/sites	SSA and S Asia	Seedqual Reports	Survey	Baseline in 2022 and end line in 2024	tbd	2022	10 `	2024

	demanded and producer preferred, high yielding, resilient variety seed	experiencing higher access to quality seed of preferred crops and varieties									
End of Initiative Outcome 2	Foundation seed providers, adopting innovative and transformative models for accessing, multiplying and disseminating quality EGS for the full range of target focus crops on pri oritized market segments following economically sustainable business models, and supplying NARES, seed companies, farmer and community organizations, and rural entrepreneurs.	Number of partners adopting new EGS models and efficiency gains	#partners EGS seed yield EGS COGS	Global	WP1-3	Reports	varies	0	2022	tbd	2024
WP1 outcome 4	Development of new models for on-farm testing and dissemination on v arietal candidates f rom CGIAR-NARES networks.	Number of seed entrepreneurs using business models	Number of enterprises	Countries: 2 in SA, 1 in SEA, 2 in WCA, 2 in ECA, 1 in Lam	Primary data	Cross-cutting methods for multiple cereal species in target	Annual	0	2022	10% increase in participa tion, 3% gain in seed)	2024

						regions and traits to support participatory variety candidate s election and promotion.					
WP3 Outcome 4	Public and private sector partners will apply new technologies that increase the efficiency of early generation seed production	Technical and cost efficiency of EGS seed production	Seed units per unit of time and per unit of cost	Countries: 2 in WCA, 2 in ECA, 1 in Lam, 1 in SEA	Existing seed production reports from projects	Review of public and private sector seed production reports	Annual	TBD from existing reports	2022	2 partners per country increase seed producti on efficienc y by > 20% and reduce cost/see d unit by > 20%	2024
WP3 Outcome 5	The application of improved seed health management strategies will boost seed yields	Seed yield	Seed yield	Countries: 2 in WCA, 2 in ECA, 1 in Lam, 1 in SEA	Reports of NARS, seed companie s, entrepren eurs, and projects	Review of data presented in reports. Field validation of seed health technologie s	On-going from 2022 to 2024	TBD from existing reports. Seed Tracker data for Nigeria and Tanzani a	2022	Seed yield increase of > 10%	2024
WP3 Outcome 6	VPC seed entrepreneurs will establish and sustainably run their businesses through applying new business models	Number of seed entrepreneurs using business models	Number	Countries: 2 in WCA, 2 in ECA, 1 in Lam, 1 in SEA	Seedqual and project reports	Review of data presented in reports	Twice	606	2022	1,800	2024

WP6 Outcome 2	-At least 30 women and youth (individuals/collectives) will establish seed production and marketing enterprises	Seed production and/or marketing enterprises established and managed by women and youth	Number of enterprises Number of women and youth involved	SSA and S Asia	Seedqual reports	Surveys	Annual	tbd	2022	30	2024
End of Initiative Outcome 3	Robust policy implementation in 3 countries leading to: (1) significant quantitative increases in EGS production/distribution relative to baseline; (2) qualitative reductions in time/effort required to release new varieties and produce quality seed; (3) significant quantitative increase relative to baseline in regional seed market values; (4) and qualitative and quantitative improvements in reach and impact of instruments to accelerate varietal turnover and increase seed demand.	(1) Volume and value of EGS produced and distributed, by crop and buyer; (2) time and cost estimates of new variety release procedures; (3) regional seed trade estimates; (4) impact assessments	(1) MT/yr/crop; (2) days and cost (as a % of GNI); (3) MT/yr/crop; (4) % change over baseline/control means, with emphasis on heterogeneous effects on sub-groups	SSA, SA	(1) NARES partners; (2) World Bank Group EBA; (3) Global and regional trade and industry monitoring reports; (4) studies by SPIA, MIPP, SeEdQUAL and partners	(1) NARES reporting or data collection by SeEdQUAL; (2) see EBA methods description; (3) standard trade statistics reporting mechanisms; (4) qualitative, experimental or quasi-experimental impact evaluation methods	(1) Annual; (2) Annual; (3) Annual; (4) in 2-3 year intervals, as possible	tbd	2022	tbd	2024
WP5 Outcome 1	Seed policy reform processes in 3	Qualitative progress	See pp. 77ff in https://agrilink	SSA, SA	SeEdQUAL	Qualitative (key	Annual	tbd	2022	tbd	2024

	countries characterized by predictable policy frameworks	towards predictable policy frameworks	s.org/sites/default/files/ftf-indicator-handbook-march-2018-508.pdf		reporting, international benchmarking Initiative data, qualitative assessments by partners	informant interviews, document analysis); quantitative (benchmarking)					
WP5 Outcome 2	Expanded inclusivity and stakeholder participation	Qualitative progress toward inclusive policy change processes	See pp. 77ff in https://agrilinks.org/sites/default/files/ftf-indicator-handbook-march-2018-508.pdf	SSA, SA	SeEdQUAL reporting, qualitative assessments by partners	Qualitative (key informant interviews, document analysis); quantitative (benchmarking)	Annual	tbd	2022	tbd	2024
WP5 Outcome 3	Utilization of evidence-based analysis in policy reform processes	Citations and references in strategy and policy documents	Citation analysis	SSA, SA	SeEdQUAL reporting, international benchmarking initiative data, qualitative assessments by partners	Qualitative (key informant interviews); Quantitative (Document analysis)	Annual	tbd	2022	tbd	2024
WP5 Outcome 4	Public investment in policy analysis, design, and	Implementation of seed policy-related	Number of events and publications	SSA, SA	SeEdQUAL	Qualitative (key informant	Annual	tbd	2022	tbd	2024

	implementation capacity	training/learning events; Publication of seed policy manuals, guidelines, catalogues, and other documents			reporting, independent assessments of seed sector programs; qualitative assessments by partners	interviews, document analysis); quantitative (public expenditure analysis)					
											2024
											2024
WP3 Outcome 9	Improved seed regulatory policies will strengthen an expanded network of seed regulatory agencies, whose efficiency will be enhanced through the scaling of ICT tools such as Seed Tracker.	Number of policies. Number of ICT tool users	Number	Countries: 2 in WCA, 2 in ECA, 1 in Lam, 1 in SEA	Government gazette documents on seed policy. Seed Tracker database	Review of government documents and Seed Tracker database	Start and end of period	2 policies. More than 800 Seed Tracker users	2022	6 policies. More than 2000 Seed Tracker users	2024
End of Initiative Outcome 4	Key private and public seed providers and development organizations using new metrics, including ICT, for tracking inclusive seed access, initiating the creation of a robust evidence base. Five national seed innovation partner organizations	NARES and other seed development partners completing training and/or using new metrics	#partners	Global	WPs1-6	Reports and surveys	varies	0	2022	tbd	2024

	modifying or introducing new seed information-sharing and delivery mechanisms to enhance inclusive access to seed.										
WP2 Outcome 3	Extension and advisory service providers delivering variety and complementary information services using inclusive methods including digital tools	Trend in number information providers X number of types of variety information including digital channels X estimated number women, youth and men farmers and SMEs using variety and related information	NARS and SMEs including QDS producers s	Regional (WCA, ESA),	information service providers, SMEs including QDS NARS		Annual	0	Start 2022	to be determined	2022
WP3 Outcome 7 (EIO 4)	System actors will have open access to a database of recommendations from case studies building on the evidence model of the RTB seed Toolbox and a strengthened community of practice will promote information sharing on VPC seed	Number of tools in toolbox. Web presence of community of practice	Number. Website	Global	Websites for seed system tools and community of practice	Website review	On-going review	11 tools. No CoP website	2022	20 tools. Website	WP3 Outcome 7 (EIO 4)

WP3 Outcome 8 (EIO 4)	The ACI-VSS will be a thriving hub for innovation in seed entrepreneurship, and will work with AGRA, national, and continental bodies as well as scaling partners to modernize VPC seed development	ACI-VSS presence	ACI-VSS presence	Base in Nigeria	Seedqual report. ACI-VSS inception meeting report	Review of reports	On-going review	ACI-VSS absent. 2 countries in SSA with modernized seed systems	2022	ACI-VSS running. 6 countries in SSA with modernized seed systems. > 40% women leaders	WP3 Outcome 8 (EIO 4)
WP4 Outcome1	NARES networks including and applying new product evaluation & advancement tools, including S2B Handbook (compatible with N4ETTS tools)	NARES networks adopting new tools and processes	#NARES	SSA, S & SE Asia	WP4	Reports	Annual	0	2022	20	2024
WP4 Outcome 3	VarScout app downloaded from Android app stores and providing data entry framework for 10 priority crops (3 cereal, 2 legume and 5 RTB) in 20 priority countries.	Use of innovative variety adoption tools	#active users #data points received	Global	VarScout app	VarScout database	continuous	0	2022	tbd	2024
WP6 Outcome 3	At least 5 public, private or community-based seed producing organizations are piloting new metrics to track	Public, private and community-based seed producers tracking their clients and consumers	Number of producer/organizations using new metrics	SSA and S Asia	Seedqual reports	Targeted Surveys	Annual	0	2022	5	2024

	inclusive access to seed	using new metrics									
Innovation Packages Output 1	Innovation Profile and Scaling Ambition Report	Number of selected Core Innovations for which scaling ambition, vision of success and roadmap co-created, agreed-upon and documented	3	SSA and S Asia	SeEdQUAL reporting		Once	-	-		2022
Innovation Packages Output 2	Evidence-Based Scaling Strategies	Number of Innovation Packages that have undergone evidence-based and quality control/validated Scaling Readiness assessments informing innovation and scaling strategies	5	SSA and S Asia	SeEdQUAL reporting						2023

6.2 MELIA plan

Narrative for MEL plans

SeEdQUAL's MEL approach will involve a comprehensive system of measuring results and performance, while emphasizing learning and adaptation at all levels. Comprehensive indicators for tracking progress towards achieving those objectives period will be defined based on the Initiative and WP-level outcomes and aligned with the TOCs. This will be supported by One CGIAR's Performance and Results Management System (PRMS), which will feature a common system housing workplan and budget, TOC, stage-gate decision points, and annual reporting processes. PRMS will allow real-time data collection and day-to-day management, enabling proactive course-correction during the Initiative.[xxxix] The integrated system will enable cross-Initiative knowledge management for continual alignment of Initiative efforts to achieve impact. WP4 will present data such as number of varieties by market segment achieving advancement stages, providing critical feedback to MIPP and ABI for more effective targeting of resources. SeEdQUAL will track seed delivery through anonymous, aggregated data-sharing based on partnership agreements with downstream private sector partners. Ex-post adoption and diffusion studies will be conducted to monitor adoption across common areas of WPs including quality seed and innovative EGS models by stakeholders and will track changes to policies for target crops and countries during the 3-year Initiative. A detailed implementation and management plan will be developed, including MEL plan with defined stage-gates for decision-making.

Initiative-level impact assessments will help determine to what extent the expected End-of-Initiative outcomes were realized, generate evidence on TOC assumptions and linkages, provide potential future impacts and will provide the basis for long-term, large-scale evaluations beyond the 3-year cycle. Key learning questions based on the key assumptions of SeEdQUAL's TOC include: (1) is quality seed demanded; (2) are innovative EGS model working; (3) are policy instruments effective; (4) do new (digital) methods for monitoring adoption of quality seed work?

Assumptions will be tested through causal impact assessment research and support impact monitoring throughout the Initiative using experimental or quasi-experimental research designs. Assessments will be conducted by creating panel datasets (baselines in 2022 and endlines in 2024). The results of these assessments will contribute to a better understanding of all End-of-Initiative outcomes. Ex-ante impact studies will be conducted to quantify the potential prospective effects of various outputs of SeEdQUAL, especially on future quality seed availability (EoI1) under different EGS models (EoI2), and policy options (EoI3).

Causal impact learning and accountability studies will empirically evaluate effects of Initiative outputs on value chain actors, particularly on farmer-level outcomes within One CGIAR Impact Areas. For this purpose, panel datasets will be created, and rigorous statistical methods applied. Closely related is the setup of long-term, large-scale evaluations to trace scaling activities and assess impacts over a 10-year period. Jointly with (scaling) partners, promising innovations and innovation packages proposed by SeEdQUAL in the first 3-year cycle will be identified, for which baseline data will be collected in 2023/2024. Primary and secondary M&E data on seed delivery and diffusion from (scaling) partners will be used to inform identification of promising innovations and to improve design of impact studies.

6.3 Planned MELIA studies and activities

MELIA type study	Result or indicator title that the MELIA study or activity will contribute to.	Timeframe	Co-Design	How the MELIA study or activity inform management decisions and contribute to internal learning
1. Adoption/Diffusion studies. Monitoring adoption of quality seed, EGS models, policies informed and developed as outputs of Initiative with special focus on gender and disadvantaged groups for all WPs. **(Accountability)**	**Indicators:** Number of adopters (seed companies, multipliers, NARES, farmers, countries) of quality seed, EGS models, policies. **EoI1-4**	2022		Documentation of determinants of adoption and reach will inform on successful implementation of Initiative and inform how adoption can be made more successful in the future.
2. Causal impact assessment studies. Testing and validating key assumptions underlying the TOC of the Initiative. **(Learning)**	**Indicators:** Quality seed demanded (**EoI1**) EGS models effective (**EoI2**) Policy instruments effective (**EoI3**) Digital methods for tracking seed validated (**EoI4**)	Baseline 2022 Intervention 2022/23 Endline 2024		Validation of critical TOC assumptions that SeEdQUAL informed outputs/innovations are effective in the way they were intended.
3. Ex-ante impact assessment. Quantify potential effects of outputs of Initiative on CGIAR Impact Areas relative to status quo.	**Indicators:** Future quality seed availability and access scenarios (**EoI1**), and as a result of EGS models (**EoI2**), and policies (**EoI3**) for several actors.	2022-2024		Identification of potential future scenarios to support decisions on (de)prioritizing investments.
4. Causal impact assessment studies. Empirical evaluation of quality seed, EGS models, policies informed and developed by SeEdQUAL on value chain actor and farmer-level outcomes. **(Learning/Accountability)**	**Indicators:** Farmer livelihoods are improved in the 5 CGIAR Impact Areas.	Baseline 2022 Intervention 2022/23 Endline 2024	Market Intelligence Excellence in Agronomy	Allows for evidence-based decision-making on outcomes in 5 Impact Areas of key innovations to (de)prioritize future investments and identify scaling opportunities.
5. Long-term, large-scale causal empirical impact assessment studies. Empirical evaluation of select outputs adopted by target actors and informed by SeEdQUAL on farmer outcomes over 10-year period. **(Accountability)**	**Indicators:** Key innovations informed by SeEdQUAL identified for impact assessment (**EoI1-4**) on 5 CGIAR Impact Areas with baseline created.	Baseline 2023/2024		No immediate short-term insights gained over the course of the Initiative.
6. Scaling Readiness Assessment study. Assessment of innovation packages in their scaling readiness	**Indicators:** 3 innovation packages identified and described in scaling readiness diagram	2022-2024	Excellence in Agronomy	Insights into innovation package stage of scaling readiness and protentional for scaling. Insights for (de)prioritizing investments into innovation packages.

7. Management plan and risk assessment

7.1 Management plan

SeEdQUAL's detailed implementation and MEL plan, to be produced during the Initiative set-up phase, will include ongoing monitoring, built on mapping activities and outputs and their related indicators toward outcomes. Pre-determined decision gates throughout the project management cycle will make use of data derived from benefits projections, incorporate risk monitoring and management, and test assumptions throughout TOC pathways for change.

A designated project management team, including MEL and program experts, will be established and regularly meet to assess and reflect on progress, and propose any adjustments to current plans and strategies where necessary, including the TOC. The 10-year projection of benefits exercise included interim targets of incremental benefits expected in the Initiative. This exercise helped define the 3-year end of Initiative outcomes toward which SeEdQUAL will monitor progress, will enable GI to gauge interim progress toward 10-year targets.

During project launch, SeEdQUAL will agree on principles for effective virtual collaboration will be across and within Work Packages. As SeEdQUAL's comparative advantage and scaling approach capitalizes on high-performing alliances of partners leveraging unique strengths to achieve impact at scale, the Partnership Health Check Up tool will be used with partners to monitor the quality and effectiveness of SeEdQUAL's partnership set up and to obtain feedback on how arrangements and processes need to be adapted.

7.2 Summary management plan Gantt table

Initiative Start Date		Timelines												Description of key deliverables (maximum 3 per row, maximum 20 words per deliverable)
		2022				2023				2024				
Work Packages	Lead organization	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Work Package 1:	CGIAR								1	2			3	1. Report technical knowledge and capacity for seed production, including pure, commercial and EGS seed. 2. Detailed comparative analysis of current collaborative and administrative mechanisms for transfer of One CGIAR germplasm. 3. Report on testing products, development and pilot new models for gender sensitive on farm testing and dissemination of cereal seed.
Work Package 2:	CGIAR		1	1 2	1	1 3					3			1. Documented understanding of effective demand, including demand elasticities of seed of different legume crop varieties and classes. 2. Coherent stakeholder maps and linkages with market pull identified to catalyze investments in seed 3. Case studies of the best production and supply business models around EGS production systems and approach.
Work Package 3:	CGIAR								2				1,3	1. NARES in six countries operating modernized breeding & VPC seed delivery pipelines with targets for seed volumes and varietal turnover 2. 2 public / private sector partners in 6 countries apply technologies & tools to increase efficiency of EGS by 20% 3. ACI-VSS with scaling partners use validated tools to modernize VPC seed development strategies in 4 countries in Africa
Work Package 4:	CGIAR		1	2			3							1. Workplan and budget for coordination of capacity building for NARES partners piloting initially in each crop archetype of cereals, and plan for scaling to RTB and Legumes. 2. *Varscout* digital app available for data input for tier-1 crops / countries, 3. Genetic Innovation variety catalog available to RIIs linked to TAAT Clearinghouse.
Work Package 5:	CGIAR			1		2							3	1. Working papers: Policy and regulatory reform priorities for seed market development. 2. Working paper: Policy and program design options to accelerate varietal turnover and quality seed use, 3. Working paper: Policy, regulatory, and investment options to enable gender-transformative seed entrepreneurship

Work Package 6:	CGIAR				1	2							3	1. Working paper on new metrics for tracking inclusive access to seed. 2. Working Paper with evidence synthesis of effective strategies for inclusive access to seed and evidence-based gender transformative strategies 3. Working Paper on context-specific business models for women and young entrepreneurs for seed production and marketing
Innovation Packages & Scaling Readiness	CGIAR					1			2					1. Documented scaling ambition, vision of success and roadmap for use of Scaling Readiness for selected 3 priority Core Innovations. 2. 3 evidence-based Scaling Readiness assessment reports and related scaling strategies for Innovation Package.
MELIA	CGIAR	**1**						**2**				**3**		1. Detailed MEL plan developed, baseline data compiled. 2. Mid-initiative evaluation report assessing impact progress for management, learning and decision making. 3. Impact assessments
Project Management	CGIAR	**1, 2**	**3**		**3**		**3**		**3**		**3**		**3**	1. Project Launch report. 2. Detailed budget and implementation plan 3. Annual progress and financial report for decision-making

7.3 Risk assessment

Top 5 risks to achieving impact (note relevant Work Package numbers in brackets)	**Description of risk (50 words max each)**	**Likelihood**	**Impact**	**Risk score** Likelihood x Impact	**Opportunities**
		Rate from 1 (low) -5 high	**Rate from 1-5**		
Inadequate funding (All WPs)	1.Reduction in number of key targeted countries and crops required for outcomes of food security under climate change. 2. Reduction in activities needed to generate knowledge and data to ensure targeted deliverable of longer-term variety access and turnover goals. 3. Loss of key staff competencies and skills	5	5	25	1. Engage NARES partners for capacity building across crops and countries, sharing methods and knowledge for fast-tracking outcomes. 2. Continued urgency and focus on bilateral funding 3. Build on success, utilize novel methods and apply cross learnings from other crops and countries Increase funding for impact studies
Climate change and variable adverse climatic conditions and pandemic lockdowns in some countries leading to seed production and dissemination failures and delays (WP1,2,3,6)	1. Incomplete activities in key target regions or countries 2. Repetition needed causing delays, needing to repurpose funds or seek additional funds 3. Delays due to key personnel not being able to travel for implementation and MELIA of field activities adequately. 4. Water scarcity during prolonged drought	3	3	9	1. Sufficient funding will enable risk minimization by increasing number of locations and countries where variety on farm trials, demos can be done to generate evidence and data for cross deployment and co-deployment strategies such as “seeds without borders” to minimize risks and faster variety turnover. 2. Generate data to develop knowledge in climate vulnerable countries to develop strategies for management and mitigation of climate change. 3. Provide feedback to ABI to enable trait discovery and development for improved climate resilient varieties, tools and packages

					with links to NARES . 4.Activties in rice such as Dry Direct Seeded Rice variety evaluations will strengthen choices.
Intellectual property restrictions and impediments in NARES key target countries (WP1,2,3 &4, 6)	1. Difficulties and delays in seed movement across regional countries in Africa and Asia due to lack of CGIAR and host country MOUs and agreements. 2.Onerous compliance requirements and restrictions on sharing of data and germplasm 3. Lack of systems across commodity based CGIAR teams restricting effective germplasm flow	2	3	6	1. Develop MOUs in target countries to ensure smooth process and germplasm flows. 2. Standardize germplasm sharing across CGIAR teams 3. Agreement with NARES for cross germplasm sharing with standard SMTA and OMTA systems irrespective which CGIAR team sends the seed consignment 4. Develop DNA fingerprinted variety hubs s for fast deployment of varieties to countries in links with NARES partners
Government policies less conducive towards seed delivery for equitable and sustainable outcomes (WP5.6)	1. Real or perceived threat to competitiveness of country farmers and trade 2. Lack of standardized agreements between CGIAR and target countries organizations and governments	2	3	6	Promote successful case studies Engage with regional and continental partners (e.g., AGRA, AU)
Failure to adopt a “One Health” approach leads to on-going damaging impacts of human-livestock crop- disease epidemics – environmental degradation and accelerated climate change		3	4	12	Strengthen collaboration across Action Areas and initiatives Engage with national and global partners

8. Policy compliance, and oversight

8.1 Research governance

Researchers involved in the implementation of this Initiative will comply with the procedures and policies determined by the System Board to be applicable to the delivery of research undertaken in furtherance of CGIAR's 2030 Research and Innovation Strategy, thereby ensuring that all research meets applicable legal, regulatory and institutional requirements; appropriate ethical and scientific standards; and standards of quality, safety, privacy, risk management and financial management. This includes CGIAR's CGIAR Research Ethics Code and to the values, norms and behaviors in CGIAR's Ethics Framework and in the Framework for Gender, Diversity and Inclusion in CGIAR's workplaces.

8.2 Open and FAIR data assets

Researchers involved in the implementation of this Initiative shall adhere to the terms of the Open and FAIR Data Assets Policy.

SeEdQUAL will align with the OFDA Policy's Open and FAIR requirements, ensuring:

- Rich metadata conforming to the CGIAR Core Schema to maximize Findability, including geolocation information where relevant
- Accessibility by utilizing unrestrictive, standard licenses (e.g. Creative Commons for non-software assets; General Public License (GPL))/Massachusetts Institute of Technology (MIT) for software), and depositing assets in open repositories.
    - Wider access through deposition in open repositories of translations and requiring minimal data download to assist with limited internet connectivity.
    - Interoperability by annotating dataset variables with ontologies where possible (controlled vocabularies where not possible).
    - Adherence to Research Ethics Code (Section 4) relating to responsible data (through human subject consent, avoiding personally identifiable information in data assets and other data-related risks to communities).

9. Human resources

9.1 Initiative team - table

Category	*Area of expertise*	*Short description of key accountabilities*
Research	Leads for crops Plant Breeding/Seed systems	Expertise in specific crops indicated in Work Packages
Research	Seed systems specialists (cereals, Beans and RTBs)	Product advancement, Variety On farm Testing partners with NARES, Demo for demand generation and Support NARES for early seed generation
Research	Product Managers (cereals, Beans and RTBs)	Product advancement, Liaison between SeEdQUAL and MIPP for feedback loop, MEL
Research	Field agronomist (cereals, Beans and RTBs)	On-farm testing and data collection co-ordination expertise
Research	Researchers (cereals, Beans and RTBs)	Co-ordinate/conduct on farm trials, demos either independently or in partnerships with NARES/SMEs
Research	Germplasm capacity building and NARES co-ordination leads	Co-ordinate germplasm dissemination and liaison with NARES and SMEs
Research	Plant Pathology, Epidemiology	Plant health, pest and disease management. Seed degeneration, novel virus diagnostics
Research	Agricultural, Development Economics	Demand led seed systems. Design of seed business models, SME entrepreneur capacity development Seeds production economics Behavioural economics
Research for Development	Social science	Transdisciplinary research methods Research on institutional and partnership arrangements
Research	Gender and social inclusion experts	Conduct gender and social inclusion research for crops and research for development of key knowledge components
Research	Policy and legal expert	Development of knowledge on EGS systems and applicable policies and testing hypothesis and development of relevant recommendation
Research support	Enabling and decision support tools coordinator	Coordination of tools for acceleration of variety demand generation, variety adoption and cross lessons implementation
Research support	Administration and data curation	Conducting data support and ensuring validated data is housed in CG databases MEL

9.2 Gender, diversity and inclusion in the workplace

The Initiative team will be comprised of individuals from diverse backgrounds but currently comprised of 32% women, below CGIAR's gender target of a minimum of 40% women in professional roles. To address this, we will consciously consider diversity and gender when recruiting follow the guidance outlined in CGIAR's *GDI Inclusive Recruitment Toolkit*, mindfully include diverse voices into all our project activities, including targeted outreach, inclusive job design for new positions, and succession planning where possible to support meeting gender targets.

Women, minorities, and other under-represented groups will hold leadership roles in the Initiative team. This will be seen in the composition of our senior team and will extend to the fair allocation of leadership activities and accountabilities.

9.3 Capacity development

SeEdQUAL confirms that team leaders and managers will complete training on inclusive leadership within three months of launch.

SeEdQUAL confirms that, within six months of launch, the Initiative team members will complete training on gender, diversity and inclusion, including on whistleblowing and how to report concerns.

SeEdQUAL confirms that Initiative kick-off will include an awareness session on CGIAR's values, code of conduct and range of learning opportunities available within CGIAR.

SeEdQUAL supports creation of development opportunities for all staff, especially junior level Initiative team members, partners and stakeholders through co-mentoring and cross-learning opportunities. Within the Initiative, SeEdQUAL will make efforts to uplift best practices for cross-CGIAR learning and benefit.

In WP 3, capacity development and technical backstopping will be provided through Africa based Center of Excellence for VPC seed innovations, providing leadership on seed systems research for development, policy development, technology transfer, capacity building, scaling, and promotion of best practices. WP 5 provides capacity development and coaching of Initiative teams and partners in policy research, communications, and influence pathways. WP 6 builds capacity of Initiative teams and partners in gender integration in R4D in seed systems.

10. Financial resources

10.1 Budget

10.1.1 Activity breakdown

USD	2022	2023	2024	Total
Crosscutting across Work Packages	0	0	0	0
Work Package 1	8,121,838	8,527,930	8,954,326	25,604,094
Work Package 2	3,767,036	3,955,388	4,153,157	11,875,581
Work Package 3	3,478,618	3,652,548	4,134,880	11,266,046
Work Package 4	2,357,250	2,475,112	2,598,868	7,431,229
Work Package 5	2,407,924	2,528,320	2,654,736	7,590,979
Work Package 6	2,560,530	2,688,557	2,822,984	8,072,071
Innovation packages & Scaling Readiness	40,000	60,000	60,000	160,000
Total	**22,733,195**	**23,887,854**	**25,378,951**	**72,000,000**

10.1.2 Geographic breakdown

USD	2022	2023	2024	Total
Global (not specific country)	22,733,195	23,887,854	25,378,951	72,000,000
Total	**22,733,195**	**23,887,854**	**25,378,951**	**72,000,000**

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