SAPLING – Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion

Lead: Isabelle Baltenweck (i.baltenweck@cgiar.org)
Co-Lead: Mourad Rekik (m.rekik@cgiar.org)

Proposal

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Initiative name	SAPLING – Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion
Primary Action Area	Resilient Agrifood Systems
Geographic scope	East Africa: Ethiopia, Kenya, Tanzania and Uganda West Africa: Mali South Asia: Nepal Southeast Asia: Vietnam
Budget	US$ 60,000,000

1. General information

- **Initiative name**: SAPLING – Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion
- **Primary CGIAR Action Area**: Resilient Agrifood Systems
- **Proposal Lead and Deputy**: Isabelle Baltenweck (CGIAR) and Mourad Rekik (CGIAR)
- **Initiative Design Team members and affiliations**:

Dessie, Tadelle (CGIAR)	Njuguna-Mungai, Esther (CGIAR)
Dione, Michel (CGIAR)	Notenbaert, An (CGIAR)
Fall, Abdou (CGIAR)	Omore, Amos (CGIAR)
Galie, Alessandra (CGIAR)	Omosa, Esther (CGIAR)
Haile, Aynalem (CGIAR)	Otieno, Mary Atieno (CGIAR)
Kassie, Girma Tesfahun (CGIAR)	Ouma, Emily (CGIAR)
Kristin Girvetz (Consultant)	Padmakumar Varijakshapanicker (CGIAR)
Marshall, Karen (CGIAR)	Peters, Michael (CGIAR)
Mwai, Okeyo (CGIAR)	Poole, Jane (CGIAR)
Najjar, Dina (CGIAR)	Teufel, Nils (CGIAR)
Nene, Vish (CGIAR)	Wamatu, Jane (CGIAR)

2. Context

2.1 Challenge statement

Transformation to a more sustainable and equitable livestock sector in Africa and Asia can secure and enhance the critical role livestock plays to support and improve livelihoods. Livestock is a fast growing, high value agriculture subsector, accounting for 15–80% of agricultural GDP in low and middle-income countries. In Africa and Asia, demand for livestock products is expected to grow 200–300% by 2030 depending on the region and commodity. This provides an opportunity for hundreds of millions of small- to medium-scale livestock producers who can meet the demand and provide nutrient dense foods for their families, countries, and regions.[1] The African Development Bank echoes other development leaders[2] [3] [4] in highlighting now as the time to "reposition livestock as a business activity with the potential to significantly improve food and nutrition security and drive inclusive [economic] growth…" [5]

Failing to capitalize on this opportunity and meet demand could lead to a shortfall in livestock-derived foods (LDFs), which are a unique source of high-quality proteins and bioavailable essential micronutrients. Relatively small amounts of LDFs can substantially increase the nutrient adequacy of diets.[6] [7] But malnutrition remains high in livestock dependent communities.[8]

This is in part because productivity is low; annual milk yield of a cow in Sub-Saharan Africa and South Asia is 6% and 12%, respectively, of a cow in an OECD country. Within production system yield gaps are high for all species.[9] In Ethiopia, for example, there is a 20% yield gap for sheep from genetics alone.[10] Widespread constraints to achieving sustainable productivity include: non-optimal use of livestock genetic potential; lack of optimal adaptive and productive livestock genetics; lack of resilient, resource efficient feeds and forages available year-round in sufficient quantity and quality; poor animal health management and husbandry; and a combination of insufficient and underutilized animal health technologies.[11] [12] [13] These combine to increase pressure on natural resources and GHG emissions intensities.[14] At the same time, value chain governance structures prevent producers from fully benefiting from markets, investing in sustainable productivity and commercializing their farms.[15]

Failure to address constraints to livestock productivity and the growing risks from climate change[16] [17] and other shocks like the COVID-19 pandemic[18] can limit productivity gains while putting sustainability at risk. Increasing yields can contribute to lowering emissions intensities while enhancing livelihoods.[19] [20] But research is needed to better understand trade-offs between productivity, environmental impacts and livelihood outcomes.[21] [22]

Women, who often look after livestock, have limited control over resources and decisions.[23] [24] Youth, who supplement household labor are marginalized from income-generation opportunities and assets.[25] Research is needed to identify livestock development solutions that achieve equitable access and benefits.

Advances in improved forages, animal breeding, herd health, and markets have demonstrated sustainable gains in on-farm productivity[26] [27] [28] [29] but need to reach impact at scale. Bundling combinations of new and scale-ready technical innovations with the right institutional arrangements and policy support has the potential to increase sustainable productivity.[30] [31] But deep and early engagement with stakeholders in iterative co-design approaches is needed to increase impact and accelerate scaling. SAPLING will engage stakeholders to generate evidence on Innovation Packages that support livestock producers, including women and youth, to

transition to sustainable, resilient livelihoods and productive enterprises. This is expected to catalyze investment by public and private sectors and enable a supportive policy environment, enhancing scale potential.[30]

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

By 2024:

1. Co-created, demand-driven Innovation Packages of productivity- and resilience-enhancing, low emissions technologies, and the institutional arrangements (including markets) necessary for their adoption, are being used by 800,000 people (male and female) in households keeping cattle, chickens, small ruminants, pigs and buffalo in Ethiopia, Kenya, Tanzania, Uganda, Mali, Nepal and Vietnam resulting in a 30-50% increase in livestock productivity.
2. Private and public sector partners invest at least US$30 million in co-creation and -delivery of novel, low emissions, demand-driven, gender and youth inclusive, and productivity- and resilience-enhancing technologies and practices for genetics, feed-forages, and health.
3. Six public and private sector organizations utilize Initiative-supported social behavior change communication strategies and tools targeted at incorporating safe LDFs into diverse diets to inform nutrition education strategies and/or campaigns.
4. Public and private decision makers utilize the Initiative-supported Innovation Packages to inform policies and investments in Ethiopia, Kenya, Tanzania, Uganda, Mali, Nepal and Vietnam towards an inclusive and sustainable livestock sector, including progress towards equity and inclusion.

SAPLING is projected to reach 800,000 people (male and female) by 2024. In the 3-year period, it is assumed SAPLING can reach 15% of the 2030 beneficiaries in two countries where relationships and programs will be built (Mali and Nepal), and 35% in five countries (Vietnam, Ethiopia, Kenya, Tanzania, Uganda) where SAPLING builds on well-established relationships and long-term activities.

2.3 Learning from prior evaluations and Impact Assessments (IA)

1. **Innovations co-designed with 'next- and end-users', especially livestock communities and public and private investors, have higher potential for adoption, impact and scale.**[32] [33] [34] [35] SAPLING will expand (and extend to other countries) the experience and lessons from the CGIAR Research Program (CRP) on Livestock's country projects in bringing scientists and stakeholders together for coordinated research for development activities.[36] A key approach is to engage early and continuously with scaling partners, especially the private sector.[37] [36] [34]
2. **Transdisciplinary collaboration is needed to translate technical advances beyond productivity gains to livelihood transformation**. Technical research should be connected to socio-economic context, farmers' demand and private sector priorities to achieve impact.[12] [36] [37]
3. **Dedicated gender programming is needed to ensure equity and empowerment can advance.** Incorporating gender as a dedicated Work Package (WP) and a cross-cutting theme will drive more impact.[36] [37] [38]
4. **Designing and delivering Innovation Packages rather than singular interventions is a promising step forward to achieve impact.**[34] [36] This approach is beginning to show

evidence of higher impact in the CRP Livestock, but further research is needed. This approach is more complex and time consuming than single interventions, which should be accounted for in program planning.

5. **Rigorous impact assessments of livestock research are needed**. A paucity of existing studies limits the evidence available to better design programs for impact. The experience with the CRPs Fish and Livestock shows the need to plan for such studies during design phase. Assessments must extend beyond the 3-year implementation timeframe to generate meaningful results. The engagement of SPIA will be instrumental in these efforts.[39] [36]

2.4 Priority-setting

Science, Innovations and Activities

Prioritization is on-going through stakeholder consultations, learning from extensive in-country research and experience (e.g., CRPs, bi-lateral projects) and co-design approaches. Stakeholder engagement includes Initiative design workshops,[40] and the 2019 ILRI Global Design Workshop, which brought together over 70 representatives of the global livestock sector from public and private sectors.[41] [42] [43] [44]

The persistent livestock yield gap in target regions is a key driver for SAPLING research priorities, which include the three pillars of livestock productivity health, genetics and feed. Priority research and activities are based on an existing innovation's readiness to Transfer or Adapt or whether Novel research is needed.

1. **Transfer** of Innovation Packages directly from past success locations to new locations for the same value chain. Example: Combinations of community-based breeding and herd-health packages in Ethiopia can be utilized and contextualized for Nepal, Mali and Tanzania.[30]
2. **Adapt** existing innovations that address unique problems in one location to contextually apply them to another. Examples: Digital data capture and feedback systems developed for dairy cattle genetic gain research in East Africa can be adapted for use in cattle and buffalo improvement in Mali and Nepal, respectively.[45] [46] Disease risk maps developed in Vietnam can be extended to Ethiopia, Mali and Nepal.[47] [48]
3. **Novel** research based on a package that seeks to promote a new, more desirable, food system (e.g., smart packaging of genetics, health and feed in pastoral small ruminant value chains).

Co-design approaches will be utilized to match demand with the research solutions SAPLING offers. Co-design involves: 1) joint identification of challenges; 2) co-creation of solutions including trade-off analysis to facilitate decision;[21] 3) continuous monitoring for relevance, reach, rigor and value for money; and 4) course correction. It can include establishing independent scientific and industry advisory committees with members from private sector, producers/producer organizations and research institutions. Examples include community-based breeding programs,[49] African Dairy Genetic Gains[50] and Tropical Poultry Genetic Solutions.[51]

Research on leveraging livestock to achieve equity for women is prioritized to increase the potential of adoption and impact.[52] Increasing consumption of safe and affordable LDFs is prioritized to ensure that gains in nutrition outcomes can be realized.[53] [54]

Geographies and Value chains

SAPLING target countries of Ethiopia, Kenya, Tanzania, Uganda, Mali, Nepal and Vietnam were selected based on:

- Tropical Livestock Units per 1,000 people[55]
- Multidimensional Poverty Index[56]
- Prevalence of stunting in children under 5 years of age[57]
- Gender Inequality Index 2019[58]
- Opportunities to rapidly scale building from CRP Livestock and bi-lateral projects
- Support and buy-in from national stakeholders[40 59 60 61 62 63 64 65]
- Aligning with geographic priorities of key potential donors

SAPLING prioritized 14 country-value chain combinations (see "Priority Value Chains in Target Countries"). Two additional country-value chain combinations are high potential for inclusion pending funding (chickens in Kenya and Vietnam). Selection of species and value chains is based on:

- Economic importance
- Contribution to food and nutrition security
- Contribution to social inclusion and women's empowerment
- National level priorities and buy-in
- Opportunity assessment (yield gap + a growing market + prospect for new and/or adapted technology to drive productivity growth)
- Existing research and partnerships

Selection of the same species in at least two countries (except for buffaloes) will facilitate comparisons and south-south knowledge exchange while minimizing the risk of losing a species if work in one country becomes impossible for reasons out of the Initiative's control (e.g., unstable security situation, etc.).

Priority Value Chains in Target Countries

2.5 Comparative advantage

SAPLING is led by an unrivaled, diverse team of scientists, including leaders in multiple disciplines across genetics, feed, health, value chains, nutrition, gender and natural resource management focused on delivering innovations for livestock productivity in the global south. No

other consortium of research institutions has the same breadth and depth of expertise across countries, species and livestock production systems.[66]

SAPLING is building on deep knowledge of local context and trusting partner relationships established over decades of work in countries to inform design and accelerate at-scale delivery (see Annex for a list of recent and current projects).[67] [68] [69]Design included consultation with over 300 stakeholders in target countries.[40]

SAPLING is leveraging strong international research partnerships (e.g., University of Florida, Washington State University) and global and regional scaling partners (e.g., African Development Bank, multinational companies). Donors were consulted in design, reflected in the focus on co-design of innovations and strong gender lens.

SAPLING scientists are experts in priority areas:

1. Implementing impactful genetic improvement innovations in Africa and Asia.[70] [10]
2. Developing robust feed solutions including well-renowned breeding programs for tropical and sub-tropical forage species.[71] [68]
3. Tackling endemic and epidemic tropical animal diseases that most impact small-scale producers.[72] [28]
4. Integrating gender sensitive and transformative approaches across innovations.[73] [74] [75] [76] [77] [24]
5. Understanding and promoting policies, value chain governance structures and institutions that support inclusive, sustainable growth.[78]
6. Leveraging innovations in phenomics;[79] genomic selection;[80] [11] digital technologies;[79] [81] climate-adapted solutions;[26] [82] women's empowerment;[83] [84] and scaling approaches[85] to drive impactful research outputs and delivery.

SAPLING will leverage significant CGIAR physical resources: 1) strong biosciences capabilities; 2) Level 2+ large animal testing facilities; 3) large research stations for field trials; and 4) the largest, most available and diverse germplasm collection of tropical and subtropical forages globally.[71]

2.6 Participatory design process

Co-design with national-level stakeholders is a SAPLING priority. As a starting point during proposal development, a series of 2–3 hour virtual national workshops were conducted to engage stakeholders in six of the seven priority countries. In CRP Livestock project countries, these consultations built on existing work and relationships. The workshops asked participants to provide input and feedback on livestock challenges, priority innovations and priority value chains and locations, and to contribute general advice and recommendations on SAPLING design. SAPLING incorporated critical pieces of feedback, including, for example, to focus on buffalo in Nepal. Participants were from a wide range of institutions including the ministries of agriculture/livestock and other relevant government bodies, national agricultural research systems (NARS), local universities, NGOs, private sector companies, livestock producer organizations, and CGIAR scientists working in the country/region. In Uganda and Tanzania, the workshops were conducted jointly with the LCSR Initiative and in Vietnam with the OneHealth Initiative.

Key feedback on priority innovations from each workshop is summarized below with more detail available in the corresponding blogs.

- Nepal (35 participants): Involve diverse stakeholders to ensure scaling; promote digital technologies; organize farmers to improve market access and competitiveness; work on appropriate feeds and forages; target youth and women empowerment; focus on livestock water productivity improvement; and work on genetic and reproductive improvement of buffalo and goats.[86]
- Vietnam (90 participants): Work on improving productivity for upland areas; focus on herd health, genetics and feed-forages; enhance market access for the deltas; support better coordination among supply chain actors to address high costs and poor infrastructure; and engage social science partners in addressing gender equality and inclusion.[87]
- Ethiopia (25 participants): Improve the infrastructure of the feed system; support herd health, producer financing and artificial insemination services; and work on capacity building, digitalization of innovations, advocacy on best practices and encouraging private-public partnerships.[88]
- Tanzania (47 participants): Introduce improved forage species, feeds, breeding programs, and vaccines and viable delivery models; support evidence-based advocacy to attract more investors for processing and value addition; and focus on the use of digital tools for extension and marketing.[89]
- Uganda (71 participants): Focus on women and youth empowerment; support work on improved feeds, vaccines research, disease control strategies and policies; work on reliable and accessible artificial insemination services; and work on technologies and innovations for value addition, financing and efficient value chain linkages.[90]
  Mali (44 participants): Improve overall data quality for the livestock sector to guide decisions; develop better market information systems; improve feed supply through planted forages and feed processing units; develop livestock markets and support access to financial services; and develop village poultry systems.[91]

In Kenya, engagement with national stakeholders was undertaken as part of the Kenya Livestock Master Plan development process which launched in May 2021.[92]

In addition to national consultations, SAPLING consulted 1:1 with donors (e.g., Bill & Melinda Gates Foundation), academic experts (e.g., Aberdeen University, Swedish University of Agricultural Sciences, University of Florida, University of Kiel, University of New England), implementing partners (e.g., NGOs such as Venture37) and other CGIAR scientists.

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.

Summary of SAPLING Project Benefits 2022–2030

Impact area	Indicator	Breadth	Depth	Probability
Nutrition, health and food security	# of people benefiting from relevant CGIAR innovations	1,220,000	Substantial[1] 320,000 Significant[2] 900,000	Medium
Poverty reduction, livelihoods and jobs	# of people benefiting from relevant CGIAR innovations	2,450,000	Substantial[1] 1,050,000 Significant[2] 1,400,000	Medium
Gender equality, youth and social inclusion	# of women benefiting from relevant CGIAR innovations	360,000	Transformative 200,000 Gender responsive 160,000	Lower
Climate adaptation and mitigation	# of people benefiting from climate-adapted innovations	1,050,000	Significant[2] 1,050,000	Medium
Environment health and biodiversity	# of ha (hectares) under improved management	59,000	Substantial[3] 59,000	Medium

[1] Substantial depth = 50% permanent impact on income
[2] Significant depth = 10% permanent impact on income
[3] Substantial = where improved management delivers to of the following three benefits: improvements in soil health and fertility, delivers biodiversity gains, and provides additional ecosystem service improvements

The full methodological approach is in the Annex.

Selected indicators for the different Impact Areas are:

(1) **# of people benefiting from relevant CGIAR innovations –** nutrition, health and food security
(2) **# of people benefiting from relevant CGIAR innovations –** poverty reduction, livelihoods and jobs
(3) **# of women benefiting from relevant CGIAR innovation –** gender equality, youth and social inclusion
(4) **# of people benefiting from climate-adapted innovations –** climate adaptation and mitigation
(5) **# of ha (hectares) under improved management –** environmental health and biodiversity

Indicators 2, 3 (gender responsive depth), 4 and 5 relate to our impact pathways on: technologies and practices; Innovation Packages and business models; and scaling. Indicator 1 is reached though our safe animal source food consumption impact pathway while indicator 3 at transformative depth is reached though our gender equality and social inclusion pathway.

Breadth for the first four indicators was calculated for value-chains (country x species combinations) targeted by SAPLING's different impact pathways, as follows. Firstly, target livestock production systems for each value chain were identified according to.[93] Secondly, the number of rural livestock keepers within these target production systems was calculated by adjusting 2020 human population figures[94] to rural population, removing percentage urbanization[95]; following this, the figure was adjusted by the proportion of livestock keepers within

selected production systems[93] (excepting chicken value chains assumed to be kept by 80% of the rural population).[96] Thirdly, national poverty headcount ratio (incomes below US$1.90 per day at 2011 purchasing power parity levels)[97] were used to convert to the number of rural poor livestock keepers. Fourthly, the adoption rate for SAPLING Innovation Packages was assumed to be 5% of the target population. Adoption rates in the literature vary widely (for example, ranges of 4 to 94%[98 99 100 101 102]). The adoption rates used here are at the lower end of the scale but are realistic given the Initiative's timeline and resources, and because those reported in the literature are often ex-ante or prior to scaling. Fifthly, to remove double-counting, it was assumed that if one impact pathway was targeting two or more value chains within the same target production system then these are the same households. Finally, estimates were summed across all countries. This gave the breadth for indicators 1 and 2 (different breadth estimates due to nutrition focus in only a subset of value-chains). For indicator 3 (# of women benefiting), number of people was adjusted to number of women by dividing by household size (giving one woman per household) and then multiplying this by the percentage of women currently engaged in the value chains (from 11 to 77% depending on the value chain, calculated from evidence provided in https://bit.ly/3hVHEP,l[103] https://bit.ly/3hYTyIs,[104] and extracted from data found in https://bit.ly/3o57sg9,[105] and https://bit.ly/3zHRwm0[106] For value-chains where gender transformative work is being undertaken, an increase in the number of women benefiting from livestock to 2030, in comparison to current levels, is 20%, based on that reported in https://bit.ly/3kA6oP5,[107] https://bit.ly/3EQSKz9[108] and https://bit.ly/3hYTyIs.[104] For indicators 4 and 5, improved forages is identified as the key innovation for climate adaptation and mitigation and environmental health and biodiversity. Thus, breadth for indicator 4 is only calculated for a sub-set of value chains (where forage work will be undertaken). For indicator 5, breadth for indicator 4 was divided by household size (to give the number of households adopting) multiplied by an area of production for each adoptee household of 0.25 hectares, based on evidence provided in https://bit.ly/2XVkD8t[109] and https://bit.ly/3CKCZYB.[110]

This process assumes that the beneficiaries for these first four indicators are poor livestock keepers. At this stage non-poor livestock keepers, other value chain actors, or LDFs consumers that are not livestock keepers have not been included but some are additionally expected to benefit.

Depth for indicators 1 and 2 were assessed based on permanent impact on income, as SAPLING Innovation Packages are expected to be sustainable. For dairy cattle value chains in Kenya, Ethiopia and Tanzania, a depth of substantial (50% permanent impact on income) was used, based primarily on values reported in https://bit.ly/3hVIzj7 [111] and https://bit.ly/3hYTyIs [104] and because there has been a considerable body of work undertaken in these value chains upon which SAPLING is building. For other value-chains a depth of significant (10% impact) was used, based on lower values of literature estimates and additional calculations (for example https://bit.ly/2ZeZkPv,[30] https://bit.ly/3kw53sA,[112] https://bit.ly/3CzZ8c1,[113] https://www.rhomis.org/ [106] and https://bit.ly/2XVkD8t)**.**[109] For indicator 3 the transformative depth category was used only for the value chains where gender transformative work[114] will be undertaken; in all other cases the depth was considered to be gender responsive.[115] For indicator 4, where the key innovation contributing to impact is considered to be planting improved forages, permanent impact on income was again used as the depth indicator and considered to be significant based on literature estimates**.**[109] Finally, for indicator 5 a depth of substantial was used as improved forages have been documented to positively impact soil health and fertility and ecosystem services.[116 117 118 119]

For all indicators, bar indicator 3, the *probability* of achieving the indicated breadth and depth was considered medium (i.e., 30–50% expectation of achieving the stated impacts by 2030). This is because of risks identified in the impact pathways (for example, private sector unable or unwilling to invest in innovations, insufficient incentives for livestock producers to change behaviors) and uncertainties in the predictions (for example, production systems used rather than focal geographic areas, due to the latter not yet being defined, and limited evidenced on assumptions, such as the percent increase in household incomes from livestock innovations). For indicator 3, the probability is considered low (10–30% expectation) in recognition that the approaches to supporting transformation in underlying gender dynamics which SAPLING will be testing are novel.

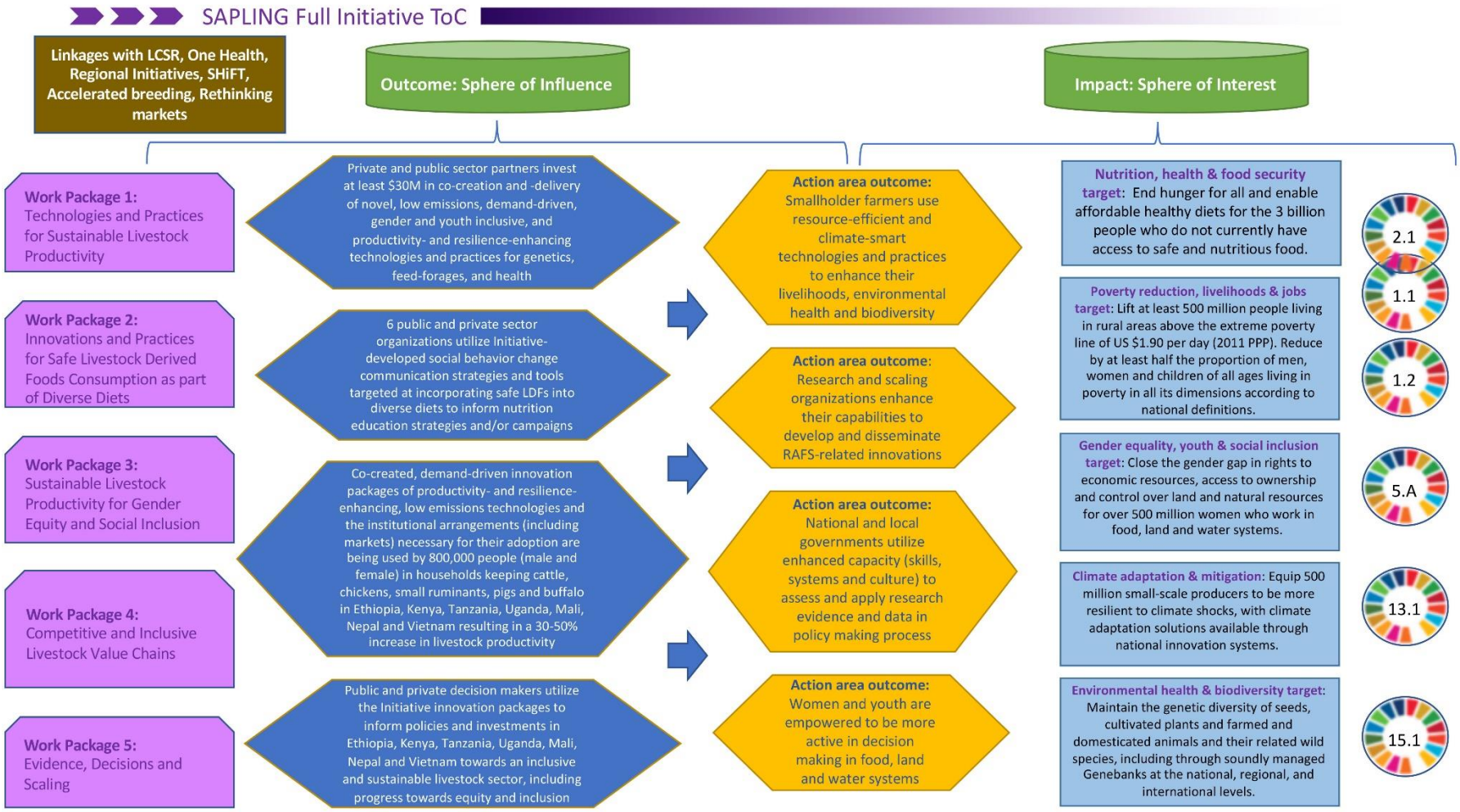
During the inception period the projections will be refined by, amongst others: (a) combining the production system area with administrative areas identified for SAPLING work to provide a more specific geographic focus for each value chain; (b) including beneficiaries besides poor livestock keepers and improved estimates on women and youth; and (c) expanding indicators 4 and 5 to include other climate-adapted innovations beyond forages.

Further, synergies with other Initiatives, particularly LCSR and OneHealth, are anticipated as per our TOC. Additional impact from these synergies has not been assumed in this set of projections, to ensure these are conservative and to avoid double counting of beneficiaries between Initiatives. Synergies will be further developed and factored into future projections during the inception period.

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

3.1 Full Initiative TOC

3.1.1 Full Initiative TOC diagram



3.1.2 Full Initiative TOC narrative

SAPLING contributes to transforming livestock sectors in target countries to make them more productive, resilient, equitable and sustainable. To support this transformation, SAPLING has three main pathways: 1) Co-creation and -delivery of sustainable productivity- and resilience-enhancing innovations that are expected to go to scale with the up-front involvement of demand and scaling partners. 2) Generation and communication of evidence that can influence policies and investments to support transformation. 3) Capacity building of partners to use the innovations packages and evidence to drive change.

SAPLING's end-of-Initiative outcomes will be achieved by 1) Building on decades of research in development (e.g., at technology level, focus on animal diseases important to the poor but of limited interest to multinational companies; market system approaches that experiment with incentive mechanisms to trigger win-win for producers and service providers. 2) Continuing to generate new, cutting-edge innovations. 3) Harnessing relevant and ready-to-go innovations, prioritized based on trade-off analyses and scaling readiness assessments. 4) Strong presence in target countries with activities aligned to national priorities and relationships that enable influencing policy makers and investments. 5) Co-design with large networks of demand, innovation and scaling partners.

By 2030, SAPLING's outcomes will translate to impacts:

1,220,000 people have significantly increased access to safe and affordable LDFs and incorporate recommended quantities in their diets through 1) increased productivity, 2) better-functioning value chains and 3) nutrition education. (**Nutrition, health and food security)**

2,450,000 people have increased sustainable livestock productivity and income through 1) adoption of productivity- and resilience-enhancing Innovation Packages and 2) participation in inclusive value chains. New business opportunities and jobs for value chain actors are also created. (**Poverty reduction, livelihoods and jobs)**

360,000 women are participating in and benefiting from livestock sector transformation through increased knowledge, capacity and buy-in of actors to facilitate equal opportunities. (**Gender equity, youth and social inclusion)**

1,050,000 people achieve large gains in productivity, reducing GHG emissions intensity, through increased knowledge, capacity and buy-in of actors to provide producers with low-emissions innovations (e.g., more adapted breeds, better feeds, improved health). (**Climate adaptation and mitigation)**

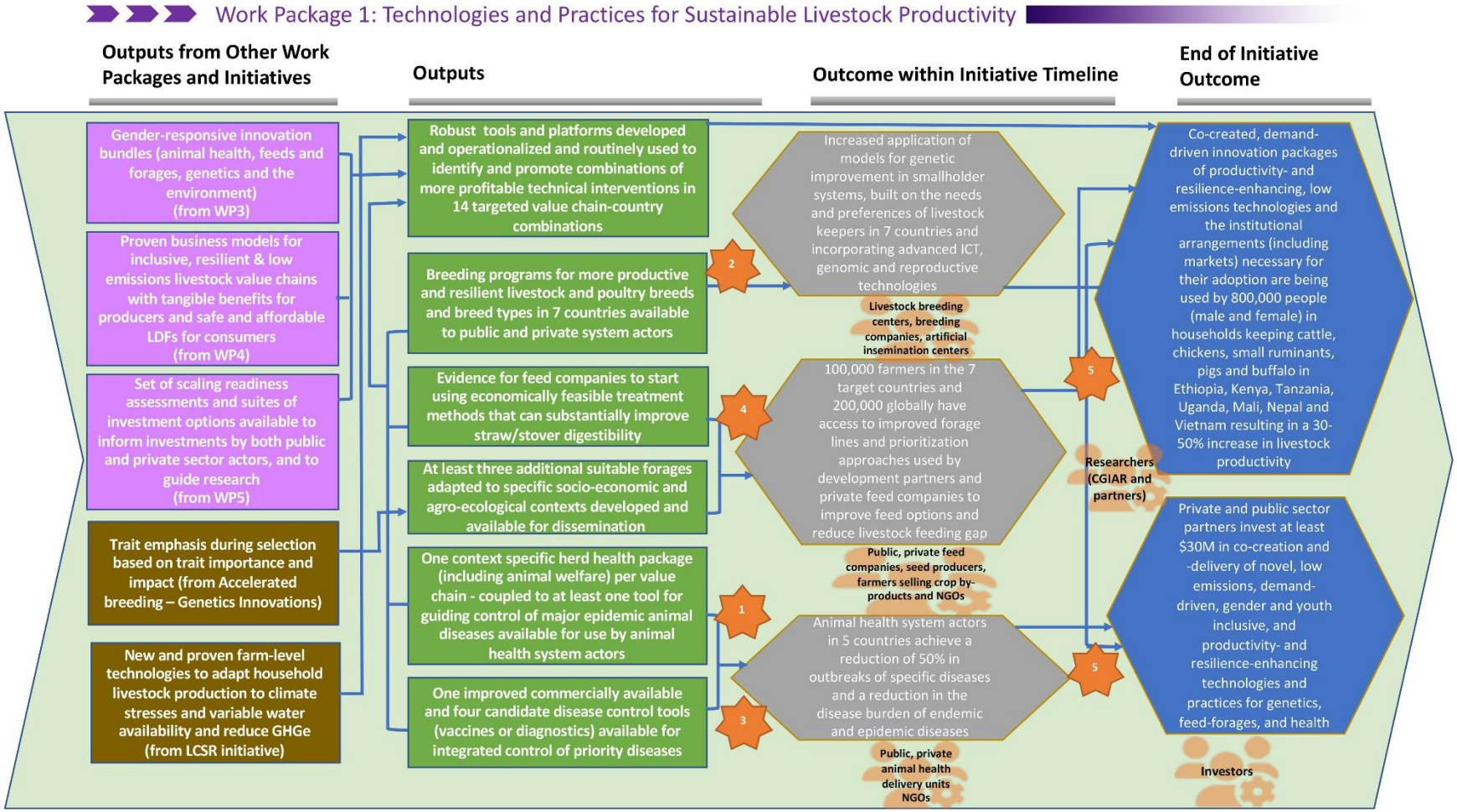
59,000 ha are planted in improved forages, resulting in improved soil health and fertility, ecosystem services and reduced land degradation as a result of producers' adopting Initiative-supported solutions. Impacts are also expected from improved manure management and reduced antibiotic residues. (**Environmental health and biodiversity)**

Adaptation and resilience of local livestock breeds and agro-biodiversity of forage species are preserved and enhanced through Initiative-supported genetic and forage improvement programs. (**Environmental health and biodiversity)**

TOC assumptions:

1. Women and men producers and value chain actors see the need for and value of SAPLING-supported innovations given their situation and market conditions.
2. Value chain actors and regulatory authorities are able, supportive and willing to invest to enhance supply of safe and affordable LDFs and to increase equity and inclusion in the value chain.
3. Private sector actors foresee business cases in the tested innovations and SAPLING and investors (i.e., donors) can reduce their risks, allowing them to co-invest.
4. Design and delivery of innovations in genetics, health and feed-forages can be amended to increase equality and women's empowerment.
5. Policy makers in the agriculture and livestock Ministries and decision makers in line departments show willingness to allocate more resources, create an enabling environment and support de-risking of private sector investments to scale successfully tested innovations.

3.2 Work Package TOCs



3.2.2 Work Package research plans and TOCs

Work Package 1: Technologies and Practices for Sustainable Livestock Productivity

Work Package title	Technologies and Practices for Sustainable Livestock Productivity
Work Package main focus and prioritization (max 100 words)	With co-design partners, WP1 will develop, adapt and test new and existing productivity- and resilience-enhancing, low emissions, scalable technologies and practices across the three main pillars of livestock productivity. This comprises the work on improved feeds (including forages and food-feed crops), animal health products (including vaccines, diagnostics, herd health packages, husbandry and disase control decision making tools) and improved genetics (tropically adapted and productive livestock and chicken breeds/breed types and reproductive technologies). Technologies and practices from the three pillars will be bundled for delivery to optimize opportunities for impact, working with WP4. Globally work focuses on all seven priority species.
Work Package geographic scope (Global/Region/Country)	Work will be in all seven priority countries: Nepal (South Asia), Vietnam (Southeast Asia), Ethiopia, Kenya, Tanzania and Uganda (East Africa) and Mali (West Africa). Innovations developed as part of this WP can be adapted other contexts and made applicable in low- and middle-income countries (LMICs) globally. This will be facilitated (with WP5) through publications and sharing of lessons learned.

The Science

No	Research questions	Scientific methods	Key outputs
1	How to accelerate the improvement of existing sub-optimal vaccines and development of more efficacious new generation vaccines and diagnostic tools for the control of the most important endemic and epidemic livestock diseases for smallholder livestock producers?	-Identify and test best bet vaccine and diagnostics technology platforms in the discovery to manufacture pathway with academic and private sector partners[120] [121]	One improved commercially available and four candidate disease control tools (vaccines or diagnostics) available for integrated control of priority diseases
2	How can recent advances in phenomics, genomics, digital and reproductive technologies be capitalized on to achieve sustainable and scalable models for livestock genetic improvement, conservation and delivery that ensure women and men livestock keepers equitably access and benefit from improved genetics?	-Conduct upstream and downstream research in phenomics, genomics, [11] digital and reproductive technologies -Adapt digital and sensor technologies to phenotype livestock and poultry -Jointly apply emerging genomic tools and quantitative genetics models to evaluate target livestock and poultry populations -Adapt emerging reproductive technologies and develop new reproductive technologies to deliver genetic gains more effectively	Breeding programs for more productive and resilient livestock and poultry breeds and breed types in seven countries available to public and private system actors

3	How to make optimum use of agricultural byproducts, mainly crop residues, using innovative, resilient, low emissions technologies already in use in other sectors (e.g., biofuel production)?	- Use 2-Chemical Combination Treatment (2-CCT) and Steam Treatment on crop residues to assess productivity impact and economic feasibility	Evidence for feed companies to start using economically feasible treatment methods that can substantially improve straw/stover digestibility
4	How to develop and apply stress resilient improved forages and food-feed crops that respond to year-round feed demands, increase productivity, improve natural resource use efficiency, and adapt to and mitigate climate change?	-Target forages and food feed-crops to specific niches -Apply state of the art technologies and multilocational evaluation including agronomic management and feed evaluation [26] -Use a product pipeline approach for continued adaptation	At least three additional suitable forages adapted to specific socio-economic and agro-ecological contexts developed and available for dissemination
5	Can integrated herd health management packages through digital farmer-support systems and appropriate animal disease control decision tools address complex interrelated disease control challenges, while being effectively delivered?	-Apply and evaluate veterinary herd health management approaches -Develop effective disease control tools and strategies	One context specific herd health package (including animal welfare) per value chain — coupled to at least one tool for guiding control of major epidemic animal diseases — available for use by animal health system actors
6	How to best combine innovations in livestock genetic improvement, animal health (herd health, vaccines and diagnostics) and feed-forages for increased livestock productivity, including under a future changed environment, and ensuring equitable benefit to livestock value chain actors?	-Pilot test and monitor different combinations of individual health, genetic and feed-forages innovations according to three paths (Transfer, Adapt and Novel) [27] -Share evidence as an input to the Innovation Packages tested in WP4 to ensure the best-bet combinations of health, genetic and feed-forages innovations are included	Robust tools and platforms developed and operationalized and routinely used to identify and promote combinations of more profitable technical interventions in 14 targeted country-value chain combinations

Theory of change

Causal process

WP1 aims to fill critical productivity gaps through two pathways. 1) Developing a pipeline of new and existing innovations across the three pillars of productivity. For example, in animal health, optimized vaccine formulations for contagious caprine pleuropneumonia and bovine pleuropneumonia. In animal genetics, genomic selection-based breeding programs for dairy cattle. In feed-forages, second generation biofuel technologies to convert ligno-cellulosic crop residues into high-quality feed. 2) Co-designing Innovation Packages that bundle technologies. The focus on bundling technologies is predicated on the need to integrate the three pillars to optimize impact (e.g., benefits of improved forages will not be optimized unless better genetics and improved healthcare are available).

Building on previous work (e.g., CRP Livestock, bi-lateral projects), multidisciplinary teams of scientists and partners will co-design technologies, tools and their combination. This is expected

to generate solutions that better meet the needs and preferences of users, resulting in higher adoption and addressing the assumption that there is demand for WP1 outputs (Assumptions 1-4). WP1 will cultivate win-win relationships with partners to stimulate investment in co-creation and delivery of innovations, helping to facilitate scale (Assumption 5). Increasing partner capacity to use this range of technologies will be supported through joint learning and building partner networks.

In three years, these efforts will contribute to 800,000 people (male and female) in livestock producing households adopting Initiative-supported Innovation Packages, transitioning their systems to sustainable, low emissions production, and achieving a 30–50% increase in productivity.

Assumptions

1. There is demand from animal health services for context specific tools and protocols to identify and prioritize major animal diseases and effectively implement control strategies
2. There is demand from livestock genetic improvement centers for breeding schemes and delivery systems that are sustainable and based on business models.
3. There is demand from animal health services to continue integrating mass-vaccination as a pillar of their strategies to control priority diseases.
4. There is demand from farmers, seed companies and feed sellers for superior quality feed ingredients and commercial products.
5. System actors are committed to co-invest, -create, and -deliver productivity enhancing technologies and practices.

Partners

Demand: Producers/producer organizations; public animal health and livestock genetic improvement centers

Scaling: Private genetics companies (e.g., Hendrix Genetics, GENUS, Taurus); vaccine manufacturing companies (e.g., Zoetis, Hester Biosciences); feed-forages seed production companies (e.g., Devenish Nutrition Ltd., NIMBUS); NGOs with strong field presence; large-scale development programmes (e.g., Regional Sahel Pastoralism Support Project)

Innovation: Transforming Animal Health Solutions and Services for LMICs (TAHSSL),[122] the Centre for Tropical Livestock Genetics and Health (CTLGH),[123] private companies (e.g., GENUS, Zoetis)

Interdependence and synergies

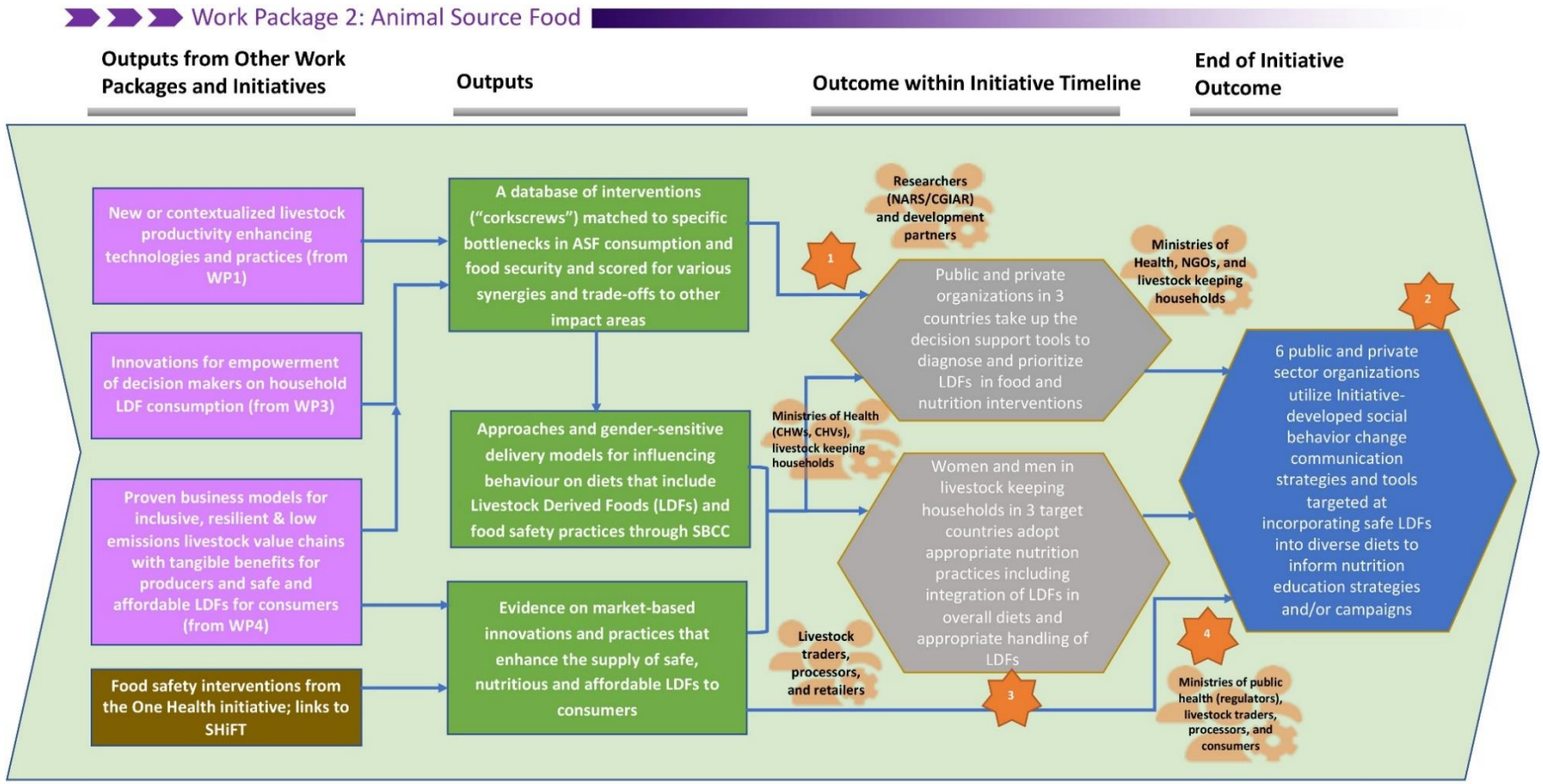
WP2: Supports safe production and handling of LDFs as part of WP1 innovations and facilitates increased productivity to translate into improved nutrition.

WP3: Designs and tests women — and youth — demanded WP1 innovations.

WP4: Utilizes WP1 technology bundles in Innovation Packages including viable business models for delivery.

WP5: Supports WP1 innovations to scale, disseminates knowledge and lessons learned globally and supports an enabling policy environment.

WP1 work with other Initiatives: **Genetic Innovations** to ensure that SAPLING forage breeding (targeting agronomy and utilization by livestock) benefits from their upstream scientific expertise. **LCSR** for low-emissions, resilient technologies and practices. **OneHealth** on herd health and practices to reduce anti-microbial use and resistance. **Regional Initiatives** working on livestock (e.g. South East Asia, East/Southern Africa) for the dissemination of relevant SAPLING innovations.


Work Package 2: Animal Source Food
Outputs from Other Work Packages and Initiatives
Outputs
Outcome within Initiative Timeline
End of Initiative Outcome
New or contextualized livestock productivity enhancing technologies and practices (from WP1)
Innovations for empowerment of decision makers on household LDF consumption (from WP3)
Proven business models for inclusive, resilient & low emissions livestock value chains with tangible benefits for producers and safe and affordable LDFs for consumers (from WP4)
Food safety interventions from the One Health initiative; links to SHiFT
A database of interventions ("corkscrews") matched to specific bottlenecks in ASF consumption and food security and scored for various synergies and trade-offs to other impact areas
Approaches and gender-sensitive delivery models for influencing behaviour on diets that include Livestock Derived Foods (LDFs) and food safety practices through SBCC
Evidence on market-based innovations and practices that enhance the supply of safe, nutritious and affordable LDFs to consumers
Researchers (NARS/CGIAR) and development partners
1
Public and private organizations in 3 countries take up the decision support tools to diagnose and prioritize LDFs in food and nutrition interventions
Ministries of Health, NGOs, and livestock keeping households
Ministries of Health (CHWs, CHVs), livestock keeping households
Women and men in livestock keeping households in 3 target countries adopt appropriate nutrition practices including integration of LDFs in overall diets and appropriate handling of LDFs
Livestock traders, processors, and retailers
3
2
6 public and private sector organizations utilize Initiative-developed social behavior change communication strategies and tools targeted at incorporating safe LDFs into diverse diets to inform nutrition education strategies and/or campaigns
4
Ministries of public health (regulators), livestock traders, processors, and consumers

Work Package 2: Innovations and practices for safe livestock derived foods consumption as part of diverse diets

Work Package title	WP2: Innovations and practices for safe LDFs consumption as part of diverse diets
Work Package main focus and prioritization (max 100 words)	WP2 aims to harness the benefits of increased livestock productivity from WP1 to translate into healthy diets through consumption of safe LDFs as part of diverse diets for livestock keeping households. It will 1) co-create innovative models and approaches for social and behavior change communication and 2) test and evaluate approaches aimed at incentivizing market actors to enhance supply of safe, nutritious, and affordable LDFs. WP2 will have a strong gender integration focus by generating evidence on how women's empowerment influences and impacts on nutrition outcomes and how to engage men to support food and nutrition decisions.
Work Package geographic scope (Global/Region/Country)	Work will be in three of the seven target countries and the poultry, dairy and pig value chains.

The Science

No	Research questions	Scientific methods	Key outputs
1	What are the context-specific barriers to achieving food security and nutrition in the context of livestock keeping communities and which interventions should be prioritized to address the constraints?	-Stock-taking: identify site-specific obstacles and bottlenecks, based on literature review and primary data collection[124] -Prioritize interventions that integrate LDFs to achieve improved food security & nutrition outcomes	An operational framework to identify context specific "bottlenecks" in LDFs consumption and food security A database of interventions ("corkscrews") matched to specific bottlenecks and scored for various synergies and trade-offs to other Impact Areas
2	What approaches and integrated nutrition interventions including SBCC on LDFs as part of diverse nutritious diets, women empowerment and food safety impact on household food security and nutrition outcomes among livestock keeping communities?	- Assessing intervention performance: design and test (in some cases using 54 Randomized Control Trials) different gender-sensitive SBCC nutrition education interventions that enhance investments and associated delivery methods. The intervention includes capacity development of nutrition champions at various levels.	Approaches and gender-sensitive delivery models for influencing behavior on diets that include LDFs and food safety practices through SBCC
3	What technologies, approaches and business models enhance processing and trading efficiency and incentivize uptake by livestock value chain actors to enhance supply of safe, nutritious and affordable animal source foods to consumers?	- Stock-taking: identify models and technologies that enhance retail and processing efficiencies, based on literature review and primary data collection[125] -Assessment of interventions will be done in WP4	Evidence on market-based innovations and practices that enhance the supply of safe, nutritious and affordable LDFs to consumers

Theory of change

Causal process
WP2 builds on evidence of positive linkages between livestock keeping and food and nutrition security outcomes through livestock income and own consumption. WP2 aims to amplify these positive linkages through two pathways: 1) nutrition SBCC for LDFs to improve nutrition strategies (including through income and women's empowerment pathways) and 2) technologies and approaches for efficient LDFs businesses (e.g., processing) to enhance the supply of safe and affordable LDFs.

The first pathway will increase participants' knowledge of the value of LDFs consumption and best practices in handling LDFs. This will increase adoption of appropriate nutrition practices, leading to improved LDFs safety and increased consumption of LDFs as part of overall diverse diets (Assumptions 1 and 2). Strategic partnerships with public and private sector partners (e.g., national nutrition programs in the Ministries of Health, livestock processing companies) in target countries plus strong communication, advocacy and capacity building efforts (with WP5) will facilitate uptake of SBCC strategies and tools. In three years, these efforts will result in six public and private sector nutrition education strategies and/or campaigns incorporating Initiative-supported SBCC strategies and tools for incorporating safe LDFs into diverse diets.

Through the second pathway, WP2 (with WP4) will co-create and test innovations that support the provision of safe and affordable LDFs through new product lines and low-cost delivery options (e.g., milk dispensers). Evidence will be generated on innovations that reduce transaction costs and support efficient businesses (Assumptions 3 and 4). Market actors and regulators are expected to co-invest and provide incentives to both suppliers and buyers of LDFs to increase supply of affordable, quality and safe LDFs.

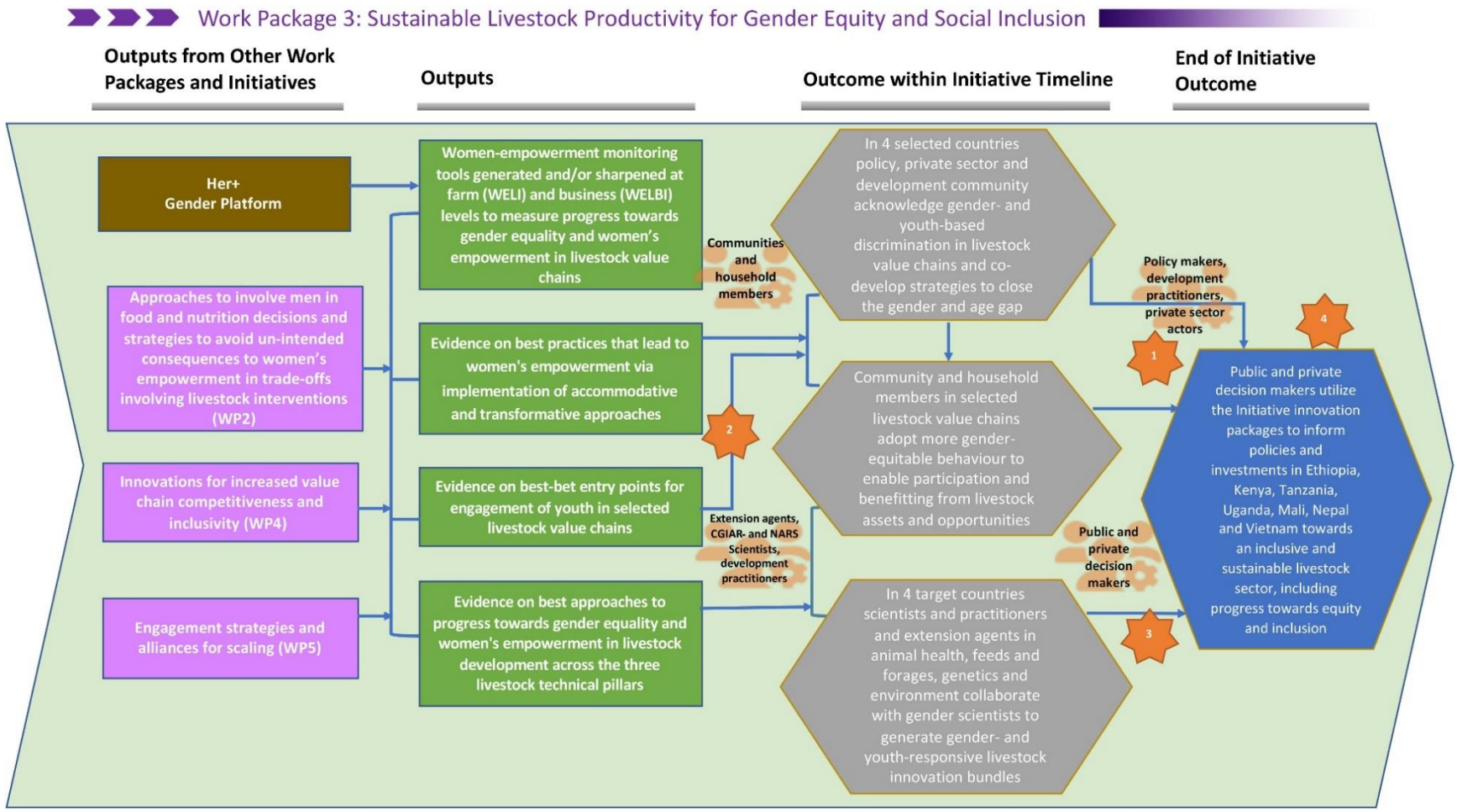
Assumptions
1. Development partners see the need and value to co-design tools and frameworks guiding the prioritization and targeting of food security and nutrition interventions and programming through livestock.
2. The social and cultural barriers that may prevent women and children from consuming some LDFs are amenable to change.
3. The technologies and innovations that enhance supply of safe, nutritious, and affordable LDFs result in a win-win business case for value chain actors.
4. Value chain actors and regulatory authorities are able, supportive and willing to invest in technologies, innovations and practices that enhance supply of safe, nutritious and affordable LDFs.

Partners
Demand: Nutrition divisions of Ministries of Health, Ministries of Agriculture and Livestock, NGOs seeking to incorporate nutrition education into their programming
Innovation: National Child Development Agency, RTI International, Threestones International, Georgia State University and Emory University (building on past and ongoing LDFs SBCC efforts in Kenya and Rwanda), GAIN, other NGOs with current programming to increase safe and affordable LDF consumption
Scaling: Nutrition divisions of Ministries of Health; Ministries of Agriculture and Livestock; regulatory authorities; private companies (e.g., processing, value-addition)

Interdependencies and synergies
WP1: Co-designs innovations for increased availability and safe handling of LDFs.

WP3 and 4: Mainstreams SBCC interventions from WP2 to enhance nutrition through income, own consumption and women empowerment pathways.
WP4: Supports market efficiency and increasing supply of LDF for consumers.
WP5: Supports communication and advocacy of evidence.

WP2 work with other Initiatives: **OneHealth** on food safety and the informal market. **ShiFT** on market systems.


Work Package 3: Sustainable Livestock Productivity for Gender Equity and Social Inclusion
Outputs from Other Work Packages and Initiatives
Outputs
Outcome within Initiative Timeline
End of Initiative Outcome
Her+ Gender Platform
Approaches to involve men in food and nutrition decisions and strategies to avoid un-intended consequences to women's empowerment in trade-offs involving livestock interventions (WP2)
Innovations for increased value chain competitiveness and inclusivity (WP4)
Engagement strategies and alliances for scaling (WP5)
Women-empowerment monitoring tools generated and/or sharpened at farm (WELI) and business (WELBI) levels to measure progress towards gender equality and women's empowerment in livestock value chains
Evidence on best practices that lead to women's empowerment via implementation of accommodative and transformative approaches
Evidence on best-bet entry points for engagement of youth in selected livestock value chains
Evidence on best approaches to progress towards gender equality and women's empowerment in livestock development across the three livestock technical pillars
Communities and household members
Extension agents, CGIAR- and NARS Scientists, development practitioners
In 4 selected countries policy, private sector and development community acknowledge gender- and youth-based discrimination in livestock value chains and co-develop strategies to close the gender and age gap
Community and household members in selected livestock value chains adopt more gender-equitable behaviour to enable participation and benefitting from livestock assets and opportunities
In 4 target countries scientists and practitioners and extension agents in animal health, feeds and forages, genetics and environment collaborate with gender scientists to generate gender- and youth-responsive livestock innovation bundles
Policy makers, development practitioners, private sector actors
Public and private decision makers
1
2
3
4
Public and private decision makers utilize the Initiative innovation packages to inform policies and investments in Ethiopia, Kenya, Tanzania, Uganda, Mali, Nepal and Vietnam towards an inclusive and sustainable livestock sector, including progress towards equity and inclusion

Work Package 3: Sustainable Livestock Productivity for Gender Equity and Social Inclusion

Work Package title	WP3: Sustainable Livestock Productivity for Gender Equity and Social Inclusion
Work Package main focus and prioritization (max 100 words)	WP3 aims to unlock the empowering potential of livestock business and rearing for women and youth. It does this 1) by understanding constraints and opportunities to support equality and empowerment during innovation (e.g. genetics, health, feed-forages) development and delivery; 2) identifying best-bet entry points for women and youth to engage profitability in value chains; 3) utilizing accommodative and transformative approaches to address constraints at the system and household level; and 4) ensuring that the right tools exist to measure whether progress towards equality and empowerment is being made. Work will focus in a subset of value chains based on existing on-the-ground relationships.
Work Package geographic scope (Global/Region/Country)	Work will be in four of the seven countries. The countries and respective value chains will be selected based on existing projects and may include multiple value chains per country.

The Science

No	Research questions	Scientific methods	Key outputs
1	How can livestock genetic improvement, feed-forages and animal health technical innovations support women's empowerment towards gender equality?	-Stock-taking: identify existing evidence and gaps based on review of the literature and existing project databases -Diagnostic research: multi-stakeholder engagement to identify critical gender-related constraints and opportunities in value chains -Designing and testing interventions: use evidence from stock-taking and diagnostic work to develop and test integrated and strategic interventions -Assessing intervention performance: utilize Women's Empowerment in Livestock Index (WELI) [126] and Women's Empowerment in Livestock Business Index (WELBI) and other tools to assess changes in women's empowerment -Capacity development: identify and address the gender capacity building needs of NARS and science partners	Evidence on best approaches to progress towards gender equality and women's empowerment in livestock development across the three livestock technical pillars[127] Women-empowerment monitoring tools generated and/or sharpened at farm (WELI) and business (WELBI) levels to measure progress towards gender equality and women's empowerment in livestock value chains
2	How can institutions (norms, markets, organizations, policies) affect women's empowerment towards gender equality?	-Stock-taking: review of evidence on gender norms and previous experiences implementing accommodative and transformative interventions	Evidence on best practices that lead to empowerment via implementation of accommodative and transformative approaches

	What gender-accommodative (GAAs) and gender-transformative approaches (GTA) in livestock value chains can be adopted as pathways towards empowerment?	-Tool development: develop tools for diagnostic, design, implementation and assessment -Diagnostic research: Based on evidence from Research Question (RQ) 2 engage communities to discuss strategies to leverage gender conducive norms -Development and implementation of interventions: use evidence to develop and implement interventions along the accommodative to transformative continuum -Assessment of intervention performance[128]: assess at baseline and endline how formal and informal institutions have changed and affected progress towards women's empowerment -Comparative analysis: assess across species and livestock systems — what approaches are most effective to support women's empowerment -Capacity development: support gender equality champions and the capacity of all involved partners to implement GTAs	
3	What are the most profitable and otherwise beneficial entry points for youth to engage in different livestock value chains?	- Diagnostic research: identify the categories of youth-men or -women in nodes of livestock value chains; assess their aspirations, values and capabilities to engage in and benefit from value chain activities -Development and implementation of interventions: Co-design, implement and test bundles of technological and institutional innovations that successfully engage youth in value chains -Tool development: develop and/or refine tools that capture youth-specific challenges and opportunities and processes of empowerment -Assessment of intervention performance: assess at baseline and endline the way interventions impact youth -Capacity development: Build capacity of partners for youth integration	Evidence on best-bet entry points for engagement of youth in selected livestock value chains

Theory of change

Causal process
WP3 aims to unlock opportunities for women and youth arising from increasing productivity and resulting livestock commercialization. WP3 works through two pathways: 1) better designing and delivering innovations in genetics, health and feed-forages so that they become entry points to increase gender equality and empowerment and 2) addressing gender norms (e.g., that limit women from accessing inputs and services while favoring men) and youth constraints (e.g., lack of resource and knowledge to engage).

By closely engaging and consulting key stakeholders along the innovation research-development-delivery continuum, WP3 works to inform research, capacity development and innovation delivery processes to achieve better and more sustainable outcomes for women and youth (Assumptions 1, 4). WP3 engages closely with community and household members and value chain actors to simultaneously strengthen their capacity and generate evidence on the interaction between livestock value chain development and local gender dynamics and norms. Context specific gender -accommodative and
-transformative approaches effective in addressing these norms are co-designed and tested (Assumption 2 and 3). The evidence feeds into quantitative and qualitative monitoring tools that can then be used by a wide range of actors with the proper training to measure whether their innovations, programs and/or policies are impacting equality and empowerment (Assumption 1).

In three years, these efforts will result in public and private decision makers in four countries acknowledging gender-and youth-based discrimination in livestock value chains and utilizing the Initiative-supported evidence and tools to inform strategies and policies towards equity and inclusion (Assumption 4). Overall, 400,000 women and girls in livestock keeping households (50% of overall Initiative target) will benefit from SAPLING.

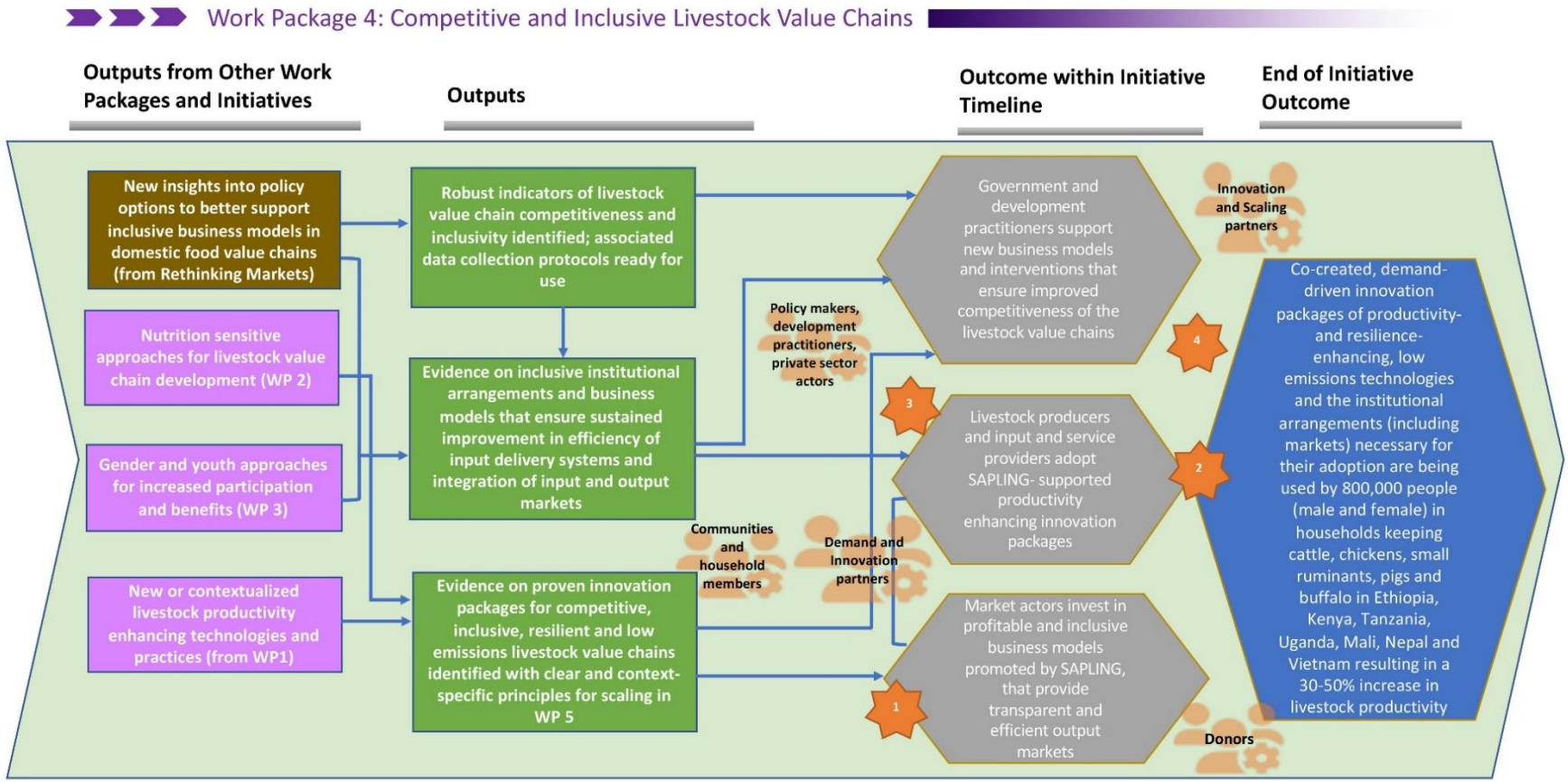
Assumptions
1. Gender equality is a development priority of policy makers, development practitioners and private sector actors, and they are interested in measuring progress towards women's and youth's empowerment.
2. Community and household members are interested in achieving progress towards gender equality and women and youth empowerment in livestock value chains.
3. Women and other members of their households are able and willing to increase their workload needed to achieve higher productivity given the extra income that women can directly control.
4. Extension agents, CGIAR and NARS Scientists and development practitioners are interested in contributing to gender equality and women and youth empowerment and are given the opportunity to do so (e.g., financial and managerial support).

Partners
Demand: Donors, development partners (e.g., CARE); UN agencies working on women empowerment; private companies involved in product development; NARS/CGIAR/other researchers; national governments
Scaling: National governments; development partners (e.g., NGOs)
Innovation: Research institutions (e.g., Emory University) that support tool development; researchers interested in incorporating gender empowerment components in measurement tools

Interdependencies and synergies
WP1: Interdisciplinary collaboration with biophysical scientists to ensure the design and delivery of gender-responsive innovations.

WP2: Sharpen the connection between women's and youth empowerment and nutrition (including unintended tradeoffs and engaging men).
WP4: Design of Innovation Packages that support equity and empowerment and ensure that value chain competitiveness is inclusive with a particular focus on women's and youth's empowerment through livestock business.
WP5: Develop engagement and scaling strategies to address structural gender discrimination in livestock value chains.

WP3 work with other Initiatives: **LCSR** to share knowledge and conduct joint action-research. **CGIAR GENDER platform** and **Her+** to utilize their tools and lessons learned (esp. from other systems).


Work Package 4: Competitive and Inclusive Livestock Value Chains
Outputs from Other Work Packages and Initiatives
Outputs
Outcome within Initiative Timeline
End of Initiative Outcome
New insights into policy options to better support inclusive business models in domestic food value chains (from Rethinking Markets)
Nutrition sensitive approaches for livestock value chain development (WP 2)
Gender and youth approaches for increased participation and benefits (WP 3)
New or contextualized livestock productivity enhancing technologies and practices (from WP1)
Robust indicators of livestock value chain competitiveness and inclusivity identified; associated data collection protocols ready for use
Evidence on inclusive institutional arrangements and business models that ensure sustained improvement in efficiency of input delivery systems and integration of input and output markets
Evidence on proven innovation packages for competitive, inclusive, resilient and low emissions livestock value chains identified with clear and context-specific principles for scaling in WP 5
Policy makers, development practitioners, private sector actors
Communities and household members
Demand and Innovation partners
Government and development practitioners support new business models and interventions that ensure improved competitiveness of the livestock value chains
Livestock producers and input and service providers adopt SAPLING- supported productivity enhancing innovation packages
Market actors invest in profitable and inclusive business models promoted by SAPLING, that provide transparent and efficient output markets
1
2
3
4
Innovation and Scaling partners
Donors
Co-created, demand-driven innovation packages of productivity- and resilience-enhancing, low emissions technologies and the institutional arrangements (including markets) necessary for their adoption are being used by 800,000 people (male and female) in households keeping cattle, chickens, small ruminants, pigs and buffalo in Ethiopia, Kenya, Tanzania, Uganda, Mali, Nepal and Vietnam resulting in a 30-50% increase in livestock productivity

Work Package 4: Competitive and Inclusive Livestock Value Chains

Work Package title	**WP4: Competitive and Inclusive Livestock Value Chains**
Work Package main focus and prioritization (max 100 words)	WP4 will generate evidence on institutional arrangements and technical interventions to transition towards more profitable, inclusive and sustainable livestock value chains. WP4 brings together the packages of technical innovations from WP1 with innovative delivery systems, including business models identified in this WP. Specifically, it aims at: 1. Identifying which business models and delivery systems work best. 2. Generating evidence, across sites and value chains, on the effectiveness of these institutional approaches to deliver the packages of technical livestock innovations from WP1, as well as some developed in LCSR and OneHealth. 3. Co-creating gender and youth inclusive Innovation Packages (with WP3).
Work Package geographic scope (Global/Region/Country)	Work will be in all seven priority countries: Nepal (South Asia), Vietnam (Southeast Asia), Ethiopia, Kenya, Tanzania and Uganda (East Africa) and Mali (West Africa)

The Science

No	Research questions	Scientific methods	Key outputs
1	What are the essential elements of livestock value chains that determine the level of competitiveness and inclusivity, and how can these be measured alongside the associated trade-offs?	-Stock-taking: Primary and secondary data collection to identify indicators currently used (and their limitations) to measure competitive and inclusive value chains [124] -Stakeholder consultations to identify a comprehensive working definition of 'competitive and inclusive livestock value chains'	Robust indicators of livestock value chain competitiveness and inclusivity identified; associated data collection protocols ready for use
2	What type of institutional arrangements for input delivery and output market linkages are profitable, inclusive, and would lead to increased sustainable livestock productivity, for different commodities?	Support to implementation and evaluation of candidate institutional arrangement: -Conduct experimental (RCTs) and observational data-based analysis of the effect of context specific institutional arrangements [111] (e.g., business models, public-private partnership) - Identify a set of value chain actors willing to engage in research in development' to share risks and lessons[129] -With these actors, co-design and co- implement candidate alternative institutional arrangements -Monitor progress using the protocol developed in RQ1	Evidence on inclusive institutional arrangements and business models that ensure sustained improvement in efficiency of input delivery systems and integration of input and output markets

3	What Innovation Packages (including technical, policies, and incentive mechanisms) result in the highest participation by, and benefits for, women and men livestock producers and other actors?	Support to implementation and evaluation of interventions: -Experimental (RCT) and observational data-based analysis of the effect of packages of interventions on participation and performance of men and women actors along the value chains.[130] A similar process of co- design, -implementation and -evaluation as in RQ2 will be followed, with the two sets of interventions combined in some cases	Evidence on proven Innovation Packages for competitive, inclusive, resilient and low emissions livestock value chains identified with clear and context-specific principles for scaling in WP 5

Theory of change

Causal process

WP4 will provide evidence from action research on Innovation Packages (livestock-specific institutional arrangements + technical interventions) to transition towards more competitive, inclusive and sustainable livestock value chains.

First, indicators of competitiveness and inclusivity for livestock value chains will be refined, based on existing knowledge and data collected on livestock technologies in use and institutional arrangements in place in target countries. Refined indicators will be used to monitor changes and adjust as pilot testing, dissemination and scaling take place. Evidence will stimulate interest from donors and other investors to buy-down the risk of private sector actors engaging in new and potentially more risky business models and interventions (Assumptions 1, 2).

Working with livestock communities, private sector actors, development partners as well as local and national authorities in target countries, two types of action research will be conducted. Action Research 1) Co-designing and testing new institutional arrangements (e.g., business models) to support women and men to better access livestock inputs and services and output markets. The choice of the same species in at least two countries (e.g., pigs in Vietnam and Uganda) will allow useful comparisons for lessons learned. Action Research 2) Co-delivery of the WP1 technology packages through new institutional arrangements. This will result in market actors investing in profitable and inclusive business models that provide transparent and efficient output markets (Assumption 3).

Alignment of priority roles and investment portfolios between private sector actors and government and development practitioners, including on gender and youth considerations, is critical to the development of Innovation Packages and their delivery models. This requires policy engagement (with WP5) as well as strong capacity development throughout the process (Assumption 4).

In three years, these efforts will result in co-created, demand-driven Innovation Packages of productivity- and resilience enhancing, low emissions technologies and the institutional arrangements (including markets) necessary for their adoption being used by 800,000 people (male and female) in livestock producing households.

Assumptions

1. Evidence generated on performance of institutional arrangements is sufficiently compelling to get buy-in for private sector actors to co-invest.
2. Co-design and -delivery of approaches will incentivize actors to scale up the Initiative-supported innovations.
3. Value chain actors are willing and able to engage in 'research in development' activities to co- invest in and -implement Initiative-supported innovations.
4. Gender equality is a development priority of policy makers, development practitioners and private sector actors, and they are interested in measuring progress towards women's and youth's empowerment.

Partners

Demand: Livestock producers and producer organizations; value chain actors identified in WP1; governments of target countries

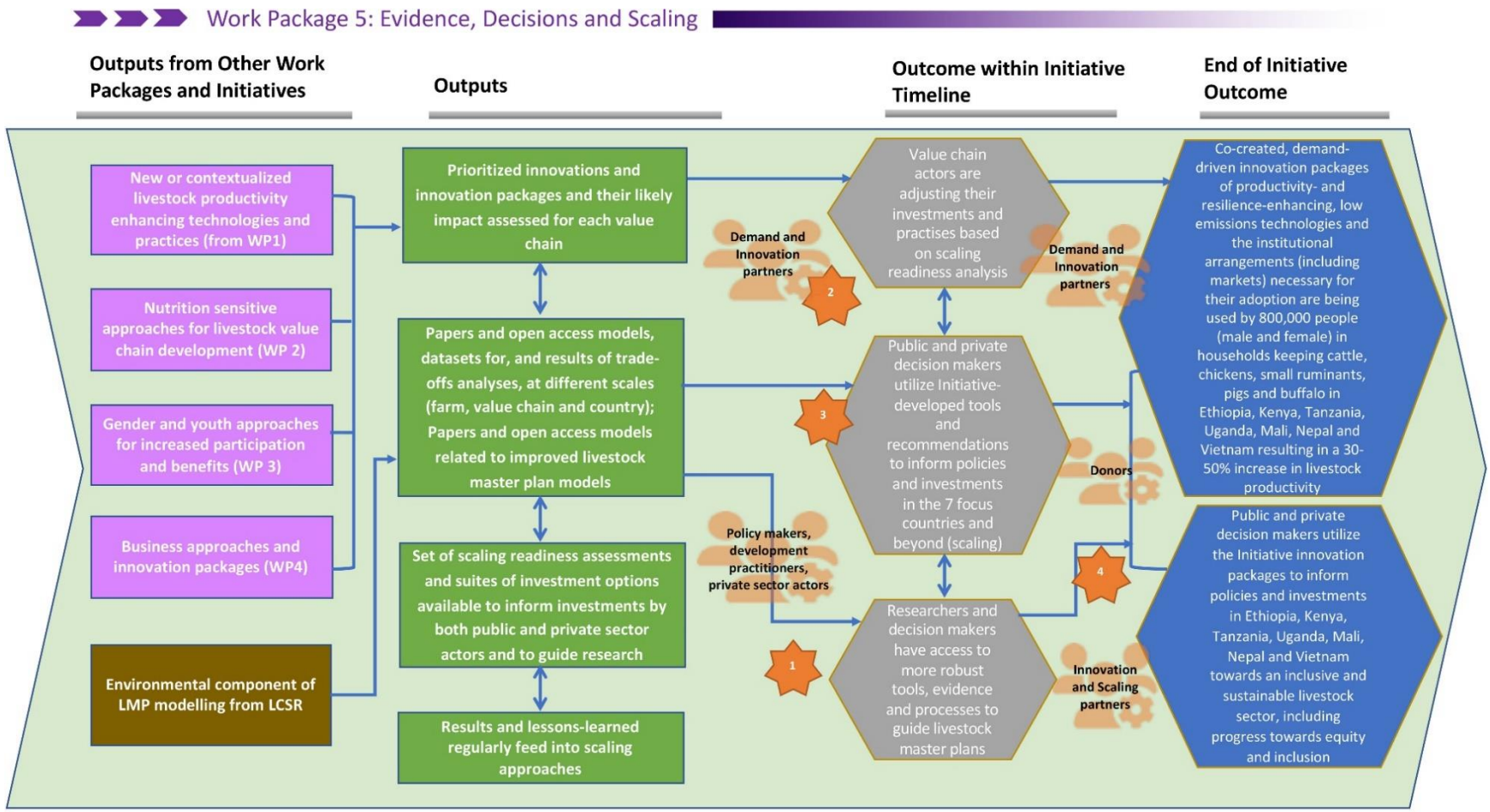
Scaling: Relevant ministries; private and public technology multiplication entities; and national and international NGOs (e.g., Venture37, Heifer International)

Innovation: Livestock producer; private sector actors; regulators; national and international agricultural research institutions; universities and other academic institutions

Interdependencies and synergies

WP1: Incorporate bundles of technical innovations from WP1 into Innovation Packages and their delivery.
WP2: Collaborate on increasing the supply of safe and affordable ASF in the market.
WP3: Collaborate on ensuring that Innovation Packages and delivery mechanisms are inclusive and have opportunities for women's empowerment.
WP5: Collaborate on policy engagement and scaling.

WP4 work with other Initiatives: **LCSR** to generate evidence on the effectiveness of the institutional arrangements and business models to deliver their technical innovations (e.g. resilient, low emissions technologies and practices). **OneHealth** on safe LDFs handling practices.


Work Package 5: Evidence, Decisions and Scaling
Outputs from Other Work Packages and Initiatives
Outputs
Outcome within Initiative Timeline
End of Initiative Outcome
New or contextualized livestock productivity enhancing technologies and practices (from WP1)
Nutrition sensitive approaches for livestock value chain development (WP 2)
Gender and youth approaches for increased participation and benefits (WP 3)
Business approaches and innovation packages (WP4)
Environmental component of LMP modelling from LCSR
Prioritized innovations and innovation packages and their likely impact assessed for each value chain
Papers and open access models, datasets for, and results of trade-offs analyses, at different scales (farm, value chain and country); Papers and open access models related to improved livestock master plan models
Set of scaling readiness assessments and suites of investment options available to inform investments by both public and private sector actors and to guide research
Results and lessons-learned regularly feed into scaling approaches
Demand and Innovation partners
2
Value chain actors are adjusting their investments and practises based on scaling readiness analysis
Demand and Innovation partners
3
Public and private decision makers utilize Initiative-developed tools and recommendations to inform policies and investments in the 7 focus countries and beyond (scaling)
Donors
Policy makers, development practitioners, private sector actors
1
Researchers and decision makers have access to more robust tools, evidence and processes to guide livestock master plans
4
Innovation and Scaling partners
Co-created, demand-driven innovation packages of productivity- and resilience-enhancing, low emissions technologies and the institutional arrangements (including markets) necessary for their adoption are being used by 800,000 people (male and female) in households keeping cattle, chickens, small ruminants, pigs and buffalo in Ethiopia, Kenya, Tanzania, Uganda, Mali, Nepal and Vietnam resulting in a 30-50% increase in livestock productivity
Public and private decision makers utilize the Initiative innovation packages to inform policies and investments in Ethiopia, Kenya, Tanzania, Uganda, Mali, Nepal and Vietnam towards an inclusive and sustainable livestock sector, including progress towards equity and inclusion

Work Package 5: Evidence, Decisions and Scaling

Work Package title	**WP5: Evidence, Decisions and Scaling**
Work Package main focus and prioritization (max 100 words)	WP5 aims at generating and consolidating evidence, models and tools to support public and private decision-making for a sustainable and inclusive livestock sector. Specifically, it will: - Prioritize innovations and Innovation Packages making explicit trade-offs in terms of productivity, profitability, gender & social equity, and environmental outcomes. - Support scaling of Innovation Packages by coordinating scaling readiness exercises that guide engagement with stakeholders and inform 'on the ground' activities. - Conduct research on policy making processes and how public research can best interact with private actors to accelerate scaling. - Strengthen the modelling component of the national livestock master plans.
Work Package geographic scope (Global/Region/Country)	Work will be in all seven priority countries: Nepal (South Asia), Vietnam (Southeast Asia), Ethiopia, Kenya, Tanzania and Uganda (East Africa) and Mali (West Africa).

The Science

No	Research questions	Scientific methods	Key outputs
1	What are the trade-offs and synergies between productivity, economics, gender & social equity, and environmental factors that need to be considered when developing and scaling livestock innovations and at national level for policy making?	- Conduct trade-off analyses to guide priority setting of innovations in the other WPs - Improve the modelling component of the national livestock master plans, i.e., multi market analysis and system dynamic modelling, with link to modelling done under WP5 of LCSR for environmental considerations	Prioritized innovations and Innovation Packages and their likely impact assessed for each value chain Papers and open access models, datasets for, and results of trade-offs analyses, at different scales (farm, value chain and country) Papers and open access models related to improved Livestock Master Plan (LMP) models
2	What partners, systems and capacities are required to support SAPLING livestock innovations to go to scale?	-Apply the existing scaling readiness methodology [85] for Initiative-supported innovations and Innovation Packages developed in the other WPs	Set of scaling readiness assessments and suites of investment options available to inform investments by both public and private sector actors and to guide research
3	How can the evidence generated by livestock research influence policy making and private decisions and investments?	-Analysis of decision-making processes -Assessments of actor engagement strategies (including in non-livestock sectors)	Results and lessons-learned regularly feed into scaling approaches

Theory of change

Causal process

WP5 aims at generating and consolidating evidence, models and tools to support public and private decision-making and scaling of prioritized innovations for a sustainable and inclusive livestock sector. To progress towards these outcomes, WP5 will first ensure that SAPLING innovations have high likelihood of being adopted with resulting expected known effects. Priority setting of SAPLING innovations will be conducted using trade-offs analysis, working in close collaboration with the other WPs as well as end users in the seven SAPLING countries to capture the demand and their needs. Scaling readiness assessments will be conducted for the most promising innovations, and updated when required, to guide the dissemination and scaling of interventions. Prioritization of innovations will also be done at national level, building on the current LMP activities. WP5 will strengthen the modelling part of the LMPs, including the gender component (with WP3) and collaborating with LCSR on environmental considerations. Finally, as influencing policy and investments is a complex and long-term process, the team will analyze various engagement strategies (including active engagement like joint planning and co-financing with partners; to more 'passive' strategies like promotion of dissemination materials and policy briefs).[131]

In three years, these efforts will result in public and private decision makers in target countries utilizing the Initiative-supported Innovation Packages to inform policies and investments towards a sustainable livestock system, including progress towards equity and inclusion.

Assumptions

1. National and international researchers are keen, see value in and are interested in co-creating a research agenda with the SAPLING team and actively engage in related collaborative research.
2. Private sector actors foresee business cases in the tested innovations and SAPLING and investors (i.e., donors) can reduce their risks, allowing them to co invest.
3. Actors in the non-government development sector (e.g., NGOs, philanthropic organizations) show interest in demand-led research to address productivity and food security issues through livestock.
4. Policy makers in the agriculture and livestock ministries and decision makers in line departments show willingness to allocate more resources, create an enabling environment and support de-risking of private sector investments to scale the successfully tested innovations.

Partners

Demand: Livestock producers and producer organizations, development actors, private sector companies, philanthropic institutions, service providers

Scaling: Agri-business entrepreneurs; private input (forage seed, feed, vaccine, pharmaceutical) manufacturers and service providers; Ministries of agriculture and livestock; empowered smallholder producers and their institutions; multi-stakeholder alliances at local, provincial and national levels; NGOs and development actors

Innovation: Research institutes (e.g., academic institutions, research foundations); private companies (animal genetics, forage seed supply, feed utilization, animal health)

Interdependencies and synergies

WP5 will be both at the start and the end of the innovation process in SAPLING. WP5 guides the selection of innovations from the other WPs, supports the scaling of promising Innovation

Packages, supports an enabling policy environment, and communicates evidence and knowledge.

WP5 work with other Initiatives: **LCSR** on environmental considerations (i.e., in the livestock master plans. **OneHealth** on scaling. WP is the contact/ liaison for the relevant **Regional Initiatives**.

4. Innovation Packages and Scaling Readiness Plan

SAPLING builds on the CRP Livestock and bilateral projects in target countries. It harvests a wide range of innovations across the five WPs, many of which have preliminary scaling readiness assessments and are in use in various contexts (see Annex). Available innovations include, amongst others, co-designed breeding schemes, certification of improved superior sires, decision support tools for disease control, improved vaccines and diagnostics, and business models to commercially produce and utilize improved feed-forages. During the inception phase, SAPLING will co-create with partners context specific Innovation Packages composed of Initiative-supported solutions and solutions from other Initiatives (e.g., LCCR, OneHealth, Her+, Accelerated Breeding). Innovation packages will undergo scaling readiness assessments (WP5).

Because SAPLING is building on strong existing research and in-country experience, by the end of the Initiative 60% of the co-created Innovation Packages are expected to be levels 4–7, already used by other projects, organizations or actors. Another 20% (e.g., herd health, small ruminant breeding programs) are expected to be levels 8–9, commonly used by their intended users. Scaling assessments will be applied to confirm.

SAPLING will build capacity among the Initiative team and partners to improve the assessment of scaling readiness, overcome scaling bottlenecks and manage the portfolio of Innovation Packages during 2022–2024 implementation. By 2024, SAPLING aims to apply the Innovation Packages and scaling readiness approach to 76–100% of the total portfolio. Thus, most Innovation Packages will be in the first wave and on the standard track by Q4-2022.

SAPLING allocated US$500,000 to implement the Innovation Packages and Scaling Readiness Plan (2022: US$200,000; 2023: US$150,000; 2024: US$150,000). Dedicated activities, deliverables, indicators and line-items are included in the management plan, MELIA and budget.

5. Impact statements

5.1 Nutrition, health and food security

Challenges and prioritization Malnutrition remains high in many livestock dependent communities, yet relatively small amounts of livestock derived foods can substantially increase the nutrient adequacy of diets. [6] Livestock research often prioritizes technical interventions to increase productivity with the assumption that increases will translate automatically to more LDFs consumed by households. But these results are rarely realized unless livestock research is nutrition-sensitive. [53] To address this, research and development efforts are increasingly targeting livestock as a direct pathway to improve nutrition and food security. WP2 is dedicated to this effort. SAPLING will contribute to ending hunger and enabling affordable healthy diets by 1) significantly increasing availability of safe and affordable LDFs through increased livestock productivity and better-functioning value chains and 2) stimulating behavior change of consumers to incorporate recommended quantities of LDFs in the diet and employ safe LDFs handling practices.

Research questions WP2 RQ1 What are the context-specific barriers to achieving food security and nutrition in the context of livestock keeping communities and which interventions should be prioritized to address the constraints? ***WP2 RQ2*** What approaches and integrated nutrition interventions including SBCC on LDFs as part of diverse nutritious diets, women empowerment and food safety impact on household food security and nutrition outcomes among livestock keeping communities? ***WP2 RQ3*** What technologies, approaches and business models enhance processing and trading efficiency and incentivize uptake by livestock value chain actors to enhance supply of safe, nutritious and affordable LDFs to consumers?

Components of Work Packages Work will be implemented in WP2, with links to WP1 (increased production of livestock and livestock products), WP3 (gender constraints and norms affecting access to a balanced diets), WP4 (market linkages to increase income from livestock production) and WP5 (communication/advocacy of evidence).

Measuring performance and results

3-year outcomes	**Metrics**
6 public and private sector organizations utilize Initiative-supported SBCC strategies and tools targeted at incorporating safe LDFs into diverse diets to inform nutrition education strategies and/or campaigns (Initiative level)	Number of education materials modified in design or implementation, informed by CGIAR research
Public and private organizations in three countries take up the decision support tools to diagnose and prioritize LDFs in food and nutrition interventions (WP2)	Number of organizations taking up the decision support tools

Partners **Demand**: Nutrition divisions of Ministries of Health, Ministries of Agriculture and Livestock, NGOs **Innovation**: National Child Development Agency, RTI International, Threestones International, Georgia State University, Emory University, GAIN, and other NGOs **Scaling:** Nutrition divisions of Ministries of Health, Ministries of Agriculture and Livestock, regulatory authorities, private companies operating in the value chain

Human resources Human nutritionists, gender scientists, value chain economists

5.2 Poverty reduction, livelihoods and jobs

Challenges and prioritization Livestock offers an opportunity to improve livelihoods for livestock producers and other value chain actors in parts of Sub-Saharan Africa and South and Southeast Asia where opportunities for jobs and a better life outside of agriculture are limited. In these regions, demand for livestock products is expected to increase 200-300% by 2030, an opportunity for hundreds of millions of small- to medium-scale livestock producers who can meet the demand.[1] Livestock sector growth will generate a wide range of jobs throughout the value chain; for example, the Kenyan dairy sector alone employs three million people.[132] SAPLING will contribute to poverty reduction, livelihoods & jobs by 1) making demand-driven productivity enhancing Innovation Packages available to livestock producers and 2) enabling their participation in well-functioning and growing inclusive livestock value chains.

Research questions WP1 RQ6 How to best combine innovations in livestock genetic improvement, animal health and feed-forages for increased livestock productivity, including under a future changed environment, and ensuring equitable benefit to livestock value chain actors? ***WP4 RQ2*** What type of institutional arrangements for input delivery and output market linkages are profitable, inclusive, and would lead to increased sustainable livestock productivity*?* ***WP4 RQ3*** What Innovation Packages (including technical, policies, and incentive mechanisms) result in the highest participation by, and benefits for women and men livestock producers and other actors? **WP5 RQ2** What partners, systems and capacities are required to support SAPLING livestock innovations to go to scale?

Components of Work Packages Together WP1 (developing combinations of technologies to drive productivity increases), WP4 (developing institutional arrangements to deliver Innovation Packages and business models) and WP5 (scaling) will deliver this Impact Area.

Measuring performance and results

3-year outcomes	**Metrics**
Co-created, demand-driven Innovation Packages of productivity- and resilience-enhancing, low emissions technologies and the institutional arrangements (including markets) necessary for their adoption are being used by 800,000 people (male and female) in households keeping cattle, chickens, small ruminants, pigs and buffalo in Ethiopia, Kenya, Tanzania, Uganda, Mali, Nepal and Vietnam, resulting in a 30-50% increase in livestock productivity (Initiative level)	Number of beneficiaries using the packages, disaggregated by gender
Market actors invest in profitable and inclusive business models promoted by SAPLING that provide transparent and efficient output markets (WP4)	Number of beneficiaries using the innovation, disaggregated by gender

Partners **Demand:** Producers/producer organizations**,** public animal health and livestock genetic improvement centers, national research institutions, national governments **Innovation**: TASSLH, CTLGH, research institutions, universities, other academic institutions **Scaling:** Commercial actors, public animal health and livestock genetic improvement centers, national research institutions, national governments, large-sale development programs

Human resources Livestock scientists (genetics, feed, health), social scientists (gender, economists, scaling experts)

5.3 Gender equality, youth and social inclusion

Challenges and prioritization Livestock as an enterprise can be a game-changing opportunity for women and youth facing high unemployment levels and constraints in controlling assets and services. But there are numerous barriers to capitalizing on these opportunities, including deep rooted cultural and gender norms. SAPLING works to ensure that livestock policies, programs and projects enhance gender equity and advance economic and empowerment opportunities for women and youth.[133] In this way, SAPLING contributes to equality and social inclusion by leveraging livestock as a pathway to empowerment for women, youth, and other marginalized groups. These groups will have equal opportunity to participate in and benefit from strengthened livestock value-chains leading to increased livestock ownership, decision-making and control over income.

Research questions WP3 RQ1 How can livestock genetic improvement, feed-forages and animal health technical innovations support women's empowerment towards gender equality? ***WP3 RQ2*** What GAAs and GTA) in livestock value chains can be adopted as pathways towards empowerment? ***WP3 RQ3*** What are the most profitable and otherwise beneficial entry points for youth to engage in different livestock value chains?

Components of Work Packages WP3 will deliver on this Impact Area with strong collaboration with WP1 (gender analysis when designing and implementing technical interventions); WP2 (gender constraints and norms affecting access to balanced diets); WP4 (market linkages, participation in value chains and benefits); and WP5 on gender responsive scaling and policy. While all WPs are committed to ensuring that women and men benefit equitably from their respective applied research and assessments, WP3 will conduct strategic gender research that aims at addressing structural barriers towards the empowerment of women and youth in livestock value chains.

Measuring performance and results

3-year outcomes	**Metrics**
Public and private decision makers utilize the Initiative-supported Innovation Packages to inform policies and investments in Ethiopia, Kenya, Tanzania, Uganda, Mali, Nepal and Vietnam towards an inclusive and sustainable livestock sector, including progress towards equity and inclusion (Initiative level)	Number of policies/ strategies/ laws/ regulations/ budgets/ investments/ curricula modified in design or implementation, informed by CGIAR research
In four selected countries, policy, private sector and development community acknowledge gender- and youth-based discrimination in livestock value chains and co-develop strategies to close the gender and age gap (WP3)	

Partners **Demand**: Donors; development partners (e.g., NGOs); UN agencies working on women empowerment; private companies involved in product development; NARS/CGIAR/other researchers; national governments **Innovation:** Research institutions (e.g., Emory University) **Scaling:** National governments; development partners (e.g., NGOs)

Human resources Gender scientists and other social scientists

5.4 Climate adaptation and mitigation

Challenges and prioritization Failure to address constraints to livestock productivity while addressing environmental impacts can limit productivity gains while putting sustainability at risk. At the same time, livestock producers face growing risks from climate change. [16] [17] Innovations are needed to ensure that the livestock sector not only adapts to climate change emergencies but also reduces its environmental footprint, at production level and other nodes of the value chains. SAPLING contributes to reducing emissions and increasing climate adaptation by providing producers with 1) climate-adapted innovations (e.g., more adapted breeds, better feeds, improved health) and 2) well-functioning value chains needed to incentivize an increase in productivity from very low levels, thus achieving a reduction in GHG emissions intensity.

Research questions WP5 RQ1 What are the trade-offs and synergies between productivity, economics, gender & social equity, and environmental factors that need to be considered when developing and scaling livestock innovations and at national level for policy making? ***WP1 RQ3*** How to make optimum use of agricultural byproducts, mainly crop residues, using innovative resilient, low emissions technologies already in use in other sectors (e.g., biofuel production)? ***WP1 RQ4*** How to develop and apply stress resilient improved forages and food-feed crops that respond to year-round feed demands, increase productivity, improve natural resource use efficiency, and adapt to and mitigate climate change? ***WP1 RQ6*** How to best combine innovations in livestock genetic improvement, animal health and feed-forages for increased livestock productivity, including under a future changed environment, and ensuring equitable benefit to livestock value chain actors?

Components of Work Packages This Impact Area will be delivered with LCSR. In SAPLING, it will be delivered by WP1, developing climate adapted technologies and practices, and WP5, prioritizing innovations with environmental factors as a key dimension in ex-ante trade off analysis.

Measuring performance and results

3-year outcomes	Metrics
Private and public sector partners invest at least US$30 million in co-creation and delivery of novel, low emissions, demand-driven, gender and youth inclusive, and productivity- and resilience-enhancing technologies and practices for genetics, feed-forages, and health (Initiative level)	US$ invested

Partners **Demand:** Producers/producer organizations, animal feed and feed-forages seed production companies, national research institutions, national governments **Innovation**: National and international research institutions, universities, other academic institutions **Scaling:** Commercial actors **(**genetics, vaccine manufacturing, feed-forages seed, animal feed companies; livestock traders, processors, and exporters; input and service providers), public animal health and livestock genetic improvement centers, national research institutions, national governments, large-sale development programs

Human resources Environmental scientists and livestock scientists (forages, genetics, animal health)

5.5 Environmental health and biodiversity

Challenges and prioritization Opportunities to reduce risks to the environment from livestock production and in some cases enhance sustainability, environmental health and biodiversity are system dependent but cut across animal genetics (e.g., biodiversity conservation, adapted-breeds), feed (e.g., utilization and management of forages and food-feed crops), animal health (e.g., reducing antibiotic residue), and resource use (e.g., manure management). [22] SAPLING contributes to environmental health & biodiversity by 1) making innovations that support environmental health (e.g., stress resilient improved forage and food-feed crops, use of agricultural byproducts for feed, adapted breeds, herd health) available to producers and 2) preserving and enhancing agro-biodiversity of local livestock breeds and forage species through improvement programs.

Research questions WP5 RQ1 What are the trade-offs and synergies between productivity, economics, gender & social equity, and environmental factors that need to be considered when developing and scaling livestock innovations and at national level for policy making? ***WP1 RQ2*** How can recent advances in phenomics, genomics, digital and reproductive technologies be capitalized on to achieve sustainable and scalable models for livestock genetic improvement, conservation and delivery that ensure women and men livestock keepers equitably access and benefit from improved genetics? ***WP1 RQ3*** How to make optimum use of agricultural byproducts, mainly crop residues, using innovative resilient, low emissions technologies already in use in other sectors (e.g., biofuel production)? ***WP1 RQ4*** How to develop and apply stress resilient improved forages and food-feed crops that respond to year-round feed demands, increase productivity, improve natural resource use efficiency, and adapt to and mitigate climate change**? *WP1 RQ5*** Can integrated herd health management packages through digital farmer-support systems and appropriate animal disease control decision tools address complex interrelated disease control challenges, while being effectively delivered?

Components of Work Packages This Impact Area will be delivered with LCSR and OneHealth. In SAPLING, it will be delivered by WP1, developing livestock technologies and practices and WP5, prioritizing innovations with environmental factors as a key dimension in ex-ante trade off analysis.

Measuring performance and results

3-year outcomes	**Metrics**
Co-created, demand-driven Innovation Packages of productivity- and resilience enhancing, low emissions technologies and the institutional arrangements (including markets) necessary for their adoption are being used by 800,000 people (male and female) in households keeping cattle, chickens, small ruminants, pigs and buffalo in Ethiopia, Kenya, Tanzania, Uganda, Mali, Nepal and Vietnam, resulting in a 30-50% increase in livestock productivity (Initiative level)	Number of beneficiaries using the packages, disaggregated by gender

Partners **Demand:** Producers/producer organizations, animal feed and feed-forages seed production companies, public animal health and livestock genetic improvement centers, national research institutions, national governments **Innovation**: National and international research institutions, universities, other academic institutions **Scaling:** Commercial actors**,** public animal health and livestock genetic improvement centers, national research institutions, national government, large-sale development programs

Human resources Environmental scientists and livestock scientists (forages, genetics)

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 Guidance for MELIA for selection of appropriate indicators)				
# of people benefiting from relevant CGIAR innovations	# of people assisted to exit poverty	# of women assisted to exit poverty	# of people benefiting from climate-adapted innovations	# of ha under improved management
SDG targets				
2.1	1.1	1.2	13.1	15.1

Resilient Agrifood Systems	
Action Area outcomes	**Action Area outcome indicators**
RAFS 1 – Smallholder farmers use resource-efficient and climate-smart technologies and practices to enhance their livelihoods, environmental health and biodiversity	RAFSi 1.1 Number of resource-efficient and climate-smart technologies at stage IV (uptake by next user), disaggregated by type
RAFS 2 – Research and scaling organizations enhance their capabilities to develop and disseminate RAFS-related innovations	RAFSi 2.1 Number of organizations.
ST & RAFS 2 – National and local governments utilize enhanced capacity (skills, systems and culture) to assess and apply research evidence and data in policy making process	STRAFSi 2.1 Number of policies/ strategies/ laws/ regulations/ budgets/ investments/ curricula (and similar) at different scales that were modified in design or implementation, with evidence that the change was informed by CGIAR research
ST & RAFS & GI 1 Women and youth are empowered to be more active in decision making in food, land and water systems	STRAFSGIi 1.2 Number of women, youth and people from marginalized groups who report input into productive decisions, ownership of assets, access to and decisions on credit, control over use of income, work balance, and visiting important locations

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**

Outcome (Initiative)	Co-created, demand-driv Innovation Packages productivity- and resilienc enhancing,, low emissio technologies and t institutional arrangemer (including marke necessary for their adopti are being used by 800,0 people (male and female) households keeping catt chickens, small ruminan pigs and buffalo in Ethiop Kenya, Tanzania, Ugand Mali, Nepal and Vietna resulting in a 30-5(increase in livesto productivity	Number of beneficiaries using the packages and change in productivity, disaggregated by gender	Number	7 SAPLING countries	Extrapolation based on survey data and secondary data	Household questionnaires, KIIs, secondary sources	Baseline and end Initiative	n/a	2022	800,000	2024
Outcome (Initiative)	Private and public sector partners invest at least US$30 million in co-creation and delivery of novel, low emissions, demand-driven, gender and youth inclusive, and productivity enhancing technologies and practices for genetics, feed/forages, and health	US$ invested	US$	Global	Primary	Evaluative studies – e.g. outcome harvesting, KASP survey	Midterm and end Initiative	n/a	2022	30 million	2024
Outcome (Initiative)	6 public and private sector organizations utilize Initiative-developed social behavior change communication strategies and tools targeted at incorporating safe LDFs	Number of strategies and/or campaigns modified in design or implementation, informed	Number	National: 3 countries	Primary	Evaluative studies – e.g. outcome harvesting, KASP survey	Midterm and end Initiative	n/a	2022	6	2024

	into diverse diets to inform nutrition education strategies and/or campaigns	by CGIAR research									
Outcome (Initiative)	Public and private decision makers utilize the Initiative Innovation Packages to inform policies and investments in Ethiopia, Kenya, Tanzania, Uganda, Mali, Nepal and Vietnam towards an inclusive and sustainable livestock system, including progress towards equity and inclusion	Number of policies/ strategies/ laws/ regulations/ budgets/ investments/ curricula modified in design or implementation, informed by CGIAR research	Number	National: 7 countries	Primary	Evaluative studies – e.g. outcome harvesting, KASP survey	Midterm and end Initiative	n/a	2022	7	2024
Output (WP1)	One improved commercially available and four candidate disease control tools (vaccines or diagnostics) available for integrated control of priority diseases	Number of Vaccine and diagnostics	Number	Global	Primary	Key informant interviews, organizations, websites	Midterm and end Initiative			1 improved commercially available and 4 candidate disease control tools	2024
Output (WP1)	Breeding programs for more productive and resilient livestock and poultry breeds and breed types in 7 countries available to public and private system actors	Number of breeding programs	Number	Global	Primary	Key informant interview; publications	Midterm and end Initiative			7	2024
Output (WP1)	Evidence for feed companies to start using economically feasible treatment methods that can substantially	Number of improved straw/ stover digestibility option options	Number	Global	Primary	Key informant interview; publications	Midterm and end Initiative			2	2024

	improve straw/stover digestibility										
Output (WP1)	At least three additional suitable forages adapted to specific socio-economic and agro-ecological contexts developed and available for dissemination	Number of forages and food-feed options	Number	Global	Primary	Key informant interview; publications	Midterm and end Initiative			3	2024
Output (WP1)	One context specific herd health package (including animal welfare) per value chain — coupled to at least one tool for guiding control of major epidemic animal diseases — available for use by animal health system actors	Number of herd health packages	Number	Global	Primary	Key informant interview; publications	Midterm and end Initiative			7	2024
Output (WP1)	Robust tools and platforms developed and operationalized and routinely used to identify and promote combinations of more profitable technical interventions in 14 targeted value chain-country combinations	Number of tools/ platforms	Number	Global	Primary	Key informant interview; publications	Midterm and end Initiative			7	2024
Outcome (WP1)	Increased application of models for genetic improvement in smallholder systems, built on the needs and preferences of livestock keepers in 7 countries and incorporating advanced ICT, genomic	Number of actors using models for genetic improvement	Number	National: 7 countries	Primary	Evaluative studies- e.g. outcome harvesting, KASP survey	Midterm and end Initiative	n/a	2022	7	2024

	and reproductive technologies										
Outcome (WP1)	100,000 farmers in the 7 target countries and 200,000 globally have access to improved forage lines and prioritization approaches used by development partners and private feed companies to improve feed options and reduce livestock feeding gap	Number of beneficiaries using the innovation, disaggregated by gender	Number	National: 7 countries	Extrapolation based on survey data and secondary data	Household questionnaires, KIIs, secondary sources	Baseline and end Initiative	n/a	2022	100,000	2024
Outcome (WP1)	Animal health system actors in 5 countries achieve a reduction of 50% in outbreaks of specific diseases and a reduction in the disease burden of endemic and epidemic diseases	Number of beneficiaries using the innovation, disaggregated by gender	Number	National: 5 countries	Extrapolation based on survey data and secondary data	Market agent questionnaires	Baseline and end Initiative	n/a	2022	Data for 5 countries	2024
Output (WP2)	An operational framework to identify context specific "bottlenecks" in LDF consumption and food security	Number of papers and other information products	Number	Global	Primary	Publication	Yearly			3	2023
Output (WP2)	A database of interventions ("corkscrews") matched to specific bottlenecks and scored for various synergies and trade-offs to other Impact Areas	Number of database	Number	Global	Primary	Online database	Yearly			1	2023
Output (WP2)	Approaches and gender-sensitive delivery models for influencing behavior on diets that include	Number of papers and other information products	Number	Global	Primary	Publication	Yearly			3	2023

	LDFs and food safety practices through SBCC										
Output (WP2)	Evidence on market-based innovations and practices that enhance the supply of safe, nutritious and affordable LDFs to consumers	Number of papers and other information products	Number	Global	Primary	Publication	Yearly			3	2023
Outcome (WP2)	Public and private organizations in 3 countries take up the decision support tools to diagnose and prioritize LDFs in food and nutrition interventions	Number of organizations taking up the decision support tools	Number	National: 3 countries	Primary	Evaluative studies- e.g. outcome harvesting, KASP survey	Midterm and end Initiative	n/a	2022	3	2024
Outcome (WP2)	Women and men in livestock keeping households in 3 target countries adopt appropriate nutrition practices including integration of LDFs in overall diets and appropriate handling of LDFs	Number of beneficiaries using the innovation, disaggregated by gender	Number	7 SAPLING countries	Extrapolation based on survey data and secondary data	Household questionnaires, KIIs, secondary sources	Baseline and end Initiative	n/a	2022	Data for 3 countries	2024
Output (WP3)	Evidence on best approaches to progress towards gender equality and women's empowerment in livestock development across the three livestock technical pillars	Number of papers and other information products	Number	Global	Primary	Publication	Yearly			4	2024
Output (WP3)	Women-empowerment monitoring tools generated and/or sharpened at farm (WELI) and business (WELBI) levels to	Number of papers and other information products	Number	Global	Primary	Publication	Yearly			5	2024

	measure progress towards gender equality and women's empowerment in livestock value chains										
Output (WP3)	Evidence on best practices that lead to empowerment via implementation of accommodative and transformative approaches	Number of papers and other information products	Number	Global	Primary	Publication	Yearly			3	2024
Output (WP3)	Evidence on best-bet entry points for engagement of youth in selected livestock value chains	Number of papers and other information products	Number	Global	Primary	Publication	Yearly			2	2024
Outcome (WP3)	In 4 selected countries policy, private sector and development community acknowledge gender- and youth-based discrimination in livestock value chains and co-develop strategies to close the gender and age gap)	Number of policies/ strategies/ laws/ regulations/ budgets/ investments/ curricula modified in design or implementation, informed by CGIAR research	Number	National: 4 countries	Primary	Evaluative studies- e.g. outcome harvesting, KASP survey	Midterm and end Initiative	n/a	2022	4	2024
Outcome (WP3)	Community and household members in selected livestock value chains adopt more gender-equitable behavior to enable participation and benefitting from	Number of beneficiaries using the innovation, disaggregated by gender	Number	4 SAPLING countries	Extrapolation based on survey data and secondary data	Household questionnaires, KIIs, secondary sources	Baseline and end Initiative	n/a	2022	Data for 4 countries	2024

	livestock assets and opportunities										
Outcome (WP3)	In 4 target countries scientists and practitioners and extension agents in animal health, feeds and forages, genetics and environment collaborate with gender scientists to generate gender- and youth-responsive livestock innovation bundles	Number of publications co-authored by gender and non-gender scientists	Number	7 SAPLING countries	Primary	Publication	yearly	n/a	2022	4	2024
Output (WP4)	Robust indicators of livestock value chain competitiveness and inclusivity identified; associated data collection protocols ready for use	Number of papers and other information products	Number	Global	Primary	Publication	yearly	n/a	2022	2	2024
Output (WP4)	Evidence on inclusive institutional arrangements and business models that ensure sustained improvement in efficiency of input delivery systems and integration of input and output markets	Number of papers and other information products	Number	Global	Primary	Publication	yearly	n/a	2024	10	2024
Output (WP4)	Evidence on proven Innovation Packages for competitive, inclusive, resilient and low emissions livestock value chains identified with clear and context-specific principles for scaling in WP 5	Number of papers and other information products	Number	Global	Primary	Publication	yearly	n/a	2024	10	2022

Outcome (WP4)	Government and development practitioners support new business models and interventions that ensure improved competitiveness of the livestock value chains	Number of policies/ strategies/ laws/ regulations/ budgets/ investments/ curricula modified in design or implementation, informed by CGIAR research	Number	National: 7 countries	Primary	Evaluative studies- e.g. outcome harvesting, KASP survey	Midterm and end Initiative	n/a	2022	5	2024
Outcome (WP4)	Livestock producers and input and service providers adopt SAPLING- supported productivity enhancing Innovation Packages	Number of input and service providers using the innovation, disaggregated by gender	Number	National: 7 countries	Extrapolation based on survey data and secondary data	Household questionnaires, KIIs, secondary sources	Baseline and end Initiative	n/a	2022	800,000	2024
Outcome (WP4)	Market actors invest in profitable and inclusive business models promoted by SAPLING, that provide transparent and efficient output markets	Number of market actors using the innovation, disaggregated by gender	Number	National: 7 countries	Extrapolation based on survey data and secondary data	Market agent questionnaires	Baseline and end Initiative	n/a	2022	Data for 7 countries	2024
Output (WP5)	Prioritized innovations and Innovation Packages and their likely impact assessed for each value chain	Number of papers and other information products	Number	Global	Primary	Publication	yearly			7	2023
Output (WP5)	Papers and open access models, datasets for, and results of trade-offs analyses, at different scales (farm, value chain and country);	Number of papers and other information products	Number	National: 7 countries	Primary	Publication	yearly			7	2024

Output (WP5)	Papers and open access models related to improved livestock master plan models	Number of papers and other information products	Number	Global	Primary	Publication	yearly			3	2024
Output (WP5)	Set of scaling readiness assessments and suites of investment options available to inform investments by both public and private sector actors and to guide research	Number of papers and other information products	Number	National: 7 countries	Primary	Publication	yearly			14	2024
Output (WP5)	Results and lessons-learned regularly feed into scaling approaches	Number of papers and other information products	Number	National: 7 countries	Primary	Publication	yearly			14	2024
Outcome (WP5)	Value chain actors are adjusting their investments and practices based on scaling readiness analysis	Number of investments/ practices curricula modified in design or implementation, informed by CGIAR research	Number	National: 7 countries	Primary	Evaluative studies- e.g. outcome harvesting, KASP survey	Midterm and end Initiative	n/a	2022	5	2024
Outcome (WP5)	Public and private decision makers utilize Initiative-developed tools and recommendations to inform policies and investments in the 7 focus countries and beyond (scaling)	Number of policies/ strategies/ laws/ regulations/ budgets/ investments/ curricula modified in design or implementation, informed	Number	National: 7 countries	Primary	Evaluative studies- e.g. outcome harvesting, KASP survey	Midterm and end Initiative	n/a	2022	5	2024

		by CGIAR research									
Outcome (WP5)	Researchers and decision makers have access to more robust tools, evidence and processes to guide livestock master plans	Number of tools in used	Number	National: 7 countries	Primary	Evaluative studies- e.g. outcome harvesting, KASP survey	Midterm and end Initiative	n/a	2022	5	2024

6.2 MELIA plan

a. Narrative for MEL plans

The MEL plan will be developed at the start of the Initiative and will evolve around four principles.

1. Starting with the end in mind: developing nested TOCs with stakeholders and partners, with yearly 'reflection moments'

An important part of the co-creation process described earlier is the alignment of partners and stakeholders on a joint, or common, vision. The team will facilitate the development of nested TOCs- starting at country and value chain levels that will cut across the Work Packages, and will eventually feed into a refined SAPLING TOC. This would support all parties to be aligned on outcomes in a participatory exercise and identify possible missing actors that need to be brought in, or at least considered. As well as articulating assumptions, the exercise will identify key stages, or moments, along the impact pathways, that would then form 'stages of progress'. Annually, qualitative assessment of progress towards outcomes, focusing on the key outcomes, will be conducted using a common checklist- across countries and species for efficiency and comparison purposes. This will also be the opportunity for reflection, self-learning and adjusting plans.

2. Taking advantage of work across countries and value chains, for support and evidence generation

By designing the MEL this way, cross country and value chains learning will be possible. It will also allow the team to support and learn from each other, including across disciplines.

3. From big picture to output monitoring

Based on the current proposal and using the TOC 'stages of progress', a more detailed and realistic list of outputs will be developed. The monitoring of outputs will be based on the 3-year horizon, broken into 6-month periods. It will also take into account events of importance to the success of SAPLING in the target countries and value chains (e.g., policy forums, investment forums).

4. Planning evaluation and impact assessment from the start

This will be done by organizing baseline surveys or coordinating them with other parties (other Initiatives, SPIA, country surveys) for efficiency and to reduce respondents' fatigue. As much as possible, tools like RHoMIS will be used. During the Initiative and as per research activities, digital platforms like dairy genetics data platforms in East Africa will be leveraged. Acknowledging that livestock keepers and other actors are both the generators and the end users of the data, feedback loops will be strengthened to enable co-creation of data for decision making and to ensure that for research data is not extractive.

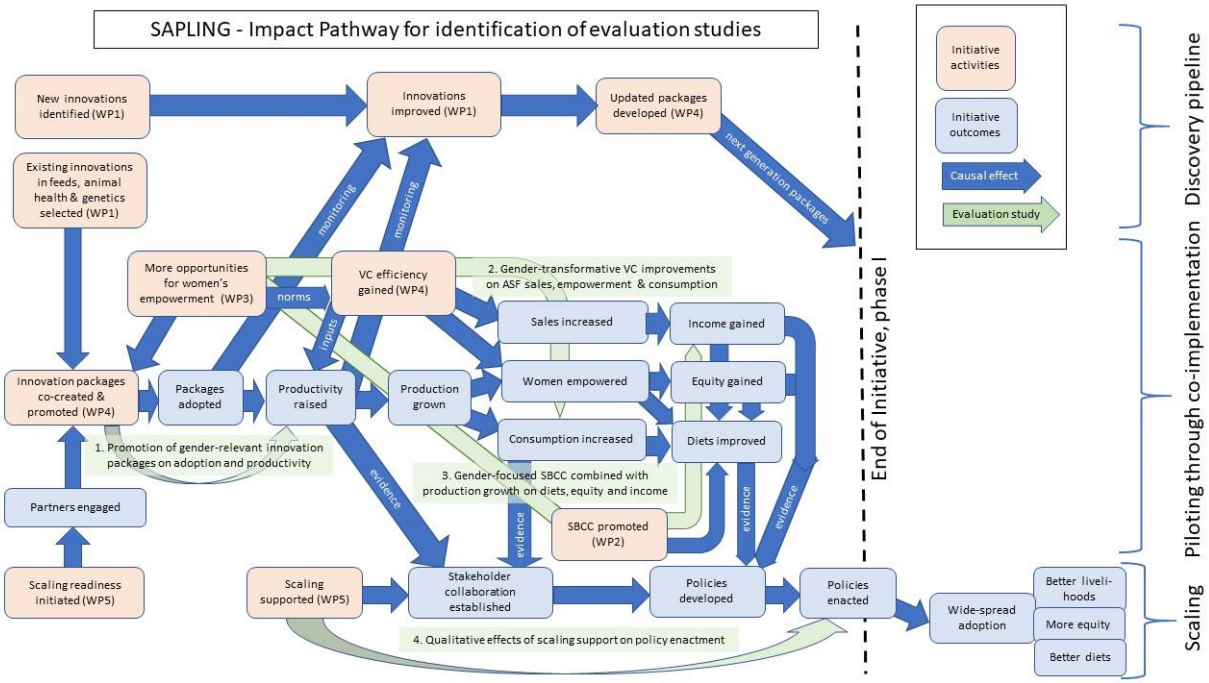
b. Narrative for impact assessment research plans

Plan for Initiative-level impact assessment based on expected End-of-Initiative outcomes.
The Initiative will focus on providing evidence of the benefits of interventions along the impact pathway, corresponding to assumptions forming the Initiative's design. The Initiative's

limited time horizon restricts the measurement of intervention effects to intermediate levels, where change will manifest itself earlier than at the final outcomes.

Learning questions around key assumptions underlying the TOC.
By assessing change along the impact pathway and engaging partners from the outset, the Initiative will be able to gain early insights into the perceptions of stakeholders and technical effects of the promoted interventions. These results will allow a reflection on specific aspects of the Innovation Packages, including the applicability to various country settings and target species, and will feed into the continuous improvement of the technical innovations contributing to the Innovation Packages and the social interventions with which they are combined. This builds on ongoing learning studies.[134] As importantly, the learning results will considerably improve the effectiveness of scaling activities by providing nationally relevant results and providing direct exchange between on-going research and policy development.

Plans for tracing activities and policy advice aimed at improving the scaling (readiness) of innovations and Innovation Packages: Designing long-term, large-scale impact assessment.
Data utilized for the Initiative-level assessment described above will also be the basis for designing long-term, large-scale impact assessments. Information on when, where and by whom relevant policy changes and development activities were implemented will allow large-scale data collection to be designed for assessing adoption and determining impacts on livelihoods and diets. Where possible this will be closely linked to other large-scale data collection such as those organized by the CGIAR or by national agencies.



6.3 Planned MELIA studies and activities

Type of MELIA study or activity	Result or indicator title that the MELIA study or activity will contribute to.	Anticipated year of completion (based on 2022-24 Initiative timeline)	Co-delivery of planned MELIA study with other Initiatives	How the MELIA study or activity will inform management decisions and contribute to internal learning
Adoption + Causal IA learning	Promotion of gender-relevant Innovation Packages on adoption and productivity Study across countries, same species, adoption at household level and animal level productivity. Work embedded in WP1, WP3 and WP4.	2024	LCSR	Prioritization and improvement of packages
Causal IA learning	Gender-transformative value chain improvements on LDF sales, empowerment & consumption Study across countries, same species, household level, possibly across seasons. Work embedded in WP2, WP3 and WP4.	2024	TBD	Trade-offs between sales, empowerment & consumption
Causal IA learning	Gender-focused SBCC combined with production growth on diets, equity and income Study across countries, same species, intra household level. Work embedded in WP2 and WP3.	2024	TBC	Gender-focused SBCC effects under various conditions
Tracing scaling activities	Scaling support on policies and development activities Process documentation, KIIs. Work embedded in WP5	2024	TBC	Effectiveness of scaling support

7. Management plan and risk assessment

7.1 Management plan

SAPLING Program Management Unit consists of the Lead and Deputy Lead with administrative, MELIA, communication and knowledge management (CKM), gender and social equity, and partnerships and scaling support.

The SAPLING Lead is responsible for scientific leadership and oversees communication and partnerships including with other Initiatives. The Deputy Lead has a dual role: 1) assisting the Lead and 2) facilitating interdisciplinary work. Adherence to research ethics processes will be supported and monitored by the Lead and Deputy Lead. Work packages are led by WP leads, in charge of coordinating the research. Country level work is coordinated by country coordinators. The PMU is in charge of budget allocation between WPs and countries and will monitor budget execution and completion of deliverables.

The MELIA expert ensures that the MELIA plan is implemented as planned and facilitates possible adjustments. The partnership and scaling expert is responsible for implementing the scaling readiness plan (proposal section 4). This expert will also take responsibility for developing and implementing a partnership strategy. The CKM expert is responsible for both internal and external communication and knowledge management.

The PMU, WP leads and country coordinators will meet monthly to monitor progress, discuss synergies and trouble shoot. Using the result framework and the TOCs, the team will discuss and agree possible adjustments twice yearly (as described in the MEL section), including staff and budget adjustments.

SAPLING will establish an advisory board to provide strategic direction, meeting twice per year. It will be composed of five independent members, factoring in gender, disciplinary balance, organization type and geographical diversity.

7.2 Summary management plan Gantt table

Initiative Start Date	Jan 2021	Timelines												Description of key deliverables (maximum 3 per row, maximum 20 words per deliverable)
	Lead	2022			2023				2024					
Work Packages	organization	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Work Package 1	CGIAR			1					2				3	1. Reports on the co-created technological innovations for the target value chains/country; 2. Progress reports on adoption level of technological innovations and bottlenecks for implementation; 3. Reports and scientific papers on preliminary changes in productivity resulting from the application of SAPLING technological packages.
Work Package 2	CGIAR				1					2			3	1. A database of nutrition sensitive interventions published; 2. Paper on effectiveness of selected nutrition sensitive interventions; 3. Paper on market-based innovations and practices that enhance the supply of safe, nutritious and affordable LDFs to consumers
Work Package 3	CGIAR				1				2				3	1. paper on gender approaches applied to the 3 livestock technical pillars; 2. Revised WELI and WELBI tools published; 3. Paper on effectiveness of GAAs and GTAs applied to livestock value chains
Work Package 4	CGIAR				1						2		3	1. paper and associated protocol on competitiveness and inclusivity indicators in livestock value chains; 2. Paper on preliminary evaluation of inclusive institutional arrangements; 3. Paper on evaluation of Innovation Packages in up to 5 countries
Work Package 5	CGIAR			1					2				3	1. 1 report on ex ante assessment of prioritized innovations; 2. Paper on strengthened modelling for livestock master plans and associated open access models; 3. 1 paper on policy engagement across SAPLING countries
Innovation Packages & Scaling Readiness	CGIAR				1				2				3	1. first set of scaling readiness reports; 2. Second set of scaling readiness reports; 3. Third set of scaling readiness reports
MELIA	CGIAR		1						2				3	1. MELIA plan published, and evaluation partners identified; 2. Midterm report of selected Initiative and WP outcomes available; 3. Final evaluations started
Project Management	CGIAR		1						2				3	1. PMU in place; year 1 POWB; TOC and monitoring system in place; 2. 1 'lessons learned' report on progress following TOC at Initiative, WP and country levels; 3. 1 report with reflections on Initiative preliminary achievements of outcomes using TOC

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 1-5	**Rate from 1-5**		
Funding from One CGIAR donors is lower than anticipated (all WPs)	Previous experience from the CRPs has shown that pooled funding from the CGIAR may fluctuate and therefore the likelihood of accessing less funds than anticipated is high.	4	4	16	Work with national partners to leverage partner funding for key activities. Work to leverage private funding (e.g., long-term contract between CGIAR and private seed companies) for the platforms where suspension of activities may be detrimental (forage seed systems, breeding schemes, delivery of health services).
Creators of new technologies (vaccines, etc.) are unable and/or unwilling to invest in innovations for sustainable livestock productivity for LMICs (WP1)	Companies are not willing to take the risk of investing in products for niche markets and/or when the end users, small and medium-scale livestock producers, have low purchasing power. Registration procedures are often intensive and country specific.	3	4	12	Explore mechanisms to de-risk private sector investment including co-design and -investment. Cultivate partnerships with smaller regional companies. Support an enabling policy and regulatory environment (e.g. work on forage seed policies).
Gender and social norms do not allow systems change (WP3)	In all SAPLING countries, there are social norms restricting women, youth and other marginalized groups from participating in and benefiting from livestock systems and markets. These social norms can prove to be very high barriers to change.	4	3	12	Engage communities, development agencies, agents of chance and government bodies at various levels on gender work. Both gender accommodative and transformative approaches will be followed. Accommodative approaches are less disruptive, though have lower impact.
Insufficient incentives for livestock producers, value chains actors and policy makers to change behaviors (WP4 and WP5)	SAPLING is working in countries where business is riskier and risk reducing mechanisms (insurance) are less available. In such risky environments, large and safe incentives are needed for market actors and policy makers to change their business approaches and adjust policies.	2	5	10	Co-design efforts will support creation of Innovation Packages that offer appropriate incentives. SAPLING builds on many years of partnerships, staff with strong knowledge of country contexts and links with reputable development agencies working directly with producers.
Unforeseen events in all or some target countries (e.g., including climatic extremes, political disruptions, pandemics) prevent field activities (all WPs)	The frequency of such events is increasing, the amplitude is larger and the duration longer. During the COVID-19 pandemic, activities with actors and stakeholders were reduced due to disruptions in everyday life (closed markets, inability of people and goods to move freely). Similar impacts may arise in case of political unrest or extreme climatic events.	2	4	8	Having seven target countries should allow work to continue in some countries or sites unless the event is global. In the case of an unforeseen event, incurred losses and impacts will be integrated in the ex-post impact assessment studies and system modelling. Lessons will be useful to assess risks in future funding cycles.

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.

Potential conflicts of interests exist with private and public sector partners. Partners may gain by linking to our strong research network or lose business advantage though Initiative activities (for example, being a sole service provider). SAPLING will mitigate this through transparency and early engagement of all relevant partners, as well as expanding business opportunities.

8.2 Open and FAIR data assets

Researchers and organizations involved in this Initiative will adhere to the terms of the Open and FAIR Data Assets Policy, which covers all knowledge and information products, including research data and software, for all Initiative data asset outputs and ensuring:

- Wider and open access by adopting unrestrictive, standard licenses (e.g. Creative Commons for non-software assets; General Public License (GPL) or similar for software) and depositing assets in open repositories (e.g. CGSpace, DataVerse) that serve the goals of the Initiative, its partners and ultimate users and are optimized for users with limited internet connectivity.
- Use of rich metadata for all data assets that conform to the CGIAR Core Schema and others (including ontologies and/or controlled vocabularies) that make them findable, accessible, inter-operable and re-usable, ensuring that these metadata are accessible even when the asset is not.
- Adherence to the CGIAR Research Ethics Code for assets derived from research with human subjects, including prior informed consent (PIC) and ensuring confidentiality of personally identifiable information (PIC).

9. Human resources

9.1 Initiative team

Category	*Area of Expertise*	*Short description of key accountabilities*
Research	Animal geneticists	Data collection and analysis, breeding values evaluation, co-develop strategies for the preservation of local genetic resources, co-development of breeding schemes and work on genomics-based selection, support capacity building and scientific production
Research	Reproductive physiologists and biotechnologists	Reproductive delivery part of the breeding programs represented by artificial insemination, embryo transfer, sires and semen certification, and new generation biotechnologies, support capacity building and scientific production
Research	Forage production scientists	Establish synergies with GI platform to maintain the forage breeding program for key traits relevant to SAPLING target countries, agronomy of forage production and impacts in the crop-livestock mixed systems; support capacity building and scientific production
Research	Animal nutritionists	Valorization of crop residues and forages in animal feed, feed assessment and formulation, precision feeding, support capacity building and scientific production
Research	Animal health scientists	Epidemiologist, herd health management, vaccines and disease diagnostics, assessment of priority diseases risk maps, co-creation of herd-health packages, development and delivery of vaccines and diagnostics tools, support capacity building and scientific production
Research	Human nutritionists	Design and run nutrition sensitive activities with actors and development actors, design monitoring tools, coordinate data analysis, engage in revisions of process based on changes (following TOC), write publications for various audiences., support capacity building of students and partners
Research	Gender and social equity scientists	Develop and test monitoring tools for women empowerment, coordinate data collection- both qualitative and quantitative, design and run gender approach activities with actors and development actors, design monitoring tools, coordinate data analysis, support capacity building of students and partners
Research	Economists and policy analysts	Develop and test value chain analysis protocol and tools, conduct data analysis, write publications, design action research by engaging with actors and agreeing on design for 'experiments', design monitoring tools, coordinate data analysis, engage in revisions of process based on changes (following TOC), write publications for various audiences, support capacity building of students and partners
Research	System modelers, economists	Coordinate ex ante trade off analysis working with the other WPs and stakeholders., work with IA scientists to link ex ante and ex post analysis, improve modelling for livestock master plans working with gender scientists and environment experts from LCSR, contribute to capacity building of next user, write publications
Research support	Communication and knowledge management	Lead development and implementation of all communication and knowledge products, including progress toward outcomes and their documentation following TOC
Research support	Scaling and partnership expert	Coordinate scaling readiness assessments, lead partnership work with WP leads and country coordinators
Research	MELIA – IA	Finalize impact assessment plan and design IA workplan linked to TOC, lead design of evaluations implemented in the WPs and run some of them, contribute to data analysis, write publications., support MELIA research support staff
Research support	MELIA	Design monitoring templates, ensure collection of relevant data (quality and timing), data analysis and reporting

9.2 Gender, diversity and inclusion in the workplace

The Initiative team will meet CGIAR's gender target of a minimum of 40% women in professional roles and is comprised of individuals from diverse backgrounds. The current Initiative Design Team is composed of 11 women and 12 men, from different backgrounds (13 members with Sub-Saharan Africa origin; six Europe and four other). The leadership team is expected to be diverse: the current one (composed of Initiative lead, co-lead and WP leads) includes three women and three men; two people of Sub-Saharan origin, one from Northern Africa, one from the Middle-East, one from Asia and one from Europe.

9.3 Capacity development

SAPLING is committed to increasing capacity of its members and partners in the areas of scientific expertise, teamwork, results orientation, partners' engagement and CGIAR's values. Co-design puts capacity development at the core of many SAPLING activities, allowing SAPLING team members, partners and stakeholders to learn from each other. For example, WP1 promotes a wide range of technologies and partners will need capacity development (e.g., training) in using these technologies. CRP Livestock experience showed that intensive training of local partners within implementation sites is highly effectual. The presence of well-trained local staff during COVID-19 travel restrictions meant that field activities successfully continued. Opportunities for formal training and mentoring will be provided for junior staff, students and partners interested in advancing their education. As much as possible, MSc and PhD students will be embedded in research activities, aligning thesis topics with SAPLING research questions to maximize synergies and progression towards outcomes.

SAPLING team leaders and managers will complete training on inclusive leadership within three months of launch. 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. Finally, the Initiative kick-off will include an awareness session on CGIAR's values, code of conduct and range of learning opportunities available within CGIAR.

10. Financial resources

10.1 Budget

10.1.1 Activity breakdown (US$)

USD	2022	2023	2024	Total
Crosscutting across Work Packages	446,308	557,884	669,460	1,673,652
Work package 1	6,188,482	7,735,603	9,282,723	23,206,808
Work package 2	1,525,593	1,906,991	2,288,390	5,720,974
Work package 3	1,524,043	1,905,054	2,286,065	5,715,162
Work package 4	3,091,094	3,863,867	4,636,641	11,591,602
Work package 5	3,091,635	3,864,544	4,637,453	11,593,632
				0
Innovation packages & Scaling Readiness	132,845	166,057	199,268	498,170
Total	**16,000,000**	**20,000,000**	**24,000,000**	**60,000,000**

10.1.2 Geography breakdown (US$)

USD	2022	2023	2024	Total
Global (not specific country)	3,557,046	4,446,307	5,335,569	13,338,922
Uganda	2,483,436	3,104,295	3,725,154	9,312,885
Tanzania	2,476,793	3,095,992	3,715,190	9,287,975
Ethiopia	2,326,520	2,908,151	3,489,782	8,724,453
Vietnam	1,404,987	1,756,234	2,107,481	5,268,702
Kenya	1,250,406	1,563,007	1,875,608	4,689,021
Mali	1,250,406	1,563,007	1,875,608	4,689,021
Nepal	1,250,406	1,563,007	1,875,608	4,689,021
Total	**16,000,000**	**20,000,000**	**24,000,000**	**60,000,000**

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