Darwin Initiative Main & Extra Annual Report

To be completed with reference to the "Project Reporting Information Note":
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It is expected that this report will be a **maximum of 20 pages** in length, excluding annexes)

Submission Deadline: 30th April 2025

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• Darwin Initiative Project Information

Scheme (Main or Extra)	Main
Project reference	31-002
Project title	Seeds4Soils: regenerating soils with agrobiodiversity for climate resilience in Madagascar
Country/ies	Madagascar
Lead Organisation	World Vegetable Center
Project partner(s)	National Center for Applied Research and Rural Development (FOFIFA), University of Antananarivo (UA), NGO CEFFEL (Conseil, Expérimentation, Formation en Fruit Et Légume).
Darwin Initiative grant value	£599,858.00
Start/end dates of project	1 April 2024 - 31 March 2027
Reporting period (e.g. Apr 2024 – Mar 2025) and number (e.g. Annual Report 1, 2, 3)	April 2024-March 2025; Annual Report 1
Project Leader name	Dr. Sognigbe N'Danikou
Project website/blog/social media	*https://avrdc.org/seeds4soils-improving-climate-resilience-in-madagascar-by-regenerating-soils-with-agrobiodiversity/*
Report author(s) and date	Sognigbe N'Danikou, Lukas Pawera, Bodo Rabary, Tatiana Rakotoson, Ida Randrianasolo, Tendro Radanielina, Mercy Mwambi, George Mgendi, Samuel Mathu Ndungu, Maarten van Zonneveld 30 April 2025

1. Project summary

Unsustainable agricultural practices degrade soils, reduce crop diversity, threaten agroecosystems, and reinforce the climate vulnerability of smallholders. Traditional African Vegetables (TAVs) and their crop wild relatives (CWRs) could serve as cover crops, although their regenerative potential and impact on soil microbiome diversity and agroecosystem productivity remain to be researched. Studies found that plant diversification has a positive effect on soil fertility in Madagascar. However, there is a research gap on which plant combinations can help regenerate degraded agricultural soils and bring back beneficial microorganisms. Combined with high-value TAVs, species combinations of cover and cash crops could support regenerative and profitable agriculture that makes Malagasy farming communities more climate-resilient. The

Seeds4Soils project aims to exploit the potential of traditional African vegetables, their wild relatives, and associated soil microorganisms to regenerate agricultural soils and increase the climate resilience of vulnerable Malagasy farming communities. Specifically, the project will: (i) rescue soil and crop biodiversity; (ii) unravel its adaptive potential for climate-resilient agriculture; (iii) increase farming system productivity and resilience through participatory restoration of soil health; and (iv) generate livelihood opportunities through new markets for vegetables and co-production of regenerative seed kits (R-kits). It is expected that the intervention will result in (1) enhanced soil health resulting in increased cropping system productivity by 30%; (2) 20% annual increase in land area under improved regenerative agricultural practices; (3) improved livelihood reported by at least 50 - 83 % of the targeted households through an income increase of US$ 5/person/year; (4) reduced food insecurity in 67% of targeted households by at least one category on Household Food Insecurity Access Scale (e.g. from moderately food insecure to mildly food insecure); (5) at least 40 prioritized landraces and populations of CWRs from at least 10 species including their rhizosphere microorganisms conserved on-farm by custodian farmers; (6) at least 400 new accessions of targeted TAVs and CWR and their rhizosphere soil samples are inventoried, collected across agroecological gradients to close collection gaps for these targeted genepools, and regenerated, characterized and conserved in national and regional genebanks; (7) at least 50 champion farmers and extension workers are enabled and actively promoting regenerative agriculture; and (8) at least 2,000 farmers have enhanced knowledge and strengthened capacity in regenerative agriculture and have received R-kits for sowing.

2. Project stakeholders/ partners

The partners include the World Vegetable Center (WorldVeg), National Center for Applied Research and Rural Development (FOFIFA), University of Antananarivo (UA), which are public research and development institutions, and CEFFEL (Conseil, Expérimentation, Formation en Fruit Et Légume), a local NGO. The project 31-002 was based on demand from national partners and local communities who expressed strong interest in scaling the achievements of the previous Darwin-funded project 26-015, implemented in Madagascar from 2019-2022. During the reporting period, FOFIFA and UA led the preparation of the inception and project-planning workshop, which was held on 27 and 28 June 2024 in Antananarivo. The inception workshop was attended by key stakeholders from sectoral ministries including the Ministry of Agriculture and Livestock, the Ministry of Higher Education and Scientific Research, the Ministry of the Environment and Sustainable Development, the University of Antananarivo, researchers from FOFIFA led by its Director General, the Director of CEFFEL, scientists from the World Vegetable Center, the FAO representative, the Africa Rice country representative, various NGOs, the GSDM, various companies working in organic farming, the LRI, the IRD, the ANAE, the CTAS, farmers representatives who attended in large number, communication houses and journalists. The workshop gave participants insight into the project's objectives and expected results on strengthening biodiversity conservation, improving soil health, and income for smallholders in Madagascar. The partners FOFIFA, UA, and CEFFEL are leading and/or contributing to different project activities, including the inventory and collection of traditional African vegetables (TAVs) biodiversity and crop wild relatives (CWRs), preparation of research protocols for cropping systems assessment, field inventories, training guides, and genomic studies. For instance, CEFFEL is leading the development of farmers' training guides for regenerative agriculture practices, and FOFIFA is leading the inventory and germplasm collection of TAVs. The project has also partnered with the National Taiwan University (NTU), which has established expertise in genomics studies. NTU will contribute to studying the beneficial microorganisms with adaptive genes to marginal soils and harsh climate conditions. The above-mentioned research protocols have been jointly developed by all project partners and discussed in regular project meetings. The project team has developed M&E tools to monitor progress with implementation. M&E data is collected, reported, and discussed among all project stakeholders.

3. Project progress

3.1 Progress in carrying out project Activities

Output 1 - Biodiversity of TAVs and CWR (including soil microbiome and traditional knowledge) inventoried and collected

1.1. Farming systems practices, including soil management, local uses, and perceptions of TAVs, CWR, and cover crops, were documented in year 1, in 10 Malagasy communities.

A literature review and a stakeholders' consultation was conducted on the subject. Tables 1 and 2 summarise the findings on current farming systems practices, soil management, and local uses and perceptions of TAVs, CWR, and cover crops in project sites.

Table 1: Agricultural systems practices, soil management, local uses, and perceptions of TAV and CWR in three regions of Madagascar.

Practices	Analamanga	Itasy	Vakinankaratra
Farming Systems Practices	Several farming systems are found, such as: i) agroecological practices; ii) crop associations; iii) traditional techniques; iv) almost all farms practice mixed farming, with food crops mainly for their own consumption.	The most common agricultural production systems in this region are different depending on the speculation, for rice: i) Intensive Rice Cultivation System (SRI); ii) Improved Rice Cultivation System (SRA), and iii) Traditional Rice Cultivation System (SRT). For other food crops, a distinction is made between iv) agroecological practices; v) crop associations.	More innovative farming systems, such as "Direct seeding under plant cover", also known as conservation agriculture. The production systems of the Middle West of Vakinankaratra are characterized by mixed farming and livestock farming. Crop diversification is an integral part of farm strategies. The most widespread crops, sole cropping or intercropping, are rice (lowland and rainfed upland), maize, cassava, Bambara groundnut, and peanuts. Contribution of crops: lowland rice 19.5%, upland rice 5.3%, maize 2.5%, legumes 4.8%, tubers 6.1%, vegetable crops 4.4%.
Soil and Fertilizer Management	This region practices systems for the self-production of agricultural inputs, such as the rice-permaculture Zanatany system, different types of biochar and composts, etc. Organic fertilizer is the most commonly used fertilizer.	Three types of soil fertility management practices: exogenous fertility enhancement, plant biomass restitution, and land use management, spatial planning, and soil conservation practices. The Exogenous Soil Fertility Improvement combining organic manure produced on-farm or acquired off-farm and mineral fertilisers. Various organic fertilizers are produced and/or used in the area. Organic manure from zebus, pigs, and poultry is produced in a rearing room with or without bedding, before being scraped (or not), piled, or spread directly on a plot of land.	The uplands (tanety) are occupied by rainfed rice and maize, organic fertilization, such as livestock manure and compost, is the most used in this area, and the use of chemical fertilizers is very rare. Irrigated rice is found in the lowlands, and during the off-season, it is replaced by short-cycle crops such as vegetable crops. However, family farms have low productive capacities, small areas, and few equipment, and they must face numerous environmental risks.
Types of cover crops used	*Stylosanthes guianensis, Mucuna pruriens, Arachis pintoï* and *Arachis repens*	*Stylosanthes guianensis, Mucuna pruriens, Arachis pintoï* and *Arachis repens*	*Stylosanthes guianensis, Cajanus cajan, Mucuna pruriens, Glycine max, Crotalaria grahamiana*

Uses and perceptions of TAVs and CWRs (for the 3 regions)	-Medicinal plants, plants useful for manufacturing green manure or biopesticide ("adigasy"), or plants for feeding domestic animals. -Eaten as vegetables, accompaniment to the main course (rice, cassava, sweet potato or corn, etc.), different cooking methods: cooked with oil (sauce or stir-fry), steamed ("ambony vary"), broth ("romazava"), cooked with rice soup.

Table 2 summarises the diversity of TAVs and CWRs documented in the literature review and stakeholders' consultation.

Table 2. The list of TAVs and the CWRs recorded during the documentation

Family name	Species	Family name	Species
Acanthaceae	*Asystasia gangetica*	Boraginaceae	*Symphytum officinale*
Amaranthaceae	*Alternanthera sessillis*	Brassicaceae	*Barbarea verna*
	Amaranthus caudatus		*Lepidium didymum*
	Amaranthus cruentus	Convolvulaceae	*Ipomoea indica*
	Amaranthus hybridus		*Ipomoea purpurea*
	Amaranthus retroflexus	Cucurbitaceae	*Citrullus colocynthis*
	Amaranthus spinosus	Fabaceae	*Cajanus cajan*
	Amaranthus viridis		*Cassia occidentalis*
	Chenopodium album		*Phaseolus lunatus*
Apiaceae	*Centella asiatica*	Hydrocharitaceae	*Ottelia ulvifolia*
Araceae	*Colocasia esculenta*	Ophioglossaceae	*Ophioglossum reticulatum*
Asteraceae	*Acmella repens*	Phytolaccaceae	*Phytolacca dodecandra*
	Bidens Pilosa	Poaceae	*Eragrostis sp.*
	Galinsoga parviflora	Polygonaceae	*Fagopyrum esculentum*
	Galinsoga quadriradiata	Portulacaceae	*Portulaca oleracea*
	Gymnanthemum appendiculatum	Pteridaceae	*Ceratopteris thalictroides*
	Taraxacum officinale	Rubiaceae	*Richardia scabra*
	Vernonia appendiculata	Solanaceae	*Solanum nigrum*

1.2. Collections of 400 accessions of targeted genetic resources of TAVs and CWRs.

Project sites were selected in the Itasy and Vakinankaratra regions and Analamanga during the planning workshop in June 2024. FOFIFA and UA have applied for the germplasm collecting permit to the Directorate of Protected Areas, Renewable Natural Resources and Ecosystems of the Ministry of the Environment and Sustainable Development. While waiting for the approval and issuance of the collection permit, the team is preparing the collection protocol and logistics. The collecting missions will start as soon as it has been approved. Meanwhile, an exploratory visit was conducted to the Malagasy highlands in Analamanga, Itasy, and Bongolava regions, to identify the rice bean production areas (see Fig. 1 below).

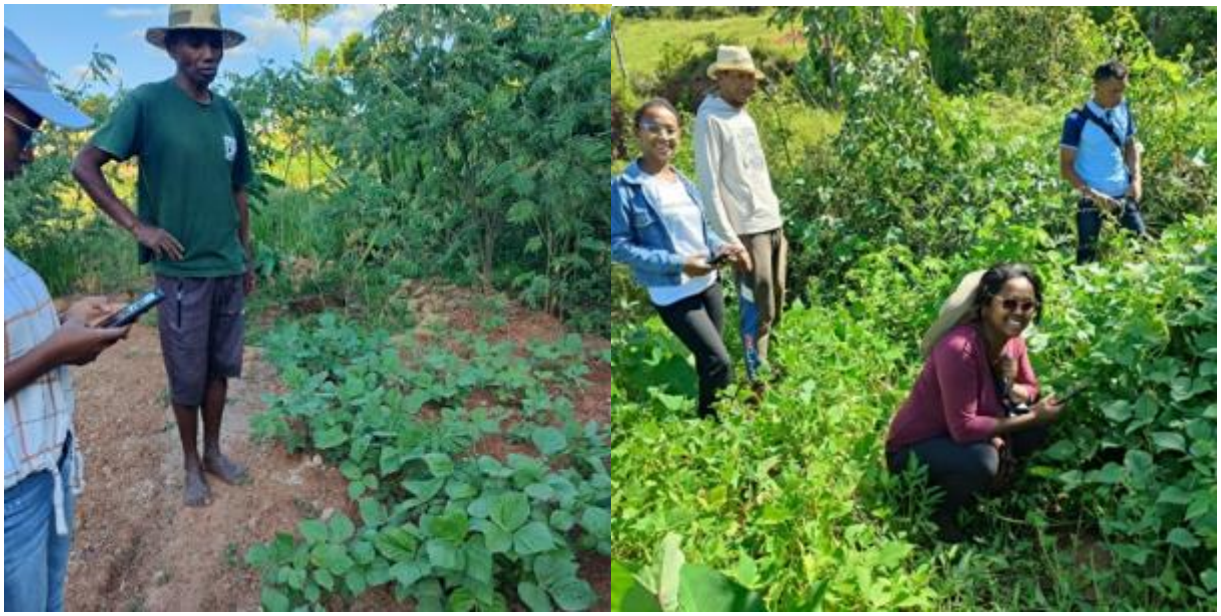

Figure 1: Field exploration to identify rice bean production sites in the project sites, Imerintsiatosika, Itasy region.

1.3. Protocol developed to identify beneficial microorganisms with adaptive genes to marginal soils and harsh climate conditions using landscape genomics. The protocol is “Rice bean landrace and microbiome diversity improves Malagasy rice production”. The objectives of that research are: (i) Understand patterns of local adaptation of rice bean (*Vigna umbellata*) to soil and climate factors in upland rice systems; (ii) Understand the composition and dynamics of the rice bean microbiome in the context of different environments; (iii) Understand how the rice bean microbiome can enhance soil health and fertility in upland rice systems; (iv) Identify genomic regions in rice beans associated with local adaptation to soil and climate factors and specific microorganisms; (v) Identify a subset of rice bean landraces that can grow under harsh climate conditions and enrich the microbiome for agroecological intensification in upland rice.

The distribution of rice beans (*Vigna umbellata,* Fig.2) was mapped, and 14 collecting sites were identified in the Diana, Sava, Alaotra Mangoro, Atsinanana, and Menabe regions of Madagascar. An initial survey of rice bean production systems, cropping calendar, and intraspecific diversity was conducted in three regions. Table 3 shows the varieties, sowing period, and cropping systems. Table 4 shows farmers’ perceptions of the advantages and constraints of rice bean production in three regions of Madagascar.

Table 3. Varieties, sowing period, and cropping systems of rice bean in three regions of Madagascar.

Variety	Sowing period	Production cycle (month)	Stage	Association with	Rotation with	Utilization
Yellow Red Green Black White	October November January February (the majority sown between October and January)	6-7 6-7 6-7 5 6-7	Vegetative (73%) Flowering (21 %) Fruiting (2.43%)	Maize Cassava Pumpkin Coffee Rice	Upland rice	All varieties: -Food -Cover crop -N supply

Table 4. Farmers' perceptions of advantages and constraints of rice bean production in three regions of Madagascar.

Region	Advantages	Constraints
Analamanga	- Growing well, easy to plant - Big biomass, covers the ground well - Produces lots of pods and seeds - Soil fertility improvement - Fast cooking - Affordable price, inexpensive - accompaniment dish - Suitable for a large family size - Provide money by selling - Foods during labour-intensive cultivation work (transplanting and rice harvesting).	- Climber and does not give way to other crops, big biomass - Long cycle, not suitable for households having few field plots. - Pods mature at different dates, which increases workload - Dehiscent pods
Itasy	- Nitrogen supply, cover crop - Food - Fast cooking - Appreciated by children - Source of income - Very easy to crop - Good food for labourers - Very productive plant - Harvested during the period of food shortage - The red variety is tastier than the green ones.	- No disadvantage - Occupy the field plot for too long. - Does not die, stays very long - Needs a stake for climbing - Needs a large field - Kill the plant with it - Difficult to harvest as the grains are too small and split open at maturity.
Bongolava	- Accompaniment dish - Food to eat and to sell - Improve soil fertility	- Damaged by birds - Needs stakes to climb - No disadvantages (many farmers said it) - Harvesting pods, which are very small

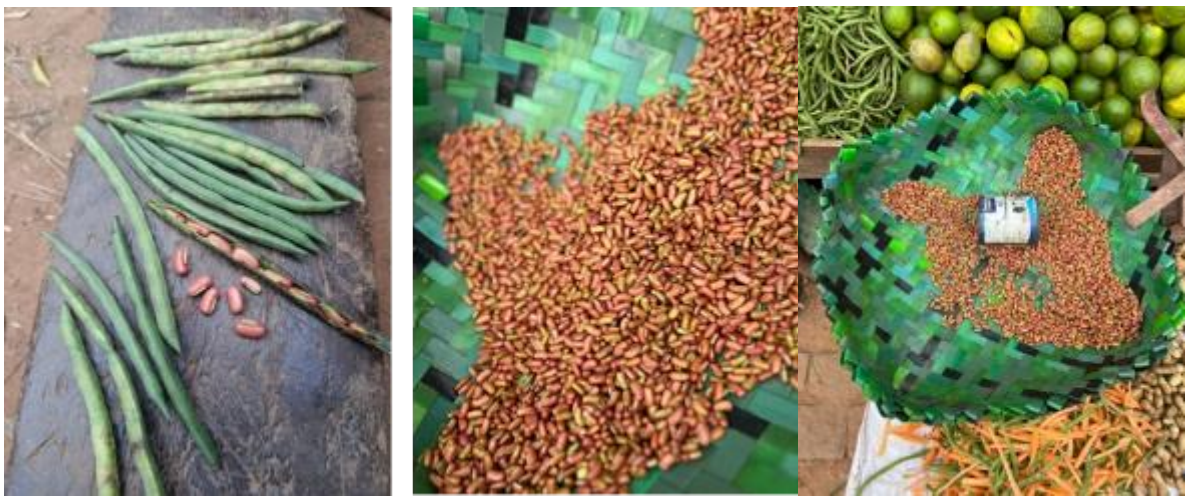

Figure 2: Rice bean variety marketed in the commune of Masindray

Output 2 - Crop & soil biodiversity conserved on-farm and in genebanks

2.1. Regeneration, characterisation, and conservation of at least 400 newly collected and existing accessions of landraces and CWR in national and regional genebanks.

A list of 10 traditional African vegetables and wild relatives of legume crops was prioritized in a participatory assessment exercise with Malagasy farmers and researchers. The prioritized 5 TAV crops include African nightshade, African eggplant, amaranth, pumpkin, and para cress, while the priority cover crops were rice bean, cowpea, soybean, common bean, and Mucuna.

Regeneration and characterization of 100 existing accessions of vegetable landraces and their wild relatives are ongoing at the World Vegetable Center in Arusha, Tanzania.

2.2. Development of protocols for seed germination and on-farm conservation to support custodian farmers to conserve prioritised plants on-farm together with associated microorganisms to stimulate soil resilience.

Experiments are ongoing to develop or revise seed germination protocols for African eggplant, African nightshade, okra, pumpkin, jute mallow, spider plant, etc. An on-farm conservation protocol is also under development.

2.3. Training and backstopping of 50 custodian farmers to conserve 40 prioritised landraces and populations of CWR from at least 10 species with associated microorganisms on-farm (crop-microbiome systems).

A set of criteria has been developed for selecting 50 custodian farmers. The criteria include: (1) Knowledge and experience: Mastery of traditional farming practices and local biodiversity; (2) Commitment: Willingness to conserve and promote agricultural biodiversity; (3) Cultivated diversity: Cultivation of a significant variety of crops or local animal breeds; (4) Sustainability: Use of sustainable farming practices; (5) Knowledge sharing: Willingness to share knowledge and materials with others. Custodian farmers are defined as men and women farmers who actively maintain, adapt, and disseminate agricultural biodiversity and related knowledge. They play a crucial role in the preservation and sustainable management of agricultural genetic resources, contributing to food security and adaptation to climate change. Their expertise and commitment are essential for the conservation of traditional, local varieties and the soil regeneration species, as well as for the transmission of agricultural knowledge to future generations. Custodian farmers preserve biodiversity by growing and maintaining the species and varieties. They use sustainable farming practices that promote soil health, conserve water, and reduce the use of chemicals. They also save seeds and breeding material, share their knowledge with others, and participate in seed exchange networks.

2.4. Training of two national/regional genebanks to increase their capacity and new skills in genetic resources conservation

Two genebank staff attended an online course on “Genetic Resource Policies for Agricultural Research Scientists”.

Output 3 - TAVs and CWRs agro-ecologically characterised and best crop combinations identified

3.1. On-station field trials established in year 1 in Ambohitsokina Antsirabe to conduct initial screening of agroecological benefits (biomass, soil health, weed control, etc.) of 5 cover crop species (legumes), and their combinations with 5 high-value TAVs.

As a first step to prioritise the 10 cover crops and TAVs for the Seeds4Soils project, a survey was conducted among farmers, field technicians, and researchers. The findings indicated that rice bean, cowpea, soybean, common bean, and Mucuna were ranked the top 5 cover crops. At the same time, African nightshade, African eggplant, amaranth, pumpkin, and paracress were selected as the 5 priority TAVs based on their importance for food, for inclusion in the project experiments. Following this, rice beans were prioritized by the research team to study the beneficial microorganisms with adaptive genes for marginal soils and harsh climate conditions using landscape genomics. Rice bean is an underutilized legume crop in Madagascar, adapted to low fertility conditions, with high potential for discovering beneficial microorganisms. It also has a high potential to be a model crop for local adaptation, as landraces may reflect many generations of local adaptation because there has been hardly any introduction of improved

varieties. Rice beans are inbreeders, so most offspring diversity is also captured in one plant. WorldVeg, FOFIFA, and the National Taiwan University jointly developed a research protocol.

On-station experiment established at FOFIFA Antsirabe to identify high-performance cover crop species and varieties good for soil fertility enhancement, soil biodiversity, and biomass production; to understand the pathways on how cover crops recycle key nutrients for the subsequent crop, and to quantify the effects of cover crops on the productivity of traditional vegetables grown in a rotation. The soil hosting the experiment is ferralitic, and soil samples were taken to determine the chemical properties before the trial. The soil analysis is performed at the FOFIFA laboratory in Antananarivo, and we are waiting for results. The experiment used an RCBD and the field layout is shown in Figure 3 below, which involved the 5 cover crops (2 varieties each) prioritized by stakeholders for testing.

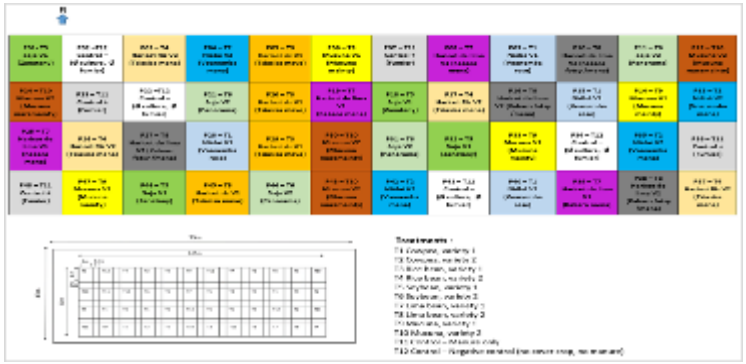

Figure 3: Field layout for testing different cover crops for biomass production, soil biodiversity, and improved soil fertility, Antsirabe, Madagascar.

Germination percentages have been collected (Table 5). However, the trial was severely affected by drought and following hail (Figure 4). Although most cover crops recovered, their performance will be reduced in the current season.

Table 5. Germination percentages for various cover crops and varieties in the experiment

Treatments*	Species	Bloc 1	Bloc 2	Bloc 3	Bloc 4	Mean
T1	Cowpea V1	95,33	93,67	97,00	95,67	95,42
T2	CowpeaV2	92,67	91,33	92,67	94,33	92,75
T3	Rice bean V1	97,67	97,33	98,33	98,33	97,92
T4	Rice bean V2	94,67	97,33	97,67	96,67	96,59
T5	Soybean V1	88,33	86,00	84,33	83,67	85,58
T6	Soybean V2	32,33	38,33	25,00	45,67	35,33
T7	Lima bean V1	90,71	90,00	85,00	75,00	85,18
T8	Lima bean V2	90,71	88,57	92,14	90,71	90,53
T9	Mucuna V1	20,83	17,71	10,42	25,00	18,49
T10	Mucuna V2	87,50	95,83	93,75	76,04	88,28

*Refer to Figure 3 for the legend of the treatments.

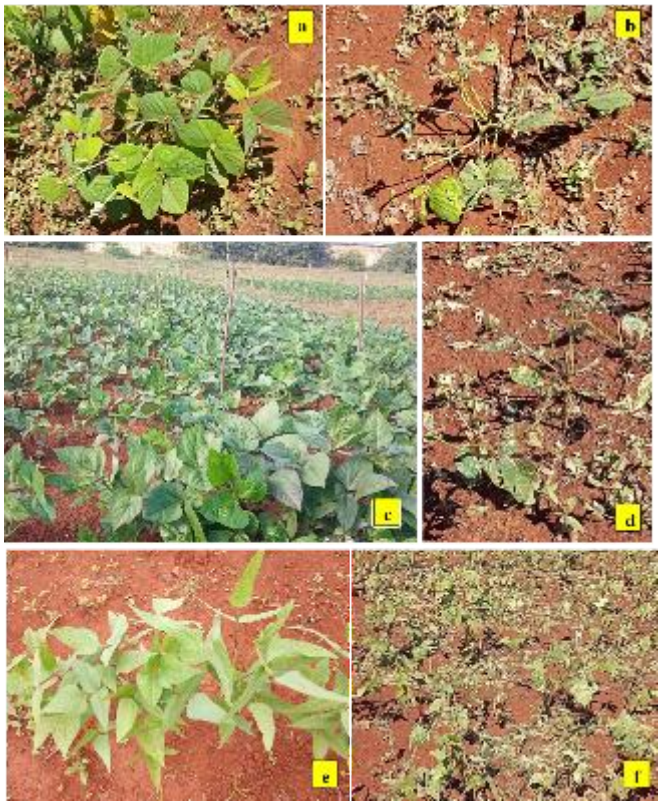

Figure 4:. Crop status before (left-a,c,e) and after hail (right-b,d,f). a & b: Mucuna; c & d: cowpea; e & f: rice bean.

3.2. Implementation of participatory on-farm trials with 150 households to test identified promising crop combinations and regenerative practices in farmers' fields. New crop combinations and regenerative practices will be compared to the current practices.

The experiment is ongoing on-station, and findings will guide the establishment of the participatory on-farm trials in year 2.

Output 4: Strengthened capacity of stakeholders in regenerative agriculture and seed production, and best practices promoted through participatory demonstrations/living labs.

4.1. Participatory demonstrations (living labs) of diversification and regenerative practices (TAVs, cover crops, soil management) will be established in champion farmers' fields (at least 1 per each community).

This activity is planned to start in year 2.

4.2. Training of at least 50 champion farmers and extension officers in regenerative agriculture and management of TAVs & cover crops.

A training guide, in Malagasy, was developed on regenerative agriculture for use by trainers and ensure consistent messaging across beneficiary communities. A 2-day training session was organized to train 50 champion farmers (45 women and 5 men) from the Vakinankaratra and Itasy regions in regenerative agriculture and management of TAVs & cover crops (Fig.5). The training comprised a theoretical session and a 1-day practical session. The training objectives were to: (i) teach champion farmers and extension officers the principles of regenerative agriculture; (ii) learn and practice techniques that enhance soil fertility and restoration; (ii) develop the skills needed to transfer this knowledge to other farmers.

Figure 5. Training participants: regenerative agriculture and management of cover crops.

4.3. Development and dissemination of leaflets on cover crops, TAVs, R-kits, and soil health

This activity is planned for year 3 of the project.

4.4. Practical training of 2000 farmers in living labs by local trainers on best practices and providing them with samples of R-kits.

This activity is planned later for years 2 and 3 of the project.

Output 5: Women's business capacities and livelihoods enhanced through new networks, training, and commercialisation of R-kits and vegetables

5.1. Annual training of at least 10 champion women farmers in seed production and the business of TAVs & cover crops.

A 1-day training session was organized to train 50 champion women farmers in seed production and business of TAVs & cover crops (Fig.6). Topics covered include (i) the fundamentals of agricultural entrepreneurship and business management; (ii) key steps for marketing TAV and cover crop seeds; (iii) learn how to develop a structured and tailored business plan; (iv) prepare participants to respond to the call for projects with strong and well-structured proposals.

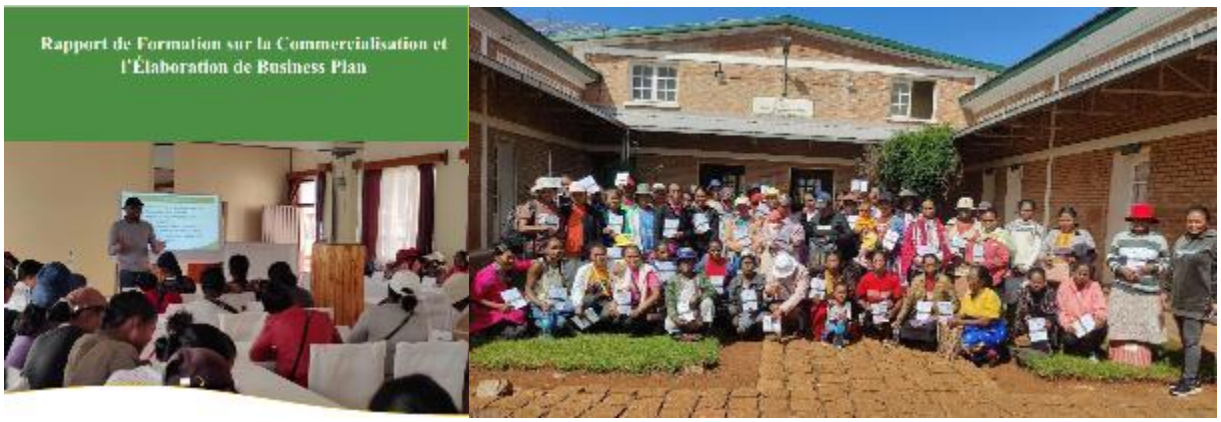

Figure 6: Training session on seed production and business of TAVs & cover crops for 50

5.2. Supporting at least 10 committed women by microgrants to develop and start their seed business, and linking them with seed companies to co-produce diverse R-kits.

This activity is planned for year 2.

5.3. Capacitating existing farmer groups and linking them with new local and urban markets to enhance seed and vegetable sales.

The first capacity building session was organized for 50 champion farmers.

5.4. Business training of 150 members from 10 farmer groups in the commercialisation and marketing of regeneratively produced vegetables.

The first business training session was organized for 50 champion farmers, see section 5.1 above.

5.5. Development and dissemination of videos on regenerative agriculture, and leaflets promoting TAVs and R-kits

Existing training videos and manuals on regenerative agriculture have been updated and are being used to train champion farmers (sample cover page in Fig.7).

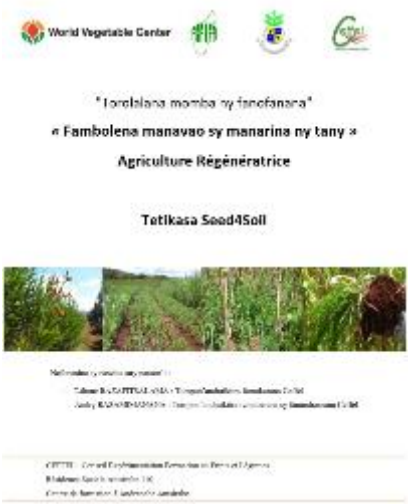

Figure 7. Training guide on regenerative agriculture

5.6. A household M&E survey evaluating the impact of project interventions on poverty reduction and cropping systems (baseline x endline, and intervention x control groups)

The project plans to conduct an impact assessment among farmers through baseline and endline data and using a quasi-experimental approach involving treatment and control groups. Key impact indicators are the adoption of regenerative agricultural practices, income, vegetable production, consumption, and food security. A baseline survey was conducted in September and October 2024, before the intervention started. The objective was to collect baseline information regarding the socio-economic and farm characteristics of farmers. A total of 382 households across the Analamanga and Vakinankaratra regions in Madagascar were reached.

Preliminary results show that treated households have better knowledge of regenerative agriculture, with an average knowledge score of 5.43 out of 10 compared to 5.01 for control households (Appendix 1). The number of regenerative practices adopted was low, with treated households reported at 2.26 and control households at 2.48 out of 18 practices ($p < 0.05$; Appendix 1). In-depth analysis shows mixed findings - control households had significantly higher adoption of minimal tillage and crop rotation than the treatment group. In comparison, treated households had higher adoption of composting.

Treatment and control farmers are similar regarding vegetable consumption, with households consuming vegetables approximately 6 days per week and including vegetables in about 2 meals per day (Appendix 1). However, differences were observed in vegetable production and income. Treated households grew fewer varieties of vegetables (2.61) compared to control households (3.12; $p < 0.01$). The reported income from vegetable sales was higher ($p < 0.05$) for the treatment group (USD 286.67 per annum) than for control households (USD 179.53 per annum). The Food Insecurity Experience Scale (FIES) Score for treated households was 2.29, lower than that of control households at 2.87 ($p < 0.05$) (Appendix 1). However, there was no significant difference in dietary diversity between the two groups, indicating comparable Dietary Diversity Scores (DDS): 5.78 for treated households and 6.00 for control households (Appendix 1). In addition, qualitative insights were gathered on the knowledge and adoption of regenerative agricultural practices.

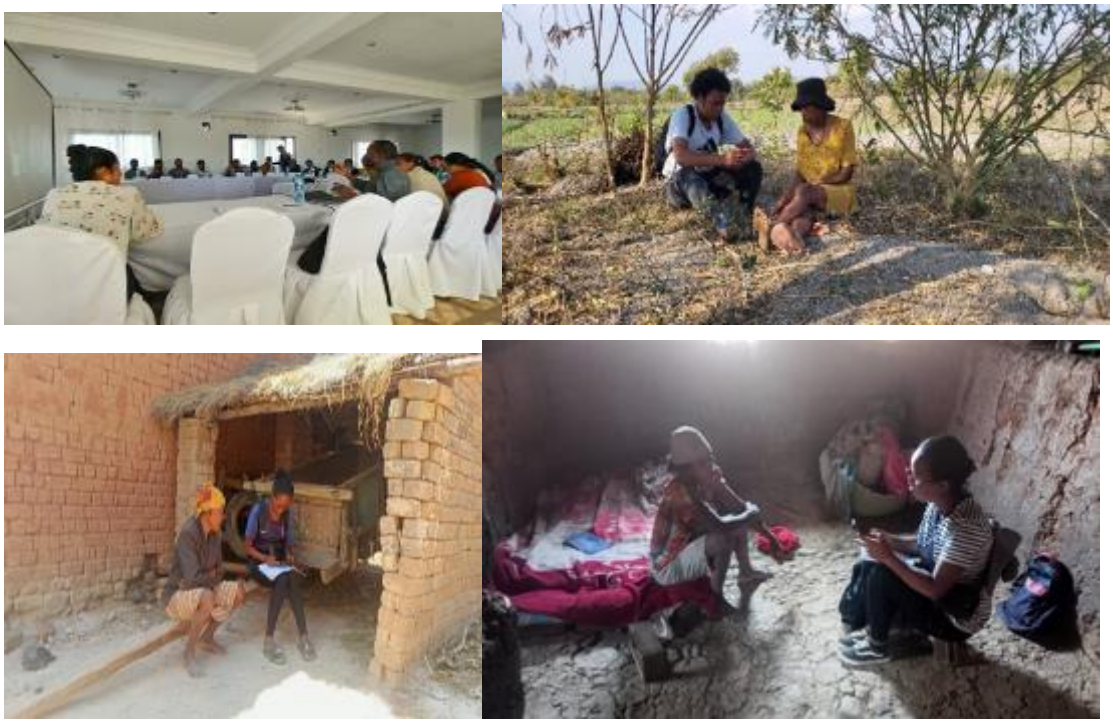

Figure 8: Enumerators' training and baseline data collection in Madagascar

5.7. Organisation of a conference for multiple stakeholders to disseminate results and raise awareness on regenerative agriculture and the importance of TAVs and CWR for soils, livelihood and climate resilience.

The conference is planned for the last quarter of year 3.

3.2 Progress towards project Outputs

Output 1 - Biodiversity of TAVs and CWR (including soil microbiome and traditional knowledge) inventoried and collected

Baseline: Assessment indicated that the diversity of TAVs and CWRs was not fully documented, and local knowledge of these species and their associated soil microbiomes was limited.

Change to date: Protocols developed, and biodiversity inventory and collection permit applied for. The field inventories will be conducted in year 2.

Source of evidence: Baseline report.

Output 2 - Crop & soil biodiversity conserved on-farm and in genebanks

Baseline: TAVs and their CWRs are poorly conserved on-farm and ex-situ genebanks. Belowground biodiversity is an untapped potential to increase farming system resilience.

Change to date: 100 accessions of the existing collection have been regenerated to enhance conservation and availability for use. Protocols developed, and a biodiversity inventory and collection permit applied. The field inventories will be conducted in year 2. After collecting, the genetic resources will be conserved on-farm and ex-situ in Madagascar and in the WorldVeg genebank in Tanzania.

Source of evidence: Section 3.1 above on "Progress in carrying out project activities".

Output 3 - TAVs and CWRs agro-ecologically characterised and best crop combinations identified

Baseline: Poor knowledge about native plants that regenerate degraded soils and improve livelihoods. There is a research gap on which plant combinations can help regenerate degraded agricultural soils and bring back beneficial microorganisms.

Change to date: On-station trials were initiated to assess the benefits of cover crops and TAVs and their combinations for stabilizing soil aggregates, microbiome diversity, biomass, weed control, and other agroecological services. Further activities started in year 1 to assess the cropping systems of cover crops in Madagascar.

Source of evidence: Section 3.1 above on “Progress in carrying out project activities”.

Output 4: Strengthened capacity of stakeholders in regenerative agriculture and seed production, and best practices promoted through participatory demonstrations/living labs.

Baseline: The baseline data showed that regenerative agriculture practices were not widely adopted in the targeted regions, and awareness was limited.

Change to date: Key activities under this output started with training and capacity-building efforts on regenerative agriculture, whereby 50 champion farmers (45 women and 5 men) from the Vakinankaratra and Itasy regions were trained. This training contributed to capacitating 50 champion farmers and extension officers who are now equipped to promote these practices within their communities, as well as group 2 farmers.

Source of evidence: This progress is supported by evidence from the training session report and photos of training participants.

Output 5: Women’s business capacities and livelihoods enhanced through new networks, training, and commercialisation of R-kits and vegetables

Baseline: Farmers in the target regions had limited access to training in seed production, business management, and marketing. A lack of structured business plans and access to networks and markets constrained the capacity for commercialisation of TAVs and cover crops.

Change to date: 50 champion women farmers were trained in a one-day training session that covered topics such as agricultural entrepreneurship, business management, and marketing of TAV and cover crop seeds. The session prepared participants to develop business plans and apply for project proposals.

Source of evidence: Progress is supported by the training session report, photos of training participants, and the training participant list

3.3 Progress towards the project Outcome

Outcome: Smallholder farmers in 10 communities diversify their farming systems with indigenous crops to regenerate soils, generate climate-resilient and nutrient-sensitive food production for income generation and food security.

Below, we report on each Outcome indicator, giving the baseline condition measured in September–October 2024, for Group 2 farmers. Information for Group 1 will be collected this year and monitored periodically (at least every six months) via a dedicated monitoring tool to track changes on each indicator.

Outcome Indicator 0.1: Enhanced soil health resulting in increased cropping system productivity (30% increase target)
Baseline: Direct soil-health or yield measurements were taken at baseline (this is still underway); however, cropping diversity averaging 2.77 vegetable types per household was noted (treated: 2.61; control: 3.12).
Change to Date: On-station trials at FOFIFA Antsirabe have been laid out on ferralitic soils, with pre-planting soil chemical analyses completed to establish fertility benchmarks. Rice bean–TAV rotations are monitored to quantify biomass return and nutrient cycling.

Source of Evidence: Section 3.1 soil sampling protocol, Table 3 in Baseline Report.

Outcome Indicator 0.2: Area under regenerative agricultural practices increased by 20% annually
Baseline: Adoption of regenerative techniques was low, with a mean adoption score of 2.33/18 practices and an Adoption Index of 0.130.
Change to Date: Fifty champion farmers trained in regenerative methods, laying the groundwork for uptake (established trial plots) on their farms, sharing knowledge with other farmers. The Group 1 monitoring tool includes modules to record field-level adoption of each technique every six months.
Source of Evidence: Table 10 in Baseline Report; Training Session Report (Annex).

Outcome Indicator 0.3: Improved livelihood reported by project end (125/150 Group 1 households; ≥50% Group 2)
Baseline: There is limited knowledge about how diversification with native plants and adoption of regenerative agriculture improve household livelihoods by improving food security, crop productivity, and farming systems resilience, among other things.
Change to Date: Capacity-building activities on regenerative agriculture (training guides, demonstration plots) and business training initiated to support future improvements.
Source of Evidence: Training report.

Outcome Indicator 0.4: Increased annual income by USD 5/person/year
Baseline: Households reported an average vegetable income of USD 251.91 in 2024, over the preceding six months (treated 286.67; control 179.53).
Change to Date: Business-skills training delivered to 50 women champions; income impacts to be assessed at endline.
Source of Evidence: Table 4 in Baseline Report; Seed-business Training Report.

Outcome Indicator 0.5: Reduced food insecurity by ≥1 FIES category
Baseline: The baseline survey established that the average FIES score was 2.48 on a 0–8 scale, with control households at 2.87 and treated households at 2.30. On average, households are food secure.
Change to Date: The regenerative agriculture training introduced to produce vegetables and the integration of TAVs into household diets will enhance household food security. The endline food-security survey will be collected in year 3 to establish impact.
Source of Evidence: Table 6 in Baseline Report.

3.4 Monitoring of assumptions

Assumption 1: related to the outcome: The project estimates that smallholder farmers in 10 communities diversify their farming systems with indigenous crops to regenerate soils, to generate climate-resilient and nutrient-sensitive food production for income generation and food security at household and community levels. This was based on the assumption that no extreme climatic or natural events hampering the project interventions or affecting the life situation or livelihood of participating communities. In addition, communities have enough time during project activities and are willing to collaborate and allocate part of the land for project activities.
Comments: Assumption 1 partly still holds true. Although drought and hail affected the on-station trials in year 1, the project team is adjusting to re-establish them in the coming season.

Assumption 2: International and national regulations allow the collection and characterisation of landraces, wild crop relatives, and soil microbiome. This is related to Output 1: Biodiversity of TAVs and CWR (including soil microbiome and traditional knowledge) inventoried and collected.
Comments: This assumption still holds true. Project partners submitted an application for a collection permit, which the Ministry of Environment of Madagascar is evaluating. The team believes that the collection permit will be granted to allow germplasm collection.

Assumption 3: FOFIFA will obtain permits from the relevant national authorities in consultation with the ITPGRFA focal point to collect and ship seeds to the WorldVeg genebank in Arusha, Tanzania. This is related to Output 2: Crop & soil biodiversity conserved on-farm and in genebanks.
Comments: This assumption still holds true. Based on past collaborations with FOFIFA and the current legal framework in Madagascar, it is optimistic that the partner will obtain the necessary documentation from relevant authorities to facilitate the collection and shipping of seed samples to WorldVeg genebank in Tanzania.

Assumption 4: Farmers will be willing to collaborate and allocate part of the land for participatory trials and demonstrations. Related to Output 3: TAVs and CWRs agro-ecologically characterised and best crop combinations identified.
Comments: This assumption still holds true.

Assumption 5: Extension workers will be able to attend the training and continue capacity building afterward. Related to Output 4: Strengthened capacity of stakeholders in regenerative agriculture and seed production and best practices promoted through participatory demonstrations-living labs.
Comments: The assumption still holds true.

Assumption 6: There is a good commercial value and demand for seeds of vegetables and cover crops. This assumption is related to Output 5: Women's business capacities and livelihoods enhanced through new networks, training, and commercialisation of R-kits and vegetables.
Comments: The assumption so far remains true.

Assumption 7: Seed companies are willing to collaborate with women farmers to produce seed kits. The assumption is related to Output 5, as above.
Comments: The assumption still holds true.

3.5 Impact: achievement of positive impact on biodiversity and multidimensional poverty reduction

Initial plan: The project originally planned that TAVs and CWRs will be conserved on-farm and ex-situ, and the soil microbiome will be conserved on-farm as plant-microbiome-soil systems (Outputs 1,2). These two Outputs have a straightforward pathway to biodiversity conservation. The remaining Outputs contribute to conservation through crop diversification and soil regeneration. Promoting biodiverse R-kits and regeneratively produced vegetables will drive agroecosystem diversification. It was also planned that the reduction of poverty would be achieved through multiple pathways. One pathway will be through the commercialisation of R-kits (Output 5). Selling vegetables and seeds has been found to contribute to growing annual income. The second pathway will be supporting at least 10 farmer groups/associations to increase vegetable, biomass, and seed sales through business skills and access to new markets (Output 5). The third pathway will be increasing agricultural productivity by integrating regenerative practices based on on-farm trials, living labs, training, and R-kits (Outputs 3,4,5). This will benefit a wider community.

Contribution to biodiversity conservation so far: 100 accessions of previously collected TAV landraces have been regenerated and conserved for the long term. A germplasm collection permit application has been submitted to the Ministry of Environment of Madagascar. This will allow the collection and further safeguarding of at least 400 new accessions of vegetable landraces and their wild relatives in Madagascar.

Contribution to higher-level impact on human development and wellbeing: 50 women champion farmers have received training on TAV seed business and business plan development. These farmers will receive further support to produce and commercialise vegetable seeds. This will enhance household income and reduce poverty.

4. Project support to the Conventions, Treaties or Agreements

International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA): By preparing and shipping seeds of 208 accessions of cover crops (rice bean, lima bean, cowpea, soybean, and mucuna) developed by the World Vegetable Center (using WorldVeg's Material

Transfer Agreement [MTA] for on-station trials and direct cultivation) to FOFIFA, the project contributes to the implementation of ITPGRFA.

Convention on Biological Diversity (CBD): The project applied for a collecting permit, which will allow the inventory and collection of at least 400 TAVs and CWRs which will be conserved ex-situ. This undertaking will contribute to Articles 9 and 10 of the CBD.

Nagoya Protocol on Access and Benefit Sharing (ABS): To support the implementation of the Nagoya Protocol, prior informed consent (PIC) will be obtained from local communities before collecting TAV landraces and CWRs.

United Nations Framework Convention on Climate Change (UNFCCC): By training 50 champion women farmers on and promoting the application of regenerative agricultural practices that will increase soil carbon stocks, reduce GHG emissions, and contribute to climate change adaptation and UNFCCC goals.

Global Goals for Sustainable Development (SDGs): By training farmers in seed and vegetable business and applying regenerative agricultural practices, the project contributes to several SDGs, particularly Goal 1, No Poverty, Goal 2, Zero Hunger, and Goal 13, Climate Action.

5. Project support for multidimensional poverty reduction

The Seeds4Soils (S4S) project directly contributes to **multidimensional poverty reduction** in Madagascar by targeting part of the country's most vulnerable farming households, primarily in Itasy, Analamanga, and Vakinankaratra regions. The project beneficiaries are primarily **women smallholder farmers**, many of whom were engaged in a previous project 26-015 (group 1).

Group 1 (150 households) – directly involved in on-farm trials, seed conservation, and commercialization of regenerative kits (R-kits).

Group 2 (2,000 households) – recipients of R-kits and training through living labs led by Group 1 champions.

- **Expected Direct Poverty Impacts**

  The project is expected to generate **direct poverty reduction outcomes** through:
  - **Increased household income** from sales of vegetables and R-kits (Indicator 0.4: 100/150 Group 1 farmers with +$5/person/year).
  - **Improved food security** through increased crop diversity and regenerative practices (Indicator 0.5: 100/150 Group 1 reduces food insecurity by at least one HFIAS level).
  - **Improved soil health and productivity** through regenerative agricultural practices (such as compost, mulch, and cover crops, etc) (Indicator 0.1: 30% increase in productivity among 150 Group 1 households).
  - **Capacity building and empowerment of women** in seed businesses (Indicator 5.1 and 5.2), promoting gender equity and enterprise growth.
- **Indirect and Long-Term Poverty Benefits**

  The project's **indirect impacts** are expected to be transformative and sustainable:
  - **Strengthened ecosystem services** through increased agrobiodiversity and soil resilience, which contribute to household food stability over time.
  - **Improved governance and participation** in agricultural decisions via living labs and decentralized learning systems.
  - **Knowledge diffusion** and innovation sharing among rural communities, promoting better agricultural planning, dietary diversity, and environmental stewardship

  The project also strengthens **institutional capacities** of national partners (FOFIFA, CEFFEL, UA), ensuring that poverty-alleviating innovations are sustained beyond the project timeline.
- **Notable Year 1 Achievements**
  - Completed **baseline survey** of group 2 households, assessing food security, income, and regenerative practices.
  - **100 accessions of TAV and CWR regenerated** at WorldVeg-Arusha, contributing to both biodiversity and food sovereignty.
  - Identified and trained **50 champion farmers and trainers**, setting up the foundation for peer-led expansion of regenerative practices.

6. Gender Equality and Social Inclusion (GESI)

GESI Scale	Description	Put X where you think your project is on the scale
Not yet sensitive	The GESI context may have been considered, but the project isn't quite meeting the requirements of a 'sensitive' approach	
Sensitive	The GESI context has been considered and project activities take this into account in their design and implementation. The project addresses the basic needs and vulnerabilities of women and marginalised groups and it will not contribute to or create further inequalities.	X
Empowering	The project has all the characteristics of a 'sensitive' approach whilst also increasing equal access to assets, resources, and capabilities for women and marginalised groups	X
Transformative	The project has all the characteristics of an 'empowering' approach, whilst also addressing unequal power relationships and seeking institutional and societal change	

- **Justification and Evidence**

  The Seeds4Soils (S4S) project qualifies as GESI Empowering as it incorporates all characteristics of a GESI Sensitive project while also increasing access to productive resources, decision-making roles, market opportunities, and leadership for women and marginalized farmers. The project targets gender-based inequalities and responds to systemic vulnerabilities across multiple levels.

- **GESI Mainstreaming in Project Design and Implementation**

  From the proposal and logframe stage, the project embedded GESI principles in its structure:
  - **60% of champion farmers** are women, and 150 Group 1 farmers were selected with gender balance in mind (Logframe: Indicator 5.1, 5.4).
  - 10 **women are being supported with microgrants** to develop seed businesses (Indicator 5.2), while commercialization-training sessions (Indicator 5.4) prioritize women.
  - Women are not just passive recipients but **are positioned as peer educators, decision-makers, and regenerative champions** (Output 5; Indicators 5.1, 5.3).

- **Application of GESI Core Principles (per GESI Guide)**

Principle	Project Actions
Rights (legal/customary)	Engaged women in leadership roles within community-level conservation, regenerative farming, and commercial seed systems (Indicators 5.1, 5.2).
Practice (attitudes/customs)	Traditional roles around nutrition and seed saving are leveraged to promote women as trainers and innovators.
Roles & Responsibilities	The project recognizes women's limited time due to caregiving and farm responsibilities, and therefore delivers training locally, using short, flexible sessions. Participatory and visual methods are used to ensure inclusive engagement, especially for low-literacy participants.
Environment (stressors/vulnerability)	Targeted areas where women face compounding risks—e.g., soil degradation, poor seed access—by providing context-relevant

	solutions (R-kits, living labs) (Indicator 4.2, 5.3).
Representation (inclusion/power)	Women lead learning hubs (living labs), mentor peers, and engage in participatory trial design (Indicator 3.2, Activity 4.1).
Resources (access/control)	Women access regenerative seed kits, receive tailored training, control microgrant use, and are supported to build business linkages. This fosters long-term control over production assets and income streams (Indicators 5.1–5.4).

GESI Outcomes and Logframe Linkages

Outcome/Output	GESI-Relevant Indicators	Expected Empowerment Impact
Outcome 0.3	125 Group 1 and 50% Group 2 report improved livelihood	Tracks increased income, autonomy, and capacity for women-led households
Output 4.1	50 champions trained	Builds technical and leadership capacity among women
Output 5.1–5.2	20 women champions trained; 10 receive microgrants	Supports business leadership and seed market entry
Output 5.4	150 group members (≥60% women) trained in commercialization	Enhances access to markets, negotiation power, group coordination, and control over income

7. Monitoring and evaluation

The Seeds4Soils (S4S) project established a MEL system based on its log frame and protocols, outlining baseline tools, sampling strategies, and alignment with Darwin Standard Indicators during Year 1. It is jointly implemented by WorldVeg, FOFIFA, UA, and CEFFEL, with WorldVeg providing coordination and technical oversight while partners collect the data. The MEL approach integrates:

- An impact assessment using a quasi-experimental approach with baseline and endline data and treatment and control groups. The baseline was done in 2023 (co-funded by another project), and the endline will be in the final year of the project. 382 farmers are included in the survey. Impact Indicators are diet quality and food insecurity (0.5), income (0.4), and perceived livelihood improvement (0.3), where initial benchmarks established by the baseline survey.
- Two monitoring tools: the first to collect data on activity/output-level indicators, such as the number of farmers trained (4.1, 5.4), R-kits distributed (5.3), and on-farm trials established (3.2). The data, collected using KoboToolBox, helps in real-time monitoring of events/ activities. The initial monitoring tool seemed complex to the partners, especially including names of event participants and a report. Changes were made to simplify while ensuring data quality; the second is to collect outcome indicators like adoption, production, and income data. This helps to document long-term impact of seed support and training provided to champion farmers who were previously engaged in project 26-015 and are receiving further support through the project 31-002.
- Qualitative and perception-based data, captured through FGDs, case stories, and field monitoring, to understand behavior change, learning, and gender empowerment.

The system uses Output-to-Outcome pathways to assess attribution. For example:

- Indicator 5.3 (2,000 R-kits distributed) is linked to increased crop diversity (Indicator 4.3b) and income improvements (Outcome Indicator 0.4).
- Training / peer-learning records (Indicators 4.1 and 4.2) are triangulated with post-training surveys and outcome self-assessments (Outcome Indicator 0.3 on improved livelihoods).

Year 1 achievements in MEL include:

Completion of the baseline household survey covering key indicators, including income, food security, cropping diversity, and awareness of regenerative practices. Design of monitoring

tools for activity/output-level indicators such as R-kit uptake, training participation, and trial establishment, etc. accessed through KoboToolbox (online form). The MEL system was **largely fit-for-purpose** during Year 1, especially for capturing baseline and foundational indicators, so there are **no major changes to the MEL plan** requiring a Change Request at this time.

■ **Partner Roles and Information Flow**

All partners have MEL responsibilities:

- WorldVeg – leads coordination, quality control, and data systems.
- CEFFEL – manages training tracking and Group 1 engagement.
- FOFIFA – supports research protocols and on-station trials.
- UA – oversees student-led monitoring and data collection in Vakinankaratra.
- Partners meet monthly via online meeting to share project progress and lessons.

8. Lessons learnt

The weather conditions in Madagascar's highlands can be challenging, as cold weather and hail affected the cover crop field trial. We learned that timely sowing is very important and that some cover crops are more resilient to the local climate. Next year, cover crops will be planted as early as possible to produce before the cold period of the year arrives.

9. Actions taken in response to previous reviews (if applicable)

NA.

10. Risk Management

The Seeds4Soils project has prioritized sustainability and scale by embedding participatory approaches and aligning with national and community-level priorities. Since inception, the project has involved key stakeholders—farmers, extension agents, research institutions (UA, FOFIFA), NGOs (CEFFEL), and local authorities—across both the design and early implementation phases. This has enhanced local ownership and created a strong foundation for scaling and sustaining results beyond the project period, but it has also enhanced buy-in and support on the ground.

11. Darwin Initiative identity

The project uses the Darwin Initiative logo on all training and communication materials developed by the project (e.g., the training guides, leaflets, project posters, and banners, etc.). In Madagascar, stakeholders (research institutes, ministry of agriculture, Ministry of environment, media, NGOs, UN agencies in the country) are well familiar with the Darwin Initiative as a legacy of the previous project 26-015 implemented in Madagascar from 2019-2022, and also the current project 31-002 which was officially launched in June 2024. Information and news about the project are posted on the WorldVeg website and social media platforms (e.g., here, and here).

12. Safeguarding

13. Project expenditure

Table 1: Project expenditure during the reporting period (1 April 2024 – 31 March 2025)
The figures in the table are indicative, as all receipts have not been received by the time of reporting.

Project spend (indicative) since last Annual Report	2024/25 Grant (£)	2024/25 Total Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)				
Consultancy costs				

Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items (see below)				
Others (see below)				
TOTAL	**203,538**	**122,748**	**60%**	

Table 2: Project mobilised or matched funding during the reporting period (1 April 2024 – 31 March 2025)

	Secured to date	Expected by end of project	Sources
Matched funding leveraged by the partners to deliver the project (£)			-GIZ vegetable seed kits project -WorldVeg's genebank project funding
Total additional finance mobilised for new activities occurring outside of the project, building on evidence, best practices and the project (£)			NA

14. Other comments on progress not covered elsewhere

NA

15. OPTIONAL: Outstanding achievements or progress of your project so far (300-400 words maximum). This section may be used for publicity purposes.

NA

● Annex 1: Report of progress and achievements against logframe for Financial Year 2024-2025

Project summary	Progress and Achievements April 2024 - March 2025	Actions required/planned for next period
Impact Women farmers from vulnerable Malagasy communities have improved food security and resilient livelihood through a diversified, productive and regenerative agricultural system	Baseline data were collected from 382 farm households, establishing benchmarks on food security, vegetable income, and regenerative agricultural practices. (source: Section 3.1 and 3.3, Baseline report in Appendix 1).	
Outcome (Smallholder farmers in 10 communities diversify their farming systems with indigenous crops to regenerate soils to generate climate-resilient and nutrient-sensitive food production for income generation and food security at household and community levels.)		
Outcome indicator 0.1 Enhanced soil health resulting in increased cropping system productivity (Target: 30% increase in 150 Group 1 households participating in on-farm trials and VBN networks)	On-station trials started at FOFIFA Antsirabe, with pre-planting soil chemical analyses completed to establish soil fertility benchmarks. On-station rice bean–TAV rotations are being monitored to quantify biomass return and nutrient cycling (source: Section 3.3)	Finalise the first season of trials and identify the best cover crop and TAV combinations that result in higher cropping system productivity. Then, in years 2 and 3, promote the best combinations in the living labs.
Outcome indicator 0.2 Area under regenerative agricultural practices increased by 20% annually (Target: 150 Group 1 households)	The baseline established that the use of regenerative techniques was low, with a Mean Adoption Score of 2.33 out of 18 assessed practices and an Adoption Index of 0.130 (sources: section 3.3, baseline report in Appendix 1)	Promote the adoption of regenerative practices among the beneficiaries.
Outcome indicator 0.3 Improved livelihood reported at the end of the project (Target: 125 of 150 Group 1 households and 50% of Group 2 households)	Capacity-building activities on regenerative agriculture (training guides, demonstration plots) and business training were initiated to support future improvements. Source: 3.1. and 3.3.	Expand the training to more farmers of the group, and 2 in years 2 and 3.
Outcome indicator 0.4 Increased annual income by USD 5/person/year (Target: At least 100 out of 150 Group 1 households)	Business-skills training delivered to 50 women champions; income impacts to be assessed at endline. Source of evidence: Table 4 in Baseline Report; Seed-business Training Report.	Expand the training in years 2 and 3.

Outcome indicator 0.5 Reduced food insecurity by at least one HFIAS category at the end of the project (Target: 100 out of 150 Group 1 households)	Baseline established for household food insecurity scales. Evidence: Table 6 in Baseline Report, Appendix 1.	Monitor HFIAS in year 3.
Outcome indicator 0.6 40 prioritised landraces and CWR populations conserved on-farm (Milestone: 15 by Year 1, 30 by Year 2, and 40 by Year 3)	This will be in years 2 and 3, after the landraces and CWRs are collected.	Activities to be implemented in years 2 and 3.
Outcome indicator 0.7 400 new accessions of targeted TAVs/CWR and soil samples collected and conserved (Milestone: 150 by Year 1, 300 by Year 2, and 400 by Year 3)	10 Germplasm collecting permit applied to the Ministry of Environment, Madagascar. The collection will start once the collection permit is approved and issued by the Ministry.	The collection will start in Year 2, once the collection permit is approved and issued by the ministry.
Output 1 (**Biodiversity of TAVs and CWR (including soil microbiome and traditional knowledge) inventoried and collected**).		
Output indicator 1.1 (Assessment of farming practices and community use of TAVs and CWRs, and soil biodiversity carried out in Year 1 and published in Year 2)	A literature review and a stakeholders consultation were conducted on the current farming systems practices, soil management, and local uses and perceptions of TAVs, CWR, and cover crops in project sites. Evidence in sections 3.1 and 3.2 of the report.	Finalize the report and submit a manuscript to a peer-reviewed journal in year 2.
Output indicator 1.2, (400 accessions of targeted landraces of selected TAVs and CWRs including associated soil microbiomes across environmental gradients in Madagascar completed to close collection gaps for these targeted genepools (Milestones: 200 by Year 1, 400 by Year 2)	Project sites were selected in the Itasy and Vakinankaratra regions and Analamanga. Ten species of cover crops and TAVs have been prioritized. The project team has applied for the germplasm collecting permit, which has yet to be issued by the Ministry of Environment. Evidence is in sections 3.1 and 3.2 of the report.	Conduct collecting missions of targeted landraces of selected TAVs and CWRs, including associated soil microbiomes.
Output indicator 1.3, (Beneficial soil microbiome communities identified from the rhizosphere of landraces and crop wild relatives by Year 2)	A protocol was developed to study the microbiome diversity of rice bean and wild relatives in Madagascar. The distribution of rice bean (Vigna umbellata) was mapped, and 14 collecting sites were identified in the Diana, Sava, Alaotra Mangoro, Atsinanana, and Menabe regions of Madagascar. An initial survey of rice bean production systems, cropping calendar, and intraspecific diversity was conducted in three regions. Evidence in section 3.1. and 3.2 of the report.	Conduct soil sampling and genomic study in year 2 to identify beneficial soil microbiome communities from the rhizosphere of landraces and CWRs.
Output 2. (*Crop & soil biodiversity conserved on-farm and in genebanks*)		

Output indicator 2.1.(Regeneration, characterisation and conservation of at least 400 newly collected and existing accessions of landraces and CWR in national and regional genebanks (Milestones: 150 by year 1, 300 by year 2, and 400 by year 3))	Regeneration and characterization of 100 existing accessions of vegetable landraces and their wild relatives are ongoing at the World Vegetable Center in Arusha, Tanzania. 10 traditional African vegetables and wild relatives of legume crops have been prioritized in a participatory assessment exercise with Malagasy farmers and researchers, for germplasm collecting in year 2. 100 existing accessions of vegetable landraces and their wild relatives are ongoing at the World Vegetable Center in Arusha, Tanzania. Evidence in section 3.1. and 3.2	Collect germplasm in year 2, after approval by the Ministry of Environment.
Output indicator 2.2. Development of protocols for seed germination and on-farm conservation to support custodian farmers to conserve prioritised plants on-farm together with associated microorganisms to stimulate soil resilience.	Experiments are ongoing to develop or revise seed germination protocols for selected TAV crops. On-farm conservation protocol is under development. Evidence in section 3.1	Continue with the experiments and finalize protocols by year 3.
Output indicator 2.3. (At least 50 custodian farmers are trained and are conserving 40 prioritised landraces and populations of crop wild relatives from at least 10 species together with associated microorganisms on-farm by year 2, according to the protocols developed. (Milestones: 20 by Year 1, 20 by Year 2, 10 by Year 3))	50 custodian farmers have been selected. The on-farm conservation training will be organised after the genetic materials have been collected. Evidence in section 3.1.	Start the on-farm conservation training in year 2, once the initial germplasm collection has occurred.
Output indicator 2.4. (Two national/regional genebanks have increased capacity and new skills in genetic resources conservation by Year 2)	Two genebank staff attended an online course on “Genetic Resource Policies for Agricultural Research Scientists”.	Additional staff from the national/regional level to attend the genetic resources conservation course in year 2.
Output 3. (*Crop & soil biodiversity conserved on-farm and in genebanks*)		
Output indicator 3.1. (Staff and students/interns from 2 national research organisations have increased research capacity and applied new skills related to agro-ecological crop and soil characterisation by year 2)	Researchers, technicians, and staff from FOFIFA prioritized 10 cover crops and TAVs. Following this, rice bean was prioritized by the research team (including FOFIFA staff) to study the beneficial microorganisms with adaptive genes to marginal soils and harsh climate conditions. On-station experiment was established at FOFIFA Antsirabe. Evidence in section 3.1	Finalize the on-station trial and summarize the findings that will support the next step, which is the rollout of living labs establishment and training.
Output indicator 3.2. (At least 150 farmers participating in on-farm trials have enhanced skills in practical agricultural research, and their knowledge of regenerative practices is increased through	The experiment is ongoing on-station, and findings will guide the establishment of the participatory on-farm trials in year 2. Evidence in sections 3.1 and 3.3	Finalize the on-station trial and summarize the findings that will support the next step, which is

experimentation. (Milestones: 50 by year 1, 100 by year 2, and 150 by Year 3)		the rollout of living labs establishment and training.
Output 4. (*Strengthened capacity of stakeholders in regenerative agriculture and seed production, and best practices promoted through participatory demonstrations – living labs*)		
Output indicator 4.1. (At least 50 champion farmers and extension workers are capacitated and are actively promoting regenerative agriculture following multiple trainings. *(Target: 50 by Year 2)*)	50 champion farmers (45 women, 5 men) trained in year 1. Evidence in sections 3.1 and 3.3	Continue the training in Years 2 and 3.
Output indicator 4.2. (2,000 farmers have enhanced knowledge and capacity in regenerative agriculture and have received R-kits from 50 trained champions. *(Milestones: 500 by Year 2, 2,000 by Year 3*)	Planned for years 2 and 3	Start the training of 2000 farmers in year 2.
Output indicator 4.3. (125 of 150 Group 1 farmers have diversified their agricultural system by at least 2 more crop species. *(Milestones: 100 by Year 2, 125 by Year 3)* And 1,500 of 2,000 Group 2 farmers have diversified by at least 1 new crop species. *(Milestones: 500 by Year 2, 1,500 by Year 3*)	Planned for years 2 and 3	For year 2
Output indicator 4.4. (125 of 150 Group 1 farmers have improved biomass management for soil improvement. *(Milestones: 50 by Year 2, 125 by Year 3*)	Planned for years 2 and 3	For year 2
Output 5. (*Women's business capacities and livelihood enhanced through new networks, training, and commercialisation of R-kits and vegetables*)		
Output indicator 5.1. (At least 20 women champions have improved capability in seed business after 3-day annual training and extension support. *(Target: 20 women trained by Year 3*)	A 1-day training session was organized to train 50 champion women farmers in seed production and the business of TAVs & cover crops. Evidence in sections 3.1 and 3.3	Continue the business training in years 2 and 3.
Output indicator 5.2. Ten women supported by microgrants have developed and submitted seed microenterprise business plans to local authorities. *(Target: 10 business plans by Year 3*)	This activity is planned for year 2.	Support 10 women with microgrants in year 2
Output indicator 5.3. (At least 2,000 R-kits produced and distributed by trained women in collaboration with seed companies. *(Milestones: 500 R-kits by Year 2, 2,000 R-kits by Year 3*)	The first capacity-building session was organized for 50 champion farmers. Evidence in sections 3.1 and 3.3	Produce and distribute R-kits in year 2. Establish and strengthen collaboration with seed companies.
Output indicator 5.4. (At least 150 members (at least 60% of women) of 10 supported farmer groups have enhanced business capacity after training and coaching, and have strengthened linkages with markets by the project end. (Target: 150 trained by Year 3)	The first business training session was organized for 50 champion farmers, see section 5.1 above. Evidence in sections 3.1 and 3.3	Training and coaching of members from the 10 supported farmer communities in business skills.

Output indicator 5.5. (A video on regenerative agriculture has at least 1,200 views 6 months after releasing on WorldVeg's YouTube and partners' social media in year 3. (Target: 1,200 views by Year 3))	Existing training videos and manuals on regenerative agriculture have been updated and are being used to train champion farmers. Evidence in sections 3.1 and 3.3	Upload the videos online and continue to use them in the training.
Output indicator 5.6. (The conference in year 3 is attended by at least 100 national participants to raise their awareness and encourage further actions. (Target: at least 10 participants are policymakers)	This activity is planned for year 2.	This activity is planned for year 2.

- **Annex 2: Project's full current logframe as presented in the application form (unless changes have been agreed)**

Project summary	SMART Indicators	Means of verification	Important Assumptions
Impact: Women farmers from vulnerable Malagasy communities have improved food security and resilient livelihoods through a diversified, productive, and regenerative agricultural system			
Outcome: Smallholder farmers in 10 communities diversify their farming systems with indigenous crops to regenerate soils to generate climate-resilient and nutrient-sensitive food production for income generation and food security at the household and community levels	Outcome indicator 0.1 Enhanced soil health resulting in increased cropping system productivity (Target: 30% increase in 150 Group 1 households participating in on-farm trials and VBN networks)	0.1a Report and manuscript on the results of on-farm trials 0.1b Report on the impact study	There are no extreme climatic or natural events hampering the project interventions or affecting the life situation or livelihood of participating communities. Communities have enough time during project activities and are willing to collaborate and allocate part of the land for project activities. Increases in sales of vegetables and seeds are not affected by a decrease in price for those commodities. International and national regulations continue to allow the collection and characterisation of landraces, wild crop
	Outcome indicator 0.2 Area under regenerative agricultural practices increased by 20% annually (Target: 150 Group 1 households)	0.2a Report and manuscript on the results of on-farm trials 0.2b Report on the impact study	
	Outcome indicator 0.3 Improved livelihood reported at the end of the project (Target: 125 of 150 Group 1 households and 50% of Group 2 households)	0.3 Report on the impact study	
	Outcome indicator 0.4 Increased annual income by USD 5/person/year (Target: At least 100 out of 150 Group 1 households)	0.4 Report on the impact study	
	Outcome indicator 0.5 Reduced food insecurity by at least one HFIAS category at the end of the project (Target: 100 out of 150 Group 1 households)	0.5 Report on the impact study	

	Outcome indicator 0.6 40 prioritised landraces and CWR populations conserved on-farm (Milestone: 15 by Year 1, 30 by Year 2, and 40 by Year 3)	0.6 Report on targeted collections and the characterisation of the collected genetic resources.	
	Outcome indicator 0.7 400 new accessions of targeted TAVs/CWR and soil samples collected and conserved (Milestone: 150 by Year 1, 300 by Year 2, and 400 by Year 3)	0.7 Report on targeted collections and the characterisation of the collected genetic resources.	
Output 1 Biodiversity of TAVs and CWR (including soil microbiome and traditional knowledge) inventoried and collected	Output indicator 1.1 (Assessment of farming practices and community use of TAVs and CWRs, and soil biodiversity carried out in Year 1 and published in Year 2)	1.1 Report on farming practices and traditional uses of TAVs and CWRs	Communities are willing to share their knowledge and accompany researchers during collections. International and national regulations continue to allow collection and characterisation of landraces, wild crop relatives, and soil microbiome.
	Output indicator 1.2, (400 accessions of targeted landraces of selected TAVs and CWRs, including associated soil microbiomes across environmental gradients in Madagascar, completed to close collection gaps for these targeted genepools (Milestones: 200 by Year 1, 400 by Year 2)	1.2a Report on targeted collections 1.2b Germplasm collection permits	
	Output indicator 1.2, (Beneficial soil microbiome communities identified from the rhizosphere of landraces and crop wild relatives by Year 2)	1.3 Draft of manuscript on landscape genomics of soil microbiome	
Output 2 Crop & soil biodiversity conserved on-farm and in	Output indicator 2.1. (Regeneration, characterisation and conservation of at least 400 newly collected and existing accessions of landraces and CWR in national and regional genebanks (Milestones: 150 by year 1, 300 by year 2, and 400 by year 3))	2.1 Report with characterisation data of the collected TAVs and CWRs	FOFIFA will obtain permits from the relevant national authorities in consultation with the ITPGRFA focal point to collect and ship seeds to the WorldVeg genebank in Arusha, Tanzania.

genebanks	Output indicator 2.2. (At least 50 custodian farmers are trained and are conserving 40 prioritised landraces and populations of crop wild relatives from at least 10 species together with associated microorganisms on-farm by year 2, according to the protocols developed. (Milestones: 20 by Year 1, 20 by Year 2, 10 by Year 3)	2.2 Copies of seed germination and conservation protocols. And notes from the monitoring of farmers.	International and national regulations continue to allow collection, characterisation, and seed shipment of land races and wild crop relatives.
	Output indicator 2.3. (Two national/regional genebanks have increased capacity and new skills in genetic resources conservation by Year 2)	2.3 Notes from the discussion with genebank staff	
Output 3 TAVs and CWRs agro-ecologically characterised and best crop combinations identified	Output indicator 3.1. (Staff and students/interns from 2 national research organisations have increased research capacity and applied new skills related to agro-ecological crop and soil characterisation by year 2)	3.1 Notes from discussion with staff and co-authored publications	Farmers will be willing to collaborate and allocate part of the land for participatory trials and demonstrations.
	Output indicator 3.2. (At least 150 farmers participating in on-farm trials have enhanced skills in practical agricultural research, and their knowledge of regenerative practices is increased through experimentation. (Milestones: 50 by year 1, 100 by year 2, and 150 by Year 3)	3.2 Reports and manuscripts on the results of on-station and on-farm trials	
Output 4 Strengthened capacity of stakeholders in regenerative agriculture and seed	Output indicator 4.1. (At least 50 champion farmers and extension workers are capacitated and are actively promoting regenerative agriculture following multiple trainings. *(Target: 50 by Year 2)*)	4.1 Lists of training participants and post-training feedback	Extension workers can attend the training and continue capacity building after the training. There will be an open-minded champion farmers who will be willing to allocate part of their land for participatory
	Output indicator 4.2. (2,000 farmers have enhanced knowledge and capacity in regenerative agriculture and have received R-kits from 50-trained	4.2 Records of champion farmers and extension workers	

production, and best practices promoted through participatory demonstrations-living labs	champions. *(Milestones: 500 by Year 2, 2,000 by Year 3)*)		demonstrations (living labs).
	Output indicator 4.3. (125 of 150 Group 1 farmers have diversified their agricultural system by at least 2 more crop species. *(Milestones: 100 by Year 2, 125 by Year 3)* And 1,500 of 2,000 Group 2 farmers have diversified by at least 1 new crop species. *(Milestones: 500 by Year 2, 1,500 by Year 3)*)	4.3 Report on the impact study	
	Output indicator 4.4. (125 of 150 Group 1 farmers have improved biomass management for soil improvement. *(Milestones: 50 by Year 2, 125 by Year 3)*)	4.4a Report on the impact study and 4.4b Report on farming practices and traditional uses of TAVs and CWRs	
Output 5 Women's business capacities and livelihood enhanced through new networks, training and commercialisation of R-kits and vegetables	Output indicator 5.1. (At least 20 women champions have improved capability in seed business after 3-day annual training and extension support. *(Target: 20 women trained by Year 3)*)	5.1 Lists of training participants and post-training feedback	Extension workers can attend the training and continue capacity building after the training. There will be some open-minded champion farmers who will be willing to allocate part of their land for participatory demonstrations (living labs). There is a good commercial value and demand for seeds of vegetables and cover crops. Seed companies are willing to collaborate with women farmers to produce seed kits.
	Output indicator 5.2. Ten women supported by microgrants have developed and submitted seed microenterprise business plans to local authorities. *(Target: 10 business plans by Year 3)*)	5.2 Copies of submitted business plans	
	Output indicator 5.3. (At least 2,000 R-kits produced and distributed by trained women in collaboration with seed companies. *(Milestones: 500 R-kits by Year 2, 2,000 R-kits by Year 3)*)	5.3 Records of women and seed companies	
	Output indicator 5.4. (At least 150 members (at least 60% of women) of 10 supported farmer groups have enhanced business capacity after training and coaching, and have strengthened linkages with markets by	5.4 Report on the impact study	

	the project end. (Target: 150 trained by Year 3))		Government and stakeholders are interested in regenerative agriculture and the potential of TAVs and CWR.
	Output indicator 5.5. (A video on regenerative agriculture has at least 1,200 views 6 months after releasing on WorldVeg's YouTube and partners' social media in year 3. (Target: 1,200 views by Year 3))	5.5 YouTube website records	
	Output indicator 5.6. (The conference in year 3 is attended by at least 100 national participants to raise their awareness and encourage further actions. (Target: at least 10 participants are policymakers)	5.6 Conference proceedings and participants list	

Activities (each activity is numbered according to the output that it will contribute towards, for example, 1.1, 1.2, and 1.3 are contributing to Output 1)

Output 1. Biodiversity of TAVs and CWR (including soil microbiome and traditional knowledge) inventoried and collected

1.1 Documentation of farming systems practices, including soil management and local uses and perceptions of TAVs, CWR, and cover crops in 10 Malagasy communities.

1.2 Collections of 400 accessions of targeted genetic resources of TAVs and CWRs.

1.3 Identification of beneficial microorganisms with adaptive genes to marginal soils and harsh climate conditions with the use of landscape genomics.

Output 2. Crop & soil biodiversity conserved on-farm and in genebanks

2.1 Regeneration, characterisation, and conservation of at least 400 newly collected and existing accessions of landraces and CWR in national and regional genebanks.

2.2 The development of protocols for seed germination and on-farm conservation to support custodian farmers to conserve prioritised plants on-farm together with associated microorganisms to stimulate soil resilience.

2.3 Training and backstopping of 50 custodian farmers to conserve 40 prioritised landraces and populations of CWR from at least 10 species with associated microorganisms on-farm (crop-microbiome systems).

2.4 Training of two national/regional genebanks to increase their capacity and new skills in genetic resources conservation.

Output 3. TAVs and CWRs agroecologically characterised, and good crop combinations identified

3.1 On-station field trials to conduct initial screening of agroecological benefits (biomass, soil health, weed control, etc.) of at least 10 cover crop species, and their combinations with high-value TAVs.

3.2 Implementation of participatory on-farm trials with 150 households to test identified promising crop combinations and regenerative practices in farmers' fields. New crop combinations and regenerative practices will be compared to the current practices.

Output 4. Strengthened capacity of stakeholders in regenerative agriculture and seed production, and best practices promoted through participatory demonstrations-living labs

4.1 Participatory demonstrations (living labs) of diversification and regenerative practices (TAVs, cover crops, soil management) will be established in champion farmers' fields (at least 1 per each community).

4.2 Training at least 50 champion farmers and extension officers in regenerative agriculture and management of TAVs & cover crops.

4.3 Development and dissemination of leaflets on cover crops, TAVs, R-kits, and soil health.

4.4 Practical training of 2000 farmers in living labs by local trainers on best practices and providing them with samples of R-kits.

Output 5. Women's business capacities and livelihoods enhanced through new networks, training, and commercialisation of R-kits and vegetables

5.1 Annual training of at least 10 champion women farmers in seed production and the business of TAVs & cover crops.

5.2 Supporting at least 10 committed women by microgrants to develop and start their seed business, and linking them with seed companies to co-produce diverse R-kits.

5.3 Capacitating existing farmer groups and linking them with new local and urban markets to enhance seed and vegetable sales.

5.4 Business training of 150 members from 10 farmer groups in the commercialisation and marketing regeneratively produced vegetables.

5.5 Development and dissemination of video on regenerative agriculture, and leaflets promoting TAVs and R-kits

5.6 A household M&E survey evaluating the impact of project interventions on poverty reduction and cropping systems (baseline x endline, and intervention x control groups)

5.7 Organisation a conference for multiple stakeholders to disseminate results and raise awareness on regenerative agriculture and the importance of TAVs and CWR for soils, livelihood, and climate resilience.

- **Checklist for submission**

	Check
Different reporting templates have different questions, and it is important you use the correct one. Have you checked you have used the **correct template** (checking fund, scheme, type of report (i.e. Annual or Final), and year) and **deleted the blue guidance text** before submission?	Yes
Is the report less than 10MB? If so, please email to BCF-Reports@niras.com putting the project number in the Subject line.	Yes
Is your report more than 10MB? If so, please consider the best way to submit. One zipped file, or a download option, is recommended. We can work with most online options and will be in touch if we have a problem accessing material. If unsure, please discuss with BCF-Reports@niras.com about the best way to deliver the report, putting the project number in the Subject line.	No
Have you included means of verification? You should not submit every project document, but the main outputs and a selection of the others would strengthen the report.	Yes
Have you provided an updated risk register? If you have an existing risk register you should provide an updated version alongside your report. If your project was funded prior to this being a requirement, you are encouraged to develop a risk register.	No
If you are submitting photos for publicity purposes, do these meet the outlined requirements (see Section 16)?	No
Have you involved your partners in preparation of the report and named the main contributors	Yes
Have you completed the Project Expenditure table fully?	Yes
Do not include claim forms or other communications with this report.	