

## Darwin Initiative Main Annual Report

To be completed with reference to the “Project Reporting Information Note”:  
(<https://www.darwininitiative.org.uk/resources-for-projects/information-notes-learning-notes-briefing-papers-and-reviews/> ).

It is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)

**Submission Deadline: 30<sup>th</sup> April 2022**

### Darwin Initiative Project Information

Project reference	28-012
Project title	Native grass forage management to feed people and protect forests  Alternative titles: Harena Voajanahary sy Kijana Mamokatra; Darwin Initiative - Productive Pasture Partnership (DI-PPP)
Country/ies	Madagascar
Lead partner	Royal Botanic Gardens, Kew (Kew)
Project partner(s)	Missouri Botanical Gardens Madagascar (MBG), Royal Botanic Garden Edinburgh (RBGE, Caroline Lehmann), University of Pretoria, Plant and Soil Sciences Department and Enterprises University of Pretoria (UP, Wayne Truter), Sarobidy Rakotonarivo, consultant sociologist (University of Antananarivo, School of Agronomy)
Darwin grant value	£454,221
Start/end dates of project	1 November 2021 - 31 October 2024
Reporting period (e.g. Apr 2021 – Mar 2022) and number (e.g. Annual Report 1, 2, 3)	November 2021 – March 2022  Annual Report 1
Project Leader name	Maria Vorontsova & Mamy Tiana Rajaonah
Project website/blog/social media	Project Facebook page <a href="https://www.facebook.com/KMCCMBG">https://www.facebook.com/KMCCMBG</a>  Twitter @vorontsovams; photos at <a href="https://www.flickr.com/photos/36803481@N06/">https://www.flickr.com/photos/36803481@N06/</a> ; videos at <a href="https://www.youtube.com/channel/UCF-IArgyzK3zMvdG0fCe7hw">https://www.youtube.com/channel/UCF-IArgyzK3zMvdG0fCe7hw</a>
Report author(s) and date	By Maria Vorontsova, Livasoa Randriamanalina and Mamy Tiana Rajaonah. Jeannie Raharimampionona, Caroline Lehmann, and Tiana Randriamboavonjy commented on the draft text; others provided data and images. Two people outside the project staff made significant contributions: Leanne Phelps (RBGE) analysed fire data and created figure 5; Sarah Z. Ficinski (Kew) created figures 1 and 6.

## 1. Project summary

We bring a modern approach to address a gap in Madagascar's environmental governance. Grasses and grasslands are neglected through the assumption they are of little value compared to forests. Fires are a long-term problem Madagascar does not have the expertise to manage. We aim to boost the wealth of 90 households and their village communities by integrating botanical knowledge, grassland ecology, agricultural science and fire management expertise to trial management methods which will support key forage grasses (output 1), improve livestock nutrition (output 2), and reduce forest fires (output 3).

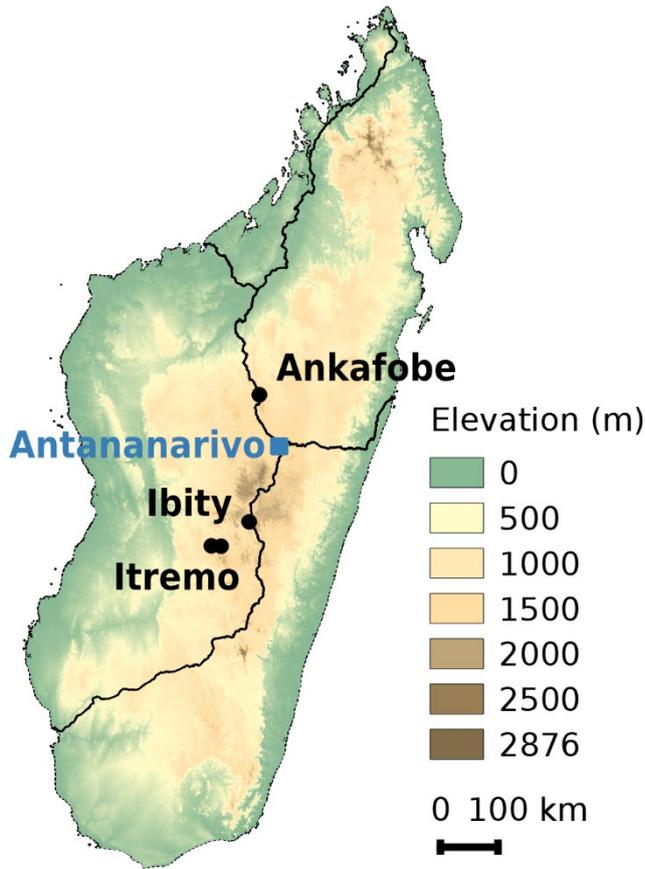
Poverty in the Central Highlands of Madagascar is partly driven by poor livestock nutrition. Inefficient exploitation of pastures and native forage grasses, and poor fire management lead to low pasture nutrition as well as damage to fire-sensitive forest patches. Disconnected approaches to agriculture and conservation are preventing progress as interventions fail to consider local ecosystems together with their human residents and their food systems. Poverty is becoming worse, with an average daily household income of 0.56 USD in Itremo (KMCC 2019), and the recorded percentage of the country's population below the poverty line expected to increase to 76.5% for 2020 (World Bank 2020). KMCC and MBG built close relationships with the pastoral communities closest to the forest patches now protected as Itremo, Ibity, and Ankafobe New Protected Areas, giving us a detailed understanding of the local situation (KMCC 2012, MBG 2012, 2018). Our 2019 Darwin scoping project carried out surveys on cattle, grazing practice, and local opinions on these issues.

Malagasy grasses were dismissed as non-native weeds until research by Vorontsova demonstrated ubiquitous and diverse native and endemic species (Vorontsova & Rakotoarisoa 2014, Vorontsova et al. 2016; Hagl 2020). Grasslands were assumed to be anthropogenic until research into their ecology led by Lehmann and Vorontsova in 2016 onwards identified ancient assemblages of highland grazing grasses (Solofondranohatra 2020).

Humped zebu, *Bos indicus* cattle, are of central importance in Madagascar as cultural symbols, rural banks, tradeable products, and working animals. This living tradition has grown disconnected from agricultural policy and herds have dwindled from 23 million in the early 1980s to about 6 million today (IFC 2018) and per capita annual consumption of beef dropped from 17kg per person in the 1970s to just 2kg per person in 2010 (MINAE 2012). Ankafobe, Ibity, and Itremo households own between 0-18 animals each but most are undernourished and calving less than once a year due to inefficient grazing practice and limited use of crop residues.

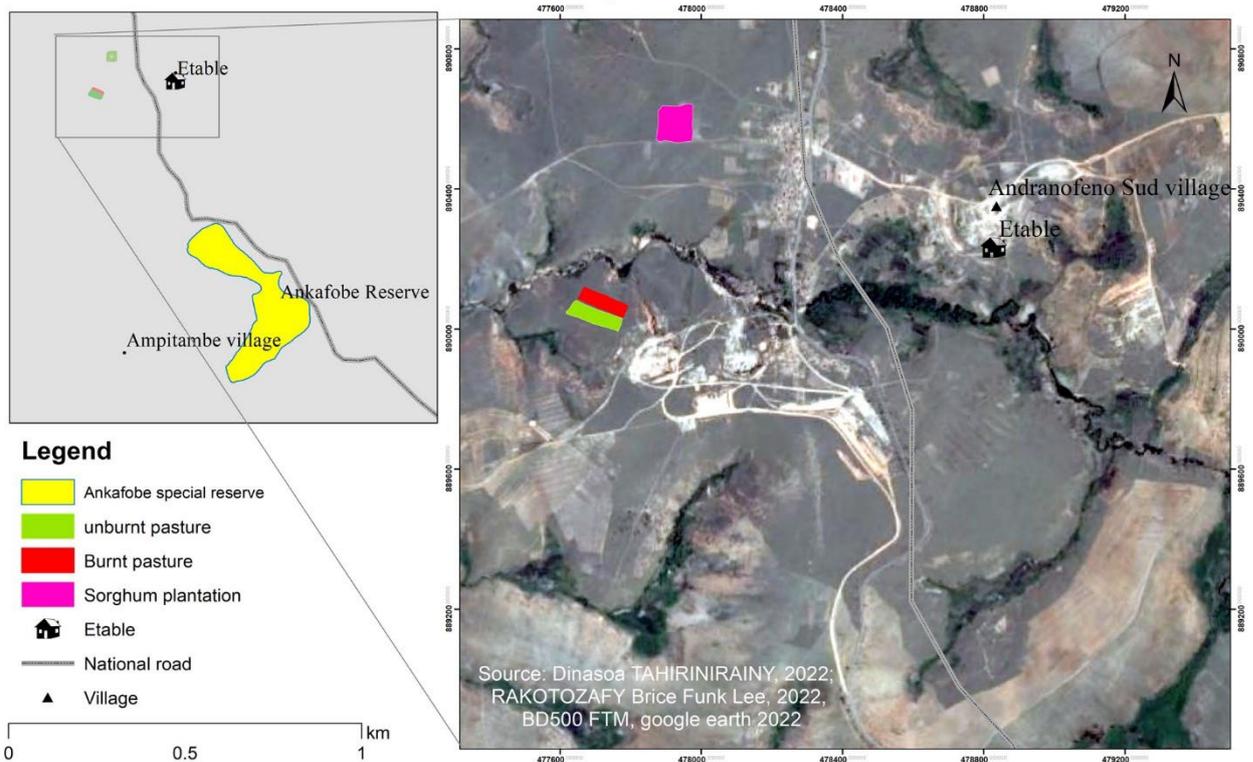
Unique fire-sensitive forest patches at Itremo, Ankafobe, and Ibity New Protected Areas are home to 15 endemic mammal species, 27 bird species, and 713 plant species. Late dry season fires lit in grasslands to stimulate forage become out of control and penetrate forest boundaries. Such fires have occurred in Ankafobe and Itremo annually (KMCC 2012, MBG 2018), undermining community-led forest conservation.

Poor fire management practices arise from the outdated view that all fires are bad, unnatural, and must be prevented. Modern research confirms that "frequent-cool-small" fires typical for human-inhabited tropical grasslands are a normal component of Madagascar's highland ecosystems like those of mainland Africa, and impossible to prevent (Kull 2004, Archibald 2013, Lehmann in press). Contrary to popular misconceptions, highland fires have significantly decreased from 1998 to 2015 (Andela 2017). Misunderstanding of fire regimes, technically incorrect fire assessment practices that misinterpret satellite counts of fires, and management failures were apparent at Lehmann's 2019 fire management workshop. Research in Ibity confirms that standard fire suppression policies failed to reduce the area burned from 1985 to 2015 (Alvarado 2018).

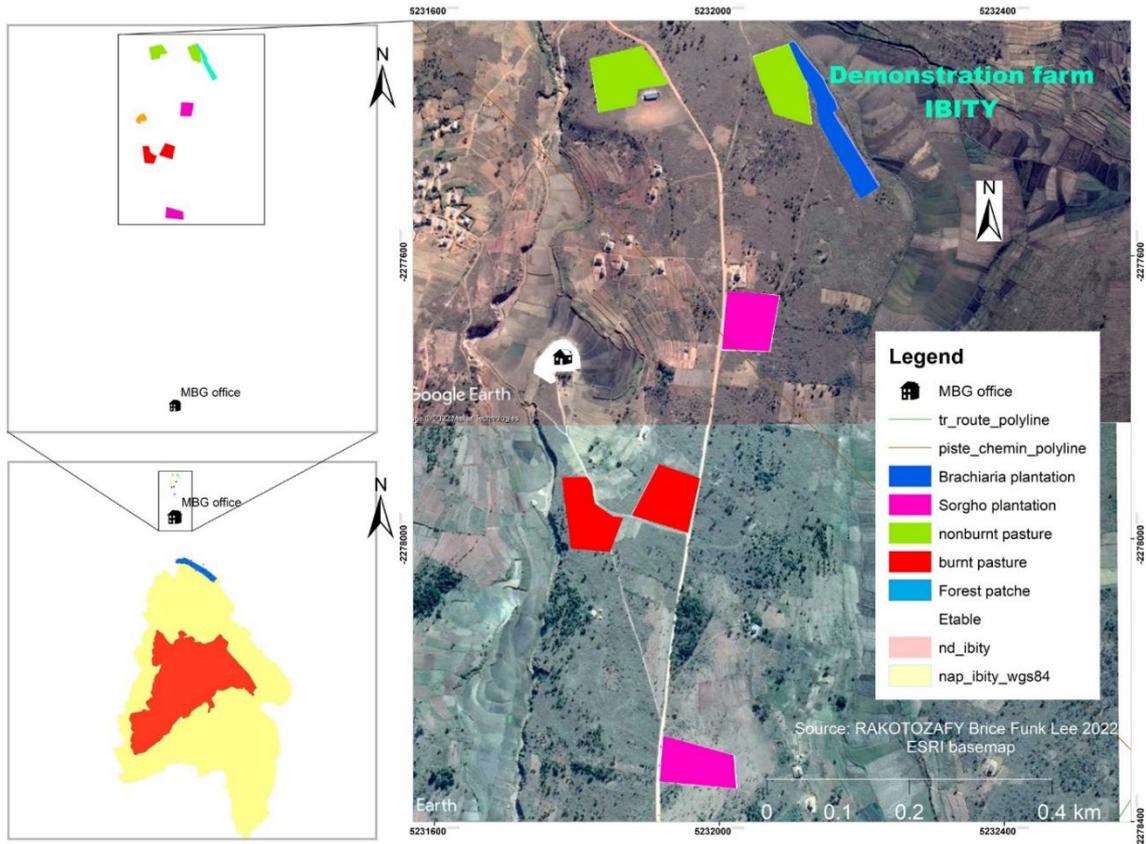


**Figure 1.** Map of the 3 project sites in Madagascar, by Sarah Z. Ficinski. Kew and MBG head offices are located in Antananarivo. Two parts of the Itremo PA are shown; the project is located in West Itremo.

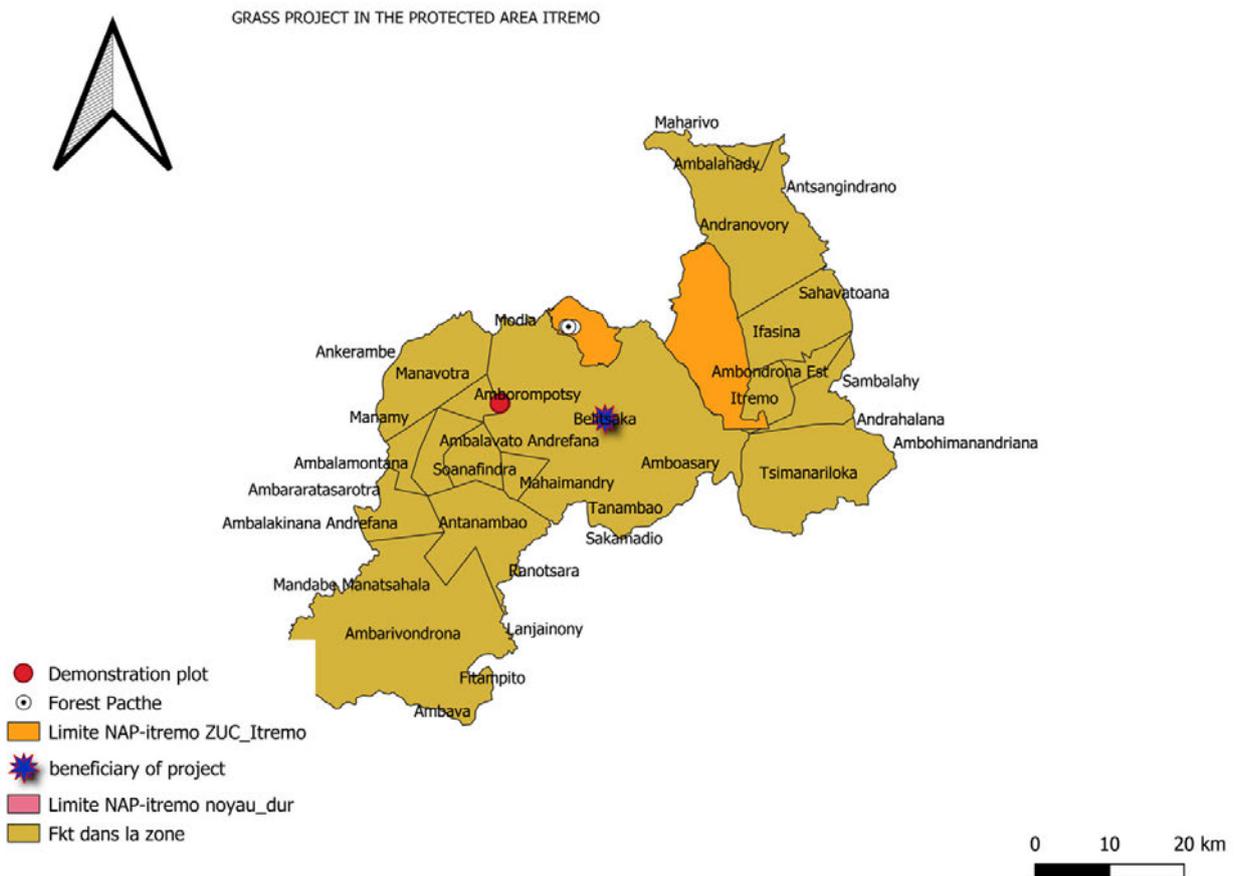
### Ankafobe project MAP



**Figure 2.** Map of project activities in Ankafobe, by Dinasoa Tahirinirainy and Brice Funk Lee Rakotozafy. Etable = cowshed. Beneficiary households are located in the Andranofeno Sud village; the project forest patch is inside the reserve.



**Figure 3.** Map of project activities in Ibity, by Brice Funk Lee Rakotozafy. NAP = New Protected Area.



**Figure 4.** Map of project activities in Itremo, by Romain Benjamina. NAP = New Protected Area. Fkt = Fokontany, local administrative units labelled with names of the local villages. Project activities are distributed over a wider area.

## 2. Project stakeholders/ partners

We feel confident that **strong motivation for the project originated from the local communities**, as livestock ownership holds great significance in Malagasy rural culture, a fact first noted during our Darwin Scoping workshop in 2018, and reflected in household enthusiasm to participate as well as the immediate unambiguous support from all the Malagasy organisations. Ibity residents selected the households to participate in this project by voting, to select the neighbours most likely to secure community benefits for the longer term (photos of voting in 10 Fokontany, the smallest administrative unit, at <https://www.flickr.com/photos/36803481@N06/albums/72177720298520013>).

The project start benefitted from pre-existing close working relationships between local communities at the three sites, Kew and MBG staff managing the Protected Areas at these sites, Environment Ministry (MEDD) staff already supporting local Protected Area governance, and UK Embassy staff already supporting Kew operations in Madagascar. Gilbertine Rakotomahafaly, Regional Director of the Environment and Sustainable Development (DREDD, Amoron'i Mania Regional subdivision of MEDD) supported our permit applications to work in Itremo, and welcomed the project team to the Ambositra regional office during our March 2022 visit (Annex 16). A broad spectrum of Malagasy organisations were invited to the national and regional project launch events, but due to the difficult situation with covid in November and December, attendance was only moderate and non-Malagasy project members were unable to enter Madagascar as their flights were cancelled (Annexes 11-15 show invitation lists and attendance lists). We were pleased that representatives of both ministries were nevertheless able to attend. In addition to the organisations listed elsewhere in this section, representatives of the following bodies attended: Heads of the Fokontany; Mayors; Gendarmerie (national police force); University of Antananarivo, Faculty of Sciences, Department of Biology and Plant Ecology (Mention Biologie et Ecologie Vegetales, MBEV); University of Antananarivo, Ecole Supérieure des Sciences Agronomiques (ESSA); Vahatra Association; Liery Geospatial Services company.

**Livestock production** is a new area for both Kew and MBG. The project manager Livasoa Randriamanalina is a veterinary doctor qualified at the University of Antananarivo with the relevant professional connections (CV in Annex 5), enabling the project to operate competently in the veterinary and livestock sphere from the start. New collaboration with the Agriculture Ministry (MINAE) started well and Lucile Razafimpamoana, Directorate of Livestock Production Support (DAPA) at MINAE, supports the project with enthusiasm because of its overlap with the MINAE target to support and increase Madagascar's livestock production (verbally communicated by Lucile Razafimpamoana to Mamy Tiana Rajaonah). She has authorised project activities, provided advice on zebu breeding, and put project staff in touch with MINAE regional technicians (her signature and stamp in Annex 11). Flavien Justin Rabenirina, Head of Animal Production Division (DRAE, Amoron'i Mania Regional subdivision of MINAE), has been supportive in order to strengthen a MINAE livestock project in the same region; he was a member of the interview panel to recruit a replacement zebu technician (Annex 8) and we plan to seek his advice on forage cultivation and feed.

The National Center for Applied Research on Rural Development (FOFIFA) are a key stakeholder for the **grasses, forages and pasture aspects** of this project. After difficulties obtaining the South African *Sorghum* cultivars FOFIFA staff helped us locate alternative local sources of forage grass seeds through their network of farmers. Jean Augustin Randriamampianina, FOFIFA weed specialist scientist already working with Maria Vorontsova on a GCRF grass weed project is proving advice on forage and weed grass research; in order to maximise the impact of the grass booklet to be produced by this Darwin project he is helping us organise a June 2022 meeting of Malagasy organisations working with forages. The first draft list of Malagasy forage stakeholder organisations to be invited (Annex 39) has been narrowed down to: University of Antananarivo, University of Antsirabe, FOFIFA, FOFIFAMANOR, DPV, MEDD, DGE, FIFATA, SPAD, and previously collaborative community farmer representatives.

**Fire management** in collaboration with MEDD is the greatest policy challenge of this project as concerns over recent fires are exacerbating the conflict between the need for preventative burns and historic legislation prohibiting fires. Rinah Razafindrabe, Directorate of Protected Areas, Natural Renewable Resources, and Ecosystems (DAPRNE, within MEDD, signatory of annex 11) is particularly interested in fire management, attended the project launch and put us in touch with DAPRNE regional staff. Even though embassy staff were not available for the launch, we were able to secure further support from Jessica Petitprez, FCDO Development Counsellor, British Embassy Antananarivo at a meeting in March 2022 to discuss especially the sensitive nature of the fire management. Jessica is keeping us up to date with the Environment Platform (one of Madagascar Government thematic platforms) meetings with the new Minister of Environment announced in March 2022, pending the long-awaited release of the national inter-ministerial fire management strategy.

Kew and MBG teams have been working closely with each other and with Sarobidy Rakotonarivo. Caroline Lehmann set up the pasture plot assessment protocols with the team during her visit in March 2022 (photos at XX), and began work on fire management. All key collaborators were present at the project staff meeting on 11 March 2022, all in person with Wayne Truter joining online. Unfortunately, the pandemic situation at the University of Pretoria allowed only sporadic contributions from UP to this project, which constitutes our greatest collaboration challenge.

### 3. Project progress

#### 3.1 Progress in carrying out project Activities

We are satisfied that within these first five months, the **essential project setup activities (under output 0)** are largely complete. National and regional project launch events have been held sadly with reduced attendance due to the COVID-19 situation (Annexes 11-15); foreign experts were unable to enter Madagascar and their project launch presentations were delivered via YouTube (Output 1 presentation by Maria Vorontsova available at <https://youtu.be/O1fY0OVfV9c>, Output 2 presentation by Wayne Truter at <https://youtu.be/TI4J324RDGM>, Output 3 presentation by Caroline Lehmann at <https://youtu.be/rh1CLGWgZVs>). Regional launch photographs are at <https://www.flickr.com/photos/36803481@N06/albums/72157720220501840>. A staff meeting was held in Antananarivo on 11 March for all staff except the technicians; copies of the PowerPoint progress presentations made by the three sites are in Annexes 18-20). Madagascar visit and site visits by the foreign experts were postponed and instead of the first month of the project (November 2021) took place in the fifth month (March 2022) by Maria Vorontsova and Caroline Lehmann but not Wayne Truter; the group visited Ankafoabe and Ibity but failed to reach Itremo after the cyclone destroyed the access road (see Assumption 6 below).

Three hectares of previously uncultivated and not extensively grazed **demonstration farmland** including land for cow sheds has been secured at all sites, rented from local landowners in Ankafoabe and Ibity, and freely given to the project by the Itremo residents (example contracts in annexes 21-23). The choice of **livestock and their purchase and accommodation** have proven time consuming due to Madagascar's complex legal and administrative system of cattle ownership, and the novelty of livestock work for both Kew and MBG. The Kew UK legal team and risk management team worked with the Kew insurance providers to accommodate livestock in Kew governance. In Madagascar livestock may only be owned by Malagasy citizens but may not be owned by NGOs, so agreements were drawn up with the staff who are now the legal owners of the animals. Following discussions between the local community, project staff, MINAE advisors, and Wayne Truter we considered only the small livestock markets closest to the Ankafoabe and Ibity project sites, to buy animals are maximally adapted to the local conditions. In Itremo, the cattle were chosen from those offered by the local communities. We purchased two cows at each site, pregnant except one in Ankafoabe (examples of livestock sale acts and livestock passports in annexes 43-44; data on livestock in Annexes 45-46); by mid-April 2022 one of the cows at Ibity gave birth (video at <https://youtu.be/UvmRBno03Ag> shows the Ibity cow with her calf demonstrated by Jean Christian Rijaniaina, the Ibity zebu technician). Custom cowshed designs were agreed for each site for different security situations, starting from a model chosen by Livasoava and aiming to provide a design superior to the local cowsheds but simple enough to be easily replicated by the community. Building work is almost complete (e.g. Ankafoabe cowshed picture posted to <https://www.facebook.com/KMCCMBG> on 14 April). The 90 project households were selected from those motivated, owning at least one cow and enough land to grow *Sorghum* fodder, including all female-headed households who expressed interest (data in Annexes 24-25); 4 Ankafoabe households temporarily withdrew (explained in section 13). Quarterly community discussions for all three outputs have not yet been formally set up, but conversations have been taking place continuously on an informal basis, with formal community meetings for ploughing (January), seed distribution and planting (January), fire break installation around the unburned pasture plots (February), weeding (March), and the international site visit (March; photos at <https://www.flickr.com/photos/36803481@N06/albums/7217772029756415>).

**Social science research on wellbeing and perception** of the project is almost ready to begin the baseline survey. Sarobidy Rakotonarivo has carried out staff training on ethics and the practice of social surveys, created the participant information sheet (Annex 26) and used theory of change (Annex 27) to design the standardised questionnaire (Annex 28).

**Grass and forb diversity and frequency (output 1)** work was enabled by our successful research permit application, noted here because of the 5-10 full working person/days needed to complete the complex process. In Ankafoabe the assessments of 10 permanent baseline plots have been completed: 6 communal pasture plots, 2 burned demo pasture plots, and 2 demo unburned demo pasture plots (field trip reports in annexes 29-30, full data from the demo plot S12 in annex 33, example field notes for a single voucher specimen collection in annex 34, example notebook page listing identifications of Nanjarisoa Olinirina Prisca (NOP) collection numbers in Annex 35, baseline analysis in

annex 36 discussed in section 3.2 below). Data analysis is presented in section 3.2. Data for 7 plots were already collected in Ibity in February before the plot protocol update (annex 32) and these will be updated and the remainder of the data gathered at Ibity and Itremo between April – June. Counting frequency of species occurrence in subplots is a time-efficient method, but not a scientifically adequate measure of pasture productivity; an additional one-off measure of pasture biomass productivity in burned and unburned pasture is being made during the first year of the project, at the end of the wet season, in order to produce internationally comparable and publishable data on the productivity of these pastures. Construction of grazing enclosure cages (previously used to measure Ibity pasture productivity in Narindra Ralainarivo's MSc) has proven too demanding under the time constraints of the 2022 field season, so plant biomass was clipped in 10 burned and 10 unburned 50 x 50 cm quadrats in Ankafobe, and biomass clippings have been dried and weighed (Annex 37). Work towards grazing value index estimation has started with the collection of 4 samples from Ibity (Annex 29), but unfortunately our permits only allow the collection of 50g samples while the UP laboratory requires 500g samples, another result of limited communication with UP explained in section 13. The administrative process required to obtain exportation permits (Annex 38) has proven too lengthy for the team to be able to carry a test batch to South Africa in April. The planned grass booklet scoping consultation with FOFIFA and a broader range of Malagasy stakeholders is explained in section 2.

**Forage crop trial cultivation (output 2)** was delayed as explained in section 13, and set back by the unexpected drought in Ankafobe as explained in section 3.4 under assumption 6. A second forage crop *Brachiaria brizantha* was added by community demand and forage crop demonstration fields were expanded from 1ha to 2ha in Ankafobe (photo at <https://www.flickr.com/photos/36803481@N06/51973174448>) and Ibity; the field at Ankafobe was fenced (photo at <https://www.flickr.com/photos/36803481@N06/51973387004>) following some conflict between local communities. The fields at each site were ploughed, by 4 ploughs for 10 days at Ankafobe, 51 people for 3 days in Ibity (picture of Ibity filed at <https://www.flickr.com/photos/36803481@N06/51972105542>), and by 5 ploughs for 2 days in Itremo. First planting at the demonstration sites was carried out at the same time as fertilisation with zebu dung: 10kg of *Sorghum* seeds and 6kg of *Brachiaria* seeds were initially planted by 55 non-beneficiary persons in Ankafobe; 7 kg of *Sorghum* and 5 kg of *Brachiaria* planted by 30 beneficiaries and 87 other farmers in Ibity (video of Sandra Andrianantenaina demonstrating the *Brachiaria* seedlings is at <https://youtu.be/zeodV59vnAw>); 6kg of *Sorghum* and 8 kg of *Brachiaria* planted by the 30 beneficiaries Itremo. Each beneficiary household received approximately 250g (2 kapoaka) of *Sorghum*, and some households also received *Brachiaria*, for cultivation in their private fields (Annex 40). Weeding was carried out 2 weeks after the planting, by 32 non-beneficiary women in Ibity and project beneficiaries in Itremo. Many of the plants in the Ankafobe trial field died after the drought (picture at <https://www.flickr.com/photos/36803481@N06/51973099561>) so weeding was not necessary; second planting after the drought was carried out with an additional 10 kg of *Sorghum* seeds planted by 35 persons for 4 days. Activities were recorded in attendance sheets and payment statements for manual labour by non-beneficiary persons. Crop residue preservation work was given lower priority as it is less time critical. Training in hay making and all stages of *Sorghum* and *Brachiaria* cultivation have been carried out continuously by the animators, with Livaso also providing occasional direct training (Photographs at XX). Analysis of the livestock indicators is presented in section 3.3.

During the first five months of the project within this reporting period priority was given to setting up the agricultural infrastructure, with less emphasis on the **fire management activities (output 3)**. The baseline regional fire analysis is presented in section 3.2. The assessment of pre-existing work on fire breaks around the gallery forest patches is presented in Annexes 49-51, with a 12 km double fire break established in Ankafobe (photo at <https://www.flickr.com/photos/36803481@N06/51973384459>), no firebreak in Ibity, and 6.2km x 6m firebreak in the West Itremo project site. Only a single gallery forest patch is available at Ankafobe and a single one at Ibity so no selection process was necessary; three gallery forest patches closest to the beneficiary village Amborompotsy were selected for this project at Itremo (project maps in figures 2-4, Google Earth images of the forest patches in Annexes 52-53 and Figure 6). Fifteen photo points were set up around the Ankafobe forest patch and 10 around the Ibity forest patch, on average 20-200m away from the trees around the outer edge of the reforestation areas, and the first set of photos were taken looking towards the forest, showing the general landscape (Figure 6). A Tinytag has been set up inside and outside a project forest patch at each site to monitor the local climate (photos posted to <https://www.facebook.com/KMCCMBG> on 27 April).

## 3.2 Progress towards project Outputs

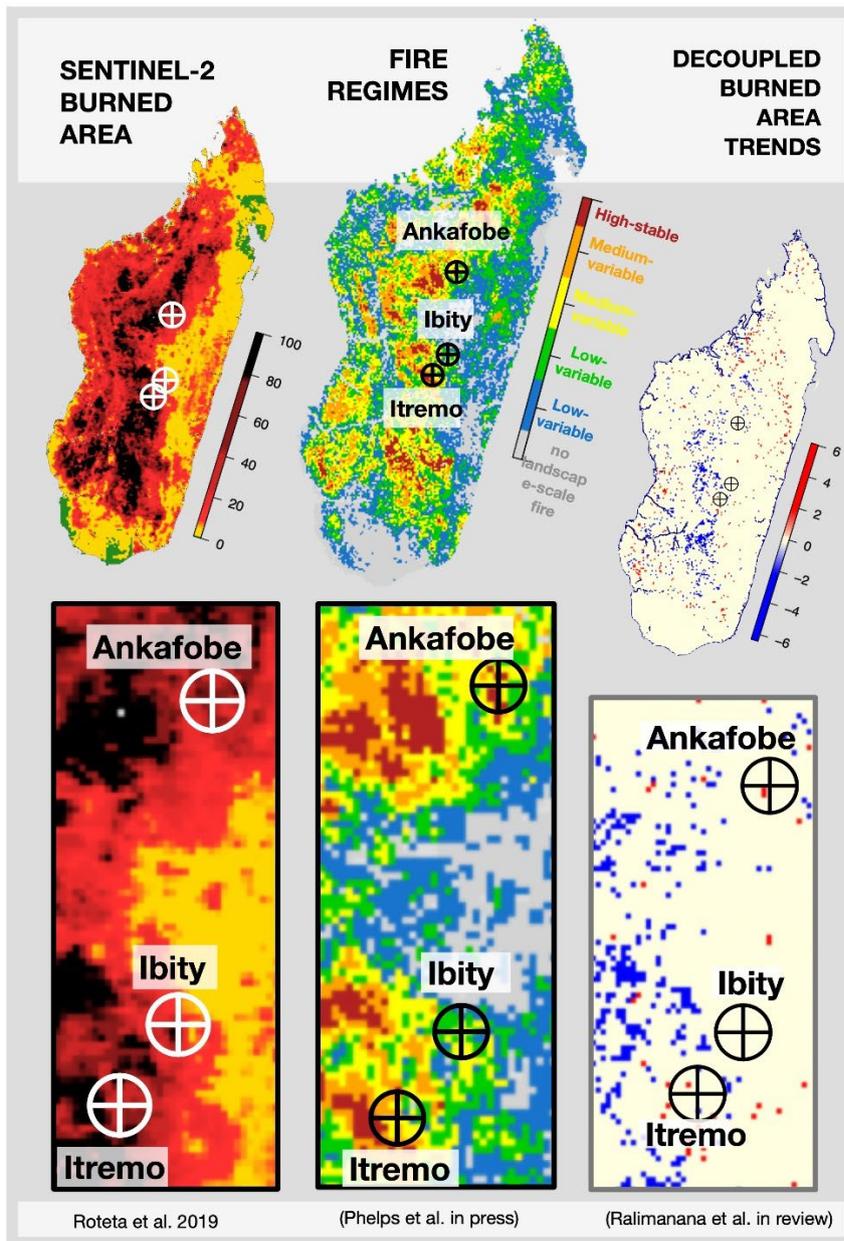
A strong start has been made on the **grass and forb diversity and frequency** (output 1) assessments as Caroline Lehmann and Maria Vorontsova's international collaborative network the *Global Grassy Group* tested the new version of the standardised herbaceous plot protocol with the project team during the March 2022 site visit (<https://globalgrassygroup.github.io>, Annexes 31-32). The first calculations of

the baseline species diversity and frequency in Ankafobe project demo and community pastures are presented in Annex 36, from the 10 plots with data entry already completed by Nanjarisoa. For Malagasy grasslands the Ankafobe pastures are actually significantly diverse, with 5-10 grass species and 10-18 forb species in each 50 × 50 m plot. Long-term community pastures are clearly a lot more diverse than the previously largely ungrazed project demo pastures, because grazing is increasing the diversity. Converting demo plots to a communal pasture seems to add an extra 1 grass and an extra 3 other herbaceous plants, possibly confirming our expectation that increasing the grazing pressure will increase species diversity, unless deeper analysis shows the community pastures are placed in wetter or more fertile locations. From the native grasses already confidently identified and reasonably common, 5 native key grass forage indicators were chosen: 2 fire grasses expected to be poorer forage (*Loudetia simplex*, photo at <https://www.flickr.com/photos/36803481@N06/51973399849>, and endemic *Aristida rufescens* known locally as *horona*, photo at <https://www.flickr.com/photos/36803481@N06/6778255960>), 2 grazing grasses expected to be good forage (*Digitaria longiflora*, photo at <https://www.flickr.com/photos/36803481@N06/51387823539> and endemic *Panicum luridum*, photo at <https://www.flickr.com/photos/36803481@N06/51972119057>), and 1 intermediate endemic *Eragrostis lateritica*. Calculating occurrence frequencies of the 5 forage indicators shows the pastures are currently all fire grasslands, dominated by *Loudetia simplex* and the endemic *Aristida rufescens*. The grazing grasses expected to be preferred forage do indeed have higher frequencies in the communal pasture plots. Regular fires in Ankafobe appear to decrease biomass production from 62g to 41g per 50 x 50 cm quadrat.

Supplementation of fodder flow through the **cultivation of new forage crops (output 2)** has been the largest piece of manual labour by this project so far, in spite of the pandemic-related failure to obtain the best cultivar seeds (explained in section 13). Staff impression so far is that the growth of *Sorghum* and *Brachiaria* has not been as good as expected even at Ibity and Itremo (the sites not affected by drought), likely due to low soil fertility and an insufficient local supply of organic fertiliser - although this year's trial planting has limited usefulness due to its late start and change of seed source (section 13). We plan to apply fertiliser depending on soil analysis results. Crop residue preservation work has been assigned lower priority with only hay making training taking place so far. The livestock data and analysis of cattle condition, calving, and milk production are presented in section 3.3.

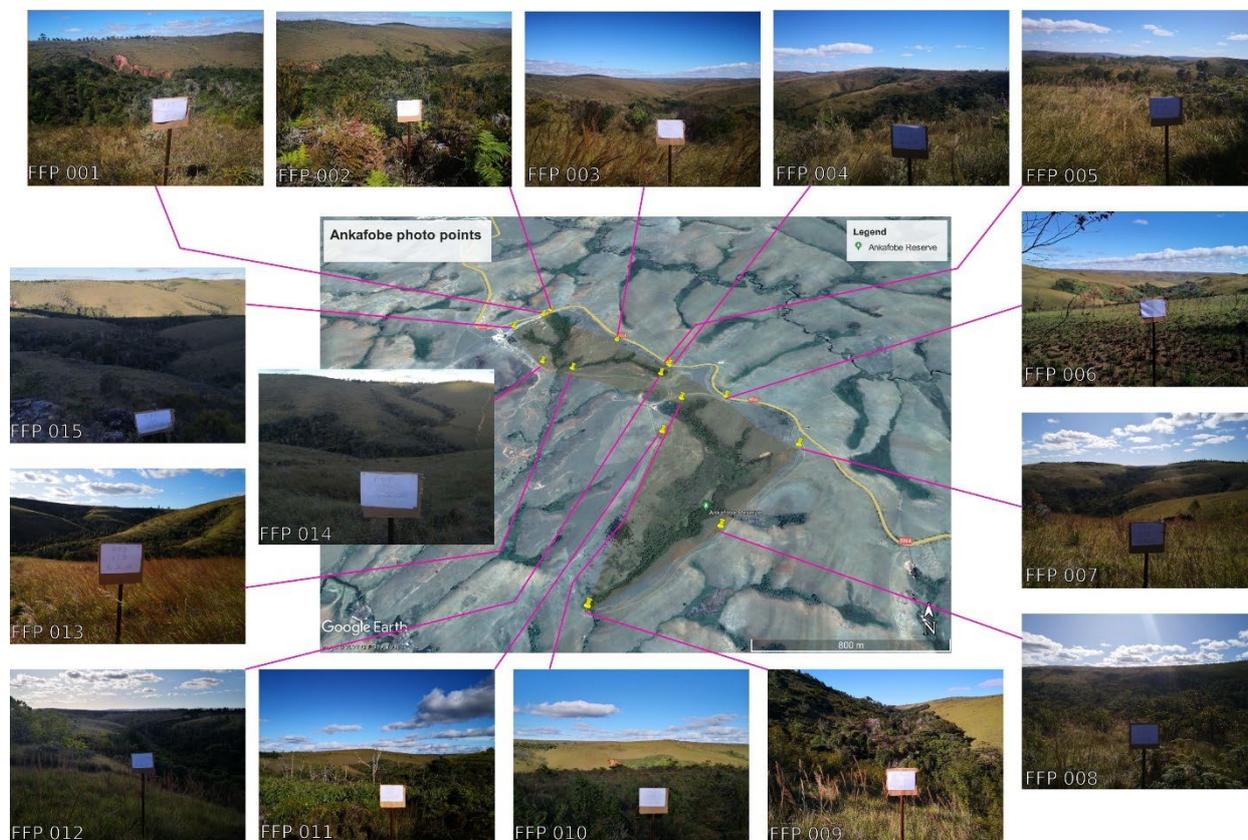
Working towards **custom site-based fire management strategies (output 3)**, detailed assessment of the forest patches closest to the project sites has demonstrated that they are too small for a practically useful baseline analysis of Google Earth Satellite images and MODIS Burned Area data, as the maximum resolution of SENTINEL-2 data is 20km. Instead of a remote sensing analysis of the project forest patch detail, we have carried out a broader regional baseline analysis (Figure 5) to inform our approach. Please note that our analysis is based on the area burned which best reflects the overall quantity of fire, unlike most previous analyses of Madagascar's fires which are based on fire counts, where data are biased by the number of active satellites and by the complex nature of spatial heterogeneity inherent to fire. Contrary to the overall reduction in burned area across the Malagasy highlands, the burned area in our project sites has not significantly changed between 2006 and 2016. It has also become clear that Ankafobe and Itremo have greater areas burned with less variability, while Ibity has less area burned with greater variability. The most likely reason there is less fire at Ibity than Ankafobe and Itremo is more people living in Ibity and consequently more cattle, roads, tracks and clearing, all of which prevent fire spread. Based on data from continental Africa, when population exceeds 8-10 people per km<sup>2</sup>, landscape fire in grassy ecosystems declines and this is what is reflected in both MODIS and Sentinel imagery in Figure 5. We conclude that a higher investment in fire management is required in Ankafobe and Ibity.

## REGIONAL FIRE CONTEXT



**Figure 5.** Analysis of the regional fire context around the three project sites carried out by Leanne Phelps (RBGE) in collaboration with Caroline Lehmann. High resolution SENTINEL-2 analysis of area burned during 2016 (left, Roteta et al. 2019; Phelps et al. in press) shows medium-low (Ibity) to medium-high (Ankafoabe and Itremo) burned area. Fire regimes (centre, definitions follow Phelps et al. in press) in Ibity are intermediate between low-variable regimes typical of tropical forest-savanna boundaries and medium-variable associated with open grassy ecosystems at higher elevations; Ankafoabe and Itremo have open grassy fire regimes, from medium-variable to high-stable. Fire trends 2006-2016 (right; Phelps et al. in press) across Madagascar as a whole show a faster than average decline in burned area compared to the similar decline observed in equivalent medium-variable and high-stable fire regimes across the tropics. Burned area is stable at all project sites, contrary to the broad decline across the Malagasy highlands.

The baseline situation around the forest edges has been recorded visually at Ankafoabe (Figure 6). We plan to replace these with more informative photo points immediately outside the tree line, with photos to be taken into the forest and away from the forest at each point.



**Figure 6.** Fifteen photo points set up around the gallery forest patch in the Ankafobe New Protected Area, with the first photographs looking towards the forest. Data from Dinasoa Tahirinirainy, figure by Sarah Z. Ficinski.

### 3.3 Progress towards the project Outcome

Five months into the project we are cautiously optimistic. We feel that *Improved grazing system management capacity, healthier cattle, sustainable grassland exploitation, and reduced loss of grassland and forest biodiversity* can be achieved as long as forage crop growth is improved, the fire management work is successful, and other technical challenges are addressed.

Since the central aim of our work lies in poverty alleviation and community empowerment, we seek to understand project cause and effect first of all through the eyes of the participant communities, using the combination of qualitative and quantitative social science approaches. We feel satisfied that the design of the **social science research for indicator 0.1**, *positive cause and effect relationship between the project interventions and perceived wealth and well-being among the 90 project household members*, has been carried out to a high professional standard. Control households with the same characteristics as the beneficiaries in areas close to the project will be surveyed to enable a comparison between the experiences of communities within and outside the project area; project staff will carry out surveys away from their normal working sites to avoid bias; an ethics committee application to the University of Edinburgh is being prepared for this research. We are exploring the possibility of supervising an MSc student for the third year of the project to carry out the endline survey or conduct qualitative interviews and focus groups.

The baseline analysis of the 77 female cows 1 year and older owned by the 49 project households in Ankafobe and Ibity (data in Annexes 45-46 and analysis in Annexes 47-48) has shown reasonably reassuring baseline average figures: 120 kg average animal weight (temporary proxy for the **cattle condition indicator 0.3** pending training), 50% **annual calving rate (indicator 0.6)**, and an average 4 litres of milk per day produced by each cow in the 60% of the **households milking their cows (indicator 0.4)**. Unfortunately, the unexpectedly broad range of animal weights, 40-250 kg (which do not reflect animal age) and an even broader range of milk yields, 1-12 litres of milk per day produced by each cow (which also have no obvious relationship to animal age), suggests that the health of the animals varies greatly at both sites, especially as around 20% of the Ankafobe households reported livestock illness. In spite of the very similar cattle condition in Ankafobe and Ibity, cows in Ibity produce 3 times as much milk as those in Ankafobe: the Antsirabe region where Ibity is located is the centre of Madagascar's milk production, and the Ibity project beneficiaries use hybrid cattle breeds which produce more milk. For the **grass and forb frequency indicator 0.2** see section 3.2.

**[Do not publish this paragraph online please]** Fire management (leading to **indicator 0.5**) is the greatest policy challenge of this project as concerns over recent fires are exacerbating the ongoing conflict between the need for preventative burns, historic legislation prohibiting burning, and widespread misconceptions around fire. The *Fondation pour les Aires Protégées et la Biodiversité de Madagascar* (FAPBM) criticized fire management at the Itremo PA because at the end of the dry season fire traces were visible across the Itremo landscape (quote from the November 2021 FAPBM report reviewing the Itremo PA: “*Le premier constat en arrivant dans l’Aire Protégée d’Itremo est la trace laissée par les feux. C’est presque généralisé dans l’Aire Protégée.. Toutes les prairies et savanes sont donc touchées par les feux*”). The detail and the timing of fires in these fire-driven savanna landscapes can be altered but suppressing fires is not in fact possible in the longer term: fire management will not become successful until this fact is accepted by the Madagascar’s PA governance community and a new generation of fire management practices (with only limited fire suppression) emerges.

### 3.4 Monitoring of assumptions

**Assumption 1:** *Political situation stable with no significant civil unrest in Antananarivo or nearby (risk mitigated by our close links with the British Embassy in Antananarivo and multiple long-term trusted local contacts at the sites so we are kept aware of any changes and receive timely advice)*

**Comments:** **[do not publish this paragraph online please]** More or less correct over the five-month reporting period. A new director of the Botanical and Zoological Garden of Tsimbazaza (PBZT) was appointed in December 2021 (<https://www.facebook.com/orangeactu/posts/3061136520823141>); PBZT is Kew’s Malagasy government partner organisation representing us to MEDD and signing each one of our permit applications before they are presented to MEDD for consideration). The new Minister of Environment was named in March 2022. Neither of those changes affected this project directly but both of them slowed down project work through a climate of increased uncertainty, and a slower research permit process. Nanjarisoa first submitted our research permit application in November 2021 but the permit was not yet granted when her first trip to Ibity took place in mid-January. Nanjarisoa began gathering grassland plot data and collecting voucher specimens in expectation of the permits, but the vouchers could not be transported to Antananarivo for identification, since the research permit is needed to apply for a transportation permit in order to move the collections. Nanjarisoa therefore could not examine the voucher specimens under the microscope located in Antananarivo and could not compare them to the herbarium also located in Antananarivo, causing a delay with Output 1.

**Assumption 1:** *Cattle remain central to rice production and income from meat and milk, no successful simultaneous technological improvements introduced (risk mitigated by advice obtained from the Agriculture Ministry and their involvement throughout the project)*

**Comments:** Correct over the five-month reporting period.

**Assumption 2:** *Cattle rustling low and does not affect more than 10% of participating households (risk mitigated by animators living at or near the demonstration farms, and employing community members as technicians and fire patrol members, to monitor the security situation and discourage theft)*

**Comments:** More or less correct over the five-month reporting period. Fear of cattle rustling means secure cow sheds need to be built to protect the project livestock at night (e.g. Itremo cowshed <https://www.flickr.com/photos/36803481@N06/52039775013>), and an additional livestock guardian needs to be employed, which we did not anticipate at the application stage. We are working in partnership with the Gendarmerie Nationale (in blue t-shirts at Ibity launch <https://www.flickr.com/photos/36803481@N06/52039863906>), staff paid a courtesy visit to the Gendarmerie local to the 3 sites, also because livestock purchase required police approval.

**Assumption 3:** *Improved cattle productivity may lead to overgrazing (risk mitigated by close monitoring of the rangeland plots throughout project)*

**Comments:** Correct over the five-month reporting period. Grazing rotation is planned if this becomes an issue.

**Assumption 4:** *Coronavirus situation permits travel at least within central Madagascar for the project duration (risk mitigated by project founded in local communities with less reliance on central and foreign staff; budget for faster internet subscriptions to improve online communications as an alternative to travel)*

**Comments:** More or less correct over the five-month reporting period. Telephone communications have proven to be the most effective between the 5 project locations in Madagascar: 3 sites, Kew head office, and the MBG head office.

**Assumption 5:** *Continued community trust and engagement; most management associations choose to participate in the project (risk mitigated by 17 years of trusting relationships already built in Ankafoabe, Ibity and Itremo, enthusiasm expressed at the scoping workshop, and investment to ensure full community engagement in project)*

**Comments:** Correct over the five-month reporting period.

**Assumption 6:** *Rainfall patterns remain within local average ranges (risk mitigated through monitoring and adjustment of plot design)*

**Comments:** **Cyclone Batsirai** ([https://en.wikipedia.org/wiki/Cyclone\\_Batsirai](https://en.wikipedia.org/wiki/Cyclone_Batsirai)) in February 2022 destroyed part of the National Route 35, the main access road to the Itremo project site. Condition of the National Route 35 has been a long-term limiting factor for work at Itremo (and will be listed as an independent risk to the project when we apply to update the logframe). By the time the cyclone struck, the government road building project had already demolished the old bridge across the Nahaverazana river but had not yet built the replacement bridge; trucks and all-terrain vehicles such as the Kew Landrovers were crossing the river by driving on stones placed at the bottom (video of the river crossing at <https://youtube.com/shorts/BXXAzFONms0>). After cyclone Batsirai the Nahaverazana river became uncrossable due to the volume of water. Other sections of the National Route 35 became too dangerous (photographs Annex 54, video at <https://youtube.com/shorts/6JhqiBzJr1o>); a Kew Landrover working on another project returning from Itremo in late February was stuck on the Nahaverazana river bank for two days. The project team with Caroline Lehmann and Maria Vorontsova judged the road to be too dangerous and turned back at Ambatofinandrahana on 2 March 2022. Activity in Itremo was subsequently delayed.

**The small drought in Anakafobe** arrived unexpectedly in late February, the middle of the wet season, after *Sorghum* and *Brachiaria* seedlings has germinated. A significant proportion of the plants died and planting was repeated, leading to some difficulties with motivation and 4 households dropping out (see also section 13). This appears to be part of the change in rainfall patterns across Madagascar even within previously regular rainfall areas such as the central highlands, likely connected to climate change.

**Assumption 7:** *Invasions of alien grasses and forbs do not significantly increase (risk mitigated through monitoring and adjustment of plot design by the grass and forb botanist, and cultivating Sorghum cultivars which have proven non-invasive)*

**Comments:** Correct over the five-month reporting period.

**Assumption 8:** *Land used for the production of Sorghum does not compete with food crops (risk mitigated by community decision making on land use and specific questions on land use consequences in project perception questionnaires)*

**Comments:** Appears to be more or less correct over the five-month reporting period. All three project sites initially started labour-intensive *Sorghum* and *Brachiaria* fields on land which has not been under cultivation in living memory. In Itremo an additional fallow field was added after the start of the ploughing, in order to provide faster trial planting results, and growth in the fallow field was indeed better. We are not aware of any adverse effect on food cultivation but feel that this assumption will need to be monitored with extra care because of the high volume of manual labour being invested by the beneficiary households seems likely to be taking time away from other activities.

**Assumption 9:** *Healthy project cattle are available for purchase (risk mitigated by reassuring results of informal enquiries already made by the PA managers)*

**Comments:** Correct over the five-month reporting period.

**Assumption 10:** *Cattle illness does not increase above current local average (risk mitigated by specialist advice availability from the National Diagnostic Veterinary Laboratory accessed through the Agriculture Ministry)*

**Comments:** Appears to be more or less correct over the five-month reporting period. We learned that livestock health is a significant ongoing concern for project beneficiary households, and the desire to access veterinary services had been a major driver in household engagement. We are planning to add the provision of veterinary services during 22/23 plan by engaging locally responsible veterinary doctors (*vétérinaires mandataires*) at each site.

**Assumption 11:** *No sudden change in fire regime e.g. following drought (risk mitigated through monitoring and adjustment of firebreak design and preventative burns)*

**Comments:** Correct over the five-month reporting period.

**Assumption 12:** *No fires deliberately started in the forest (risk mitigated by decreasing community need for fires through improved dry season livestock nutrition supply by outputs 1 and 2, and increased community control over fires)*

**Comments:** Correct over the five-month reporting period.

### 3.5 Impact: achievement of positive impact on biodiversity and poverty alleviation

The project impact is “*Conservation of biodiversity and improved welfare of communities in the Central Highlands of Madagascar through optimal grazing of cattle and management of grasslands*”. The notably high levels of enthusiasm expressed by the full range of Malagasy stakeholders is making us optimistic, but the project outcome will only lead to this impact if our agricultural work in outputs 1-2 is successfully linked to our fire management work in output 3. This is linked to the broader challenge of linking our new poverty alleviating (and enthusiasm generating) agricultural work to the smaller biodiversity and ecosystem conservation sector. We are using grasses and grasslands to build a bridge between these two worlds.

## 4. Project support to the Conventions, Treaties or Agreements

### I. CBD articles 7, 8, 10, 13

Demonstration of the livelihood value of native Malagasy grasses (output 1) is contributing to **CBD Article 7: “Identify components of biological diversity important for its conservation and sustainable use”** and **Article 13: “Promote and encourage understanding of the importance of the conservation of biological diversity”**. Trials to establish productive and sustainable grazing protocols (output 1) will improve cattle nutrition (outcome indicators 0.3, 0.4 and 0.6) while conserving native grasses (output 1), contributing to **CBD Article 10: “Integrate consideration of the conservation and sustainable use of biological resources”**. Work towards establishing flexible and locally responsive fuel load and fire management systems around humid forest patches (output 3), including specialist skills development by community members and adding methods to protected area management protocols (indicator 3.3), is contributing to **CBD Article 8: “Develop guidelines for the management of protected areas”**.

### II. ITPGRFA

We are supporting the ITPGRFA aims to “**recognize the enormous contribution of farmers to the diversity of crops**” and “**access plant genetic materials**” by generating new knowledge on native forage grass grazing and nutritional value (output indicators 1.1-1.3), and publishing a booklet on the key species and their exploitation (output indicator 1.4).

### III. Madagascar’s National Biodiversity Strategy and Action Plans 2015-2025 strategic goals 1-5 (Rabarison 2016, pages 18-19).

We are contributing to **goal 1: “awareness about the value of biodiversity”** by researching, demonstrating, and publicizing native nutritious forage grass diversity (output 1) and its effectiveness in boosting livestock nutrition (outcome indicators 0.3, 0.4 and 0.6). We are contributing to goal 2: “**minimization of direct pressures on biodiversity ... sustainable use is to be encouraged**” by building more resilient and sustainable grazing livelihoods in the highland grasslands (impact). We are contributing to **goal 3: “management of terrestrial protected areas”** by working towards the first custom-designed modern Fire Management Plans for Ankafobe, Ibity, and Itremo Protected Areas, to be included in each Protected Area management plan (indicator 3.3). We are contributing to **goal 4: “Strengthening the benefits of biodiversity .. under sustainable management”** by building both productive and sustainable rangeland management (outcome) valorising nutritious native grasses (output 1). We are contributing to **goal 5: “participatory planning of knowledge management and capacity building .. a system to protect traditional practices and knowledge”** by co-creating this project with communities and implementing a community-led consultative and responsive approach throughout (planned activities 1.6, 2.10, 3.8); we have responded to community requests communicated through daily informal discussions with beneficiary household members by adding a second forage crop, as well as planning to introduce veterinary service provision and purchase bulls in year 2.

## 5. Project support to poverty reduction

The 90 beneficiary households (86 active households not including those who have paused their participation) are already benefitting from the direct poverty alleviation activities. Each household has received a minimum of 250g (2 kapoaka) of *Sorghum* forage seeds (Annexes 40-41), participated in the supervised ploughing, planting, and weeding of the same seeds being grown in the demo farms, and repeated the newly learned forage crop cultivation activities in their household plots. In Ibity hay making has been taught directly to the households by the animator and by Livaso, both in large groups (e.g. photo at <https://www.flickr.com/photos/36803481@N06/52029723581>) and during household visits. By community demand, we plan to add the provision of veterinary services to the project activities in year 2;

so far the veterinary services we have provided have been sporadic and not aimed specifically at the beneficiary households (narrative in section 16).

It is important to note that since we are working to boost household livestock production, only the wealthier households who own at least one cow and enough land for forage crops were eligible to become project beneficiaries. We are concerned about leaving behind the poorer sectors of local society; other local people from outside the project households have been employed to carry out the erection of fences, clearing firebreaks around unburned pasture plots, ploughing, weeding, cowshed building, and will also be employed to guard the project livestock and clear firebreaks around forest patches.

## **6. Consideration of gender equality issues**

Following past negative reactions to women's meetings organised by projects in other parts of Madagascar, we started out with a cautious approach to the beneficiary community culture, with a focus on awareness and leading by example, at least during the first months of the project while we establish trust. The process of selecting beneficiary households accepted all the female-headed households who expressed interest. Self-reported gender is surveyed in all attendance forms and recorded for each participant household from the interview of the household informant. Six out of 30 households in Ibity and 3 out of 30 households in Itremo are represented by women; 47% of people in our 30 Ibity households, and 46% of people in our 30 Itremo households are female (data in Annexes 24-25); our assumptions about traditional gender roles seem to be broadly correct as mostly men represent households and attend events concerning livestock, while mostly women attend the events concerning hay making. In year 3 we hope to conduct separate workshops with men and women participants to understand any gender specific impacts of the project, if the community do not object.

Ten of the 25 named project staff (staff structure in Annex 4) are women, with majority female leadership, although all three protected areas are led by men. Unlike the project membership, the people reached by our Facebook advert are 52% female (28,160 who Facebook classifies as female out of 53,760 people reached who Facebook assigns to a gender, data in Annexes 55-56).

The most notable project achievement this year is the recruitment of two professional young female agronomists as site animators, given positions of authority in Ankafobe and Ibity by this project (CVs in Annexes 6-7). Malagasy professional networks are dominated by staff educated at the University of Antananarivo in the capital city, and we are proud to be promoting the careers of these two women educated at agricultural colleges in Antsirabe and Miarinarivo.

## **7. Monitoring and evaluation**

Work during the past five months has made it apparent that even though the logframe activities and indicators seem reasonably representative of the project achievements, numerous other complex and time-consuming activities were not listed in the original application text. Grass diversity and pasture work for output 1 requires applications for research permits, transportation permits, and also exportation permits; pressing and drying the herbarium voucher specimens and making labels; identifying these specimens at the Malagasy and UK herbaria, including the majority of non-grass herbaceous plants outside the team taxonomic expertise; entering voucher specimen data into the BRAHMS database; uploading BRAHMS data to the relevant herbaria database and then up to GBIF. The agricultural indicators used in output 2 and livestock outcome indicators are the industry standard measurements, but the following labour-intensive contributing activities have not been captured: ploughing, weeding, fertiliser purchase and application, design and material purchase and building of cowsheds, guarding of the project livestock. This report writing process is making us realise that the project is actually far larger and more demanding than we had previously understood, and the full execution may be beyond our capacity, also reflected by our failure to complete all the activities in the second part of output 2 and output 3.

The monitoring and evaluation measurements are first made by the site technicians under the supervision of the site animator, then verified by the PA managers, and sent to the project manager (Livasoa) who compiles them and sends the relevant datasets out for specialist analyses: grass vouchers for identification to Maria Vorontsova, pasture plot and fire data to Caroline Lehmann, forage and agricultural data to Wayne Truter. This process has not yet been fully set up, communicated, and executed during the first five months of the project (e.g. full data on hay making training times and attendees has not been recorded), and the measurements from the different sites are not fully standardised (e.g. ploughing labour has been recorded by counting participant people in Ibity and participant ploughs in Ankafobe and Itremo). This is the first close collaboration between Kew Madagascar and MBG; standardisation of the processes between Itremo (Kew) and Ankafobe and Ibity (MBG) has not been straightforward because the two organisations have different management structures and are

located on the opposite sides of Antananarivo, making regular meetings difficult. Following pandemic changes to travel timetables, March and April 2022 has been particularly challenging for Livasoa and the team as the international site visits in March and preparation of team documents for the South Africa visit in April coincided with the end of year purchasing and the preparation of this report.

## 8. Lessons learnt

Perhaps our greatest error this year is the long time October-January we spent attempting to contact Hydromulch Madagascar (see section 11) and waiting for the UP team to provide advice on the planting of forage crops. Waiting for Caroline Lehmann's visit to Madagascar to begin the fire management work was also a mistake. From now on we will plan alternative actions when timely expert input is not received.

We have understood the differences between the three project sites at a deeper level. Since our top priority is to maximise project success and legacy at each site, we have decided to sacrifice data standardisation and permit the approaches and budgets to diverge. Our biggest logical challenge and a significant project risk is access to the Itremo site while the road Route National 35 has not been repaired.

Our biggest agricultural production lessons from the past five months are that natural zebu dung fertiliser seems insufficient to produce the necessary forage crop yields, and that the provision of veterinary services is likely to be a limiting factor for livestock production. The team are currently building a response plan together with Wayne Truter during their visit to South Africa.

Looking forward to the next 2.5 years of the project, our strategic challenge will be creating a stronger connection between the agricultural production in the villages and the fire protection work around the forest edges. We have learned that the forest patches are situated further away from the project beneficiary villages than we expected (up to 15 km in Itremo, Figure 4) so village livestock cannot be used to graze firebreaks without walking so far the animals would fail to gain weight. A second staff meeting will be held in Antananarivo during June 2022 during Maria Vorontsova and Caroline Lehmann's visit to discuss this strategic challenge and the other learning points.

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

Feedback received when the project was funded, addressed point by point:

1. *"The benefits to forests are assumed and long term, but may not be realised if fire management is not maintained over long timeframes – please address in your first half year report (HYR)"* **Response:** We agree that is a serious concern, as also highlighted by the FAPBM review of the Itremo PA. Long term fire management will be implemented by Kew and MBG with the local communities through ongoing long-term Protected Area management of all the three PAs in this project, using the Fire Management Plans which will be added to the existing Protected Area management plans through output indicator 3.3. In addition to this mechanism, Itremo PA will be one of the sites included in the new 6-year DEFRA BLF consortium *Sustainable Management for Future Generations*, where fire management will be trialled more extensively; Maria Vorontsova and Caroline Lehmann are employed on both projects enabling them to ensure complementarity.

2. *"It is not completely clear how Fire Management Plans will be co-created with the communities and how these plans will be implemented. It is also noted that this is likely to be after project end (HYR)"* **Response:** We plan to have this task completed within the project timeline. In response to this feedback the text of the logframe indicator 3.3 was edited as follows, together with the change request submitted in September 2021, change request approved: *"Fire Management Plans co-created with communities driven by the PA managers, with a focus around establishing safe burn days and times, weather adaptation and no-fire zones. Plans added to the Protected Area management plans by June 2024 in draft form and by September 2024 in the final form, guided by Lehmann."*

3. *"Benefits to the grasslands are likely, but there is no indication of the degree of expected improvement in current grassland diversity (HYR)"* **Response:** Our application text may not have been understood correctly: indicator 1.1 specifies quantitative improvement in pasture diversity, and the first baseline measurements are presented in section 3.2, with 5-10 grasses and 10-18 forb species recorded per plot.

4. *"If non-native sorghum fodder crop is a necessary part of the management, then this puts an additional risk to long term legacy. Also, there may be a risk that the sorghum will prove the best feed and replace native grass use (HYR)"* **Response:** We agree with the first part of this comment. The fundamental limitation faced by our communities are poor soils, leading to low pasture productivity, leading to low livestock productivity and to poverty. The fastest way out of poverty is to introduce non-

native wealth boosting inputs. We judge the non-native *Sorghum* to be the least risky option as similar cultivars are becoming an increasingly common solution to similar pasture fertility limitations in sub-Saharan Africa, so it should not be too difficult for the cultivation to be continued after project end. We do not agree with the second part of the comment: the fodder crops are labour intensive to cultivate while the native grasses are abundant and free to use; the chances of wild pasture grazing becoming redundant in the next 50 years seem small.

5. *"The risk that improved cattle revenues may lead to overgrazing is not mentioned (HYR)"*

**Response:** The livestock are so few in number, and the grazing pressure in our project area is so low (typical landscape at <https://www.flickr.com/photos/36803481@N06/52042052558>), we do not believe this to be a significant risk, except in the small private areas safest from cattle rustling directly outside the beneficiary households. This risk was added to the logframe together with the change request submitted in September 2021 and approved.

6. *"There is no baseline against which to judge or measure biodiversity gains or losses. This baseline will presumably be established in Year 1, but significant change by Year 3 seems unlikely (HYR)"* **Response:** Our application text may not have been understood correctly: indicator 1.1 specifies quantitative improvement in grass and forb diversity, and the first baseline measurements are presented in section 3.2. We are working towards the recognition of Madagascar's unique grassland diversity as being no less valuable than the diversity in its forests. Any biodiversity losses within the forest patches will be judged through recording fire incursion into the gallery forests, as recorded by monthly photo point photographs, means of verification 3.2: *Photographs of forest edges made by monthly Protected Area fire patrols using the SMART-Mobile app, including monthly photographs at 10 set photo points in each Protected Area.* We aim towards no change to the forest edges, evidencing zero forest biodiversity loss.

7. *"How will the uptake of the demonstrated Sorghum crop happen? Is it likely that this will happen after project end?"* **Response:** *Sorghum* seeds have been distributed to each project beneficiary household at the same time as *Sorghum* for the demo farm. Each stage of the demo farm cultivation is being repeated by the project households in their own plots; see section 3.2 output 2.

8. *"Can the native fodder provide the tangible benefits to cattle that will incentivise the restricted burns if the fodder crop is not used?"* **Response:** We believe that without the commercially-bred non-native fodder crop, improved management of the native grasses will not boost livestock production quickly enough to motivate the communities, because the soil fertility and resulting pasture productivity are simply not high enough. Non-native fodder crop is central to the project premise of boosting wealth and motivation. Native forage grasses have not yet undergone any breeding programs to establish them as fodder crops.

9. *"Is it feasible to create the village associations in Year 3 or should this start earlier?"*

**Response:** We agree with this feedback, and will start work to create the village associations in year 2. Creating these associations in year 2 will also create a convenient vehicle for project implementation with targeted households, creating more communication and mutual support between them, and helping project staff organise training and M&E.

10. *"The biodiversity conservation aspect could be better explained and it is disappointing not to see any specific species targeted in the logframe (HYR)"* **Response:** We are a little bit confused by this comment, as indicators 0.2 and 1.3 both list the 5 key forage grass species this project planned to work with. A different set of 5 species has been tentatively identified from the baseline data explained in section 3.2: *Loudetia simplex*, *Aristida rufescens*, *Digitaria longiflora*, *Panicum Luridum*, and *Eragrostis lateritica*; links to photographs of these species also in section 3.2.

11. *"It seems probable that the 3 year timeframe is short to yield robust information on well-being benefits. An additional, robust quantified measure of actual change in income would be prudent, and is probably necessary to understand drivers of any change in Global Person Generated Index over the long term (HYR)"* **Response:** We agree that measuring monetary income will strengthen our analysis. In response to this comment, we have decided to also collect several quantitative proxies of income: land holdings, assets, quality of houses, livestock tropical units, multidimensional poverty indexes, and local people's perceptions of any changes in their well-being due to the project's interventions. We are also planning to use a BACI impact evaluation design (before-after-control design) and not merely a before-after design to be able to robustly attribute any changes in people's income to the project (new list of indicators in Annex 27, and the questionnaire in Annex 28). Sarobidy is also planning to conduct unstructured qualitative interviews and in-person focus groups with a sub-sample of project beneficiaries, to explore the project's impacts in more depth and understand any mechanisms leading to these impacts.

12. *"With the £17,600 allocated to communications materials (such as booklets and pamphlets), perhaps the project could produce a short film to sum up the issues and approach as this project is novel and innovative. The film could be shown at project locations but also disseminated widely across Madagascar and the region via social media. Brochures and posters will only have limited reach and if successful a film has great potential for replicability/further investment if the concept can be conveyed*

*succinctly and visually (HYR)*” **Response:** We agree, this was added to the logframe indicator 1.4 together with the change request submitted in September 2021 and approved.

12. “*The logframe could be strengthened by enhancing some of the Outcome Indicators. For example, 0.1: could be more specific in terms of number of households and/or concrete wealth and/or well-being indicators; 0.5: how animal diversity will be measured.*” **Response:** We have decided to add quantitative wellbeing indicators besides more subjective measures such as GPPI, see feedback item 11. Indicator 0.1 will include the 90 beneficiary households. Measuring animal diversity directly, rather than using forest intactness as a proxy, we feel would be beyond the capacity of this project.

## 10. Other comments on progress not covered elsewhere

See section 8 for difficulties and risks.

## 11. Sustainability and legacy

We feel that 5 months into the project we are not yet in a position to have a clear view of the exit strategy and legacy planning.

## 12. Darwin identity

This project has a particularly distinctive identity in Madagascar, being the first piece of work with livestock executed by the plant-focused environmental conservation organisations Kew and MBG. Our impression is that the close-knit community of Madagascar’s environmental conservation organisations already recognises the UK government contribution and the Darwin brand, and this project is currently extending that reach further to MINAE, FOFIFA, and the much larger network of agriculture professionals. We have understood from Jessica Petitprez that the UK Embassy have not previously worked with MINAE but plan to do so as part of this work.

Our chosen primary communication channel targeted at the Malagasy professional community and social networks is the project Facebook page ran primarily in Malagasy, *Harena Voajanahary sy Kijana Mamokatra* at <https://www.facebook.com/KMCCMBG>, chosen because Facebook does not charge for mobile data accessed through several in-country mobile internet providers, and has therefore become Madagascar’s primary social media website. Social media champions were nominated for each site. In April 2022 the page has 481 subscribers and 44 posts, with an average 12 reactions per post. In order to raise awareness of the project soon after its start we paid for a commercial Facebook advert, and 53,809 people in all 23 regions of Madagascar were reached while the advert ran 23 February – 15 March 2022. 60% of the people reached were based in the Analamanga region of Madagascar and 74% of people reached were under the age of 34, likely reflecting the wealthier educated residents of the capital city with Facebook accounts. Facebook reactions to the advert-boosted post reached a maximum of 7,425 (Facebook Advert reach statistics in Annexes 55-56). Early cancellation of the 6-month advert restricted the total advert cost to £12.42 (Annex 57) so we are planning to run further commercial adverts to communicate key project messages.

The international English language project promotion was planned for Twitter, staff were asked to set up Twitter accounts, and the project hashtag #kijanamaharitra (sustainable pasture) was decided on at the 13 March staff meeting (photo at <https://www.flickr.com/photos/36803481@N06/51973169453>), but the Twitter campaign did not take off in a way comparable to Facebook, probably because Twitter was not a significant pre-existing social media platform used by our staff and is less prominent in Madagascar.

The value of Madagascar’s native grasses as overlooked uncharismatic biodiversity was highlighted in the article Nanjarisoa wrote for March Darwin newsletter, titled *The dullest of plants? How grasses help feed Madagascar and protect it from fire*, at [bit.ly/3Lx2iC6](http://bit.ly/3Lx2iC6). Links to the Darwin pages have regularly been made in the Facebook page and the Twitter posts. Project t-shirts including the Darwin Initiative logo will be printed during 22/23.

## 13. Impact of COVID-19 on project delivery

**[Please do not include first two paragraphs in the online publication]**

Project start and launch in November 2021 coincided with the University of Pretoria (UP) pandemic reopening and reactivation of the field trials run by Wayne Truter’s group, followed by the emergence of the omicron variant in South Africa and the closure of borders. Wayne Truter, Maria Vorontsova, and

Caroline Lehmann's tickets to Madagascar to attend the national launch and set up activity at the project sites 15-23 November (Annex 9) were cancelled as Madagascar's borders were still closed and Ethiopian Airlines were not granted the authority to land planes in Madagascar (flight cancellation email in Annex 10). The international expert team's failure to reach Madagascar in November 2021 cause **delays in all aspects of the project, with the agricultural production aspects (output 2) suffering the most** as agriculture is outside the historic expertise of the Malagasy partners and was most in need of foreign expert's (Wayne Truter's) presence in Madagascar. Our most effective response was engaging the qualified veterinary doctor Dr Livasoa Randriamanalina as the project manager, and two agricultural professionals as animators (CVs in Annexes 5-7). Since starting work in early December Livasoa has been advising the team on all aspects of livestock farming and providing staff and household training, in addition to his role as project manager.

**Hydromulch Madagascar, the Malagasy subsidiary of the South African company Hydromulch and AGT Foods due to supply the chosen South African *Sorghum* cultivar, went bankrupt during the pandemic** and no longer exists in Madagascar. Following several months of enquiries, discussions with community members and community requests for *Brachiaria* forage crops, Livasoa started looking for alternative sources of *Sorghum* seeds in January 2021 and received Malagasy-grown *Sorghum* and *Brachiaria* seeds from local growers recommended by FOFIFA. This delay meant the trial planting began in the middle of the wet season in February, instead of the start of the rains in December, and cultivation took place without the expected support from Hydromulch and UP. Since the South African seeds and methods were promised at the launch events and not delivered, staff and local community expectations were somewhat undermined, and 4 out of the 30 project beneficiary households recruited in Ankafobe temporarily ceased their participation. In the absence of expected instructions from UP Livasoa determined the appropriate protocols and continues to supervise the ploughing, sowing, growing, and weeding at *Sorghum* and *Brachiaria* at the project sites (described under output 2). We are working to import the South African *Sorghum* cultivar originally chosen from AGT Foods but since the Malagasy company no longer exists the seed importation process had to begin from scratch; Livasoa and Nanja have invited a FOFIFA inspector to visit the project sites to grant permission for the seed importation permit to be issued. We hope to complete the seed importation process in time for the year 2 wet season in December 2022.

All project activities involving project staff follow the Kew COVID-19 safety guidance, including masks in indoor spaces and vehicles, social distancing, and self-isolation protocols (example Kew Madagascar COVID-19 briefing document in Annex 58).

## 14. Safeguarding

Please tick this box if any safeguarding or human rights violations have occurred during this financial year.

If you have ticked the box, please ensure these are reported to [ODA.safeguarding@defra.gov.uk](mailto:ODA.safeguarding@defra.gov.uk) as indicated in the T&Cs.

All policies and procedures outlined in the application remain in place. We encourage a culture of open communication around difficult subjects for all project stakeholders. The Kew Head of Safeguarding Ella Remes is currently in Antananarivo carrying out Phase 1 of a Contextual Safeguarding Assessment to support Kew work in Madagascar. Mamy Tiana Rajaonah attended the safeguarding workshop run by Paul Wilkin in January 2022 and the safeguarding training run by Ella Remes on 13 April 2022 (attendance sheet in Annex 60). The Kew safeguarding policy has now been translated into French and Malagasy (Malagasy version in Appendix 59). This project has a duty of care towards the project animals in addition to the people; we are learning from our professional veterinary doctor Livasoa and following his advice in this new area of work.

## 15. Project expenditure

**Table 1: Project expenditure during the reporting period (1 April 2021 – 31 March 2022)**

Project spend (indicative since last Annual Report)	2021/22 Grant (£)	2021/22 Total Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)	██████	██████	██████	Staff hire was slower than expected with the cumulative pandemic delays with some starting work in December,

				over a month after the project start. The Itremo livestock technician left his post in January and this position was not re-hired until the end of March 2022.
Consultancy costs	████	████	██	As planned
Overhead Costs	████	████	██	Calculated proportionally to Kew staff costs
Travel and subsistence	████	████	██	As planned
Operating Costs	████	████	██	International flights had to be rebooked several times (see section 13); forage crop seeds had to be purchased as the project did not receive the commercial donation expected from Hydromulch Madagascar (see section 13); the destruction of the access road to Itremo created a need to deliver materials on motorbikes (see section 3.4 assumption 6); we did not originally anticipate new cowsheds would need to be built; food and other prices increased in Madagascar post pandemic.
Capital items (see below)	████	████	██	As planned
Monitoring & Evaluation (M&E)			██	M&E costs are included in the salary line above, calculated as a salary proportion of project advisors, manager, animators, grass botanist, and consultant. Variance is estimated proportionally from the late employment start dates of the project manager and grass botanist.
Others (see below)	████	████		
<b>TOTAL</b>	████	████		

The figures in the table are those requested by our approved change request in September 2021. We would like to apologise that the variances listed above were not approved by Darwin, as these did not become apparent until the figures were compiled for this report.

## 16. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum). This section may be used for publicity purposes

I agree for the Darwin Initiative Secretariat to publish the content of this section (please leave this line in to indicate your agreement to use any material you provide here).

Our project has helped livestock in the Ambatofinandrahana area in an unexpected way. On the way to the Itremo project site in March 2022, the team visited the mayor of Ambatofinandrahana to seek support for the project. The mayor told us about the local livestock suffering from a new and serious disease caused by the consumption of a harmful forage grass. Luckily, our project Manager, Dr Livasoa Randriamanalina, is a qualified veterinary doctor, who was already carrying the correct medicines to treat the same disease in the livestock purchased for our project: a combination of streptomycin, penicillin and trimethoprim and a vitamin B mixture, or oxytetracycline with a vitamin B mixture. Livasoa explained to the mayor that the origin of this disease is not yet known, as it is new to Madagascar and currently being studied by scientists from MINAE (DSV: *Direction des Services Vétérinaires*). It is most likely waterborne, and not actually caused by fodder grasses but transmitted in the waterways and through contaminated objects. The mayor and his staff were excited and grateful to receive this unexpected solution and instructions for treatment. We expect the zebu are now feeling better.

## 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 <b>correct template</b> (checking fund, type of report (i.e. Annual or Final), and year) and <b>deleted the blue guidance text</b> before submission?	yes
<b>Is the report less than 10MB?</b> If so, please email to <a href="mailto:Darwin-Projects@ltsi.co.uk">Darwin-Projects@ltsi.co.uk</a> putting the project number in the Subject line.	More than 10MB
<b>Is your report more than 10MB?</b> If so, please discuss with <a href="mailto:Darwin-Projects@ltsi.co.uk">Darwin-Projects@ltsi.co.uk</a> about the best way to deliver the report, putting the project number in the Subject line.	
<b>Have you included means of verification?</b> You should not submit every project document, but the main outputs and a selection of the others would strengthen the report.	yes
<b>Do you have hard copies of material you need to submit with the report?</b> If so, please make this clear in the covering email and ensure all material is marked with the project number. However, we would expect that most material will now be electronic.	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.	