Darwin Initiative, Darwin Plus and Illegal Wildlife Trade Challenge Fund

Covid-19 Rapid Response Round - Final Report

Due within two months of the end date of the Rapid Response Round project

(maximum 6 pages)

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If linked with an ongoing project, please include that project reference here (e.g. IWT001)	25-016
Project title	Reducing Covid-19-related food insecurity through household farming in southeast Madagascar
Country/ies	Madagascar
Lead organisation	SEED Madagascar
Partner institution(s)	Dr. Cortni Borgerson (Montclair State University)
Start/end date of project	01 January 2021 – 31 March 2021
Which fund was this project relevant to?	Darwin Initiative - Covid-19 Rapid Response Fund
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1. Project Summary

In response to Covid-19-related food insecurity, SEED Madagascar (SEED) conducted a rapid pilot of insect and crop farming at household level, intending to increase food security and diet diversity for 90 households across two rural communities. Rather than actively achieving changes for biodiversity, SEED's rapid response targeted the immediate food security risk to alleviate pressure on biodiversity that may have been exacerbated by Covid-19.

This project built on 25-016 by working with a subset of existing beneficiary communities, utilising relationships with community structures. The biodiversity monitoring of 25-016 was expanded in CV19RR14 to assess the impact of Covid-19.

A more detailed examination of the project's rationale can be found in application CV19RR/1004.

The project was delivered in two communities, Sainte Luce and Elodrato (Figure 1). Both communities encompass several hamlets. In the community of Sainte Luce, these are Ambandrika, Ampanasatomboky, and Manafiafy. In the community of Elodrato, these are Ebakika (North and South), and Esohihy (North and South) and the hamlet Elodrato.

Figure 1: Locations of the target communities of Sainte Luce and Elodrato and encompassed hamlets in the Anosy region, southeast Madagascar.

2. Project Achievements

2.1 Activities

This project sought to increase dietary diversity and food security at a household level, evaluated to inform longer-term recovery. Concurrently, research was conducted to determine the socio-economic impact of Covid-19 and its potential relationship with unsustainable practices, specifically in relation to the regional elasmobranch fishery. This section discusses the activities undertaken to achieve the intended outcome.

Insect and Crop Farming

Beneficiary Selection

45 households were selected for insect farming (Sainte Luce) and 45 for crop farming (Elodrato), based on level of food insecurity and motivation for project participation (90 total). Across the project, 52.2% of household representatives were women.

SEED's application (CV19RR/1004) proposed utilising Community Ambassadors in a cascading training model, with ambassadors training household representatives. Instead, SEED trained household representatives directly. This enabled a greater number of people to receive detailed training and for SEED to liaise directly with them, providing an enhanced opportunity to adapt to beneficiaries' expressed needs and feedback.

Research

A baseline survey, periodic check-ins, and an endline survey were conducted with each of the 90 households. To provide a rapid analysis of food insecurity amongst the households, baseline surveys assessed Minimum Dietary Diversity Scale for Women (MDD-W) (Annex 1) and the Coping Strategy Index (CSI) (Annex 2) as key indicators. During the baseline survey in Elodrato, participants were also asked about their agricultural practices and desired crops to inform project delivery. Periodic check-ins monitored crop and insect farming progress and emergent challenges, while project endlines assessed learning and tracked progress against outputs. Further research, including an MDD-W and CSI endline, will be conducted as part of future project phases to assess intervention impact on food security after both edible insects and crops have been harvested, consumed, and/or sold.

In the original application, research on insect and crop success was to be undertaken only on household plants. To enable SEED to better isolate variables, the team also performed controlled growing experiments in SEED's nursery in Sainte Luce. The research aimed to support expansion by determining optimal conditions for plant survival in challenging weather and soil conditions. Similar experiments were performed at a household level in the region's urban centre.

Training

Training in insect farming followed the structure created by project partner Dr. Cortni Borgerson, whose research specialises in the farming of *sakondry* at household level[1]. In Sainte Luce, households received initial training on the nutritional value of *sakondry*; how to grow the host plants, *antaky;* how to protect host plants from pests; and how to harvest and cook *sakondry* safely. Visual learning aids (VLAs) were utilised within the community to reinforce and supplement learning. As *antaky* is an edible bean species, follow-up training was delivered to harvest both beans for food and beans for seed stock, ensuring that *antaky* can be maintained as a food source in the future.

In Elodrato, initial training was carried out on plot development and planting. Households were provided with seven crop species' seeds, each based on the overall preferences of each hamlet. Households were supported with four training sessions: land preparation and planting, pest management, compost, and harvesting strategies. VLAs and farming materials were distributed at training sessions (Annex 3). Further training in seed collection, propagation, and

[1] Borgerson, C., Fisher, B., Herrera, P., Martinez, K. M., Rajoana, D., Randriamanetsy, J. M., Rasolofoniaina, B. J. R., Razafindrapaoly, B. L., & Aardema, M. L. (n.d.). Zanna tenebrosa: A nutrient-rich edible insect tool for addressing child malnutrition, food insecurity, and unsustainable hunting in Madagascar and Sub-Saharan Africa. *Conservation Letters*. [in press]

making compost promoted sustained project benefits by enabling long-term growth and crop regeneration.

Elasmobranch Monitoring

Two locally-recruited data collectors were trained over the course of three days on elasmobranch catch monitoring. Data collectors subsequently operated independently in Sainte Luce and Elodrato, recording data at landing beaches on elasmobranch species (using photographs), the size of individuals, and the prevalence of selling fins, when applicable. Monitoring was conducted via mobile data collection Open Data Kit software (ODK). Training was followed by two check-in support sessions with each data collector.

Concurrently, 97 interviews were conducted with fishers from target communities to improve SEED's understanding of socio-economic factors relating to the Covid-19 pandemic, and the impact this has had on the fisheries of Sainte Luce and Elodrato.

The application proposed focus groups as well as interviews; however, only interviews were conducted to enable more efficient use of staff time and resources. The efficiencies of ODK cannot currently be achieved during focus groups. Interviews also provided staff with a better method to assess individual responses and degree of agreement with any given question than could be established in a focus group, enabling more exploratory research.

Safeguarding

All activities delivered in this project adhered to SEED's Safeguarding Framework (Annex 4). Project design, implementation, management, and monitoring considered the status of beneficiaries, especially with regards to working with vulnerable adults and the wider impact for at risk children, young adults, and pregnant or breastfeeding women. All SEED staff, partners, and related personnel had responsibility for the protection and safeguarding of vulnerable children and adults throughout the project. Risk was managed for all activities including risk due to Covid-19, with focus on preventing and minimising risk to all parties involved.

2.2 Project Results and Achievements

All project activities ultimately worked towards fulfilling the project aim: To understand and mitigate increased biodiversity pressures resulting from Covid-19-related food insecurity. All three project elements achieved their goals to this end, providing high-impact avenues for food security in the short term and characterising the elasmobranch fishery in the region.

Objective One: *Establish insect colonies for 45 households in Sainte Luce by project end*

- 2,769 plants germinated by project end
- 75 plants colonised by insects
- Up to 25 insects per plant

While colonisation rate may appear low, colonisation only occurs when the *antaky* plants reach 1.5 metres, which happens approximately two months after germination. It is expected that colonisation rates and colony size will increase beyond project end.

Objective Two: *Install plots and establish crops for 45 households in Elodrato by project end*

- 204 crop plots established
- 68.6% of crops germinated by project end
- Change in types of crop cultivated: an average of 5.2 additional crops sown per household

Prior to the project start, the primary crops grown by beneficiary households were cassava, rice, sweet potato, and maize (Annex 5). All households now have changes in crop cultivation, having received seeds for seven new crops (Annex 6). Germination rates of each crop species ranged from 12.9% to 100.0% (Annex 7), with harvest expected two to three months after project end.

Objectives One and Two

- 90 households reached
- 496 directly benefiting individuals, of whom 225 were women (Annex 8)

- Baseline CSI of 76.0 reported in Sainte Luce[2] and 47.1 in Elodrato
- Most common and frequency of utilising coping strategies used by households in each community identified (Annex 9)
- Baseline average number of different food groups consumed by women of reproductive age (15-49 years) via MDD-W reported as 2.5 in Sainte Luce and 1.9 in Elodrato[3] (Annex 10.1-10.3)
- Common problems identified and analysed (Section 3)
- 100% training session attendance by all 90 household representatives

Suitability for crop farming scaling will depend, in part, on success rates at harvest time, though retention of key techniques and materials by the households, including propagation and replanting methods, will facilitate any future replication and scaling. Motivations for project scaling are already high amongst insect farming households, with 100% of beneficiaries reporting a desire to obtain greater edible insect numbers. There has also been sustained motivation to scale from the local mayor since project inception, and anecdotal evidence that Elodrato community members are interested in *antaky* cultivation, which would expand crop variety alongside providing access to edible insects.

Endline surveys revealed high knowledge levels of farming techniques. Many crop farming households were confident in their abilities to carry out several key activities. 76.4% of beneficiaries surveyed were confident in their abilities to manage pests and to make compost. 100% were confident in their ability to harvest their crops, and 92.3% felt confident that they could continue to grow their crops without assistance from SEED. Similar levels of farming knowledge were seen within insect farming, with 100% of households successfully germinating *antaky* seedlings by project endline. All beneficiaries retained VLAs to support knowledge retention.

Both crop and insect farming beneficiaries appear to be highly motivated to continue cultivation independently past the conclusion of SEED's assistance.100% of crop farming beneficiaries and 93% of insect farming beneficiaries reported that they had plans to continue growing their crops.

Objective Three: *Understand elasmobranch catch and socio-economic factors relating the fishery in Sainte Luce and Elodrato by project end*

- 85 data collection days completed, and analysis performed (Annex 11)
- 0 focus groups and 97 interviews (Annex 12) completed and analysed (Annex 13)
- List of elasmobranch species created (Annex 14)
- Definition of conservation priorities outlined

Landings data were collected for 43 days in Elodrato and 42 days in Sainte Luce. 300 individual elasmobranchs were recorded and identified to the lowest taxonomic level feasible: at least 15 taxa of which seven were species, four were genera, three were families, and one was order. These data, in combination with those previously collected, enabled SEED to define conservation priorities as follows, detailed further in Annex 11: seek avenues to address or mitigate i) export markets for shark fins, ii) the high frequency of Scalloped hammerhead catch, iii) the high frequency of guitarfish catch; and continue monitoring and confirm species identification, especially of guitarfish.

Interview analysis revealed that, whilst 100% of fishing households reported lower food availability during Covid-19 as compared to before, the amount of food available for their household to eat did not affect their decision to fish for elasmobranchs. Elasmobranchs were not a target species and were instead caught incidentally in the wider finfish fishery. However, the sale of meat and fins were reported to contribute to household income at least occasionally,

[2] On a scale that ranges from 0 (most secure) to a maximum of 420 (least secure), with scores above 40 cited in multiple studies in comparable contexts as highly to severely food insecure[2.1 - 2.2]

[2.1] Borgerson, C., Razafindrapaoly, B., Rajaona, D., Jean, B., Rasolofoniaina, B. J. R., & Golden, C. D. (2019). Food Insecurity and the Unsustainable Hunting of Wildlife in a UNESCO World Heritage Site. *Frontiers in Sustainable Food Systems*, *3*, 99. https://doi.org/10.3389/fsufs.2019.00099

[2.2] Maxwell, D., Vaitla, B., & Coates, J. (2014). How do indicators of household food insecurity measure up? An empirical comparison from Ethiopia | Elsevier Enhanced Reader. *Food Policy*, *47*, 107–116.

[3] Minimum adequate dietary diversity is five food groups

with fishers relying more on this income when lucrative lobster fishing is prohibited during the national closed season for lobster fishing (NCS), suggesting a possible link between the NCS and the finfish fishery. The reduction in household income during the NCS is likely a factor influencing this complex relationship between fishing activity and elasmobranch landings. Overall, the evidence was not strong enough to definitively use elasmobranch fishing as an indicator for unsustainable resource extraction linked with Covid-19 and food insecurity, as was initially assumed.

Discussion

Both insect and crop farming are anticipated to have positive impacts on both MDD-W and CSI metrics. *Sakondry* will provide an alternative source of 'meat' protein, which may reduce pressure on livestock and fishing. Further, *antaky* beans and crops alike will contribute to dietary diversity through the following food groups: pulses (*antaky* beans); dark, leafy greens (*petsai*); Vitamin A-rich vegetables (carrots and tomatoes); non-Vitamin A-rich vegetables (courgettes and cucumbers); other vegetables (onions and spring onions).

Furthermore, both insect and crop farming show great capacity to establish as enduring supplemental livelihoods in each community. The high focus on training throughout the project encouraged sustained benefits, working to promote insect and crop farming as an indefinite food source for long term recovery from Covid-19. The inclusion of women in training sessions also provides women with future opportunities to generate household income through the sale of *sakondry* as a food source once *sakondry* populations are large enough.

Currently, it is too early to see a definitive impact of the increasing availability of *sakondry* within Sainte Luce on extractive livelihoods such as fishing. However, it is expected that over time, the implementation of *sakondry* farming through this project will directly contribute to a reduced reliance on potentially unsustainable practices, as seen in the work of Borgerson et al.[4] in the northeast of Madagascar. With interest in *sakondry* as a food source growing within the community, there is likely to be market interest in the future. Additionally, beneficiaries may be able to sell surplus seed stock to other community members, leading to natural expansion of the techniques across Sainte Luce.

Overall contributions

Both crop and insect farming have demonstrated efficacy and sustainability as supplementary livelihoods and will contribute to greater dietary diversity and food availability in Elodrato and Sainte Luce. Evaluation revealed that this pilot is scalable and that there is significant appetite for expansion, particularly with regards to edible insect farming. As such, SEED is actively seeking funding to expand the work to additional communities.

An understanding of the socio-economic impact of Covid-19 was gained through baseline surveys assessing food insecurity in target communities, and interviews gauging how income and food security related to elasmobranch fishing. Research successfully established target catch species and relative frequency of taxa landed during the NCS for lobster fishing. Interviews were not able to support the use of elasmobranch fishing as a key indicator of unsustainable practices, suggesting the assumption made in the original proposal does not hold true in practice. However, significant insight into the biological and socio-economic characteristics of the elasmobranch fishery was gained and data were used to inform conservation priorities.

3. Lessons Learnt

Crop and Insect Cultivation

Ongoing monitoring revealed similar problems within crop and insect cultivation, largely related to pests and planting location. One insect farming household had a problem with pest control due to location, remedied by replanting. 35 crop farming households also had issues with pests during germination. In response, *adigasy* (local pest management strategies) were incorporated

[4] Borgerson, C., Fisher, B., Herrera, P., Martinez, K. M., Rajoana, D., Randriamanetsy, J. M., Rasolofoniaina, B. J. R., Razafindrapaoly, B. L., & Aardema, M. L. (n.d.). Zanna tenebrosa: A nutrient-rich edible insect tool for addressing child malnutrition, food insecurity, and unsustainable hunting in Madagascar and Sub-Saharan Africa. *Conservation Letters*. [in press]

into training sessions, and VLAs helped households target specific pests based on mild, moderate, and severe pest infections, preventing unnecessary harm to the wider environment. Several households saw improvement after using *adigasy* and have continued use. Those that did not generally had plots located farther from the household or were not tended as actively, suggesting that active and consistent management is important to control pests.

In Sainte Luce, space available for *antaky* was limited. While a key benefit of *antaky* is its success with limited space, some plants were sown in suboptimal locations and lost to intense sun or wind. Transplanting or replanting remedied most of these issues. The location of some vegetable plots generated logistical challenges. Plots located far from the road made transport of heavy compost and manure more difficult. Drought increased water requirements, with logistical implications felt more acutely by those with plots located farther away. In response, SEED increased assistance and material provision. Future developments and expansion will incorporate these learnings on optimal growing locations and conditions, paying particular attention to sowing location and ensuring materials are provided to address locational and logistical challenges.

Crop sowing and germination rates also yielded learnings. Not all households sowed all the crop seeds received, with basil in particular rarely sowed. Both basil and chili were supplemental to crops chosen by the community, added as potential natural pest remedies. However, low uptake of basil and low survival of chili reflected the high water input needed that participants were not able or willing to provide for crops they did not specifically request. Further, as pest infections were more severe than expected, *adigasy* pest remedies proved most useful, with chili and basil rendered redundant in that regard. Though useful learning that chili and basil could not work in this context, in future farming projects, crop seeds distributed will more strictly reflect community-expressed desires and suited to local growing conditions.

Visual Learning Aids

Both crop and insect farming utilised VLAs to supplement and enhance training. As literacy rates were low amongst project beneficiaries, VLAs were a more accessible learning resource and have proved highly effective across multiple SEED projects. Designing context-specific materials in this way reinforced learning and created resources available to both stakeholders and the wider community that can be referenced into the future.

Working with Partners

This rapid pilot project necessitated knowledge specific to the project to be built in a short amount of time, particularly with regards to insect farming, which has not been implemented in this context by SEED before. This was achieved by undergoing a rapid knowledge transfer from Dr. Borgerson to SEED staff, and SEED staff to beneficiaries. This facilitated efficiency on multiple fronts, including the use of pre-existing baseline survey tools (CSI and MDD-W) that had already been tested and adjusted in a similar context. Utilising established training techniques also enabled SEED to avoid issues previously identified by communities farming *sakondry* in the northeast, saving time on troubleshooting and material development.

Partner skills and experience were complemented by tacit, local knowledge, allowing SEED to contextualise and adapt materials and approaches to local conditions and norms. For example, baseline surveys with households, specifically for crop farming, quickly established which crops had been trialled in the past, which had or had not worked, and why. Similarly, conversations with community members revealed an existing familiarity with the edible insect *sakondry* via positive childhood associations.

Project-specific knowledge was built, contextualised, and successfully implemented within the pilot. SEED will seek to employ a similar approach in future pilots, taking advantage of external learning opportunities with field experts to build specialised knowledge.

4. Other comments and feedback

Representative photos of activities can be accessed in the Annex (15.1 - 15.8), as can the Community Comparison of Baseline Survey Results report (Annex 16), the Summary of Insect Household Farming Intervention report (Annex 17) and the Summary of Household Crop Farming Intervention report (Annex 18).