Madagascar Rapid Digital Resilience and Food Security Assessment

Solar charger in garden in Kirindy village, Menabe. Credit: Josh Woodard

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Background

This report is based on a rapid assessment conducted in Madagascar from March 19 - April 1, 2023. It included one week in Antananarivo, a three day visit to the Menabe region and a one day visit to Fort Dauphin to interview agriculture sector stakeholders and to assess the on-the-ground context of digital technology access and uptake.

Limitations

This rapid assessment is based on an extremely limited sample size, so cannot claim to be representative of the populations that USAID will target through its resilience and food security programming, especially since at the time of the assessment the target regions for future programming had still not been finalized. While we attempted to interview a diverse range of stakeholders, including factors such as gender, age, and ethnic groups, interviews were ultimately guided based on who was available at the time we arrived in a particular community or market.

All told, interviews were conducted with three farmers, members of three cooperatives, vendors in one market, two civil society organizations, three international development actors, two mobile network operators (MNOs), one technology service provider, four government agencies, two agribusinesses, one multilateral agency, four incubators and training centers, and one youth group. In addition, there were a number of CSOs, international development actors, and government representatives who participated in a roundtable discussion in Fort Dauphin, although discussion of digital technology was extremely limited during that session. See Annex 1 for more details on interviews.

Therefore, the observations and potential opportunities presented in this report cannot purport to be reflective of the full depth of nuances related to how rural and agriculture sector stakeholders in Madagascar are interfacing with digital technology. However, it can provide some insights into how a small subset of stakeholders are using digital technology and point to what opportunities may exist to leverage digital technology within USAID's Feed the Future (FTF) and resilience programming. Before acting upon the findings outlined in this report, it will be important to further explore and verify them. This can be done by USAID's implementing partners who will ultimately implement any Feed the Future or resilience programming or other development sector actors with an interest in this topic.

Brief Overview of Digital Sector

Mobile connectivity

According to the most recent data from the International Telecommunications Union, there were around 16 million mobile phone connections in Madagascar in 2021 out of a population of around 28 million people.[1] That does not mean, however, that 16 million people own a mobile phone. Owning more than one SIM card was not uncommon among the small sample size interviewed during this assessment–and is a common practice in other countries as well. As that 16 million figure essentially represents the number of active SIM cards, it is likely that the unique individual ownership was much less than 16 million people. Conservatively assuming that each person with a phone has an average of 1.5 SIM cards

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[1] ITU data

and excluding the 39 percent of the population under 14[2], one can roughly estimate that perhaps around 60-70% of the population had a mobile phone with an active SIM card in 2021.

Furthermore, there is not yet universal mobile network coverage in the country. Telma, which has the nation's most expansive mobile network, claimed during our interview to only cover around 85-90% of the population, with the goal of reaching 95% of the population by 2026. As of March 2023, only 65% of their network was 4G, which is critical for smooth and fast access to the internet, although they stated that they are in the process of upgrading 98% of their network to 4G within this year. According to the representative we met with from Airtel, around 60-80% of mobile internet users in the country across all mobile network providers are in the region around Antananarivo.

Affordability also appears to be somewhat of an inhibitor to internet access, which only about 20% of the population used in 2021.[3] A two gigabyte mobile data package with one week validity on Telma costs Ar 10,000, which would put the price of one gigabyte at just over $1. While relatively cheap compared to global averages, it represents 13% of the gross national income, making it fairly expensive in relative terms. It marks a stark improvement though, from 2013 when that figure was at 56% of GNI.[4] This cost will potentially drop further once the 2Africa submarine cable is fully operational in Madagascar, likely by the end of 2023.[5]

Madagascar also ranks poorly on overall affordability of access to mobile devices and connectivity, scoring a 27.6 out of a 100 on the mobile connectivity index, enabler score, which is below both the regional and its income group average.[6] The lowest end phones found in the one market we surveyed was Ar 40,000 (~ $9.40), with smartphones falling in the Ar 150,000 - 180,000 (~ $35-42) range. The Airtel respondent we met with also shared that the government still assesses an excess tax on mobile devices and airtime, as they are still viewed as luxury goods.

The cost of airtime can also be more expensive for rural communities. As one farmer shared with us, the only airtime topup cards that are sold in their village are in the amount of Ar 1,000, for which they have to pay Ar 1,200. This informal surcharge may well vary between communities as it is set by whoever is selling the cards. Informal surcharges were also observed at the one money money agent we met, who shared that they will send over-the-counter payments for people who do not have or know how to use a mobile money account, but they set their own fees for that rather than following the official fee structure of the provider.

It should also be noted that every phone model sold in the market surveyed were low-end Chinese models, so their durability and dependability is unknown. From the author's experience elsewhere, low-end Chinese smartphones, in particular, are sometimes problematic because they sometimes run older versions of the Android operating system or have other feature limitations that make them incompatible with certain applications. During the meeting with Telma, they claimed to sell a subsidized smartphone for Ar 69,000 (~ $16), although this model was not seen during the assessment.

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[2] World Bank data
[3] ITU data
[4] ITU data
[5] Connecting Africa
[6] USAID IDEA

There also appear to be some legacy constraints related to the country's transition to telecommunications liberalization in the past 25 years. The government of Madagascar owns a 20 percent stake in Telma, the country's largest mobile network operator. At the moment, only Axian Group, of which Telma is a subsidiary, and one other smaller provider are licensed to sell fiber optic broadband. This may create a disincentive among other mobile network providers to build out their fiber optic network since they are not allowed to sell excess capacity to consumers. There are also only two mobile network infrastructure providers in the country, one of which is also owned by Axian Group. This limited competition may also be impacting the price to deliver services, although this warrants further validation.

Digital and traditional literacy

While no data could be found related to digital literacy in Madagascar, Madagascar scored in the bottom 10 percent of countries in a World Economic Forum survey of executives in relation to the presence of sufficient digital skills in the country.[7]

UNESCO data from 2018 shows a traditional literacy rate of 76.7% for the overall population, although that number drops to 66.7% among adults over 65. Amongst those over 65, only 61.7% of women are literate compared to 72.1% of men.[8] These differences are important to consider as text-based digital solutions may not be appropriate to all population segments.

Digital agriculture solutions

A study funded by CCARDESA and the World Bank in 2021/2022 identified 23 digital agriculture innovations in Madagascar.[9] Of those, we were only able to meet with two during this assessment (Lecofruit/Basan Group and Viamo). It is unclear what the scale of any of the innovations in the CCARDESA study are and whether they would represent viable partners for USAID FTF and/or resilience programming.

The FAO supported the Ministry of Agriculture, Livestock, and Fisheries (MAEP) to develop a national digital agriculture strategy that was finalized in 2023. As part of the strategy development, they have conducted additional research into the state of the digital agriculture sector, which they will hopefully make public at some point in the future. That research, as well as the final strategy itself, will likely be helpful to further understanding opportunities for USAID to make use of digital technology in its FTF and resilience programming, as well as to identify potential collaboration opportunities.

Key Observations

This section includes some of the key observations made related to access to and usage of digital technology during the four days spent in the Menabe and Fort Dauphin regions.

Mobile phone access

Of the 15 farmers that we spoke to directly, either individually or with the cooperatives in Kirindy, 11 had feature phones (5 male, 6 female), one had a smartphone (male), and three did not own a phone (all

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[7] World Bank
[8] UNESCO Institute for Statistics
[9] Digital Agriculture Country Study Annex: Madagascar

female). The president of the fish cooperative in Betania also estimated that of their 119 members, around 70-80 percent owned a phone, the majority of which were basic or feature phones. Only a few members had smartphones. The one lead farmer we met with in Marofandilia shared that of the 14 households he supports, only half of them owned a phone.

The conditions of the phones seen varied widely. The screen on one male farmer's phone was so scuffed up that it was difficult to clearly see the screen, although he said that it did not affect his ability to use the phone at all.

Phones on display at Mahabo district market

The one phone repairman we interviewed shared that the most common issues he fixed were damaged screens and damaged motherboards. He sources his parts by buying old phones and stripping them for parts. He charges Ar 25,000 (~ $5.90) to replace a screen and Ar 15,000 for a new motherboard (~$3.50).

Mobile network access

For the most part, all of the areas we visited during the assessment trip had at least some mobile phone signal from one of the three mobile network operators (Telma, Airtel, and Orange). However, one provider might have had a better signal in one area than the others or had no signal at all. To deal with this, and also likely to take advantage of different promotions offered by operators, a few of the farmers we met mentioned having SIM cards with more than one operator. In the center of Kirindy and Betania villages there was at least 3G internet access, although in other areas where we traveled the network was only GPRS (G) or EDGE (E). Both of these are older generation technologies that came after 2G but before 3G. While technically one can use the internet on either connection, they have such limited speeds that they struggle to handle modern websites.

Conversations with Telma revealed that the Menabe region has some of the slowest speeds because their network there is not yet connected to their fiber optic network. They have plans to expand that connection into the region, which should improve mobile broadband speeds for Telma users–as well as Orange and Airtel users, if they happen to be leasing towers in that area from the Axian Group provider.

It is important to note that we never ventured more than a few miles from a Route Nationale. It is highly likely that more remote areas would have even worse network coverage.

Electricity access

According to the World Bank, only around a third of the country has access to electricity.[10] Although there was not grid connectivity in the communities we visited in Menabe, we saw solar panels on many

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[10] World Bank data

of the homes. They ranged from small capacity ones that likely could only power one lightbulb and charge phones to larger ones that could possibly run lighting for an entire house. Smaller ones were much more common, varying in condition.

Most of the farmers we spoke to also confirmed using solar panels to charge their phones. Members of one of the groundnut cooperatives said that during the rainy season when there is not enough sunshine on some days for solar they charge them off of batteries (presumably car or motorcycle batteries).

Phone charging booths were also observed in a number of markets along the roads. At the one in Mahabo district, the phone repair booth also offered phone charging services for Ar 500 per charge, regardless of how much battery life was on the phone at the start.

The unreliability of electricity was also noted by Basan Group as a factor impacting their ability to fully digitize their operations, as it makes it a challenge to charge equipment.

Digital technology usage

Given the relatively small sample size, it is impossible to draw broad conclusions about how agriculture and resilience sector stakeholders, including farmers, traders, agribusinesses, and government agencies are using mobile phones and other forms of digital technology. Having said that, here are some of the use cases that were observed:

- Several farmers made use of their phones to call buyers/sellers to coordinate with them.
- Several farmers noted receiving mobile payments from buyers, who also included the cost of the cash out fee with payment. Sometimes agent liquidity can be a problem. In leaner periods, the mobile money agents might not have enough cash on hand for them to cash out the entirety of a payment, so they may need to go back over several days before receiving the cash in full.
- The fish cooperative promotes themselves on Facebook. They found one potential buyer through their Facebook page but when she visited to make a purchase they did not have enough stock on hand to sell to her.
- NCBA/CLUSA staff noted that some other cooperatives have used Facebook to promote themselves and market their products as well.
- The president of the fish cooperative uses the Windy app on his smartphone to forecast weather to make sure they avoid fishing during storms. He was taught how to install and use it by a Farmer-to-Farmer volunteer.
- The fish cooperative also uses a GPS device to identify and save fishing spots. The GPS device is owned by the vice president, although he loans it to the cooperative.
- The lead farmer we met uses his phone to coordinate and share information with households he supports who own a phone, which saves him time.
- Basan Group paid a local firm to develop a data collection app to help them track volumes of purchases from farmers and payments to them.
- Blue Ventures uses Kobo toolbox for data collection, although they have faced challenges with repairing and replacing damaged devices since they have been buying the devices for the community members they work with.
- FANAMBY uses drones to map and observe protected areas. They reported finding them to be efficient and effective.

- CRS is using CommCare to collect field data and ArcGIS to support with geospatial planning. They have also sent out emergency messages to warn about cyclones by SMS, although they do not send out any other types of messaging that way.
- Viamo's voice-based 3-2-1 service, in partnership with Airtel, includes information on health, agriculture, microfinance, weather, nutrition, and other services, like radio dramas and interactive games. They also partnered with GIZ PrAdaand the Ministry of Agriculture to create crop calendar messaging.
- MAEP has set up a producer card that includes a digital farmer profile. To date, uptake has been limited and done exclusively through donor funded projects, as the Ministry does not have financial resources to onboard farmers directly.
- ONE has the [Hay Natiora platform](), which was developed for them by USAID's Hay Tao project. It is unclear what their plans are to maintain it and expand access to it.

Startup ecosystem and tech capacity

Several of the interviewees noted limitations to the startup ecosystem in Madagascar, particularly in relation to digital technology. At least based on the interviews, there do not appear to be a significant number of high quality local IT firms. While Basan Group did work with a local technology company to develop their tool, they shared that it required a lot of follow up to ensure that they were meeting their quality requirements. They have started building up an in-house team of IT experts, currently at 65 people, with 35 specialized in software development and 30 on digital infrastructure. They have a much larger team than one might ordinarily expect due to a scarcity of local technical skills. They have to do a lot of in-house training and are even thinking about developing a digital academy–potentially in partnership with other private sector actors–to promote a digital culture and provide further training.

NextA noted that youth do not have an entrepreneurial spirit in Madagascar and that there is also a lot of risk aversion, both of which are a drag on startups. CARA further noted that entrepreneurs in rural areas tend to do it out of necessity. They want money quickly and do not have patience to invest significant time in a venture before seeing any financial returns. While both entities are focused on supporting entrepreneurship and startups, they have had limited focus on digital technology startups to date.

According to the CCARDESA/World Bank study from 2021/2022, the University of Antsiranana has courses related to digital agriculture, although the study also noted that there is no computer lab at the university and very weak wifi[11], so it is unclear how much applied training students are receiving. As we were not able to speak with any universities as part of this assessment, it is unclear what the broader state of IT and digital technology curricula looks like in Madagascar.

Potential Opportunities

Based on the key observations of this rapid assessment, there are a number of opportunities where digital technologies may potentially have value add in USAID's FTF and resilience programming. As the Mission is currently in the process of finalizing its FTF and resilience approaches, some of these opportunities are fairly broad.

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[11] [Digital Agriculture Country Study Annex: Madagascar]()

It is also important to note that the opportunities below require further market research and exploration before being implemented. It is particularly critical to understand how stakeholders are interfacing with digital technologies in the precise areas where USAID's programming will be implemented. Aggregate data on access and usage do not always correlate to the situation in a given community.

It is also important to recognize that stakeholders' access to and usage of digital technologies will run a spectrum that will include people without access to a phone at all up to those comfortably using smartphones and able to afford unlimited data packages. Therefore, it is unlikely that a single opportunity will be broadly applicable. Efforts should therefore be taken to ensure that some stakeholders are not excluded due to differences in their digital access or ability.

Include digital literacy skills strengthening in activities

As Madagascar's digital economy grows, the individuals that USAID's activities work with will likely find themselves interfacing with digital technology more and more. Therefore, it may be beneficial for activities to include a focus on strengthening digital literacy skills as part of their broader capacity strengthening focus. This can be done along with other types of capacity strengthening that USAID FTF and resilience programs are already undertaking. This should be the case even if the activity is not explicitly using digital technology directly with project participants. [USAID's Digital Literacy Primer](#) is a great place to start to learn more about how to do this.

Explore pathways to formalize resilience and food security-related information and advisory services

Around 80 percent of the farmers we met with during the rapid assessment had a mobile phone, the majority of which were basic phones without internet capabilities, feature phones that allow for limited internet capabilities. None of them mentioned using their phones to access agriculture information or advisory services, although one person did mention consulting and sharing market price information with their relatives over the phone. No one we spoke with was familiar with Viamo's 3-2-1 service. There is also apparently some usage of Facebook for marketing by cooperatives, but it is unclear how common this is and how effectively they are using it. For example, the fish cooperative we met with only found one potential customer via Facebook and they were not able to fulfill their order.

The government extension system also lacks the resources to provide direct support to all of the farmers in the country. In Menabe, for example, MAEP has only 21 technicians for the entire region. One of the ways they deal with this shortage of labor is through the radio program they broadcast on Monday afternoons for farmers. Similar programs may run in other regions as well, although this would require confirmation. In addition, it would be worthwhile to understand how many people in the communities that USAID plans to target listen to these programs in the first place.

While any USAID activity could very easily set up its own digitally-enabled information or advisory service, doing so in a way that would live beyond the life of the activity is significantly more challenging. Having said that, there are still some potential ideas that USAID may wish to explore further, which include:

Dissemination of agriculture and resilience-related information, such as generalized production and post-harvest tips, **via mobile messaging**. USAID and its implementing partners could explore the development of agriculture value added services (VAS) by one or more MNOs. The VAS model is one that

is already used by MNOs in Madagascar, whereby customers can subscribe to a service (such as daily horoscopes, TV streaming, and daily religious messages), which is often delivered by SMS (text message) or voice service. MNOs in a number of countries have also included agriculture information services as one such VAS, and the opportunity could exist to do the same in Madagascar. For example, Orange in Mali launched a mobile agriculture information service back in 2013[12] and Airtel has previously launched similar services in Kenya and Malawi.

These services need not be exclusively focused on one type of content, and there is some evidence to the benefit of integrating multiple types of content into one. That is the model that Viamo uses for its 3-2-1 platform in Madagascar and elsewhere. An assessment by USAID's SPRING activity in Ghana also identified opportunities for integrating nutrition-sensitive information into existing agriculture information services.[13] There may be other existing information services, such as those run by the government or local organizations, that are operating in the same areas where USAID's FTF and resilience programs will operate that could potentially be leveraged to disseminate additional content related to resilience and food security that would also be of interest to users of their service. Whether or not such opportunities exist will require additional research by USAID's implementing partners. RFS has also commissioned the development of a new briefer related to cross-sectoral usage of digital technology that may be of use.

In order to make the case to MNOs, in particular, it may be necessary for USAID, through its activities, to conduct a market opportunity analysis and/or to buy down some of the initial cost of deploying such a service, such as by developing content. While it may be expeditious for USAID's activities to subsidize the cost to deliver these services to farmers by paying the fee that the MNO would ordinarily charge its customers for using a VAS, doing so will likely have a distortionary effect and is not advisable.

Video production on good agriculture and nutrition practices in local languages that can be uploaded to a single YouTube channel, broadcast on television, and/or disseminated locally in communities. Videos can be produced in communities using low-cost methods, created using animation (e.g. SAWBO), or developed with high production quality (e.g. Shamba Shape Up). While video can be a helpful learning medium for anyone, it can be particularly helpful for low literate and illiterate individuals who may be more challenged to engage with written content.

A more detailed analysis of the cost-benefit of each model in the context of Madagascar would need to be conducted before the production and dissemination modalities are decided upon. Regardless of the modalities selected, given the growing mobile data penetration, it will make sense to have any videos developed stored on a single YouTube channel, even if that is not the primary mode of dissemination. While it may be expeditious for that channel to be run by the USAID activity directly, a better approach would be to identify a relevant in-country partner who can be supported to produce and manage such videos.

It is important to recognize that streaming videos can consume large amounts of data, and may be expensive to access for individuals who are paying by the gigabyte without unlimited data plans. It is possible to share videos from phone to phone for free via Bluetooth, where accessible, although this requires the sender and receiver to be in close proximity to each other. It may also be possible to

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[12] ICRISAT
[13] USAID SPRING

negotiate deals with one or more MNO to host the videos on their servers and provide their subscribers with free access to them, although that would require further exploration. These options are obviously only accessible to individuals who have access to a smartphone, tablet, or computer.

Videos can also be shown locally within communities using projectors or on a tablet, which is a model that USAID has employed through its partners, such as Digital Green and others, in several countries. However, such an approach requires significant logistical planning and human resources to effectively execute. It tends to be better suited to environments where there is already on-the-ground presence in these communities that can be leveraged to help disseminate videos. While such a model could work in Madagascar, further analysis would be required to determine its feasibility in the local context. Although more than a decade old, the USAID-funded Integrating Low-Cost Video into Agricultural Development Projects Toolkit is still a helpful resource on this subject.

Interactive radio. Conversations with MAEP in Menabe revealed that their radio programming is still a one-way broadcast. There may be opportunities to support MAEP to make those programs more interactive and engaging, including on-air farmer questions, live polling, and other means. Before determining if this would be beneficial, it would be helpful to better understand the current state of MAEP's radio programming and whether there is significant listenership in the areas where USAID plans to work. While also dated, the USAID-funded Interactive Radio for Agricultural Development Projects Toolkit is a good place to start to learn more about this topic.

Build out the use case for digital financial services

Digital financial services are still fairly new in Madagascar. Uptake of these services appears to still be limited at the moment, and use cases are limited to person-to-person transfers and mobile top up, as well as limited merchant and utility payment options, all via mobile money.

Yet despite still being new and underdeveloped, there is already some initial organic uptake that was observed during the assessment. Basan Group shared that their goal is to make 100 percent of their payments to farmers using mobile money. At the moment, only around 4% of the area they work in has a stable network that they can consistently use for mobile money payments. In addition, one of the individual farmers and all of the cooperatives we met with have used mobile money to receive payments from buyers. As noted earlier, the biggest challenge for them appears to be limited agent cash liquidity during certain times of the year.

Consistent with USAID Procurement Executive's Bulletin No. 2014-06 on Guidance for Electronic Payments under USAID awards, **there is an opportunity for USAID's activities to also begin testing out the use of mobile payments in lieu of cash for field-based payments** across its portfolio, not just within its FTF and resilience programming. This is a model that has been tried by several other USAID Missions, including in Bangladesh, which encouraged its activities to digitize all field payments for things like training expenses.[14] Mobile money can also be used to facilitate the disbursement of social protection payments. There are also examples of digitizing VSLAs from elsewhere, as well as for enabling access to

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[14] A wealth of information from the experience with digitizing payments in USAID's activities in Bangladesh can be found here:
https://www.marketlinks.org/resources/mstar-mobile-solutions-technical-assistance-and-research-activity-profile-bangladesh

credit and index-based insurance products. Whether or not any of these would be appropriate for Madagascar given the current state of digital maturity would require further exploration.

By being one of the early adopters of mobile payments, USAID's activities can indirectly help build out the infrastructure and use cases for such services, which may then directly benefit farmers and other actors down the road.

However, before this can be done, it will be critical for USAID's programs to understand the mobile money agent presence in the areas they are working. Conveniently located agents with sufficient cash liquidity, as well as a strong mobile network, are critical if mobile transactions are to be used in lieu of cash payments. Even if there is a weak agent network in place, USAID and/or its programs may be able to work with mobile money providers to expand their network in the areas we work if they can present sufficient demand to the providers.

Support the use of digital technology for improved business processes

Based on a very limited sample size during this assessment, it would appear that there could be opportunities for USAID activities to support the digitization of agribusinesses working in overlapping areas with USAID's FTF and resilience activities. While we were unable to see the data collection tool that Basan Group built, the way it was described sounded similar to functions that could be done using open source software. Whether or not this is the case, some local agribusinesses who are looking to digitize may not be fully aware of what options exist or of good practices and lessons learned from elsewhere. Therefore, there could potentially be value to USAID's FTF and resilience activities exploring whether they can support digitization of some business processes of relevant agribusinesses, particularly those that might lead to benefits to individual farmers and communities.

Strengthen the capacity of cooperatives to leverage digital technology

From the interviews with cooperatives, it was clear that they are already using digital technology in some capacity, even if it is simply to coordinate with buyers. There is likely significant opportunity to support them to make better use of the digital tools they are already using. This could be done either directly through USAID's FTF and/or resilience programming or through programs like Farmer to Farmer, which have already provided some technical support to cooperatives in Madagascar. While the exact areas for support will depend on the cooperatives in question, a couple of areas that may be ripe for support include:

Capacity strengthening for online marketing. There could be opportunities to work with cooperatives to strengthen their capacity to use social media and other online channels to help market–and potentially aggregate the sales of–their produce.

Dissemination of information to members. There may be opportunities to explore how cooperatives can improve the effectiveness of how they disseminate information to their members. Unfortunately, the most cost effective way of sharing information requires access to a messaging app (such as WhatsApp or Messenger), which most of the farmers we spoke with do yet have. Having said that, there may still be ways to help cooperatives optimize how they are sharing information with their members in a way that is most cost effective.

Explore opportunities to strengthen the startup ecosystem and digital capacity

There are a number of ways that USAID could potentially support the strengthening of the local startup ecosystem and digital capacity of students and professionals without having to provide direct financial support. For example, USAID FTF and resilience activities could help to facilitate linkages between entrepreneurs and investors, strengthen the capacity of existing incubators and training centers on digital technology, or partner with universities to provide opportunities for students to apply what they are learning in the classroom to real-world settings. It may also be worthwhile to follow up with Basan Group on their potential plans to set up a training academy for digital skills to explore whether there might be opportunities for collaboration with USAID's activities. There are likely several other ways that USAID could support strengthening these areas, although further analysis will need to be undertaken to determine alignment with future programs. Should this opportunity be pursued, it will be critical to avoid taking steps that could have a distortionary effect on the market, such as providing grants directly to startups without it contributing to building out a local investor community.

Leverage geospatial and ground data for decision making and early warning

Over the years numerous donors, including USAID, have apparently funded efforts to improve the Government of Madagascar's ability to make use of geospatial and other data sources to support decision making and planning. Some of these efforts seem to have become static or defunct, and it is certainly not advisable for USAID to invest additional financial resources into the development of new–or maintenance of existing–spatial management tools. However, there may be opportunities for USAID to build the capacity of the government and other local actors to make better use of existing data sources, and/or to facilitate improved access to and data standardization of existing in-country resources.

It is also possible to leverage digital technology to facilitate early warning detection and notification. As previously mentioned, CRS shared that they have sent early warning SMS to people to notify them of cyclones. Such systems can be automated and early warning detection is improving along with advances in artificial intelligence. While certainly possible to deploy in Madagascar, before investing time or resources in this space it will be important to identify a genuine partner with the capacity to maintain and continue to invest in such systems over the long term. Otherwise, anything USAID supports in this space is likely to be tied to the life of an activity.

Collaborate with the Government of Madagascar on implementation of its forthcoming digital agriculture national strategy

While it is not possible to say what direction the Government of Madagascar's forthcoming digital agriculture national strategy will take, once it is final it will be worth exploring whether there are any mutually beneficial areas for collaboration with USAID programs and the Ministry of Agriculture, Livestock, and Fisheries. Any such efforts will need to closely examine the long-term benefit of such collaboration given the limited financial resources the Ministry's digital office currently has access to and the unlikelihood that USAID would want to provide direct financial support to the Ministry over an extended period of time.

Having said that, there could be opportunities for USAID's programs to collaborate with the Ministry. For example, providing technical support to the Ministry on the development of its producer card, including facilitating linkages with other stakeholders and supporting them with a more integrated and inclusive design of the program as it grows. USAID programs can also help the Ministry to onboard the farmers

they work with onto the platform. However, this is likely to provide only short-term benefit, as long as the Ministry lacks sufficient resources to update those farmer profiles themselves.

Things to Consider Moving Forward

The development of Madagascar's digital landscape has lagged behind some countries in the region, particularly in terms of digital skills, infrastructure, and digital government.[15] Yet despite that, at least in the areas visited for this assessment, the digital age has very much arrived. With the arrival of the 2Africa submarine cable and continued investment in mobile network infrastructure domestically, internet speeds should improve and costs should, hopefully, come down, although the latter is uncertain given the limited competitive market.

However, there will likely be a lag in terms of access, affordability, and digital literacy amongst the populations that USAID's FTF and resilience programs will work with. Unlimited access to the internet on a high quality mobile device still remains out of reach for most smallholder farmers in Madagascar due to current costs. Lower-end, yet more affordable smartphones, many of which are produced in China, often offer limited functionality due to their scaled down nature and use of older Android operating systems. Furthermore, the cost of mobile data and speed constraints can limit the extent to which individuals can afford to use online services, particularly bandwidth heavy ones such as YouTube. Digital literacy skills, which are often self-learned through user experience, can also be inhibited by limited access and use cases. Furthermore, building a large and technically competent cadre of software engineers and IT specialists, especially those with an entrepreneurial spirit, within the country will take time, meaning that a robust startup ecosystem will not be built overnight.

While USAID's FTF and resilience programs will not be able to address some of the structural and policy constraints that exist, there are steps they can take to effectively and responsibly leverage digital technology in ways that are contextually appropriate.

Signal USAID's recognition of relevance of digital technology

While Madagascar may still have a way to go before there is ubiquitous uptake and usage of digital technology at the individual level where USAID works, there is no doubt that the country has already entered the digital age. It is likely that mobile phones, at the least, will be present to some degree in any community where USAID works. As USAID's implementing partners are often responsive to what they think USAID prioritizes, signaling that the Mission recognizes the relevance of digital technology in its FTF and resilience programs will be important.

This can be done through explicit reference to digital technology in the forthcoming Madagascar FTF Country Plan as well as in all solicitations. The USAID Digital Strategy, USAID/RFS Digital Strategy Action Plan, and Global Food Security Strategy Cross-cutting Intermediate Result 10 (Enhanced integration of digital technologies) can all be used as references highlighting the importance of digital in our programs. The GFSS explicitly recognizes the integral nature of digital in our food security programs when it notes, "Digital technology must play an integral role in the USG's work in food systems, rather than being treated as an add-on or an afterthought." The Mission may also want to consider explicitly suggesting FTF and resilience programs include a digital focal point in their staffing plan to ensure that they have technical capacity to cover this area.

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[15] Digital Agriculture Country Study Annex: Madagascar

Focus on inclusion

Prior to making any decisions about how to use digital technology in agriculture programming, it will be important for the implementing partner to assess the state of access, affordability, digital literacy skills, and usage across a broad spectrum of project participants. This should include focus on potential differences related to age, gender, ability status, education level, ethnic groups and language in order to parse out what groups may be more or less likely to fully use digital technologies. Understanding the general usage patterns and any variance will help the activity align any digitally-enabled interventions to where users are, as well as to develop any differentiated approaches to reduce the likelihood of excluding those with lower levels of access.

Strongly consider privacy and security

Many of the individuals that USAID's agriculture programming works with are likely to have only recently started using digital devices and online services. As such, they may not have a rich understanding of the privacy and security risks that may exist from, for example, posting their phone number and address on a public Facebook group or opening a file shared with them in WhatsApp. In addition, they may have limited knowledge about what types of data online service providers collect about them and how it is used. Making sure that any individuals that USAID engages with have a full understanding of the risks and privacy considerations associated with their using any digital tool is of utmost importance.

Find appropriate market fits

In countries with underdeveloped digital ecosystems, it can be tempting for donor-funded projects to choose the most expeditious path, which is to develop and deploy digital solutions themselves. While there is no doubt that this can often be the fastest and easiest (in the short-term) way to bring a product to market, experience shows that this is very rarely a recipe for long-term success. Handing off a donor-funded digital solution to a local entity, such as a government agency, is rarely straightforward or easy.

While there may be instances where donor funding is necessary to subsidize the development or deployment of a digital solution, it should be done in a way that is aligned with market forces. Ongoing donor subsidization is generally not a viable pathway, so finding the right business model is critical to increasing the likelihood of long-term success. Such pathways can include for-profit, non-profit, or government-led models. The key factor is that there is a locally-based owner of the digital solution with a business model that can exist independent of ongoing donor support. This is likely going to be a challenge to identify in the short-term in Madagascar. The most likely prospects are larger agribusinesses with an interest in digitization and MNOs, who might have an interest in offering quality content and/or services to rural customers.[16]

Learn from elsewhere, but apply contextually

As there are not yet many examples of digital agriculture solutions in Madagascar, a lot can be learned about what has worked (and not worked) elsewhere. USAID has compiled a number of resources related to digital agriculture that may be of use, along with others such as the FAO's e-agriculture site, the World Bank's Digital Agriculture Learning Series, and others. These can serve as inspiration, although generally

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[16] For example, Airtel expressed an openness to partnering with others to disseminate content that might be of interest to their customers.

there are no cut-and-paste solutions so it is still critical to find a contextually appropriate fit for Madagascar.

The Principles for Digital Development are also a helpful resource. These nine principles, which USAID helped establish, have been endorsed by more than 300 organizations globally and offer tested guidance for effectively and responsibly using digital technology in the context of development. While each principle is important, those focused on designing with the user, building for sustainability, addressing privacy and security, and being collaborative are particularly relevant in the context of Madagascar.

Remember that the digital ecosystem is not static

Things can change very quickly in the digital world. What might not be possible or feasible today due to technological, infrastructure, or cost constraints may be so in the next year or two. Adaptive management is particularly important when it comes to digital technology. It will be critical for the Mission, as well as its FTF and resilience programs, to keep abreast of trends related to digital technology in Madagascar, such as the operationalization of the 2Africa submarine cable or any relevant changes to government policy, as examples.

Annex 1: List of Interviews

Organizations/Companies

Organization name	Type	Location
Alliance Voahary Gasy	Civil society organization	Antananarivo
CRS	International development actor	Virtual
Telma	Mobile network operator	Antananarivo
Ministry of Agriculture, Livestock, and Fisheries, Direccion of Digital	Government agency	Antananarivo
Office National pour l'Environnement (ONE)	Government agency	Antananarivo
Viamo	Technology service provider	Antananarivo
Airtel	Mobile network operator	Antananarivo
Basan Group	Agribusiness	Antananarivo
NextA	Incubator	Antananarivo
FAO	Multilateral organization	Antananarivo
NCBA/CLUSA	International development actor	Antananarivo/Menabe
Ministry of Agriculture, Livestock, and Fisheries, Menabe	Government agency	Morondava, Menabe
Menabe Governor's Office	Government agency	Morondava, Menabe
FANAMBY	Civil society organization	Morondava, Menabe
Vatel Center	Training center	Morondava, Menabe
Consortium of Youth	Youth group	Morondava, Menabe
Blue Ventures	International development actor	Morondava, Menabe
American Center	Training center	Fort Dauphin, Anosy
CARA	Incubator	Fort Dauphin, Anosy
Senteurs et Saveurs du Monde	Agribusiness	Fort Dauphin, Anosy

Cooperatives

Value chain focus	Location
Poultry and groundnuts	Kirindy village, Menabe
Groundnuts	Kirindy village, Menabe
Fish	Betania, Menabe

Individuals

Type of Respondent	Estimated Age	Gender	Location
Farmer (groundnut, maize, beans, squash)	30s-40s	Male and female (married)	Kirindy village, Menabe
Lead farmer (groundnuts)	40s-50s	Male	Marofandilia, Menabe
Phone vendor	20s	Male	Mahabo district, Menabe
Phone vendor	20s	Female	Mahabo district, Menabe
Phone vendor	20s	Female	Mahabo district, Menabe
Digital content provider	20s	Male	Mahabo district, Menabe
Phone repair shop	20s	Male	Mahabo district, Menabe
Mobile money agent	20s	Male	Mahabo district, Menabe