Project Title: Improving Dietary and Health Data for Decision-Making in Agriculture and Nutrition Actions in Africa

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Research Organizations involved in the study:
Food Agriculture and Policy Analysis Network (FANRPAN) and International Livestock Research Institute (ILRI)

Location of Study: Nairobi and Samburu County, Kenya

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1. Executive summary

Child (mal)nutrition is one of the most commonly used indicators for tracking progress towards attainment of Sustainable Development Goals (SDGs) and the impacts of development interventions. Unfortunately, the current methods for collecting child nutrition indicators require considerable training, are slow and expensive to collect data accurately. In this project, we are developing and testing a mobile-based platform by which households can easily collect, submit, and access information on their children's nutritional status in near-real time and at extremely low cost.

The project has four main components. The first component is to develop the initial tool. The second component is to improve the tool through a pilot and use the lessons—participant feedback and data quality—from the pilot to improve the tool. The third component is to implement the updated tool in multiple locations to assess its value for meeting our objectives. The fourth component is to create awareness of our findings and build capacity on how to use the tool and related data.

By the end of the first year of the project, we had a functional tool that had been tested by caregivers in Samburu County, Kenya. This report covers the second 12 months of the project, which were focused on the first and second components— the cycle of tool development, piloting, and further development. September, October and November of 2019 were spent updating the tool to reflect lessons learned from the initial pre-pilot testing. The tool was then launched with 189 caregivers and 22 Community Health Volunteers (CHVs) in Samburu County, starting in late November 2019. All participants were trained on their perspective tools, and most have been recording and submitting data since. As of August 31, 2020, the pilot has been running for nine months. During that time, caregivers have submitted over 50,000 surveys on their consumption and health, and that of their children. During this time, CHVs have been collecting monthly verification data from the same households. We plan to close down the 12 month data collection activity in late November to early December 2020.

2. The research problem

Malnutrition has direct consequences on child health and long term cognitive and physical development (Barker 1998; Alderman et al. 2006; Black et al. 2008; Victoria et al. 2008; Almond and Currie 2011). Globally, 144 million children under five are stunted, 47 million are wasted, both symptoms of malnutrition, while 2 million people lack important micronutrients such as iron and Vitamin A (FAO et al 2020). More than a third (40%) of stunted children live in Africa (FAO et al 2020), and Sub-Saharan Africa (SSA) is the only region in the world to have experienced an increase in child stunting rates over the last two decades (UNICEF and Bank, 2015). While there has been some progress, based on recent trends, Africa is unlikely to meet the nutrition targets by 2030.

More and more, humanitarian, development, and government organizations are focusing on nutrition as a primary objective, as illustrated by the Sustainable Development Goal Target 2.2. At the same time, accurate and reliable information on nutrition and health is severely lacking. There are few public databases available, and standard forms of primary data collection are extremely costly, especially in remote regions of SSA where nutrition data are most needed and are lacking. In addition, the common methods of collecting nutrition data are inadequate for tracking impacts in the face of heterogeneous, fast-moving, and difficult-to-observe

confounding factors. Low-frequency data can seriously misrepresent the nature of shocks, coping strategies, and the food and nutrition security status of households—with implications for how practitioners and policy makers judge the impact of interventions aimed at improving household welfare. Furthermore, commonly collected household consumption and young child health data are often of little direct use to households themselves.

The overall objective of this project is to develop an accurate and cost-efficient solution to measure indicators that track nutrition and health outcomes at high frequency. It is important to note that there has been no change to the objectives of the study or of the activities for this reporting period.

3. Progress towards milestones

The status of milestones for the 12 months under review are summarized in Table 1. Details are described in the ensuing narrative.

Table 1. Status of project milestones

Activities	Milestones	Reporting indicators and comments	Status in August 2020
Months 13-24 2nd Interim Technical Report			
Objective 1: Develop and test cost-effective, scalable technologies to improve the collection of high-resolution (individual-level) dietary, nutrition and health data	Identify, contract and train participating (data collecting) households and community health volunteers (CHVs) for conventional data collection	Lists of participating households enrolled and trained Training reports for CHVs	- An anonymized list of participants that were enrolled and trained is attached. - Training reports are attached.
	Develop a front-end mobile application that is designed to be user-friendly and operable	User friendly data collection application	- The application can be downloaded from the Google play store. Installation instructions are found in the attached document titled "Mbiotisho installation"
	A back end-web system that serves as a database and dashboard and platform developed	Database, dashboard and platform set-up for data analysis, monitoring and evaluation and dissemination of information to web-users	- The backend that accepts and maintains an up-to-date database has been developed. - The backend is being used by researchers to monitor the data collection but it was decided to hold back on any dissemination features until we know more about the accuracy of the data.
	Data dissemination platform launched	Data accessible to and useable by contributors via smartphones	- The dissemination platform has been launched as an in-app set of informational screens that rely on icons and audio.
	Participant and data user feedback collected	Feedback used to improve data collection and dissemination platform	- In addition to three feedback sessions with all contributors, all of which have directly led to improvements in the application, we have also had feedback from other researchers and nutritionists.
	Machine trained learning algorithms using the data points and associated photos developed	Results generated from the algorithms	- This activity has been postponed until the data collection is complete and we have cleaned the data appropriately for training the learning algorithms.

Activities	Milestones	Reporting indicators and comments	Status in August 2020
	Application updated to improve data quality and user experiences	Feedback and initial data quality analysis used to improve application	- We have had several large updates to the application in response to the data and feedback from contributors.
	Initial data quality analysis conducted	Results and recommendations	- Quality assessment of the data will be performed after the pilot is complete in late 2020. This offset in milestones is due to the initial five month delay in contracting between FANRPAN and ILRI. We hope to complete the assessments by mid-2021.
Objective 2: Strengthen country-, regional- and household-level capacity to use project-generated tools and data, to make data-driven agriculture, nutrition and health policy and practice decisions at each respective level	A method provided for households to track their own consumption and child health indicators against benchmarks	Information successfully delivered to contributors	- This has been completed and iterated in response to feedback from caregivers.
	Cost efficiency of the developed tool and platform tested against other conventional collection methods	Cost-efficiency study report	- The cost efficiency assessment will be performed after the pilot is complete in late 2020. This offset in milestones is due to the initial five month delay in contracting. We hope to have this completed by mid-2021.
	Capacities developed in pilot country at national, sub-national and household levels[1]	Training materials and training workshop reports	- The pilot included multiple trainings of the caregivers and CHVs that are participating in the project. - Outreach and training to/with non-project individuals and institutions will take place once we are assured of the data quality and the tool's value.
	Engage a post-graduate (PhD) student(s) to conduct project related research	Research paper draft and graduation certificates	- We have searched for an appropriate student and have located one but have faced delays largely due to COVID-19 restrictions. - Student now working on project proposal and registration with Stellenbosch University
Objective 3: To create awareness through communication and policy advocacy of the resulting insights as well as the achieved advancements in technology and methodology to policy makers and related stakeholders	Outreach to practitioners and the scientific community	Tool use manual developed and shared Preliminary findings shared at scientific conferences	- This work has been delayed until the end of the 12-month data collection and until after we have assessed the data quality.
	Reflection and learning workshop convened	Reflection and lessons learned report prepared and shared	- Delayed until the end of the 12 month data collection
Project and research management	Technical progress update (at 18 month point)	Brief update on the key project achievements and status of milestones	Completed and submitted
	Annual monitoring and progress reports prepared	Annual technical progress and financial reports submitted	Completed and submitted

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[1] Capacities will be built through: (i) development of training tools and materials capacity; (ii) targeted trainings of engaged CVHs and household on diets and health data collection; (iii) engagement of post graduate student; (iv) formation of strategic partnerships; and (v) establishment of communities of practice at different levels to enhance the use of the tool and engagements with government ministries of Agriculture, Health, Education and other key development actors (i.e., UNICEF, WFP and FAO).

3.1 Objective 1 activities:

After testing the application, which was just wrapping up as the 2018-2019 annual report was being written, we worked with our developers to update the caregiver and CHV data recording tools. We then launched the main pilot for Phase 1, which included 189 caregivers and 22 CHV in Samburu County, Kenya. The caregivers and CHVs were selected from four Community Health Units (CHU) in the region to provide variation in remoteness, access to cellular connection, and education. We conducted a three-day training all the CHVs as a single group on the project, the CHV tool, and the caregiver tool. We then launched a nine-day training sequence with the caregivers. The caregiver trainings were performed sequentially by CHU to reduce class size. The training sessions provided caregivers with information on the objective of the project, outlined basic nutrition guidelines, and a great deal of practical training on phone maintenance and use, and how to use the new tool. As part of the nine-day training, participants took their phone home and practiced recording data for two days and then returned to provide feedback on the tool and for further training.

The caregivers then started recording and submitting data. Each month, they are provided with phone credit to facilitate syncing their data, and are then paid for the submissions that they have made. We have also had two additional re-training and feedback sessions with the caregivers since the activities started. The second re-training and feedback session was specifically to train and receive feedback on the in-tool feature that provided caregivers with tracking and feedback on their child's MAUC and consumption. The caregivers responded enthusiastically to this new feature and requested that a similar feature that tracked their own progress be added. We developed the new feature but, travel restrictions related to COVID-19 came into effect just as we were preparing to roll the new feature out. Rather than wait until the restrictions were lifted, we decided to update the tools remotely. Our field team developed a series of training videos, which were then launched on YouTube and links sent to the CHVs. The CHVs then called the caregivers that they work with and walked them through the update remotely. This process was successful in that most caregivers successfully updated their tools without any additional support. The processes developed for this remote update are documented in the blog titled "Project work amid the COVID-19 pandemic: Updating the household nutrition data collection app in Samburu" which can be found at the following link: https://livestocksystems.ilri.org/2020/08/12/project-work-amid-the-covid-19-pandemic-updating-the-household-nutrition-data-collection-app-in-samburu/.

The sequence of activities for data collection are shown in Figure 1.

	2019				2020							
	S	O	N	D	J	F	M	A	M	J	J	A
Tool update	x	x										
CHV training			x									
Caregiver training			x	x								
Caregiver data collection				x	x	x	x	x	x	x	x	x
CHV data collection				x	x	x	x	x	x	x	x	x
CHV and caregiver feedback and retraining												
Child tracking feature launched												
Caregiver tracking feature launched												
Remote update launched											x	

Figure 1. Sequence of training and data collection activities

3.2 Objective 2 activities

In late December 2019 we developed and launched an in-application feature that tracked the caregivers reports of child MUAC and consumption, compared it to internationally recognized standards and provided the caregivers with feedback on their index child's progress against those standards. The caregivers were trained on how to access and use this feature, and the meaning of the messages.

The participants responded positively to the child indicator tracking feature and requested one that tracked and made recommendations for themselves as well. In response we developed one, which was launched during an application updated in June, 2020.

3.3 Objective 3 activities

Our activities related to Objective 3 were to take place after the pilot data collection is complete. The delay in contracting created a delay in the pilot's launch and, therefore, completion because we want to make sure that we capture data for an entire 12 months period to account for seasonal variation related to health and nutrition. We expect much of Year 3 to be focused on these activities. To date, awareness of the project has been mainly through the website, blogs and UNSCN publication (see Section 4).

3.4 Project and research management

All reports have been completed and delivered on time, while the FANRPAN and ILRI teams were in regular contact via email and teleconference.

4. Synthesis of research results to date

Research Objective 1. Develop and test cost-effective, scalable technologies to improve the collection of high-resolution (individual-level) dietary, nutrition and health data

In July and August of 2019, the newly developed tools were tested with caregivers and CHVs in Samburu County, Kenya. During that period, 4 CHVs were trained on and tested the CHV tool and 8 caregivers were trained on and tested the caregiver tool. In both cases, participants tested the tools in the classroom and outside the classroom (i.e., at home). The learning and feedback from these activities, which were well documented in the 1st interim (first annual) report, were used to improve the tools.

The pilot of the tools was launched in November of 2019. A total of 22 CHVs and 189 caregivers were trained on how to use the tool. These participants have since been recording and submitting data on health and nutrition. Importantly, CHVs are collecting the same data as the caregivers, which will provide the project with a benchmark by which to assess the caregiver collected data.

As of August 31, 2020, the participating caregivers have submitted a total of 24,609 surveys on their own health and nutrition, 24,079 surveys on the health and nutrition of their index child, and 4,499 MUAC measurements for their index child. The CHVs have submitted a total of 1,593 surveys on the caregivers' health and nutrition and 1,511 surveys on the health and nutrition and MUAC of the index children. While data analysis will take place once the pilot data collection has closed, preliminary analysis shows that caregiver- and CHV-recorded

MUAC measurements are highly correlated ($\rho=0.69$) and that the monitoring and feedback feature had a large and statistically significant impact on reported child minimum dietary diversity score (MDDS)—mean MDDS increased 17% after the feature became available (Figure 2).[2] Such correlation provides evidence that the caregivers are correctly recording MUAC and the impact of the additional features are especially exciting as they indicate a large and beneficial change in behavior.
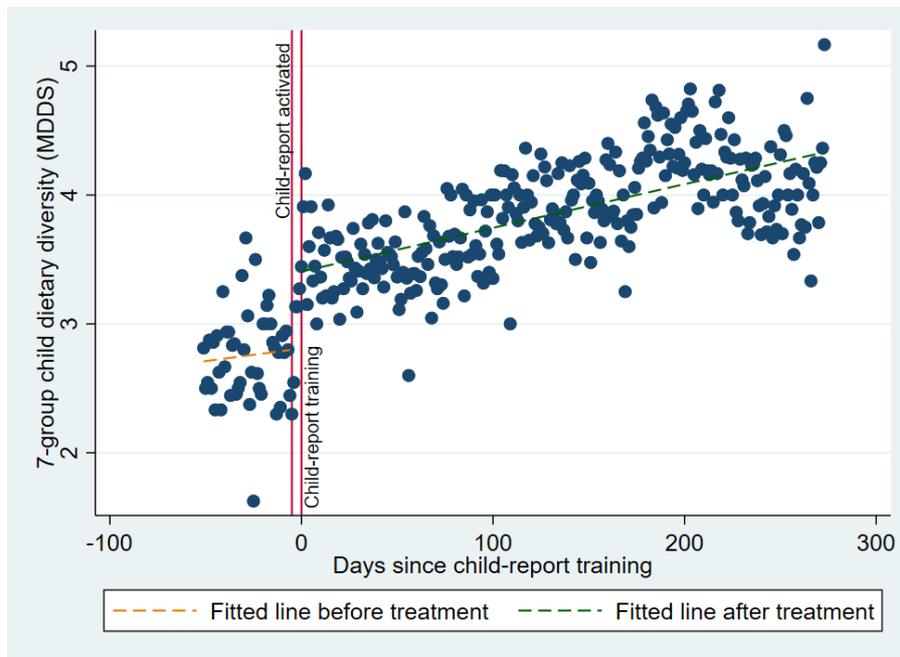

Figure 2. Minimum Dietary Diversity Score (MDDS) reported by the caregivers for their children before and after the feature that provided them with feedback on their child's MDDS became active and they were trained on it.

Research Objective 2. Strengthen country-, regional- and household-level capacity to use project-generated tools and data, to make data-driven agriculture, nutrition and health policy and practice decisions at each respective level

Our current activities are focusing on tool development and testing as described for research objective 1. Once the tool has been shown to produce useful information, we will then promote it and provide training on its use.

Research Objective 3. To create awareness through communication and policy advocacy of the resulting insights as well as the achieved advancements in technology and methodology to policy makers and related stakeholders

While most of our current activities are focused on tool development and research objective 1, we have produced multiple outputs about this project that are in the public domain, including one peer reviewed manuscript that was published as part of the UNSCN Nutrition 45. Once we have assurance that the data collected by the tool are accurate and useful, we will then promote the tool, including through policy briefs and advocacy to a wider audience.

To date, the following project outputs have been achieved:

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[2] The analysis for impact of the monitoring and feedback feature controls for linear time trends.

4.1 Reports:

September 1, 2018 – August 31, 2019 (submitted with 1st interim report)
- Inception workshop report
- Project summary
  https://docs.wixstatic.com/ugd/2912d8_354813be9fc1489189cd319839ae3f31.pdf
- Report on Pre-Pilot

September 1, 2019 – August 31, 2020
- Six-month project update FANRPAN-ILRI Project No 108872-001 Sep 2019 - Feb 2020 (submitted)
- Caregiver training report, attached as Annex 1
- CHV training report, attached as Annex 2

4.2 Websites:

- https://www.drylandinnovations.com/healthandnutritiondata

4.3 Mentions and blogs:

September 1, 2019 – August 31, 2020
- ILRI and FANRPAN test nutrition data collection in rural communities using pictography, November 19, 2019. https://www.ilri.org/news/ilri-and-fanrpan-test-nutrition-data-collection-rural-communities-using-pictography
- Project work amid the COVID-19 pandemic: Updating the household nutrition data collection app in Samburu, August 12, 2020. https://livestocksystems.ilri.org/2020/08/12/project-work-amid-the-covid-19-pandemic-updating-the-household-nutrition-data-collection-app-in-samburu/

4.4 Trainings:

September 1, 2019 – August 31, 2020
- 189 caregivers and 22 CHVs were trained on how to use their respective data collection tools. Among other activities, this included how to use a smartphone, how to classify foods into food categories, what dietary diversity is and why it matters, how to collect MUAC from their children, and what to do if their child's MUAC falls below 11.5 cm. Training materials are submitted with this report:
    - Caregiver app training.pdf (Annex 3)
    - Caregiver MUAC training.pdf (Annex 4)
    - Dietary diversity caregiver training.pdf (Annex 5)
    - Caregiver paper survey.pdf (Annex 6)
- 189 caregivers were remotely trained on how to update their application and on how to use the new caregiver benchmarking feature. The videos used to train the caregivers can be found at https://www.youtube.com/channel/UCyenaI5Uh92teuqLGmyyeNg

4.5 Tools:

- Mbiotisho (Samburu) version of the CHV tool
- Mbiotisho (Samburu) version of the caregiver tool

4.6 Peer reviewed articles:

Jensen, Nathaniel, Vincent Alulu, Watson Lepariyo, Tshilidzi Madzivhandila, Bertha Mkandawire-Munthali, Simbarashe Sibanda. 2020. Improving nutrition and health data to and from remote regions. United Nations System Standing Committee on Nutrition (UNSCN)-- Nutrition, 45, 96-102.

5. Synthesis towards AFS themes

This project is aimed at improving the nutrition of rural households, especially for women and children, by developing and testing a cost-effective smartphone-based application to improve the collection of high-resolution (individual-level) and near-time dietary, nutrition and health data. The tool will provide an alternative to traditional data collection approaches based on field enumerators and help in filling the gaps in data caused by seasonal changes. The application of this tool will help to make data-driven agriculture, nutrition and health policies and decisions to support nutrition-sensitive food and agriculture systems.

6. Project implementation and management

6.1 Workplan for the next 12 months

The project workplan for the next 12 months is summarized in Table 2. The workplan is designed to ensure that all originally planned milestones are on schedule by the end of Year 3.

Table 2. Workplan and milestones for Year 3 of project

Activities	Milestones	Reporting indicators and comments	Timeframe (start-completion)
Post-pilot project setup	Nutrition-targeted projects in Kenya and non-Kenya locations with which to partner identified and contracted	Collaborative research agreements between partner organizations (FANRPAN, ILRI and partner projects) executed	January – March, 2021
	Project review meeting by primary partners and stakeholders convened	Project review meeting report, with detailed workplan	January – March, 2021
	Ethics approval secured from ILRI's Research Ethics Board (IREC) and relevant national research review boards	Signed approvals from review boards	April-June 2021
Objective 1	Tool modified and improved	Modified tool to reflect new local languages and customs	April-June 2021
	Post-pilot testing and improving		April-June 2021
	Candidate version of the tool released	Refined prototype	July 2021
Objective 2	Capacity to use tool developed at sub-national, national and regional levels (i.e., beyond pilot country).	Relevant stakeholders trained

Training materials and training workshop reports | July 2021 |
	Dissemination and innovation workshops convened with the broader nutrition community	Results on performance of released tool shared with community of practice	- Results for the pilot in Phase 1: January – March, 2021
Objective 3	Buy-in from the policy- and decision makers from the pilot country secured	Letters of commitment and interest from key potential users (e.g. research and development organizations) and governments	April-June 2021
Project and research management	Technical progress update (at 30 month point)	Brief update on the key project achievements and status of milestones	March 2021
	Annual monitoring and progress reports prepared	Technical and financial reports completed and submitted	September 30, 2021

6.2 Financial and administrative issues/challenges

The current year budget is underspent by 35 %, mainly due to the delays in spending carried over from the first year, delays in engagement of the PhD student, and the travel restrictions related to COVID-19. We expect to fully utilize the funds in the third and fourth periods.

From the pilot data collection experience, we expect the launch of the tool into the new regions to cost about 22% higher than originally anticipated. We have reviewed the budget and propose to cover the shortfall from the consultancy, international travel, training, continental engagements and advisory committee as detailed on the financial template for your consideration.

6.3 Research partnerships

We have started the process of sponsoring the enrollment of Joyce Marangu (joyce.marangu@gmail.com) in a PhD programme at Stellenbosch University under Professor Mark Tomlinson.

We have also submitted a proposal to IMMANA to help support a collaboration with the University of Maryland School of Medicine (Baltimore, Maryland) to integrate greater decision support logic into the tool.

6.4 Governance

ILRI and FANRPAN continue to collaborate well together and to communicate frequently on the workplan and implementation.

6.4 Research ethics

ILRI presented the project to the Ministry of Health's Technical Working Group on Nutrition Research in Kenya in October 2018, a first and necessary step to receiving ethics approval for nutrition research in Kenya. Ethics approval for the tool testing was granted by ILRI's ethics committee (IREC, previously submitted with 1st interim report) and Kenya's National Commission for Science, Technology and Innovation (NOCASTI, previously submitted with 1st interim report), the national body that approves all Scientific research in Kenya. We have also received approval for the main pilot activities that started in November 2020 and will continue through November 2020.

7. Challenges encountered/actions taken

While we continue to hope for this plan, it might be hindered by restrictions related to COVID-19, which have made training and feedback more expensive and slower. This would especially be the case for launching the tool in a new region for the scaling activities because the initial trainings are quite expensive. Our current strategy is to reduce costs by training large class-sizes—40-50 caregivers at a time. Current restrictions in Kenya, for example, would reduce the class size to 10, meaning that our trainers would need to be in the field for 4 to 5 times longer.

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