PART 1: REVISED TECHNICAL PROPOSAL

An Impact Evaluation of the Uganda Multi-Sectoral Food Security and Nutrition Project (UMFSNP)

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The World Bank
1818 H Street
Washington DC, USA

Submitted by:
Partnership for Child Development (PCD)
Department of Infectious Disease Epidemiology
Imperial College, London
United Kingdom

In partnership with:

Ideal Development Consulting Ltd.(IDCL)
Kampala
Uganda

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Executive Summary

More than one third of all child deaths worldwide are attributable to child and maternal undernutrition, and Uganda is one of the 20 countries in the world with the highest risk. The associated economic costs are substantial - in Uganda, stunting among children alone is estimated to cost US$899 million annually to the economy (5.6% of GDP). The evidence base highlights the need for multi-sectoral interventions to address the multiple causes of undernutrition.

In response, a multi-sectoral food security and nutrition project led by the Government of Uganda will commence in 2015 with financial support provided by the Global Agriculture and Food Security Program (GAFSP) with the World Bank as the supervising entity. The long-term aim of the project is to reduce under-nutrition and stunting among children less than 2 years old. Using schools as a platform, the Uganda Multi-Sectoral Food Security and Nutrition Project (UMFSNP) will introduce a holistic package of nutrition-specific and nutrition-sensitive interventions targeting different stages of the lifecycle particularly for women and children, achieved through three types of interventions. School demonstration gardens will provide an entry point through which parent groups will be formed and mobilized to increase production of micronutrient-rich foods. Enhanced nutrition services such as nutrition education and deworming will be delivered in primary schools. Lastly, community nutrition services for pregnant and lactating women and their infants will be enhanced. Activities detailed in the Project Implementation Manual will take place in 15 districts over five years.

This Technical Proposal outlines a rigorous Impact Evaluation (IE) that has been designed to evaluate the program in terms of the Project Development Objectives (PDO) spanning nutrition and agriculture, as well as identify the pathways through which these outcomes are realized. Several deliverables are planned to document findings from the IE and inform the implementation of the project.

1. Background

More than one third of all child deaths worldwide are attributable to child and maternal undernutrition, and Uganda is one of the 20 countries in the world with the highest risk.[1] The impact of undernutrition on population health and the associated economic costs are substantial. In Uganda, stunting among children alone is estimated to cost US$899 million annually to the Uganda economy (5.6% of GDP).[2,3] Therefore it is in the interest of multiple sectors, including business, agriculture, health and education, to encourage and promote the general sequence of health and development programmes.[4]

The period between conception and 2 years of age, known as the "window of opportunity", is especially critical for a child's development, as damages incurred during this period are often difficult to reverse.[5] The costs of undernutrition are amplified by the young age structure in Uganda where over half of the population is under the age of 15 years, and the high fertility rate of more than 6 births per childbearing woman. [6] As presented in the UNICEF nutrition conceptual framework, the determinants of stunting are multiple and require a coordinated approach across sectors.[7]

In order to reduce undernutrition, studies highlight the need to scale up both nutrition-specific interventions to address the immediate determinants of stunting (e.g. improving breastfeeding, complementary feeding, and caregiving practices, and reducing disease burden), and nutrition-sensitive interventions to address the underlying determinants (e.g. improving food security, school feeding and caregiving resources, and environmental health). [8] This underscores the need for interventions that address the whole life course, including maternal nutrition and health[9], and that exploit the synergies between agricultural, health and education. For example, in order to exploit their full nutrition-enhancing potential, agricultural interventions should also incorporate a component related to behavioural changes (e.g. dietary diversity, feeding, and hygiene).[10]

Nutrition-specific and nutrition-sensitive interventions over the course of the lifecycle can help children reach their full potential. Women of childbearing age with higher nutritional status are more likely to experience healthier pregnancies, and to have children with higher nutritional status. Smallholder agricultural interventions to increase and diversify the production of micronutrient rich foods can promote their accessibility and consumption in communities.

While a body of work exists in this area, there is a lack of studies that employ rigorous methods such as impact evaluations. For example, an evaluation of a program in Asia highlighted the benefits of

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[1] Black, Robert E., et al. 2013. "Maternal and child undernutrition and overweight in low-income and middle-income countries." The Lancet, Volume 382, Issue 9890, p 427 - 451

[2] Figure taken from the World Bank project document, p.14. July 2014.

[3] Stunting or chronic undernutrition relate to the failure to reach linear growth potential because of inadequate nutrition or poor health. Chronic undernutrition is associated with long-term malnutrition and poor health and is measured as height for age that is two *z*-scores below the international reference standards (WHO 2005). This measure is recognized internationally as an indicator of long-term undernutrition among young children.

[4] Bundy, D. 2011. Rethinking school health: A key component of education for all. World Bank

[5] UNICEF. 2013. Improving Child Nutrition. The achievable imperative for global progress. New York. Available at: http://www.unicef.org/media/files/nutrition_report_2013.pdf

[6] Uganda Demographic and Health Survey 2011.

[7] UNICEF nutrition conceptual framework.

[8] Ruel M, Alderman H. 2013. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? The Lancet Maternal and Child Nutrition series; 382: 536–51

[9] Black, Robert E., et al. 2013. "Maternal and child undernutrition and overweight in low-income and middle-income countries." The Lancet, Volume 382, Issue 9890, p 427 - 451

[10] Ruel M. 2001. Can Food-Based Strategies Help Reduce Vitamin A and Iron Deficiencies? A Review of Recent Evidence. *Food Policy Review.* Washington DC: IFPRI.

providing technical assistance and agricultural support to women farmers on nutrition education at the household level in order to increase food diversity.[11] However, the impact pathways were not defined, nor did the study suggest how the programme could be implemented sustainably. Another study from Ecuador found that children gained significant knowledge about nutrition behaviours, but details on the knowledge transfer were not provided.[12]

The IE will also contribute to the global knowledge base on the effectiveness of schools as a platform for delivering community-based nutrition interventions.

2. Project Description

2.1 Overview

The project draws on experiences from other multi-sectoral projects that have been implemented in line with the Uganda Nutrition Action Plan (UNAP) 2011-2016 in particular the parent-led school gardens program implemented by SNV/Netherlands Development Organization in partnership with the Embassy of the Kingdom of Netherlands and UNICEF, which found that primary schools can be an effective platform to mobilize communities to improve agriculture practices. The UMFSNP will be complemented by other agricultural efforts such as the Agricultural Technology and Agribusiness Advisory Services (ATAAS) project and the Agriculture Cluster Development Project (ACDP) both financed by the World Bank, which are designed to raise agricultural productivity and income primarily through cash and staple crops, but will not address the gap in production and consumption of micronutrient-rich foods. The project will be implemented through national systems to achieve ownership, build capacity, and achieve sustainability.

The Project Development Objective (PDO) is to "increase production and consumption of micronutrient-rich foods and utilization of community-based nutrition services by smallholder households in project areas." The objective is expected to be achieved through provision of a set of nutrition-sensitive and nutrition-specific interventions in targeted communities, primarily by leveraging schools as a platform for delivery, and with the objective of promoting short-term changes in high-impact nutrition behaviours and practices known to contribute to stunting reduction in the medium- and long-term. Schools will serve as an entry point to strengthen linkages between the community and nutrition services provided by primary school teachers, agricultural extension services, community health centres and VHTs.[13] In addition, the project will support demand-side interventions to enhance utilization of VHT delivered community-based nutrition services. Together, the interventions are holistic and address different stages of the lifecycle, particularly for women and children. The interventions have several components as follows:

1) *Agricultural support for school-based nutrition services:* Parent groups (PGs) from communities in catchment areas of selected primary schools will be formed and mobilized to establish gardens at primary schools as "agriculture and nutrition classrooms". Through strengthened linkages between community groups and strengthened agriculture extension services, PGs, 60% of whom will be women, will be trained in improved agricultural technologies and practices and will engage

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[11] Talukder, A. et al (2010). Homestead food production model contributes to improved household food security and nutrition status of young children and women in poor populations. The Journal of Field Actions: special issue 1.
[12] FAO (1997). Nutrition education for the public. Discussion papers of the FAO expert consultation. FAO food and nutrition paper 62.
[13] Health Centers 2 (HC II) are the closest structural health facility for communities and delivers the MAP (Minimum Activity Package of the NMHCP). It is at parish level of the politico-administrative system and serves a population of up to 5000 households.

in demonstration and replication of these to increase production of micronutrient-rich foods. The participation of PGs will be facilitated by two lead farmers (LFs) selected by the community taking into consideration their agricultural skills, available land and interest in sharing improved technology. The LFs will undertake community-based multiplication and replication of micronutrient-rich planting materials to increase availability of these products at the community. In some districts, these activities will also be supported by local community-based organizations (CBO) These activities correspond with Sub-components 1.1 and 1.3 of the PAD.

2) *Enhancing nutrition services delivered through primary schools:* School and community-based nutrition activities will be strengthened through the establishment of a School Nutrition Committee, provision of nutrition education (promotion of optimal nutrition and hygiene practices), school-based deworming for all school children, and weekly iron folic acid (IFA) tablet supplementation for female students in primary four and above. These activities correspond with Sub-component 1.2 of the PAD.

3) *Enhanced nutrition services through Village Health Teams (VHTs):* Nutrition services will be delivered through schools and the community including monthly delivery of community mobilization on nutrition, nutrition behaviour change communications, and monthly growth monitoring and promotion of children under 24 months; provision of IFA supplements to pregnant or lactating women, deworming to pregnant women, and zinc supplements for children 6-59 months.

2.2 Implementation

The UMFSNP will be implemented in 15 of the 111 districts in Uganda based on a number of pre-established criteria, including high levels of stunting and low levels of adequate dietary diversity. These districts are located in four geographical regions and six ecological zones (see Table 1). Each has an average of 348,000 residents for a total population of 7 million.

The intervention will commence in 2015 in 5 districts with the greatest nutritional deficits[14] (Phase 1), and will be introduced in 10 of the remaining 15 additional districts in Year 2 depending on their readiness to implement (Phase 2). The Ugandan decentralization policy introduced in 1997 as rendered the Chief Administrative Officer and District Directorates as virtually responsible for all activities and operational fund management within the district. Some districts are better staffed and able to plan, manage and coordinate than others, and as such, readiness to implement was a key factor in the selection process.

TABLE 1: Summary table of 20 districts by region and ecological zone

	SW farmland and X highland ranges	NW savannah grassland	Kyoga plains	Lake Victoria crescent	Western savannah grassland	West savannah grassland and pastoral grassland
Southwest	*Bushenyi,*Isingiro *Ntungamo*					

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[14] Levels of stunting are higher and diet diversity are lower in the Phase 1 districts as compared with the Phase 2 districts (PAD, Annex 7).

West Nile		*Nebbi,* Yumbe, Arua, *Maracha*,	7				
East Central			*Namutamba*	Bugiri, Iganga			
Western	Kabale					Kyegwegwa, Kamwenge, Kyenjojo, Kabarole, Kibaale, Kasese	Kiryandongo, Masindi, Hoima

Note: Phase 1 districts are noted in italics. The project will be also implemented in 10 of the remaining 15 districts in Phase 2.

Schools in the districts will be selected for the project based on a two-stage process. In the first stage, eligible schools will be identified to participate in the project based on criteria including: (a) Rural or peri-urban; (b) Government aided schools implementing the Universal Primary Education (UPE) program; (c) Presence of head teacher and agriculture teacher; and (d) Unqualified school audit for the past financial audit. At Stage II, the schools that met stage I criteria will be requested to fill out an application form with the following criteria to identify school-level ownership and readiness for implementation: (a) Presence of a functional School Management Committee (SMC); (b) An existing, or commitment to establish a functional sub-committee of the SMC, a "School Nutrition Committee", which will include representation of the school administration; (c) Existence of at least one half acre of arable and conflict-free land with available water; (d) Organized PGs willing to participate in school level nutrition programs, including time and labour commitments; and the establishment of a project bank account.

Data from the Ministry of Education for these districts indicate that there is an average of 130 public primary schools per district. Districts will identify a list of schools that meet all of the eligibility criteria. These lists will be reviewed and confirmed by the project team. The Project Implementation Manual budgets for up to 100 schools per district to participate in the project. The actual figure of schools participating per district will be updated during project design consultations.

In total, the project is expected to have 1.14 million primary beneficiaries mainly from smallholder farming families. In total, it is estimated that approximately 15 districts, 5,400 VHT members, 1,500 primary school demonstration gardens, 3,000 LFs and 3,000 PGs (consisting of an estimated 45,000 parents) will be supported over the life of the project. More than 60 percent of the PG members will be women. The 5 districts included in phase 1 comprise of about 380,000 primary beneficiaries, 75,000 pregnant and lactating women, 125,000 children 0 to 23 months, and 180,000 people in households of LFs and PGs that are expected to benefit.

3. Impact Evaluation

3.1 Overview

A rigorous impact evaluation (IE) will be carried out to assess the impact of the multi-sectoral intervention on key outcomes as well as to identify pathways through which the project activities translate into the outcome-level changes realised. The IE will be limited to the Phase 1 districts to permit as much time as possible for outcomes to accrue over the project period. In addition, the evidence emerging from the IE will help identify lessons learned to inform the implementation of the project in the Phase 2 districts.

The evaluation will define a set of treatment and control schools and surrounding parishes matched on baseline characteristics such as ethnic group composition, school attendance and level of agricultural infrastructure. Treatment schools and the parishes in which they are located will be selected from the pool of schools that will receive the project in the 5 Phase 1 districts. Control schools and the parishes they are located in will be selected from an adjacent district with a comparable sociodemographic and agricultural profile and which will not be participating in the project. The baseline IE survey will be conducted in Year 1 of the project while an end-line IE survey will be conducted in Year 4 of the project. In addition, a midline IE survey will be conducted in Year 2, while Focus Group Discussions (FGD) and Key Informant Interviews (KII) will be carried out in project areas during the course of the project. The baseline and end-line surveys will include indicators aligned with the GAFSP global indicators to allow for cross-country comparisons with other projects. More information about the Data Collection Plan including sample size calculations can be found in Section 4.

The IE will be complemented by the project's M&E plan through which output-level data will regularly be collected from districts. Frequent correspondence and information sharing between the PCD-IDCL evaluation team and M&E focal point in the Project Coordination Unit (PCU) will be critical to ensure that the IE and M&E are aligned and complementary, and to assess the contribution of activities to realized outcomes. Given the geographic spread of the project, previous interventions carried out in the districts, and the decentralized nature of the project, significant heterogeneity in project implementation is expected and must be accounted for in the interpretation of results.

3.2 Research questions and impact pathways

The key research question of the IE is: What is the impact of the project on feeding practices for children 0-5 months and 6-23 months? In addition, the evaluation seeks to address the following research questions regarding the implementation of the project and the impact pathways:

- What is the impact of the project on the production of micronutrient-rich foods year round at the community level?

- What is the impact of school and community-based nutrition activities on anaemia prevalence among school-aged children?

- To what extent did project activities contribute to changes in nutrition knowledge and behaviours primarily for pregnant and lactating women, caregivers of children 0-23 months as well as for school-age children?

- What barriers to adoption of improved nutrition behaviours/practices are addressed by the project? Which activities were most successful in facilitating the adoption of desired nutrition behaviours/practices?

The evaluation also presents an opportunity to assess the viability of the project in terms of the extent to which targeted PGs and households in project areas adopt new agricultural practices and technologies.

Figure 1 illustrates the impact pathways of the project from outputs to impacts with causal links noted by arrows. For example, knowledge about production of micronutrient-rich foods through the demonstration gardens may lead to replication in the community through knowledge sharing and direct support from LFs. Additional assumptions that are critical to the success of the project are:

- Districts, VHTs and schools will have the capacity and resources to implement the project activities;

- Targeted individuals will have time to allocate to the activities introduced by the project;

- Women's workload resulting from participating in the demonstration garden intervention will not compromise their role as caregivers;

- Improved knowledge and skills can increase agricultural production all year round;

- There is adequate agricultural potential and water to produce micronutrient-rich foods in the target communities;

- Referral higher-level nutrition and health services are accessible in target communities.

FIGURE 1: Impact pathways of the project – from outputs to impacts
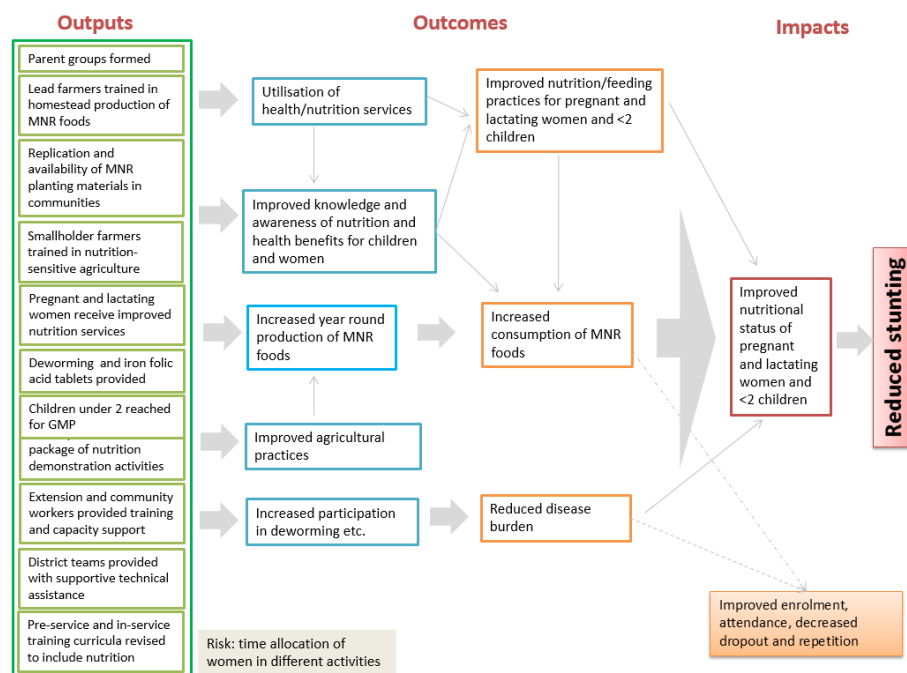
3.2 Key factors underlying the validity of the IE

The validity of the IE depends on a number of factors identified by the PCD team, some of which are addressed through the IE design while others will require monitoring during the course of the project. The PCU M&E focal point will be alerted to these factors, and will also play an instrumental role in ensuring the validity of the IE findings.

First of all, the IE seeks to identify the impact of the UMFSNP alone and not in conjunction with other interventions. As such, no other major interventions that can contribute to the PDO indicators can be introduced into the 5 Phase 1 districts between the periods of the baseline and end-line surveys, nor the adjacent districts where the comparison parishes will be selected. This will need to be ensured through regular communication between the PCU M&E focal point and the districts.

In order to identify the impacts of the UMFSNP it is critical to have a comparison group that is not affected by the project. Contamination is one of the greatest risks that can affect the validity of an IE. As the roll-out of many activities in the Phase 1 districts will be at the district-level, the IE technical assistance team will select comparison schools and parishes in adjacent districts where the project will not be introduced in the Phase 2.

The project team conducted visits in March 2015 to all of the 5 Phase 1 districts. Reports from the visits indicate that several districts have implemented similar projects before. For example, Bushenyi participated in the National Agricultural Advisory Services (NAADS) food security programme, SPRING USAID, and a backyard gardens and nutrition education project of the Catholic Women Association. Districts which have already been exposed to a nutrition-agriculture project may not be as responsive to the project as others who have not. Prior exposure to similar projects will be reviewed, and community perceptions of the UMFSNP project will also be assessed through the IE.

The number of households and communities sampled for the IE must be in accordance with the expected changes over the project period to ensure for the identification of treatment effects, as well as to contain costs to the degree possible. Sample size calculations based on the expected treatment effects outlined in the PAD are described in Section 4.

The timing of data collection in relation to project activities and the agricultural season is also critical. According to the timeline set by the IE team, the baseline survey should occur as soon as possible after the research protocol is approved. Follow-up surveys should be conducted in the same season to allow for easier comparison over time, although seasonal variation can be accounted for with data from the comparison group.

Lastly, the IE, in particular the qualitative information collected from FGD and KII, can be a source of objective information to identify what is working and not working about the project, and help validate the M&E data, which will be provided from the districts. Objective information is critical to inform the project implementation and ensure its success. As such, it is critical for the PCU and project team to respect negative findings as well as positive ones, as well as the IE team to not only report findings but provide suggestions for improvement and learning.

4. Methods

Based on the methods described in this proposal, the final methodology is detailed in the Research Protocol.

4.1 Study design

The table below presents the timing for the baseline, midline and end-line surveys. In addition to the data collection for the IE, a baseline survey will also be conducted in the 10 Phase 2 districts within 3 months of project implementation in order to set the PDO indicators.

TABLE 2: Timing of survey data collection

Survey	Geographic area	Planned date
Baseline	5 Phase 1 districts and 4-5 comparison districts	October 2016
	10 Phase 2 districts	TBD
Midline	5 Phase 1 districts	TBD
End-line	5 Phase 1 districts and 4-5 comparison districts	July 2019

Household and school surveys would be implemented at all of the time points and for all districts. The questionnaires for the IE districts, however, will be more in-depth. The school survey will be fielded to an administrator in each school of the selected parishes. An anaemia sub-subsidy will be undertaken of school children in grades P4-P7. Haemoglobin concentration will be tested amongst both boys and girls in school.

The survey data will complement information collected through FGD and KIIs, as well as the project M&E. TABLE 3 illustrates the relation between the collection of data from these three sources.

TABLE 3: Collection of monitoring and evaluation data for the project by project year

	2015	2016	2017	2018	2019

Household and school surveys	X		X		X
Focus groups; Key informant interviews; Rural rapid appraisals	X	X	X	X	
Monitoring (undertaken by project team)	X	X	X	X	X

The qualitative information will be especially useful to address research questions related to project implementation and impact pathways, as well as to validate some measures collected through the survey and the M&E.

4.2 Sample size calculation

The sample size calculation found that a minimum total of 108 parishes with 25 households in each parish, that would represent the cluster, evenly split across treatment and control arms of the IE, should be selected. These households must include at least one child 6-23 months. To ensure sufficient sample to detect statistically significant differences, the IE technical assistance team suggests that 54 parishes representing clusters are sampled for each IE arm with 25 households from each parish.

TABLE 4 presents the recommended sample size figures for the main category and sub-categories. As mentioned above according to sample size calculation, a total of 54 parishes from each arm of the IE with 25 households from each parish leading to a total sample of 1350 households in each arm will be sampled. In addition, 324 households will be sampled for each arm for each of the 3 categories described in Table 4 i.e. 0-5 months ;24-59 months and P4-P7 children to measure other indicators besides the PDO indicator (Minimum Dietary Diversity), such as infant feeding practices, complimentary foods, Minimum Meal Frequency, stunting and anaemia. Thus the total sample is 2322 households for each arm with 43 [(25) +(6*3)] households per parish. Some of the 1350 households may include an infant 0-5 months, and they will be surveyed as well. Sampling of more parishes and households would lend greater confidence to detecting impact in the key indicators. For a sub-sample of these households, haemoglobin concentration would be tested for mothers and children ages 0-24 using Hemocue.

TABLE 4: Sample size calculation results

	Treatment arm:	Comparison arm:
Districts	5	3-5
Parishes	54	54
Schools	54	54
Total Households per parish	43(25+18)	43(25+18)
6-23 mo	25	25
0-5	6	6
24-59 mo	6	6
P4-P7 children	6	6
Households, total	2322	2322

6-23 mo	1350	1350
0-5	324	324
24-59 mo	324	324
P4-P7 children	324	324

The 54 schools and surrounding parishes for the treatment arm could be evenly selected from the 5 Phase 1 districts such that each district has minimum 10 sampled parishes. A similar approach could be taken for the comparison districts; such that minimum 10 parishes are selected from each of 5 adjacent districts. TABLE 5 identifies an adjacent district for each of the 5 Phase 1 districts. Alternatively, one comparison district could be selected for two treatment districts if there is comparability and cost savings are apparent. For example, Arua could serve as a comparison for Maracha and Nebbi, instead of Koboko and Zombo. Once the comparison districts are identified, candidate comparison schools can be identified using the two sets of eligibility criteria applied in the 5 Phase 1 districts to identify project schools. From the pool of candidate comparison schools, a set of schools and their surrounding parishes for the IE would be identified through matching with the treatment schools and parishes using EMIS data and district provided information.

TABLE 5: Treatment and comparison districts

Treatment districts:	Comparison districts:
Maracha	Koboko
Bushenyi	Sheema
Namutumba	Kaliru
Nebbi	Zombo
Ntungamo	Rukungiri or Mbara

Following the baseline survey and the baseline indicators will be reviewed to estimate the minimum detectable effects (MDEs) over the period of the impact evaluation and compared with the target values presented in PAD.

Accurate age determination may be challenging and is a critical factor in this study. Thus the PCD-IDCL team will support the data collection team at each survey data collection point to carefully identify households with a child whose age falls within the specified range. A random sample of at least 50 households from each parish should then be drawn from the sampling frame to respond to the survey. In the Community Connector project, VHTs were instrumental in identifying women with young infants in the project districts. For the IE, VHTs would be consulted to identify the sampling frame.

4.3 Sampling frame

The sampling frame for the treatment group will be the set of schools selected for the project intervention. The project team estimates that 500 UPE schools per district will be part of the project in Phase-1. Assuming these are evenly distributed across the 5 phase 1 districts, this would imply 100 UPE schools per district. To reach our sample, we need a minimum of 10 schools per district. The sampling frame for the control group/comparison group are the UPE schools in the 5 comparison districts that meet the eligibility criteria applied in the 5 phase 1 districts to identify project schools.

A list of all households in the selected parishes that include a household with a child 0 to 23 months of age would be drawn and enumerated, and will constitute the sampling frame for households. A

similar approach will be used for the midterm and end-line surveys, that will draw a fresh sample as the baseline sample will age beyond the 0-23 month age bracket over the period. Similarly, a list of households with a child of 24-59 months of age and school age will be also drawn for each parish and will constitute the sample frame for these categories.

While additional time and effort is required, the enumeration of households and random sampling will enhance the rigour of the study. Other studies have not used enumeration, but this may introduce biases into the study. Households that are available and sampled may differ systematically than households that are not in terms of socioeconomic status and health outcomes, thus providing a skewed assessment.

4.4 Data collection and Quality Control
Data Collection will be undertaken by a third party which has been selected through a competitive open bidding process; data will be collected using the survey instruments designed by PCD. The whole process will be monitored by the PCD-IDCL team based in Kampala and London. To ensure high quality data, data collection will be subject to a rigorous and tested multi-level quality control process.

Quantitative data – will be collected using a single digital questionnaire, administered face-to-face to mothers/ caregivers of children 0-23 months in home settings. The data collection tool designed in English will be translated into local languages. For the IE districts these languages will include: Alur for Nebbi and Zombo districts; Lugbara and Kakwa for Maracha and Kaboko, respectively; Runyankole for Bushenyi, Shema, Ntungamo and Rukungiri; and Lusoga for Namutumba and Kaliro districts. Data will be collected simultaneously in the IE districts (5 intervention and 5 control districts) by trained Enumerators.

Qualitative data – will be collected during focus group discussions and key informant interviews. FGDs will be conducted with mothers or caregivers of children 0-23 months; PGs; and school children. Questions in the FGD will focus on knowledge, behaviours and practices, in particular facilitators and barriers to behaviour change. KIIs will be conducted with district officials; school headmasters or teachers; VHTs; and lead farmers. The KIIs will focus on project management and implementation, institutional capacity and costing. In both the FGDs and KIIs, knowledge about the UMFSNP and how it differs from other projects will be assessed.

Quality Control- PCD-IDCL shall adopt three main strategies to ensure high standards of the data collection process and the ultimate quality of the data collected. First, there will be a constant and random back-checking of field enumerators' work by the field supervisors to make sure that the quality of the data is not compromised in any way. A minimum 5% of all interviews conducted by each interviewer are to be 'back-checked' by the supervisor. This will involve returning to a respondent who will have been interviewed in order to re-interview and verify key points of the questionnaires, and to check that the standard protocol had been correctly applied. Secondly, PCD-IDCL will also have a monitoring team on the field to review the work of the supervisors and the interviewers to ensure their adherence to protocols in the field. This will ensure that enumerators are conducting the survey according to lay down standards and quality assurance mechanisms. Since the CAPI system will also allow the project coordinator to have access to the data to review whilst interviewers are still on the field, cases with issues can be rectified through interviewers' call-backs. The third and most significant is the role of the quality control assistants. The quality control assistants will provide further quality control as they will randomly select a percentage of each field enumerator's output and re-interview

respondents on selected screener questions for the purpose of cross-validation and to provide feedback to the field enumerators. The entire quality control process will be supervised by IDCL in Kampala and by the lead IE expert at the Centre for Health Policy at Imperial College London.

4.4 Measurement indicators

The outcomes to be assessed are at different levels of the impact pathway of the project. The primary outcome indicators targeting the project development objective include:

- Changes in infant and young child feeding practices (0-23 months) assessed by indicators such as exclusive breastfeeding rates among children 0-5 months; and minimum dietary diversity (MDD), minimum meal frequency (MMF) and minimum acceptable diet (MAD) among children 6-23 months. MDD is a PDO indicator and is the key outcome measure of the impact evaluation.
- Changes in stunting prevalence among children 0-23 months
- Changes in production of micronutrient-rich crops namely green leafy vegetables, yellow/orange vitamin A rich fruits and vegetables such as carrots, pumpkins, etc, at household level (PDO indicator)

Secondary outcome indicators include:

- Anemia status among children 6-23 months
- Anemia status among primary school children (P4-P7)
- Anemia status among mothers of children 0-23 months
- Underweight/wasting status among mothers of children 0-23 months
- Changes in nutrition knowledge and behaviours among: i) mothers of children 0-23 mo (knowledge of essential nutrition actions – number of meals, knowledge on deworming, vitamin A supplementation, knowledge and practice on IFA supplementation), ii) mothers and caregivers of children 0-23 months (knowledge of age of exclusive breastfeeding, knowledge on timing of breastfeeding and introduction of complementary feeding, knowledge on dangers of prenatal feeding, knowledge on appropriate complementary feeding especially meal frequency and dietary diversity), iii) school going children targeting both boys and girls in primary 4 – 7 (knowledge on the importance of IFA in adolescence, and knowledge on importance MN rich foods)

Explanatory indicators – these are optional but may be important in providing the basis for success or failure of the project. The majority of the explanatory factors will be addressed in the qualitative assessments.

- Morbidity indicators such as the two week prevalence of common childhood illness
- Primary health care and services such as immunisation coverage of for children 0-23 months, deworming and IFA supplementation among school going children, participation in GMP activities
- Equity – assessed by socioeconomic status of households covered by the project
- Household food security
- Gender dynamics especially the time and decision dynamics for child care between men and women in households.

The above stated indicators will be defined and assessed as follows:

Diet - the key indicators of dietary diversity will be assessed at the individual level. Individual dietary diversity scores (IDDS), which is a measure of the diversity of food groups contained in the diet consumed by children 6-23 months will be developed. Dietary diversity will be assessed based on seven food groups namely: cereals, pulses and oils, meats, eggs, milk, vitamin A rich fruits and vegetables, and other fruits and vegetables.[15] The key indicator for the project is minimum dietary diversity (MDD) defined as the proportion of children who will have received foods from at least four food groups the previous day of the assessment. Additional indicators to be assessed will include: minimum meal frequency (MMF) defined as children 6-23 months who will have had three meals (if breastfeeding) or four meals (if not breastfeeding); and minimum acceptable diet (MAD). Minimum acceptable diet is the combination of children who had minimum acceptable diet diversity and those who had minimum meal frequency. In additional household total nutrient intake will be computed for children using Optifood linear programing software to describe changes attributable to the project.

Nutritional status - Weight, height (or recumbent length in children under two years of age), and mid-upper arm circumference (MUAC) will be measured in sampled mothers/caregivers and children. It will not be possible to collect anthropometric measurements in triplicate because of the digital data collection but due emphasis will be made during training and the recorded measures will be shouted out to the entire team of Enumerators in order to minimize error. The World Health Organization (WHO, 2006) growth standards will be used to determine children's z-scores for height-for-age, weight-for-age, weight-for-height, BMI, and MUAC. Body mass index (BMI) will be calculated for all non-pregnant mothers while only MUAC will be assessed for both pregnant and non-pregnant women. Instruments, particularly scales (electronic scales will be use), will be validated regularly, and staff will perform the anthropometric measurements according to standard and standardized techniques.

Anaemia status- Blood samples will be collected from the children (6-23 months) and mothers to determine haemoglobin levels using hemocue analysers (H301). A hemocue is an instant digital test and will be carried out by trained Biomedical Technologists in the field. Haemoglobin concentration to assess anaemia prevalence will be determined using a HemoCue on all caregivers and children. Analysis will be based on national and WHO cut-offs.

Agricultural production- household agricultural activities and production of MNR foods will be assessed. Household food security status will be assessed using food consumption scores (FCS) and the household hunger scales (HHS) approaches.

Morbidity- Morbidity from common childhood illness like acute respiratory infections (ARI), malaria, diarrhoea, measles, skin and eye infections will be assessed over a two-week recall period. In addition, coverage of the essential primary care services such as immunization, vitamin supplementation and deworming among infants and young children, GMP, and environmental and domestic sanitation factors such as latrine and safe water coverage will be assessed.

4.5 Survey instruments
All the survey instruments have been designed and finalized based on consultations with the PCU, departmental representatives from education, health and agriculture and the World Bank.

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[15] WHO Indicators for assessing infant and young child feeding practices part 2: measurements.

The household survey will be the main source of information for the IE. The instrument includes a wide range of questions covering agricultural production including of micronutrient-rich foods, agricultural investment, technologies and practices, diversity of food produced and consumed and utilization of agricultural inputs. Caregivers with a child 6-23 months will be asked additional questions regarding infant feeding using 24-hour recall using validated measures to assess diet diversity. Caregivers with a child less than 6 months of age will be asked about other infant feeding practices including breastfeeding. All caregivers will also be asked to provide information retrospectively about the pregnancy of the focus child. More information on the specific indicators are described in Section 4.4.

In addition, a school survey will provide information about ongoing activities, programs and infrastructure that may or may not be part of the GAFSP. The school survey will capture information on critical factors such as the state of WASH facilities, and health and nutrition education. Blood samples of P4-P7 school children will be conducted at the same time as the school surveys to minimize data collection costs. Permissions from the households will be solicited beforehand.

5. Analysis Strategy

A mixed-methods strategy will be undertaken to conduct the impact evaluation. The main analyses will focus on the PDO indicators listed in Table 4 using the baseline and endline surveys. The treatment effect of the intervention will be estimated as per the equation below where Yi represents the PDO indicator, T_c represents treatment status at the community level, and community (c), household (hh). Depending on the level of the PDO indicator, child-, mother-, or district-level (i) covariates associated with the dependent variables. The inclusion of covariates in the impact estimations can enhance the precision of the treatment effect.

$$Yi = \beta_0 + T_c\beta_T + \sum_c \beta_c X_c + \sum_{hh} \beta_h X_h + \sum_i \beta_i X_i$$

If significant differences in the PDO indicators are detected at baseline, a differences-in-differences approach will be employed to obtain robust estimates of the treatment effect.

In addition to the main impact estimations, the evaluation team will undertake analyses to address the other research questions. Analyses of lower level variables (e.g. inputs and outputs) can help identify the pathways through which impacts are or are not realized at the school and community levels, and can be especially important to inform the scale-up of the program. In addition, sub-group analyses will be conducted for populations of interest, for example girls and women, to assess differential impacts and pathways.

6. Ethical considerations

Ethical considerations in studies involving human subjects are always of paramount importance. The ethics approval for this study will be processed through IDCL as per the Uganda National Council for Science and Technology and will also be reviewed by PCD/ICL ethical review board. The IRBs will review any modifications to the protocol or reportable new information about the study.

A written informed consent will be sought from study participants (caregivers a), such that each participant understands that participation in the research is voluntary, and that they are free to withdraw participation at any time, even after consent is granted. Prior to enrollment, study

participants will be provided with information on the study objectives and design, and confidentiality issues will be emphasized. After providing the information, they will be given the opportunity to ask questions and enroll in the study, or not. Caregivers who may want to discuss their participation with family members will be given an opportunity to do so and to enroll at another visit by the study Research Assistants. If participants are unable to read, a witness to the consent process will sign the consent form. All participants will receive a copy of the consent form to keep. The consent form will also discuss the possibility of data being used in future research.

Participants' privacy and confidentiality will be strictly observed and all research-associated risks will be minimized. In order to protect participants' privacy, all questionnaires will be administered in a private setting. To protect participants' confidentiality, all completed consent forms will be stored in a locked space. All electronic data will be entered into a password-protected database only accessible by authorized personnel. Information on identity of participants will never be revealed to or discussed with third parties.

Potential research-associated risks include breach of confidentiality, discomfort with answering some sensitive questions, and slight risks associated with finger pricks to assess anaemia. Every effort will be made to prevent a loss of confidentiality, as described above. Research staff will be specifically trained to administer the questionnaires and will recognize that some individuals may feel uncomfortable discussing certain topics especially on household feeding practices and income. They will let participants know that they may refuse to answer any question.

Standard safety precautions will be taken to do finger pricks and will be performed only by trained research staff. Participants who will be found to have severe anaemia (haemoglobin < 8 g/dL) or malnutrition (BMI < 18.5 in adults or children with visible severe wasting, or with oedema, or MUAC < 125 mm in children 12-23 months) will be promptly counselled and referred to a health facility for treatment.

7. Roles & Deliverables

The Partnership for Child Development (PCD) under a direct contract with the World Bank has developed an MoU and a Terms of Reference towards all of the activities described in the Technical Proposal. PCD will enter into a sub-contract with 'Ideal Development Consulting Limited (IDCL) to be the local project interface and for providing staff resources for data entry, survey training and supervision. IDCL was selected based on a scoping exercise undertaken by Mr Aggrey Kibenge (Under Secretary, Office of the PM) on behalf of PCD. PCDs focus will be in terms of developing survey instruments, research protocol, quality control, training, analysis and report writing, while IDCLs focus will be in terms of liaising with PCU/Government departments, IRB approval, field supervision, data management, first level QA of data collection and preliminary analysis.

TABLE 7: Deliverables from the PCD-IDCL technical assistance team

ACTIVITIES/DELIVERABLES	DATES
Finalized research components	July 2016
Contract finalized for data collection	Aug 2016
IRB Approval	Aug/Sept 2016
Baseline data Collection and preliminary analysis	Oct 2016 – Jan2017
Draft Baseline	March 2017

Final baseline	June 2017
Briefing on key findings on baseline report	July 2017
Midline Survey	TBD
Midline Report	TBD

A draft baseline report will be prepared as soon as possible following the data collection that will focus on key indicators including PDO indicators. A more detailed baseline report will be completed in early 2017 that will assess the comparability of the treatment and control arms, and highlight how potential pathways may be affected by project activities. Accompanying briefings will be developed and presented to stakeholders with a focus on findings that can inform the project implementation and scale-up to Phase 2 districts.

The Midline Report will present findings from the M&E data review, the midline survey as well as the qualitative data collection through the FGDs and KIIs in the 5 districts. The final IE report will be the main deliverable of the project, and will be completed in early 2020. This report will focus on the baseline and end-line data from the 5 Phase 1 districts (well as well as data collected from the comparison districts) to estimate the impact of the GAFSP on key outcome-level over the period using analytic methods described in Section 5. In addition, the impact pathways triggered by the project activities will be described. The briefing on key findings from the final IE report will be prepared for stakeholders of the UMFSNP in Uganda, as well as the GAFSP coordinating committee. The briefing will focus on findings from the final IE report, and will also draw on findings from the implementation report.

A capacity statement of both institutions is presented below. Their combined expertise will support the provision of technical assistance, analysis and interpretation of results, and dissemination of results.

Partnership for Child Development. Since its creation in 1992, PCD has grown to become a global consortium of over 100 civil society organizations, academic institutions and technical experts with a streamlined Coordinating Centre based at Imperial College London. All of PCD's work is underpinned with strong in-country collaboration and consultations with key stakeholders. This aspect ensures informed programme designs, identification of key issues to be addressed, stakeholder buy in and commitment of resources. Through global partnerships with the World Bank, WFP and the African Union's New Partnership for Africa's Development (NEPAD) amongst others, PCD has been providing direct, evidence-based and context-specific support to governments to strengthen school health and nutrition policies and programs, sourced with local agricultural production, in 20 countries globally. PCD has expertise in monitoring and evaluation assistance, particularly impact assessments and is currently engaged in impact evaluation in several African countries. Governments are directly benefiting from this practical knowledge based products for more effective programming of their food and nutrition security programmes and policies.

PCD will be the lead organization contracted by the World Bank to carry out the evaluation. Dr. Lesley Drake will be the Principal Investigator for this study. Additional expertise will be provided by Research Associate in Food Policy (Samrat Singh), Senior Research Advisor (Dr. Meena Fernandes), Senior Nutrition Consultant (Prof. Josephine Kiamba), Public Health IE specialist (Dr Ranjeeta Thomas), Health Economist (Dr Lesong Conteh) and Senior Programme Managers (Elodie Yard and Iain Gardiner).

To carry out the evaluation, PCD will be supported by **IDCL,** which has a strong in-country experience of conducting impact evaluation for Government departments and development partners. IDCL has substantial experience in undertaking surveys and training especially in the area of agriculture, nutrition and public health. Mr. Julius Twinamasiko who has been closely involved with the IE since its inception will be leading the management of IDCL for this project and will coordinate fieldwork and data management.