

Action Against Malnutrition through Agriculture

Nepal Child Survival Project

Kailali and Baitadi Districts, Far Western Region

Bajura Expansion District

Final Evaluation Report

Child Survival Health Grants Program –Innovation Category

Helen Keller International – Nepal

in collaboration with the Nepali Technical Assistance Group

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List of Abbreviations, Acronyms and Special Terms

AAMA	Action Against Malnutrition through Agriculture Project (AAMA = “Mother” in Nepali)
ARI	Acute Respiratory Infection
BCC	Behavior Change Communication
BMI	Body Mass Index
CATCH	Core Assessment Tool on Child Health
CHD	Child Health Division
DADO	District Agricultural Development Office
DEO	District Education Office
DHO	District Health Office
DIP	Detailed Implementation Plan
ENA	Essential Nutrition Actions
FANTA	Food and Nutrition Technical Assistance project
FAO	Food and Agriculture Organization of the United Nations
FCHV	Female Community Health Volunteer
FWR	Far Western Region
HFP	Homestead Food Production
HFPB	Homestead Food Production Beneficiaries
HH	Household
HKI	Helen Keller International
HQ	Headquarters
IFA	Iron + Folic Acid
IFPRI	International Food Policy Research Institute
IMR	Infant Mortality Rate
KPC	Knowledge Practices and Coverage
M&E	Monitoring & Evaluation
MCH	Maternal Child Health
MI	Micronutrient Initiative
MOH	Ministry of Health and Population
MOU	Memorandum of Understanding
MTOT	Master Training of Trainers
NAC	National Advisory Committee
NDHS	Nepal Demographic and Health Survey
NFHP	Nepal Family Health Program
NNSWA	Nepal National Social Welfare Association (Nepali NGO)
NTAG	Nepali Technical Assistance Group
SD	Standard Deviation
SMJK	Snehi Mahila Jagaron Kendra (Nepali NGO)
SWC	Social Welfare Council
VDC	Village Development Committee or the geographic area served by the committee
VMF	Village Model Farm or Farmer
WAZ	Weight for Age
WHO	World Health Organization
WDF	Women’s Development Forum (NGO)

A. Preliminary Information

Executive Summary

In Nepal, where rates of chronic malnutrition are among the highest in the world, Helen Keller International (HKI) has implemented an innovations category project funded by USAID's Child Survival and Health Grants Program (CSHGP) with additional funding from USAID Nepal. The premise of the innovation was that by addressing the barrier of lack of access to nutrient-rich foods, the Expanded Household Food Production (EHFP) model enables families to put into practice the accompanying recommendations for women and young children to eat a varied diet to achieve optimal nutritional status. The project, called Action Against Malnutrition through Agriculture (AAMA) targeted three districts in Far West Nepal: Kailali, Baitadi and Bajura. The EHFP intervention was the same in all districts, but Baitadi served as the Operations Research (OR) district. The project goal and three results were the same in the OR district and the other districts, with a fourth result related to scaling up for Kailali District.

Project Goal: To reduce child malnutrition and related mortality in the target districts.

Results:

1. To improve the **nutrition and health status** of children under two years and pregnant and lactating women
2. To increase the **accessibility and availability of year round of micronutrient-rich foods** for consumption by children under two years and pregnant and lactating women;
3. To **increase the capacity** of local NGO and district staff, FCHVs and community members to promote improved nutrition and agricultural practices; and
4. To develop an integrated **food security and nutrition intervention** that serves as a district wide model to scale-up (Kailali District only).

The EHFP strategy combines HKI's signature Household Food Production model with promotion of the Essential Nutrition Actions. In each target community, volunteers were selected to serve as Village Model Farmers (VMF), receiving training, inputs, and supportive supervision to start models of vegetable gardening and poultry raising. They formed two groups of approximately 15 women who were either pregnant or had children under two years of age. The group members, called Household Food Production Beneficiaries (HFPPBs), received inputs of seeds, seedlings and chickens of improved breeds.

HKI collaborated with national partner Nepali Technical Assistance Group (NTAG) and local partners Nepal National Social Welfare Association (NNSWA - Kailali) and *Snehi Mabila Jagaron Kendra* (SMJK - Baitadi) as well as the government to implement the program. With the additional funding from USAID Nepal, HKI was able to add a governance component which served to bring together various government entities at the national, regional, district and local levels to collaborate on addressing food security and nutrition. This component also empowered local stakeholders to advocate through local governance channels for funding to support AAMA activities or replication of the activities in adjacent wards.

Key Findings/Results

Nutritional status, specifically chronic malnutrition and anemia among children, improved significantly in Kailali District and among the Dalit (disadvantaged) population in Baitadi. There

was no change in these indicators for Bajura or for Baitadi OR district¹, where exposure to project activities was limited to two years and there are other factors such as extremely poor sanitation that may affect nutritional status.

Across all districts, there was impressive adoption of both HFP practices and improved nutrition and health behaviors. Over two-thirds of families now have proper gardens and have adopted related practices such as planting in rows, using homemade bio-pesticides, and raising a greater variety of vegetables. About twenty percent of families now report year-around garden production, which is an improvement, and overall vegetable production increased. There were significant improvements in dietary diversity and in infant and young child feeding practices such as exclusive breastfeeding, adequate complementary feeding and feeding children Vitamin A-rich plant foods.

Poultry-raising was less successful due to introduction of improved breeds which required more care and feed than HFPBs provided. There were very high losses due to predators, accidents and disease. The project did not have an initial plan for vaccinating poultry and was not able to come up with sustainable solutions before the end of the project.

The operations research was implemented as planned. In Baitadi the EHFP intervention was implemented as a community randomized effectiveness trial. Four intervention Ilakas, or sub-regions were been randomly selected and matched with four control Ilakas on economic, health and food security indicators; baseline and end line measures of both arms were compared (double-difference estimates) to allow for probability assessment of the impact of the intervention. While the OR intervention did not achieve the expected results in improving nutritional status, the results of adoption of HFP practices and improved nutrition and health practices were significantly better in the intervention Ilakas by the end of the project.

Main Conclusions

1. The AAMA project achieved excellent outcomes in changing ENA and maternal health behaviors and adoption of HFP practices for raising vegetables.
2. These outcome improvements were equally impressive in the OR district where there was a much higher ratio of staff and volunteers per beneficiary as in the scaling-up district where the ratio was lower, particularly during the first half of the project.
3. The project did not achieve expected improvements in nutritional status outcomes. There are other factors such as very low levels of sanitation and continued high levels of food insecurity which the project did not address that may play a larger role than dietary diversity and IYCF practices in the current high levels of stunting and anemia. The short time frame of project implementation may not have provided sufficient exposure to new practices, including significantly increasing the amount of micronutrient-rich foods consumed.

¹ HKI addendum: multivariate analysis completed by HKI's Asia-Pacific regional team after the final evaluation report was completed revealed that while no significant impact was achieved on child growth, there was a marginally significant reduction in anemia in intervention compared to control children and a significant reduction in both anemia and underweight in women of reproductive age. HKI will footnote adjustments to findings in this report. Data that are revised following more careful cleaning and analysis are indicated in the text and tables in boldface font.

4. The poultry component of EHFP needs serious strengthening before further replication. Family flocks did not increase significantly and egg consumption remained very low overall. That said, the fact that some strict Brahmin families in Baitadi adopted chicken production and agreed to feed eggs to their children is an accomplishment.
5. The official registration of EHFP groups with DADO with the requirement for their becoming a savings group has greatly enhanced potential for sustainability.
6. The governance component, although limited, was very successful in promoting citizen participation in influencing budget allocations, and in bringing together cross-sectoral working groups to plan, to coordinate, and to influence VDC and District-level funding. The success of the governance component is evident in the official designation of VHF's as Local Resource Persons and in replication of some AAMA activities to many other wards and to marginalized populations.

Recommendations

The first set of recommendations listed here are directed at HKI globally to improve EHFP.

1. HKI needs to assess carefully any major changes in the HFP model, such as the elimination of the model farmers. While the concern about equity is understandable, it may be possible to lower criteria and to find VMF's from the same socio-economic strata as the intended participants who can be trained in advance and their model farms developed with the same inputs that will be given to the HFPB's. A major determinant in adoption of new agricultural practices is fear of risk. Research shows that farmers are much more likely to adopt a practice they have seen already successful on another farm; therefore, there is value in having one person in the community implementing new practices in advance of the others in order for them to see the results before investing their time and resources.
2. Reassess introducing improved breeds of poultry for Homestead Food Production. There is consensus from poultry experts (FAO, UC Davis²) that it is best to focus on teaching people to take better care of existing local poultry. They require less feed and care, and have instincts to survive that have been lost in developing improved breeds. Five well-cared-for local hens can produce up to 70 eggs each per year, which would be 350 eggs total. Twenty-five of these could be used for reproduction leaving 325 for the family to consume. If all twenty-five chicks hatch and survive, which is feasible if they are kept penned, some can be sold to cover cost of vaccine and additional feed to supplement what is available from the household.
3. Assure that there is a sustainable system of vaccination against Newcastle Disease before promoting poultry in any context. Village level campaigns on a regular schedule 3-4 times a year are effective.
4. Work with technical staff to develop interactive learning tasks to use with both volunteers and participants for all key messages. Using interactive learning tasks is important not only for agriculture, but also to enhance ENA counseling and discussions.

² A consultant from the University of California at Davis visited on the invitation of HKI/Nepal during the final evaluation and provided valuable guidance on village poultry strategies, which are informing future approaches.

AAMA project staff worked with the evaluation team to prepare a detailed list of technical interventions for Suaahara Project and other projects that are going to be replicating the EFHP model or parts of it in Nepal. The detailed technical recommendations are attached in Annex 16. Recommendations to USAID regarding OR projects are found at the end of the narrative.

Table 1: Summary of Major Project Accomplishments Kailali and Bajura Districts

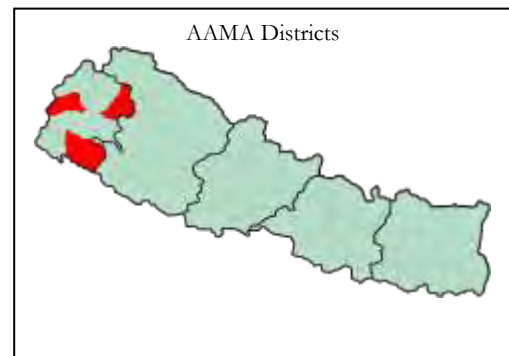
Result 1: Increased year round accessibility of micronutrient-rich foods for children < 2 and for pregnant and lactating women.			
Project Inputs	Activities	Outputs	Outcomes
VMF/FCHV Selection	<ul style="list-style-type: none"> - Coordination with Health facility and VDC - Meeting with FCHV for VMF selection - VMFs chosen based on selection criteria 	<ul style="list-style-type: none"> - Kailali: 3 VMF in each VDC : Total 126 VMF in Kailali district - Bajura: 5 VMF in each VDC: Total 135 VMF in Bajura 	<ul style="list-style-type: none"> - 89.5% of families with children under age two in Kailali now have gardens and 77.4% have poultry with an average of seven varieties of vegetable and ten chickens in their garden - 72.7% of families with children under two in Bajura District have gardens and 66.2% have poultry with an average of six varieties of vegetable and three chickens in their garden
HFPBs	<ul style="list-style-type: none"> - Coordination and data collection with FCHV - Coordination with VMF/FCHV 	<ul style="list-style-type: none"> - Kailali: 30 - 40 HFPBs in each ward : Total 4,632 Beneficiaries in Kailali - Bajura: 15-30 HFPBs in each VMF: Total 3412 HFPBs in Bajura 	
Poultry distribution 2,520 chickens to VMF chicken coops built 16,565 hens to HFPBs	<ul style="list-style-type: none"> - Training on HFP - Building poultry coop - Distribution of poultry - Supervision 	<ul style="list-style-type: none"> - Kailali: 4,758 people trained - 57.5% VMFs selling eggs and chicks 	
2025 chickens to VMF chicken coops built 17060 chickens to HFPBs		<ul style="list-style-type: none"> - Bajura: 3547 people trained - 12.1% VMFs selling eggs and chicks 	
Project Inputs	Activities	Outputs	
Seed distribution	<ul style="list-style-type: none"> - Training - Distribution - Supervision 	Kailali:	
seeds distributed		<ul style="list-style-type: none"> - 126 VMFs trained in basic gardening - 4617 trained HFPBs - 126 VMF gardens established 	
seeds distributed		Bajura:	
		<ul style="list-style-type: none"> - 135 VMFs trained in gardening - 3412 HFPBs trained - 135 VMF garden established 	
HFP Handbooks for field supervisors HFP Handbooks for VMF Poster of seasonal planting Schedule of key HFP messages for VMF Seasonal calendars flyers on specific crops	<ul style="list-style-type: none"> - Distribution of materials along with trainings 	<ul style="list-style-type: none"> - VMFs have basic knowledge - Supervisors have a resource from which to learn and to provide further training to VMFs 	

Table 2: Summary of OR Accomplishments in Baitadi District

Result 1: Increased year round accessibility of micronutrient-rich foods for children < 2 and for pregnant and lactating women.			
Project Inputs	Activities	Outputs	Outcomes
VMF/FCHV Selection	<ul style="list-style-type: none"> - Coordination with Health facility and VDC - Meeting with FCHV for VMF selection - VMFs chosen based on selection criteria 	<ul style="list-style-type: none"> - 6 VMF in each VDC: Total 122 	<ul style="list-style-type: none"> - 97.6% of families with children under two in intervention areas of Baitadi District have gardens and 29.1% have poultry with an average of eight varieties of vegetable and four chickens in their garden
HFPBs	<ul style="list-style-type: none"> - Coordination and data collection with FCHV - Coordination with VMF/FCHV 	<ul style="list-style-type: none"> - 20 – 40 HFPBs in each VMF - 3,329 HFPBs 	
Poultry distribution 2,440 chickens to VMF 126 chicken coops built 16,255 chickens to HFPB	<ul style="list-style-type: none"> - Training on HFP - Building poultry coop - Distribution of poultry - Supervision 	<ul style="list-style-type: none"> - 3,451 people trained - 65% VMFs selling eggs and chicks 	
Project Inputs	Activities	Outputs	
Seed distribution seeds distributed	<ul style="list-style-type: none"> - Training - Distribution - Supervision 	<ul style="list-style-type: none"> - 122 VMFs trained in gardening - 3329 HFPBs trained - 122 VMF garden established 	
HFP Handbooks for field supervisors HFP Handbooks for VMF Poster of seasonal planting Schedule of key HFP messages for VMF Seasonal calendars flyers on specific crops	<ul style="list-style-type: none"> - Distribution of materials along with trainings 	<ul style="list-style-type: none"> - VMFs have basic knowledge - Supervisors have a resource from which to learn and to provide further training to VMFs 	

B. Overview of the Project, OR Structure, and Implementation

The **Action Against Malnutrition through Agriculture** project (AAMA, or mother in Nepali), is an innovation to significantly improve nutritional status of pregnant and lactating women and children less than two years of age by addressing a key determinant of malnutrition; that is, increasing household food production in two Far West districts: Kailali District in the lowland Terai and Baitadi District in the hill country. With a grant from USAID Nepal in 2010, the project was extended to a third district Bajura and a governance component was added in all three districts.



Project Goal: To reduce child malnutrition and related mortality in the districts of Kailali and Baitadi of Nepal.

Results:

5. To improve the **nutrition and health status** of children under two years and pregnant and lactating women
6. To increase the **accessibility and availability of year round of micronutrient-rich foods** for consumption by children under two years and pregnant and lactating women;
7. To **increase the capacity** of local NGO and district staff, FCHVs and community members to promote improved nutrition and agricultural practices; and
8. To develop an integrated **food security and nutrition intervention** that serves as a district wide model to scale-up

Helen Keller International (HKI) and its national partner Nepali Technical Assistance Group (NTAG) and local partners Nepal National Social Welfare Association (NNSWA - Kailali) and *Snehi Mahila Jagaron Kendra* (SMJK - Baitadi) have been collaborating on the innovation that merges two proven programs addressing complementary and critical facets of malnutrition in Nepal and throughout the developing world: food security and nutrition knowledge and practices. Addressing the first is HKI's signature Homestead Food Production (HFP) program, which has been bringing appropriate technologies for improved household food availability and diversification for almost 20 years in South Asia and for over 10 years in Nepal. This approach, establishing demonstration village model farms (VMFs) that provide technical support and inputs to affiliated beneficiary households to enable them to set up "developed" home gardens and poultry raising, has demonstrated positive impact on household food production, consumption and micronutrient status, as well as on women's economic and social empowerment³. The second element is applying the Essential Nutrition Actions (ENA) framework to improve key nutrition practices at the household level.

The project strategy involved establishing a network to diffuse HFP and ENA in all 42⁴ sub-divisions of Kailali District through establishment of VMFs in collaboration with Nepal's highly

³ Helen Keller International Nutrition Bulletins for Nepal (May 2001; July 2004), Bangladesh (Sept 2003; Nov 2004) and Cambodia (May 2004; December 2006).

⁴ The approved Detailed Implementation Plan mentions 43 VDCs, but one was re-designated by the government as an urban municipality.

successful Female Community Health Volunteer (FCHV) program, and with support from the District Health Office (DHO), District Agriculture Development Office (DADO), and District Livestock Office (DLO). Each VMF has two groups called Household Food Production Beneficiaries (HFPB) of about 15-20 women (mothers of children under two or pregnant women) who are expected to share their learning with relatives and neighbors. FCHVs were given the option of being VMFs, if they had enough land, or of joining the HFPB. All affiliated FCHVs received training intended to expand their basic nutrition knowledge around the ENA and, skills for nutrition counseling. The VMFs provide a platform to facilitate their education efforts regarding nutrition, and have enabled them to reach mothers of children under two who are not currently in their traditional mother's groups.

In the Kailali district the project used an adequacy assessment (comparing baseline to end line measures on a spectrum of nutrition, hygiene, food security and food production indicators) to measure project impact. The intent in Kailali was to create a district-wide model that can be replicated elsewhere. While this model was expected to improve food security and nutrition knowledge and practices for the entire population of the district, direct participants in HFP represented slightly less than 10 percent of the population of mothers with children under two years (2009 census estimate). With funds allocated by the government through Village Development Committees, project activities were minimally extended to another 5% of the population. Because the project interventions in Kailali coincided with significant economic growth and increased food security in an already-food secure region⁵, along with renewed efforts by the Ministry of Health to improve coverage, the final survey shows very good results.

In the Baitadi district the intervention was implemented as a randomized community effectiveness trial. Intervention sites (Ilakas, or sub-regions) were randomly selected and matched with control sites on economic, health and food security indicators. Baseline and end line measures of both arms were compared (double-difference estimates) to allow for probability assessment of the impact of the intervention on child and maternal nutritional status, household nutrition practices and food production. In this model, the project was trying to improve food security and nutrition practices for the entire population of the intervention Ilakas by actively involving approximately 70 percent of the population of mothers of children under two in these areas. The elements of the implementation strategy were the same in both districts but there are double the number of VMFs per VDC in Baitadi.

The technical interventions covered included infant and young child feeding (40%), vitamin A-micronutrients (40%), control of diarrheal diseases (10%) and maternal and neonatal care (10%). All of these interventions are covered under ENA. AAMA relies on the FCHVs and VMF to convey these messages to the HFPBs who are expected to diffuse the messages to others in the community. FCHVs received limited training (3 hours) in using "negotiation for behavior change" as the counseling method and were provide flipcharts with key messages

⁵ HKI addendum: Kailali is considered moderately food insecure by the Government of Nepal, UNICE and WFP (2011)

Estimated Target Population (based on 2009 census estimates)

	Children <2	Children <5	Pregnant Women	Total Target Pop.	Total Population
Kailali District	40,257	100,166	20,125	160,528	632,994
Baitadi District*	4,991	11,715	2,455	19,161	78,331
Bajura District**	6,588	18,726	3,297	9885	131,374
Total	51,836	130,607	25,877	189,574	842,699

*intervention areas only **Added in 2010 with funding from USAID Nepal

In 2010, USAID Nepal gave HKI a grant to replicate the model in remote Bajura District, covering parts of all 27 sub-regions (VDCs). This grant of \$728,387 was added to the CSHGP grant and greatly increased the target population and reach of the project. Partnering with a local NGO, Women’s Development Forum (WDF), in Bajura, HKI reached 3412 women and approximately 3500 children under two during the two-year period, working through 135 VMFs. The baseline and endline surveys used cluster sampling and the same instruments used in Kailali and Baitadi. Another goal of the USAID Nepal grant was to improve related governance in all three project districts. This add-on activity enabled HKI to strengthen local government and community capacity and to expand and sustain the project interventions and resulted in replication of some project activities in additional geographic areas of the original two districts, thus, another 2,477 women directly received some inputs and some education on ENA and HFP.

C. Evaluation Methodology and Limitations

Quantitative Evaluation

For each district HKI, contracted local firms with experience and good reputations in survey research to conduct the final KPC surveys and analyze the data. Each firm used the same survey tools that were validated prior to the baseline and used for the baseline surveys in each district. The surveys in Kailali and Baitadi and their control areas were conducted at the same time of year as the baseline: March in Kailali and July in Baitadi. This removed possible seasonal impact on food security, agriculture production, and child illness. Because of the short timeframe of the expansion project in Bajura, the baseline and endline surveys had to be conducted in opposite seasons, with the final survey done during the rainy season, which is a limitation in assessing prevalence of illnesses and both quantity and type of vegetables grown.

For the OR district of Baitadi, HKI decided to over-sample for the endline. They had decided to use a cross-sectional sampling framework using the approach of intent to treat, even though the project included only 70% of eligible households. Because of the over-sampling, there was sufficient sample size of families who actually received the project intervention in the study areas to make it feasible to analyze their data separately for the impact indicators⁶.

The following table shows the samples for the surveys as used in the analyses. For both baseline and final, Kailali was matched with another Far West Terai district Biyardia. As will be fully explained in the OR section of this report, the Baitadi intervention areas were matched to control areas (llakas) in the same district.

⁶ HKI addendum: when we recalculated the indicators we determined it would be too complicated to include the subset of direct beneficiaries and given that our design was intent-to-treat, we eliminated this column. We are including that table as a separate document appended to the report.

Sample Sizes

Survey	Kailali	Control Bardiya	Baitadi Intervention	Baitadi Control llakas	Bajura
Baseline	497	466	1055	1051	450
Endline	696	540	1307*	1307	450

*890 were actual project participants.

Limitation: The organization that conducted the baseline for Kailali and Baitadi was no longer available. HKI contracted different research firms to conduct the final evaluation and provided them training, but the change in research firms and software may have led to some issues in comparability of the baseline and final results. To address this, the firm working with Kailali data re-calculated all the baseline data. This, however, would not compensate for possible differences in data collection by endline enumerators compared to the work done by baseline enumerators. We have found in the endline, for example, that homemade pesticide was mis-coded as compost and that the food security question was asked based on the past month, rather than on the past year as in the baseline.

Since HKI developed separate M&E tables and presented separate KPC reports for each district in the DIP, the tables and KPC results have been kept separate in this final evaluation report. The detailed Final KPC reports for each district are presented in Annex 6.

Qualitative Evaluation

The qualitative evaluation was conducted exactly two years after the mid-term qualitative evaluation in the month of September. Using a participatory approach led by an external consultant, AAMA staff (both HKI and NGO partners) conducted field visits over six days in Baitadi and Kailali, dividing into two teams. The teams used interview guides, which were pre-tested in Kailali communities. In each district, the teams visited ten communities selected as being very good, average, or poor in terms of VMF and HFPB capacity. Annex 10 lists those interviewed, which included district officials, VDC staff, participating women, and VMFs. Using an observation guide, the evaluation team members documented current status of gardens and poultry. Each evening, the teams compiled and synthesized the qualitative findings. When field work was completed, the two teams met to examine findings as strengths or weaknesses and to articulate conclusions and recommendations. Staff from the Suahaara project participated in this process. Details of the evaluation process are listed in the following annexes:

Annex 8 – Evaluation Team Members

Annex 9 – Evaluation Scope of Work with description of information collection methods

Annex 10 – List of persons interviewed during the final evaluation, names of places visited.

Limitation: Due to landslides, Bajura District was not accessible. The evaluation team did not have an opportunity to witness first-hand the results of the intensive effort in the two-year intervention nor see how lessons learned from the MTE were applied to Bajura implementation. The team leader did discuss Bajura implementation with the HKI staff involved.

D. Data Quality and Use

At the time of the baseline survey and the MTE, no problems were detected with the quality of the baseline data. One indicator was separated at the time of the MTE to more accurately measure desired behaviors related to feeding during and after illness: % of children fed the same during or after illness, and % of children fed more during or after illness.

The final evaluation results for Baitadi, as well as an intermediate survey conducted for an add-on micronutrient supplement (MNS) trial, now call into question the baseline results for anemia among women. The baseline figures are not only much lower than in the final survey and the MNS surveys, they are also much lower than the 2010-11 DHS data for that region of Nepal⁷.

HKI has done an exceptional job of collecting useful monitoring data and documenting the project processes, inputs and outputs. This can be seen in Table 1 Summary of Project Accomplishments. From this data and documentation, it is possible to clearly associate project efforts with the outcomes as will be further discussed in Section E below.

The same tools were used to collect data for the baseline and final evaluations, the same methods used for data collection, and the same training given to the enumerators and supervisors. The research firms did use different statistical software packages between baseline and final but there is no evidence that this affected the results of the data analysis, although it did lead to delays in processing data.

For Kailali, the control district of Bardiya, and for Bajura, HKI used Population Proportional Sampling once the 30 clusters (VDCs) had been randomly selected. AAMA project was designed to cover one third of the wards in each VDC in Kailali. Although the 126 wards where the project intervened were presumably selected randomly at the beginning of the project, a disproportionate number of them showed up in the sample for the endline survey (25 out of the 41 wards sampled). HKI could not produce the population data used for PPS nor explain whether the intervention wards selected by the project in 2008 were more populous than other wards. The data collection firm said that when they could not find enough eligible households to survey in a selected cluster (ward), they went to an adjacent ward and most of these turned out to be AAMA target areas. Therefore, the Kailali results appear skewed, even though they were intended to be cross-sectional to assess the impact of the diffusion of the project in the district.

E. Presentation of Project Results

HKI developed separate M&E matrices for the OR district and the others from the beginning of the project. The up-dated matrices are presented here.

⁷HKI addendum: According to the 2012 NDHS, low hemoglobin among children 6-59 months in the far western hills was 40.9% compared to a baseline of 29.9 in HKI's survey among children 12-48 months. Among women of reproductive age the comparison was 28.8% NDHS and 22.3%.

Table 3: M&E Matrix Kailali and Bajura

Project Goal: To reduce child malnutrition and related morbidity in Bajura and Kailali districts of Far Western Region⁸						
Strategic Objective: To improve nutritional status among children <2 and their mothers						
Sub-results	Indicators	Bajura⁹		Kailali		
		Baseline	Endline	Baseline	Endline	Final Target
1. To improve anthropometric status of children 0-24 months	Stunting in children 0-24 months (height for age Z-score <-2 SD)	47% (42.3-51.6)	52% (47.3-56.6)	28.9% (24.8-32.9)	18.3% (15.4-21.1)	23%
	Wasting in children 0-24 months (weight for height Z-score <-2 SD)	15% (11.7-18.2)	21.8% (17.9-21.8)	9%	19%	6.3%
	Underweight in children 0-24 months (weight for age Z-score <-2 SD)	37% (32.5-41.4)	44.7% (40.1-49.2)	30.6% (26.4-34.7)	20.7% (17.6-23.7)	21%
2. To decrease anemia levels in children 6-24 months and pregnant and lactating women	Prevalence of Anemia in children 6-24 months	NC ¹⁰	NC	57.7% (53.2-62.1)	48.8% (45.1-52.5)	40%
	Prevalence of Anemia in women of reproductive age (Hb<11 g/dl)	NC	NC	36% (31.7-40.2)	32.3% (28.8-35.7)	21%
	Proportion of women who reported taking full 180 days of iron supplements in previous pregnancy	33.5% (29.1-37.8)	76.8% (72.8-80.7)	43.8% (39.3-48.2)	86.7% (84.1-89.2)	53.8%
Result 1: To increase the availability of MN-rich foods year round for consumption by children under 2 years, pregnant and lactating women						
Sub-results	Indicators	Bajura		Kailali		
		Baseline (95% CI)	Endline (95% CI)	Baseline (95% CI)	Endline (95% CI)	Final Target
1. 1 To increase the number of varieties and volume of micronutrient rich foods (plant and animal sources) available year round for family consumption through HFP	Proportion of households with developed or improved HFP	8.2% (5.6-10.7)	34.4% (30-38.8)	11.5% (8.7-14.4)	59.7% (56.1-63.4)	-
	Mean number of MN-rich vegetable cultivated by HH each year	2.41	6.36	2	5.78	5
	Mean number of improved chickens owned per household	0	3.37	0	9.6	3
	Mean production (in kg) of MN-rich fruits and vegetables over 2-month period	19.4	22.3	45.4	156.9	60
1.2 To increase household income generated by women through HFP (and available for purchase of high value foods)	Percent of women with HFP generate income by selling garden and/or poultry products	13.9% (10.7-17)	46% (41.3-50.6)	<1% (0.11-1.8)	13.8% (6.9-20.6)	15%
	Percent of HHs purchasing animal source foods with income generated by sales of garden produce	4.9 % (2.9-6.8)	13.3% (10.1-16.4)	<1% (0.11-1.8)	0.6% (0.02-1.1)	15%

⁸ For all values the confidence interval calculated are at 95% confidence level

⁹ In Bajura, project was only for 2 years with short intervention period, hence no targets were set

¹⁰ NC: Not collected; ND: Not defined

Result 2: To improve essential nutrition knowledge and practices						
Sub-results	Indicators	Bajura		Kailali		
		Baseline (95% CI)	Endline (95% CI)	Baseline (95% CI)	Endline (95% CI)	Final Target
2.1 To increase optimal breastfeeding feeding practices	Proportion of children born in past 24 months who were put to the breast within 1 hour of birth	41.7% (37.1-46.2)	81.1% (77.4-84.7)	59.9% (55.5-64.2)	79.1% (76-82.1)	75%
	Proportion of infants 0-5.9 months who received only breast milk during the previous day	73.7% (69.6-77.7)	78.3% (74.4-82.1)	79.1% (75.4-82.7)	82.9% (80.1-85.6)	80%
2.2 To improve the quality, diversity and quantity of complementary feeding of children 6-24 months	Proportion of children 6-24 months of age receiving foods from ≥4 food groups during the previous day ¹¹	35.7% (31.2-40.1)	69.1% (64.8-73.3)	20.8% (17.1-24.4)	78.3% (75.2-81.3)	31%
	Proportion of children 6-24 months of age receiving solid, semi-solid or soft foods the minimum number of times or more in the previous day ¹²	59.3% (54.7-63.8)	84% (80.6-87.3)	6-8 mos: 39.6% (35.2-43.9) 9-23 mos: 52.5% (48.1-56.9)	6-8 mo 62.5% (58.9-66.1) 9-23 mos: 91.9% (89.8-93.9)	6-8 mos: 50% 9-23 mos: 62.5%
	Proportion of children 6-24 who consumed iron-rich animal-source foods during previous 24 hour period	10.2% (4.7-12.9)	45.2%	15.2% (12-18.3)	25.6% (22.3-28.8)	30%
	Proportion of children 6-24 who consumed Vitamin A rich animal source food	50.9% (46.2-55.5)	76.2% (72.2-80.1)	5.2% (3.2-7.1)	32.4% (28.9-35.8)	20%
	Proportion of children 6-24 consumed iron rich plant source food	44.5% (39.9-49)	70.4% (66.1-746)	32.2% (28.0-36.3)	43.3% (39.6-46.9)	30%
	Proportion of children 6-24 consumed Vitamin A rich plant source food over previous 24 hour period	52.3% (47.6-56.9)	14.4% (11.1-17.6)	42.6% (38.1-47.0)	54.7% (51.0-58.3)	ND ⁶
	Proportions of mothers or child caretakers washing hands at all four key occasions	8.9% (6.2-11.5)	53.6% (48.9-58.2)	<1% (0.1-1.8)	6.5% (4.6-8.3)	10%
	2.3 To improve the nutritional care of sick children	Proportion of sick children receiving increased breastfeeding	20.9% (17.1-24.6)	62.1% (57.6-66.5)	37.3% (32.9-41.6)	46.8% (43.1-50.5)
Proportion of sick children 6-24 mos fed same or more during illness		42.1% (37.5-46.6)	46.8%	42.5% (38.1-46.9)	40.9% (37.2-44.5)	62%
Proportion of sick children 6-24 months fed more after illness		31.7% (27.4-35.9)	48.7% (41.5-50.8)	32.9% (25.5-40.2)	28.2% (20.6-35.8)	ND ⁶
Proportion of children 6-24 months receiving homemade or ORT during most recent episode of diarrhea		30.5% (26.2-34.7)	53.9% (49.2-58.5)	11% (8.2-13.7)	66.8% (63.3-70.2)	28%
2.4 To improve dietary practices of pregnant and lactating women	Proportion of women eating more during pregnancy	25% (20.9-29)	83.8% (80.3-87.2)	10.6% (7.8-13.3)	66.7% (40.0-93.3)	20%
2.5 To increase postpartum vitamin A supplementation coverage	Proportion of mothers of children <24 months receiving VAS within 45 days of last delivery	55.4% (50.8-59.9)	84% (80.6-87.3)	69.4% (65.2-73.5)	90.1% (87.8-92.3)	85%

¹¹ Out of seven groups: grains, roots & tubers; legumes & nuts; dairy products; flesh foods (meat, poultry fish, organ meats); eggs; Vitamin A-rich fruits and vegetables; other fruits and vegetables

¹² Defined as 2 times for breastfed infants 6-8.9 months and 3 times for breastfed children 9-23 months and includes meals and snacks

Result 2: To improve essential nutrition knowledge and practices

Sub-results	Indicators	Bajura		Kailali		
		Baseline (95% CI)	Endline (95% CI)	Baseline (95% CI)	Endline (95% CI)	Final Target
2.6 To sustain Vitamin A supplementation and de-worming coverage of children 6-59 months	Proportion of children 6-59 months receiving VAS every six months	87.6% (84.5-90.6)	92.1% (89.6-94.5)	86.6%	85.7% (83.1-88.3)	>85%
	Proportion of children 12-59 months receiving de-worming treatment every six months	87.4% (84.3-90.4)	93.1% (90.7-95.4)	65.4%	78.6% (75.5-81.6)	75%

Table 4 M&E Matrix Baitadi OR District

Research Goal: To significantly reduce child malnutrition and related morbidity in intervention compared to control llakas of Baitadi¹³						
Sub-Objective: To improve the nutritional status of children under 2 years and their mothers in the intervention compared to control llakas						
Sub-objectives	Double-Difference Final targets/Indicators	Intervention area		Control area		DID ¹⁴
		Baseline	Endline	Baseline	Endline	
1. To improve anthropometric status of children assessed at age 12-48 months and women of reproductive age	Reduction in stunting among children 12-48 months (height for age Z-score <-2 SD)10 percentage points greater in intervention compared to control llakas	-2.23 ± 1.14	-2.10 ± 1.28	-2.40 ± 1.14	-2.33 ± 1.26	0.93 (0.73-1.18)
	Reduction in wasting among children 12-48 months (weight for height Z-score <-2 SD)6 percentage points greater in intervention compared to control llakas	-0.91 ± 0.93	-0.85 ± 0.98	-0.93 ± 0.89	-0.71 ± 1.08	0.99 (0.68 – 1.45)
	Reduction in underweight among children 12-48 months (weight for age Z-score <-2 SD)2 percentage points greater in intervention compared to control llakas	1.87 ± 0.99	-1.77 ± 1.00	-1.97 ± 0.94	-1.77 ± 1.04	1.13 (0.89 – 1.43)
	Reduction in underweight among women of reproductive age (BMI <18.5 kg/m ²)	28.2 (25.3 – 31.1)	26.6 (24.0 – 29.1)	17.5 (15.0 – 20.0)	23.0 (20.6 – 25.4)	0.65 (0.49 – 0.87)*
2. To decrease anemia levels in children 6-24 months and pregnant and lactating women	Reduction in prevalence (%) of anemia among children 12-48 months significantly greater in intervention compared to control llakas (target: 15 percentage points difference) defined as Hb concentration <110g/dL adjusted for altitude	28.2 (25.4 – 30.9)	30.8 (28.3 – 33.3)	31.6 (28.8 – 34.4)	42.5 (39.9 – 45.2)	0.77 (0.60 – 1.00)#
	Reduction in prevalence of anemia in non-pregnant women of reproductive age (Hb<11 g/dl) significantly greater in intervention compared to control llakas (target: 5 percentage points difference)	19.4 (16.9 – 21.9)	24.3 (21.8 – 26.7)	20.9 (18.2 – 23.5)	36.0 (33.2 – 38.7)	0.59 (0.45 – 0.76)*
	Increase in proportion of women who reported taking any iron supplements in previous pregnancy (target: 20 percentage difference)	72.2 (69.5 – 74.9)	92.3 (90.9 – 93.8)	77.3 (74.7 – 79.8)	85.4 (83.5 – 87.3)	2.70 (1.95 – 3.73)*

¹³ For all values the confidence interval calculated are at 95% confidence level. Age of the children selected for survey was 12-47 months. Boldface numbers indicate changes with final analysis.

¹⁴ Adjusted logistic regression testing for difference in differences and controlling for: number of children in HH; male-headed HH; caste (high/low); respondent employed outside home; mother's education (some/none); mother as primary caretaker (y/n) (child outcome only); child's age and sex (child outcome only); mother's age (WRA outcome only).

*P<0.05; # P<0.051 (borderline significant)

Result 1: To increase the availability of MN-rich foods year round for consumption by children under 2 years, pregnant and lactating women in intervention compared to control llakas						
Sub-results	Double-Difference Final targets/Indicators	Intervention area		Control area		DID
		Baseline	Endline	Baseline	Endline	
1.1 To increase the number of varieties and volume of micronutrient rich foods (plant and animal sources) available year round for family consumption through HFP	Increase in proportion of households with developed or improved HFP significantly greater in intervention compared to control llakas	1.3 (0.2 – 2.4)	60.0 (57.3 – 62.7)	0.7 (-0.1 – 1.5)	2.1 (1.2 – 3.0)	37.8 (8.38 – 170.2)*
	Increase in median number of MN-rich vegetable cultivated by HH each year significantly greater in intervention compared to control llakas	4.0 ± 2.0	8.0 ± 4.0	4.0 ± 2.0	4.0 ± 2.0	1.80 (1.69 – 1.92)*
	Increase in proportion of households with poultry production significantly greater in intervention compared to control llakas	11.9 (10.0 – 13.9)	29.5 (27.0 – 31.9)	14.7 (12.5 – 16.8)	16.7 (14.7 – 18.7)	2.64 (1.93 – 3.62)*
	Increase in median production (in kg) of MN-rich fruits and vegetables over 2-month period significantly greater in intervention compared to control llakas significantly greater in intervention compared to control llakas	10.0 ± 15.5	30.0 ± 30.0	10.0 ± 15.5	13.0 10.0 ± 12.0	2.24 (1.97 – 2.54)*
1.2 To increase household income generated by women through HFP	Increase in proportion of women with HFP generating income by selling garden and/or poultry products significantly greater in intervention compared to control llakas	8.4% (6.7-10.1)	15.3% (13.3-17.3)	6.6% (5.1-8.1)	6.8% (5.4-8.2)	NC
	Number and percent of HHs purchasing animal source foods with income generated by sales of garden produce	0	8.0% (3.0-13.0)	0	10% (-0.7-20.7)	NC

Result 2: To improve essential nutrition knowledge and practices in intervention compared to control llakas						
Sub-results	Double-Difference Final targets/Indicators	Intervention area		Control area		DID ¹⁵
		Baseline	Endline	Baseline	Endline	
2.1 To increase optimal breastfeeding feeding practices	Increase in proportion of children born in past 24 months who were put to the breast within 1 hour of birth significantly greater in intervention compared to control llakas (target: 10 percentage points difference)	59.2 (54.2 – 64.2)	52.2 (47.3 – 57.0)	50.4 (45.3 – 55.5)	37.5 (33.3 – 41.6)	NC
	Increase in proportion of infants 0-5.9 months who received only breast milk during the previous day significantly greater in intervention compared to control llakas (target: 10 percentage points difference)	62.5 (53.0 – 72.0)	76.7 (68.4 – 85.0)	61.6 (51.9 – 71.4)	63.0 (54.5 – 71.5)	1.86 (0.83 – 4.20)
2.2 To improve the quality, diversity and quantity of complementary feeding of children 12-24 months [Note that by design sample focused on children 12-48 mos., therefore complementary feeding practices are limited to ages 12-23 months]	Increase in proportion of children 12-23 months of age receiving foods from ≥4 food groups ¹⁶ during the previous day significantly greater in intervention compared to control llakas (target: 10 percentage points difference)	41.5 (36.5 – 46.5)	82.0 (78.3 – 85.8)	42.2 (37.2 – 47.2)	46.9 (42.6 – 51.2)	5.33 (3.50 – 8.11)*
	Increase in proportion of children 12-23 months of age receiving solid, semi-solid or soft foods the minimum number of times ¹⁷ or more in the previous day significantly greater in intervention compared to control llakas (target: 10 percentage points difference)	83.8 (80.1 – 87.6)	96.4 (94.5 – 98.2)	87.3 (84.0 – 90.7)	91.5 (89.1 – 93.9)	NC
	Increase in proportion of children 12-23 who consumed animal flesh foods during previous 24 hour period significantly greater in intervention compared to control llakas (target: 20 percentage points difference)	4.6 (2.4 – 6.7)	5.6 (3.4 – 7.8)	4.2 (2.2 – 6.3)	4.3 (2.6 – 6.1)	NC
	Increase in proportion of children 12-23 who consumed eggs significantly greater in intervention compared to control llakas	2.7 (1.0 – 4.4)	14.6 (11.1 – 18.0)	1.6 (0.3 – 2.8)	2.4 (1.1 – 3.8)	3.94 (1.20 – 13.0)*
	Increase in proportion of children 12-23 consumed iron rich plant source food (legumes) significantly greater in intervention compared to control llakas (target: 20 percentage points)	55.5 (50.4 – 60.6)	90.3 (87.4 – 93.2)	54.1 (49.0 – 59.1)	62.7 (58.6 – 66.8)	5.22 (3.26 – 8.34)*
	Increase in proportion of children 12-23 consumed Vitamin A rich plant source food over previous 24 hour period significantly greater in intervention compared to control llakas (target: 20 percentage points difference)	63.1 (58.1 – 68.0)	93.0 (90.5 – 95.4)	66.0 (61.2 – 70.8)	68.4 (64.4 – 72.3)	6.94 (4.14 – 11.16)*
	Increase in proportions of mothers or child caretakers washing hands at all four key occasions significantly greater in intervention compared to control llakas (target: 20 percentage points difference)	0	11.3 (9.6 – 13.0)	0	0.9 (0.4 – 1.4)	NC

¹⁵ Difference in differences unadjusted; * P<0.05; NC=Not calculated

¹⁶ Out of seven groups: grains, roots & tubers; legumes & nuts; dairy products; flesh foods (meat, poultry fish, organ meats); eggs; Vitamin A-rich fruits and vegetables; other fruits and vegetables

¹⁷ Defined as 2 times for breastfed infants 6-8.9 months and 3 times for breastfed children 9-23 months and includes meals and snacks

Result 2 (cont): To improve essential nutrition knowledge and practices in intervention compared to control llakas						
	Double-Difference Final targets/Indicators	Intervention area		Control area		DID¹⁸
		Baseline	Endline	Baseline	Endline	
2.3 To improve the nutritional care of sick children	Increase in proportion of sick children receiving increased breastfeeding significantly greater in intervention compared to control llakas (target: 20 percentage points)	16.7 (0.6 – 32.7)	74.5 (61.5 – 87.4)	19.6 (7.7 – 31.5)	44.3 (32.4 – 56.2)	4.46 (0.97 – 20.57)*
[Note that by design sample focused on children 12-48 mos., therefore complementary feeding practices are limited to ages 12-23 months]	Increase in proportion of sick children 12-23 months fed same or more during illness significantly greater in intervention compared to control llakas	31.8 (10.7 – 53.0)	46.8 (32.0 – 61.6)	39.6 (24.3 – 54.8)	40.5 (29.1 – 52.0)	NC
	Increase in proportion of sick children 12-23 months fed more after illness significantly greater in intervention compared to control llakas	NA	34.4% (27.8-41.0) (12-23 mos.)	NA	11.4% (8.1-14.7) (12-23 mos.)	NC
	Increase in proportion of children 12-23 months receiving homemade or ORT during most recent episode of diarrhea significantly greater in intervention compared to control llakas (target: 10 percentage points difference)	51.1% (36.5-65.7) (12-23 mos.)	77% (69.5-84.5) (12-23 mos.)	46.3% (35.4-57.2) (12-23 mos.)	70.1% (65.0-75.2) (12-23 mos.)	NC
2.4 To improve dietary practices of pregnant and lactating women	Increase in proportion of women eating more during pregnancy significantly greater in intervention compared to control llakas (target: 10 percentage points difference)	15% (8.0-22.0)	40% (31.4-48.6)	10.9% (5.5-16.3)	9.4% (4.3-14.5)	4.45 (1.56 – 12.63)*
2.5 To increase postpartum vitamin A supplementation coverage of women	Increase in proportion of mothers of children <24 months receiving VAS within 42 days of last delivery significantly greater in intervention compared to control llakas (target: 15 percentage points difference)	35.5 (32.7 – 38.4)	80.3 (78.2 – 82.5)	41.4 (38.4 – 44.4)	63.1 (60.5 – 65.7)	3.06 (2.38 – 3.92)*
2.6 To sustain Vitamin A supplementation and de-worming coverage of children 6-59 months	Proportion of children 12-59 months receiving VAS every six months sustained at >85%	93.6 (92.2 – 95.1)	98.0 (97.3 – 98.8)	95.3 (94.1 – 96.6)	95.6 (94.5 – 96.7)	NC
	Proportion of children 12-59 months receiving de-worming treatment every six months increased by 10 percentage points.	85.5 (83.4 – 87.6)	94.8 (93.6 – 96.0)	90.6 (88.8 – 92.3)	92.8 (91.4 – 94.2)	2.30 (1.51 – 3.50)*

¹⁸ Difference in differences unadjusted; * P<0.05; NC=Not calculated; NA=Not available

Result 3: To increase the capacity of health, agriculture, NGO and community agents to promote improved nutrition and agricultural practices			
Sub-results	Final Targets/Indicators	Baseline	Endline
3.1 To strengthen the capacity of district health and agricultural staff, NGO staff, FCHVs and members of Mothers Groups to promote optimal nutrition practices	Number of people trained in ENA BCC by type (e.g. district health and agricultural staff, FCHV supervisors, FCHVs, members of mothers groups) ENA/BCC MTOT: 25 master trainers ENA/BCC TOT ENA training VMF/FCHVs: 40 FCHVs ENA training HFPBs	0	24 Master Trainers 8 trainers 318 VMF/FCHVs 3029 HFPBs
3.2 To strengthen the capacity of local NGOs, district agricultural staff and selected FCHVs to establish and maintain Village Model Farms (VMFs)	Number of local NGO and district agricultural staff trained in HFP (target: 25) HFP MTOT and TOT HFP VMF training (target: 120) HFP HFPB training Number of VMFs including poultry (target: 120) Number of VMFs including improved or developed garden (target: 120)	0	12 Master trainers 8 trainers 122 VMFs 3329 HFPBs 122 VMFs 122 VMFs
3.3 To develop the capacity of members of HFPBs to undertake HFP	Number of Mothers Groups established around VMFs Number of Mothers Groups members given training in HFP	0	179 179
3.5 To strengthen the decision making role of women over use of HFP income	Percent of women with home gardens/poultry having major control of decisions on the utilization of income generated from poultry sales	32.4	59.3

Result 4: To share results of operations research with decision-makers in Nepal and internationally in order to catalyze replication of model			
Sub-results	Final Targets/Indicators	Baseline	Endline
4.1 To keep national policy makers in charge of food security, agriculture and health programs aware and informed of the progress and results of OR	At least 3 meetings held each year (every 4 months) with national level stakeholders to report on progress and share results At least 3 meetings held each year (every 4 months) with district level stakeholders to report on progress and share results	0	every month every month
4.2 Data collected for operations research analyzed, submitted for publication, and disseminated widely	-- Research findings shared with all relevant stakeholders within Nepal -- At least 3 peer review publications in process by LOP --At least 2 presentation of research progress/findings at international conferences by LOP	0	2 articles submitted 2 presentations

F. Discussion of the Progress towards Achievement of Results

Overall, the AAMA project was implemented as designed with some improvements after the MTE including hiring more staff for the bigger district, and adding the governance component to enable replication and enhance potential sustainability of certain elements. The NGO partners were very dedicated, although there was some issue with high turnover of staff in Kailai at the beginning of the project. There was almost no desertion of the volunteer VMFs, which may be because the inputs they received served as good incentives. The initial participants in the AAMA groups were exposed to all the learning opportunities before attendance started to wane. At that point, HKI staff created new, attractive activities to re-engage the participants, such as cooking demonstrations. Looking at monitoring data, it can be seen that most AAMA beneficiaries received at least 26 months of exposure, meeting twice a month.

1. Contribution Towards Project and OR Objectives

*Result 1. To improve the **nutrition and health status** of children under two years and pregnant and lactating women*

AAMA did not achieve changes in nutritional or health status in the OR district according to the cross-sectional survey data. There was a modest change in the overall mean z-score for stunting among the intervention population as compared to the baseline, but there was no statistical change in the percentage of children in the intervention area with height for age below -2z and no change in the other anthropometric indicators. There were higher rates stunting among children in the control area when compared the intervention area at both baseline and final.

Child Anthropometry¹ for Baitadi District

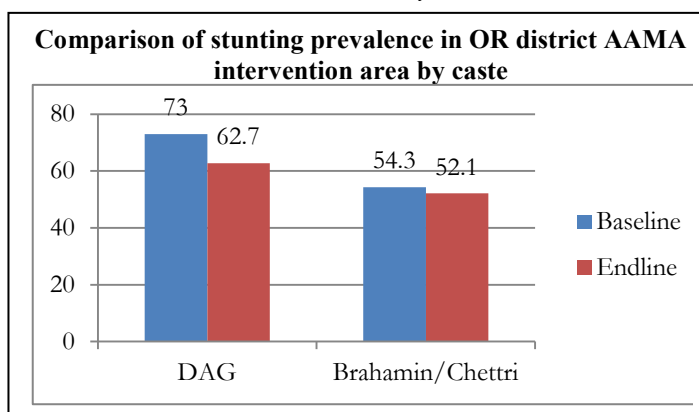
	Baseline			Endline		
	Total	Intervention	Control	Total	Intervention	Control
<i>n</i>	2106	1055	1051	2613	1306	1307
HAZ ²	-2.31 ± 1.14	-2.23 ± 1.14	-2.40 ± 1.14*	-2.21 ± 1.28 [#]	-2.10 ± 1.28 [#]	-2.33 ± 1.26*
<-2 to ≥ -3, %	35.6	34.2	37.0	34.6	33.4	35.7
<-3, %	26.2	23.5	28.8*	24.8	21.7	27.8*
Total (<-2), %	61.7	57.7	65.8*	59.3	55.1	63.5*
WAZ	-1.92 ± 0.97	-1.87 ± 0.99	-1.97 ± 0.94*	-1.77 ± 1.02 [#]	-1.77 ± 1.00 [#]	-1.77 ± 1.04 [#]
<-2 to ≥ -3, %	32.8	31.0	34.6	29.7 [#]	30.6	28.8 [#]
<-3, %	12.9	12.4	13.4	11.1	10.4	11.8
Total (<-2), %	45.7	43.4	48.0*	40.8 [#]	41.0	40.6 [#]
WHZ ³	-0.92 ± 0.91	-0.91 ± 0.93	-0.93 ± 0.89	-0.78 ± 1.03 [#]	-0.85 ± 0.98	-0.71 ± 1.08* [#]
<-2 to ≥ -3, %	8.6	8.7	8.4	8.2	8.7	7.8
<-3, %	1.8	1.9	1.7	1.9	1.8	1.9
Total (<-2), %	10.4	10.6	10.1	10.1	10.5	9.7

¹Values are mean ± SD or percent; ²n=2098 at baseline and 2596 at endline ³n=2102 at baseline and 2603 at endline

*Different from corresponding treatment group, $P < 0.05$; [#]Different from baseline value $P < 0.05$.

HAZ: height for age z-score; WAZ: weight for age z-score; WHZ: weight for height z-score

As explained previously, HKI used cross-sectional sampling in the target areas as well as in the control areas at endline. Approximately eighty-six percent of respondents of the total sample in the OR intervention areas reported participating in AAMA. In the Table 3 M&E Matrix for Baitadi above, we have presented data for this subset of the total cross-sectional sample in the intervention area separately. As can be seen in the table, the stunting rate among direct beneficiary children is significantly lower ($P < 0.05$) than at baseline or in the control area. Notably, there was much greater impact on stunting in the intervention area among disadvantaged groups (DAG). The AAMA project made a concerted effort to include DAG, creating strategies for the VMFs to feasibly work with those of different castes. After the MTE in Kailali, the governance activities facilitated inclusion of more DAG in AAMA activities as will be described in the later in this document.



In Kailali District, there was a significant decrease in stunting from 28.9% to 18.4%. In Kailali, anemia prevalence among children decreased significantly from 57.7% to 48.8%. Anemia prevalence among women in Kailali did not change although 87.7% reported taking the full 180 day course of iron supplements during their most recent pregnancy, up from 43.8% at baseline.

In Baitadi, the prevalence of anemia among children, did not change in the intervention (treatment) group and increased in the control area as shown in the table below. Total anemia prevalence among the women in the intervention group was higher in the endline (24.3%) than the baseline (19.4%) but increased even more among women in the control areas from 20.9% to 36.0% ($P < 0.05$).¹⁹

	Child hemoglobin concentration and anemia ¹					
		Baseline		Endline		
	Total	Treatment	Control	Total	Treatment	Control
<i>n</i>	2105	1055	1050	2614	1307	1307
Hemoglobin g/dL	11.8 ± 1.2	11.9 ± 1.2	11.8 ± 1.3	11.7 ± 1.2 [#]	11.8 ± 1.2	11.5 ± 1.3* [#]
Anemia, ² %						
Mild and moderate	29.6	27.8	31.4	36.5 [#]	30.6	42.5* [#]
Severe	0.3	0.4	0.2	0.1	0.2	0.1
Total	29.9	28.2	31.6	36.6 [#]	30.8	42.5* [#]
Difference in differences in any anemia adjusted for potential confounders: 0.77 (0.60 – 1.00)[#]						

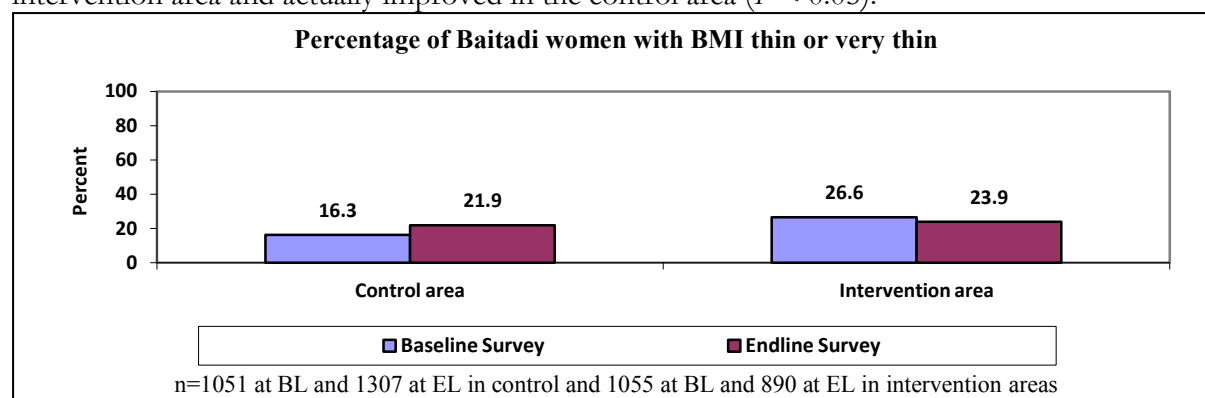
¹Values are mean ± SD or percent

²Anemia was defined as: hemoglobin < 11.0 g/dL, with mild and moderate defined as hemoglobin < 11.0 to ≥ 7.0 g/dL and severe as hemoglobin < 7.0 g/dL **and adjusted for altitude**

*Different from corresponding treatment group, $P < 0.05$; [#]Different from baseline value $P < 0.05$.

¹⁹ HKI addendum: As footnoted previously, the difference in differences analysis showed a near significant reduction in anemia among children 12-48 months in treatment compared to control areas and a significant reduction in anemia among women of reproductive age: for the latter the adjusted odds ratio was 0.59 (0.45 – 0.76); $p < 0.05$.

While Body Mass Index was not a specific OR indicator, it is a measure of improvement of in women’s nutritional status. As can be seen in the figure below, BMI did not change in the intervention area and actually improved in the control area ($P < 0.05$).²⁰



As can be seen in the Table 3 M&E Matrices and summarized in the table below, there were many very positive changes (all statistically significant) in the Essential Nutrition Actions related to Infant and Young Child Feeding. These reflect the effectiveness of the ENA sessions conducted by the VMFs and FCHVs who were trained by the project and the fact that they were conducting these sessions in small groups with repetition of messages in different ways. The group setting provided an opportunity for women to share experiences and support each other to try new behaviors.

Changes in Infant and Young Child Feeding Practices in all Districts

Behavior	Kailali		Baitadi		Bajura	
	Baseline %	Endline %	Baseline %	Endline %	Baseline %	Endline %
Exclusive Breastfeeding	79.1	82.9	62.5	76.7	73.7	78.3
Immediate Breastfeeding	59.9	79.1	59.2	52.2	41.7	81.1
Dietary Diversity \geq 4 groups	20.8	78.3	41.5	82.0	35.7	69.1
Adequate Feeding Frequency	52.5 ²	91.9	83.8	96.4	59.3	84.0
Child ate iron-rich animal food	15.2	25.6	7.3	20.2	10.2	45.2
Child ate Vit. A-rich animal food	5.2	32.4	78.6	88.3	50.9	76.2
Child ate iron-rich plant food	32.2	43.3	55.5	90.3	44.5	70.4
Child ate Vit. A- rich plant food	42.6	54.7	63.1	93.0	52.3	14.4 ¹
Increased breastfeeding during illness	37.3	46.8	16.7	74.5	20.9	62.1
Same or more food offered during illness	42.5	40.9	31.8	46.8	42.1	46.8

¹ Seasonality is a factor due to timing of endline only in Bajura. ² Baseline and endline of children 6-23 months of age for Kailali and Bajura; 12-23 months for Baitadi.

There may be many explanations why the anthropometric and anemia indicators did not improve significantly in the OR district. Participants in Baitadi were engaged in project activities for slightly more than two years. They planted their first gardens in the spring of 2010 and received their poultry after that. This simply may not have been enough time to show impact of increased access to nutrient-rich foods which was needed in addition to the improvements in feeding behaviors.

The survey results for the OR district show a much higher prevalence of illness during the two weeks prior to the survey for all illnesses at endline: fever, respiratory and diarrhea, all statistically

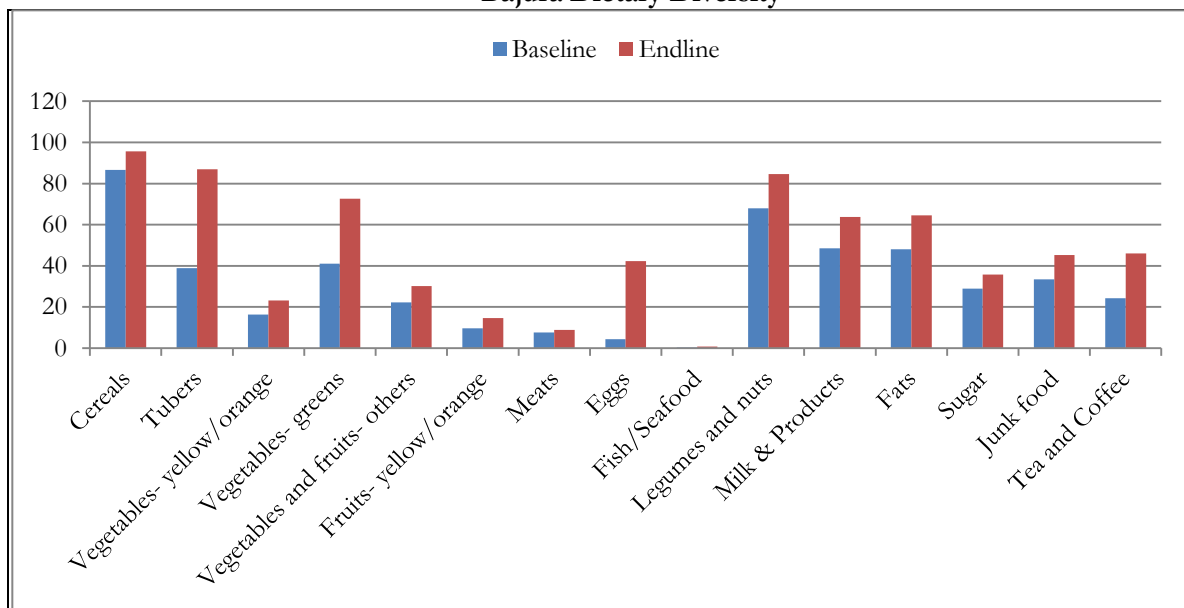
²⁰ **HKI addendum:** adjusted logistic regression analysis revealed a significant reduction in underweight: the odds of underweight in intervention compared to control communities was 0.63 (0.47 – 0.84); $p < 0.05$. The proportions differed somewhat in final analysis but the conclusion is the same.

significant. Baseline was 15.1% prevalence of any illness, and the prevalence at endline was 31.2%. Bi-variate analysis showed no direct association of anthropometric status with illness. There is recent research²¹ that has found an association between tropical enteropathy of the gut and chronic malnutrition. This is caused by children being exposed to poor sanitation and hygiene and is hypothesized to explain the link between poor sanitation and stunting rather than just diarrhea prevalence.

Hygiene and sanitation remain very serious issues in the target areas. In Kailali, 77% of families have a latrine or toilet. Only 18% of families disposed of children’s feces in the toilet or latrine. While Kailali families reported using soap to wash their hands, only 6.5% reported washing hands at all four key occasions. This was up from less than 1% at baseline. In Baitadi OR areas, the percentage of families having a latrine increased from 42.5% at baseline to just over 50% in the endline (unrelated to AAMA). Only 7.2% of mothers reported disposing of the child’s feces in the toilet. Nearly half of women in Baitadi OR areas have to leave their yard to wash their hands, although there was a great increase in the number who have soap at the place where they wash hands. (Baseline: 29%, Endline: 80%). Nevertheless, only 11% of the women in the OR areas reported washing their hands at all four key times.

There were improvements in dietary diversity as a result of the ENA messages including the demonstrations on making enriched weaning food. Although direct attribution is difficult without further analysis, the increased home food production may have also played an important role in increasing dietary diversity.

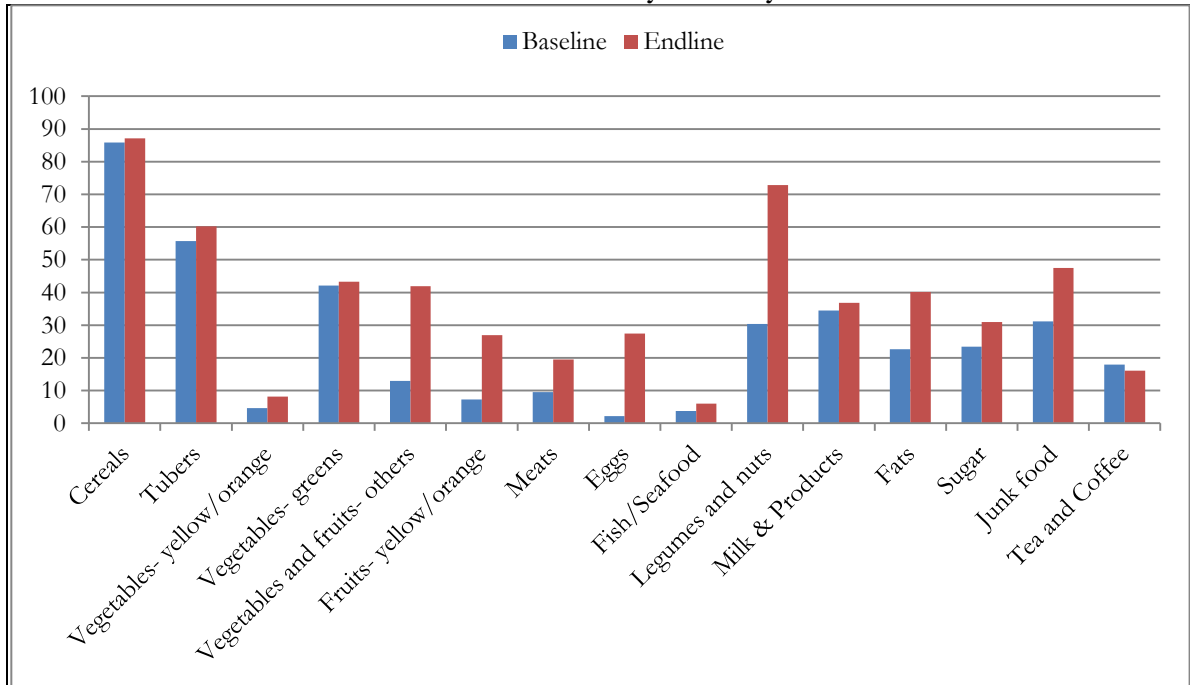
Bajura Dietary Diversity



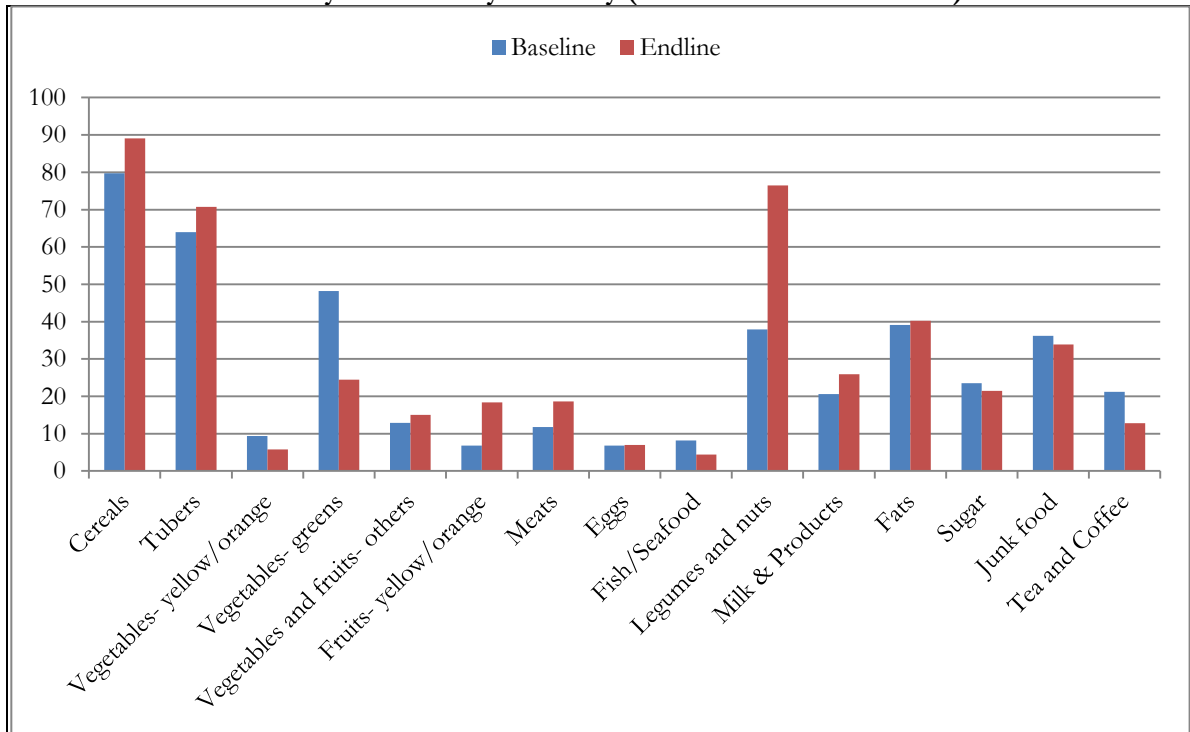
The improvements in dietary diversity become even more evident when comparing to control districts as seen in the following pairs of graphs.

²¹ Humphrey, J.H. Child undernutrition, tropical enteropathy, toilets, and handwashing, *Lancet*, **2009**; 374: 1032–35

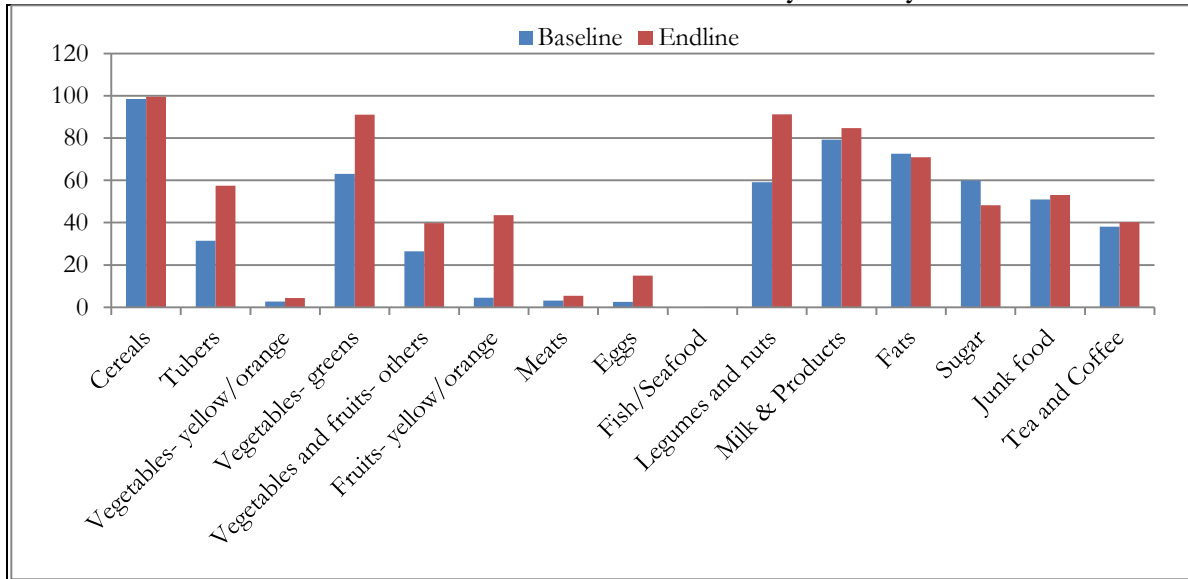
Kailali Dietary Diversity



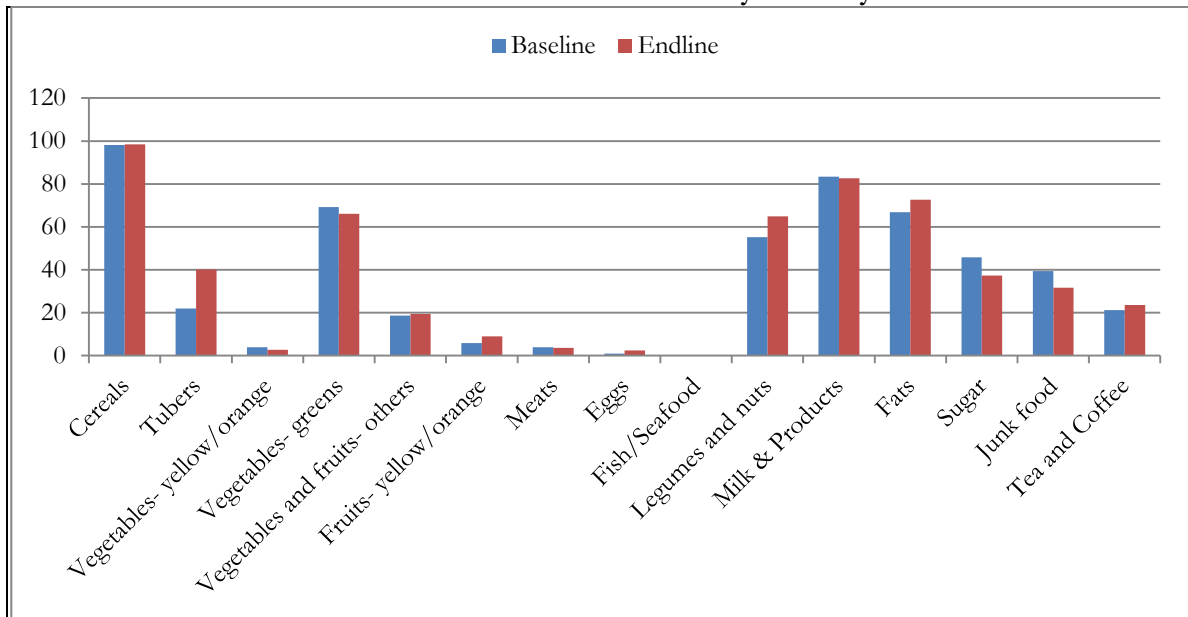
Biyardia Dietary Diversity (Control district for Kailali)



Baitadi OR Intervention Areas Dietary Diversity²²



Baitadi Control Areas Dietary Diversity



One caveat in interpreting results for dietary diversity in the endline is that women in the AAMA target areas have gotten the messages on dietary diversity and which foods they are supposed to be feeding their children or eating more of themselves during pregnancy. Therefore, when asked what they fed their child the previous day, they may have given the “expected” answer rather than what they actually gave their child. Another concern with dietary diversity is the lack of quantification – we do not know how much of any particular mentioned food was actually eaten.

²² HKI addendum: final proportions differ somewhat; see OR report.

Result 2. *To increase the **accessibility and availability of year round of micronutrient-rich foods** for consumption by children under two years and pregnant and lactating women*

Increasing access and availability of micronutrient-rich foods throughout the year would remove the biggest barrier that families in the target areas face in increasing nutrient intake of women and children. AAMA had two components within their Homestead Food Production approach: home gardens and poultry-raising. There is evidence from the baseline and final surveys of success in the vegetable garden component as summarized in the table here.

Up-take of Home Gardening in All Districts

HFP practices for home gardens	Kailali		Baitadi Intervention Area		Bajura	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
% of HH having a kitchen garden	69.6	89.5	44.8	97.6	40.7	72.7
% having Improved/Developed Gardens	11.5	59.7	1.3	60	8.2	34.4
Vegetable production in last 2 mos. (kg)	45.4	156.9 ¹	10	30	19.4	22.3
Mean number of vegetable varieties	2	5.78	4.0	8.0	2.41	6.36
Produced or planted year around	-	36.4	-	28.1	-	31.8
Use of domestic pesticide	6.2	25.7	3.3	57	3.8	56.1

¹ Total is likely affected by weight of pumpkin harvest.

Besides basic gardening skills of plotting, use of compost and home-made organic pesticides, AAMA introduced technologies such as row covers in Baitadi and raised beds in Kailali to extend the growing season. It was, perhaps, a bit ambitious to strive for year around vegetable production for everyone, considering the frost in high altitudes and monsoonal flooding in the lowlands, but project efforts have definitely extended the growing season in both environments.

The final evaluation team found that there were still issues with site selection in Kailali with some gardens or fruit trees planted in the shade or in low-lying spots prone to water-logging. On the other hand, AAMA had started to create stronger links with agriculture extension and private companies to enable beneficiaries to access seed, including varieties suitable for marketing. There had been less attention given to promoting vegetables that are the better sources of beta carotene, particularly pumpkins and carrots. For example, in Baitadi which has a very suitable climate and soil for both, the endline survey showed that, on average out of the 8 varieties grown, families were growing only one dark yellow/orange vegetable but were growing about 4 green leafy vegetables and the other 4 varieties were vegetables of low Vitamin A value.²³

Overall, the data from the dietary diversity tables above shows that vegetable consumption in the target areas has definitely increased. Another question in the survey asked mothers whether they are feeding their child either purchased or home-grown vegetables daily and this practice increased from 30 to 53% in Baitadi intervention zone.

During the final evaluation, women interviewed with specific questions, reiterated that the single most important facilitating factor to feeding their child eggs frequently was having their own hens to lay eggs. Under the HFP strategy, each AAMA beneficiary was given five chickens of improved breeds and some instruction on how to care for them. The VMFs were given 20 chickens, including roosters, with the intent that they could reproduce chicks to sell to others. Unfortunately, this

²³ HKI addendum: at the time of the final evaluation it was not the season for pumpkins or carrots, but these plants are important components of the HFP.

strategy was not very successful. Losses of chickens were very high because, in most households, the improved breeds were not kept confined in coops with pens. They died in accidents, were killed by predators including dogs and cats, and were killed by neighbors when found in their crops.

The Government of Nepal does not have a vaccination program for poultry, although they recommend seven vaccinations to cover three different diseases: Newcastle, Marek’s Disease and Fowl Pox. The latter immunizations are particularly costly and more related to egg production than to poultry death. The single biggest killer of poultry in Nepal and elsewhere is Newcastle Disease. AAMA did not start out with a strategy for poultry vaccination since they were giving out poultry that had already received the seven vaccines. The offspring of these chickens, however, needed vaccination from Newcastle to survive, particularly since this disease is endemic in local poultry. This was brought to the attention of AAMA staff at the time of the MTE and some effort was then made to provide vaccine to some communities, either through coordination with DLSO or by teaching some VMFs to purchase vaccine and vaccinate chicks. The latter was complicated by the vaccine being sold in vials of 200 doses. HFPBs were largely still unaware of the importance of vaccination at the time of the final evaluation and reported many chickens, both local and improved, lost to disease. As shown in the chart below, vaccination coverage for poultry was essentially nil.

At the end of the project, very few beneficiaries had any chickens of the improved breeds left although some few had a generation of chickens from crossing local chickens with the improved breeds. Over all, there was no statistically significant increase in the mean number of chickens owned by the households. There was, however, a statistically significant increase in the numbers of households owning poultry, but having 3 or 4 laying hens will result in only two or three eggs for about nine months out of the year²⁴.

Poultry Production Data

	Kailali		Baitadi		Bajura	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
% of households with any chickens	60.9	77.4	10.8	29.1	24	66.2
Mean number of chickens in household	9.2	9.8	4.40	4.36	2.37	3.37
No vaccination of chickens	97.8	97.3	98.4	98.2	95.4	96.6
Wife spends money earned from poultry	37.0	50.9	32.4	59.3	31.3	64.9

On a positive note, among those families who have chickens now, the final survey found that the women raising the chickens were in control of spending any income earned, more so than at baseline. This may be because the new chickens were perceived as hers instead of belonging to the extended household where most income is shared. The women reported spending this money for household items rather than for micronutrient-rich food, but that included spending for soap and school supplies among a wide range of other utilitarian needs.

Some families reported feeding their children eggs, which is a cultural shift. Particularly, among Brahamin families, this was taboo prior to the project intervention, and they did not raise chickens, but, as reported in the MTE learning briefs, some progress was made in getting them to adopt raising chickens and feeding eggs to their child. Note that the question on which the following table

²⁴ HKI addendum: by our calculations the mean of 4 hens lay 80 eggs per year and production is year round.

was based, did not ask how often the child had been fed an egg²⁵. The large majority of families were still not feeding eggs to their children, a behavior which may have directly affected the lack of improvement in nutritional status.

Fed egg to child age 6-23 months (12-23 months in Baitadi) in last 2 months						
	Kailali		Baitadi		Bajura	
	Baseline	Endline	Baseline	Endline	Baseline	Endline
Yes	7.6	36	5.5	21.3	5.8	61.7
No	92.4	64	94.5	78.7	94.2	38.3

*Result 3. To **increase the capacity** of local NGO and district staff, FCHVs and community members to promote improved nutrition and agricultural practices*

Across all districts, this result has been achieved. The Training chart in Annex 7 shows the numbers of NGO and district government staff, FCHVs and community members (VMFs) trained. Evidence from the quantitative surveys, as shown in Table 2, and from qualitative questions used to triangulate these findings, testify that those trained have the capacity to effectively transmit learning to the target population.

Result 4. To develop an integrated **food security and nutrition intervention** that serves as a district wide model to scale-up

Kailali, the district chosen for the scale-up model, is one of the most populous and one of the largest in territory in all of Nepal. The original model, based on the concept of diffusion, was perhaps unrealistic in this setting. HKI's design of 3 VMFs per VDC with their groups of approximately 40 women, was reaching only 10% of the population at mid-term. After the MTE, HKI used the USAID Nepal funding for adding a governance component, to work with the District Development Committee and the Village Development Committees to raise awareness about the issue of malnutrition among children and women and to promote the formation of Food and Nutrition Security Committees, to whom the EHFP model was presented. As a result, the VDCs funded replication of some AAMA activities, but not the entire EHFP package in wards that were not originally targeted. This increased coverage to another five percent of the population. Fifty more women's groups were formed as a result of the VDC-funded replication.

The original design for Kailali called for HFPBs to share their learning with friends and relatives as a means of further diffusion. At the time of the MTE, this was not yet happening. During the final evaluation, HFPBs and VMFs reported that sharing had become much easier, that neighbors were coming around asking what they learned from AAMA and, that there was widespread adoption of certain practices such as preparation of enhanced weaning food (*jaulo*). The project monitoring system, understandably, had no way to capture this diffusion. The endline cross-sectional survey should have captured some of the diffusion, but this is now uncertain due to the apparently skewed sampling of direct project participants.

²⁵ HKI addendum: according to the 24-hour recall, the proportion of children 12-23 months fed eggs increased from 2.4 to 14.6% and was significantly higher in intervention compared to control (though not as much higher as intended).

2. Contextual Factors

Food security is a logical consideration in assessing the nutritional outcomes. The baseline and endline surveys included a series of questions designed by FANTA to assess food security status of the household. According to the survey analysis, food insecurity²⁶ increased in Kailali from 38.8 to 61.2 percent of households within the past 12 months. However, we saw earlier that stunting significantly decreased in Kailali in spite of this. In Bajura, a district noted for food insecurity, 85.8% of households experienced some food insecurity in the year prior to the endline survey. Unfortunately, for Baitadi, the endline question was not asked the same way as the baseline, so we cannot draw conclusions about any possible change in food security over the life of the project.

The endline survey results also show major improvements in the utilization and delivery of health services that are unrelated to AAMA since there were improvements across the control districts, as well. While AAMA may take some credit for promoting utilization, the following chart shows some of the positive changes attributable to the Government of Nepal because access improved in the control areas, as well.

Improvements in Access to and Utilization of Health Services

	Kailali		Bardiya (control)		Baitadi Intervention		Baitadi Control	
	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
Attended growth monitoring	49.6	74.1	22.1	47.8	50.6	74.5	33.3	51.4
DPT 3 doses	79.5	97.8	81.7	97.9	79.7	98.6	73.0	98.6
De-worming last six months	65.4	78.6	90.4	73.3	85.5	94.8	90.6	92.8
Measles immunization	88.3	95.9	88.1	97.1	90.0	98.3	90.5	98.3

Unexpected Results

AAMA did not have a maternal-newborn care (MNC) intervention other than promoting the nutrition practices related to MNC; nevertheless, the final survey analysis found improvements in Baitadi with statistically significant changes ($P < 0.05$) in the intervention areas compared to the control areas.

Improvements in Maternal Newborn Care Attributable to AAMA

Maternal practices	Baitadi Intervention		Baitadi Control		DID ²⁷ (unadjusted)
	Baseline	Endline	Baseline	Endline	
Received any antenatal care	70.0	93.0	70.2	85.2	NC
≥ 4 antenatal visits	29.3	65.2	20.2	38.8	1.50 (1.14 – 1.98)*
Skilled attendance at delivery	71.8	92.3	81.0	84.2	3.72 (2.69 – 5.15)*

²⁶ HKI clarification: the scale measures respondent perceptions of food insecurity.

²⁷ Addendum added by HKI. * $p < 0.05$

3. Role of Key Partners

The following table summarized the planned and actual roles of the key partners.

Partner	Role in Project	Result of collaboration
NTAG	<ul style="list-style-type: none"> - Support and coordination for planning and implementation of ENA/BCC activities in the districts - Technical support and guidance for production of IEC/BCC materials - Training on ENA/BCC at district level - Coordination with DPHO and health facilities - Support and coordination for monitoring to HKI district coordinators and local NGO partners 	<ul style="list-style-type: none"> - NTAG provided training of trainers (TOT) in ENA and BCC for field staff and FCHV/VMF, and trainings to HFPB - Supported pre-testing of all draft community education materials - Trained staff in MTOT and trainers for FCHV/VMF level - Participated HF and DPHO meetings - Participated in all ENA and IYCF monitoring activities - Assisted field supervisors ENA and IYCF counseling - Assisted field supervisors with growth monitoring at field level in coordination with HF - Assisted with the organization of food demonstrations and counseling to mothers
Local NGOs - NNSWA, SMJK and WDF	<ul style="list-style-type: none"> - Implementation of all AAMA activities in their respective districts - Coordination with district level line agencies - Provision of the human resources required to implement the AAMA activities - Regular follow up of all field activities - Administrative support to HKI district coordinator - Participation in and support to all types of training (HFP, ENA, BCC) at district and community level - Support to monitoring and supervision activities 	<ul style="list-style-type: none"> - Implemented ENA/HFP training, counseling mentoring and monitoring activities with the help of field staff - Participated in regular coordination meetings with line agencies - Made regular joint program monitoring field visits with government officials - Provided support to HKI staff members on administrative and financial operations - Participated and provided logistics support in training and workshops organized by HKI - Participated in and provided field staff support during LQAS and periodic assessments, including the MTE - Field supervisors provided on-site coaching, interpersonal counseling with home visits and growth monitoring /counseling - Field supervisors organized demonstrations for mothers on food preparation for children under 2 years of age during the HFPB group meetings - Field supervisors supported project site visits to national and international visitors
DPHO	<ul style="list-style-type: none"> - Attend training and meetings - Supervision of FCHVs - Provide technical support on ENA 	<ul style="list-style-type: none"> - Participated and supported in ENA/BCC training - Supervised all training and activities - Provided facilitators for training - Provided training materials - Provided support during growth monitoring - Provided support to VMFs and HFPBs during ENA training at VDC level
DADO	<ul style="list-style-type: none"> - Attend training and meetings - Supervision of VMFs - Provide technical support on HFP 	<ul style="list-style-type: none"> - Participated in HFP training - Supervised all training activities - Provided facilitators for training the VMFs as local resource persons - Provided training in mushroom cultivation and

		<ul style="list-style-type: none"> - distributed mushroom seedlings - Coordinated multi-sector input for food security and nutrition - Provided regular technical support through VDC level agro-vets
DLSO	<ul style="list-style-type: none"> - Attend training and meetings - Supervision of VMFs - Provide technical support for poultry 	<ul style="list-style-type: none"> - Participated in HFP training - Provided pig raising training - Provided technical advice for improved poultry rearing practices during integrated supervision and monitoring visits and during training and field activities - Provided cold chain boxes for poultry vaccination
DDC	<ul style="list-style-type: none"> - Support DDC level activities - Support program monitoring - Support DDC level activities VDC committee members orientation on their roles and responsibilities 	<ul style="list-style-type: none"> - Conducted coordination meetings on the multi-sectoral approach through the local governance program - Provided facilitators for the Ward Citizen Forum orientation and VDC committee members orientation - Initiated growth monitoring for children under 2 years through VDC staff - Distributed Salter scales for community based growth monitoring services at community level in coordination with HFs. The scales were supplied by UNICEF. - Led joint monitoring and supervision visits three times a year at VDC level to promote AAMA initiated activities - Convened regular meetings at DDC level to explore available resources from various sectors to contribute to AAMA initiated activities
VDC	<ul style="list-style-type: none"> - Support VDC level activities 	<ul style="list-style-type: none"> - Provided chickens to local families - Partnered with HKI and trained an additional non-HFPB mothers in poultry raising and ENA - Provided improved seed for HFPB and non-HFPBs - Provided refresher ENA to non-VMF and additional FCHVs - Provided nutrition and food security training to FCHVs by VDC - Provided funds for storing bio-pesticide

4. Overall Design Factors that Influenced Results

Two design issues did affect the project. One, discussed previously, was the selection of Kailali as the scaling-up district with the challenge of reaching so many people in such a large geographic area. This affected the level of scale and diffusion achieved but did not affect outcomes among the direct beneficiaries.

The second design issue of distributing improved breeds of chickens instead of focusing on improving care of existing local chickens was compounded by staff error. The project planned to introduce improved breeds of poultry rather than focusing on improving care of existing (local)

chickens. Beneficiaries struggled to feed the donated chickens properly or protect them adequately with resulting high losses. The protection issue was compounded by the fact that staff did not follow the policy of ensuring the family had built a suitable cage before giving them the chickens. As a result, families did not really increase overall numbers of chickens or eggs to the extent envisioned, as was explained above under Result 2.

The two-year timeframe for Bajura did limit exposure to the learning sessions and also the time available to VMFs and beneficiaries to repeatedly practice new skills such as gardening. Most participants only got to plant one year and received their poultry just months before the endline. This lack of exposure does not show up in the outcome indicators, but may affect how well participants sustain the new behaviors and practices. The local implementing partner is strong and may continue to provide some follow-up support to the VMFs.

a. Contribution to Global Learning

Policy Dialogue for Nutrition-Sensitive Development

HKI helped catalyze a process for bringing together government officials from multiple sectors to develop plans for integrating nutrition objectives into activities both within and beyond the health sector. While this effort was reinforced by the additional support provided by USAID/Nepal, it was the CSHGP funding that initially demonstrated the great promise of this approach. The process began with the establishment of the National Nutrition & Food Security Committee as a forum for dialogue about policy solutions to the persistent high prevalence of undernutrition. These discussions were led by the National Planning Commission (NPC) and included representatives from the ministries of health, agriculture and livestock, local development, and education and aimed to define where and how the different sectors could coordinate to achieve the targets of the National Health Strategic Plan and support the recommendations of the Nutrition Assessment and Gap Analysis. These meetings were followed by a series of workshops to strengthen intersectoral planning at the national as well as regional and district levels. HKI's EHFP approach (local, small scale plant and animal-source food production combined with greater awareness of nutritional content and its value to human health and development) was the starting point for the dialogue on nutrition-friendly programs. The national government has clearly embraced these approaches.

Similar joint planning structures were established at district and village development committee (VDC) levels and stimulated enthusiastic discussions of what each department could contribute to advancing and sustaining AAMA activities. The visible outcomes of the model locally inspired local government bodies to commit funding and staff to replicating the approach as well as to assume responsibility for sustaining the investments. (See the Learning Brief on Governance in the annexes.) More details are presented in HKI's Food Security and Nutrition Bulletin No. 5.

Addressing Equity

Following observations that disadvantaged community members perceive or experience barriers to participation in the program, HKI developed adapted approaches for these groups. In some instances the project supported groups that were comprised only of Dalits (VMF and mothers' group members). In the Chaumala VDC in Kailali, HKI provided technical assistance and supervision to a group of 40 pregnant and breastfeeding mothers and women with children under

two who were all from the marginalized group of former bonded laborers (Kamaiya or Tharu) were freed by the government of Nepal some years ago but remaining exceedingly disadvantaged. The women received project inputs of seeds purchased with VDC funds and training to enable them to exploit the 0.25 hectare plots granted to them previously by the government. Supervisors from the VDC, the food security and nutrition steering committee and AAMA visited the groups quarterly to review their progress with vegetable cultivation and poultry production and, as needed, to provide additional technical support. Through the project, the disadvantaged group has learned the process for securing VDC nutrition and food-security funding, helping to ensure project sustainability. See the Learning Briefs for a more detailed description of reaching the former bonded laborers.

Supervision of volunteers

Lessons for scale up were learned through AAMA to help define the ratio of supervisors needed to follow implementation, support the translation of training into practice, and identify areas needing improvement. HKI now estimates that each supervisor might oversee between 6-10 VMFs depending on geography. Although at start up supervision visits must be more frequent, once routines are established each VMF should be visited once per month by the field supervisors. District coordinators should conduct additional quality control visits to approximately 25 VMFs each month in the terai geography, and 9-10 per month in terrain that is hilly or mountainous. Joint supervisions by government partners should be conducted quarterly so that they remain engaged and informed of the intervention.

Following the mid-term evaluation recommendations, supervision checklists were developed to guide field supervisors in what to look for during visits to VMFs and HH beneficiaries (plotting and raised beds, area of cultivation, number of varieties, poultry coop size and lighting, feed/water, ranging) and questions to explore regarding ENA practices.

For more quantitative monitoring of progress in implementation of program impact pathways (in the case of EHFP, these include quality and completion of training, volume and quality of garden production, quality of animal husbandry, improved maternal, infant and young child nutrition practices, including consumption of garden products) LQAS surveys should be conducted semi-annually, and data analyzed for evidence of implementation weaknesses that need to be resolved. During AAMA, data were collected by PDA, greatly facilitating the immediate use of data for management. Each region should have a dedicated monitoring and evaluation coordinator to oversee the process in the districts and the practical application of findings.

b. Dissemination and Information Use

Dissemination Activity	Target Audience	Target Date (approximate)
Share findings at district level	District Health and Agriculture office, District Development committee	November 2012
Prepare presentation slide to share findings	National Planning Commission, Ministry of Health and Population, Ministry of Agriculture and Cooperatives, Ministry of Local Development	December 2012
Share key AAMA findings to National Nutrition Group (NNG)	USAID, UNICEF, World Bank, WFP, WHO, EU, ACF, Save, academics,	January 2013
Publish results in peer reviewed journals	Researchers, academics, nutrition policy makers and planners	March 2013

G. Conclusions and Recommendations

Conclusions

1. The AAMA project achieved excellent outcomes in changing ENA and maternal health behaviors and adoption of HFP practices for raising vegetables.
2. These outcome improvements were equally impressive in the OR district where there was a much higher ratio of staff and volunteers per beneficiary as in the scaling-up district where the ratio was lower, particularly during the first half of the project.
3. The project did not achieve expected improvements in nutritional status outcomes. There are other factors such as very low levels of sanitation and continued high levels of food insecurity which the project did not address that may play a larger role than dietary diversity and IYCF practices in the current high levels of stunting and anemia. The short time frame of project implementation may not have provided sufficient exposure to new practices, including significantly increasing the amount of micronutrient-rich foods consumed.
4. The poultry component of EHFP needs serious strengthening before further replication. Family flocks did not increase significantly and egg consumption remained very low overall. That said, the fact that some strict Brahman families in Baitadi adopted chicken production and agreed to feed eggs to their children is an accomplishment.
5. The official registration of EHFP groups with DADO with the requirement for their becoming a savings group has greatly enhanced potential for sustainability.
6. The governance component, although limited, was very successful in promoting citizen participation in influencing budget allocations, and in bringing together cross-sectoral working groups to plan, to coordinate, and to influence VDC and District-level funding. The success of the governance component is evident in the appointment of VHF's as Local Resource Persons and in replication of some AAMA activities to many other wards and to marginalized populations.

Recommendations

The first set of recommendations listed here is directed at HKI globally and the second set is specific to Suaahara and other projects in Nepal which may adopt the EHFP model. Finally, there are some recommendations to USAID CSHGP for support to operations research.

For HKI globally to improve HFP:

1. Repeat the OR study, in Nepal under Suaahara and in another context (Africa) with modifications in the sampling design to capture the impact on those children whose mothers have the maximum exposure to the EHFP activities. The final sample should include only those who received the interventions.
2. HKI needs to assess carefully any major changes in the HFP model, such as the elimination of the model farmers. While the concern about equity is understandable, it may be possible to lower criteria and to find VMFs from the same socio-economic strata as the intended participants who can be trained in advance and their model farms developed with the same inputs that will be given to the HFPBs. A major determinant in adoption of new agricultural practices is fear of risk. Research shows that farmers are much more likely to adopt a practice they have seen already successful on another farm; therefore, there is value in having one person in the community implementing new practices in advance of the others in order for them to see the results before investing their time and resources.
3. Reassess introducing improved breeds of poultry for Homestead Food Production. There is consensus from poultry experts (FAO, UD Davis) that it is best to focus on teaching people to take better care of existing local poultry. They require less feed and care, and have instincts to survive that have been lost in developing improved breeds. Five well-cared-for local hens can produce up to 70 eggs each per year²⁸, which would be 350 eggs total. Twenty-five of these could be used for reproduction leaving 325 for the family to consume. If all twenty-five chicks hatch and survive, which is feasible if they are kept penned, some can be sold to cover cost of vaccine and additional feed to supplement what is available from the household.
4. Assure that there is a sustainable system of vaccination against Newcastle Disease before promoting poultry in any context. Village level campaigns on a regular schedule 3-4 times a year are effective.
5. Work with technical staff to develop interactive learning tasks to use with both volunteers and participants for all key messages. A good resource is the book *Taking Learning to Task* by Jane Vella. Using interactive learning tasks is important not only for agriculture, but also to enhance ENA counseling and discussions.

For replication projects in Nepal including Suaahara:

AAMA project staff worked with the evaluation team to prepare a detailed list of technical interventions for Suaahara Project and other projects that are going to be replicating the EFHP model or parts of it in Nepal. The detailed technical recommendations are attached in Annex 16. Some additional recommendations regarding strategy follow here.

²⁸ Data from David C. Bunn, University of California at Davis.

1. Start the mothers' groups with the plan that women will "graduate" when their child completes 2 years or, the graduates may continue meeting independent of the volunteer leader, so that she can incorporate newly pregnant women and mothers in the HFPB group.
2. Getting the groups registered with DADO and starting their savings and loan activities is a good step to creating sustainable groups which can continue to share experiences and technical knowledge, accessing information from government agencies and health posts.
3. While HKI's plan under Suahaara for the selection of the volunteer leader after the EHFP group has been formed and has received some training has advantages in relation to equity and eliminating one layer in the initial cascade training, this idea needs to be tested. Will a mother of a child under two have time to devote to lead the group, prepare demonstrations, make home visits, etc? Will the women be willing to try gardening practices and poultry management without seeing a model already functioning in their community? Will the group members accept training from one of their peers after they are accustomed to receiving training from paid staff?
4. There is a need to bridge the gender gap between the male-dominated ag and livestock service centers and the women in the communities if we expect them to access technical support from the service centers on into the future.
5. The role of supervision using well-thought-out checklists in assuring quality of knowledge and skills transfer must be emphasized. The supervisors should be held responsible for behavior change and adoption of new practices.
6. Multi-sectoral collaboration needs to be started from the very beginning to engage government agencies into the project. Appoint a focal person in each government office involved to orient new staff about shared nutrition goals across sectors, relationship of nutrition to development, and the program activities. Enhance linkages between beneficiaries and markets, brooding centers, livestock and agriculture service centers, health facilities, WASH, HFOMC, VDC, DDC, and WCF (ward citizen forum).
7. Initiate governance programs in all VDCs and wards. Use cross visits to motivate VDC officials and community representatives.

For USAID CSHGP and MCHIP:

1. For the recent round of CSHGP awards, USAID is now requiring a Principle Investigator, one person responsible for the OR. The experience of AAMA losing their Senior M&E Officer, who was essentially filling this role, to a new job with the USAID mission just weeks before the final evaluation suggests that PVOs be encouraged to have from the onset a Plan B for this type of eventuality. Personnel cannot necessarily be committed to stay with the project to the very end. HKI had committed in the OR plan to conduct more in-depth of analysis in time for this report, but had no plan who would carry out that analysis if the M&E officer left or did not have the advanced statistical analysis skills.

2. As part of the OR planning process, grantees may want to create dummy results tables they would like to use in the final report and in dissemination of OR results through other means. This would clarify before the baseline, what variables need to be measured and which types of analysis will be needed for the final results. This will help the principle investigator and research partners plan ahead.
3. CSHGP is now also recommending or requiring collaboration with local institutions on the OR, assuming that such capacity exists in each country. As HKI learned from working with the two local research firms on the final quantitative survey, local capacity was lacking even though these research firms are made up of university faculty in statistics and research methods. How can MCHIP help PVOs learn to assess the capacity of potential local research partners before signing one on during the proposal phase?
4. With the current global focus on nutrition, and particularly the current USAID investments, there is an urgent need for funding to support strengthening measurement of dietary diversity (HDDS tool) to include a practical methodology for measuring quantity of consumption. Also, researchers and academicians involved with using HDDS may want to assess the validity of the tool for use in evaluating changes in practices. Does a respondent's newly-acquired knowledge of healthy eating bias her responses?

AA. Assessing the Operations Research Study

The overall operations research plan was sound, using an experimental design to measure the impact of the intervention Expanded Household Food Production (EHFP) on the target population. In Baitadi, the OR district, the intervention was implemented as a community randomized effectiveness trial. Intervention sites (Ilakas, or sub-regions) were randomly selected and matched with control sites on economic, health and food security indicators. Baseline and end line measures of both arms were compared (double-difference estimates) to allow for probability assessment of the impact of the intervention on child and maternal nutritional status, household nutrition practices and food production. In this model, the project was trying to improve food security and nutrition practices for the entire population of the intervention Ilakas by actively involving approximately 70 percent of the population of mothers of children under two in these areas.

The OR protocol was implemented as planned, with no modifications. There were ultimately some challenges in the final quantitative assessment, beyond the control of HKI. The NGO partner which conducted the baseline survey under supervision of HKI was no longer available to conduct the endline survey. HKI contracted a well-known respected local research firm to collect the data and do the basic analysis. In at least one instance, a key question on food security was asked differently on the final survey than it had been asked at baseline, making the results non-comparable. There may have been some other discrepancies in data collection. HKI incurred extra expense for this data analysis and invested much additional staff time in reviewing the results and coaching the research firm.

HKI promised in the original OR plan to conduct advanced analysis on the final results; however, the plan did not lay out what the analysis might include nor define exactly who would conduct this analysis. This lack of defining the responsibility, including an alternate plan in case of staff changes, resulted in considerable delay in getting analyses beyond the basic frequencies.

The OR activities were carried out on schedule.

The complete OR results, discussion of findings and discussion of factors that may have influenced results are found in Section F.1 in this report and in Annex 12. Plans for dissemination of results are found on page 31 above. Decisions to replicate or scale-up EHFP within Nepal were made by donors and government prior to the completion of the OR.

BB. Potential for Scale-up

The AAMA project has served as the basis for new USAID Nepal nutrition initiatives including the Integrated Nutrition Project RFA which was awarded to a consortium that includes HKI. Now called the Suahaara Project, this includes scaling up the EHFP model to eleven more districts over the course of the next four years. Key AAMA staff members are moving to Suahaara full-time to use their experience and lessons learned to replicate AAMA strategy.

The Essential Nutrition Actions strategy of AAMA was built into the new USAID Feed the Future project where it will be integrated with value chain agriculture and family food production. This project will target 16 to 20 districts including Baitadi and Bajura.

The Government of Nepal is preparing to operationalize their inter-sectoral plan for addressing nutrition through agriculture. There is great interest on the part of multi-lateral donors of this government program in having the government replicate parts of the AAMA strategy.

Annex 1. Learning Briefs

A. Engaging Local Governance for Replication and Sustainability

The Village Development Committees (VDCs) in Nepal receive funds from the central government to use for local development projects and programs. There are stipulations on how this money is to be allocated, for example, a minimum of 15% is to be spent on programs that benefit women, another 15% is to go to agriculture, etc. Often, the VDCs have difficulty in deciding how to use the funds and the default is to allocate it for infrastructure projects. At both the District Development Council (DDC) and VDC levels, there was a lack of awareness about the importance of food security and nutrition to both health and development. To address these limitations, and promote use of local government funds to replicate or sustain project activities, HKI added a governance component to the Action Against Malnutrition through Agriculture Project (AAMA). USAID Nepal granted additional funding for the governance component from 2010-2012.

AAMA was a four-year project funded through USAID's Child Survival and Health Grants Program from 2008 -2012. Initially, the project targeted two districts Baitadi and Kailali in the Far West of Nepal, combining promotion of Essential Nutrition Actions (ENA) with Helen Keller International's signature Homestead Food Production (HFP), which has a goal of increasing dietary diversity through promotion of home gardens and poultry. HKI and the local NGO partners trained volunteer women village model farmers (VMFs) in ENA and HFP who, in turn, each trained 30 to 40 women in their villages who were either pregnant or had a child under age two in these areas. Government service providers, including agriculture extension workers and the Female Community Health Volunteers (FCHV), were engaged in the training. Along with the training, HKI provided improved breeds of poultry and vegetable seeds or seedlings. In 2010, USAID Nepal granted funds to expand to a third district Bajura. Final evaluation results show that there was very good up-take of gardening and significant behavior changes in key nutrition and health practices.

As a part of the larger governance component, HKI facilitated district-level workshops comprised of representatives of key government agencies such as Agriculture, Livestock, Planning, Education, Women's Development Office and the District Development Committee and NGOs. An outcome of this workshop was the decision to create VDC-Level Food Security and Nutrition Working Groups. HKI then worked with the VDC secretaries to make this new working group a reality.

In Kailali, with the District Area Development Council (DADC), HKI selected 15 of the VDCs in which to support this "bottom up" process, while all targeted VDCs were included in Baitadi and Bajura. Each of the government agencies working in the VDC were invited to form a working group, based on the terms of reference that had been written at the district-level workshop. HKI oriented the working groups to the nutrition issues in the area, AAMA project activities and the government guidelines for budget allocation. After the initial meeting, the group was formalized as the VDC Food Security and Nutrition Working Group and included FCHVs, VMFs, representatives of political parties, the heads of the agriculture service centers, the health facility, the district education office, the Ward Citizen Forum, local NGOs/CBOs, and the VDC secretary.

These community representatives developed potential projects to improve food security and dietary diversity through vegetable and poultry production, and then advocated for the support of the local Ward Citizen Forums. It is the Ward Citizen Forum that must make budget requests to the VDC

prior to the annual budgeting process. In wards where AAMA was not directly working, the FCHVs were most often the link between the community, Ward Citizen Forum and the VDC.

During the 2011-2012 budget cycle, the VDCs approved funding for a wide range of related activities. They fall under replication, reinforcement, or sustainability of AAMA activities.

- Replication of selected AAMA activities in additional wards or among marginalized populations including provision of agriculture inputs to additional families, training in agriculture or ENA, or specific training such as demonstrations to prepare the complementary food called *jaulo*.
- Provision of additional inputs to AAMA beneficiaries including containers for storing bio-pesticides, tubing for micro-irrigation, poultry vaccine, and seeds.
- To sustain and expand project activities, VDCs have selected 15 VMFs in Kailali and 8 in Baitadi to become “Local Resource Persons”, a VDC-supported position to provide technical assistance and training to community members.

Village Development Committee Support

District	Activity	Target group reached		Inputs received	HKI Budget	VDC Budget
		New beneficiaries	AAMA Participants			
Kailali	ENA/HFP training (1 day)	2,277	664	Seed	Rs184,799 (\$ 2309)	Rs788,380 (\$ 9854)
	Seed distribution			Poultry		
	Poultry distribution			Shallow tube-well		
	Poultry vaccination			Pesticide containers		
	Micro-irrigation					
	Shallow tubewell					
	Jaulo demonstration					
	Bio-pesticide jar distribution					
	Pig raising training					
Baitadi	Seed distribution	200	253	Seed	0	Rs193,500 (\$ 2418)
	ENA training (1 day)					
	Coop improvement training					
Bajura	Activities for coming FY					Rs295,914 (\$3698)
TOTALS		2,477	917		\$2,309	\$15,970

The funding from the VDCs was crucial in enabling the AAMA project to reach some of the poorest and most marginalized communities in the districts. This allowed for expansion of the project to include formation of fifty new women’s groups. The total VDC investment as of July, 2012 is \$15,970. The VDC Food Security and Nutrition Working Groups will soon begin to begin planning for the next budget cycle.

An unexpected result was that the secretaries of seven additional VDCs, not targeted by the AAMA governance component in Kailali, saw the outputs and took the initiative to replicate the “bottom up” process, ultimately funding similar activities in their VDCs.

The other goal of the governance component was to bring together the government entities working in the districts and VDCs to promote inter-sectoral collaboration to improve food security and nutrition. As a result, the government line agencies at both the district and VDC levels have begun to undertake joint planning, monitoring and supervision in their respective plans of action related to

food security and nutrition. This has promoted coordination within VDCs of certain related activities in the budget, instead of each entity pursuing separate interests in the budget process.

A lesson learned from the governance component is that it should be initiated early in the project in order for the VDC-level process to occur in more than one budget cycle. This would increase potential for institutionalization of the Food Security and Nutrition Working Groups. If these working groups are dependent on the leadership of the VDC secretary, there is also the risk of a leadership vacuum if the VDC secretary (a government employee) is transferred to another post.

B. Community capacity building: An approach to improve household food security and nutrition

Although there has been significant reduction in maternal and child mortality rates, progress on the nutritional status of women and children in Nepal has been slow. According to the 2011 Demographic and Health Survey, the prevalence of stunting, wasting, and underweight among children under five in the Far-Western Region of Nepal was 46.4%, 10.9%, and 32.6%, respectively. Anemia prevalence was also extremely high among both women of reproductive age and young children, at 36% and 49%, respectively. Both lack of availability of nutrient-rich foods and a lack of knowledge about nutrition and infant and young child feeding contribute to the high rates of malnutrition.

There has been minimal agricultural extension as well as a lack of programs to address nutrition comprehensively. For example, Nepal's highly effective Female Community Health Workers (FCHVs) had a rather narrow nutrition mandate, focusing mainly on micronutrients (e.g. distribution of Vitamin A capsules and iron supplements). The lack of agriculture extension and lack of knowledge about consumption and cultivation of nutrient-rich food at household level created a gap in availability and consumption of diverse foods.

AAMA's challenge was to provide the knowledge and accessibility that would bring together nutrition and agriculture, and thus reduce malnutrition. The approach of Enhanced Homestead Food Production (EHFP) was designed to build the capacity of NGOs, FCHVs, Village Model Farmers (VMFs), Homestead Food Production Beneficiaries (HFPBs), and to engage FCHVs as VMFs where possible to build on their experience in leading mothers groups, service provision and their good reputation in their communities. The goal of the capacity building was to build knowledge and skills at the household level so that improved agriculture and nutrition practices would be introduced and maintained through a network of sustainable linkages.

Approach

The project components have addressed two complementary facets of undernutrition: household food security and nutrition knowledge. The first component, Homestead Food Production (HFP), established Village Model Farms managed by women, almost 70% of whom are FCHVs, and linked them with groups of HFPBs, who are pregnant or women with children under two. The VMFs demonstrated improved HFP techniques using project and household inputs, and were used to train HFPBs in gardening and poultry-raising. They provided a venue for ongoing technical assistance as the HFPBs developed their own gardens and for regular discussion groups.

The second aspect of the program promoted improved nutrition knowledge and practices using the Essential Nutrition Actions (ENA) framework, both via the HFP component and by building the

capacity of FCHVs to address nutrition more broadly. The ENA framework includes training in the skills for counseling for behavior change as well as in knowledge of the practices that promote optimal maternal, infant and young child nutrition (immediate, exclusive and continued breastfeeding, complementary feeding, the care of sick children, women's nutrition, the integrated control of anemia, and control of vitamin A and iodine deficiency). Either in their capacity as VMFs (where they chose to play this role as well) or as FCHVs working collaboratively with the local VMF, they trained HFPBs in ENA and in related reproductive and child health practices through monthly meetings at the VMFs. In turn, HFPBs were responsible for reaching out to 5-10 other pregnant and breastfeeding mothers in their communities to share what they learned about optimal nutrition (and HFP) practices.

Staff from the line ministries of agriculture and health were also involved in program actions, provided technical support, attended meetings and trainings, and supervised FCHVs and VMFs, while the Village Development Committees (VDCs) offered support for training and provided supplies and equipment, such as seeds and irrigation tubing.

Results

The project strengthened community capacity in Kailali District across these objectives. The enhanced capacity of FCHVs for providing support for nutrition in their communities was evident at endline, with FCHVs providing nutrition advice to over 80% of mothers in Kailali. For example, at baseline, only 51.4% of women had received counseling on exclusive breastfeeding until 6 months, compared to 95.7% at endline. The evidence from bi-annual LQAS also revealed positive trends in meeting participation and technical support from FCHVs in Kailali. For instance, the proportion of HFPBs who reported visiting or being visited by their FCHV in the last month increased from 74.1% for LQAS1 to 91.0% for LQAS3.

Comparing baseline and endline results, there were significant improvements in both food production and nutrition. The percentage of households with improved and modern homestead gardens in Kailali increased from 11.6% at baseline to 59.8% at endline. The mean number of micronutrient-rich vegetables grown by each household per year increased from 2 to 5.78. There was an increase from 59.9% to 79.1% in the proportion of children born in the past 24 hours who were put to the breast within one hour of birth. The proportion of children ages 6-24 months receiving foods from 4 or more food groups the previous day increased from 20.8% to 78.3%.

These improvements corresponded with a positive impact on nutritional indicators in Kailali. The percentage of underweight children 0-24 months decreased from 30.6% to 20.7%; the percentage of stunting in children 0-24 months decreased from 28.9% to 18.3%; and the percentage of anemic children 6-24 months decreased from 57.7% to 48.8%. There was also a modest decrease in the proportion of anemic women of reproductive age, from 36% to 32.3%.

Conclusions

The findings from the endline survey confirm that the intervention has successfully built the capacity of local NGOs and community members to understand the dimensions of household food security and to address undernutrition. As government agencies and the VDCs have started to take ownership of and participate in the AAMA initiative, there has been considerable progress towards sustainability. Government agencies and VDCs are now supporting VMFs and providing HFP inputs in many communities.

C. Strengthening Disadvantaged Families Through Agriculture and Nutrition in Baitadi District of Nepal

Although Nepal banned caste-based discrimination in 1963, caste and ethnicity still have a significant influence on health indicators. Disadvantaged castes in Nepal, including Dalits, disadvantaged Janajati, and disadvantaged non-Dalit Terai caste groups, tend to be poorer, have lower life expectancy, and have poorer health indicators than more advantaged castes (World Bank & DFID Nepal 2006). Compared to Brahmins and Newars, Dalit children have a much higher rate of under-five mortality and have two times the risk of death within their first year of life (World Bank & DFID Nepal 2006). Research by the World Bank suggests that there is also a significantly higher prevalence of underweight and stunting among Dalit, Terai Middle Caste, and Muslim children in Nepal (World Bank & DFID Nepal 2006).

Approach

Given these disparities, it is critical that health interventions in Nepal reach the most marginalized groups. Helen Keller International's (HKI) Action Against Malnutrition through Agriculture (AAMA) was an integrated homestead food security and nutrition education intervention that aimed to improve household food security and nutrition in women of reproductive age and their children under two in the Far Western region of Nepal. AAMA addressed two underlying causes of undernutrition: household food security and nutritional care. The first factor is addressed using HKI's Homestead Food Production (HFP) approach to improve food access and quality at the household level, while the second is addressed through the Essential Nutrition Actions (ENA) framework, which aims to improve nutritional knowledge, including infant and young child feeding.

Baitadi, one of the AAMA districts, is a remote hill area in the Far Western region where nearly 85% of households are food insecure, according to a 2009 HKI survey. Baitadi also has a large Dalit population, with Dalits comprising about 20% of the total population (DLSO Baitadi 2010/2011). HKI used very specific strategies to assure Dalits were reached with project activities including organizing mothers' groups for them led by a Dalit woman and assisting non-Dalit leaders of primarily Dalit groups to overcome caste barriers in their interactions.

Results

Consistent with national data, AAMA data at both baseline and endline suggest that children from disadvantaged groups in Baitadi district have poorer nutrition indicators than other groups. In both intervention and control areas in Baitadi at baseline and endline, the prevalence of underweight was significantly higher in Dalit children compared to children from non-Dalit families. Dalit children were also significantly more likely to be stunted than non-Dalit children at both time points in the intervention area. Similarly, in both intervention and control areas, there was a higher prevalence of wasting in Dalit children than in non-Dalit children at both time points. While the difference in the intervention area was not significant, Dalit children in the control area were significantly more likely to be anemic than non-Dalit children (Table 1).

Dalit women were also more likely than non-Dalit women to have poor nutrition outcomes. In both the intervention and control areas, Dalit women were more likely to be anemic than non-Dalit women, although the difference was statistically significant only in the control areas.

The prevalence of stunting, underweight, wasting, and anemia among Dalits in Baitadi showed greater improvement than non-Dalits in many of the outcome indicators. In the intervention area, Dalits children showed a greater improvement in stunting, underweight, and reduction in anemia than non-Dalits. Although anemia in mothers increased in all groups, there was a smaller increase in Dalits in the intervention area compared to non-Dalits.

Dalits in the intervention area also showed greater improvement in stunting, underweight, and prevalence in anemia in children compared to Dalits in the control area. There was an increase in the prevalence of anemia among Dalit mothers in both intervention and control areas, but the increase was greater in the control area (Table 1). This evidence suggests that Dalits in the intervention area show a tendency for greater improvement in nutrition indicators than non-Dalits and that the intervention appears to have increased this improvement.

Table 1: Prevalence of nutritional outcomes by caste/ethnicity in Baitadi

Outcome (%)	Control area			Intervention area		
	Baseline	Endline	Change	Baseline	Endline	Change
Stunting	**	ns		**	**	
Dalit	75.1	68.7	-6.4	72.6	62.2	-10.4
Other	64.0	62.7	-1.3	54.2	52.4	-1.8
Underweight	**	**		**	**	
Dalit	59.1	52.5	-6.6	62.8	48.4	-14.4
Other	46.1	37.5	-8.6	38.1	37.9	-0.2
Wasting	ns	*		*	**	
Dalit	13.8	12.7	-1.1	15.4	15.4	0
Other	9.7	8.8	-0.9	9.7	8.9	-0.8
Anemia in 12-47 mo. children	**	**		**	ns	
Dalit	49.7	57.0	+7.3	41.0	37.2	-3.8
Other	32.5	44.9	+12.4	29.7	35.1	+5.4
Anemia in mothers	*	**		**	ns	
Dalit	33.1	50.4	+17.3	33.8	35.7	+1.9
Other	24.8	41.7	+16.9	23.0	30.6	+7.6

**p<0.1; *p<0.05, ns= not significant

Conclusions

While the results from AAMA show continued disadvantages in nutritional status among Dalits compared to non-Dalits in Baitadi, they also suggest a reduction in the gap. Given that Dalits in Nepal have much lower nutrition indicators than non-Dalits, it is important to highlight such improvements. This evidence demonstrates the positive impact these interventions can have and suggests that disadvantaged groups can benefit greatly from programs like AAMA and that such approaches have the potential to narrow the gap in nutritional indicators.

References

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Informal Sector Service Centre. (1992). *Bonded labour in Nepal under Kamaiya system*. Kathmandu, Nepal: Informal Sector Service Centre.

D. Advancing the Kamaiya in Kailali District of Nepal

AAMA was a four-year project funded through USAID's Child Survival and Health Grants Program from 2008 -2012. The project targeted three districts Bajura, Baitadi and Kailali in the Far West of Nepal, combining promotion of Essential Nutrition Actions (ENA) with Helen Keller International's signature Homestead Food Production (HFP), which has a goal of increasing dietary diversity through promotion of home gardens and poultry. HKI and the local NGO partners trained volunteer women leaders (village model farmers, or VMFs) in ENA and HFP who, in turn trained 30 to 40 women in their village who were either pregnant or had a child under age two. Government service providers, including agriculture extension workers and the Female Community Health Volunteers (FCHV), were engaged in the training. Along with the training, HKI provided improved breeds of poultry and vegetable seeds or starts. Final evaluation results show that there was very good up-take of gardening and significant behavior changes in key nutrition and health practices, along with a significant reduction of stunting in Kailali District.

Halfway through the project, staff realized there was a need for a concerted effort to reach more disadvantaged sub-groups. Including the Kamaiya, former bonded laborers in the Terai region of Kailali. Historically, they lived on land that was later claimed by large landowners who came from other parts of Nepal. They became bonded to the landowners in exchange for the right to continue living on the land or because they incurred indebtedness to the land owners. For generations, the Kamaiya exchanged agricultural and domestic labor for small remuneration or share cropping privileges. In July 2000, Nepal passed a law banning the Kamaiya system and granted the laborers small plots of land to cultivate and provided some job skills training.

Working through the local government, the AAMA project chose to work with the Kamaiya in Chaumala Village Development Committee (VDC), Ward No. 7, where the rates of undernutrition were especially high. AAMA organized 40 beneficiaries (women who were pregnant or had children under two) into two HFPB groups, training two of the women as VMF leaders. The VDC provided funds for ENA and HFP trainings, poultry and vegetable seeds, and containers to store bio-pesticides, while AAMA provided overall technical assistance and supervision. Members of the VDC and of the food security and nutrition steering committee visited to monitor progress. Near the project end, the VDC selected one of the women to serve as an ongoing Local Resource Person (LRP) and who will continue to receive incentives and training to support these groups.

The location of the land has been a challenge for the Kamaiya beneficiaries: it is on a riverbank, making it prone to flooding and difficult to cultivate vegetables during the rainy season. Despite this, the beneficiaries are motivated to continue the gardening efforts, and the VMF, Local Resource Person and Female Community Health Volunteer (FCHV) have expressed their commitment to continuing their support. The participating Kamaiya families have also learned how to participate in local governance and to petition for resources to help their community.

References

Sharma, S., Basnyat, B., & G.C., G. (2001). *Bonded labour among child workers of the Kamaiya system: A rapid assessment*. Geneva: International Labour Organization, International Programme on the Elimination of Child Labour.

The World Bank & DFID Nepal. (2006). *Unequal citizens: Gender, caste, and ethnic exclusion in Nepal (Summary)*. The World Bank. DFID Nepal.

Annex 2. List of Project-related Publications and Presentations

Nepal Nutrition and Food Security Bulletin 1: Household Food Insecurity and Nutritional Status of Children aged 6-23 months in Kailali District of Nepal. Kathmandu: Helen Keller International Nepal, 2010.

Nepal Nutrition and Food Security Bulletin 2: Household Food Insecurity is Highly Prevalent and Predicts Stunting Among Pre-School Children and Anemia Among Their Mothers in Baitadi District of Nepal. Kathmandu: Helen Keller International Nepal, 2010.

Nepal Nutrition and Food Security Bulletin 3: Breastfeeding and Complementary Feeding Practices are less than Adequate among Mothers of Children 12-23 Months in the Baitadi District of Nepal. Kathmandu: Helen Keller International Nepal, 2010.

Nepal Nutrition and Food Security Bulletin 4: Designing a Context-Specific Behaviour Change Strategy to Improve Key Infant and Young Child Feeding Practices in Kailali and Baitadi Districts of Nepal: Not a Cookie-Cutter Approach. Kathmandu: Helen Keller International Nepal, 2010.

Nepal Nutrition and Food Security Bulletin 5: Multisectoral Governance for Food Security and Nutrition in Nepal. Kathmandu: Helen Keller International Nepal, 2012.

Osei A, Pandey P, Spiro D, Nielsen J, Shrestha R, Tulukdar Z, Quinn V, Haselow N (2010). Household food insecurity and nutritional status of children aged 6-23 months in Kailali district of Nepal. *Food and Nutrition Bulletin*; 31(4), 483-494.

Locks LM, Pandey PR, Osei AK, Spiro D, Adhikari D, Haselow NJ, Quinn VJ and Nielsen JN. Using Formative Research to Design a Context-Specific Behavior Change Strategy to Improve Infant and Young Child Feeding Practices and Nutrition in Nepal. *Maternal and Child Nutrition* (in press).

Annex 3 Project Management Evaluation

Planning

Initial planning for the project included involvement of Ministries of Health, Agriculture, and Livestock at the national level. There was less engagement of district-level officials and HKI now acknowledges that would have made a difference in having a closer partnership with them at local levels from the beginning. In spite of this, the local and district government agencies did become quite engaged by the end of the project as was described earlier in the report and in the learning brief on governance.

At the national level, HKI maintained close cooperation with the relevant ministries on matters of related policy and fully engaged them for development of project tools. At the district level, HKI participated in reproductive health coordination meetings, and at the regional level, in regular regional health review meetings.

The DIP was comprehensive in most areas. HKI could have used more support from MCHIP in designing the OR, particularly on sampling. This was discussed in the narrative on the section describing the OR and is covered in the recommendations.

Supervision of Project Staff

Supervision of project activities improved after the MTE when more field supervisors were hired for each district, making it possible for them to have more frequent contact with the VMFs. They were also given a clearer job description and guides on what to do during the supervisory visits. The detailed VMF registers were eliminated which relieved the field supervisors of hours spent manually copying these to feed into the M&E system. HKI provided field supervisors training on participatory monitoring approaches and supported the NGOs in developing a supervision plan. It is probable that the NGOs will continue to use the learning in supervision in new projects.

District agriculture and livestock staff know most of the VMFs and may continue to have contact with them, although this may be mostly at the initiative of the VMFs due to lack of government funding for frequent field visits by their staff. In the seven VDCs in Kailali where the DHO implemented growth monitoring at HFPB meetings, there will be continued contact with government health workers.

Human Resources and Staff Management

There were no issues in partner or staff relations. There was high turn-over among field supervisors during the first half of the project due to their work load and low benefits. To rectify this, after the MTE, three more field supervisors were added for each district. Further, the add-on Micronutrient Supplement Project added four more for Baitadi specifically for ENA. Benefits were increased by covering cost of cell phones. Their work was also laid out more clearly with better definition of responsibilities and a schedule of messaging.

HKI did not conduct organizational capacity assessments of the two NGOs in Baitadi and SMJK, who had good track records, but conducted one with WDF in Bajura, which was a new partner with no previous experience using USAID funding. HKI used the results to build the management capacity of WDF, particularly in procurement, budget management and accounting.

Transition of project staff has been facilitated by HKI's role in the new Suahaara Project. All Kathmandu-based staff are being shifted to Suahaara and most key district-level staff.

Financial Management

Management of the budget appears to have been very adequate. All CSHGP budgets are tight and HKI has done their utmost to carry out planned project activities within these constraints which meant reducing the number of training days and dropping the plan for widespread distribution of fruit trees. Assessing burn rate is complicated by the additional funding allocated mid-way through the project by USAID Nepal to add Bajura District and a governance component. The governance activity had to coincide with the Government of Nepal fiscal year which starts July 1. Although the USAID Nepal funds were added to the AAMA budget in September, 2010, the governance activities could not start until mid-2011 to coincide with VDC planning. This resulted in funds available to cover the no-cost extension granted by CSHGP with governance activities continuing until December, 2012.

As described earlier, any sustainability of project activities is dependent on the Village Development Committees who have the option of deciding to fund replication or to fund the VMFs as Local Resource Persons. Please, see the Learning Brief on Governance for details.

HKI has external auditors that annually perform the A-133 audit required by the Office of Management and Budget. HKI executed an MOU with each local partner (NTAG, NNSWA and SMJK) which requires that they provide HKI with monthly financial reports documenting all expenses. They also provide HKI with copies of their own annual audits performed according to generally accepted accounting practices. All partners are fully responsible and meeting their financial responsibilities to HKI.

NTAG and NNSWA have fully developed budgeting capabilities that allow them to develop budgets and perform for a range of international organizations; SMJK is still developing these skills but has benefitted from its collaboration with HKI. WDF had no experience in handling external funding before joining AAMA but now demonstrated their newfound capacity in writing a proposal and accompanying budget for participation in *Suabaara* Project.

Adequate resources: The proposal was developed at a time when HKI/Nepal had no resident technical staff, so a number of key costs (professional salaries, government per diem requirements, logistical costs for delivering chicks to each VDC in Baitadi) were significantly under budgeted. The project is overly ambitious for the relatively limited financing available through the CSHGP, but HKI has mobilized considerable resources to supplement the original budget and is committed to continuing to increasing funds available.

Partner capacity: WDF and SMJK capacity has been strengthened through its partnership with HKI and the demands that have been made in the financial accounting (as well as other areas) and mentoring by HKI financial office. NNSWA and NTAG have a long history of collaboration with INGOs and have full capacity to develop financial plans for their future endeavors.

Logistics

The logistics of poultry distribution turned out to be more cumbersome than HKI participated since it involved finding quality hatcheries and establishing brooding arrangements. This delayed distribution by two to three months, particularly affecting Bajura District which had a short project time-frame. There were no other problems with logistics that affected the project. The donation of an additional vehicle by USAID Nepal from a terminating project facilitated logistics in Bajura. Continuation of any project activities is now the responsibility of the Village Development Committees and the local government services for health and agriculture. The AAMA program

itself is not being continued, only those elements which the VDCs choose to fund and for which the VMFs will solicit technical and logistical support from the agriculture service centers.

Information Management

The system to measure progress towards objectives, that is, the M&E system was discussed under Data Quality in the report. The project did not attempt to strengthen government data collection. In addition to the baseline and final surveys, HKI conducted annual mini-surveys using LQAS sampling. The data was collected by field staff using PDAs which sent the data directly to the Kathmandu office. The reports from this data could be compiled within an hour of receiving the data. This enabled HKI to use the data to take immediate actions to improve implementation. Examples of how the data were used for continual learning and improvement of the project include:

- When HFPB meeting attendance began to drop, the project BCC coordinator developed new attractive activities for the meetings such as recipe contests for products, cooking demonstrations on preparing weaning foods, etc.
- Specific agriculture-related messages were developed based on seasons, with four messages disseminated per season.
- HKI convened a technical meeting with livestock service centers to discuss the issues of poultry disease and creating a feed from locally available materials.

Data from the baseline and formative research were used in two peer-reviewed publications of HKI. The Food and Nutrition Bulletin published “Household food insecurity and nutritional status of children aged 6-23 months in Kailali district of Nepal” in the December 2010 issue. A second manuscript, “Using Formative Research to Design a Context-Specific Behavior Change Strategy to Improve Infant and Young Child Feeding Practices and Nutrition in Nepal has been accepted for publication in *Maternal and Child Nutrition*. HKI has published 5 bulletins related to AAMA project baseline in the Nepal Nutrition and Food Security Bulletin, which is published by HKI. These bulletins are as follows:

- *Household Food Security and Nutritional Status of Children 6-23 Months in Kailali District of Nepal.*
- *Household Food Insecurity is Highly Prevalent and Predicts Stunting among Preschool Children and Anemia among their Mothers in Baitadi District of Nepal.*
- *Breastfeeding and Complementary Feeding Practices are Less Than Adequate among Mothers of Children 12-23 Months in the Baitadi District of Nepal.*

Project staff in Nepal, the local NGO partners, and HQ backstop fully understand the project outcomes based on the final data. Results will be shared with the government partners and USAID Nepal. There are no plans to collect additional data.

Technical and Administrative Support

During the development of the operations research design, the MCHIP advisor assigned to the project provided the HQ backstop valuable input on questions such as sampling frames and strategies to minimize spill-over between intervention and control areas. This was particularly helpful as our Asia-Pacific Regional (APR) Nutrition Advisor did not come on board until just before the DIP workshop. HKI also received considerable design input from colleagues at the International Food Policy Research Institute (IFPRI), with whom we unsuccessfully collaborated on

a proposal for supplementary funding to support the impact evaluation. IFPRI has highly specialized expertise in nutrition research, and provided technical input that may not be realistic to expect from the MCHIP team.

The HQ backstop and APR nutrition advisor both have PhD's in nutrition and were closely engaged in all phases of the research, including overall design, sampling frame, development of relevant qualitative and quantitative questionnaires, analysis and write-up. Over the project the HQ backstop probably devoted as much as 20% LOE, while the APR advisor may have devoted slightly less (~10%). A Leland Hunger Fellow assigned to the APR office during the last year of the project also provided extensive and valuable support to the quantitative data analysis. The location of these advisors far removed from the research site and country office did prove challenging at times, as was the fact that all had numerous other responsibilities to juggle. A dedicated primary investigator is certainly desirable, but the funding available for these projects is very limited.

Management Lessons Learned

HKI and partners originally looked for health backgrounds in hiring the NGO staff, but soon realized persons with this profile did not have the required social mobilization skills. The requirements were changed in hiring new field supervisors, giving preference to people with previous work in community mobilization and participation.

In initial hiring for Baitadi, there was a cultural barrier of hiring women in that they cannot move between communities alone. HKI and the NGO partner now realize they could have hired 2 or 3 women to work together as a team across VDCs. This lesson is being applied to hiring in Suahaara.

AAMA also learned that more effort should have been made from the onset to preferentially hire staff and recruit VMFs from the disadvantaged groups (Dalits and Tharus) in the VDCs where these marginalized populations are predominant. There were cultural barriers to interaction that had to be creatively overcome.

As described above, AAMA had minimal engagement with local ministry officials or VDCs during the planning and start-up of AAMA, rather, this emphasis was added on after mid-term. This lesson is being immediately applied to the Suahaara Project, where work started from day one with local government.

While quarterly review meetings were held with the field staff and local partners, the Kathmandu staff did not come to these meetings, which would have been very useful. Further, the meetings were held in each district and it would have been helpful to have occasional cross-district review in order for the local partners and district coordinators to share learning and experiences.

Annex 4. Work Plan Table

Activities	Objective Met	Activity Status
Form National Advisory Committee and hold meetings	Yes	completed
Preparation and submission of DIP	Yes	completed
Strategic Planning Workshop to Develop DIP	Yes	completed
Annual Planning and Review Meeting	Yes	completed
Quarterly meetings with USAID	Yes	completed
Preparation for baseline survey and organize community	Yes	completed
Conduct baseline survey including HemoCue® - Kalali	Yes	completed
Conduct baseline survey including HemoCue®) - Baitadi	Yes	completed
Conduct baseline survey to assess innovation component	Yes	completed
Review of existing ENA related materials to identify strengths and gaps	Yes	completed
Formative research with partners to develop ENA messages for BCC activities and training	Yes in Kathmandu	completed
ENA/BCC materials/tool development, pre-testing and production	Yes	completed
SHOUT Organizational Capacity and Viability Assessment of local NGO partners		
Major Activities		
Monitoring and supervision of project activities	Yes	Completed
Conduct MTOT HFP foundation and ENA/BCC trainings for AAMA Partners staff	Yes	Completed
Selection of VMFs - Kailali	Yes	Completed
Selection of VMFs - Baitadi	Yes	Completed
Conduct HFP for VMF owners & District Officers – Kailali	Yes	Completed
Conduct HFP for VMF owners & Ilaka Officers – Baitadi	Yes	Completed
Conduct ENA/BCC trainings for FCHVs & District Officers – Kailali	Yes	Completed
Conduct ENA/BCC trainings for Ilaka FCHVs & Ilaka Officers – Baitadi	Yes	Completed
Establishment of VMFs (Inputs and TA) - Kalali	yes	Completed
Establishment of VMFs (Inputs and TA) - Baitadi	Yes	Completed
Selection of HFPB Groups – Kailali	Yes	Completed
Selection of HFPB Groups - Baitadi	Yes	Completed
Conduct basic HFP and ENA Training for HFPBs - Kalali	Yes	Completed
Conduct basic HFP and ENA Training for HFPBs - Baitadi	Yes	Completed
Forge Linkages between VMFs and FCHVs & HFPBs	Yes	Completed
Activities	Objective Met	Activity Status
Brief Quarterly progress reports to USAID and Partners	Yes	Completed
Preparation and submission of annual report to USAID	Yes	Completed
Refresher training on HFP for District and NGO staff - Kalali	Yes	Completed (during monthly meeting)
Refresher training on HFP for Ilaka and NGO staff - Baitadi	Yes	Completed (during monthly meeting)
Refresher training on ENA/BCC for District and NGO staff - Kailali	Yes	Completed (during monthly meeting)
Refresher training on ENA/BCC for Ilaka and NGO staff - Baitadi	Yes	Completed (during monthly meeting)
Refresher trainings on HFP and ENA/BCC for FCHVs - Kailali	Yes	Completed (during monthly group meeting but not to all FCHVs)
Refresher trainings on HFP and ENA/BCC for FCHVs - Baitadi	Yes	Completed (during monthly group meeting but not to all FCHVs)
Refresher training for HFPBs on HFP and ENA - Kailali	Yes	Completed (during monthly group meeting)
Refresher training for HFPBs on HFP and ENA - Baitadi	Yes	Completed (during monthly group meeting)
Conduct Baseline and Select HFPBs/FCHVs for Sprinkles intervention	Yes	Completed

Distribution of Sprinkles and program implementation	Yes	Completed
Promotion of development materials	Yes	Completed
Process Monitoring, Supervision, Feedback, Implementation Adjustments	Yes	Completed
Midterm evaluation field work	Yes	Completed
Midterm evaluation report submitted to USAID	Yes	Completed
Results dissemination workshop on midterm evaluation	Yes	Completed
Revision of project work plan according to midterm results	Yes	Completed
Preparation and implementation of end line assessment	Yes	Completed
Conduct end line assessment including HemoCue®)	Yes	Completed
Conduct end line survey to assess innovation component	Yes	Completed
Conduct participatory final evaluation Final evaluation report submitted to USAID	Yes	Completed
Results dissemination on final evaluation	Yes	Completed (USAID Nepal)

Annex 5 Rapid Catch Tables

Table 1: Priority Child Health Indicators for RAPID CATCH for sample children <24 months of Bajura

	Indicators	Baseline (N=450)	Endline (N=450)
	Maternal and Newborn Care		
1	% of mothers of children age 0-23 months who had four or more antenatal visits when they were pregnant with the youngest child	28.8%	57.1%
2	% of mothers of children age 0-23 months who received at least two tetanus toxoid before the birth of the youngest child	71.8%	62.8%
3	% of children age 0-23 months whose births were attended by skilled personnel	18.6%	28.0%
4	% of children age 0-23 months who received a post-natal visit from an appropriately trained health worker within 2 days after birth	15.1%	29.3%
6	% of mothers of children age 0-23 months who are using a modern contraceptive method	16.7%	26.2%
	Breastfeeding and Infant and Young Child Feeding		
6	% of children age 0-5 months who were exclusively given breast milk the day prior to the interview	73.7% (N=107)	78.3% (N=74)
7	% of children age 6-23 months fed according to a minimum of appropriate feeding practices	34.6% (N=343)	64.9% (N=376)
	Vitamin A Supplementation		
8	% of children age 6-23 months who received a dose of vitamin A in the last 6 months: card verified or mother's recall	87.6%	92.1%
	Immunization	(N=187)	(N=137)
9	% of children age 12-23 months who received measles vaccine according to the vaccination card or mother's recall by the time of the survey	82.4%	95.3%
10	% of children age 12-23 months who received DPT1 according to the vaccination card or mother's recall by the time of the survey	93.0%	97.5%
11	% of children age 12-23 months who received DPT3 vaccine according to the vaccination card or mother's recall by the time of the survey	79.5%	94.4%
	Malaria		
12	% of children age 6-23 months with a febrile episode during the last two weeks who were treated with an effective anti-malarial drug within 24 hours after fever began	0.6%	3.6%
13	% of children age 0-23 months who slept under an insecticide-treated bed net the previous night	0	1.8%
	Control of diarrhea	(N=67)	(N=102)
14	% of children age 6-23 months with diarrhea in the last two weeks who received oral rehydration solution(ORS) and/or recommended home fluids	31.6%	53.9%
	Acute Respiratory Infections	(N=91)	(N=89)
15	% of children age 0-23 months with chest-related cough and fast and/or difficult breathing in the last two weeks who were taken to an appropriate health provides	37.3%	43.8%
	Point of Use Water Treatment		
16	Percentage of households of children age 0-23 months that treat water effectively	3.1%	3.1%
	Appropriate Hand Washing Practices		
17	Percentage of mothers of children age 0-23 months who live in households with soap at the place for hand washing	16.4%	34.7%
	Anthropometry		
18	% of children age 0-23 months who are underweight (-2SD for the median weight for age, according to WHO/NCHS reference population)	37.0%	43.8%

Table 2: Priority Child Health Indicators for RAPID CATCH for sample children <24 months of Kailali

	Indicators	Baseline (N=484)	Endline (N=696)
Maternal and Newborn Care			
1	% of mothers of children age 0-23 months who had four or more antenatal visits when they were pregnant with the youngest child	31.8%	87.7%
2	% of mothers of children age 0-23 months who received at least two tetanus toxoid before the birth of the youngest child	67.2%	49.2%
3	% of children age 0-23 months whose births were attended by skilled personnel	20.7%	43.4%
4	% of children age 0-23 months who received a post-natal visit from an appropriately trained health worker within 2 days after birth	12.3%	52.7%
6	% of mothers of children age 0-23 months who are using a modern contraceptive method	33%	39.4%
Breastfeeding and Infant and Young Child Feeding			
6	% of children age 0-5 months who were exclusively given breast milk the day prior to the interview	79.1% (N=116)	82.9% (N=193)
7	% of children age 6-23 months fed according to a minimum of appropriate feeding practices	50.3% (N=368)	51.1% (N=503)
Vitamin A Supplementation			
8	% of children age 6-23 months who received a dose of vitamin A in the last 6 months: card verified or mother's recall	86.6% (N=240)	85.7% (N=314)
Immunization			
9	% of children age 12-23 months who received measles vaccine according to the vaccination card or mother's recall by the time of the survey	88.3%	95.2%
10	% of children age 12-23 months who received DPT1 according to the vaccination card or mother's recall by the time of the survey	92.6%	98.3%
11	% of children age 12-23 months who received DPT3 vaccine according to the vaccination card or mother's recall by the time of the survey	79.5%	94.7%
Malaria			
12	% of children age 6-23 months with a febrile episode during the last two weeks who were treated with an effective anti-malarial drug within 24 hours after fever began	32.8% (N=63)	36.2% (N=138)
13	% of children age 0-23 months who slept under an insecticide –treated bed net the previous night	2.2% (N=73)	60.5% (N=164)
Control of diarrhea			
14	% of children age 6-23 months with diarrhea in the last two weeks who received oral rehydration solution(ORS) and/or recommended home fluids	9.6%	71.1%
Acute Respiratory Infections			
15	% of children age 0-23 months with chest-related cough and fast and/or difficult breathing in the last two weeks who were taken to an appropriate health provides	30.7% (N=129)	67.8% (N=121)
Point of Use Water Treatment			
16	Percentage of households of children age 0-23 months that treat water effectively	6.2%	5.9%
Appropriate Hand Washing Practices			
17	Percentage of mothers of children age 0-23 months who live in households with soap at the place for hand washing	40.9%	80.3%
Anthropometry			
18	% of children age 0-23 months who are underweight (-2SD for the median weight for age, according to WHO/NCHS reference population)	30.6%	20.7%

Table 3: Priority Child Health Indicators for RAPID CATCH for sample children <24 months of Baitadi (data from intervention Ilakas only for children aged 12-23 months)

	Indicators	Baseline (N=401)	Endline (N=412)
	Maternal and Newborn Care		
1	% of mothers of children age 12-23 months who had four or more antenatal visits when they were pregnant with the youngest child	29.2%	67.7%
2	% of mothers of children age 12-23 months who received at least two tetanus toxoid before the birth of the youngest child	70.1%	75.2%
3	% of children age 12-23 months whose births were attended by skilled personnel	15.7%	17.7%
4	% of children age 12-23 months who received a post-natal visit from an appropriately trained health worker within 2 days after birth	19.4%	25.7%
6	% of mothers of children age 12-23 months who are using a modern contraceptive method	22.4%	22.8%
	Breastfeeding and Infant and Young Child Feeding		
6	% of children age 0-5 months who were exclusively given breast milk the day prior to the interview ¹	60% (N=105)	77.9% (N=104)
7	% of children age 12-23 months fed according to a minimum of appropriate feeding practices	35.7%	79.4%
	Vitamin A Supplementation		
8	% of children age 12-23 months who received a dose of vitamin A in the last 6 months: card verified or mother's recall	90.7%	97.1%
	Immunization		
9	% of children age 12-23 months who received measles vaccine according to the vaccination card or mother's recall by the time of the survey	86.7%	97.3%
10	% of children age 12-23 months who received DPT1 according to the vaccination card or mother's recall by the time of the survey	82.8%	98.1%
11	% of children age 12-23 months who received DPT3 vaccine according to the vaccination card or mother's recall by the time of the survey	72.3%	97.6%
	Malaria²		
12	% of children age 12-23 months with a febrile episode during the last two weeks who were treated with an effective anti-malarial drug within 24 hours after fever began	NA	NA
13	% of children age 12-23 months who slept under an insecticide-treated bed net the previous night	NA (N=21)	NA (N=52)
	Control of diarrhea		
14	% of children age 12-23 months with diarrhea in the last two weeks who received oral rehydration solution(ORS) and/or recommended home fluids	66.7%	73.1%
	Acute Respiratory Infections	(N=22)	(N=44)
15	% of children age 12-23 months with chest-related cough and fast and/or difficult breathing in the last two weeks who were taken to an appropriate health provider	80.9%	63.6%
	Point of Use Water Treatment		
16	Percentage of households of children age 12-23 months that treat water effectively	2.8%	10.9%
	Appropriate Hand Washing Practices		
17	Percentage of mothers of children age 12-23 months who live in households with soap at the place for hand washing	14.7%	57.3%
	Anthropometry		
18	% of children age 12-23 months who are underweight (-2SD for the median weight for age, according to WHO/NCHS reference population)	41.6%	35.7%

¹ Although the operations research does not cover this age range, the surveyors were instructed to include all children in surveyed households who were <6 months for these questions.

² Baitadi is not a malaria endemic area

Annex 6 Final KPC Reports – Baitadi, Bajura, Kailali

**Endline Survey on Action against Malnutrition through Agriculture (AAMA)
Project in Baitadi District**

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December, 2012

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Executive Summary

Introduction and objectives

Helen Keller International (HKI), its local partners the Nepal National Social Welfare Association (NNSWA), Ministry of Health and Population (MoHP), and the Ministry of Agriculture and Cooperatives (MOAC) have implemented the USAID funded “Action against Malnutrition through Agriculture” (AAMA) project since 2008, in Kailali and Baitadi districts and in Bajura district since 2010. The project integrates agriculture and health interventions to reduce malnutrition among children aged 0-24 months and women of reproductive age. The homestead food production (HFP) component focuses on increasing households’ year round access to nutritious foods and is linked to a second component that delivers nutrition education and behaviour change communications (BCC) on a package of proven Essential Nutrition Actions (ENA).

This endline survey was conducted in Baitadi district to assess the project achievements. The overall objective of the survey was to assess change in HFP and ENA to determine whether they could significantly improve child nutrition (anthropometry and anemia status) compared to control groups and measure the change in nutritional indicators

Methodology

The method of the study was primarily cross-sectional and descriptive with analysis of key variables and based on primary sources of information, which were collected using a semi-structured survey questionnaire at the household level. Anthropometric measurements and blood samples were also taken from both mothers and children. The survey covered 2,614 children (1,307 each in intervention and control areas) 12-47 months of age and their mothers from 28 village development committees (VDCs) in Baitadi. A four-day training of supervisors and enumerators were organized to orient them about the survey.

The household questionnaire used was identical to the baseline survey questionnaire, and covered demographic characteristics of responding mothers; infant and young child feeding (IYCF) and nutrition knowledge; attitudes and practices and other behavioural determinants; market access and use of information; women’s decision making power; household food security and diet diversity; sanitation and hygiene practices; and agricultural practices and use of land. Anthropometric measurements of children and mothers were performed. The concentration of hemoglobin in the blood of children and mothers were measured using the HemoCue® system. A GPS machine was also used to plot the position of the responding household. Data quality was monitored by supervisors from PHIDReC, HKI and its partners.

The data were entered and analyzed using SPSS version 20.0 and Stata 10.0.

Key findings

The prevalence of anemia in children increased from baseline to endline in both control and intervention areas, however, the proportion of anemic children was higher in control (48%) than in intervention (36%). Although the proportion of moderately anemic children was lower in intervention areas, there were more severely anemic children there than in control areas.

Overall, there was no marked improvement in the nutritional status of children in intervention areas at endline. The proportion of underweight children declined significantly from baseline to endline in control areas, but declined only slightly in intervention areas. With regards to stunting, there was a reduction in both areas, but not statistically significant. The prevalence of wasting was also slightly higher in

intervention than control areas. The study indicates that children of mothers that belong to the Dalit community and come from a lower socio-economic status, were more stunted and underweight than their counterparts.

The proportion of thin mothers was higher in intervention than control areas, however there was a decline from baseline to endline in the former and none in the latter, indicating moderate progress in reducing the proportion of thin mothers after intervention. The proportion of anemic mothers rose both in control areas (from 26% to 44%) and intervention areas (25% to 33%).

The proportion of mothers who exclusively breastfed their children was higher in intervention (80%) than control (64%) areas. Mothers from both groups opined that the colostrum should be giving to newborns (89% in control and 95% in intervention). Mothers who were aware of the correct timing of introducing complementary foods to children increased substantially to 75% in intervention areas at endline; however awareness on the frequency of complementary foods was lower at 54%. More mothers in the control group were aware of the need to feed children frequent snacks than in the intervention group. The practice of minimum appropriate feeding was higher in intervention (79%) than in control (44%) areas. Overall, the practice of infant and young child feeding improved notably in intervention areas than in control areas.

An equal proportion of mothers in control and intervention areas were receiving vitamin A and deworming tablets, indicating only a marginal effect of the intervention program.

The proportion of mothers who did not treat drinking water was very high in both areas (89% intervention and 99% control).

More households in the former also had toilet facilities than in the latter. The practice of using them by children however, was unsatisfactory – only 48% in intervention and 21% in control areas used toilets the last time prior to the survey. Forty-five percent of mothers discarded of their children's excrement in places other than toilets. Hand washing practice among mothers was higher in intervention (93%) than in control (62%) areas.

With regards to antenatal and delivery services, more mothers in intervention (70%) than in control areas consumed iron tablets during pregnancy. A substantially greater proportion of mothers in the former were aware that pregnant women should eat more food than usual during pregnancy (93% as opposed to 62%). Although the proportion of mothers who received tetanus toxoid vaccination was higher in intervention (55%) than in control (31%), it is still on the lower side.

Home gardens increased significantly in intervention areas (97%) compared to control areas (77%), indicating more households in the former had the opportunity to maintain vegetable food security. Although only 44% of households in intervention areas had year-round production of vegetables, this was nevertheless higher than in control areas (15%). There was also more progress in the proportion of households that consumed produce grown in the home gardens in intervention areas (46%) than control areas (38%). More children in the former were also fed fruits almost daily than in the latter.

More mothers at endline compared to baseline had increasing control over the income generated from selling their home garden produce, indicating more opportunities for mothers to spend the income on nutritious foods for their children.

The proportion of households rearing poultry increased markedly from 12% to 30% in the intervention group. There were also more households keeping improved varieties of chicken and consuming chicken and its products. However, only 38% of households consumed 100% of the chicken from their farms.

Similarly only 4% of households fed their children chicken meat 2 to 3 times a week. Overall, the production and consumption of meat and meat products was poor in both control and intervention areas, compared to the production and consumption of garden products.

The average amount earned by selling poultry and its products was higher in intervention than control areas; however the money was spent on purchasing household items, rather than food.

Abbreviations

AAMA	Action Against Malnutrition through Agriculture
AHW	Auxiliary Health Worker
ANM	Auxiliary Nurse Midwife
ARI	Acute Respiratory Infection
BMI	Body Mass Index
DID	Difference in Difference
ENA	Essential Nutrition Action
FANTA	Food and Nutrition Technical Assistance
FCHV	Female Community Health Volunteer
FWDR	Far Western Development Region
HA	Health Assistant
HAZ	Height-for-Age Z score
HFIAS	Household Food Insecurity Access Scale
HFP	Homestead Food Production
HKI	Helen Keller International
IYCF	Infant and Young Child Feeding
MCHW	Maternal and Child Health Worker
MN	Micronutrient
MoHP	Ministry of Health and Population
NGO	Non-Governmental Organization
ORS	Oral Rehydration Solution
SD	Standard Deviation
SES	Socio-Economic Status
TT	Tetanus Toxoid
USAID	United States Agency for International Development
VaRG	Valley Research Group
VDC	Village Development Committee
VHW	Village Health Worker
WAZ	Weight-for-Age Z score
WHO	World Health Organization
WHZ	Weight-for-Height Z score

Chapter 1 Introduction

Background

Malnutrition is a serious problem throughout Nepal. Forty-one percent of children under five years of age are stunted, 11% are wasted and 29% are underweight. In addition, 46% of children are anemic. Currently 1-in-10 children below the age of 6 months is stunted (11.6%), underweight (16.2%) and wasted (12.3%). Malnutrition is much worse in the Far Western Development Region (FWDR) than in other regions of the country. For example, the proportion of stunted children is 46% and the prevalence of anemia among children 6-59 months is 52% in the FWDR²⁹, compared to 48% nationally. The human development index score for the FWDR is 0.404 while the national average is 0.471. In Baitadi, approximately 84% of the households had some level of food insecurity. Among mothers, prevalence of underweight (BMI<18.5 kg/m²) and anemia were 22.8% and 20.3% respectively.³⁰ It is assumed that lack of nutritious food security and poverty may have contributed to the presence of high malnutrition among children, including stunting, wasting, and underweight in the Mid-western and FWDR. In addition, the general lack of knowledge about adequate nutrition and health, poor child feeding habits, and poor child care and hygiene practices may have played an important role in high prevalence of malnutrition in this. In short, poor health, low education and improper agricultural practices are jointly influencing the malnutrition situation in the region.

Several international and bilateral agencies and international non-governmental organizations and non-governmental organizations (NGOs) with different strategies are engaging with the Government of Nepal (GoN) to curb malnutrition among children and mothers in the country. Maternal and child focused protocols consisting of nutrition components to improve the nutritional status of children are in place. Helen Keller International (HKI), the MoHP, the Ministry of Agriculture and Cooperatives, and local NGO partners have implemented the United States Agency for International Development (USAID) funded “Action against Malnutrition through Agriculture” (AAMA) project in Baitadi, Kailali, and Bajura districts - all relatively under developed districts located in the FWDR of the country.

The goal of the AAMA Project is to reduce child malnutrition and related morbidity in these three districts. The strategic objective is to improve nutritional status among children below two years of age and their mothers. The four intended results of the projects are: increased year round availability of micronutrient (MN)-rich foods for children below two years and their mothers; improved essential nutrition knowledge and practices, increased capacity of health, agriculture, NGO and community agents to promote improved nutrition and agricultural practices; and a replicable, integrated food security and nutrition model developed and shared.

The AAMA project in Kailali and Bajura has developed a program model of integrated food security and nutrition that can be adapted and taken to scale in other areas of Nepal to reduce

²⁹ Nepal Demographic and Health Survey. Ministry of Health and Population, New ERA, ICF International, 2011.

³⁰ Nepal Nutrition and Food Security Bulletin, Helen Keller International, 2010.

malnutrition. The operations research entails an impact evaluation of HKI's Homestead Food Production plus an essential nutrition action model in Baitadi district to determine whether it can significantly improve child nutrition (anthropometry and anemia status). Children between the age of 12-47 months were examined, and defined based on the fact that children in this age range at endline would have been exposed to the intervention for at least 12 months (sufficient duration to benefit) when they were between 0 and 24 months of age. In order to attain its objectives, HKI has been implementing the AAMA project in Baitadi district since 2008.

To assess the progress of the AAMA project HKI, through the Valley Research Group (VaRG) conducted a Baseline Survey in Baitadi district in June/July 2009 and an Endline Survey in 2012.

Objectives of the study

The overall objective of the survey was to assess change (measure impact) in HKI's Homestead Food Production in all three districts, the essential nutrition action model in Baitadi district, to determine whether it could significantly improve child nutrition (anthropometry and anemia status) compared to control groups and measure the change of nutritional indicators after the intervention.

The specific objectives of the study were to assess changes occurred as a result of the intervention on the:

- a) proportion of underweight, wasted, stunted children 12-47 months of age;
- b) proportion of anemic children 12-47 months of age and their mothers;
- c) proportion of children 12-23 months of age who received foods from ≥ 4 food groups in the last 24 hours;
- d) proportion of children 12-23 months of age who received solid, semi-solid, or soft foods the minimum number of times or more in the last 24 hours;
- e) proportion of children 12-23 months of age who consumed Vitamin A and iron-rich plant/animal-source foods in the last 24 hours;
- f) proportion of children 12-23 months of age who received a minimum acceptable diet in the last 24 hours preceding the survey;
- g) proportion of households with developed homestead food production (HFP);
- h) average number of MN-rich vegetables grown in the garden;
- i) percentage of women with HFP who generated income by selling garden and/or poultry products;
- j) proportion of food-insecure households;
- k) and proportion of mothers or child care-takers practicing adequate hygiene-related behaviors.

Chapter 2 Methodology

Selection of VDCs and Survey Population

There are 62 village development committees (VDCs) and one municipality in Baitadi district with a total population of 252,116. HKI implemented the AAMA project in 21 intervention VDCs and 20 control VDCs in October 2008. As in the baseline survey, 28 VDCs (14 each from intervention and control areas) were selected for the endline survey, with a total of 2,614 children between 12-47 months of age and their mothers (n=1307 from intervention and 1307 from control areas) (Table 1). Approximately 93 children aged 12-47 months and their mothers were intercepted from each VDC depending on the household size of the sampled VDC. Six wards were selected from each VDC, making a total of 168 wards (84 wards each for the intervention and the control areas).

Table 1: Distribution of mothers included in the study

Distribution	Control area	Intervention area	Total
Number of VDCs	14	14	28
Number of mothers in baseline	1051	1055	2106
Number of mothers in endline	1307	1307	2614
Total	2358	2362	4720

Selection of households and respondents

Respondents in each selected VDCs were determined using the PPS technique. Children 12-47 months of age were the basis for selecting the mothers/caretakers or respondents. Trained enumerators visited households and used a screening questionnaire to identify children between the age of 12-47 months. The questionnaire was administered to the mothers/caretakers. Approximately 15-16 children aged 12-47 months of age and their mothers were intercepted from each ward, to collect necessary information including anthropometric measurements (height/length and weight) and blood sample collection, from both the children and their mothers.

Instrumentation

Information required for the endline survey was collected through semi-structured interviews with mothers; and anthropometric and biochemical measurement of the children and mothers. The same questionnaire that was used during the baseline survey was used with some modification in the endline. Two sets of instruments i.e. (a) a semi-structured quantitative/qualitative questionnaire, (b) an anthropometric/hemoglobin assessment information record form were developed and used for the study. Both instruments were provided by HKI.

The semi-structured quantitative/qualitative questionnaire was administered among the sample mothers/caretakers of children aged 12-47 months and generated information on:

- Socio-economic background of the household
- Household food production including household food security
- Water, hygiene and sanitation

- Antenatal, delivery and postnatal care services
- Infant and young child feeding practices
- Morbidity pattern among children including prevalence of diarrhea, fever and acute respiratory infection (ARI)
- Growth monitoring and promotion including use of preventive health services
- Involvement in community-based organizations and interaction with female community health volunteers (FCHVs)

Anthropometric assessments were made using electronic weighing scales for weight measurement and a shorr board to measure the length/height of the mothers and children. Similarly, blood samples from each child and mother were taken using the finger-prick method to estimate the level of hemoglobin (Hb). Hemocue machines, safety lancets and cuvettes were used to assess the level of Hb and GPS machines were used to collect altitude data for each sampled household. All equipments were standardized every day before their actual use.

Field organization

There were a total of 9 teams, each comprising of 1 supervisor and 2 interviewers; and each team covered approximately 3 VDCs. Field work was conducted between July and August 2012.

The field staff were given training/orientation for four days before mobilizing them to the field. In addition to classroom training, mock interviews were conducted to ensure the interviewers were familiar with the questionnaire and received practice interviewing. VaRG's researchers and HKI Nepal staff were involved in providing the training/orientation to the field staff. Senior supervisors also visited some of the study areas to supervise and monitor data collection.

Data processing and analysis

A data entry program using the CS-pro software package was designed which consisted of a system of checks to ensure consistency and completeness of data entry. Before the data entry, all the field checked questionnaires were thoroughly rechecked at the central office in Lalitpur. Data entry, using trained data entry personnel, was done directly from the edited questionnaires.

Data were analyzed using SPSS 20.0 and Stata 10.0. The clean data were analyzed using simple frequency tables and cross tabulations. Results obtained from the intervention and control areas were comparatively analyzed. The relationship between/among the key variables was tested using appropriate statistical tools such as Chi Square test. In addition, regression analysis was done to observe the association between the selected intervention variables and nutrition status. The variables appearing as significant in bivariate distribution were treated in multivariate analysis. The binary logistic regression model was used to identify the factors related to nutrition of children for baseline and endline surveys separately. The final models were derived by excluding insignificant contributing variables.

To understand the impact of intervention on reducing malnutrition, the percentage of malnourished children were identified for each of the intervention and control areas, both at baseline and endline. Then average percentages were computed. The impact of intervention program was assessed by calculating difference in difference (DID) estimates using the difference in difference model.

The difference in difference regression model is given by

$$Y_{i,t} = \alpha + \beta T_i + \gamma P_t + \delta T_i * P_t + \epsilon_{i,t}$$

Where

$Y_{i,t}$ is percent malnourished change in period t in VDC i

T_i is a binary variable: =1 if VDCs are receiving treatment and =0 if VDCs are control

P_t is a binary variable: =1 if Endline survey and = 0 if Baseline survey

$\epsilon_{i,t}$ is the usual error term.

α , β , γ and δ are regression parameters.

α is average percent malnourished in control at baseline. β is initial difference between two groups. γ is pre post difference in control. δ is difference in difference estimate.

Household food insecurity status was assessed using the Food and Nutrition Technical Assistance (FANTA) HFIAS scale.

The weight and length of children were used to compute age and sex specific z-scores of weight for age (WAZ), weight for length (WHZ) and length of age (HAZ) using the ENA for SMART software³¹. Underweight, wasting and stunting were defined respectively as $WAZ \leq 2$ SD, $WHZ \leq 2$ standard deviation (SD) and $HAZ \leq 2$ SD, using the World Health Organisation (WHO) standards 2005. The cut-off point used for estimating anemia in children and mothers, i was <11.0 g/dl and 12.0 g/dl, respectively, by adjusting hemoglobin for altitude of households with the use of WHO reference values.

³¹ ENA for SMART, developed by Dr Juergen Erhardt in cooperation with Prof. Michael Golden, October 2007.

Chapter 3

Characteristics of Respondents

Two thousand six hundred and fourteen (1307 each from the control and intervention areas) mothers of children between 12-47 months of age at endline and 2,106 (1051 from control and 1,055 from intervention areas) at baseline were included in the study. This chapter presents selected background characteristics of the responding mothers as well as possession of household items, housing conditions, sources of drinking water and sanitation facilities, and involvement of women in community based organizations, including HHFP/AAMA mothers groups.

Socio-demographic characteristics

The vast majority (88% in control and 89% in intervention areas) of the households in the study areas were headed by male members which was slightly higher than the baseline figures (84% and 77%, respectively). Almost all the household heads in both surveys were either currently married or widowed/widower. Over half of the mothers in both areas were living in the current villages for more than 10 years. Almost all (99%) the mothers included in both surveys were currently married and the rest were either widowed or divorced.

Caste, age and education

Table 2 presents data on the caste or ethnic composition, age and education of the respondents. The largest proportions of the respondents in both surveys were Brahmin and Chhetri. However, the proportion of Dalit respondents who participated at endline was significantly higher than that at baseline in both the control (17% versus 22%) and intervention (22% vs. 29%) areas. The majority of the responding mothers in both surveys were between 25-34 years of age, with slightly more representation of women from this age group at endline than at baseline. However, the median age of the mothers in both study areas remained the same in both surveys (26.0 years) indicating no significant difference in age composition of respondents across the two surveys. In general, the educational level of the mothers in both areas and survey strata increased, with more visibility among non-formal education class attendants in intervention areas, from 8% at baseline to 20% at endline.

Table 2: Percent distribution of respondents by ethnicity, age and education

Description	Control area		Intervention area	
	Baseline (n=1051)	Endline (n=1307)	Baseline (n=1055)	Endline (n=1307)
Caste/ethnic group				
Brahmin/Chhetri/Giri/Thakuri/Puri	82.3	78.1	77.4	70.2
Dalit	17.2	21.7	22.2	29.4
Disadvantaged janajatis	-	0.1	0.2	0.4
Disadvantaged non dalit Terai caste	0.5	-	0.2	-
Relatively advantaged Janajatis	-	0.1	-	0.1
Age (in years)				
15-24	33.8	33.1	38.1	34.3
25-34	50.6	53.3	47.8	50.5
35-50	15.6	13.5	14.1	15.2
Median	26.0	26.0	26.0	26.0
(SD)	(5.7)	(5.5)	(5.8)	(5.5)
Level of education				
None	69.0	55.9	49.4	31.7
Literacy classes / non formal education	11.3	16.1	7.9	19.5
Primary level (1-5)	8.8	10.6	18.4	16.8
Secondary level (6-10)	7.4	12.0	20.0	24.6
Higher secondary	3.2	5.0	3.8	6.3
Bachelor or above	0.3	0.5	0.6	1.1

Family size and living children

Over 3-in-5 respondents had 5 to 8 members in their households in both the control and intervention areas; and there was no significant difference in family size across the groups between the two survey points. The average family size was 6.7 persons in the control areas and 6.6 persons in the intervention areas; this figure was slightly lower than that at baseline. Approximately half of the mothers had 1-2 living children in both the control and intervention areas, followed by slightly over two-fifths with 3 to 4 living children. The mean number of currently living children was estimated at 2.6, which is slightly lower than at baseline.

There were more boys than girls at endline in both areas. A higher proportion (41%) of children in the control areas were between 12-23 months of age, while in the intervention areas, there were more children 24-35 months of age. Overall, no marked difference was observed in birth spacing among the respondents of both areas across two survey points.

Respondents were also asked about the main care givers of their youngest child, with mothers being the predominant ones, followed by grandmothers/fathers in both areas. Surprisingly, the proportion of mothers as primary care givers increased markedly from baseline (49%) to endline (77%) in intervention areas, whereas it remained the same in control areas (70% at both survey points).

Economic characteristics

Farming, followed by daily wage labor, was the main form of occupation of the head of households in most of the control and intervention areas, at both baseline and endline. More households (16%) in intervention than in control (13%) areas were engaged in daily wage labor. The proportion of household

heads engaged in farming decreased notably at endline in both areas (Table 3). Farming followed by remittance or foreign employment – which increased in both control and intervention areas at endline - and daily wage labor were the main sources of income for the majority of households of both areas at baseline and endline.

Table 3: Percent distribution of respondents by main occupation of the household head including main sources of household income

Description	Control area		Intervention area	
	Baseline (n=1051)	Endline (n=1307)	Baseline (n=1055)	Endline (n=1307)
Occupation of HH head				
Farming (own land)	77.7	65.9	67.0	48.8
Daily labor (irregular)	10.4	12.5	17.1	16.4
Government / Office work	4.9	8.9	7.9	10.6
Foreign employment	na	5.3	na	10.1
Small scale business	3.7	4.1	4.5	6.7
Farming (regular work for others)	0.3	0.6	0.4	0.3
Unemployed/physically weak	1.5	0.4	2.8	0.2
Other§	1.4	2.3	0.3	6.9
Main source of household income				
Farming (own land)	46.2	51.5	20.9	32.3
Remittance/ foreign employment	19.3	21.0	23.5	28.8
Daily labor (irregular)	20.3	11.8	29.5	17.0
Government / Office work	6.9	9.4	17.2	13.8
Small scale business	5.3	4.2	6.7	7.1
Farming (regular work for others)	0.3	0.8	0.7	0.3
Other (livestock, blacksmith; tailoring; priest; pension)	1.8	1.4	1.6	0.8

§ Other includes: sewing; overseas employment; priest; pension; student.

Over 4-in-5 respondents at both baseline and endline reported not working outside the home to earn money. Approximately 14% of the mothers in control areas and 11% in intervention areas were engaged in daily wage labor and another 5% in other activities, such as small scale businesses and salaried work.

The proportion of households earning any cash income in the one month preceding the survey was much higher in intervention (76%) than in control (62%) areas and higher at endline than baseline in both areas. About 42% of the households in control and 33% in intervention areas at endline had a monthly cash income of less than Rs 6000. More than two-fifths of the women in both areas considered their monthly income figures as “typical” for a normal month. More women (60%) from intervention areas than from control areas (39%) reported that their monthly cash income was sufficient to cover their basic household expenses such as food, clothing, health and education, indicating better economic status among the households of intervention areas than control areas.

Over 80% of the respondents in control and 68% in intervention areas reported that they were in debt. Compared to the baseline survey, the proportion of households at endline with debt decreased notably from 77% to 68% in intervention areas, while in control areas this figure increased from 76% to 81%.

Household items

The proportion of households possessing various household items was much higher in the intervention than in the control areas. For instance, 65% and 79% of the respondents in intervention areas reported having electricity and telephone connections in their households, whereas the corresponding figures for control areas was 51% and 60%, respectively. Overall, the proportion of the households possessing household items increased from baseline to endline. Very few households in the study areas had some means of transport such as bicycles, motorcycles, cars or trucks.

Drinking water and sanitation facilities

Drinking water

In intervention areas, 84% of the households at baseline and 88% of the households at endline had improved drinking water facilities, while the corresponding figures in control areas were 80% and 72%, respectively. More respondents from control areas reported obtaining water from public places or other's plots and over 3-in-5 in both control and intervention areas spent less than 20 minutes to fetch water (Table 4).

Table 4: Percent distribution of respondents by main sources and location of drinking water for their homes

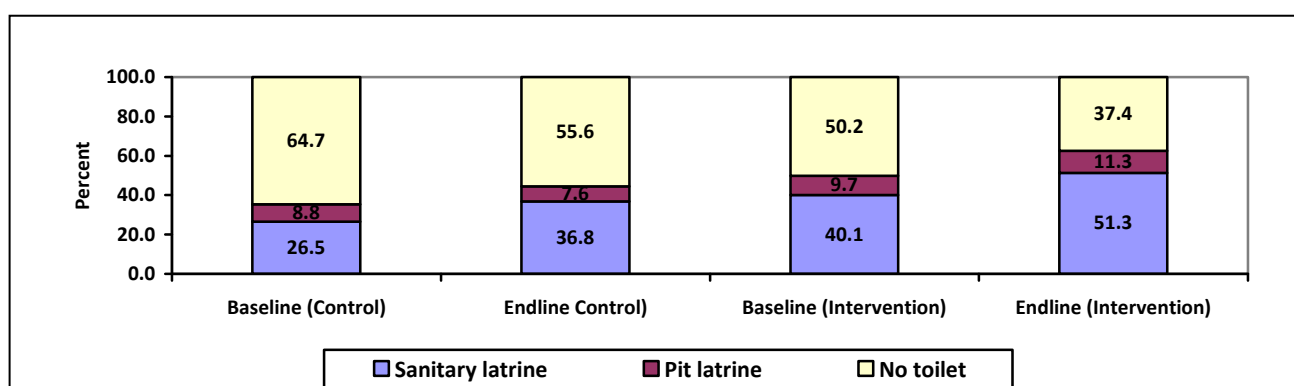
Description	Control area		Intervention area	
	Baseline (n=1051)	Endline (n=1307)	Baseline (n=1055)	Endline (n=1307)
Main source of drinking water				
Improved source	79.5	71.7	83.7	87.6
Piped water into dwelling	4.3	32.4	6.4	50.5
Tube well/Borehole	-	-	0.1	-
Public tap	74.8	39.3	77.2	37.1
Dug well	0.4	-	-	-
Unprotected source	20.5	28.3	16.4	12.5
River/pond/spring	3.3	5.2	0.8	1.8
Well	16.7	19.7	15.5	10.3
Rainwater	0.1	-	-	-
Other (spring; canal or kulo)	0.4	3.4	0.1	0.4
Location of water source				
In your house	2.1	0.3	6.4	2.9
In your plot	97.8	23.9	93.5	32.7
In public places	0.1	70.2	0.1	53.2
In others plot	-	5.6	-	11.2
Missing	-	-	0.1	-
Time required to fetch water (to get to the water source and return)				
More than 20 minutes	31.7	32.2	18.8	21.7
Less than 20 minutes	65.0	63.2	74.6	66.6
On the premises	3.3	4.6	6.5	11.7
Missing	-	-	0.1	-

A vast majority (89% to 99%) of the respondents in both areas reported that they did not treat the water to make it safe. However, relatively more respondents in intervention (11%) than in control (1%) areas followed some means of treating the drinking water at endline. For example, more respondents in intervention (8.5%) than in control areas (0.8%) at endline followed the boiling method, indicating progress at ensuring safe drinking water.

Toilet facilities

About 44% of the households in control and 63% in intervention areas had toilets in their homes. Those with toilet facilities increased notably at endline in both areas (by 9 and 13 percentage points in control and intervention areas, respectively) from baseline. The possession of sanitary latrines also increased in both, but at a higher pace in intervention areas (Figure 1).

Figure 1: Percentage of respondents by existence of toilet facilities in their household



The use of toilets by children was relatively low compared to the existence of toilet facilities in the households. Only 21% of children in control and 48% in intervention areas had used toilets the last time they needed to – the rest used open spaces for defecation. Only a small proportion (7% to 10%) of the respondents in both areas disposed of their child’s feces into toilets – most disposed of it in the yard and rinsed or washed it away in open areas (Table 5). However, there was more improvement in the use of toilets by children in intervention (by 21 percentage points) than control (3 percentage points) areas at endline.

Table 5: Percent distribution of respondents by place of defecation and disposal of the children's feces

Description	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
Place of defecation of the child the last time				
Used toilet facility	17.3	20.6	26.4	47.8
Went outside the house	61.3	55.1	52.8	31.8
Went in house/yard	10.0	13.6	8.8	13.2
Pit; brook side; jungle; road	2.7	4.4	3.8	3.7
Inside house on the floor; on bed	7.7	5.3	6.8	2.2
Used potty	0.5	1.0	1.0	1.3
Other (no specific place; do not know)	0.4	0.1	0.1	-
Missing	0.2	-	0.3	-
Total	1051	1307	1055	1307
Place of disposal of the child’s feces				
Disposed somewhere in yard	22.7	34.2	36.7	24.3
Rinsed/washed away in open area	42.3	28.0	22.8	21.7
Buried	4.9	7.6	4.1	11.6
Dropped into toilet facility	2.4	7.2	4.1	9.5
Rinsed/washed away in drainage system	3.6	-	1.7	-
Did nothing	23.4	22.9	30.1	32.8
Missing	0.2	-	0.4	-
Do not know	0.5	-	0.1	-
Total	869	1038	777	682

Hygiene practices

Over 62% of the women in control and 93% in intervention areas affirmed that they used soap to wash their hands one day prior to the endline survey, up by 5 and 18 percentage points at baseline, respectively.

Almost 48% and 87% of respondents in control and intervention areas reported washing their hands with soap after defecating; and 47% and 82%, respectively, washed their hands after cleaning their child's bottoms. The proportion of women washing hands before feeding child and before eating was relatively low in both areas (Table 6). The survey results show a substantial improvement in hand washing practices on the above mentioned four key occasions at endline, however, the proportion of respondents who washed hands on all four key occasions was only 1% in control and 11% in intervention areas, indicating the need to educate people about the need to wash their hands regularly on various occasions.

Table 6: Percent distribution of respondents by use of soap while washing hands for different purposes

Purpose of using soap (Multiple Response)	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
Washing hands after defecating	30.4	47.5	39.5	87.3
Washing child's bottoms	23.3	47.1	23.2	82.0
Washing hands before feeding child	5.0	7.2	1.9	33.3
Washing own hands before eating	-	8.1	-	22.8
<i>Washing hands all four key occasions</i>	0	0.9	0	11.3
After cleaning dung; after moping floor; after collecting fodder	34.2	45.1	39.8	59.8
Washing child hands before eating	10.2	9.8	6.3	29.2
Washing hands after cleaning child	6.2	6.6	7.6	13.3
Washing hands before preparing and handling food	1.0	2.4	1.4	12.5
After cleaning utensils; after completing household works	2.5	7.3	8.7	11.2
Washing clothes/hand	36.9	0.2	46.9	0.5
Washing hands after eating	10.8	0.2	2.7	0.4
Other (to wash hands and face)	0.8	0.5	1.0	0.2
None	33.2	37.9	25.0	7.3
Total	1051	1307	1055	1307

Membership in AAMA mothers'/community groups

Over half (54%) of the respondents in control and 77% in intervention areas reported that they themselves or their family members were affiliated with community groups; this figure was more than double compared to the baseline results of 29% in control and 34% in intervention areas. The trend of mothers themselves becoming members of a community group increased markedly from 56% to 83% in control and 63% to 97% in intervention areas at endline. There was a reduction in husbands becoming members of such groups in both the control and intervention areas at endline (Table 7).

Table 7: Percent distribution of respondents by their or their household members involvement in community groups

Description	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
Whether anyone in the households belonging to any community group				
Yes	28.9	54.3	33.7	77.0
No	69.4	44.6	62.2	19.8
Do not know	1.7	1.1	4.1	3.2
Total	1051	1307	1055	1307
Persons belonging to community group (Multiple Response)				
Myself	56.3	82.8	63.2	96.9
My husband	29.6	13.7	14.6	7.1
Mother-in-law	4.3	5.1	10.4	3.1
Father-in-law	5.3	2.8	6.5	2.3

Other family member (female)	2.6	0.6	3.1	0.5
Other family member (male)	2.0	0.7	1.1	-
Myself and husband	-	-	1.1	-
Total	304	710	356	1006
Kinds of community organization (Multiple Response)				
AAMA Mothers Group	3.3	-	9.8	86.5
Saving credit groups	81.6	52.1	71.3	32.2
Mothers group (other than AAMA mothers group)	-	47.0	-	9.7
Users group (forest, water)	10.5	10.0	16.0	6.1
ADO Farmers Group	0.7	0.4	0.3	1.3
Poverty alleviation fund	-	0.4	-	0.1
Other groups §	3.3	4.1	2.5	1.9
Do not know	0.7	-	-	-
Total	304	710	356	1006

§ Other includes: MCH care committee; Phenida Cooperative; Pooja Group; Janajaran Community Organization; Simirik Youth Club; School Management Committee; Dalit Mukti Samuha; Ekades Nepal; Women Development Office; Mahila Sanjal; Pragatisil Samuha; Rudes; Laligurans Tarkari Samuha; Hariyali Samudaik Sanstha.

The majority of the respondents in control areas had affiliations with saving credit (52%) and mothers groups (47%) at endline. The great majority (87%) of the respondents in intervention areas were members of AAMA mothers' groups and nearly one-third (32%) with saving credit groups. Membership in organizations such as saving credit groups, forest and water users groups reduced at endline among control and intervention areas (Table 7). More respondents (74%) in intervention compared to only 45% in control areas, reported participating in any groups in the last three months, with 65% from the former participating in HFP/AAMA mothers groups (Table 8).

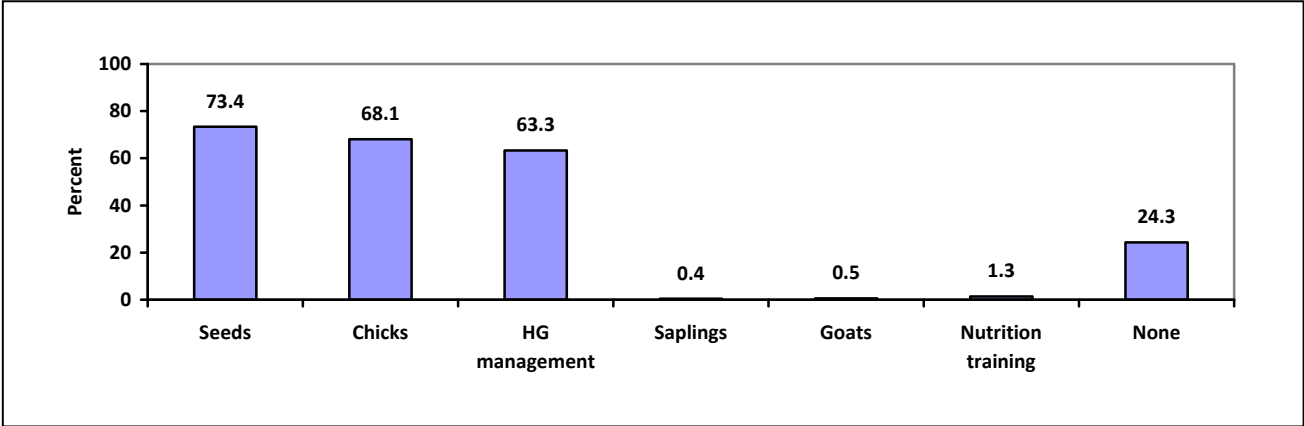
Table 8: Percent distribution of respondents by their participation in community organizations in the last three months preceding the survey

Participation in any community organization in the last 3 months (Multiple Response)	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
HFP/AAMA Mothers group	0.7	-	1.6	65.2
Saving credit	13.4	22.4	16.9	19.7
Mothers group (other than AAMA mothers group)	-	23.9	-	6.9
Poverty alleviation fund	-	0.2	-	0.5
Other§	0.9	2.9	1.0	2.3
Did not participate	14.0	54.6	14.2	26.2
None	71.1	-	66.3	-
Total	1051	1307	1055	1307

§ Other includes: nutrition; agriculture; goat farming; vitamin A program; outreach clinic; school management committee; women development office; Mahila Sanjal; Pragatisil Samuha; Rudes; Laligurans Tarkari Samuha; Hariyali Samudaik Sanstha.

More than two-thirds (68%) of the respondents in intervention areas had secured memberships in HFP/AAMA mothers groups and 89% of them met 1-2 times in the last two months, indicating high participation of mothers in the groups. A great majority of the mothers had received seeds (73%), chicks (68%) and home gardening management support (63%) from the groups, while almost 24% did not receive any assistance from the groups (Figure 2).

Figure 2: Percentage of respondents in intervention areas by type of assistance they received from the HFP/AAMA group at endline



Chapter 4 Findings

Home gardening and consumption of vegetables

Existence of home gardens

Nearly all (97%) of the respondents in intervention and 77% in control areas had home gardens. The proportion of households having improved or developed home gardens increased significantly in intervention areas while control areas saw only a slight increase (Table 9).

Table 9: Percent distribution of respondents by existence of home gardens by type in their households

Description	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
Existence of home garden by type				
No HG	58.0	23.2	62.3	3.4
Traditional HG	41.7	75.2	37.3	38.6
Improved HG	0.3	1.5	0.4	30.8
Developed HG	-	0.1	0.1	27.1
Total	1051	1307	1055	1307
Area of home garden (in square meter)				
Less than 32 square meter	5.7	27.0	1.3	9.5
32-63 square meter	7.7	40.8	5.8	31.0
64-95 square meter	32.7	18.7	23.6	19.0
96-127 square meter	32.9	6.6	31.9	18.9
128-255 square meter	11.8	4.9	17.8	14.3
256 square meter or more	6.8	2.0	12.1	7.2
Average size	138	55	174	111
SD	150	74	161	141
Do not know	0.5	-	-	-
Missing	2.0	-	7.5	-
Total	441	1004	398	1262

Among those who have home gardens, 44% in intervention areas had year round production of vegetables in the gardens, as opposed to 15% in control areas. The person who usually tended the gardens was the wives in both areas (up from 50% at baseline to 66% at endline in control and from 44% to 75% in intervention areas).

Types of vegetables grown in the home garden

The mean number of vegetables grown in the intervention areas increased from 4.2 at baseline to 8.2 at endline and was appreciably higher than those in control areas (which increased from 3.7 to 4.1).

The average amount of vegetables in kilograms produced by households increased notably in intervention areas, by 26 percentage points (from 16.6% to 42.7%), while in control areas there was only a 5 percentage point increment (13.7% to 18.5%).

The proportion of households who used non-chemical organic materials to control pests and diseases increased from 3% to 57% in intervention areas while in control areas, it decreased from 6% to 4%.

Consumption of vegetables

There was a marked improvement in the practice of feeding green, leafy vegetables to children 12-48 months of age almost daily in intervention areas (from 30% to 53%); however, this practice declined from 38% to 33% in the control areas. The proportion of mothers who provided yellow and orange vegetables to their children almost daily reduced in control areas (from 6% to 4%) and increased in intervention areas (from 4% to 8%) (Table 10).

Table 10: Percent distribution of respondents by consumption of green leafy and yellowish vegetables by children 12-47 months of age in their households

Description	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
Frequency of feeding green leafy vegetables				
Yes, nearly daily (5 to 7 days a week)	37.8	33.1	30.2	53.1
Yes, about every other day (2 to 3 days a week)	24.3	46.6	26.9	40.0
Yes, sometimes (1 day a week)	10.3	12.1	14.2	4.4
No, never	27.2	8.3	28.1	2.5
Missing	0.3	-	0.6	-
Total	378	986	331	1261
Frequency of feeding yellow and orange vegetables to the children 12-47 months old				
Yes, nearly daily (5 to 7 days a week)	5.9	4.2	3.9	7.6
Yes, about every other day (2 to 3 days a week)	3.4	17.5	4.6	10.8
Yes, sometimes (1 day a week)	5.9	13.9	5.3	18.8
No, never	84.7	64.4	86.2	62.7
Total	118	815	152	1216

Although almost 3-in-4 households in both areas had consumed all of the home garden products in the last two months preceding the survey by themselves, there was a slight decline in the proportion of households that did at endline compared to baseline (Table 11).

Table 11: Percent distribution of respondents by consumption of the home garden products by the household members in the last 2 months preceding the survey

Percentage of garden produce consumed by household members	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
100%	82.2	76.9	85.3	71.2
75%	14.5	21.7	10.8	25.1
50%	2.8	1.3	3.6	3.3
25%	0.3	0.1	0.3	0.3
Less than 25%	0.3	-	-	0.1

Total	394	965	360	1241
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The proportion of respondents mentioning home gardens as their main source of vegetable consumption increased significantly from 25% to 85% at endline in intervention and from 35% to 61% in control areas. Those obtaining vegetables from local market declined sharply in intervention areas (from 31% to 15%) while it increased notably in control areas (from 27% to 35%).

At the same time, 76% and 65% of respondents in control and intervention areas, respectively, purchased vegetables from the market in the two months preceding the survey. The average amount spent by households for purchasing vegetables increased from Rs 624 to Rs 717 in control and Rs 736 to Rs 786 in intervention areas, with 98% in the former and 92% in the latter spending it on root and gourd vegetables. Those purchasing green vegetables were much higher in control (24%) than in intervention (16%) areas.

Sale of vegetables and fruits

Only a small proportion of the respondents in both the control (2%) and intervention (9%) areas reported selling garden produce, a very slight increase from 3% and 5%, respectively. The average income from the sale of these garden produce in control areas increased from Rs 426 to Rs 1207 per household and in intervention areas, from Rs 561 to Rs 1519. A majority of the households in both areas (90% in control and 77% in intervention) used the money earned for household expenses (Table 12).

Table 12: Percent distribution of respondents by main use of the money earned by selling fruits and vegetables

Description	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
Main use of the money earned by selling fruits and vegetables for various purposes (Multiple Response)				
Household expenses	67.6	90.0	63.8	77.0
Food	20.6	33.3	19.0	24.8
Clothing	5.9	20.0	1.7	21.2
Education	2.9	13.3	5.2	9.7
Saved	-	6.7	6.9	9.7
Medicine	-	20.0	3.4	8.0
Productive purpose	2.9	16.7	-	7.1
Total	34	30	58	113
Type of foods was purchased (Multiple Response)				
Cooking oil	42.9	50.0	45.5	67.9
Rice/wheat/Cereal	71.4	70.0	54.5	60.7
Meat/egg/Animal-source foods	-	20.0	-	28.6
Fruits & vegetables	28.6	20.0	18.2	17.9
Fish/dry fish	-	10.0	-	7.1
Other food (salt; ghee; tea)	28.6	10.0	36.4	3.6
Total	7	10	11	28

Nearly half of the respondents in the intervention and about one-third in control areas reported controlling the money earned, which increased notably in both areas at endline, but with a greater increment in intervention areas. However, males still have significant control over the money earned from selling the garden produce (Table 13).

Table 13: Percent distribution of respondents by persons in households who control money earned from selling garden produce

Person having major control over the money earned from selling produce	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
Own	20.6	33.3	15.5	48.7
Husband	35.3	40.0	32.8	26.5
Father-in-law	35.3	13.3	19.0	18.6
Mother-in-law	5.9	13.3	29.3	5.3
Other family members	2.9	-	3.4	0.9
Total	34	30	58	113

Poultry farming and livestock

The proportion of respondents having poultry in their households markedly increased from 12% to 30% at endline in intervention areas and slightly from 15% to 17% in control areas (Figure 3.5). Except for one household in the intervention area, none of the households had ducks or pigeon. Over 20% of the households in control and 11% in intervention areas had less than 5 chickens and about 9% in intervention and 5% in control areas had 5 or more chickens. The average number of chickens in a household increased from 0.6 at baseline to 0.8 at endline in control areas and from 0.5 to 1.3 at endline in intervention areas. The main purpose for chickens in both control and intervention areas was primarily for their own consumption rather than for selling (69% and 97%, respectively).

However, almost 30% of households in both control and intervention areas earned money by selling poultry and poultry products, although these figures did not increase by much from baseline (23% in control and 30% in intervention areas). The average amount earned by selling poultry and its product in the last two months preceding the survey was much higher in both areas (Rs 733 in control and Rs 726 in intervention) compared to the baseline figures of Rs 292 and Rs 414, respectively. Most of the households in both areas spent the money on household expenses (83% in control and 71% in intervention), food (42% in control and 23% in intervention) and clothing (14% in control and 13% in intervention).

Only 13% of respondents in control and 21% in intervention areas had consumed meat that came from their own farms. More respondents in intervention (37%) than in control (25%) areas reported feeding meat products to their children 12-47 months of age in the last two months preceding the survey, indicating better feeding practices in the former. A considerably higher proportion (80%) of respondents in intervention than in control (67%) areas reported purchasing meat, with a greater increment in intervention (19 percentage points) than control (6 percentage points) areas. The average amount spent on meat in the last two months prior to the survey was not only higher in intervention (Rs 998) than in control (Rs 740) areas, but there was also a greater increase in the former than the latter. More (36%) of the respondents in intervention as opposed to (19%) in control areas had fed purchased meat to children 12-47 months of age.

With regards to whether they purchased milk for consumption during the last two months preceding the survey, only a small proportion responded in the affirmative (3% in control and 5% in intervention areas). Among those who purchased milk, over 95% of the respondents in both areas said that they fed purchased milk to their children 12-47 months of age and about 80% gave their children milk almost daily. The average amount spent on milk for the last two months preceding the survey was approximately Rs 850 at endline in both areas, up from Rs 515 in control and Rs 550 in intervention areas.

Only a small proportion of households in both the control (6%) and intervention (8%) areas earned money by selling milk or milk products in the last two months preceding the survey, which is slightly higher than baseline figures of 2% in control and 6% in intervention areas. The average amount earned from milk and milk products increased sharply from Rs 1101 to Rs 1852 at endline in control and moderately from Rs 1531 to Rs 1605 in intervention areas. Approximately 60% of the respondents in intervention and 40% in control areas said that they had most of the control over the money earned. Most of the households in control and intervention areas spent this money on household expenses (82% and 63%, respectively) followed by food (48% in both).

Food security

The food security status of households was estimated using “household food insecurity access scale (HIFAS) developed by the FANTA Project, Academy for Educational Development, 2007. The survey results are presented in Table 14. The percentage of households experiencing food insecurity in the last 12 months preceding the survey declined more and at a greater pace in intervention areas (from 80% to 54%) than in control areas (from 87% to 78%).

Table 14: Food security indicators

Description	Control area		Intervention area	
	Baseline (n=1051)	Endline (n=1307)	Baseline (n=1055)	Endline (n=1307)
Worry about food	77.0	71.3	72.9	40.8
Unable to eat preferred food	59.0	67.3	50.0	44.4
Eat just a few kinds/varieties of foods	51.2	63.2	35.5	41.6
Eat food they really do not want to eat	52.4	60.6	50.8	42.9
Eat a smaller meal (in terms of quantity)	32.8	41.3	27.3	16.3
Eat fewer meals in a day (in terms of number)	22.5	36.6	22.5	14.8
No food of any kind in the household	47.0	26.9	47.9	12.0
Go to sleep hungry	20.9	5.1	16.4	1.9
Go a whole day and night without eating	-	1.0	-	0.5
Household food insecurity access (HFIA) prevalence				
Food secure households	13.5	21.7	20.3	46.4
Households with some food insecurity (mild, moderate or severe)	86.5	78.2	79.7	53.6
Mildly food insecure access	19.9	14.5	21.7	17.4
Moderately food insecure access	15.0	35.8	8.8	23.3
4 Severely food insecure access	51.6	27.9	49.2	12.9

In addition to the above, respondents were also asked to comment on those statements that best described the situation of their households in the last 12 months preceding the survey, the results for which are presented in Table 15.

Table 15: Percent distribution of respondents by their opinion regarding the food situation in their households in the last 12 months preceding the survey

In the last 12 months.....	Control area		Intervention area	
	Baseline (n=1051)	Endline (n=1307)	Baseline (n=1055)	Endline (n=1307)
The food that we bought just did not last, and we did				

not have enough money to get more				
Often true	16.4	14.8	13.2	7.7
Sometimes true	54.1	36.6	46.0	32.4
Rarely true	-	25.4	-	16.9
Never true	29.5	23.3	40.9	43.0
Does not Know	-	-	-	0.1
We could not feed our children nutritious animal foods such as eggs, meat, because we could not afford that				
Often true	30.4	17.4	15.3	9.9
Sometimes true	37.9	34.4	35.1	31.0
Rarely true	-	23.8	-	15.8
Never true	31.8	24.4	49.7	43.3
Does not Know	-	-	-	0.1
Our children were not eating enough because we just could not afford enough food				
Often true	6.6	5.6	5.6	2.4
Sometimes true	28.4	15.3	19.8	10.1
Rarely true	-	23.6	-	15.2
Never true	64.8	55.5	74.6	72.1
Does not Know	0.3	-	-	0.1
Our children ever skipped meals because there was not enough money for food.				
Often true		0.8		0.2
Sometimes true		1.1		2.1
Rarely true		4.3		1.8
Never true		93.7		95.9
Does not Know	na	0.1	na	0.1

Antenatal care and delivery services

Use of antenatal services during current pregnancy

Nearly 74% of women in intervention areas received antenatal services during their current pregnancy compared to 59% in control areas; and almost all of them received services from health workers. A higher percentage in intervention than in control areas had taken iron tablets (84% and 68%) and de-worming tablets (82% and 59%) at any time during their current pregnancy. The proportion of women who received tetanus toxoid (TT) injections during their current pregnancy was higher in intervention (55%) than in control (31%).

Incidence of night blindness during pregnancy is considered to be a useful indicator of vitamin A deficiency among women. In this context, all currently pregnant women were asked if they had suffered from night blindness during their current pregnancy, through which it was discovered that its prevalence was much higher in control (19%) than in intervention (11%) areas.

More respondents in intervention areas reported eating more-than-usual amount of food during their current pregnancy (which increased from 15% at baseline to 40% at endline) than in control areas (which declined from 11% to 9%).

Use of antenatal services during last pregnancy

A higher proportion of women in intervention (93%) than in control (85%) areas received antenatal services during their last pregnancy, with most of them from skilled or trained health workers. The percentage of women who received the recommended 4 or more number of antenatal checkups was much higher in intervention (64%) than in control (39%) areas and by much more at endline than baseline (35 percentage points versus 19, respectively).

Similarly, more women (92%) in intervention areas had received TT injections at any time during their last pregnancy than those in control (81%) areas and with a much greater increase from baseline to endline (18 percentage points versus 3, respectively). The proportion of women receiving iron tablets increased by more in intervention (from 72% to 92%) than in control areas (from 77% to 85%). The main source of supply of iron tablets was FCHVs (70% in control and 57% in intervention) followed by health facilities (30% in control and 43% in intervention). The proportion of respondents receiving iron tablets for 180 or more days also increased markedly from baseline in both the intervention and control areas (88% and 71%, respectively); however, the pace of increase was much higher (by 34 percentage points) in the former than in the latter (by 16 percentage points) areas.

Approximately 22% of women in control and 14% in intervention areas reported that they were suffering from night blindness, both of which were higher than at baseline (18% and 11%, respectively).

Delivery care

The proportion of women who received assistance by a skilled health worker (doctor, nurse or auxiliary nurse midwife) during delivery increased from 6% to 10% in control and from 13% to 18% percent in intervention areas. These figures were lower than the national average of 36%³².

Table 16: Percent distribution of women by person who assisted them during the delivery of their last child

Persons assisted with the delivery of last child	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
Doctor/Nurse/ANM	6.4	9.9	13.3	18.1
HA/AHW	1.1	2.0	2.1	2.2
MCHW	2.6	5.4	4.6	6.0
Traditional Birth Attendant	0.1	1.9	0.2	0.2
FCHV	2.7	4.7	2.4	2.9
Family member	64.8	53.3	44.5	56.7
Neighbor; friend	3.2	7.0	4.6	6.2
Other (peon)	0.1	-	0.1	-
No one	19.0	15.8	28.2	7.7
Total	1051	1307	1055	1307

Post-natal services

The knowledge of respondents regarding the correct timing of taking vitamin A supplementation increased significantly at endline in both control and intervention areas, from 27% to 68% in the former and from 21% to 71% in the latter.

³² Nepal Demographic Health Survey, 2011

Nearly 58% of respondents in intervention as opposed to 32% in control areas affirmed that their youngest child received check up services following birth, with a majority of them reporting that their child received the checkups from MCHWs (56% and 59%, respectively) followed by nurses or auxiliary nurse midwives (25% and 20%) and finally doctors (12% and 14%).

Breast feeding

The vast majority of respondents in both control and intervention areas at endline (89% and 95%, respectively), opined that colostrum should be given to newborns, compared to 70% and 73% at baseline, respectively. Similarly, knowledge about feeding newborns breastmilk for up to six months after birth, increased from 72% to 83% in control and from 64% to 96% in intervention areas.

The proportion of women who breast-fed their youngest child within an hour after birth increased and decreased slightly in intervention and control areas, respectively (from 50% to 54% in the former and from 39% to 31% in the latter). There was also progress in the proportion of children 0-5 months of age in intervention areas who were exclusively breastfed (from 64% to 78%), while in control areas this declined slightly (from 66% to 64%).

Infant and young child feeding

Correct knowledge about the timing of introducing complementary foods to newborns (after 6 months of age) was significantly higher among respondents in intervention areas (75%) than in control areas (47%).

A significant proportion of respondents in both control (87%) and intervention (96%) areas considered yellow, orange, green vegetables and fruits to be the optimal foods for children 6-23 months of age. Similarly, more women in intervention than in control areas considered eggs, chicken or meat including liver, and legumes and porridge to be the best foods for children (Table 17).

Table 17: Percent distribution of respondents by opinion regarding the foods that are best to feed children 6-23 months of age in addition to breast milk

Opinion on the foods that are best to feed the children aged 6-23 months in addition to breast milk	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
Yellow, orange and green vegetables and fruits	68.6	87.0	65.5	95.9
Milk or yogurt	85.8	89.1	82.7	92.0
Eggs	30.7	32.0	28.7	80.2
Chicken or meat including liver	44.1	57.7	41.5	80.0
Legumes	-	59.1	-	79.7
Porridge that is enriched with other foods	45.5	52.6	26.2	76.2
Porridge that is not enriched with other foods	50.5	45.8	57.5	74.0
Ghee, butter or oil	45.8	28.2	41.8	53.6
Total	1051	1307	1055	1307

The survey results show that more children in intervention areas (82%) than in control areas (47%) were fed the recommended variety of foods. The proportion of children who were fed four or more variety of foods increased significantly in intervention areas (from 41% to 82%), while in control areas it increased only slightly (from 42% to 47%). There was also a greater increase in the proportion of children receiving vitamin A and iron-rich animal source foods in intervention than control areas (Table 18).

Table 18: Percent distribution of children who consumed various types of micronutrients within 24 hours preceding the survey

Type of food groups consumed in the last 24 hours	Control area		Intervention area	
	BL	EL	BL	EL
Iron rich animal source foods	5.2	6.6	6.5	18.0
Vitamin A rich animal source food	84.3	84.0	78.6	88.3
Iron rich plant source food	64.4	65.7	59.9	89.1
Vitamin A rich plant source food over previous 24 hour period	66.5	68.4	63.3	93.0
Total	421	531	401	412

Common childhood illness

More children in control areas had incidences of all health problems listed in Table 19 than those in intervention areas, with 39% of mothers in control and 23% in intervention areas, reporting their children had at least one of the symptoms in the last two weeks preceding the survey. Overall, the proportion of children suffering from any illness was higher in both areas at endline than at baseline (Table 19).

Table 19: Percent distribution of respondents by type of health problems experienced by their youngest child in the last two weeks preceding the survey

Type of health problems experienced in the past two weeks	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
Diarrhea	7.4	23.9	4.1	9.3
Blood in stools	0.3	3.7	0.3	.5
Cough that comes from the chest	4.2	15.7	3.5	7.5
Pneumonia	1.0	3.0	1.2	1.7
Difficult breathing	0.1	5.8	0.3	2.4
Fever	6.9	22.1	6.7	15.3
Other illness	1.4	1.5	1.4	1.5
<i>At least one of above</i>	16.9	39.2	13.2	23.3
Total	1051	1307	1055	1307

§Other includes: ear infection; throat infection; wound and infection; eye infection; jaundice.

The proportion of women who provided more breast milk to their children during times of illness, increased markedly at endline in both areas; however, the level of increase was much higher in intervention (42 percentage points) than in control (28 percentage points) areas. With regard to meals, the proportion of mothers providing the same or more-than-usual amount of food to sick children during illness remained almost unchanged in both the control (from 35% to 36%) and intervention (43% in both) areas (Table 5.2).

Prevalence of diarrhea and its treatment

Although a higher proportion (24%) of children 12-47 months of age in control than in intervention (9%) areas had diarrhea in the last two weeks preceding the survey, the figures were still higher than at baseline for both (8% and 4%, respectively).

Almost 94% of respondents in intervention as opposed to 69% in control areas opined that a child should be breastfed more than usual during diarrheal episodes, the proportion of which increased significantly more in the former (by 30 percentage points) than in the latter (6 percentage points).

More than 80% of respondents in both areas gave their children some form of treatment during diarrheal episodes, including oral rehydration solution (ORS), zinc tablets and antibiotics (Table 20). Children receiving ORS during the most recent diarrhea case increased markedly in both control and intervention areas (from 46% to 70% and from 51% to 77%, respectively). Most (62%) of the children in both areas got treatment from health facilities followed FCHVs (19% in control and 15% in intervention areas).

More (67%) respondents in intervention than in control (42%) areas reported giving more than usual amount of breast milk to their child, with a significantly higher increase from baseline to endline in the former (by 60 percentage points) than the latter (by 22 percentage points). However, there was not a substantial increase in children receiving more than usual amount of meals during diarrheal cases (which was around 33% in both areas, up only by 4 percentage points in intervention areas and remaining constant in control areas).

Table 20: Percent distribution of respondents by treatment of diarrhea including source of treatment

Description	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
Type of treatment sought during diarrhea (Multiple Response)				
Fluid from ORS packet	43.8	65.0	37.8	73.0
Homemade fluid	11.3	9.9	13.3	6.6
Zinc tablet	10.0	39.8	2.2	26.2
Antibiotics	15.0	16.6	22.2	13.9
Other§	11.3	6.1	17.8	0.8
Missing	2.5	-	-	-
Nothing	33.8	19.7	24.4	14.8
<i>Given ORS or homemade fluid during diarrhea</i>	46.3	70.1	51.1	77.0
Total	80	314	45	122
Places visited for treatment (Multiple Response)				
Health facility	69.8	62.3	50.0	62.5
Local Private Pharmacy	11.3	12.3	38.2	15.4
FCHV	13.2	19.0	8.8	15.4
Home remedies	1.9	9.5	-	8.7
Traditional healer	-	0.8	-	-
Missing	3.8	-	2.9	-
Total	53	252	34	104

§ Other includes: metronidazol; syrup; piprajin; cotrim; deworming tablet; IV drip; glucose.

Acute respiratory infection

Over 16% (from 5% at baseline) of children in control as opposed to 8% (from 4.5%) in intervention areas had problems associated with ARI in the last two weeks prior to the endline survey.

Approximately 68% of children in intervention and about 63% in control areas received treatment for ARI, with visible improvements seen in the proportion of children receiving treatment from appropriate providers (i.e. from health facilities) in both areas at endline. For instance, 51% of the children at endline as opposed to 40% at baseline in intervention and 47% at endline as opposed to 26% at baseline in control areas had received treatment services from appropriate providers (Table 5.7). Nearly 73% of the respondents in intervention compared to only 29% in control areas reported feeding more than usual amount of breast milk to children with ARI.

Malaria or fever

Approximately 22% of the mothers in control and 15% in intervention areas reported that their child was suffering from fever or malaria in the past two weeks preceding the survey, up from 7% at baseline in both areas. About two-thirds of the respondents in both areas reported seeking treatment for fever or malaria, out of which 48% in control and 53% in intervention areas received it from government health facilities. Almost 65% of the respondents in intervention and 43% in control areas reported taking their child for treatment on the same or next day of the illness and 64% and 67% in affirmed that their child was given drugs for the fever, in the respective areas.

Immunization of children

During the survey, mothers were asked to produce child immunization cards to confirm the vaccination status of their children. Twenty-two percent of mothers in control and 41% in intervention areas could show the cards to the interviewers at endline; these figures were higher than the baseline figure of 16% in both areas. Results show an increase in children 12-23 months of age receiving all types of immunization (Table 21).

Table 21: Percent distribution of children 12-23 months of age who received immunization by the type of vaccination

Type of immunization taken	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
BCG	na	97.2	na	98.1
DPT First dose	88.1	97.2	84.8	98.1
DPT Second dose	85.0	96.8	84.0	97.8
DPT Third dose	71.7	96.0	74.3	97.6
Polio First dose	88.1	98.1	84.8	98.3
Polio Second dose	85.0	97.7	84.0	98.3
Polio Third dose	71.7	96.4	85.5	96.4
Measles	88.8	96.6	86.8	97.3
% fully immunized	na	94.7	na	97.1
Total	421	531	401	412

Growth monitoring and nutrition

Only 13% of the mothers in control and 20% in intervention areas reported that their child was weighed at birth, among which a higher proportion of the children in intervention (80%) than in control (69%) areas

were reported to be of normal weight – between 2.5 and 4.0 kg. Again, these figures were higher than those at baseline, at 62% and 74%, respectively.

There was much improvement in the proportion of mothers taking their child for growth monitoring compared to the baseline results in both areas, with an increment of 18 percentage points in control and 25 percentage points in intervention areas. However, only about a quarter of children in both areas were taken for growth monitoring in the last 3 months preceding the survey (Table 22). Over 80% of the children in control and 43% in intervention areas were taken to health facilities such as hospitals, primary health care centers, health posts or sub-health posts, followed by outreach clinics (18% in control and 53% in intervention areas). Approximately 83% of the respondents in intervention as opposed to only 51% in control areas reported that service providers talked to them about child health when they took their children to health facilities for growth monitoring.

Table 22: Percent distribution of respondents by taking their youngest child for growth monitoring birth

Description	Control area		Intervention area	
	Baseline (n=1051)	Endline (n=1307)	Baseline (n=1055)	Endline (n=1307)
Whether taken child for growth monitoring				
Taken child for growth monitoring	33.3	51.4	50.6	75.4
Last time weighed				
Last 30 days	11.0	12.2	3.0	13.4
Last 3 months	9.9	17.5	5.3	12.5
Last 3-6 months	-	8.1	-	9.7
More than 6 months ago	12.3	13.2	42.2	37.9
Do not know	0.1	0.5	0.1	2.0
Not taken child for growth monitoring	66.7	48.6	49.4	24.6
Number of times child was weighed in the last 6 months				
None	77.5	60.4	91.4	60.4
1-2 times	8.8	28.2	5.0	26.8
3-5 times	8.7	10.5	3.1	6.2
6 times or more	5.0	0.8	0.5	6.7

Nearly half (49%) of the mothers in intervention compared to 27% in control areas reported having heard of growth monitoring (*balbridhi*) cards, which were higher than the baseline figure of 6% in both areas. There was a marked increase in the knowledge of respondents in both areas regarding the purpose of growth monitoring cards at endline (Table 23).

Table 23: Percent distribution of respondents who have heard of growth monitoring cards

Description	Control area		Intervention area	
	Baseline	Endline	Baseline	Endline
Whether heard of GMP “Balbridhi” card				
Yes	5.5	26.6	6.4	49.3
No	94.5	73.4	93.6	50.7

Total	1051	1307	1055	1307
Knowledge about purpose of the growth-monitoring card (Multiple Response)				
Just recording child's weight	58.6	81.0	52.2	86.4
To check if the child is growing properly	29.3	64.4	32.8	80.8
Used to improve the child's health and nutrition	37.9	21.8	34.3	48.4
Other (to check the date of immunization; to maintain immunization records)	5.2	-	20.9	2.5
Do not know	17.2	5.2	7.5	2.0
Total	58	348	67	645

Health and nutrition advice from service providers

The majority of respondents in both areas, with a higher percentage in intervention (81%) than in control (58%) areas, reported that they generally sought advice on maternal and child health issues from FCHVs. There was also a significant increase in respondents in intervention areas who sought advice from AAAM/HFP mothers groups (from almost 0% to 53%) than in control areas (which remained at 0%). The proportion of respondents who sought advice from FCHVs increased markedly from baseline to endline in both areas (by 36 percentage points in control and by 68 percentage points in intervention area). More respondents (15%) in control than in intervention (2%) said that they do not seek advice from any one.

Similarly, more respondents (92%) in intervention than in control (55%) areas received advice on health and nutrition, up by 44 and 16 percentage points from baseline, respectively. Overall the proportion of respondents in both areas who received advice increased substantially at endline (more in intervention areas), with more receiving advice on immunization, nutrition for sick children, and breastfeeding. The majority of the respondents, with a higher percentage in intervention areas, received advice from FCHVs, voluntary health workers or maternal and child health workers. Fifty-two percent of the respondents in intervention areas also received advice from AAMA/HFP mothers groups.

Almost all respondents in intervention (98%) and less than 90% in control areas received advice on: the need to provide children with vitamin A and deworming tablets; importance of exclusive breastfeeding until 6 months of age and initiating complementary feeding afterwards. Similarly, 95% and 64% in intervention and control areas, respectively, received advice on the importance of feeding sick children. The proportion of respondents receiving this advice was much higher at endline in both study areas, with a greater increment in intervention areas. There was similar improvement in respondents receiving advice on mothers health, including diet for pregnant and lactating women, importance of taking iron and deworming tablets during pregnancy (95% in intervention and 80% in control areas) and vitamin A 42 days after delivery (89% and 71%, respectively).

Over 98% of the respondents in intervention and 83% in control areas also reported receiving advice on the importance of feeding red, orange and yellow fruits and green leafy vegetables followed by animal source foods to both the mothers and children (80% in control and 97% in intervention) and importance of using iodized salt (95% in intervention and 67% in control areas).

Nutritional status of mothers and children

Children

Anemia

The prevalence of anemia among mother and children included in the study was examined through the measurement of hemoglobin concentration. The cut-off point used for estimating the hemoglobin status of children in the study is as follows:

Severe anemia	Hb<7.00 g/dl
Moderate or mild anemia	Hb 7.00-10.99 g/dl
Normal	Hb 11.00 or more g/dl

The prevalence of childhood anemia in control areas increased by more and was higher than in intervention areas at endline (from 36% to 48% and from 32% to 36%, respectively) than in intervention areas (36%).

The prevalence of childhood anemia was significantly higher among Dalits in control areas, while in intervention areas, no significant difference was observed across caste or ethnicity. Surprisingly, anemia level was significantly higher among the currently breastfed children than their non-breastfed counterparts. Children consuming foods from four or more groups and having the minimum feeding frequency were significantly less likely to be anemic in control areas while in intervention areas, no such association was observed. Children who were sick in the last 2 weeks preceding the survey were more likely to be anemic than those who were not ill – however, this was significant in intervention areas only. No significant association was observed between anemia and sex of child, mother’s literacy, mother’s age, socio-economic status (SES) and BMI of mothers in both areas (Table 24).

Table 24: Percent distribution of anemic children by selected background characteristics

Background characteristics	Control area		Intervention area	
	BL	EL	BL	EL
Age of child	**	**	**	**
12-23 months	50.4	61.8	49.1	53.9
24-47 months	25.6	37.8	21.9	27.4
Sex of child	ns	ns	ns	ns
Boy	35.7	47.2	32.7	36.5
Girl	35.3	47.9	31.7	34.8
Caste/ethnicity	**	**	**	ns
Dalit	49.7	57.0	41.0	37.2
Other	32.5	44.9	29.7	35.1
Mother’s literacy status	ns	ns	ns	ns
Illiterate	35.3	47.8	33.2	32.1
Literate	35.9	47.1	31.3	37.4
Mother’s age (in years)	*	ns	ns	ns
15-24	41.4	52.2	32.1	38.2
25-34	32.5	45.6	32.1	33.9
35-49	32.3	43.5	32.9	36.2
Consumption of food groups	ns	**	*	ns
<4 food groups	36.5	51.6	34.8	39.7
4 or more food groups	34.1	43.2	28.9	34.9

Minimum feeding frequency	ns	**	ns	ns
<3 times	32.3	39.4	37.9	28.0
3 times or more	36.0	49.1	31.3	36.6
Breastfeeding status	ns	**	*	**
Currently not breastfeeding	32.4	40.1	21.6	26.9
Currently breastfeeding	36.1	50.2	33.5	39.0
SEX index	ns	ns	ns	ns
Lowest	36.7	48.7	31.7	33.3
Middle	34.7	47.4	35.7	35.4
Highest	34.5	45.2	30.7	37.4
Disease prevalence	ns	ns	*	**
No illness in the last 2 weeks	34.9	45.8	31.1	32.7
Illness in the last 2 weeks	38.2	50.2	39.6	45.7
Body mass index of mother	ns	ns	ns	ns
Normal	34.8	47.9	31.3	35.2
Thin	39.2	46.2	34.9	37.5
Total	35.5	47.5	32.2	35.7
	1051	1307	1055	1307

** $p < .01$; * $p < .05$, ns=not significant

Difference in difference (DID) estimate for childhood anemia

The difference in percent of moderately anemic children at two time spans for intervention areas showed an average rising from 34% to 36% at endline, with an increase of 2 percentage points. Control areas had an 11 percentage point increase. The initial difference between the two groups was 1 percentage point at baseline and 10 percentage points at endline. The DID estimate was -8.5, indicating the proportion of moderately anemic children to be 9 percentage points lower in intervention areas. However, the initial difference in severely anemic children showed that intervention areas experienced higher percentages of severe anemia than control areas, but the DID estimate was not as high as that seen in moderate anemia (Table 25).

Table 25: Average percentage of anemic children

Description	Baseline	Endline	Difference between periods	95% CI of DID estimate	p
Moderate anemia					
Intervention	33.53	35.65	2.12		
Control	34.64	45.24	10.60		
Difference between groups	-1.11	-9.59	-8.48*	-20.41, 3.44	0.16
Severe anemia					
Intervention	0.38	0.14	-0.23		
Control	0.16	0.09	-0.07		
Difference between groups	0.22	0.05	-0.17*	-0.67, 0.33	0.50

* indicates coefficients are difference in difference estimates

Nutrition Status

Three standard anthropometric indicators namely, weight-for-age (underweight), height-for-age (stunting) and weight-for-height (wasting) have been used to assess the changes in nutritional status of the surveyed children. Children whose weight-for-age, height-for-age or weight-for-height are below minus two standard deviations (i.e. -2SD) from the median of the reference population (i.e. Z-score <-2) are considered malnourished (underweight, stunting and wasting). Similarly, children whose weight-for-age, height-for-age or weight-for-height are below minus three standard deviations (i.e. -3SD) from the median of the reference population (i.e. Z-score <-3) are considered severely malnourished. This section presents findings on the nutritional status of children 12-47 months of age from the two survey points. Binary logistics regression for the three anthropometric indicators are provided in Annex 1.

Underweight

The children whose weight-for-age was below minus two standard deviation (-2SD) from the median of the reference population or Z score <-2 were considered underweight. The proportion of underweight children declined significantly from 48% at baseline to 41% at endline in control areas ($p<.05$) while in intervention areas it declined slightly from 44% to 41%.

Dalit children and those belonging to the lowest socio-economic status (SES) were significantly more underweight than children from other castes and higher SES. A significantly higher proportion of children with mothers that had lower BMI were underweight in both intervention and control areas and at baseline and endline. Similarly, a higher proportion of currently breast-fed 24-47 month-old children and children with older mothers were more underweight at endline in intervention areas. No significant difference was observed in the prevalence of underweight children in terms of sex, feeding frequency and disease prevalence in both areas (Table 26).

Table 26: Prevalence of underweight (weight for age <-2z-scores) among children by selected background characteristics

Background characteristics	Control area		Intervention area	
	BL	EL	BL	EL
Age of child	**	ns	ns	**
12-23 months	42.8	38.6	41.6	35.7
24-47 months	52.1	42.3	44.8	43.5
Sex of child	ns	ns	ns	ns
Boy	47.0	39.1	44.9	39.9

Table 26: Prevalence of underweight (weight for age <-2z-scores) among children by selected background characteristics

Background characteristics	Control area		Intervention area	
	BL	EL	BL	EL
Girl	49.9	42.5	42.1	42.2
Caste/ethnicity	**	**	**	**
Dalit	59.1	52.5	62.8	48.4
Other	46.1	37.5	38.1	37.9
Mothers literacy status	ns	ns	ns	**
Illiterate	49.9	41.4	46.1	44.0
Literate	44.8	40.0	41.2	39.6
Age of the mothers	ns	ns	ns	*
15-24	49.3	40.4	41.5	38.6
25-34	47.0	41.3	42.9	40.0
35-50	50.6	39.5	51.7	49.7
Food Group	*	**	**	ns
< 4 food groups	51.3	44.4	48.0	45.0
4 or more food groups	44.4	36.9	38.0	40.2
Minimum feeding frequency	ns	ns	ns	ns
<3 times	53.5	40.3	39.3	40.2
3 times or more	47.4	40.9	44.3	41.1
Breastfeeding status	ns	ns	ns	*
Currently not breastfeeding	50.9	37.8	42.3	35.4
Currently breastfeeding	47.8	41.8	43.8	43.1
SES index	ns	**	**	**
Lowest	51.3	44.2	50.6	47.7
Middle	48.1	42.7	43.0	42.8
Highest	42.8	30.4	39.0	35.6
Disease prevalence	*	*	**	ns
No illness in the last 2 weeks	47.0	38.5	41.8	40.0
Illness in the last 2 weeks	55.1	44.3	55.4	44.4
Body mass index of mother	**	**	**	**
Normal (18.5 - 26.76)	46.5	38.9	39.1	37.6
Thin (<18.5)	57.9	47.6	55.9	51.4
Total	48.3	40.8	43.6	41.0
	1051	1307	1055	1307

** $p < .01$; * $p < .05$, ns=not significant

Stunting

Children whose height-for-age is below minus two standard deviation (<-2Z) from the mean of the reference population are considered short-for-age or stunted. More children (64%) in control than in intervention (55%) area were found to be stunted at endline, although there was a reduction in both areas; however, the observed difference was not statistically significant.

Similar to underweight children, stunting was significantly higher among Dalit children and those from lower SES (Table 27). Children of thin mothers were more likely to be stunted in both areas; however, the observed difference was statistically significant in control areas only ($p < .01$).

Table 27: Prevalence of stunting (height for age $< -2z$ -scores) among children by selected background characteristics

Background characteristics	Control area		Intervention area	
	BL	EL	BL	EL
Age of child	ns	ns	ns	ns
12-23 months	62.7	63.7	56.1	53.9
24-48 months	68.1	64.2	59.6	56.0
Sex of child	ns	ns	ns	ns
Boy	67.3	64.1	59.5	53.1
Girl	64.3	63.8	56.9	57.9
Caste/ethnicity	**	ns	**	**
Dalit	75.1	68.7	72.6	62.2
Other	64.0	62.7	54.2	52.4
Mother's literacy status	*	ns	*	ns
Illiterate	68.4	66.2	61.6	57.2
Literate	60.4	61.2	55.1	54.4
Mother's age (in years)	ns	ns	ns	ns
15-24	63.9	62.6	55.0	53.6
25-34	68.2	65.4	60.1	55.3
35-50	62.8	61.6	61.1	59.3
Consumption of food groups	*	*	*	ns
< 4 food groups	69.2	67.2	61.1	56.3
4 or more food groups	61.7	60.6	54.6	55.1
Minimum feeding frequency	ns	ns	ns	ns
<3 times	71.6	66.2	60.0	54.5
3 time or more	65.0	63.5	58.0	55.4
Breastfeeding status	ns	ns	*	ns
Currently not breastfeeding	66.5	64.2	49.5	51.8
Currently breastfeeding	65.8	63.9	59.3	56.6
SES index	**	**	*	**
Lowest	71.8	68.8	63.4	59.8
Middle	65.6	62.7	60.1	58.3
Highest	55.0	56.3	53.7	50.2
Disease prevalence	ns	ns	ns	ns
No illness in the last 2 weeks	64.9	62.3	57.3	55.8
Illness in the last 2 weeks	70.8	66.6	64.7	53.6
Body mass index of mother	ns	*	ns	ns
Normal (18.5 - 26.76)	64.9	62.2	56.7	54.5
Thin (<18.5)	71.3	70.3	62.6	57.9
Total	65.9	64.0	58.3	55.3
	1051	1307	1055	1307

***p<.01; *p<.05, ns=not significant*

Wasting

Children 12-47 months of age, whose weight-for-height is below minus two standard deviation (<-2Z) from the mean of the reference population are considered wasted. The prevalence of wasting was slightly higher among children in intervention than control areas and no significant improvements were observed in this indicator at endline (from 10.4% to 9.6% in control and from 11% to 10.8% in intervention areas).

Similar to stunting and underweight, wasting was significantly higher among Dalit and currently breastfeeding children than their respective counterparts in both areas at endline. Likewise, children from lower SES were more wasted in intervention areas. No significant difference was observed on the wasting status of children across age, sex, feeding practices, literacy status of mothers, age and BMI of mothers in both areas (Table 28).

Table 28: Prevalence of wasting (weight for height <-2z-scores) among children by selected background characteristics

Background characteristics	Control area		Intervention area	
	BL	EL	BL	EL
Age of child	ns	ns	*	ns
12-23 months	10.5	10.9	14.0	12.6
24-48 months	10.3	8.8	9.2	9.9
Sex of child	ns	ns	ns	ns
Boy	11.0	11.0	12.4	12.3
Girl	9.7	8.3	9.3	9.1
Caste/ethnicity	ns	*	*	**
Dalit	13.8	12.7	15.4	15.4
Other	9.7	8.8	9.7	8.9
Mother's literacy status	*	ns	ns	ns
Illiterate	11.7	9.7	11.5	13.0
Literate	7.4	9.5	10.5	9.7
Mother's age (in years)	ns	ns	ns	ns
15-24	9.9	8.8	10.2	10.3
25-34	10.5	10.0	11.1	9.7
35-50	11.0	10.2	12.8	15.6
Consumption of food groups	ns	ns	ns	ns
< 4 food groups	11.6	11.0	12.5	13.5
4 or more food groups	8.8	8.2	9.1	10.2
Minimum feeding frequency	ns	ns	ns	ns
<3 times	12.3	7.9	10.3	6.1
3times or more	10.0	10.0	11.1	11.3
Breastfeeding status	ns	*	ns	**
Currently not breastfeeding	8.7	6.4	11.7	6.2
Currently breastfeeding	10.7	10.8	10.9	12.5
SES index	ns	ns	ns	*
Lowest	11.1	10.3	14.3	15.3
Middle	10.8	9.9	9.3	9.0

Table 28: Prevalence of wasting (weight for height <-2z-scores) among children by selected background characteristics

Background characteristics	Control area		Intervention area	
	BL	EL	BL	EL
Highest	8.3	7.8	9.6	9.6
Disease prevalence	**	ns	**	ns
No illness in the last 2 weeks	8.8	9.7	9.9	9.7
Illness in the last 2 weeks	18.0	9.6	18.0	14.5
Body mass index of mother	**	ns	**	ns
Normal (18.5 - 26.76)	8.4	8.8	9.0	9.7
Thin (<18.5)	20.5	12.6	16.4	14.2
Total	10.4	9.6	11.0	10.8
	1051	1307	1055	1307

** $p < .01$; * $p < .05$, ns=not significant

Difference in difference (DID) estimate for nutrition status

The DID estimate in percentage of underweight children showed that the intervention was effective in both areas. However, the control group saw better improvement, with an 8 percentage point decline in underweight children, as opposed to 2 percentage points in intervention areas. The initial difference between the two areas was 5 percentage points. The DID estimate was 6.2, indicating the proportion of underweight children was 6.2 percentage points higher in the intervention group (Table 29).

The proportion of stunted children in intervention areas declined from 58% to 56% at endline. Control areas also saw a 1 percentage point decrease in the percentage of stunted children. The DID estimate was -0.9, indicating the proportion of stunted children was around 1 percentage points lower in intervention area.

Control areas saw a decline in the percentage of wasted children by 1 percentage point, while in intervention areas, there was a 1 percentage point increase. The DID estimate was 1.6, indicating the proportion of wasted children was around 2 percentage point higher in intervention areas.

From these findings, it can be concluded that the program intervention was more effective in reducing stunting, i.e chronic malnutrition, but was not nominal enough to reduce the proportion of underweight children, or acute malnutrition. However, none of the estimates were significant.

Table 29: Average percentage of malnourished children

Description	Baseline	Endline	Difference between periods	95% CI of DID estimate	p
Underweight					
Intervention	43.1	41.4	-1.7		
Control	48.0	40.2	-7.8		
Difference between groups	-4.9	1.2	6.2*	-1.5, 13.8	0.11
Stunting					
Intervention	58.3	56.0	-2.3		
Control	65.4	64.0	-1.4		

Difference between groups	-7.1	-8.0	-0.9*	-8.1, 6.3	0.8
Wasting					
Intervention	10.7	11.0	0.2		
Control	10.6	9.3	-1.3		
Difference between groups	0.1	1.7	1.6*	-3.1, 6.2	0.5

* indicates coefficients are difference in difference estimates

To understand the effect of a child's age on malnutrition, analysis was carried out for the two age groups (12-23 months and 24-47 months of age) separately (Table 30). The decline in underweight children 12-23 months of age during the project period was around 4 percentage points in intervention areas as well as in control groups. The initial difference at baseline between the two areas was 2%. This indicates that the percentage of underweight children was less than a half percentage point lower in intervention areas compared to control areas. While there was a minimal 0.06 percentage point decline in stunted children in intervention groups, in control groups there was a 2 point increase. The DID estimate indicates 2% less stunted children in intervention areas, compared to control areas. The decline in the percentage of wasted children during the study period was quite low in both areas with and without project implementation. The DID estimate indicates around half percentage point less wasted children in intervention than in control area. The survey results showed that none of the impact estimates were statistically significant.

The percent decline in underweight children 24-47 months of age from baseline to endline was very low in intervention areas compared to the 10 percent decline seen in control areas (Table 30). The preliminary difference at baseline between the two areas was around 7% and the DID estimate specified that the percentage of underweight children was 10 percentage points more in intervention than control areas. There was a 3 and 4 percentage point decline in stunting in intervention and control areas, respectively. The DID estimate shows around 1 percent less stunted children in control than intervention areas. Control areas saw a 2 percentage point decline in wasted children, was it increased by 1 percentage point in intervention groups. The DID estimate shows 3 percentage point more wasted children in intervention than control groups. Similar to children 12-23 months of age, none of these estimates were statistically significant expect for the percentage of underweight children.

Age stratification shows that the intervention was less effective among children from the higher age group, but operative among younger children.

Table 30: Average percentage of malnourished children 12-23 and 24-47 months of age

Description	Baseline	Endline	Difference between periods	95% CI of DID estimate	P
<u>Children aged 12-23 months</u>					
Underweight					
Intervention	40.5	36.2	-4.29		
Control	42.8	38.5	-4.27		
Difference between groups	-2.3	-2.3	-0.02*	-10.4, 10.3	0.99
Stunting					
Intervention	54.9	54.8	-0.06		
Control	62.4	64.7	2.24		
Difference between groups	-7.5	-9.8	-2.30*	-14.5, 9.9	0.7
Wasting					
Intervention	13.1	12.4	-0.63		
Control	10.4	10.4	-0.01		

Difference between groups	2.6	2.0	-0.62*	-8.7, 7.5	0.87
<u>Children aged 24-47 months</u>					
Underweight					
Intervention	44.4	44.2	-0.1		
Control	51.8	41.7	-10.1		
Difference between groups	-7.4	2.6	10.0*	0.9, 19.0	0.03
Stunting					
Intervention	60.2	57.1	-3.2		
Control	67.7	63.9	-3.9		
Difference between groups	-7.5	-6.8	0.7*	-8.2, 9.5	0.87
Wasting					
Intervention	8.8	10.3	1.4		
Control	10.5	8.5	-2.1		
Difference between groups	-1.7	1.8	3.5*	-1.5, 8.4	0.16

* indicates coefficients are difference in difference estimates

Mothers

Body mass index of mothers

According to the WHO definition, if a woman's body mass index (BMI) value is less than 18.5 she is considered thin, if BMI is between 18.5 and 24.99 she is considered normal, and if it is 25 or more, she is considered overweight or obese. A higher (24%) proportion of women in intervention than in control (22%) areas were found to be thin at endline. However, the proportion of thin women increased significantly from 16% at baseline to 22% at endline in control areas ($p < .01$) while this figure declined moderately from 27% to 25% in intervention area.

Anemia among mother

The cut-off point used for estimating the hemoglobin status of mothers in the study is as follows:

Severe anemia	Hb < 7.00 g/dl
Moderate or mild anemia	Hb 7.00-11.99 g/dl
Normal	Hb 12.00 or more g/dl

The proportion of anemic mothers at endline was much higher in control (44%) than in intervention (33%) areas and also increased by more from baseline to endline in the former than in the latter (26% and 25%, respectively).

Dalit and younger women in both control and intervention areas at endline were more likely to be anemic than their counterparts; however, the observed difference was statistically significant in control areas only. Similarly, women with normal BMI were found to be more anemic than thin ones, with this being statistically significant in intervention areas only. No significant difference was observed on the hemoglobin levels of mothers across their literacy and SES status in both areas at endline (Table 31).

Table 31: Percent distribution of anemic mother by selected background characteristics

Background characteristics	Control area	Intervention area
----------------------------	--------------	-------------------

	Baseline	Endline	Baseline	Endline
Caste/ethnicity	*	**	**	ns
Dalit	33.1	50.4	33.8	35.7
Other	24.8	41.7	23.0	30.6
Literacy status	ns	ns	ns	ns
Illiterate	26.2	43.7	25.5	30.9
Literate	26.4	43.5	25.3	32.6
Age group (in years)	ns	*	ns	ns
15-24	28.2	48.0	27.4	32.4
25-34	26.1	42.5	24.6	33.6
35-49	22.6	37.3	22.8	26.1
SEX index	ns	ns	*	ns
Lowest	29.3	45.7	30.2	34.0
Middle	23.1	40.4	24.8	31.4
Highest	25.3	45.2	22.4	31.5
Body mass index of mother	ns	ns	ns	**
Normal	25.3	44.9	25.6	33.9
Thin	31.0	39.2	24.9	26.3
Total	26.3	43.6	25.4	32.1
	1051	1307	1055	1307

** $p < .01$; * $p < .05$, ns=not significant

The DID estimate indicates an alarming picture as shown by baseline and endline differences in both intervention and control areas. Intervention areas saw about a 9 percentage point increase in anemic women from baseline to endline, while control areas showed an even greater, 16 percentage point increase. The final difference impact showed that anemia among women was around 7 percentage points lower in intervention areas (Table 32).

Table 32: Average percentage of anemic women

Moderate anemia	Baseline	Endline	Difference between periods	95% CI of DID estimate	p
Intervention	24.9	33.6	8.7		
Control	28.3	44.0	15.7		
Difference between groups	-3.4	-10.5	-7.18*	-21.4, 7.3	0.32

* indicates coefficients are difference in difference estimates

Chapter 5

Discussions and Recommendations

The content within this chapter are categorized based on the specific objectives of the study – namely the nutritional status of children and mothers, food intake by children, development of HFP, hygiene and related behavior and maternal, newborn and child health.

Nutritional status

Children

The proportion of anemic children increased from baseline to endline in both the control as well as intervention areas. However, there were less anemic children in intervention (36%) than in control (48%) areas at endline, indicating a moderate effect of the AAMA program on reducing anemia among children 12-47 months of age. The associational analysis indicates that it was their illness status, rather than socio-demographic factors, that explained anemia among children. As such, to reduce anemia among children, it is clear that they should first be prevented from falling ill. The DID estimate shows that the proportion of moderately anemic children was almost 9 percentage points lower in intervention area; however the proportion of severely anemic children was found to be higher in intervention areas.

Overall, as per the anthropometric measurement indicators, there was no marked improvement in the nutritional status of children in intervention areas at endline. The proportion of underweight children declined significantly from baseline to endline in control areas, while it declined only slightly in intervention areas. In the case of stunting, there was no statistically significant reduction in the proportion of stunted children in both the control as well as intervention areas at endline. The prevalence of wasting was slightly higher among children from intervention than control areas.

The study indicates that Dalit children and those from lower SES were more underweight and stunted than their counterparts. The feeding frequency including breastfeeding status and other demographic factors did not make a significant difference in underweight, stunted, and wasted children.

Mothers

There was moderate progress in reducing the number of mothers with lower BMI at endline in intervention areas. However, anemia increased significantly in both control and intervention areas at endline and was also more prevalent in mothers from Dalit or lower SES communities.

Food intake by children

Exclusive breastfeeding including colostrum feeding

The vast majority (89% in control and 95% in intervention areas) of women at endline opined that colostrum should be given to newborns. The proportion of mothers who exclusively breastfed their child and within one hour of birth, was much higher in intervention than in control areas. The nutritional status of children below the age of six months was also better in intervention than control areas, reflecting the positive effects of intervention activities.

Infant and young child feeding

The proportion of mothers who were aware of the correct timing of introducing complementary and correct consistency of foods to children increased substantially among the intervention group at endline and was also much higher than in the control group. However, mothers in intervention groups were less aware about the need to feed snacks to babies than in control groups, indicating the need to increase awareness regarding frequent snacking.

At endline, more mothers in the intervention areas than in control areas provided the recommended variety of foods including iron and vitamin A rich plant foods to their children. However, less mothers fed their children iron rich animal foods, a potential reason being its cost and limited availability. Overall, the minimum appropriate feeding was much higher in intervention (79%) than in control (44%) areas.

Development of Homestead Food Production (HFP)

Gardening

More households in intervention areas (97%) than control (77%) areas had home gardens, with the former having improved opportunities to produce more nutritious and adequate quantity of foods. However, less than half (44%) had year-round production of vegetables in the gardens in the intervention areas, which was nevertheless still higher than in control areas (15%).

The amount and variety of green, yellow and orange colored vegetables also increased more in intervention areas. Consumption of the produce was also significantly higher in intervention than control areas, with more children in the former being fed fruit almost daily. Another positive practice included the use of non-chemical organic fertilizers in the gardens.

The proportion of women involved in HFP, who generated income by selling garden products, and had control over the income, also increased in the intervention areas and from baseline to endline.

Poultry

Although the proportion of households rearing chicken increased markedly from 12% to 30% in intervention areas, and the varieties and consumption of poultry was much higher in intervention than control areas, only 38% of households consumed 100% of the chicken and only 4% provided chicken meat to their children on a regular basis. Similarly, although the sale of poultry and its products was higher in intervention areas, thus fulfilling the aim of increasing women's income through poultry-keeping, the money was spent more on household items rather than food. Overall, the practice of consuming meat, either from one's own farm or purchased from the market was relatively low both in the control and intervention areas.

Hygiene and related behavior of mothers/caretakers

Drinking water

Despite more mothers using improved sources of drinking water in intervention (88%) than in control (72%) areas at endline, the proportion of mothers who did not treat drinking water was very high in both (89% and 99%, respectively).

Toilet facility

A considerable proportion of households in study areas did not have toilet facilities; however, more households in intervention areas did than in control areas (63% and 44%, respectively). The practice of children using toilets was rather unsatisfactory as only 21% of the children in control and 48% in intervention areas used toilet facilities prior to the survey and a substantial proportion (45%) of mothers discarded the feces in places other than the toilet.

More mothers in intervention (93%) than in control (62%) areas at endline washed their hands with soap one day prior to the survey, particularly before feeding their child, after washing their child's bottom and after defecation.

Maternal health, newborn care and child health

More mothers in intervention areas (70%) were knowledgeable about the month at which to start taking iron tablets than in control areas (50%). They were also more aware of the fact that pregnant women should eat more-than-usual amounts of food (93% versus 62%). Among currently-pregnant women, the tendency of consulting any health workers or volunteers, particularly MCHWs, increased notably in intervention areas, although only 25% did. Mothers' knowledge regarding the correct timing of taking vitamin A supplementation was also much higher in interventions areas.

Although less than in control areas (19%), the prevalence of night blindness among pregnant women was alarmingly high in intervention groups (11%).

Similarly, although the proportion of deliveries assisted by skilled birth attendants was double in intervention than that in control areas, most deliveries still occurred under the assistance of family members.

Overall TT coverage was also low, but higher in intervention (55%) than control (31%) groups.

Specific recommendations

On nutritional status including anemia among children

- Emphasis should be placed on preventing sickness among children to prevent them from becoming anemic. The ethnic background of mothers and gender differentials among children need to be carefully considered when designing nutrition programs. In addition, improving the socio-economic status of mothers as well as feeding practices should be taken into account to reduce the number of underweight children and mothers.

On food including micro-nutrient intake by children

- To further improve breastfeeding practices, more emphasis needs to be placed on the dissemination of information about the importance of colostrum feeding and exclusive breastfeeding. Mothers should also be well-informed about the need for frequent feeding of snacks in addition to providing at least 3 meals a day, focusing on iron-rich animal foods.

- Efforts should be made to make micronutrient powders available at health facilities and/or commercial outlets, in addition to continuing the regular distribution of vitamin A capsules, and de-worming tablets to prevent micro-nutrient deficiency disorders.

On development of HFP including home gardening

- Households should be encouraged to have year-round production of foods from their home gardens, by introducing seasonal varieties of vegetables and introducing good plotting methods. Efforts should be made to maintain or increase the current practice of planting varieties and quantities of vegetables, by providing appropriate and adequate information as well as other technical support to the households.
- Householders need to be better oriented on improved methods of poultry keeping, to increase the amount and quality of poultry products.
- Mothers need to be encouraged that preference be given to consuming their home garden products first, followed by selling them if there is a surplus. Along the same line, families need to be give priority on purchasing foods for their children from the income generated through the sale of garden and poultry products.
- Mothers should be encouraged to provide eggs and other poultry products to their children on a regular basis to fulfill the requirement of micro-nutrients from animal sources. Similarly, efforts should be made to improve the practice of providing chicken meat to children and increase the frequency of provision of fruits to their children, as well as plain milk.

On hygiene and related behavior of mothers/caretakers

- Increased effort is needed to encourage mothers to treat drinking water, preferably by boiling it before drinking.
- Since the provision and use of toilets by children were low, households should be motivated to build toilets and mothers should be encouraged to discard their children's excreta in an appropriate place and to teach their children to use toilets.
- Although the proportion of mothers washing their hands with soap was found to be high in intervention areas, to ensure universal coverage of this important practice, effort on encouraging mothers to follow proper hand-washing techniques need to be maintained.

On maternal and child health

- Mothers should be encouraged eat a proper diet, as well as consume more amounts of foods than usual, to avoid night blindness during pregnancy. They also need to be further educated on the appropriate timing of consuming de-worming tablets to prevent themselves from malnutrition and also need to consult more with health workers and volunteers during pregnancy.
- Efforts should be strengthened to increase deliveries assisted by skilled birth attendants.

Overall Recommendations

- i) Based on the improvements observed in the intervention areas at endline, compared to those in the control areas, it is recommended that the strategies and approaches followed in Baitadi district be extended to other districts in the country.
- ii) Programs for educating mothers and family members on various aspects of maternal and newborn care should be reinforced by mobilizing community level health workers/volunteers and through the use of mass media.
- iii) The potential of joint health and agriculture efforts to improve the health and nutritional statuses of the children should be revisited and exploited more vigorously.

Annex 1. Logistics Binary Regression

Underweight

Children 12-47 months of age from intervention areas were at 22% lower risk of being underweight at baseline. Older children, and those from Dalit communities were also more likely to be underweight than their counterparts, at both baseline and endline. It is also apparent that the lower the BMI of the mothers, the greater the risk of underweight children. In addition, the socio-economic status (SES) of respondents appeared to be a significant contributor to children being underweight – children from higher SES showed a significantly lower risk (20% and 30% lower at baseline and endline, respectively).

Table 33: Odds of underweight children

Factors	Baseline survey					Endline survey		
	P	Odds ratio	95.0% C.I. for odds ratio		p	Odds ratio	95.0% C.I. for odds ratio	
			Lower	Upper			Lower	Upper
Control		1.00				1.00		
Intervention	0.01	0.78	0.65	0.94	0.86	1.01	0.86	1.20
Dalit		1.00				1.00		
Non-dalit	<0.001	0.50	0.40	0.63	<0.001	0.66	0.55	0.80
Normal BMI		1.00				1.00		
BMI of mothers (Thin)	<0.001	1.69	1.36	2.11	<0.001	1.53	1.27	1.84
12- 23 months		1.00				1.00		
Age of child (24-47 months)	0.001	1.34	1.12	1.61	0.001	1.32	1.11	1.55
SES								
Lowest		1.00				1.00		
Middle	0.51	0.93	0.75	1.15	0.87	0.98	0.81	1.19
Highest	0.03	0.79	0.63	0.98	0.001	0.69	0.56	0.86
Constant	0.017	1.39			0.03	0.79		

Stunting

Children from intervention areas were at lower risk of being stunted (Table 34). Much like for underweight children, those belonging to the non-dalit group and those from a better socio-economic status were at much lesser risk of being stunted.

Table 34: Odds of stunted children

Factors	Baseline survey					Endline survey		
	P	Odds ratio	95.0% C.I. for odds ratio		p	Odds ratio	95.0% C.I. for odds ratio	
			Lower	Upper			Lower	Upper
Control		1.00				1.00		

Intervention	0.003	0.75	0.62	0.91	<0.001	0.73	0.62	0.87
Dalit		1.00				1.00		
Non-dalit	<0.001	0.55	0.42	0.70	0.01	0.78	0.64	0.95
SES								
Lowest		1.00				1.00		
Middle	0.16	0.85	0.68	1.07	0.19	0.87	0.72	1.07
Highest	<0.001	0.64	0.52	0.81	<0.001	0.67	0.54	0.83
Constant	<0.001	3.75			<0.001	2.46		

Wasting

Table 35 shows that children from intervention areas were at 5% lower risk of being wasted at baseline, but this risk was almost the same in both intervention and control areas at endline. Dalit children were more likely to be wasted than children from other castes and the relation between mothers' BMI and their children's nutritional status was significant.

Table 35: Odds of wasted children

Factors	Baseline				Endline			
	P	Odds Ratio	95.0% C.I. for Odds Ratio		P	Odds Ratio	95.0% C.I. for Odds Ratio	
			Lower	Upper			Lower	Upper
Control		1.00				1.00		
Intervention	0.72	0.95	0.71	1.26	0.58	1.07	0.83	1.38
Dalit		1.00				1.00		
Non-dalit	0.02	0.69	0.50	0.96	<0.001	0.61	0.46	0.79
Normal BMI		1.00				1.00		
BMI of mothers (Thin)	<0.001	2.20	1.63	2.97	0.007	1.46	1.10	1.93
Constant	<0.001	0.13			<0.001	0.14		

Endline Survey on Action against Malnutrition through Agriculture (AAMA) Project in Bajura District

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PHIDReC Team

December, 2012

Executive Summary

Introduction and objectives

Helen Keller International (HKI), its local partners the Nepal National Social Welfare Association, the Ministry of Health and Population (MoHP), and the Ministry of Agriculture and Cooperatives (MoAC) implemented the USAID funded “Action against Malnutrition through Agriculture” (AAMA) project since 2008, in Kailali and Baitadi districts and in Bajura district since 2010. The project integrates agriculture and health interventions to reduce malnutrition among children aged 0-24 months and women of reproductive age. The homestead food production (HFP) component focuses on increasing households’ year round access to nutritious foods and is linked to a second component that delivers nutrition education and behaviour change communications on a package of proven Essential Nutrition Actions (ENA).

Methodology

The survey covered children 0-24 months of age and their mothers, selected randomly from VDCs in the district. The survey used a thirty cluster sampling method proportionate to population size, with each ward representing a cluster. A total of 450 mothers with children less than 24 months of age were selected. A two-day training of supervisors and enumerators was organized to inform and orient them about the survey and its objectives. During data collection, female community health volunteers (FCHVs) from the selected clusters were contacted and their support utilized to identify appropriate households.

The household questionnaire used was identical to the baseline survey questionnaire, and covered demographic characteristics of responding mothers, IYCF and nutrition knowledge; attitudes and practices and other behavioural determinants; market access and use of information; women’s decision making power; household food security and diet diversity; sanitation and hygiene practices; and agricultural practices and use of land. Anthropometric measurements of children and mothers were performed and the concentration of hemoglobin in the blood of children and mothers were measured using the HemoCue® system. A GPS machine was also used to plot the position of the responding household. In addition, 6 FGDs with mothers of children less than two years of age, 11 key informant interviews with district and VDC level stakeholders, 2 in-depth interviews with fathers and grandmothers of children less than two years of age were conducted to collect qualitative information. Data quality was monitored by supervisors from PHIDReC, HKI and its partners. The data were entered and analyzed using SPSS version 11.5. The descriptive analyses were computed comparing the findings from the endline and baseline surveys and focused on HKI project indicators.

This survey received ethical approval from the Nepal Health Research Council. Research approval was also obtained from the Bajura District Public Health Office. Mothers and household heads were informed about the survey, from whom consent was obtained before interviews and anthropometric/haemoglobin measurements.

Key Findings

There was no significant difference from baseline to endline in the proportion of stunted, wasted and underweight children. There were more children in the 6-11 month age group who were wasted and underweight; however stunting was higher in the 12-23 month age group. There was more malnutrition among children from food insecure households and males were found comparatively more under-

nourished than females. Mothers' education and membership in AAMA groups were independent predictors of wasting, underweight and stunting in children.

With regards to hygiene and sanitation, only 13.4% of mothers washed their hands with soap on the four key occasions (after defecation, after their child defecates, before feeding children, before cooking food). However, the proportion of mothers washing their hands with soap before feeding their children rose from 3.8% at baseline to 36.8% at endline.

Slightly more than half of the mothers consulted skilled health workers for antenatal care (ANC) at endline. The major indicators of ANC - consuming iron/folic acid during pregnancy; receiving at least two tetanus-toxoid (TT) vaccinations; receiving at least 4 ANC visits - were more than two thirds at endline. Although the assistance of skilled health workers during delivery increased at endline compared to baseline, it is still low. However, skilled health workers performing check-ups on children within 24-hours of delivery and women taking vitamin A within 42 days of delivery increased significantly.

There was also much progress in mothers' knowledge of overall nutrition, including foods to be consumed during pregnancy, initiation of iron tablets and vitamin A, colostrum feeding, exclusive breastfeeding up to six months, initiating complementary feeding, and frequency of feeding children during times of illness. The improvement in knowledge was also reflected in improvements in practice. Optimal breastfeeding practices, the quality, diversity and quantity of complementary feeding of children 6-24 months of age all improved at endline. For example, the proportion of women breastfeeding their newborn within one hour of birth almost doubled at endline. Exclusive breastfeeding till the age of 6 months also increased. Overall, at least every four out of five children received the minimum number of foods per day, with progress also observed in dietary diversity.

The prevalence of any illness among children within two weeks preceding the survey at endline was 35.7%, with diarrhea, acute respiratory illness and fever being the most common. One third of ill children were fed more-than-usual at endline.

Involvement of FCHVs, mother's group or other community health workers in providing advices on nutrition significantly improved from baseline to endline.

The most common, often-experienced food insecurity situations included household members not having enough food to eat and lack of resources to buy foods they want. With regards to HFP, the majority of households had improved and developed home gardens at endline, with 3 times more median number of vegetables grown than at baseline. The proportion of households earning money by selling garden products in the last two months preceding the survey was still low at endline. Of those that did, only one-fifth used the money to buy food items.

The proportion of households with chickens increased by twice as much at endline, with more households rearing improved breeds (from 0% at baseline) and most keeping them in the closed-farming system. In 72.1% of households that raised chickens, the caretaker were women. Households earning money by selling poultry products in the two months preceding the survey more than doubled at endline, with a majority of the expenditure being used to buy food items, medicines and to pay for the children's school fees.

Abbreviations

AAMA	Action against Malnutrition through Agriculture
ANC	Antenatal Care
BCC	Behaviour Change Communication
ENA	Essential Nutrition Action
FCHV	Female Community Health Volunteers
FGD	Focus group discussion
FWDR	Far Western Development Region
GPS	Geographical Positioning System
HAZ	Length for Age
HFP	Homestead Food Production
HKI	Helen Keller International
IYCF	Infant and Young Child Feeding
MoAC	Ministry of Agriculture and Cooperatives
MoHP	Ministry of Health and Population
PHIDReC	Public Health and Infectious Disease Research Center
TT	Tetanus Toxoid
VDC	Village Development Committee
WAZ	Weight for Age
WHZ	Weight for Length

Chapter 1

Introduction and Objectives

Background

Poverty, household food insecurity and malnutrition are prevalent throughout Nepal, but is more critical in the Far Western Development Region (FWDR) of the country. Forty-one percent of children under five years of age are stunted, 11% are wasted and 29% are underweight. In addition, 46% of children are anaemic. Currently 1-in-10 children below the age of 6 months is stunted (11.6%), underweight (16.2%) and wasted (12.3%). Malnutrition is much worse in the FWDR than in other regions of the country. For example, the proportion of stunted children is 46% and the prevalence of anemia among children 6-59 months is 52% in the FWDR³³, compared to 48% nationally. The Human Development Index score for the FWDR of Nepal is 0.404, compared to the national average of 0.471.

The limited availability, variety and quality of nutritious foods, as well as high poverty rates contribute to the high rates of stunting, underweight (low weight for age) and anaemia in children in the Mid- and Far-Western Regions. Growth faltering begins in-utero and occurs in the first two years of life, during which children undergo rapid growth and therefore require increased nutrients. The prevalence of anaemia among children in Nepal places the country in the WHO category of severe public health significance³⁴. The low status of women in these communities, sub-optimal maternal nutrition, the general lack of knowledge about adequate nutrition and health contributing to poor child feeding, care and hygiene practices, all play an important role in the high prevalence of malnutrition across Nepal.

The AAMA Expansion Project

Several international and bilateral agencies, international/non-governmental organisations (I/NGOs) are engaging with the Government of Nepal (GoN) to curb malnutrition among children and mothers in the country. Helen Keller International (HKI), the Ministry of Health and Population (MoHP), the Ministry of Agriculture and Cooperatives (MOAC), and local NGO partners implemented the USAID funded “Action against Malnutrition through Agriculture” (AAMA) project from 2008 in Kailali, and Baitadi and the AAMA Expansion Project from 2010 in Bajura, all three districts in the FWR of Nepal.

AAMA integrates agriculture and health interventions to address malnutrition among children aged 0-24 months and women of reproductive age and improve household food insecurity. The project uses a homestead food production (HFP) model that focuses on increasing households’ year-round access to nutritious foods as a platform to deliver educational messages on a package of proven Essential Nutrition Actions (ENA) to households with children less than two years of age. In Bajura, HKI is carrying out the AAMA Expansion Project, which in addition to the HFP and ENA activities, also aims to strengthen governance capacity within the MOAC and MOHP to enhance multi-sectoral coordination for planning, implementation and scale-up of nutrition and food-security programs at district, regional and national levels.

The main objectives of the AAMA Expansion Project are:

1. To improve governance capacity within the MOAC and MOHP and strengthen multi-sectoral coordination for the joint identification and analysis of nutritional and food security challenges

³³ *Nepal Demographic and Health Survey*. Ministry of Health and Population, New ERA, ICF International, 2011.

³⁴ *Iron Deficiency Anemia - Assessment, Prevention and Control: A Guide for Programme Managers*. WHO/UNICEF/UNU, 2001.

and joint planning for the effective implementation of multi-sectoral interventions at the district, regional and national levels

2. To improve household food security and nutritional status of children under 2 years of age and their mothers in Bajura district by expanding the AAMA model currently being implemented in the Baitadi and Kailali districts.

Please note that only details and analysis on objective number 2 will be provided in the main body of this report. With regards to governance, in-depth interviews were conducted with district stakeholders, the results for which are provided in Annex 1.

Objectives and Indicators of the Survey

The survey included the following specific objectives:

- a) Determine the proportion of underweight, wasted and stunted children of age 0-23 months
- b) Assess knowledge and practice of exclusive breastfeeding and complementary feeding
- c) Describe the status of food security situation, and vitamin A, iron rich foods consuming practice
- d) Determine the proportion of mothers and FCHVs able to recite correctly selected ENA messages
- e) Describe hygiene related behaviours
- f) Determine women generating HFP income by selling garden and/or poultry products

Indicators calculated with data

- a) Proportion of households with developed or improved HFP.
- b) Proportion of food insecure households.
- c) Proportion of children 6-23 months of age receiving foods from ≥ 4 food groups during the previous day.
- d) Proportion of children 6-23 months of age receiving solid, semi-solid or soft foods the minimum number of times or more in the previous day.
- e) Proportion of children 6-23 months who consumed Vitamin A- and iron-rich plant/animal-source foods during previous 24 hour period.
- f) Proportion of mothers or child caretakers practicing adequate hygiene-related behaviours
- g) proportion of mothers and other caregivers able to recite correctly ENA messages on exclusive breastfeeding.
- h) Proportion of mothers and other caregivers able to recite correctly ENA messages on appropriate diversity (plant and animal source additions) complementary foods and sick child feeding.
- i) Proportion of mothers and FCHVs able to recite correctly selected ENA messages.
- j) Percent of women with HFP generate income by selling garden and/or poultry products.
- k) Proportion of underweight, wasted and stunted 0-23 months aged children.

Chapter 2 Methodology

Selection of Survey Districts and Survey Population

The endline study was carried out in Bajura, a remote mountain district located in the FWR of Nepal, where HKI implemented the AAMA expansion model in 27 village development committees (VDCs). The total population of Bajura is 135,506, with 27 VDCs each consisting of 9 wards. There are relatively few activities by non-governmental organizations in the district.

The survey covered 450 children 0-23 months of age and their mothers. Anthropometric and haemoglobin measures were taken for both children and mothers. Mothers and/or caretakers were also interviewed with selected questions on socio-economic status and other related variables.

Sample size and sampling

The same VDCs selected at baseline were used for the endline evaluation. Cluster sampling was used to make the study more representative and for rapid data collection. Each ward from the 27 VDCs represented a cluster. A sampling frame of women with children less than 24 months of age was prepared and a sampling interval was calculated. The first cluster from the sampling frame was selected randomly and other clusters were selected based on systematic sampling, with sampling intervals. If the desired number of women with children less than 24 months of age were not available in the selected clusters (ward), mothers from adjoining wards were selected.

The endline survey covered 450 randomly selected children 0-23 months of age from 30 clusters, based on the cluster sampling method. For quantitative information collection, the sample size was 15 in each cluster.

Survey tools and instruments

Two sets of instruments, including a) a semi-structured quantitative/qualitative questionnaire and b) anthropometric/haemoglobin assessment instruments (scales, HemoCue® machines, safety lancets, cuvettes) and geographical positioning system (GPS) machines were used for the study.

The questionnaire covered demographic characteristics of responding mothers and their household, infant and young child feeding (IYCF) and nutrition knowledge, attitudes, practices and other behavioural determinants, market access and use of information, women's decision making power, household food security and dietary diversity, sanitation and hygiene practices, homestead food production practices and use of land, maternal and child health and growth monitoring.

Anthropometric measurements included the measurement of height and weight of children and mothers. The concentration of hemoglobin in the blood of children and mothers was measured using the HemoCue® system and GPS machines were used to collect altitude data for each sample household.

Selection and training of supervisors and enumerators

Field supervisors and enumerators were given 2-day training and orientation sessions, which concentrated on the selection methods of the study population, detailed review of the questionnaire, use of GPS and practice taking anthropometric and haemoglobin measurements and interviews.

Data collection procedures

Five teams of enumerators (two in each team) visited the 30 clusters and collected data under close supervision of the two survey supervisors. Data collection was completed in 22 days, including travel days.

In addition, supervisors conducted qualitative data collection from FCHVs, District Agricultural Officer, Junior Technical Assistant of Agriculture, Local Development Officer, VDC secretary, District Livestock Officer, Junior Technical Assistant of Veterinary, Nutrition Focal Person of District Public Health Office. In depth interview with father/grandmother of under 2 years child, focus group discussions (FGDs) with mothers, interview with health facility incharge and NGO staff from Women Development Forum were conducted

Two in-depth interviews with fathers/grandmothers of children under the age of 2, 6 FGDs with mothers, and 11 key informant interviews with district and VDC-level stakeholders were also conducted. The key variables from the FGDs, key informant interview (KII) and in-depth interviews were summarized on a spread sheet. The analysis focused on similarities and differences on practices, knowledge and attitudes of the respondents on key variables. Where relevant, information gathered and analyzed from the FGDs, KII and interviews will be explained under the respective topic areas throughout the report.

Data management and analysis

All data was analyzed using SPSS version 11.5 and underwent multiple checks for completeness, clearness and consistency by field supervisors and PHIDReC. The descriptive analyses were computed by comparing the endline and baseline findings and focused on predefined HKI project indicators.

Anthropometric Calculations

All anthropometric calculations followed standard WHO procedures using Anthroplus software. The weight and length of the children were used to compute age- and sex-specific z-scores for weight-for-age (WAZ), weight-for-length (WHZ), and length-for-age (HAZ). Underweight, wasting, and stunting among children were defined as WAZ, WHZ, and HAZ less than -2 SD, below the 2006 WHO growth standards, respectively.

Calculation for household food insecurity

Household food insecurity was assessed using the Household Food Insecurity Access Scale (HFIAS) developed by the Food and Nutrition Technical Assistance (FANTA) project. The HFIAS tool consists of nine questions that are believed to capture all three core domains that reflect a household's inadequate access to food.

The HFIAS consists of two types of related questions. The first question type is called an occurrence question. Nine occurrence questions ask whether a specific condition associated with the experience of food insecurity *ever* occurred during the previous 12 months. Each severity question was followed by a frequency-of-occurrence question, which asked *how often* a reported condition occurred during the previous four weeks (30 days). Each occurrence question consists of the stem (timeframe for recall), the body of the question (refers to a specific behavior or attitude), and two response options (0 = no, 1 = yes). There was also a 'skip code' next to each "no" response option. This code instructed the enumerator to

skip the related frequency-of-occurrence follow-up question whenever the respondent answers “no” to an occurrence question. There were three response options representing a range of frequencies (1 = rarely, 2 = sometimes, 3 = often).

The questions included the following:

1. In the past 12 months, did you worry that your household would not have enough food?
2. In the past 12 months, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?
3. In the past 12 months, did you or any household member have to eat a limited variety of foods to due to lack of resources?
4. In the past 12 months, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources?
5. In the past 12 months, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?
6. In the past 12 months, did you or any other household member have to eat fewer meals in a day because there was not enough food?
7. In the past 12 months, was there ever no food to eat of any kind in your household because of lack of resources to get food?
8. In the past 12 months, did you or any household member go to sleep at night hungry because there was not enough food?
9. In the past 12 months, did you or any household member go a whole day and night without eating anything because there was not enough food?

Chapter 3 Characteristics of Respondents

Background characteristics of the study population

The majority of mothers at baseline and endline were 20-35 years of age and illiterate (Table 1). Dalits accounted for almost one third of the surveyed mothers; however, 70% came from upper caste groups (Brahmin, Chhetri). There were more boys than girls at endline (55.8% and 44.2%, respectively).

Table 36: Profile of surveyed mothers

Characteristics	Baseline (n=450) %	Endline (n=450) %
<i>Age (years)</i>		
<20	7.3	4.9
20-35	79.8	89.6
>35	12.9	5.1
<i>Education status</i>		
None	79.9	74.2
Primary	-	-
Secondary	21.1	25.8
Higher secondary and above	-	-
<i>Caste/ethnic group</i>		
Dalit	28.9	29.3
Disadvantaged janajati	0.4	0.2
Upper caste group(Brahmin, Chhetri)	70.7	70.4
<i>Age of children (months)</i>		
<6	23.8	16.4
6-12	34.7	14.0
>12	41.8	69.6
<i>Sex of children</i>		
Boy	58.0	55.8
Girl	42.0	44.2

Hygiene and sanitation

Most of the households had improved drinking water facilities at both baseline and endline, with the proportion of households using piped water as their drinking water source increasing significantly from 5.1% at baseline to 26.4% endline (Table 2).

Table 37: Drinking water facilities in households

Indicators	Baseline (n=450) %	Endline (n=450) %
<i>Improved water sources</i>		
Piped water	5.1	26.4
Public tap	76.2	63.5
<i>Unprotected water sources</i>		
River/pond/spring	8.0	4.7
Open well	10.6	5.3

Only 13.4% of mothers washed their hands with soap on four key occasions (after defecation, after their child defecated, before feeding their children, and before cooking food) (Table 3). However, mothers washing their hands with soap before feeding their children rose substantially from 3.8% to 36.8%, as did the number of mothers washing their hands after defecating and their child defecating (from 12.4% to 91.7% and 18.9% to 91.4%, respectively).

Table 38: Hand-washing practice with soap before meals and after defecation

Indicator	Baseline (n=450) %	Endline (n=450) %
<i>Mothers using soap to wash hands on the preceding day of the survey</i>		
After child's defecation	18.9	91.4
After defecation	12.4	91.7
After bathing the child	-	33.3
Before feeding children	3.8	36.8
Hand washing of children before feeding	-	21.6
Before cooking food	-	21.0
After taking food	3.3	33.2
Proportions of mothers or child caretakers washing hands at all four key occasions	7.9	13.4

Chapter 4 Findings

Key project indicators

The proportion of stunted, wasted and underweight children did not improve from baseline but improvements were observed in optimal breast-feeding practices, and the quality, diversity and quantity of complementary foods to children 6-24 months of age (Table 4). There were also positive changes in the proportion of women who reported taking the full 180 days of iron supplements during their previous pregnancy (76.8% versus 33.5%), proportion of households with improved HFP (5.3% versus 0.2%), median number of micronutrient-rich vegetables cultivated by households each year (5 versus 2), mean number of improved chickens owned per household (3.3 versus 0), median production of micronutrient-

rich fruits and vegetables over a 2-month period (15 versus 7) improved significantly at endline. Similarly, household income generated by women through HFP also rose substantially at endline.

Table 39: Key project indicators

Sub-results	Indicators	Baseline (95% CI)	Endline (95% CI)	P-value
To improve anthropometric status of children 0-24 months	Stunting	47.0 (42.3-51.6)	51.5 (46.7-56.3) n=441	0.1922
	Wasting	15.0 (11.7-18.2)	18.9 (15.1-22.6) n=440	0.1359
	Underweight	37.0 (32.5-41.4)	43.8 (39.1-48.6) n=447	0.0398
To increase the number of varieties and volume of micronutrient rich foods (plant and animal sources) available year round for family consumption through HFP	Proportion of women who reported taking full 180 days of iron supplements in previous pregnancy	33.5 (29.1-37.8)	337/404(83.4) (81.3-85.4)	0.0000
	Proportion of households with developed or improved HFP	0.2 (0.21-0.61)	5.3 (3.2-7.3)	0.0000
	Median number of MN-rich vegetable cultivated by HH each year	2	5	NA
	Mean number of improved chickens owned per household	0	3.37	NA
	Median production (in kg) of MN-rich fruits and vegetables over 2-month period	7	15	NA
To increase household income generated by women through HFP (and available for purchase of high value foods)	Median income generated from sales of plant in the last 2 months.	500 (n=28)	500 (n=65)	NA
	Percent of women with HFP generate income by selling garden and/or poultry products	13.9 (10.7-17)	141/ 449(31.4) (29.2-33.5)	0.0000
	Percent of HHs purchasing animal source foods with income generated by sales of garden products	4.9(2.9-6.8)	2/15 (13.3) (10.1-16.4)	0.0000
To increase optimal breastfeeding practices	Proportion of children born in past 24 months who were put to the breast within 1 hour of birth	41.7 (37.1-46.2)	365/450 (81.1) (77.4-84.7)	0.0000
	Proportion of infants 0-5.9 months who received only breast milk during the previous day (DHS national level is 53 percent)	73.7 (69.6-77.7)	78.3 (74.4-82.1)	0.1185
To improve the quality, diversity and quantity of complementary feeding of children 6-24 months	Proportion of children 6-24 months of age receiving foods from ≥4 food groups during the previous day	35.7 (31.2-40.1)	270/375 (72.0) (69.8-74.1)	0.0000
	Proportion of children 6-24 months of age receiving solid, semi-solid or soft foods the minimum number of times or more in the previous day	59.3 (54.7-63.8)	6-8 months: 100% 9-23 months: 81.2%	0.0000
	Proportion of children 6-24 who consumed iron-rich animal-source foods during previous 24 hour period	10.2 (4.7-12.9)	35/378 (9.3) (7.2-11.3)	0.0000

	Proportion of children 6-24 who consumed Vitamin A rich animal source food	50.9 (46.2-55.5)	290/378 (76.7) (74.5-78.8)	0.0000
	Proportion of children 6-24 consumed iron rich plant source food	44.5 (39.9-49)	70.4 (66.1-746)	0.0000
	Proportion of children 6-24 consumed Vitamin A rich plant source food over previous 24 hour period	52.3 (47.6-56.9)	291/378 (77.0) (74.5-79.1)	0.0000
	Proportion of mothers or child caretakers washing hands at least 2 of the appropriate times in a day	8.9 (6.2-11.5)	264/450 (58.6) (56.4-60.7)	0.0000
To improve the nutritional care of sick children	Proportion of sick children receiving increased breastfeeding	20.9 (17.1-24.6)	62.3 (60.1-64.4)	0.0000
	Proportion of sick children 6-24 months fed more after illness	31.7 (27.4-35.9)	48.7 (41.5-50.8)	0.0000
	Proportion of sick children 6-24 months fed same or more during illness	42.1(37.5-46.6)	46.8 (44.6-48.9)	0.1399
	Proportion of children 6-24 months receiving homemade or ORT during most recent episode of diarrhea	30.5 (26.2-34.7) (n=58)	53.9 (49.2-58.5)	.0031
To improve dietary practices of pregnant and lactating women	Proportion of women eating more during pregnancy	25 (20.9-29) (n=12)	83.8 (80.3-87.2)	0.0036
To increase postpartum vitamin A supplementation coverage of women	Proportion of mothers of children <24 months receiving VAS within 45 days of last delivery	55.4 (50.8-59.9)	84 (80.6-87.3)	0.0000
To sustain Vitamin A supplementation and de-worming coverage of children 6-59 months over 85%	Proportion of children 6-59 months receiving VAS every six months	87.6 (84.5-90.6)	92.1 (89.6-94.5)	0.0277
	Proportion of children 12-59 months receiving de-worming treatment every six months	87.4 (84.3-90.4)	93.7 (90.7-95.4)	0.00352
To strengthen the decision making role of women over use of HFP income	Percent of women with home gardens/poultry having major control of decisions on the utilization of income generated	19.5 (15.8-23.1) (n=41)	99/155 (63.8%) (61.5-66.0)	0.0000

Maternal care

Slightly more than half of the mothers consulted skilled health workers (doctors, staff nurses, auxiliary nurse midwives or ANMs) for antenatal care (ANC) at endline and only 11.6% of did not receive any ANC at all (Table 5). Although assistance from skilled health workers during delivery increased to 28.0% at endline from 18.7% at baseline, it is still low. There were significant improvements in mothers consuming 180 tablets of iron/folic acid (93.6%); receiving at least two TT vaccines (89.3%); and receiving at least four ANC visits (69.6%) during their pregnancies. Post natal check-up of children within 24 hours of delivery increased from 42.1% to 61% and women taking vitamin A within 42 days of delivery was 84% at endline.

Table 40: Antenatal, delivery and post-natal care

Indicators	Baseline (n=450) %	Endline (n=450) %
<i>Person involved in ANC</i>		
Skilled HW (Doctor/Staff nurse/ANM)	35.8	53.3
HA/AHW	8.7	15.8
MCHW	22.4	19.3
TBA and others	2.2	-
None consulted for ANC	30.7	11.6
<i>Antenatal care</i>		
Consuming iron/folic acid during pregnancy	83.0	93.6
Number of mothers receiving at least two TT vaccine	86.7	89.3
Women taking more food during pregnancy	25.0	1.1
Women having at least four times of ANC visit	38.6	69.6
<i>Delivery care</i>		
<i>Health worker assisting during delivery</i>		
Skilled HW attended the delivery (Doctor/Staff nurse/ANM)	18.7	28.0
HA/AHW	1.3	1.3
MCHW	3.8	11.1
TBA	45.2	7.1
Others (FCHV, mother in law)	10.5	41.1
Nobody assisted	-	11.3
<i>Post-natal care</i>		
<i>Health check up of children after delivery</i>		
Within 24 hours	42.1	61.0
Within 1-6 days	14.0	19.5
More than one week	34.7	16.5
<i>Health worker examining newborn</i>		
Doctor	19.2	10.7
Nurse/ANM	54.2	63.2
MCHW	16.7	23.6
Others (FCHV, TBA)	10.0	2.3
Women taking vitamin A within 42 days of delivery	55.4	84.0

Integrated management of childhood illness

Almost 36% of children were found to be suffering from some kind of childhood illness/symptoms two weeks preceding the endline survey (22.7% with diarrhoea, 15.1% with cough, 10.0% with pneumonia, 6.9% having difficulty breathing, and 20.0% with fevers) (Table 6).

Table 41: Prevalence of illness among children within two weeks preceding the survey

Illnesses	Baseline (n=450) %	Endline (n=450) %
Diarrhoea	14.9	22.7
Blood in stool	0.2	2.7
Cough	14.0	15.1
Pneumonia	6.9	10.0
Difficulty in breathing	2.7	6.9
Fever	12.9	20.0
Prevalence of any illness within two weeks preceding the	34.0	35.7

More mothers breast-fed their ill child more-than-usual at endline (62.1%) than at baseline (20.6%) and 35% of mothers fed their children more-than-usual, up from 19.1% (Table 7). Results from the FGDs showed that mothers gave children more rice, pulses, fruits, super flour, and animal milk than usual during times of illness.

Table 42: Frequency of feeding children during illness

Feeding status	Baseline %	Endline %
Breast feeding to ill children	n=68	n=161
Less than usual	27.9	23.0
Same as usual	51.5	13.7
More than usual	20.6	62.1
Not at all	-	1.2
Food feeding to ill children aged 6-24 months	n=68	n=157
Less than usual	41.2	41.4
Same as usual	27.9	10.2
More than usual	11.7	35.0
Not at all	19.1	13.3

Nutritional status of children and mothers

The proportion of wasting and underweight were higher among children 6-11 months of age; however, the proportion of stunting was higher among children 12-23 months of age. Boys were more under-nourished than females and the proportion of malnutrition was higher among children from food insecure households than food secure households. Mothers' education and their membership in AAMA group were independent to wasting, underweight and stunting in children (Table 8).

Table 43: Nutritional status of children by age group, sex, ethnicity, mother's education, household size and mother's BMI

Variables	Wasting (<-2SD)		Underweight (<-2SD)		Stunting (<-2SD)	
	Baseline %	Endline %	Baseline %	Endline %	Baseline %	Endline %
Age in months						
< 6 months	14.3	19.2	18.7	21.6	19.8	16.2
6-11	11.8	41.3	37.2	57.1	43.2	39.7
12-23	18.3	18.5	47.3	47.6	65.6	62.9
Sex						
Male	18.2	25.5	38.3	48.6	47.3	53.0
Female	10.8	17.2	35.1	39.7	46.3	50.8
Caste						
Dalit	17.7	26.7	44.2	54.5	55.1	60.6
Upper caste(Brahman, chhetri)	14.0	19.9	34.0	40.7	43.2	98.3
Wealth quintile						
First quintile	19.8	21.6	43.5	46.0	50.0	51.7
Second quintile	11.2	22.4	34.0	45.5	45.5	53.7
Third quintile	8.5	15.4	19.1	26.9	36.2	38.5
Fourth quintile	0.0	50.0	0.0	50.0	0.0	50.0

Fifth quintile	0.0	0.0	0.0	0.0	100.0	0
Food security						
Secure	9.4	12.5	25.6	40.6	39.5	53.1
Non-secure	17.4	23.2	41.6	45.3	49.8	51.1
HH size						
< 5 members	21.0	21.7	45.3	53.8	52.6	61.5
6-7 members	11.3	22.0	35.0	42.3	48.2	49.3
8 and more	13.3	21.3	31.7	39.0	41.0	46.3
Mother education						
No education	15.2	21.9	39.8	45.8	50.3	53.3
At least primary	14.9	21.7	25.5	41.4	33.3	48.3
Mother's BMI						
Thin (<18.5 kg/m²)	NA	28.4	NA	53.2	NA	58.7
Normal (18.5-25)	NA	19.6	NA	41.5	NA	49.9
Overweight (25-30)	NA	33.3	NA	100.0	NA	66.7
Obese (>30)		-		-		
Member of AAMA group						
Yes	NA	18.8	NA	43.9	NA	55.5
No	NA	30.3	NA	46.7	NA	42.5

Breast feeding and complementary feeding of children

The practice of breast feeding improved from endline to baseline: mothers breast feeding their newborns within one hour of birth almost doubled from 41.8% to 81.1%. Although there was no substantial increase in exclusive breastfeeding and continued breastfeeding from baseline to endline, they were nevertheless high at both survey points (Table 9).

Information from the FGDs reveal that most mothers fed their children rice, pulses, eggs, milk, curd, super flour, vegetables, fruits, fish, meat, gruels and bread as complementary foods after 6 months of age. Although they were aware of the importance of exclusive breastfeeding for 6 months after birth, mothers also claimed giving their child animal milk if breast milk was insufficient.

Table 44: Breastfeeding practices

Indicators	Baseline (n=450) %	Endline (n=450) %
Breastfed within one hour of birth	41.8	81.1
Received pre-lacteal feeding	0.7	0.9
Exclusive breastfeeding	73.7	78.3
Continued breastfeeding	98.9	98.2

The proportion of children 6-8 months of age fed meals for a minimum number of times improved markedly at endline (100%) from baseline (59%). Overall, 83.3% of children received the minimum number of meals a day at endline (Table 10).

Table 45: Complementary feeding practices for children 6-24 months of age

Indicators	Baseline (n=450) %	Endline (n=450) %
Fed (solid/semi-solid foods) minimum number of times per		

<i>day</i>		
6-8 months	59.0	100.0
9-23 months	60.0	81.9
Fed minimum number of food (6-24 months)	58.5	83.3

Dietary diversity improved across age, gender and ethnicity. Children 6-8 months of age saw the least diversity in foods; nevertheless, there was an increase from baseline to endline (Table 11). With regards to ethnicity, there was more improvement among disadvantaged janajatis than other groups.

Information from the FGDs show that most mothers gave their child milk or curd daily, but the frequency of giving them eggs, fish or meat ranged from once a month to once a week. Super flours and gruels were cooked separately for children, but rice, pulses and vegetables were taken from food prepared for the entire household.

Table 46: Mean dietary diversity by age, gender, ethnicity and mothers education status

Indicators	Baseline	Endline
<i>Child age (in months)</i>		
6-8	2.1	2.7
9-11	3.0	4.1
12-17	3.2	4.1
18-24	3.3	4.3
<i>Gender</i>		
Male	3.1	3.3
Female	2.7	3.7
<i>Ethnic group</i>		
Dalit	-	3.0
Disadvantaged janajati	-	5.0
Brahmin, chhetri, dasnami	3.1	3.7
<i>Mother's literacy status</i>		
Yes	3.5	3.9
No	2.8	3.3

Knowledge of mothers on child nutrition and health

Mothers knowledge on breast feeding and complementary feeding to children increased significantly at endline (Table 12). Those who did not know the importance of colostrum feeding declined from 62% to 0.7%. Mothers who were aware of the duration of exclusive breast-feeding until 6 months of age increased from 69.3% to 86.2% and knowledge on complementary feeding after 6 months of age went up from 2.2% to 68.2%.

Table 47: Mothers knowledge on breast feeding and complementary feeding

Characteristics	Baseline	Endline
	(n=450) %	(n=450) %
<i>Colostrum feeding</i>		
Feed to the child	76.9	92.7
Do not feed to the child	16.9	6.7
Do not know	62.0	0.7
<i>Duration of exclusive breast feeding</i>		
Less than 6 months	13.6	7.3

Until 6 months	69.3	86.2
More than 6 months	9.1	4.0
Do not know	1.7	2.4
<i>Time of initiating complementary feeding</i>		
From less than 6 months	56.9	1.8
From 6 months	22.0	28.0
After 6 months	2.2	68.2
Do not know	0.2	2.0
<i>Complementary feeding for children aged 6-23 months</i>		
Rice pudding and gruels without other nutritious food	39.3	34.2
Rice pudding, gruels and super flour with other nutritious food	38.0	59.8
Yellow or orange coloured fruits, vegetables and green vegetables	75.1	90.0
Eggs	38.0	79.1
Animal Milk and Yoghurt	78.4	83.6
Chicken meat, other meat and liver	50.2	70.4
Cereals	0.0	71.3
Ghee, butter, oil	40.9	37.8
<i>Frequency of complementary food in addition to breast milk for child aged 6-11 months in a day</i>		
1-3 times	67.2	42.6
4-6 times	20.7	53.6
>6 times	1.5	3.8
Do not know	10.9	
<i>Frequency of snacks to 6-11 months child in a day</i>		
1-3 times	80.1	82.2
4-6 times	4.3	15.1
>6 times	0.2	2.7
Do not know	15.6	
<i>Types of food to be given to 8 months child</i>		
Solid food	NA	85.6
Semi solid food	NA	12.5
Grinded food	NA	0.8
Liquid food	NA	0.3
Others	NA	0.8
<i>Frequency of breast feeding during diarrhoea</i>		
Less than before	17.8	8.9
Same as before	30.7	10.2
More than before	51.3	80.9

At endline, 83.8% of mothers knew about the more-than-usual frequency of food consumption, up from 59.8%. Their knowledge regarding nutritious foods to be consumed during pregnancy; initiation of iron tablets, and vitamin A during pregnancy and after delivery all increased at endline (Table 13).

Table 48: Mothers knowledge on nutrition and health of pregnant women

Characteristics	Baseline	Endline
	(n=450) %	(n=450) %
<i>Frequency of food to be consumed during pregnancy</i>		
More than usual	59.8	83.8
Same as usual	20.6	10.2
Less than usual	18.4	5.3
Do not know	1.1	0.7
<i>Nutritious food to be consumed during pregnancy</i>		

Yellow and orange coloured fruits, vegetables and green vegetables	75.8	89.1
Eggs	72.7	75.8
Milk and curd	76.0	80.2
Fish, meat and liver	NA	84.4
Cereals	NA	79.3
Others	NA	0.4
<i>Time of initiation of iron tablet by pregnant women</i>		
<3 months	17.6	0.9
3-6 months	52.0	88.9
>6 months	0.6	10.2
<i>Time of taking antihelminthic drug by pregnant women</i>		
<3 months	1.1	0.9
3-6 months	43.5	81.5
>6 months	6.2	17.3
<i>Time of taking vitamin A capsule after delivery</i>		
Within 42 days after delivery	32.9	82.0
More than 42 days after delivery	67.1	18.0

FCHVs, mother's group or other community health workers provided more advice to pregnant women at endline than at baseline – more than 75% of mothers responded having received advice from them on nutrition (Table 14). Other sources of information on nutrition and child health came from watching television and listening to the radio.

Table 49: Nutrition advice or services provided by FCHVs, mother's group or other community health workers

Advice	Baseline	Endline
	(n=450) %	(n=450) %
Giving vitamin A capsule to 6-59 months child	64.7	82.0
Taking vitamin A within 42 days after delivery	66.2	76.7
Antihelminthic drug to 1-5 years child	63.6	86.2
Breast feeding to newborn immediately after birth	60.7	84.2
Exclusive breast feeding within 6 months	73.8	87.6
Complementary feeding after 6 months	62.2	85.8
Providing green vegetables and yellow fruits to mothers and children	62.0	85.3
Providing animal food (milk, meat, eggs, fish) to children and mothers	54.4	84.7
Use of iodized salt	48.2	80.2
Additional foods to be taken by pregnant women	50.4	77.6
Intake of iron tablet after 3 months of pregnancy	45.1	76.0
Intake of antihelminthic drug during pregnancy	43.3	81.6
Additional feeding of lactating women	47.8	76.2
Frequency and foods to be given to sick child	48.7	70.4

Food Insecurity

The proportion of households that experienced food insecurity in the last 12 months preceding the survey was 85.8% (Table 15). Households often experiencing specific food insecurity-related conditions in the last four weeks preceding the survey were below 1% to 8.7%. The most common condition was household members unable to eat the kinds of foods preferred because of a lack of resources (8.7%) followed by household members having to eat the kinds of foods they really did not want to eat because of lack of resources (6.0%). More than four fifths of the households never went to sleep at night hungry

because of no food to eat. The proportion of this condition was: rarely for 12%, sometimes for 5.3% and often for 0.7% of households.

Table 50: Percentage of households that experienced specific food insecurity-related conditions in last four weeks preceding the survey

Food insecurity situations	Endline %			
	Never	Rarely	Sometimes	Often
Worry that a household would not have enough food	29.3	33.6	32.7	4.4
Household member not able to eat the kinds of foods preferred because of a lack of resources	32.0	35.6	23.8	8.7
Household member had to eat a limited variety of foods to due to lack of resources	50.4	26.4	18.2	4.9
Household member have to eat some foods that they really did not want to eat because of a lack of resources	32.0	38.7	23.3	6.0
Household member had to eat a smaller meal than they felt needed because there was not enough food	64.7	18.7	13.6	3.1
Household member had to eat fewer meals in a day because there was not enough food	71.3	16.7	10.9	1.1
There ever no food to eat of any kind in the household because of lack of resources to get food	63.8	24.0	9.6	2.7
Household member go to sleep at night hungry because there was not enough food	82.0	12.0	5.3	0.7
Household member go a whole day and night without eating anything because there was not enough food	86.7	11.3	2.0	-

The socio-demographic and morbidity characteristics of the study subjects stratified by household food insecurity status reveals that major proportion of the morbidities, illiteracy of mothers, and households with debt were prevalent in food insecure households.

Agriculture related practices, homestead food production and income generation

Almost 73% of households had home gardens at endline, with improved home gardens in 68.5% of households as opposed to 8% at baseline (Table 16). The median number of vegetables in the home gardens was three times more at endline than at baseline. During the FGDs, mothers mentioned growing the following produce: potato, cauliflower, garlic, tomato, okra, broad mustard leaves, bitter gourd, Chichinda, gourds, cabbage, onion, coriander, fenugreek, and pumpkins, among others. The use of compost in home gardens increased by 2% at endline and the use of home-made organic insecticides significantly increased at endline (56.1%) compared to baseline (3.8%).

Table 51: Home garden and production of vegetables and fruits

Characteristics	Baseline (n=450) %	Endline (n=450) %
HHs having home garden	40.6	72.7
<i>Types of home garden</i>		
Traditional	32.4	52.5
Improved	8.0	68.5
Developed	0.2	7.3
Median number of vegetables in the home garden	2	6.36

Median weight of vegetables product from home garden within two months preceding the survey (Kg)	NA	22.39
Median number of fruit trees in HHs	NA	1.36
<i>Types of manure used in home garden</i>		
Do not use	1.1	2.5
Chemical fertilizers	2.7	0.3
Compost	95.1	97.6
<i>Insecticides used in home garden</i>		
Do not use	79.2	30.7
Chemical insecticides	7.7	5.5
Organic insecticides (home made)	3.8	56.1
Mechanical	2.2	0.3
Biological	0.5	6.1
Others (ash, plant)	6.5	1.2

The proportion of households having chickens rose from 24% at baseline to 66.2% at endline. The majority of households (88%) owned less than 5 chickens and more importantly, among the households that owned chickens, 78.6% raised improved breeds at endline (at baseline, 100% of households raised only local chickens). Women were the caretaker of the chickens in 72.1% of households and 68.9% of households farmed the chickens in a fenced area (Table 18).

Table 52: Characteristics of poultry production

Characteristics	Baseline (n=450) %	Endline (n=450) %
HHs having chicken	24.0	66.2
<i>Number of chicken owned by HHs</i>		
1-5	98.1	88.0
6-10	1.5	9.4
11-20	0.4	2.3
>20	-	0.3
Median number of chickens per HH		3.0
<i>Species of chicken owned by HHs</i>		
Local only	100.0	15.7
Improved only	-	78.6
Both improved and local	0.0	5.7
<i>Main caretaker of chicken rearing</i>		
Husband	6.5	8.4
Wife	66.7	72.1
Both	-	19.5
<i>Type of chicken rearing practice</i>		
Opened	89.8	15.1
Closed	6.5	68.9
Both	3.7	16.1

Although still relatively low, the proportion of households earning money by selling garden products two months prior to the survey increased from 9.7% at baseline to 14.4% at endline (Table 19). One fifth of these households used this money to buy food items, while 3% invested it in other income generating activities.

Households earning money by selling poultry products two months preceding the survey more than doubled at endline (from 15.1% to 32.3%). The majority of the income went into household expenditure (31.3%), buying food items (21.9%), buying medicine (16.7%) and education (13.5%).

Table 53: Income generated from HFP activities

Characteristics	Baseline (n=450) %	Endline (n=450) %
HHs earned money by selling garden products in the last two months	9.7	14.4
Median income within last two months from vegetables and fruits (in NRs)	500	500
<i>Use of income from vegetable and fruits selling</i>		
Bought food items (only cereal)	46.4	20.9
Expenditure in cloths	17.9	4.5
Bought medicine	7.1	19.4
Expenditure in education	10.7	11.9
Saving	7.1	-
HHs expenditure	10.7	40.3
Others (invested)	-	3.0
HHs earning money by selling poultry product in the last 2 months	15.1	32.3
Median income in last 2 months from poultry (in NRs)	450	-
<i>Use of income from selling of poultry products</i>		
Bought food items (only cereal)	43.8	21.9
Expenditure in cloths	-	7.3
Bought medicine	12.5	16.7
Expenditure in education	18.8	13.5
Saving	6.3	4.2
HHs expenditure	12.5	31.3
Invested	-	1.0
Others	6.3	4.2

Chapter 5

Discussion and Recommendations

The integrated approach for improving the nutritional status of children and mothers through improved agricultural practices, increased awareness, better feeding and health care seeking practices were important factors for the improvements seen in many of the indicators.

However, because of the short duration of the intervention, there was so significant improvement in the proportion of stunted, wasted and underweight children. However, significant progress was seen in the proportion of women who reported taking the full 180 days of iron supplements during their previous pregnancy; proportion of households with developed HFP; median number of micronutrient (MN)-rich vegetables cultivated by households each year; mean number of improved chickens owned per household; and median production of MN-rich fruits and vegetables over a 2-month period from baseline to endline. Although the practice of hand washing with soap - which is crucial for preventing diarrheal diseases - significantly improved at endline, it was still low. The findings also revealed that mothers had correct perceptions and knowledge on causes of malnutrition and the types of nutritious foods to be consumed.

There was overall improvement in HFP activities, showing HKI-implemented strategies were successful. This included increasing household income generated by women through HFP. However, only 14.2% households in Bajura were food secure. The common, often experienced food insecurity situations were a) household members did not have enough food to eat, and b) they had to eat the kinds of foods that they did not want to. This suggests more effort is needed to improve the food insecurity status in the district. Improved HFP, better chicken farming practices and use of land for agricultural production are useful tools to address this gap.

The district level of stakeholders agreed that linking food security and nutrition interventions, with health is important for improving the health of the people.

Although outcome indicators did not change significantly at endline, the output and intermediate output indicators significantly improved at endline compared to baseline. This indicates that the project has made a significant contribution in improvement nutritional practices in Bajura and has the potential to reduce outcome indicators in the future.

To ensure these achievements are sustained in the future, the following points are recommended:

- a) The integrated approach of HFP, nutrition and health, should be replicated and scaled-up in other districts.
- b) More work is needed to ensure food security - this can be a focused area of intervention by government and support agencies.
- c) There is the need to implement other intervention projects in Bajura to improve the intermediate indicators of health and nutrition, which will eventually contribute to reducing impact indicators.

Annex 1: Key informant interview with Health Facility In-charges, MCHWs and FCHVs

Examples of the kind of information provided from stakeholders during key informant interviews, are provided below.

Kolti VDC:

It was discovered that due to landslides, the primary health care center (PHCC) was damaged and therefore, unable to provide health services. UNICEF has committed to reconstruct the damaged building. Prior to the landslide however, Kolti PHCC was providing out-reach clinics (ORC), immunization, ANC, nutrition, family planning, maternal and child health services. ORCs and immunization clinics are conducted by VHWs, AHWs, ANMs and people from the community.

FCHVs conduct home visits during which they provide nutrition, maternal and child health related advice, iron to pregnant women and refer children to health facilities for immunization, etc. FCHVs, in addition to ORCs and different local organizations are also providing health and nutrition services to mothers and children. Drinking water facilities in the VDC were poor and despite the existence of an AAMA mothers' group, the nutritional status of both mothers and children were poor – due to lack of nutritious foods, underweight, anaemia, and wasting were prevalent among mothers and children.

Institutions, apart from HKI, involved in nutrition activities in Kolti VDC include, PEAS WIN, SAPROS Nepal and SAHAS Nepal. They have provided stretchers, helped construct toilets, give trainings on nutrition for mother and children, distribute vegetable seeds, chicken, and nutritious foods for under five year children. Regarding the AAMA project, one stakeholder claimed that the *“AAMA programme was effective in the community because it brought about improvements in food habits, sanitation, nutrition, ANC, PNC, institutional delivery, and breastfeeding practices”*.

Bramhatola VDC:

Motorable roads and tap water were lacking in this VDC. The Bramhatola sub-health post does not have sufficient rooms, for which the AAMA group in this VDC have campaigned for. UNICEF and CARE Nepal provided delivery kits for the birthing center. The health worker who was interviewed mentioned that the nutritional status of under-5 children and mothers is not satisfactory and that many mothers are anaemic. To address this, health workers are providing iron tablets, health education and albendazole.

Kuldevmandu VDC:

In Kuldevmandu, significant problems included safe drinking water. However, behaviour with regards to ANC visits and iron consumption have improved due to increased community awareness about health.

Budhiganga VDC:

In Budhiganga VDC, the condition of the health facility along with drinking water facilities, were better than many other VDCs. The nutritional status of children and mothers also improved and the mortality rate of mother and child is low.

Overall:

FCHVs were unable to provide optimal nutrition education because the district health office did not have enough available materials.

The general consensus was that AAMA groups were effective at improving the nutrition status of the community. They also believed that the AAMA project could do more by providing adequate supplies for improving the nutrition status as well as train AAMA mothers' groups and FCHVs on health and nutrition of mothers and children

Endline Survey on Action against Malnutrition through Agriculture (AAMA) Project in Kailali District

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PHIDReC Team

December, 2012

Executive Summary

Introduction and objectives

Helen Keller International (HKI), its local partners the Nepal National Social Welfare Association (NNSWA), the MoHP, and the Ministry of Agriculture and Cooperatives (MOAC) have implemented the USAID funded “Action against Malnutrition through Agriculture” (AAMA) project since 2008, in Kailali and Baitadi districts and in Bajura district since 2010. The project integrates agriculture and health interventions to reduce malnutrition among children aged 0-24 months and women of reproductive age. The homestead food production (HFP) component focuses on increasing households’ year round access to nutritious foods and is linked to a second component that delivers nutrition education and BCC on a package of proven Essential Nutrition Actions (ENA).

This endline survey was conducted in Kailali district to assess the project achievements. The survey was also conducted in neighbouring Bardiya district, which served as a non-randomized opportunistic comparison group. The objective of the survey was to assess the nutritional status of children below 24 months of age and evaluate change in practices related to the intervention activities (HFP and ENA) in the intervention district of Kailali.

Methodology

The survey covered children 0-24 months of age and their mothers, selected randomly from VDCs of these two districts. The survey used a thirty cluster sampling method proportionate to population size, with each ward representing a cluster. In Bardiya and Kailali, 540 and 690 mothers with children less than 24 months of age were selected, respectively. Two days training of supervisors and enumerators were organized. Data were collected simultaneously from selected clusters of Kailali and Bardiya. During data collection, female community health volunteers (FCHVs) of selected clusters were contacted and their support utilized to identify the appropriate households.

The household questionnaire used was identical to the baseline survey questionnaire, and covered demographic characteristics of responding mothers; IYCF and nutrition knowledge; attitudes and practices and other behavioural determinants; market access and use of information; women’s decision making power; household food security and diet diversity; sanitation and hygiene practices; and agricultural practices and use of land. Anthropometric measurements of children and mothers were performed. The concentration of hemoglobin in the blood of children and mothers were measured using the HemoCue® system. A GPS machine was also used to plot the position of the responding household. Data quality was monitored by supervisors from PHIDReC, HKI and its partners.

This survey received ethical approval from the Nepal Health Research Council. In addition, research approval was obtained from both District Public Health Offices. Mothers and household heads were also informed about the survey and consent was obtained before interview and anthropometric/haemoglobin measurements.

The data were entered and analyzed using SPSS version 11.5. The descriptive analyses were computed comparing the findings of Kailali and Bardiya districts and focused on HKI project indicators.

Key findings

The project achieved or exceeded 14 of the 28 indicator targets it defined at baseline, including nutrition, the indicators for reduced stunting and underweight, increased practice of breast feeding within one hour of birth, the proportion of children 6-23 months fed appropriate frequency, diversity and vitamin A- rich animal source food and increased dietary intake by pregnant women. Similarly, the proportion of women receiving at least four ante-natal care visits increased significantly in both Kailali and Bardiya. The project did not achieve the targets for reductions in child or maternal anaemia (although it did exceed the target for women's consumption of iron supplements during pregnancy), nor for increasing the proportion of sick children provided more breast milk and food or for improved hygiene practices.

There was a very high prevalence of illnesses (diarrhoea, blood in stool, cough, pneumonia, difficulty breathing, and fever) in the two weeks preceding the survey in both Kailali (42.3%) and Bardiya (56.3%). The majority of the mothers were aware of feeding and breast-feeding their sick child more-than-usual, the latter of which most mothers did. More than 95% households of Kailali and Bardiya had bednets. In Kailali, use of bednets increased significantly at endline, as did the use of insecticide-treated bednets, which was higher than in Bardiya.

In Kailali, male children were found to be more wasted, stunted and underweight than female children. A significant correlation was found with the mothers' body mass index (BMI) and stunted and underweight children. The proportion of wasting and stunting was slightly lower among children from households with mothers participating in AAMA groups formed by HKI.

The prevalence of anaemia among mothers was 32.3% in Kailali and was higher in households with larger family sizes and illiterate mothers.

The practice of breastfeeding within one hour of birth was relatively high in both districts (79.1% in Kailali and 71.8% in Bardiya) but exclusive breastfeeding was comparatively lower in Bardiya (51.1%) than Kailali (73.1%). Similarly, complementary feeding practices to children 6-24 months of age improved significantly in Kailali at endline, as did the mean dietary diversity.

Mothers' knowledge on nutrition indicators also improved in Kailali at baseline, including frequency and types of nutritious foods to be consumed during pregnancy; initiation of iron tablets during pregnancy; and time of taking vitamin A capsules after delivery. More than 80% of mothers in Kailali were advised by FCHVs, mother's group or other community health workers about nutrition.

About two-thirds of the households in our sample experienced some degree of food insecurity in Bardiya and less in Kailali. A greater proportion of children from food insecure households were found to be suffering from illness two weeks prior to the survey in both the districts. Mothers from food insecure households were shorter, weighed less and had lower haemoglobin levels than those in more food secure households.

With regard to HFP practices, the project achieved the target for increased number of micronutrient-rich vegetables cultivated by the household and the proportion of households with an improved garden increased markedly, but the target for households with "developed" gardens was not achieved. In Kailali, 89.5% of households had home gardens. The median number of vegetables grown in the home garden during the survey period was 2 in both Kailali and Bardiya and the mean production of micronutrient-rich vegetables was three times higher at endline than at baseline. The median number of chickens per household was 7 in Kailali and 4 in Bardiya. Only 15.7% households in Kailali had improved breeds of chicken.

Women's reported influence over decisions regarding use of income generated from HFP increased markedly and exceeded the target two-fold. The median income by selling vegetables and fruits within the

last two months preceding the survey was Rs. 1000 in Kailali and Rs. 1500 in Bardiya. A majority of households in Kailali (60.0%) expended the income by selling garden products on household expenditure. The proportion of households earning money by selling poultry products were 10.6% in Kailali and 4.3% in Bardiya and most of them used that money on household expenditure in both districts.

Abbreviations

AAMA	Action against Malnutrition through Agriculture
ANC	Antenatal Care
ARI	Acute Respiratory Infection
BCC	Behaviour Change Communication
BMI	Body Mass Index
ENAs	Essential Nutrition Actions
FCHVs	Female Community Health Volunteers
FDWR	Far Western Development Region
GPS	Geographical Positioning System
HAZ	Length for Age
HFIAS	Household Food Insecurity Access Scale
HFP	Homestead Food Production
HKI	Helen Keller International
INGO	International Non-Governmental Organisation
IYCF	Infant and Young Child Feeding
MN	Micro-nutrient
MoHP	Ministry of Health and Population
MoAC	Ministry of Agriculture and Cooperatives
NDHS	Nepal Demographic and Health Survey
NGO	Non-governmental organization
ORT	Oral rehydration therapy
PHIDReC	Public Health and Infectious Disease Research Center
VDC	Village Development Committee
WAZ	Weight for Age
WHZ	Weight for Length
WHO	World Health Organization

Chapter 1

Introduction

Background

Poverty, household food insecurity and malnutrition are prevalent in Nepal. Forty-one percent of children under five years of age are stunted, 11% are wasted and 29% are underweight. In addition, 46% of children are anemic. Currently 1-in-10 children below the age of 6 months is stunted (11.6%), underweight (16.2%) and wasted (12.3%). Although malnutrition is a serious public health problem throughout Nepal, the situation is more critical in the Far Western Development Region (FWDR) of the country. For example, the proportion of stunted children is 46% and the prevalence of anemia among children 6-59 months is 52% in the FWDR³⁵, compared to 48% nationally. The Human Development Index score for the FWDR of Nepal is 0.404, compared to the national average of 0.471.

The limited availability, variety and quality of nutritious food, as well as high poverty rates contribute to the high rates of stunting, underweight (low weight for age) and anaemia in the Mid- and Far-Western Regions. Growth faltering begins in-utero and occurs in the first two years of life, during which children undergo rapid growth and therefore require increased nutrients. Currently, 1 in every 10 children below the age of 6 months is stunted (11.6%), underweight (16.2%) and/or wasted (12.3%). Among children below 24 months, the prevalence of anaemia is greater than 70% representing a problem of severe public health significance³⁶. The low status of women in these communities, sub-optimal maternal nutrition, the general lack of knowledge about adequate nutrition and health contributing to poor child feeding, care and hygiene practices, all play an important role in the high prevalence of malnutrition across Nepal.

Several international and bilateral agencies, international/non-governmental organisations are engaging with the Government of Nepal (GoN) to curb malnutrition among children and mothers in the country. Helen Keller International (HKI), the Ministry of Health and Population (MoHP), the Ministry of Agriculture and Cooperatives, and local NGO partners implemented the USAID funded “Action against Malnutrition through Agriculture” (AAMA) project from 2008 in Kailali, and Baitadi and from 2010 in Bajura, three districts in the FWR of Nepal. This project integrates agriculture and health interventions to address malnutrition among children aged 0-24 months and women of reproductive age and improve household food insecurity. The project uses a homestead food production (HFP) model that focuses on increasing households’ year-round access to nutritious foods as a platform to deliver educational messages on a package of proven Essential Nutrition Actions (ENA) to households with children less than two years of age.

To assess the progress of the AAMA project, HKI, through the Public Health and Infectious Disease Research Center (PHIDReC), conducted this endline survey in Kailali and in neighbouring Bardiya district, which was selected at baseline to serve as an “opportunistic” external comparison group. The survey was conducted from March to June, 2012. This final report covers objectives, methodology used in the survey, findings, conclusion and recommendations.

Objectives and Indicators of the Survey

³⁵ *Nepal Demographic and Health Survey*. Ministry of Health and Population, New ERA, ICF International, 2011.

³⁶ *Iron Deficiency Anemia - Assessment, Prevention and Control: A Guide for Programme Managers*. WHO/UNICEF/UNU, 2001.

This endline survey assessed the nutritional status of children below 24 months of age and homestead food production (HFP) and Essential Nutrition Actions (ENA) and behaviour change-communication (BCC) related practices in Kailali (program) and Bardiya (comparison) districts.

The survey included the following specific objectives:

- g) Determine the proportion of underweight, wasted and stunted of children of age 0-24 months
- h) Assess knowledge and practice of exclusive breastfeeding and complementary feeding
- i) Describe perceptions of food security and homestead food production, consumption and marketing practices
- j) Describe hygiene related behaviours
- k) Determine women generating HFP income by selling garden and/or poultry products

Indicators calculated with data

- a) Proportion of underweight, wasted and stunted 0-24 months children
- b) Proportion of infants 0-5.9 months who received only breast milk during the previous day
- c) Proportion of children 6-24 months of age receiving foods from ≥ 4 food groups during the previous day
- d) Proportion of children 6-24 months of age receiving solid, semi-solid or soft foods the minimum number of times or more in the previous day
- e) Proportion of children 6-24 months who consumed Vitamin A- and iron-rich plant/animal-source foods during previous 24 hour period
- f) Proportion of households with improved HFP
- g) Proportion of food insecure households
- h) Proportion of mothers or child caretakers practicing adequate hygiene-related behaviors
- i) Proportion of mothers and other caregivers able to cite correctly ENA messages on exclusive breastfeeding
- j) Proportion of mothers and other caregivers able to cite correctly ENA messages on appropriate quantity, frequency and diversity (plant and animal source additions) of complementary foods and feeding of the sick child
- k) Percent of women generating income by selling garden and/or poultry products

Chapter 2 Methodology

Selection of survey districts and survey population

The endline survey was conducted in Kailali and Bardiya, the Terai districts located in the mid and far western region of Nepal. HKI has been implementing the AAMA model in Kailali since October 2008, and neighboring Bardiya district was selected as a comparison district at baseline. Kailali and Bardiya districts have a total population of 770,279 and 426,946, respectively. There are relatively large numbers of activities by non-governmental organizations in both districts.

The survey covered children 0-24 months of age and their mothers, who were selected from rural VDCs; municipalities were excluded. Anthropometric and haemoglobin measures were taken for both children and mothers. Mothers or children's caretakers (fathers or grandmothers) were also interviewed with selected questions on socio-economic status and other related variables. A total of 540 and 689 interviews, anthropometric and haemoglobin measurements were conducted in Bardiya and Kailali, respectively.

Sample size and sampling

The sample size required for the survey was calculated using the formula for cluster sampling.

Sample size calculation for Bardiya (Mid Western Terai):

Using the prevalence of under five aged children (-2SD) stunting of Mid Western Terai (P=42.1%, NDHS, 2006), the sample size will be 491 for Bardiya.

$p=0.421$ and $q=0.579$

$Z= 1.96$ (5% level of significance) =2 (approximately)

$L=$ allowable error = 15% of $p=0.063$

Design effect =2 (usually it is taken 2 in nutrition survey with cluster sampling)

$n=$ Design effect * $4pq/L^2$

$= 2 \times 4 \times 0.421 \times 0.579 / 0.063 \times 0.063 = 491$

Sample size calculation for Kailali (Far Western Terai):

Using the prevalence of under five aged children (-2SD) stunting of Far Western Terai (P=43.1% NDHS, 2006), the sample size will be 478 for Kailali.

$p=0.431$ and $q=0.569$

$Z= 1.96$ (5% level of significance) = 2 (approximately)

$L=$ allowable error = 13% of $p=0.056$

Design effect =2 (usually it is taken 2 in nutrition survey with cluster sampling)

$n=$ Design effect * $4pq/L^2$

$= 2 \times 4 \times 0.431 \times 0.539 / 0.056 \times 0.056 = 626$

In calculating the sample size, the design effect of 2 was taken into consideration. Using 10% non-response rate, the sample size for Bardiya was 540 and for Kailali was 689. We conducted 540 and 696 interviews and anthropometric measurements and haemoglobin measurements in Bardiya and Kailali districts respectively.

The survey used a probability sampling proportionate to population size. Cluster sampling was used to make the study more representative and for rapid data collection. Thirty-cluster sampling was used for the survey and each ward (a subdivision of a VDC) represented a cluster. A sampling frame of children less than 24 months of age by ward was prepared and cumulative frequency of children was prepared. Sampling interval was calculated dividing total number of children less than two years of age in sampling frame of each district by 30 (required number of clusters). The first cluster from the sampling frame was selected randomly using a random number table and other clusters were selected based on systematic sampling adding the calculated sampling interval. In Bardiya, 18 women with children less than 24 months of age were selected in each cluster for a total sample size of n=540. In Kailali, 23 women with children less than 24 months of age were selected in each cluster for a total sample size of n=696. If the desired number of women with children less than 24 months of age were not available in the selected cluster (ward), mothers from an adjoining ward were included.

Selection and training of supervisors and enumerators

Field supervisors and enumerators were selected by the Public Health and Infectious Disease Research Center (PHIDRec) and HKI. Field supervisors were staff from PHIDReC, with substantial prior experience in survey research. In addition to their academic background, enumerators were selected based on previous work experience in health survey research and/or data collection. Both supervisors and enumerators were given 2-day training and orientation sessions, which concentrated on the selection methods of the study population, detailed review of the questionnaire, use of geographical positioning system (GPS) and practice taking anthropometric and haemoglobin measurements and interviews.

Survey tools and instruments

Two sets of instruments, including a) a semi-structured quantitative/qualitative questionnaire and b) anthropometric/haemoglobin assessment instruments (scales, HemoCue® machines, safety lancets, cuvettes) and GPS machines were used for the study.

The questionnaire covered demographic characteristics of responding mothers and their household, infant and young child feeding (IYCF) and nutrition knowledge, attitudes, practices and other behavioural determinants, market access and use of information, women's decision making power, household food security and dietary diversity, sanitation and hygiene practices, homestead food production practices and use of land, maternal and child health and growth monitoring.

Anthropometric measurements were used to measure the height and weight of children and mothers. The concentration of hemoglobin in the blood of children and mothers was measured using the HemoCue® system and GPS machines were used to collect altitude data for each sample household.

Data collection

The enumerators collected data from selected clusters from 29 March to 17 April, 2012. Before data collection began, support letters from the District Public/Health Offices of Kailali and Bardiya were obtained and the offices were informed about the survey objectives and process. Female community health volunteers (FCHVs) were contacted and their support was utilized to identify households with children less than 24 months of age. Four teams of enumerators collected data in each district. On average, one and half hours were required to complete the interview and take anthropometric and haemoglobin measurements in each household.

Anthropometric measurements

The age of each subject child was taken in completed months and verified using birth certificates, if available. The height of the child was measured by using a height measuring board. The height of the mother was measured using a height measuring scale. The weight of the children and mothers were measured by using a digital weighing scale. The apparatus used were readable to a one decimal point in kilograms.

Haemoglobin measurements

The concentration of hemoglobin in the blood of children and mother were measured by trained enumerators using the HemoCue machine. Each mother was asked for her consent to participate in the haemoglobin test of both mother and child. A sterile lancet was used to prick blood from fingers and immediately put on microcuvettes, which were placed in the HemoCue machine calibrated to zero. The haemoglobin content in the blood was then displayed within one minute and recorded in the questionnaire.

Geographical Positioning System (GPS)

GPS machines were also used to locate the geographic position of the responding household and included information on elevation and cardinal direction.

Supervision of data collection

Data collection was closely monitored by field supervisors throughout data collection. The central team at PHIDReC and HKI also provided guidance and supervision to ensure quality of data was maintained. At the end of each day, collected data were checked by PHIDReC supervisors for completeness and correctness. Suggestions were given to the enumerators to correct any mistakes by returning to the households to verify and complete the information. Regular communication between the field team, the supervising team at PHIDReC and HKI ensured quick resolution of any problems identified.

Ethical review

This survey received ethical approval from the Nepal Health Research Council and the District Public Health Offices in both districts. Before conducting the survey in a selected ward, FCHVs were informed of the objectives of the study. The study was explained to the selected mothers and household heads and consent was obtained from them before the interview and anthropometric/haemoglobin measurements.

Data processing and analysis

A data management process was developed that incorporated a system of editing and documentation during all stages of the study. All data forms underwent multiple checks for completeness, clearness and consistency by field supervisors and were further reviewed by PHIDReC. The data was entered and analysed using SPSS version 11.5.

A descriptive analysis was carried out that focused on predefined HKI project indicators and proportions from the two districts were compared.

Calculation for anthropometry

All anthropometric calculations followed standard World Health Organisation (WHO) procedures using Anthroplus software. The weights and lengths of the children were used to compute age- and sex-specific z-scores for weight-for-age (WAZ), weight-for-length (WHZ), and length-for-age (HAZ). Underweight, wasting, and stunting among children were defined as WAZ, WHZ, and HAZ less than -2 SD below the 2006 WHO growth standards, respectively. The Z score beyond -3SD or +3SD are considered plausible but reflects extreme nutritional status limits shown below are considered implausible values. Z scores beyond the following limits were discarded.

Calculation for anaemia

Anemia among children and mothers was defined as hemoglobin < 11 g/dL and < 12 g/dL, respectively, after adjusting for the influence of altitude on hemoglobin using appropriate CDC reference values (CDC, 1989). The altitude of each household involved in the survey was measured with a hand-held global positioning device (model-eTrex H). The altitude of the households ranged from 128 to 3567 m above sea level.

Calculation for household food insecurity

Household food insecurity was assessed using the Household Food Insecurity Access Scale (HFIAS) developed by the Food and Nutrition Technical Assistance (FANTA) project. The HFIAS tool consists of nine questions that are believed to capture all three core domains that reflect a household's inadequate access to food. The data analyzed for this study were based on the answers to five questions that were similar to those of the HFIAS tool and were therefore used as a proxy for the full HFIAS tool.

The questions used were as follows:

1. In the past 12 months, were you ever worried that food would run out before you got money to buy more?
2. In the past 12 months, were you not able to feed your children nutritious animal-source foods like eggs and meat because you could not afford it?
3. In the past 12 months, did you or any of your family members ever eat less than usual because you felt there was not enough money to buy food?
4. In the past 12 months, did you or any of your family members ever skip a meal because there was no money to buy food?
5. In the past 12 months, how often did food stored in your home run out and there was no money to buy more?

Each question had four response options—never, rarely, sometimes, or often—which were coded in order of increasing frequency from 0 to 3. A household was classified as food insecure if the family reported experiencing any of the five conditions within the recall period (i.e., if the answer to any of the questions was “rarely,” “sometimes,” or “often”). All households that did not meet this condition were classified as food secure. The only exception was among households in which the respondent's answer to question 1 was “rarely” but the response to all the other questions was “never.” Such households were also considered food secure. The internal consistency of the responses to the five questions was assessed using Chronbach's alpha statistics. All the responses correlated positively, and the alpha was 0.75. Although we used a short version of the HFIAS tool, the five questions included in our analysis reflected the three core domains of household food insecurity and allowed us to estimate the overall prevalence of this variable in our sample. If anything, we conjecture that the limited number of questions used underestimated the prevalence of household food insecurity among our study households.

Chapter 3

Characteristics of Respondents

Background characteristics of the study population

Most of the mothers were in the 20-35 year age group in both Bardiya (81.5%) and Kailali (87.4%) districts, followed by mothers less than 20 years of age (Table 1). A majority of them were illiterate, but this declined from baseline. In Kailali, 44.6% of mothers at endline were illiterate compared to 64.2% at baseline; in Bardiya it declined from 60.5% to 39.1%. The majority of mothers in Bardiya belonged to disadvantaged Janajati groups (53.1%), while in Kailali, the majority came from disadvantaged non-dalit terai caste groups (53.6%). Dalit mothers constituted 12.8% and 10.9% of the total in Bardiya and Kailali districts, respectively. Most of the children were more than 12 months of age (48.0% in Bardiya and 41.1% in Kailali) and there were more boys than girls in both districts.

Table 54: Profile of surveyed mothers

Characteristics	Baseline Kailali % n=497	Endline Kailali % n=696	Baseline Bardiya % n=466	Endline Bardiya % n=540
<i>Age (years)</i>				
<20	8.7	11.1	60.5	17
20-35	83.7	87.4		81.5
>35	7.6	1.6		1.5
<i>Education status</i>				
None	64.2	44.6	60.5	39.1
Primary	17.7	20.0	17.0	17.4
Secondary	13.5	29.7	19.0	34.6
Higher	4.6	40	3.0	8.9
<i>Caste/ethnic group</i>				
Dalit	14.9	10.9	8.6	12.8
Disadvantaged janajati	39.4	11.4	60.7	53.1
Disadvantaged non-dalit terai caste groups	0.2	53.6	8.8	14.1
Religious minorities	0.8	-	-	-
Relatively advantaged janajatis	2.0	0.1	0.9	1.1
Upper caste group	42.7	24.0	21.0	18.9
<i>Age of children (months)</i>				
<6	26.0	27.7	27.0	23.5
6-12	26.0	31.2	26.0	28.5
>12	52.0	41.1	47.0	48.0
<i>Sex of children</i>				
Boy	51.7	53.9	50.4	53.0
Girl	48.3	46.1	49.6	47.0

Hygiene and sanitation

Most of the households in Bardiya and Kailali had improved drinking water facilities (piped water, tube wells/hand pumps, public taps), with only 3.1% of the former and 4.1% of the latter depending on unprotected waters sources, such as rivers, ponds, springs, open and dug wells. Households with toilets at endline (49.3%) increased significantly in both Kailali and Bardiya compared to baseline (from 28.7% to 49.3% in the former and from 57.4% to 27% in the latter). Among the households with toilet facilities, the majority in Kailali had sanitary toilets (77.6%), while the majority in Bardiya had pit toilets (57.1%) (Table 2).

Table 55: Households with drinking water sources and toilet facilities

Indicators	Baseline Kailali %	Endline Kailali %	Baseline Bardiya %	Endline Bardiya %
Improved water sources				
Piped water	3.0	3.6	0.4	5.7
Tube well/hand pump	50.4	87.6	91.8	88.7
Public tap	19.0	4.6	5.2	2.2
Unprotected water sources				
River/pond/spring	4.6	1.4	NA	0.0
Open well, dugwell	23.0	2.7	NA	3.1
Households with toilet	28.7	49.3	27.0	57.4
Types of toilet				
Sanitary toilet	66.2	77.6	39.2	42.9
Pit toilet	33.1	22.4	55.2	57.1

The number of mothers using soap to wash their hands on the preceding day of the survey has substantially improved compared to the baseline, with approximately 90% in Bardiya and 96% in Kailali having done so. Similarly, a large number of mothers in Bardiya and Kailali washed their hands with soap after their child defecated (Table 3).

Table 56: Hand-washing practice with soap before meals and after defecation

Indicator	Baseline Kailali %	Endline Kailali %	Baseline Bardiya %	Endline Bardiya %	p-value*	p-value**
Mothers using soap to wash hands on the preceding day of the survey	34.8 (168)	95.7	74.2	90.6	0.000	0.000
After child's defecation	-	89.5	47.6	75.5	-	0.000
After defecation	-	95.9	32.6	86.3	-	0.000
Before feeding children	8	33.3	32.6	22.1	0.000	0.000
Hand washing of children before feeding	-	21.0	13.7	17.2	-	0.039
Before cooking food	8.7	32.4	4.3	19.6	0.000	0.000
Proportions of mothers or child caretakers washing hands at all four key occasions (first four of above)	5(<1)	6.5	12.7	4.3	0.000	0.091

*p-value comparing baseline Kailali and endline Kailali

**p-value comparing endline Kailali and endline Bardiya

Chapter 4 Findings

Key project indicators

In this section, we present the key project indicators (nutritional status of and anaemia among children and mothers, hygiene and sanitation, maternal care including antenatal, delivery and postnatal care, integrated management of childhood illness, and the food insecurity situation) at baseline and end line for the intervention district Kailali and the comparison district Bardiya (Table 4).

The project achieved or exceeded 14 of the 28 indicator targets it defined at baseline, including nutrition, reduction in stunting and underweight, increased practice of breast feeding within one hour of birth, the proportion of children 6-23 months of age fed a variety of foods, availability and frequency of feeding vitamin A-rich animal source foods, use of oral rehydration therapy (ORT) for the treatment of diarrhoea, and increased dietary intake by pregnant women. The project did not achieve the targets for reductions in child or maternal anaemia (although it did exceed the target for women’s consumption of iron supplements during pregnancy), nor for increasing the proportion of sick children provided more breast milk and food or for improved hygiene practices.

With regard to homestead food production (HFP) practices, the project achieved the target for increased number of micronutrient-rich vegetables cultivated by the household. The proportion of households with an improved garden increased markedly, but the target for households with “developed” gardens was not achieved. The mean production of micronutrient-rich vegetables was three times higher compared to baseline. Women’s reported influence over decisions regarding use of income generated from HFP increased markedly and exceeded the target two-fold.

Table 57: Key project indicators in Kailali

Indicators	Baseline value (95% CI)	Endline value (95% CI)	Final target	p-value*
Underweight in children 0-24 months	30.6% (26.4-34.7)	20.7% (17.6-23.7)	21%	0.000
Stunting in children 0-24 months	28.9% (24.8-32.9)	18.3% (15.4-21.1)	23%	0.000
Wasting	8.5% (6.0-10.9)	20.1% (17.1-23.0)	6.3%	0.0004
Anaemia in children 6-24 months	57.7% (53.2-62.1)	48.8% (45.1-52.5)	40%	0.001
Anaemia in women of reproductive age	36% (31.7-40.2)	32.3% (28.8-35.7)	21%	0.195
Proportion of women who reported taking full 180 days of iron supplements in previous pregnancy	43.8% (39.3-48.2)	86.7% (84.1-89.2)	53.8%	0.000
Proportion of households with “developed and improved” HFP	11.6%	59.7%	30%	NA
Mean number of MN-rich vegetable cultivated by HH each year	2	5.78	5	NA

Mean number of improved chickens owned per household	0	9.6	3	NA
Mean production (in Kg) of MN-rich vegetables over 2 month period	45.4 Kg	156.9 Kg	60 Kg	NA
Percent of women with any form of HFP generated income by selling garden and or poultry products	<1% (0.11-1.8)	13.8% (6.9-20.6) (n=96)	15%	0.045
Number and percent of HHs purchasing animal source foods with income generated by sales of garden products	<1% (0.11-1.8)	0.6% (0.02-1.1)	15%	0.013
Proportion of children born in past 24 months who were put to the breast within 1 hour of birth	59.9% (55.5-64.2)	79.1% (76-82.1)	75%	0.000
Proportion of infants 0-5.9 months who received only breast milk during the previous day	79.1% (75.4-82.7)	82.9% (80.1-85.6)	80%	0.101
Proportion of children 6-24 months of age receiving foods from 4 or more food groups during the previous day	20.8% (17.1-24.4)	78.3% (75.2-81.3)	31%	0.000
Proportion of children 6-24 months of age receiving solid, semi-solid or soft foods the minimum number of times or more in the previous day (2 or more times for children 6-8 months of age and 3 or more times for children 9-23 months of age)	6-8 mos: 39.6% (35.2-43.9)	62.5% (58.94-66.1)	50%	0.000
	9-23 mos: 52.5% (48.1-56.9)	91.9% (89.87-93.9)	62.5%	0.000
Proportion of children 6-24 months of age who consumed iron rich animal source foods during previous 24 hour period	15.2% (12-18.3)	25.6% (22.3-28.8)	30%	0.000
Proportion of children 6-24 months of age who consumed vitamin A rich animal source food	5.2% (3.2-7.1)	32.4% (28.9-35.8)	20%	0.000
Proportion of children 6-24 months of age consumed iron rich plant source food	32.2% (28.0-36.3)	43.3% (39.6-46.9)	-	0.000
Proportion of children 6-24 months of age consumed vitamin A rich plant source food over previous 24 hour period	42.6% (38.1-47.0)	54.7% (51.0-58.3)	60%	0.000
Proportions of mothers or child caretakers washing hands at all four key occasions	<1% (0.1-1.8)	6.5% (4.6-8.3)	10%	0.000
Proportion of sick children receiving increased breast feeding	37.3% (32.9-41.6)	46.8% (43.1-50.5)	57%	0.001
Proportion of sick children 6-24 months fed same or more during illness	42.5% (38.1-46.9)	40.9% (37.2-44.5)	62%	0.580
Proportion of children 6-24 months receiving homemade or ORT during most recent episode of diarrhoea	11% (8.2-13.7)	66.8% (63.3-70.2)	28%	0.000
Proportion of women eating more during pregnancy	10.6% (7.8-13.3)	66.7% (40.0-93.3) (n=12)	20%	0.000
Proportion of mothers of children <24 months receiving VAS within 42 days of last delivery	69.4% (65.2-73.5)	90.1% (87.8-92.3)	85%	0.000
Proportion of children 6-24 months receiving VAS every six months	-	85.7% (83.1-88.3)	-	NA

Proportion of children 12-24 months receiving de-worming treatment every six months	-	78.6% (75.5-81.6)	-	NA
Percentage of women with home gardens/poultry having major control of decisions on the utilization of income generated	4.4% (2.5-6.2)	53.1% (49.3-56.8)	25%	0.001

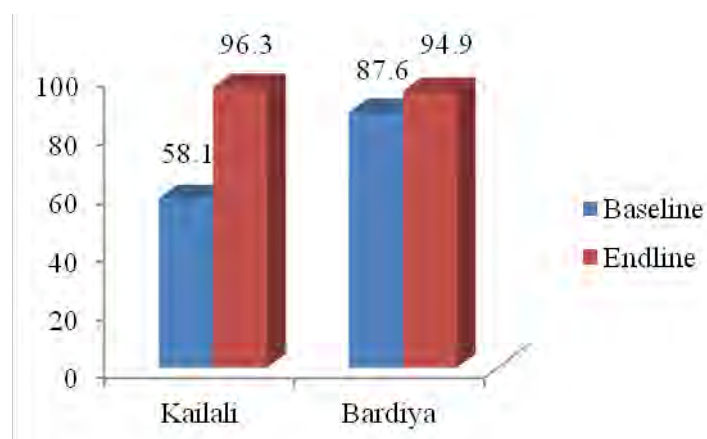
*p-value comparing baseline and endline

Some of the results are described in greater detail below.

Maternal care

A substantial proportion of mothers in both districts consulted with doctors or medical assistants for antenatal care (ANC) check-ups (96.3% in Kailali and 94.9% in Bardiya). These figures were much higher than at baseline (Figure 1), with significant improvements seen in Kailali. It should be noted that the improvements in ANC visits in Bardiya may be due to the existence of different interventions, such as SUSAHARA, the five-year USAID funded nutrition project.

Figure 3: Proportion of women consulting doctors/medical assistants during ANC visits



In Bardiya, 28.3% of mothers received ANC from skilled health workers (doctors, staff nurses, auxiliary nurse midwives or ANMs), while 35.5% did in Kailali. Similarly, 80% of mothers in Bardiya and 87.7% of mothers in Kailali received four ANC visits during their last pregnancy (Table 5). Most of the mothers were found to be consuming iron/folic acid tablets during their last pregnancy in both the districts. In Bardiya, 43.9% of mothers received delivery services from skilled health workers during their last delivery, while 43.4% of mothers in Kailali did. A large proportion of children received health care after delivery in both districts (78.0% in Bardiya and 68.1% in Kailali). Nurses and ANMs examined the majority of newborns, followed by doctors and maternal and child health workers (MCHW).

Table 58: Antenatal, delivery and post-natal care

Indicators	Baseline Kailali %	Endline Kailali %	Baseline Bardiya %	Endline Bardiya %
<i>Person involved in ANC</i>				

Skilled HW (Doctor/Staff nurse/ANM)	58.1	35.5	87.6	28.3
HA/AHW	-	16.5	-	50.7
MCHW	-	44.3	1.3	15.9
Trained Birth Attendant (TBA)	0.4	0.3	0.4	0.7
Others (FCHV)		0.7	1.7	2.2
None	25.4	2.7	9.0	2.0
<i>Antenatal care</i>				
Consuming all recommended iron/folic acid during pregnancy	75.2	97.0	92.3	98.3
Mothers receiving at least two TT vaccine	52.5	49.2	93.6	78.5
Women taking more food during pregnancy (n=12 Kailali, n=9 Bardiya)		66.7		33.3
Women having at least four ANC visit	32.2	87.7	56	80.1
<i>Delivery care</i>				
<i>Health worker assisting during delivery</i>				
Skilled HW (Doctor/Staff nurse/ANM)	21.1	43.4	32.8	43.9
HA/AHW	-	7.2	7.9	30.9
MCHW	-	15.9	-	6.1
TBA	19.6	14.2	36.1	7.4
Others (FCHV, mother in law)	39.9	13.9	20.6	7.4
None	9.9	5.6	-	4.3
<i>Post-natal care</i>				
<i>Health check up of children after delivery</i>				
		68.	28.1	78.0
Within one hour	22.5	77.4	3.2	81.2
Within 1-6 days	15.6	17.5	71.6	14.3
More than one week	27.5	4.2	8.5	3.1
<i>Health worker examining newborn</i>				
Doctor	63.9	28.9	68.7	22.6
Nurse/ANM	22.2	45.4	23.7	40.6
MCHW	9.3	21.3	6.1	22.3
Others (FCHV, TBA)	4.6	4.4	-	14.5
Women taking vitamin A within 42 days of delivery	70.5	90.1	1.5	78.0

Integrated management of childhood illnesses

A significant number of children were found to be suffering from some kind of childhood illness (diarrhea, blood in stool, cough, pneumonia, difficulty breathing, and fever) two weeks preceding the survey in Kailali and Bardiya (42.3% and 56.3%, respectively). Most of the children complained of diarrhea followed by fever in Kailali and cough in Bardiya (Table 6). The prevalence of acute respiratory infection (ARI) was 17.4% in Kailali and 26.0% in Bardiya.

Table 59: Prevalence of illness among children two weeks preceding the survey

Illnesses	Kailali (n=696) %	Bardiya (n=540) %
Diarrhoea	23.4	25.4
Blood in stool	1.3	2.6
Cough	15.8	24.6
Pneumonia	2.3	3.3
Difficulty in breathing	3.9	9.6
Fever	19.8	18.5
Prevalence of any illness within two weeks preceding the	42.3	56.3

Mothers in Bardiya (43.7%) and Kailali (56.0%) breast-fed their ill child more-than-usual during times of illness (Table 7). Although most mothers were aware that their children need to be fed more-than-usual during times of illness, they responded feeding them less because their child showed less desire to eat.

Table 60: Frequency of feeding children during illness

Feeding status	Kailali (n=295) %	Bardiya (n=304) %
Breast feeding to ill children		
Less than usual	17.4	30.2
Same as usual	23.0	24.9
More than usual	56.0	43.7
Not at all	3.5	1.2
Feeding meals to ill children aged 6-24 months		
	n= 71	n= 83
Less than usual	46.5	49.4
Same as usual	25.4	31.3
More than usual	15.5	10.8
Not at all	12.7	8.4

More than 95% households of Kailali and Bardiya had bednets. Among them, 23.1% of children in Kailali and 28.4% of children in Bardiya used bednets on the night preceding the survey, with use of bednets increasing significantly in Kailali from baseline to endline (Table 8). The use of insecticide-treated bednets also increased substantially in both districts from baseline to endline.

Table 61: Use of bed nets in the households

Characteristics	Baseline Kailali (%)	Endline Kailali %	Baseline Bardiya %	Endline Bardiya %
HHs having bednets	74.8	96.8	96.1	95.9
Use of bednets in the previous night of the survey				
Child	8.9	23.1	21.3	28.4
Others	-	72.7	2.2	65.3
Use of insecticide treated bednets	2.5	60.5	-	38.5

Nutritional status of children and mothers

In Kailali, the prevalence of wasting was found most in the 6-11 month age group, whereas stunting and underweight children were found mostly in the 12-23 month age group. Male children were more wasted, stunted and underweight than female children and overall prevalence increased as household size increased. Significant correlation was found between the mothers body mass index (BMI) and wasted, stunted and underweight children. Thin mothers' children were more wasted (29.8%) and underweight (28.6%); however, obese mothers' children were more stunted (25.0%). The proportion of children who were wasted and stunted was slightly lower among children of households with mothers participating in AAMA groups formed by HKI (Table 9).

Table 62: Nutritional status of children by age group, sex, ethnicity, mother's education, household size and mother's BMI in Kailali (n=696)

Variables	Wasting (<-2SD)		Underweight (<-2SD)		Stunting (<-2SD)	
	Endline	Baseline	Endline	Baseline	Endline	Baseline
<i>Age in months</i>						
< 6 months	16.9	8.0	11.5	12.1	10.9	12.1
6-11	21.8	7.0	20.6	14.3	12.2	26.6
12-23	21.0	10.8	26.4	29.2	26.4	50.4
<i>Sex</i>						
Male	20.2	8.1	25.1	22.2	21.4	39.1
Female	20.0	9.3	15.6	20.3	14.7	30.5
<i>Caste</i>						
Dalit	17.1	9.9	21.1	31.0	23.7	46.5
Disadvantage Janjati	19.5	11.6	19.0	20.6	23.1	29.1
Disadvantage non-dalit tarai	21.8	-	19.9	-	14.5	100.0
Religious group	-	-	-	-	-	75.0
Advantage Janjati	-	-	100.00	-	-	30.0
Upper caste	18.1	6.2	22.8	20.1	22.3	35.4
<i>Wealth quintile</i>						
First quintile	13.5	10.8	23.7	31.1	24.3	48.6
Second quintile	17.9	7.0	20.9	24.2	23.0	37.7
Third quintile	23.7	12.1	20.5	18.1	15.7	29.5
Fourth quintile	16.4	2.3	20.9	2.3	17.2	18.6
Fifth quintile	20.0	0.0	13.3	0.0	6.7	0.0
<i>Food security</i>						
Secure	17.6	6.8	19.9	17.6	17.5	29.7
Non-secure	21.5	9.6	21.3	23.0	19.0	37.3
<i>HH size</i>						
< 5 members	17.4	5.7	18.2	19.0	15.7	36.1
6-7 members	18.4	12.7	19.5	24.6	19.1	37.3
8 and more	22.6	8.3	22.7	20.8	18.6	32.3
<i>Mother education</i>						
No education	21.4	10.6	21.6	25.8	17.7	37.4
At least primary	19.1	5.2	20.0	13.2	18.8	30.5
<i>Mother's BMI</i>						
Thin (<18.5 kg/m ²)	29.8	13.8	28.6	36.2	21.4	48.3
Normal (18.5-25)	16.8	7.8	18.6	19.3	18.2	33.5
Overweight (25-30)	4.2	14.3	12.1	14.3	3.0	14.3
Obese (>30)	-	-	25.0	33.3	25.0	66.7
<i>Member of AAMA group</i>						
Yes	19.8	-	21.2	-	16.8	-
No	20.8	-	19.8	-	21.2	-
Total	8.5	20.1	20.7	30.6	18.3	28.9

In Bardiya, the prevalence of wasting, underweight and stunting in children was higher than in Kailali. The prevalence of underweight and stunting was lower in upper wealth quintiles, whereas there was no such correlation with regards to the prevalence of wasting. The proportion of all three anthropometric measurements was comparatively lower in children from food secure households than from non-food secure households. Similarly, as household size increased, the prevalence of all three indicators increased. However, there was improvement in these indicators among children with mothers having at least primary level and above education.

Table 63: Nutritional status of children by age group, sex, ethnicity, mother's education, household size and mother's BMI in Bardiya (n=540)

Variables	Wasting (<-2SD)	Underweight (<-2SD)	Stunting (<-2SD)
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	Endline	Baseline	Endline	Baseline	Endline	Baseline
<i>Age in months</i>						
< 6 months	20.0	7.2	12.6	20.6	12.7	23.0
6-11	24.8	9.9	18.8	16.5	17.3	24.0
12-23	19.3	10.0	30.4	26.0	34.6	42.0
<i>Sex</i>						
Male	24.1	7.8	25.5	23.4	26.9	36.8
Female	17.1	10.7	20.9	20.9	23.3	28.1
<i>Caste</i>						
Dalit	23.2	10.0	31.9	30.0	31.9	47.5
Disadvantage Janjati	23.1	8.9	23.0	20.8	23.0	27.2
Disadvantage non-dalit tarai	17.3	17.1	23.7	31.7	24.0	46.3
Religious group	-	-	-	50.0	-	-
Advantage Janjati	-	-	33.0	-	50.0	-
Upper caste	16.7	7.1	19.6	17.3	26.5	36.7
<i>Wealth quintile</i>						
First quintile	41.0	14.3	33.9	28.6	27.9	33.9
Second quintile	23.5	8.2	27.5	20.9	27.5	31.1
Third quintile	15.2	9.5	17.9	22.1	23.6	34.9
Fourth quintile	11.9	8.1	16.9	17.7	16.9	27.4
Fifth quintile	0.0	0.0	33.3	66.7	100.0	68.7
<i>Food security</i>						
Secure	18.5	8.5	16.4	22.5	17.8	37.2
Non-secure	22.0	9.0	26.8	21.6	29.0	30.3
<i>HH size</i>						
< 5 members	22.9	12.1	27.1	21.3	29.1	35.5
6-7 members	21.8	8.5	26.8	17.8	24.9	31.4
8 and more	18.8	7.8	18.3	25.1	24.6	30.9
<i>Mother education</i>						
No education	24.3	11.7	27.5	25.2	21.1	31.6
At least primary	18.6	5.5	20.7	17.5	24.0	33.3
<i>Mother's BMI</i>						
Thin	30.4	15.1	29.3	32.9	24.3	37.0
Normal	18.4	8.7	22.1	20.0	25.8	31.4
Overweight	6.5	-	16.1	23.8	22.6	33.3
Obese	33.3	-	33.3	-	50.0	-
Total	20.8	9.2	23.3	22.1	25.2	32.4

Anaemia among children and mothers

The prevalence of anaemia among mothers was 32.3% in Kailali and 28.2% in Bardiya and was higher in households with larger family sizes. The proportion of anemia among literate mothers with at least primary level education was lower compared to illiterate mothers in both the districts (Table 11). However, the anemia status of mothers was independent of wealth quintiles.

Table 64: Anaemia status among mothers

Characteristics	Endline Kailali (n=693) %		Endline Bardiya (n=539) %	
	Anaemic	Non-anaemic	Anaemic	Non-anaemic
<i>Age category of mothers (years)</i>				
<20	32.5	67.5	29.3	70.7
20-35	32.6	67.4	28.5	71.5
>35	18.2	81.8	0.0	100.0

<i>BMI category of mothers</i>				
Thin	40.5	59.5	25.9	74.1
Normal	30.2	69.8	30.1	69.9
Overweight	18.8	81.3	22.6	77.4
Obese	50.0	50.0	0.0	100.0
<i>Family size</i>				
<5	34.7	65.3	23.7	76.3
5-7	26.2	73.8	27.8	72.2
8 and above	36.4	63.6	30.9	69.1
<i>Mother's education</i>				
Illiterate	33.4	66.6	29.5	70.5
Literate at least primary	31.4	68.6	27.4	72.6
<i>Food security</i>				
Secure	32.2	67.8	25.3	74.7
Non-secure	32.1	67.9	29.0	71.0
<i>Wealth quintile</i>				
First	5.4	94.6	14.5	85.5
Second	26.0	74.0	33.3	66.7
Third	35.4	64.6	26.5	73.5
Fourth	43.4	56.6	32.2	67.8
Fifth	20.0	80.0	0.0	100.0
<i>Ethnicity</i>				
Dalit	21.6	78.4	24.6	75.4
Disadvantaged janajati	24.4	75.6	31.0	69.0
Disadvantaged non-dalit terai people	39.1	60.9	29.3	70.7
Janajati	0.0	100.0	0.0	100.0
Brahmin, Chhetri etc.	25.7	74.3	23.5	76.5
<i>Member of AAMA group</i>				
Yes	33.0	67.0	-	-
No	31.1	68.9	-	-
Total	32.3	67.7	28.2	71.8

There was more anaemia among children 6-24 months of age in Bardiya (60.6%) than in Kailali (48.8%). The proportion of anaemic children increased with age in Kailali and the prevalence of anaemia among children of mothers with lower BMI was higher compared to normal and overweight mothers. Anemia was also higher in those children with larger family sizes and lower among children of mothers with primary level education and above and in more food-secure households (Table 12).

Table 65: Anaemia status among children 6-24 months of age

Characteristics	Endline Kailali		Endline Bardiya	
	Anaemic	Non-anaemic	Anaemic	Non-anaemic
<i>Age category of children (months)</i>				
<6	29.3	70.7	63.1	36.9
6-11	40.4	59.6	58.3	41.7
>11	53.8	46.2	61.7	38.3
<i>BMI category of mothers</i>				
Thin	62.7	37.3	64.9	35.1
Normal	44.1	55.9	58.8	41.2
Overweight	31.8	68.2	56.5	43.5
Obese	0.0	100.0	66.7	33.3
<i>Family size</i>				
<5	43.3	56.7	71.3	28.7
5-7	46.4	53.6	58.6	41.4

8 and above	53.1	46.9	56.5	43.5
Mother's education				
Illiterate	49.3	50.7	64.6	35.4
Literate at least primary	48.4	51.6	58.2	41.8
Food security				
Secure	42.5	57.5	59.0	41.0
Non-secure	44.1	55.9	61.4	38.6
Wealth quintile				
First	44.4	55.6	66.7	33.3
Second	42.5	57.5	61.6	38.4
Third	50.4	49.6	56.4	43.6
Fourth	54.5	45.5	65.1	34.9
Fifth	50.0	50.0	66.7	33.3
Ethnicity				
Dalit	48.2	51.8	55.2	44.8
Disadvantaged janajati	38.9	61.1	68.1	31.9
Disadvantaged non-dalit terai people	50.7	49.3	64.2	35.8
Janajati	0.0	100.0	60.0	40.0
Brahmin, Chhetri etc.	49.6	50.4	43.4	56.6
Member of AAMA group				
Yes	50.6	49.4	-	-
No	45.4	54.6	-	-
Total	48.8	51.2	60.6	39.4

Breast feeding and complementary feeding of children

The practice of breastfeeding within one hour of birth was 79.1% in Kailali and 71.8% in Bardiya. Exclusive breastfeeding was comparatively lower in Bardiya (51.1%) than in Kailali (73.1%). In Kailali, 98.3% of mothers with children less than two years of age continued to breastfeed, while in Bardiya this figure was 99.3% (Table 13).

Table 66: Breastfeeding practices

Indicators	Baseline Kailali (%)	Endline Kailali (%)	Baseline Bardiya (%)	Endline Bardiya (%)
Breastfed within one hour of birth	65.5	79.1	58.1	71.8
Received pre-lactealing feeding	12.1	3.9	23.0	5.8
Exclusive breastfeeding	79.1	73.1	NA	51.1
Continued breastfeeding	99.5	98.3	NA	99.3

Complementary feeding practices for children aged 6-24 months of age improved significantly in both districts. More children in Bardiya received food from four or more food groups than in Kailali (Table 14) and the increase from baseline to endline was also greater for the former (from 19.5% to 80.6%) than for the latter (from 50.5% to 78.3%).

Table 67: Complementary feeding practices for children 6-24 months of age

Indicators	Baseline Kailali %	Endline Kailali %	Baseline Bardiya %	Endline Bardiya %
Fed (solid/semi-solid foods)				

<i>minimum number of times per day</i>				
6-8 months	39.6	62.5	25.4	41.8
9-23 months	52.5	91.9	69.0	76.3
Fed minimum number of food groups (6-24 months)	50.5	78.3	19.5	80.6

The mean dietary diversity was greater than 4 in both districts (Table 15).

Table 68: Mean dietary diversity by age, gender, ethnicity and mothers education status

Indicators	Baseline Kailali	Endline Kailali	Baseline Bardiya	Endline Bardiya
<i>Child age (in months)</i>				
6-8	1.3	4.4	0.8	4.4
9-11	2.5	4.5	2.4	4.4
12-17	2.8	4.4	3.1	4.4
18-24	2.8	4.3	3.6	4.5
<i>Gender</i>				
Male	1.9	4.3	1.9	4.3
Female	1.9	4.3	2.1	4.3
<i>Ethnic group</i>				
Dalit	1.5	4.3	1.2	4.3
Disadvantaged janajati	1.6	4.1	2.0	4.4
Disadvantaged non-dalit terai people	4.0	4.3	1.2	4.1
Janajati	1.4	3.0	1.5	4.5
Brahmin, chhetri, dasnami	2.6	4.4	2.8	4.4
<i>Mother's literacy status</i>				
Yes	2.1	4.3	2.1	4.3
No	1.8	4.4	1.9	4.3

Knowledge of mothers on child nutrition and health

Mothers' knowledge on breast-feeding and complementary feeding practices also increased substantially at endline in Kailali and Bardiya, although the proportion of mothers with knowledge about these issues was higher in Kailali than in Bardiya. Knowledge on colostrum feeding increased from 87% to 97.1% in Kailali and from 76.4% to 95.4% in Bardiya. In Kailali, 90.8% of mothers were aware of the importance of exclusively breastfeeding their children until 6 months of age; this was significantly lower in Bardiya (73.9%). In addition, more mothers in Kailali (80%) than in Bardiya (59.7%) were knowledgeable about the importance of feeding their children more-than-usual during cases of diarrhea (Table 16).

Table 69: Mothers knowledge on breast feeding and supplementary feeding

Characteristics	Kailali		Bardiya	
	Baseline <i>n=484</i>	Endline <i>n=696</i>	Baseline <i>n=466</i>	Endline <i>n=540</i>
<i>Colostrum feeding</i>				
Feed to the child	87.0	97.1	76.4	95.4
Do not feed to the child	10.7	2.0	23.4	3.5
Do not know	2.3	0.9	0.2	1.1
<i>Duration of exclusive breast feeding</i>				

Less than 6 months	10.3	1.3	9.0	3.0
Until 6 months	61.0	90.8	61.4	73.9
More than 6 months	20.5	5.9	21.7	12.4
Do not know	8.3	2.0	7.9	10.7
<i>Time of initiating supplementary feeding</i>				
From less than 6 months	NA	0.7	NA	3.7
From 6 months	NA	40.5	NA	29.8
After 6 months	NA	57.0	NA	55.2
Do not know	NA	1.7	NA	11.3
<i>Supplementary feeding for children aged 6-23 months</i>				
Plain rice/jaulo	87.0	75.0	71.7	38.1
Rice, jaulo and sarbottam pitho with other nutritious food	64.9	63.4	85.0	41.7
Yellow or orange coloured fruits, vegetables and green vegetables	50.4	87.5	58.6	72.2
Eggs	15.9	74.6	23.8	26.7
Milk and curd of cows and buffaloes	42.8	71.4	44.8	48.9
Chicken meat, other meat and liver	33.3	74.3	36.1	49.4
Cereals	-	80.5	14.6	73.5
Ghee, butter, oil	9.1	39.1		5.6
<i>Frequency of supplementary food in addition to breast milk for child aged 6-11 months in a day</i>				
1-3	59.1	58.6	56.4	42.8
4-6	38.7	39.2	39.1	46.7
>6	-	-	4.5	-
Do not know		2.2		11.1
<i>Frequency of snacks to 6-11 months child in a day</i>				
1-3	84.7	65.8	80.7	61.7
4-6	11.8	30.9	9.4	26.9
>6	-	0.2	6.4	0.0
Do not know	-	4.2	3.4	17.4
<i>Types of food to be given to 8 months child</i>				
Solid food	44.7	11.6	42.7	34.8
Semi solid food	49.1	70.3	37.6	44.8
Pineko food	71.4	3.2	2.8	2.6
Liquid food	1.7	14.8	15.2	15.6
Others	3.1	1.0	2.6	2.8
<i>Frequency of breast feeding during diarrhea</i>				
Less than before	22.5	8.9	27.3	14.6
Same as before	12.8	9.8	15.5	10.9
More than before	59.7	81.3	52.8	74.5

The knowledge of women regarding frequency of foods to be consumed during pregnancy improved markedly in Kailali from baseline to endline (24.8% to 88%). Knowledge of the types of nutritious foods to be consumed during pregnancy, and timing of taking iron tablets and vitamin A capsules by pregnant women and after delivery, also improved significantly (Table 17).

Table 70: Mothers knowledge on recommended nutrition and health practices during pregnancy

Characteristics	Kailali		Bardiya	
	Baseline	Endline	Baseline	Endline

<i>Frequency of food to be consumed during pregnancy</i>	<i>n=484</i>	<i>n=696</i>	<i>n=466</i>	<i>n=540</i>
More than usual	24.8	88.4	25.5	80.0
Same as usual	13.0	7.3	16.5	9.8
Less than usual	60.1	3.3	56.2	7.0
Do not know	2.1	1.0	1.7	13.1
<i>Nutritious food to be consumed during pregnancy</i>				
Yellow and orange coloured fruits, vegetables and green vegetables	81.8	98.4	85.0	90.7
Eggs	NA	79.7	46.6	35.0
Milk and curd	NA	74.1	NA	43.7
Fish, meat and liver	66.9	93.8	57.3	79.0
Cereals	NA	85.3	NA	74.3
Others	NA	1.0	NA	0.6
<i>Time of initiation of iron tablet by pregnant women</i>				
<3 months	NA	1.5	NA	2.0
3-6 months	NA	97.6	NA	96.0
>6 months	NA	6	NA	1.9
<i>Time of taking antihelminthic drug by pregnant women</i>				
<3 months	NA	1.3	NA	1.6
3-6 months	NA	96.7	NA	98.0
>6 months	NA	2.0	NA	0.4
<i>Time of taking vitamin A capsule after delivery</i>				
Upto 42 days after delivery	NA	65.7	NA	27.0
More than 42 days after delivery	NA	34.3	NA	73.0

More than 80% mothers in Kailali and 75% in Bardiya were given nutrition advice by female community health volunteers (FCHVs), mother's group or others community health workers (Table 18).

Table 71: Nutrition advice or services provided by FCHVs, mother's group or other community health workers

Advices/service	Kailali		Bardiya	
	Baseline (n=484)	Endline (n=696)	Baseline (n=466)	Endline (n=540)
Giving vitamin A capsule to 6-59 months child	60.7	82.2	77.0	75.0
Taking vitamin A within 42 days after delivery	61.2	72.1	70.2	65.7
Antihelminthic drug to 1-5 years child	58.3	89.2	73.8	78.3
Breast feed newborn immediately after birth	57.4	96.2	71.5	90.7
Exclusive breast feeding until 6 months	51.4	95.7	61.4	87.2
Appropriate complementary feeding after 6 months	42.1	94.1	54.7	84.1
Feed green vegetables and yellow fruits to mothers and children	48.1	97.1	58.4	88.3
Feed animal food (milk, meat, eggs, fish) to children and mothers	44.0	96.8	50.0	80
Use of iodized salt	41.3	93.8	63.3	80.4
Additional foods to be taken by pregnant women	38.8	93.2	54.7	79.8
Intake of iron tablet after 3 months of pregnancy	74.2	90.8	93.6	85.9
Intake of antihelminthic drug during pregnancy	59.3	94.1	85.0	85.7
Additional feeding of lactating women	43.8	86.5	57.3	74.1
Frequency and foods to be given to sick child	25.0	77.6	30.3	60.7

Food insecurity situation

Food insecurity was more prevalent in Bardiya than in Kailali, with 71.7% of the households experiencing some degree of food insecurity the last 12 months preceding the survey in the former and 61.2% in the latter.

There were more households in Bardiya that often worried over household food supply due to lack of money (11.7%) than in Kailali (6.2%); and often could not feed children nutritious foods (11.7% versus 7.5%) (Table 19).

Table 72: Percentage of households that experienced specific food insecurity-related conditions in last 12 months preceding the survey

Food insecurity situations	Kailali (n=696)				Bardiya (n=540)			
	Never	Rarely	Sometimes	Often	Never	Rarely	Sometimes	Often
Worry over household food supply due to lack of money	48.3	10.2	35.3	6.2	32.6	10.0	43.1	11.7
Could not feed children nutritious foods	46.7	10.3	35.3	7.5	36.3	11.7	38.0	11.7
Household member ate less than usual	85.1	5.7	7.2	1.6	56.9	10.6	24.1	6.3
Household member skipped meal	95.5	1.1	2.3	0.3	81.1	6.5	5.2	3.1
Household ran out of food	66.8	-	33.2	-	62.6	-	37.4	-

A greater proportion of children from food insecure households were found to be suffering from some form of illness two weeks prior to the survey in both districts. Mothers from food insecure households had lower height, weight, and haemoglobin levels, although not significantly different from food secure households. Food insecure households had lower socioeconomic statuses and more illiterate mothers than food secure households. Similarly, significantly more food insecure households had less monthly incomes, electricity, toilet facilities, home gardens, or durable household assets such as radios, televisions, fans, and telephones.

Agriculture related practices, homestead food production and income generation

A large majority of households in Kailali and Bardiya had home gardens (89.5% and 75.7%, respectively). The proportion of improved and modern home gardens in Kailali increased from 11.6% at baseline to 59.8% at endline, while a majority of households in Bardiya (63.3%) still had traditional home gardens. The median number of vegetables grown in the home gardens during the survey period was 2 in both districts, down from 4 in Kailali and 9 in Bardiya. However, the median weight of vegetable products from the home gardens within two months preceding the survey was significantly higher at endline and in Kailali (100 Kg) than in Bardiya (30 Kg) (Table 20).

Table 73: Home garden and production of vegetables and fruits

Characteristics	Baseline Kailali %	Endline Kailali %	Baseline Bardiya %	Endline Bardiya %
HHs having kitchen garden	-	89.5	74.0	75.7
<i>Types of kitchen garden</i>				
Traditional	58.1	29.7	56.0	63.3
Improved	11.4	53.0	16.1	11.9
Developed	0.2	6.8	0.2	0.6
Median number of fruit trees in HHs	NA	8	NA	4
Median number of vegetables in the home garden	4	2.0	9	2.0
Median weight of vegetables product from home garden within two months preceding the survey (Kg)	45.4	100.0	30	30.0
<i>Types of manure used in kitchen garden</i>				
None	3.1	1.4	5.1	2.9
Chemical fertilizers	10.7	5.9	10.1	9.8
Compost	84.0	92.6	84.8	87.3
<i>Insecticides used in kitchen garden</i>				
None	58.2	19.1	48.7	25.2
Chemical insecticides	32.3	50.4	43.8	71.4
Organic insecticides (home made)	6.2	25.7	6.8	2.4
Mechanical	0.6	0.5	0.3	0.0
Biological	2.7	0.0	0.3	0.2
Others (ash, plant)	-	4.3	-	0.7

More households in Kailali had chickens at endline than in Bardiya (77.4% and 63.9%) and the median number of chickens per household was 7 and 4, respectively (Table 21). Although only 15.7% of households had improved breeds of chicken in Kailali, this was higher than in Bardiya (4.4%). Similarly, the practice of rearing poultry in closed conditions was higher in Kailali (52.9%) than in Bardiya (34.4%).

Table 74: Characteristics of poultry production

Characteristics	Baseline Kailali % (n=484)	Endline Kailali % (n=696)	Baseline Bardiya % (n=466)	Endline Bardiya % (n=540)
HHs having chicken	61.2	77.4	68.2	63.9
<i>Number of chicken owned by HHs</i>				
1-5	42.9	42.6	40.9	60.3
6-10	27.0	26.3	26.1	20.6
11-20	24.7	22.7	22.6	13.7
>20	5.4	8.4	10.4	5.5
Median number of chickens per HH		7		4
<i>Species of chicken owned by HHs</i>				
Local only	99.7	84.4	98.7	95.7
Improved only	0.3	5.6	1.3	3.8
Both improved and local		10.1	-	0.6
<i>Main caretaker of chicken rearing</i>				
Husband	1.0	3.4	3.8	9.9
Wife	53.9	54.7	49.1	37.1
Others	45.1	41.9	47.2	53.0

<i>Type of chicken rearing practice</i>				
Opened	92.2	47.1	79.9	65.5
Closed	3.4	46.9	9.1	30.1
Both	4.4	6.0	11.0	4.3

Regarding income generation, 8.6% households of Kailali and only 0.9% households of Bardiya earned money by selling garden products in the last two months preceding the survey. The median income by selling vegetables and fruits was Rs. 1000 in Kailali and Rs. 1500 in Bardiya. Households earning money by selling poultry products in the last two months were 10.6% in Kailali and 4.3% in Bardiya and the majority of them used that money on household expenditure in both districts (Table 22).

Table 75: Income generated from HFP activities

Characteristics	Baseline Kailali % (Number) (n=484)	Endline Kailali % (Number) (n=696)	Baseline Bardiya % (Number) (n=466)	Endline Bardiya % (Number) (n=540)
HHs earned money by selling garden products in the last two months	8.5	8.6	2.3	0.9
Median income within last two months from vegetables and fruits (in NRs)	NA	1000	NA	1500
<i>Use of income from vegetable and fruits selling</i>				
Purchase food items (only cereal)	4.9	8.3	14.3	20.0
Purchase cloths	7.9	1.7	0	40.0
Purchase medicine	4.9	16.7	14.3	20.0
Education expenditure	12.2	-	0	-
Other HHs expenditure	53.7	60.0	37.1	20.0
Savings	4.9	6.7	0	0.0
Others (invested)	12.2	6.7		0.0
HHs earning money by selling poultry product in the last 2 months	11.5	10.6	8.5	4.3
Mean income in last 2 months from poultry (in NRs)	471.80	735.70	1185.00	6408.60
<i>Use of income from selling of poultry products</i>				
Purchase food items (only cereal)	-	5.3		13.3
Purchase cloths	11.1	7.0		13.3
Purchase medicine	14.8	19.3		0.0
Education expenditure	11.1	3.5		6.7
Savings	7.4	5.3		6.7
HHs expenditure	40.7	56.1		60.0
Others (invested)	14.8	3.6		0.0

Chapter 5

Discussion and Recommendations

The major project indicators, including underweight, stunted and anaemic children declined significantly from baseline to endline. The proportions of underweight and stunting in children 0-24 months were 20.7% and 18.3% in Kailali at endline, lower compared to the rest of the far-western terai region, with 24.7% of underweight and 31.5% of stunted children. This demonstrates that the AAMA project has contributed to the reduction in the proportion of underweight and stunted children.

Other outcome indicators improved significantly and also achieved project targets. The proportion of women taking the full 180 days of iron supplements during their previous pregnancy was 86.7%, much greater than the target of 33% and about double than that from baseline. Although it did not reach the project's target, anaemia in children and mothers also declined significantly at endline.

Another key project objective was to increase homestead food production. The mean number of micronutrient rich vegetables cultivated by households each year was 5.78 at endline, which is almost 3 times greater than 2 at baseline. Similarly, the status with regards to improved chickens owned per household increased from no chickens at baseline to 9.6 at endline. The project has therefore contributed significantly to establish and increase homestead food production, the model based on which can be replicated in other districts.

Despite the increase in homestead food production, food insecurity was still high in both districts, with 61.2% of households being food-insecure in Kailali and 71.7% in Bardiya. However, the food security status in Kailali was better than the rest of the mid-western region. Bardiya on the other hand was on par with the rest of the region. In Kailali, food insecurity within the last 12 months preceding the survey was slightly lower than that shown in the Nepal Demographic Health Survey 2011. More food insecure households had less monthly income, electricity, toilet facilities, home gardens and household durable assets such as radios, televisions, fans, telephones, etc. Similarly, mothers from food insecure households weighed less, were shorter and had less haemoglobin than those in food secure households. Therefore, improvement in the socioeconomic status of households, maternal education, awareness on optimal nutrition practices, and adequate maternal nutrition are needed to address malnutrition among children.

Hygiene and sanitation indicators improved dramatically at endline in Kailali. Mothers using soap to wash hands on the preceding day of the survey was 95.7% in Kailali. However, only 6.5% of mothers or child caretakers washed their hands at all four key occasions. Although this was an increase from baseline, this signifies the need to carry out awareness-raising campaigns or programmes to improve hand-washing practices.

Maternal care practices including antenatal, delivery and post-natal care, including examination by skilled health workers such as nurses or ANMs, all improved at endline, except the proportion of mothers receiving at least two TT injections during pregnancy.

Breastfeeding within one hour of birth, exclusive breastfeeding and continued breastfeeding for children less than two years of age were improved in both Kailali and Bardiya. Although complementary feeding practices increased in both districts at endline, more children received food from four or more food groups and there was a greater increase from baseline to endline in Bardiya than Kailali.

The prevalence of any illness in children two weeks preceding the survey was 42.3% in Kailali and 56.3% in Bardiya. The most common illness was diarrhea in both districts, followed by ARI. The majority of mothers were aware of the importance of breastfeeding and feeding sick children at more-than-usual

frequencies. In practice, however, this was not always the case as children would often refuse food when they were ill. Around 60% of households in Kailali used insecticide treated bed nets on the night preceding the survey.

In conclusion, there was significant improvement in project indicators at endline and most of them achieved project targets. However, to ensure these achievements are sustained in the future, the following points are recommended.

- 1) The project achieved its goal by integrating improved agriculture and nutrition practices. It needs to be strengthened in the project districts and scaled-up in other districts.
- 2) The project contributed to reducing food insecurity to some extent through the homestead food production activities. However, because food insecurity is still on the higher side, the implementation of extensive food security related programmes is necessary.

Annex 7 CHW Training Matrix

Project Area	Type of CHW	Official government CHW or AAMA	Paid or Volunteer	Number Trained over life of project	Focus of Training
Kailali District	FCHV (Female Community Health Volunteer)	Government	Volunteer	1012 (among these, 95 FCHV are also VMF)	ENA/BCC: IYCF, Breastfeeding, Women nutrition, Care of sick child, Counseling
"	VMF (Village Model Farmer)	AAMA	Volunteer	31 VMF	ENA/BCC: IYCF, Breastfeeding, maternal nutrition, care of sick child, Counseling
"	HFPBs	AAMA	Volunteer	4417 HFPBs	ENA/BCC: IYCF, Breastfeeding, maternal nutrition, care of sick child
"	VMF/FCHV (Village Model Farm)	AAMA	Volunteer	126	HFP: Planting, Compost, Pest management (IPM), Poultry raising
"	HFPBs	AAMA	Volunteer	4632	HFP: Planting, Compost, IPM, Poultry raising
"	VMF	AAMA	Volunteer	123	Group facilitation skills
"	VMF	AAMA	Volunteer	15	Group Marketing
"	HFPBs	AAMA	Volunteer	2	Group Marketing
Baitadi District	FCHV	Government	Volunteer	230 (among this 34 FCHV are also VMF)	ENA/BCC: IYCF, Breastfeeding, Women nutrition, Care of sick child, Counseling
"	VMF (Village Model Farm)	AAMA	Volunteer	88 VMF	ENA/BCC: IYCF, Breastfeeding, maternal nutrition, care of sick child, Counseling
"	HFPBs	AAMA	Volunteer	3029	ENA/BCC: IYCF, Breastfeeding, maternal nutrition, care of sick child
"	VMF/FCHV (Village Model Farm)	AAMA	Volunteer	122	HFP: Planting, Compost, Pest management (IPM), Poultry raising
"	HFPBs	AAMA	Volunteer	3329	HFP: Planting, Compost, IPM, Poultry raising
"	FCHV	Government	Volunteer	76	IYCF and MNP
"	VMF	AAMA	Volunteer	110	Group facilitation skills
"	HFPBs	AAMA	Volunteer	13	Refresher training on ENA
Bajura District	FCHV	Government	Volunteer	261 (among this 122 FCHV are also VMF)	ENA/BCC: IYCF, Breastfeeding, Women nutrition, Care of sick child, Counseling
"	VMF	AAMA	Volunteer	12	ENA/BCC: IYCF, Breastfeeding, maternal nutrition, care of sick child, Counseling
"	HFPBs	AAMA	Volunteer	3412	ENA/BCC: IYCF, Breastfeeding, maternal nutrition, care of sick child
"	VMF/FCHV	AAMA	Volunteer	133	HFP: Planting, Compost, Pest management (IPM), Poultry raising
"	HFPBs	AAMA	Volunteer	3412	HFP: Planting, Compost, IPM, Poultry raising
Total				13007	

Annex 8. Evaluation Team Members

1. Judiann McNulty, consultant, Team Leader
2. Jennifer Nielsen, Senior Program Manager for Nutrition and Health, HKI New York
3. Dale Davis, HKI Country Director Nepal
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9. Dr. Shiv Adhikari, Consultant
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11. Bhim Neure, Cluster Agriculture Coordinator
12. Harendra Bahadur Chand, Regional Governance Manager
13. Nabaraj Upreti, District Coordinator
14. Ratanpati Joshi, Program Assistant
15. Bhupendra Thapa, Livestock Officer, DLSO

Annex 9. Evaluation Assessment Methodology

SCOPE OF WORK - Nepal AAMA Final Evaluation Team Leader

I. Introduction

Nepal has made considerable progress in reducing child and maternal mortality, but has had less success improving nutritional status. Problems are more severe in the remote Far Western Region. According to the findings of 2006 Demographic & Health Survey (DHS 2006), stunting (low height for age-HA) or evidence of chronic malnutrition among children under five is 52 percent in the FWR; wasting (low weight for height-WH) or evidence of recent severe malnutrition is an alarming 16.7 percent; and the composite measure underweight (low weight for age-WA) is estimated for the region at 44 percent. Anemia prevalence is extremely high among both women of reproductive age and young children, at over 50 percent. It is well documented that undernutrition increases mortality and reduces cognitive and human potential and the economic status of households and nations³⁷. It is also clear that the damage from poor nutrition during gestation and the first two years of life are largely irreversible³⁸, and that early prevention has lasting and compounding benefits³⁹.

II. Project Background

The **Action Against Malnutrition through Agriculture** project (AAMA, or mother in Nepali) targeted pregnant and lactating women and children less than two years of age in three FWR districts, Kailali and Baitadi and later in Bajura. Helen Keller International (HKI) and its national partner Nepali Technical Assistance Group (NTAG) and local partners Nepal National Social Welfare Association (NNSWA - Kailali), *Snehi Mahila Jagaron Kendra* (SMJK - Baitadi) and Women Development Forum (Bajura) collaborated on an **innovation** that merged two proven programs addressing complementary and critical facets of malnutrition in Nepal and throughout the developing world: food security and nutrition knowledge and practices. To address the first, the project used HKI's signature Homestead Food Production (HFP) program, which has been bringing appropriate technologies for improved household food enrichment and diversification for almost 20 years in South Asia and for over 10 years in Nepal. This approach, establishing demonstration village model farms (VMFs) that provide technical support and inputs to affiliated beneficiary households to enable them to set up "developed" home gardens, has demonstrated positive impact on household food production, consumption and micronutrient status, as well as on women's economic and social empowerment⁴⁰. The second element, Essential Nutrition Actions (ENA), encompasses interventions targeting the key knowledge and behaviors with proven impact on nutritional practices⁴¹ and on related undernutrition and mortality⁴².

Over four years (October 1, 2008-September 30, 2012) the project will reach a total target population in Kailali of 149,280 women of reproductive age and 28,959 children under two with the ENA interventions, and all children under five, or an additional 60,790 with HFP (total beneficiaries in Kailali 239,029). In Baitadi's four intervention Ilakas, AAMA will reach a total of 20,300 women of reproductive age and 5,120 children under two with ENA and an additional 6,880 children 24-59 months with HFP.

³⁷ Victora CG et al. *Maternal and child undernutrition: consequences for adult health and human capital*. 2008 *Lancet* (371):340-57

³⁸ World Bank, *Repositioning Nutrition as Central to Development: A strategy for large-scale action*. 2006; Washington, DC.

³⁹ Black RE, Allen LH, Bhutta ZA, Caulfield LE et al. 2008 *Maternal and child undernutrition: global and regional exposures and health consequences*. *Lancet*;371:243-60.

⁴⁰ Helen Keller International Nutrition Bulletins for Nepal (May 2001; July 204), Bangladesh (Sept 2003; Nov 2004) and Cambodia (May 2004; December 2006). Copies will be submitted as annexes to this report.

⁴¹ Guyon A, Quinn V, Rangeloson Z and Hainsworth M. 2006. *Final Report: Using the ENA approach to improve nutritional practices of women and children at scale in Antananarivo and Fianarantsoa provinces of Madagascar*. Linkages Project. *Successful community nutrition programming: Lessons from Kenya, Tanzania and Uganda*. 2002; Linkages Project. *Integrated Nutrition and Health Project (INHP-II)*. 2002. CARE/India.

⁴² Bhutta ZA, Ahmed T, Black RE, Cousens S et al. 2008. *What works? Interventions for maternal and child undernutrition and survival*. *Lancet*;371:417-40

The innovation was also designed to reinforce and strengthen Nepal's highly successful Female Community Health Volunteer (FCHV) program. Training intended to expand their skills in nutritional counseling while the VMFs provided a platform to facilitate and reinforce their education and outreach efforts. FCHVs, many of whom are also village model farmers, have used the VMFs as a meeting place for nutrition education discussions with the homestead food production beneficiaries (HFPBs). In turn, the HFPBs were asked to reinforce the FCHV efforts by conveying key ENA messages to their wider communities. By providing a platform for mothers group meetings and engaging HFPBs in supporting the behavior change communications, the project intended to reduce the burden on FCHVs. Also, HKI's prior experience with HFP suggests that other household members will help provide the labor, and that, by developing production close to the household, the system reduces the burden of the traditional practice of tending to distant plots.

In the Kailali district the project used an adequacy assessment (comparing baseline to end line measures on a spectrum of nutrition, hygiene, food security and food production indicators) of project impact⁴³ and create a district-wide model that can be replicated elsewhere. This model attempted to improve food security and nutrition knowledge and practices for the entire population of the district, although direct participants were HFP were only around 15 percent of the population. In the Baitadi district the intervention was implemented as a randomized community effectiveness trial. Intervention sites (Ilakas, or sub-regions) were be randomly selected and matched with control sites on economic, health and food security indicators. Baseline and end line measures of both arms were compared (double-difference estimates) to allow for probability assessment of the impact of the intervention on child and maternal nutritional status, household nutritional practices and food production. In this model, the project intended to improve food security and nutrition practices for the entire population of the intervention Ilakas while actively involving approximately 40 percent of the populations in these areas.

A. Scope of Work

- Purpose:** To perform the final evaluation of the Nepal AAMA Child Survival Project, GHS-A-00-08-00001-00
- Dates:** This consultancy will be performed between approximately September 1 and October 30, 2012. The final evaluation team leader will work a total of 25 days and will arrive in Kathmandu on September 13 and depart on September 29, performing most of the data collection work in the target areas of Kailali and Baitadi. The work-plan given below will be revised if necessary, based on the field situation in consultation with the evaluation team.
- Product:** The product of this work is a written document (can be submitted in electronic format) the body of which does not exceed 40 pages with all annexes in English following the format given in USAID's Final Evaluation Guidelines, May, 2012. A draft report shall be submitted by October 15, 2012. The final document incorporating suggestions and inputs from the Nepal and US teams of HKI shall be finalized by October 26, 2012.

B. Methodology

As stated in USAID's *Guidelines for Final Evaluation*, "the final evaluation provides an opportunity for all project stakeholders to take stock of accomplishments to date and to listen to the beneficiaries at all levels, including mothers and caregivers, other community members and opinion leaders, health workers, health system administrators, local partners, other organizations, and donors".

The evaluation objectives are to determine the extent to which the project has achieved its results in accordance with the Detailed Implementation Plan (DIP), to describe what has and hasn't worked, so that the learning can inform future projects and to demonstrate how the project has contributed to the global

⁴³Baseline data have been collected from a district that was to serve as a control for a plausibility assessment, the neighboring terai district of Bardia, but subsequent government plans to roll out a community-based management of acute malnutrition project across that district may confound comparisons.

knowledge-base on integrated agriculture and nutrition programming and its impact on the nutritional status of pregnant and breastfeeding women and children under two years of age.

The AAMA evaluation should involve project stakeholders and beneficiaries in order to gain their perspective on what has worked and the challenges they encountered. In Nepal these include the staff of HKI and its partner NGOs (NTAG, SMJK and NNSWA), FCHVs, HFPPBs, health and agriculture extension workers and administrators, other community members, opinion leaders, partners and other organizations that work in the same area, and donors. The USAID/Nepal mission is also a critical partner.

The Team Leader will select the most appropriate methods for data collection and analysis, which may include focus group discussions or group interviews, key informant in-depth interviews with stakeholders, observations of field activities, and shall include review of all relevant project documents, project monitoring data and reports, and Ministry of Health information systems.

USAID’s guidance defines the key activities of the final evaluation as follows:

- Review project documents prior to travel to the country
- Travel time to the country and to the project site
- Team planning meetings with key PVO and partner staff to explain the purpose of the evaluation, and with the evaluation team to organize specific activities
- Field work and data collection: site visits and interviews (key informants and/or focus groups)
- Data analysis and additional interviews
- In-country debriefing preparation and presentation
- Travel out of the country
- Drafting and finalizing report.

Observations if feasible will be made of the following activities: Village Model and household farms, ENA counseling sessions held at VMFs by FCHVs, and other project activities.

The documents review will include: DIP, Annual Reports, baseline and endline survey reports, BCC and training materials developed for the project and other project reports.

Composition of Evaluation Team

The evaluation team shall be made up of approximately 10 persons, divided into 2 teams and shall be made up of:

1. An external consultant approved by USAID who will be the team leader (1)
2. MOH Central/Provincial/District Level staff (2-3)
3. AAMA project staff (6-8)
4. HKI Headquarters backstop (1)
5. NGO partner representatives (2-3)
6. Drivers (2)

A representative of the USAID mission will also be invited to join the team. The team leader is responsible for coordinating all evaluation activities, supervising the team and overseeing field data collection, meeting all specified objectives, collaborating with HKI, USAID, and submitting a draft and a final report according to the defined timeline.

C. Estimated Work Schedule

# of days	Task Description	Location of work
2	Familiarization with project documents	US

2	Travel to Kathmandu/FWR	Transit
3	Team planning meeting, development of tools, pre-testing	Kathmandu/Kailali
3	Data collection from randomly selected project villages	Kailali & Baitadi
2	Data analysis and synthesis	Kailali
1	Preparation of presentation to stakeholders; presentation of preliminary finding	Kailali
1	Travel to Kathmandu	Transit
1	Briefing for USAID and MOH	Kathmandu
2	Depart for US	Transit
6	Report Writing	US
2	Finalize report	US

D. Deliverables

The final evaluation report shall address each of the relevant elements outlined in USAID's guidelines. Of particular interest is:

- The extent to which the ENA and HFP elements are successfully integrated and how this might be strengthened (for example, Have agriculture staff understood the ENA messages and are they promoting them? Are the FCHVs who are not VMF owners using the VMFs as a platform for nutrition BCC? Was the HFP and ENA training phased in sufficiently to allow absorption of the many technical topics and skills?)
- The strength of linkages achieved between VMFs and HFPBs (household producers) and whether the ties could be further strengthened.
- The extent to which BCC techniques have been mastered and are practiced effectively by those responsible for promoting ENA, and the responses of target mothers to these techniques regarding such key actions as exclusive breastfeeding, enriching complementary foods for children 6-12 months with eggs and other animal-source foods, and hand washing.
- The impact of the program on FCHV motivation and whether involvement in HFP is indeed a mechanism for improving retention and commitment of FCHVs to their health work.

Annex 10 List of Persons Interviewed

Kailali	Baitadi
<p>VMFs interviewed:</p> <ol style="list-style-type: none"> 1. Rita Chaudhary, Durgauli 2. Urmila Chaudhary, Munuwa 3. Laxmi Chaudhary, Masuriya 4. Sita Rana, Urma 5. Basanti Chaudhary, Kotatulsipur 6. Sona Chadhary, Geta 7. Sagunawati Rana, Beladevipur 8. Jokhani Chaudhary, Janakinagar 9. Sarita Chaudhary, Udasipur 10. Shakuntala Chaudahry, Chaumala 	<p>VMF interviewed:</p> <ol style="list-style-type: none"> 1. Parbati Bohora, Gurukhola 2. Manju Bohora, Dehimandu 3. Rajmati Mahara, Bhumeshowre 4. Manju Mahara, Bhumeswore 5. Tulsi Chand, Basuling 6. Ratna Chand, Nwali 7. Dhanmaya Thagunna, Nwali 8. Geeta Chand, Bhauneli 9. Devaki Joshi, Gwallek 10. Yashoda Bhandari, Patan
<p>HFPBs group interview:</p> <ol style="list-style-type: none"> 1. Munuwa: Seven HFPBs 2. Urma: Ten HFPBs 3. Kotatulsipur: Ten HFPBs 4. Masuriya: Nine HFPBs 5. Geta: Thirteen HFPBs 6. Beladevipur: Ten HFPBs 7. Janakinagar: Eight HFPBs 8. Udasipur: Eight HFPBs 9. Chaumala: Seven HFPBs 	<p>HFPBs group interview:</p> <ol style="list-style-type: none"> 1. Dehimandu: 16 HFPBs 2. Bhumeswore: 12 HFPBs 3. Basuling: 7 HFPBs 4. Nwali: 13 HFPBs 5. Gwallek: 6 HFPBs 6. Patan: 7 HFPBs
<p>Government staffs interviewed:</p> <ol style="list-style-type: none"> 1. Dr. Binod Kattel, Senior Veterinary Officer, DLSO 2. Mr. Khagendra Prasad Sharma, Senior Agriculture Development Officer 3. Mr. Jaya Bahadur Karki, Senior Public Health Administrator, District Public Health Office 4. Mr. Gokarna Prasad Sharma, Local development Officer, District Development Committee 5. Bhupendra Thapa, Livestock Officer, DLSO (also involved in field visit) 6. Jeet Bahadur Malla, VDC secretary, Kotatulsipur VDC 7. Purna Bazagain, VDC secretary, Janakinagar VDC 8. Khadga Singh Chaudhary, Urma-1, VDC accountant 9. Mr. Keshab Bhatta, Chaumala, VDC secretary 	<p>Government staffs interviewed:</p> <ol style="list-style-type: none"> 1. Dr. Guna Raj Awsasthi, District Health Office 2. Bhuwan Raj Joshi, Former Nutrition Focal person, District Health Office 3. Karna Bahadur Chand, Planning officer, DADO 4. Khem Raj Bhatta, Junior Technician, DLSO 5. Aatma Ram Bhatta, Junior Technician, DLSO 6. Hajari Air, ANM, Bhauneli SHP 7. Damber Datta Pandey, VDC secretary, Dehimandu/Durgasthan VDC 8. Nabin Chandra Pandey, Social Development Officer, DDC
<p>Suahara staff attending the synthesis workshop:</p> <ol style="list-style-type: none"> 1. Badri Paudel, Cluster Senior Program Coordinator 2. Sharad Basnet, Cluster Health System Coordinator 3. Ishwor Sharma, EHA Cluster Officer 4. Rajeev Banjara, Cluster M&E Coordinator 	<p>HFPBs individual interview:</p> <ol style="list-style-type: none"> 1. Bhumeswore: 1 2. Bhauneli: 4 3. Gwallek: 1 4. Srikedar: 4

Annex 11 Final OR Report

Executive Summary

Background and objectives: Under a four-year child survival grant from USAID, HKI conducted a community randomized effectiveness trial to test whether its enhanced homestead food production model (EHFP) could reduce rates of stunting, wasting, underweight and anemia in target groups. EHFP combines nutrition-sensitive agriculture production strategies targeted at women to increase year-round access to nutrient dense plant and animal source foods with behavior change communications to reinforce optimal nutrition practices for women and children from 0 to 23 months of age. The research was implemented in the hilly Baitadi district of Nepal's far western region.

Methods: Four Ilakas (sub-districts) were randomly assigned to the treatment arm (EHFP) and four to the control arm (no intervention). Each "Ilaka" is further divided into an average of 5 village development councils (VDC), and each VDC consists of nine wards. The intervention created one village model farm (VMF) in six randomly selected wards in each of the selected VDCs, to reach 40 HFP beneficiaries (HFPBs) and their households in each ward and to achieve the maximum spillover to the entire population of the treatment VDCs. The study used a cross-sectional design, and assessed children ages 12-48 months on the presumption that this would best be able to capture the impact of the intervention on children who would be exposed during the -9 to 23 month nutritional "critical window." A stratified, three stage, probability proportional to size (PPS) survey methodology was used to select households for inclusion in the baseline and endline surveys. Data were collected on household socioeconomic characteristics, homestead food production practices, nutrition and health knowledge and practices, maternal and child anthropometry and hemoglobin concentration. In addition to baseline and endline surveys, four rounds of data collected using LQAS methodologies, twice yearly over two years of implementation, were used to monitor the quality of project implementation.

Results: Data were available for n=2106 children at baseline (n=1055 treatment; n=1051 control) and for n=2614 at endline (n=1307 treatment; n=1307 control). Logistic regression showed significant improvements in treatment compared to control communities along all aspects of the program impact pathways, including household food production, perceptions of food security, nutrition knowledge, receipt of reproductive health care, and complementary feeding practices. Children 12-23 months were more likely fed a minimum acceptable diet [OR 5.36 (3.53 – 8.14); p<0.05] and/or eggs [OR 3.94 (1.20 – 13.0); p<0.95]. No significant changes were found in adjusted logistical regression analysis on measures of child anthropometry; for stunting the AOR was 0.93 (0.73 – 1.18). Borderline significant reductions were found in adjusted analysis of child anemia [AOR 0.77 (0.60-1.00; p=0.051)]. On the other hand, significant reductions were detected in women's underweight (BMI<18.5 kg/m²), AOR 0.63 (0.47-0.84; p<0.05), and in women's anemia, AOR (0.59-0.76; p<0.05).

Conclusions: The EHFP model may not be sufficient to reverse stunting in settings with extremely high prevalence, but does appear to contribute significantly to women's improved nutritional status. Further research is needed to determine if a longer exposure period could positively influence child growth or if the EHFP in combination with a reinforced strategy to reduce and treat infections could have stronger impact and to explore if the model, which aims to empower women, also contributes to their nutritional gains.

1. Introduction and Key Research Question

Helen Keller International (HKI) has been implementing its homestead food production (HFP) program for over 20 years to increase household production of micronutrient-rich foods and improve food security and diet quality among vulnerable households. The HFP strategy establishes village model farms (VMFs) to demonstrate improved gardening techniques to affiliated groups of mothers; these techniques support more diversified, year round production of micronutrient-rich crops as well as improved breeds of poultry and ruminants. The enhanced HFP program (EHFP) includes nutrition behavior change communications using the Essential Nutrition Actions (ENA) framework to encourage consumption of these nutrient rich products, especially among vulnerable household members such as pregnant and lactating women and infants and young children⁴⁴. The ENA framework focuses on seven fundamental interventions (support for optimal breastfeeding, complementary feeding, and nutritional care of the sick child; maternal nutrition, integrated control of anemia and control of vitamin A and iodine deficiencies) with demonstrated impact on child survival (1). The intersectoral approach of EHFP has been shown to increase the number of developed gardens, the quantity, quality and diversity of produce generated by home gardens, the consumption of targeted foods, the income of program participants, and in some, but not all, cases, reduce levels of anemia among women and/or young children (2, 3). While recent efforts have begun applying program theory (Figure 1) to identify the pathways by which these programs are expected improve nutrition outcomes and to collect data along these pathways to inform adjustments to the design and maximize outcomes, a rigorous probability design has not previously been used to test the impact of the program on the anthropometry of women and children.

The operations research undertaken in the AAMA project was designed to address this knowledge gap, using a cluster-randomized, pre/post design in the Baitadi district of Nepal's Far Western Region. The evaluation included two cross-sectional surveys, one at baseline in year one and a post-intervention survey exactly three years later. In addition, process monitoring using lot quality assurance sampling (LQAS) was conducted every six months to assess the extent to which the project was delivering the program as intended by the program impact pathways model, and to better assess how the model did or did not achieve the intended outcomes. A randomized assignment of the intervention and control areas resulted in 21 intervention VDCs and 20 comparison VDCs out of a total of 61 of these units in the district.

The objective of the research was to test the impact of EHFP targeted to households with children 0-24 months of age on the prevalence of stunting, underweight, wasting and anemia. To best capture children's exposure to the program, the researchers chose to examine children 12-48 months of age, based on the assumption that children in this range at endline would have been exposed to the intervention for at least 12 months (estimated to be sufficient duration to benefit) between the ages of 0 and 24 months of age (the critical window). In addition, the impact of the intervention on maternal underweight and anemia were assessed. The study was designed as cross-sectional rather than longitudinal for practical reasons given the narrow age group to be studied. The research intended to test the following hypotheses:

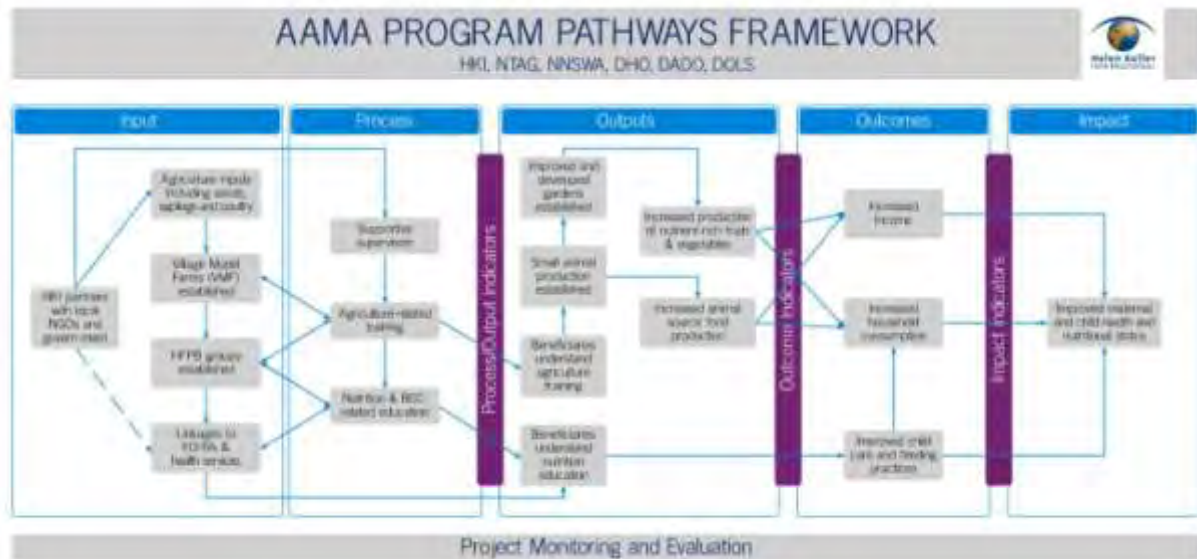
Exposure to the HFP+ENA intervention will reduce rates of **stunting** (length for age <-2SD WHO 2006 reference) by 10 percentage points, **underweight** (weight for age <-2SD) by 10 percentage points, **wasting** (weight for length <-2SD) by 5 percentage points, and **anemia** (hemoglobin concentration < 110 g/L) by 15 percentage points in

⁴⁴ HKI refers to the incorporation of ENA with HFP as Enhanced Homestead Food Production or EHFP.

intervention compared to control children 12-48 months of age at endline compared to baseline.

Exposure to HFP + ENA intervention will reduce maternal **underweight** and **anemia**⁴⁵, although we did not set specific targets to be achieved for these indicators.

Figure 1: AAMA Program Pathways Framework



Data were collected on a spectrum of other variables expected to influence or potentially confound the outcome, including socioeconomic status, household food security and agricultural production practices, access to and use of health services, and water and sanitation infrastructure, in order to control for any significant intervening variables in analysis. Data were also collected on variables along the impact pathways to evaluate the impact of the intervention on practices expected to contribute to the ultimate outcome and impact variables. Data analysis also included adjusting for clustering at the level of village development committees (VDCs) using random-effects regression models to assess the difference in change over time between the two groups and control for potentially confounding variables.

Because iron requirements are so difficult to meet in children with little or no access to fortified foods or supplements, HKI applied for and was awarded a grant from the Alive & Thrive project to include a **small nested sub-study** to test whether providing a micronutrient powder (Sprinkles) along with the HFP+ENA intervention had a greater impact on reducing anemia in young children than the HFP+ENA intervention alone. The details of methods and findings of this nested study have been reported elsewhere (4).

2. Detailed description of innovation tested

Intervention model: For the food security element, village model farms (VMF) were established at the homestead of one leader mother in each of the six wards per VDC directly supported by the AAMA project). These mothers had to meet certain selection criteria (access to land and water adequate to sustain demonstration activities; proximate location to other participating households; at least one literate household member). These village model farmers

⁴⁵ Targets were not established for these outcomes but the survey instrument was designed to assess them.

were then trained by the project in both food production and ENA to, in turn, train and support members of two women's groups each comprised of 17-20 women who were pregnant or had a child < 2 years at recruitment (called Homestead Food Production Beneficiaries-HFPBs). Female Community Health Volunteers (FCHVs)⁴⁶ who were interested were given priority to become VMF managers; 28% of the VMFs in Baitadi were managed by FCHVs. In addition to technical training, VMFs and HFPBs were provided with seeds, chickens and on-going technical support for their HFP activities.

Following the training in HFP, a nutrition and behavior change communications training was provided to all VMFs as well as to all FCHVs in the intervention zones. Using the Essential Nutrition Actions (ENA) framework, it was intended to emphasize the importance of nutrition for pregnant and lactating women, exclusive breastfeeding for six months, enriching of complementary foods for children 6-24 months using nutrient rich plants and eggs from home production, and continued breastfeeding for at least two years. This training was then given by VMFs with the support of project staff to all HFPBs. The HFPB mothers then established their own homestead gardens with support from the model farms, met together monthly at the VMF to discuss techniques to improve garden production and ENA topics, act as a support group for each other, and were encouraged to share their expertise in both HFP and ENA with other mothers in their communities. FCHVs facilitated the nutrition discussions at these monthly meetings. Formative research conducted by HKI prior to the start of the intervention was used to tailor the nutrition BCC strategy to target local barriers to and enablers of uptake of new practices. Adult learning principles⁴⁷ were applied to make these discussion sessions interactive, stimulating and enjoyable.

Study area: Baitadi district is a hilly district located in the far western region of Nepal. With a total population of 257,659, the district is divided into 12 sub-districts called "Ilakas". Each "Ilaka" is further divided into an average of 5 village development councils (VDC), and each VDC consists of nine wards. The communities in this district engage mainly in subsistence farming and the majority of households have a kitchen garden. There are relatively few activities by non-governmental organizations in this district.

Randomization: A complete list of Ilakas and VDCs was obtained from the department of health in Baitadi district. Eight Ilakas were selected for the study based on their comparability on factors such as food availability, life expectancy, educational attainment, health service access, and poverty index, total number of VDCs, villages and number and size of households within these Ilakas. Of these, four Ilakas were then randomly assigned to the treatment arm (HFP+ENA) and four to the control arm (no intervention). The intervention was designed to create one VMF in six out of nine wards in each of the selected VDCs, not only to reach the 40 HFPBs and their households in each ward, but to achieve the maximum spillover through demonstration and advocacy by beneficiary women and enable dissemination of nutrition messages and improved gardening practices throughout as much of the entire treatment VDCs' population as possible.

Survey sampling procedures: For the baseline and endline surveys, a total of 14 VDCs were chosen within each study arm using the probability proportional to size technique; a total of 28 VDCs (14 treatment and 14 control) were included in the evaluation. The research design was

⁴⁶ Nepal's national Female Community Health Volunteer (FCHV) program was established in 1988 by the Ministry of Health to enhance the reach of the primary health care network through local volunteers. Across Nepal's 75 districts, there are now almost 50,000 FCHVs supporting primary health care activities and acting as a bridge between government health services and the community.

⁴⁷ The widely acknowledged theory that adults learn best by practice and reflection on their experiences.

cross-sectional, and thus separate samples were drawn for the two surveys. All nine wards and households within the selected VDCs were considered to be part of the study population.

A stratified, three stage, probability proportional to size (PPS) survey methodology was used, with the population defined by children 12-48 months and the VDC as the primary sampling unit. The framework for first stage sampling was based on the number of Illakas and their respective VDCs as enumerated by the most recent census (2001)⁴⁸. A total of 28 VDCs were selected by the PPS method from the selected Illakas; 14 for each study arm. In the second stage, six wards were randomly selected for inclusion from each VDC.

The third stage was the random selection of households with a child in the 12-48 month age range. Guided by local residents, the interview team went to the center of a ward and used the spin of a pen to select the starting direction. The team then determined the number of houses located along a line extending in that direction from the centre of the ward to the outer boundary. A random number was selected as the count to the first eligible household. If a child in the stipulated age group was living in that particular household and the mother provided informed consent, the mother/caretaker of that child was interviewed. If the same household had another mother with a child of the 12-48 month age range, that child was also included for a full interview. The research team estimated that there would be one child aged 12-48 months eligible to participate in the study per every 3 households.

3. Internal Review Board (IRB) compliance

The study protocol was submitted to the Nepal Health Research Council (NHRC), Nepal's ethics review board, in February 2009 and was approved in June 2009.

The objectives of the study were also explained and consent was obtained from government officials and local community leaders in the study areas, as well as from all heads of households and parents or legal guardians of study children prior to data collection and implementation of the intervention. Children who were found to be severely anemic (Hemoglobin < 70.0 g/L), underweight (WAZ < -3), stunted (HAZ < -3) or wasted (WHZ < -3) were referred to the nearest community health facility for treatment but were not excluded from the analysis.

4. Study methodology

Impact evaluation: baseline and endline data collection

The study evaluated the impact of the intervention on the prevalence of stunting, underweight, wasting and anemia (assessed by Hemoglobin concentration) among children **12-48 months of age**. The program theory also hypothesized that increased production of nutrient-rich foods and improvements in the quality of women's dietary intake, breastfeeding practices and the quality of complementary foods and feeding practices would contribute to these outcomes, so these aspects were assessed as well. Additional information on socioeconomic variables that might also have an influence on uptake of practices or ability to benefit from the intervention was also collected. As noted, the hypothesis was that this age group would have the greatest likelihood of being exposed to the intervention for at least 12 months between 0 and 24 months of age (the critical age window for nutrition interventions) and that this exposure period would be sufficient to positively influence growth.

⁴⁸ Data from the 2011 census were not published until November 2012, after endline data collection.

Sample size estimation: The key outcome indicators of interest in the study were underweight, stunting, wasting and hemoglobin concentration among children 12-48 months. The sample size was calculated using a statistical significance of 0.05, a power (beta) of 0.80 and a 10 percentage point difference in differences in the rates of both underweight and stunting among children in the intervention compared to the control communities after the project. This sample size would also allow the detection of a 5 percentage point difference in the prevalence of wasting. Sample size was adjusted for the cluster-randomized design, using an assumed design effect of 2. Our calculations indicated a total of 1970 children would be required to test the main hypotheses of the study but to allow for some attrition the sample size was increased to n=2,106 children (n=1,055 from treatment communities; n=1,051 from control communities). In addition, researchers included n=203 children <6 months in the selected households in order to assess exclusive breastfeeding practices using the 24-hour recall question of WHO. The sample for the end line survey was n=2,614 (n= 1,307 treatment; n=1,307 control) plus n=230 children < 6 months. The baseline survey was implemented by HKI's Nepali partners, Nepali Technical Assistance Group (NTAG) and Snehi Mahila Jagaran Kendra (SMJK), with close supervision by HKI. To preserve independence, the endline survey was conducted by a Nepali research firm, PHIDRec.

Data collection for both baseline and endline entailed an interview with primary caretakers of study children using a household questionnaire and measurement of anthropometrics and Hemoglobin (Hb) concentrations of children and their mothers in intervention and control communities.

Enumerator training: At baseline, a total of 6 teams, each consisting of one interviewer and one anthro/lab assistant, together with one survey supervisor and one quality controller conducted the fieldwork. An 8-day basic training was given in January 2009 to the survey team in Kathmandu before data collection in Kailali district (February 2009) where the project was also to be implemented, and a two-day refresher training was given in Baitadi in July, 2009, just before that baseline survey was conducted (July-August, 2009). The training was divided into three parts. The first part included an introduction to the program, objectives and methodologies of the baseline survey, general interviewing techniques and a detailed review of each question of the questionnaires. The second part included training on anthropometry measurements (weight and length), hemoglobin measurements and use of a Global Positioning System (GPS) machine to collect spatial data (X,Y and Z coordinates). For the standardization of the survey team in anthropometric measurements, training manuals developed by the FANTA Project (5), translated into Nepali, were used. The third part of the training consisted of a three-day field practice in the Kathmandu Valley and a one-day field practice in Dasarathchand Municipality, Baitadi. During data collection, quality was assured by daily debriefings between surveyors and supervisors, reviewing of completed questionnaires, and spot checks of 10% of all surveys and measurements against households.

The training for the PHIDReC end line survey team took place over four days, including a one-day field practice. There were nine data collection teams, each comprised of one supervisor and two interviewers, and each team covered approximately three VDCs.

(a) Quantitative household surveys: The questionnaire included 350 items covering household demographic and socio-economic characteristics, homestead food production, purchasing and consumption practices, food security, water and sanitation facilities and hygiene practices, antenatal and postnatal care, infant and young child feeding practices, child immunization status, morbidity and management of childhood diseases, household participation in community groups, exposure to project agricultural activities and resources, exposure to FCHVs and nutrition messages, and knowledge of ENA messages.

Breastfeeding and complementary feeding practices used with study children were assessed using the WHO indicators for assessing infant and young child feeding practices (2010).

- (b) **Anthropometric assessments:** Weight, recumbent length of children aged <2 years and height of children > 2 years, and height of mothers were measured according to internationally recommended procedures (5). Weight was measured using a portable electronic weighing scale, which was calibrated daily. Recumbent length or standing height were measured using a ShorrBoard®.
- (c) **Biomarker assessments:** Finger prick of blood was taken from children and their mothers and hemoglobin concentration was measured in the field using HemoCue® analyzer.
- (d) **Qualitative and operations research:** At baseline, qualitative data collection was conducted concurrently with the quantitative baseline survey using focus group discussions and in-depth interviews in order to inform the design of the behavior change communications strategy (6). At the mid-term and final evaluation additional qualitative research was conducted led by an external consultant, to explore take-up of production and nutrition practices and the most salient barriers and facilitators, in order to provide further insights into the quality of program delivery and address areas of weakness.

During the course of program implementation, four rounds of surveys using lot quality assurance sampling (LQAS) were conducted to assess whether project activities were proceeding as planned and, as necessary, inform course corrections. These data were also used to evaluate progress along the hypothesized impact pathways, and to provide additional evidence for the impact evaluation that outcomes among beneficiary populations were likely due to the program activities and not due to bias, confounding or chance (7). The surveys were based on the project schema of hypothesized pathways of program impact (Figure 1) and included observations and questions excerpted from the baseline survey and were intended to assess beneficiary comprehension and application of the contents of HFP and ENA training. The nutrition knowledge and practices section of the LQAS rounds focused on mothers with children <24 months of age to assess whether complementary feeding practices were improving and incorporating products from HFP.

5. Timeline for study

The impact evaluation was executed over three years of project implementation and was estimated to capture two years of the complete integrated intervention.

Table 1: Project timeline

Stage	Start date	End date
Preparation, development of program theory, program design and implementation strategy for Baitadi	3/1/09	5/31/09
Design of baseline/end line questionnaire and preparation for execution	6/1/09	7/15/09
Baseline survey field work and data entry (including qualitative research)	7/15/09	8/31/09
Analysis of baseline data, dissemination workshop in Nepal	9/1/09	11/15/09
Implementation of main intervention (HFPP-ENA vs. control)	9/1/09	9/1/12
Round 1 of process monitoring.	8/1/10	8/31/10
Analysis of process monitoring data, consultation on program adjustment/improvement	9/15/10	11/1/10

Stage	Start date	End date
Round 2 of process monitoring, rapid feedback for implementation	2/1/11	3/1/11
Round 3 of process monitoring, rapid feedback for implementation	8/1/11	8/31/11
Round 4 of process monitoring	3/1/12	3/31/12
Final survey field work and data entry	7/15/12	8/31/12
Final qualitative evaluation	9/13/12	9/30/12
Analysis of final evaluation and survey data, dissemination workshop in Nepal	9/30/12	11/30/12
Preparation of journal manuscripts, conference presentations, etc.	12/1/12	6/1/13

6. Data analysis

Data were analyzed using SPSS version 20 and Stata version 11. Initial descriptive statistics were examined comparing control and treatment groups at baseline (T_0) and endline (T_1), followed by within group comparisons between baseline and endline; proportions and means/medians were used for this phase of analysis. Differences found in bivariate analyses were tested for significance using 2-sided Fisher's exact chi-square tests with proportions, independent sample t-tests for means, and Mann-Whitney U-tests for medians. Variables in these bivariate comparison included HFP income and production; IYCF knowledge and practices; preventive healthcare utilization; child morbidity; food security; and maternal and child nutritional status (anthropometrics, hemoglobin and maternal night blindness). Logistic regression with interaction between treatment and time was used to compare the difference in changes in proportion between the treatment and control groups, from baseline to endline, for the outcome and impact variables of interest. First, crude logistic regression models were run; this was followed by an adjusted regression model, controlling for variables that were found to be significantly different (<0.05) in the bivariate analysis. Covariates in the regression models were demographic and socioeconomic variables that differed significantly between groups at baseline, and were independent of the pathway to impact. This included: number of children in household; sex of household head; caste (lower or upper⁴⁹); respondent working outside the home (yes/no); respondent pregnant; mother's education (none vs. any formal); and mother primary caretaker (yes/no). Biological factors, including child's sex and age and mother's age, were also controlled for in analysis of respective nutritional outcomes as the literature shows these can confound outcomes. Linear regression was also used to compare the difference in changes in median of several continuous variables between the treatment and control groups, from baseline to endline. As these variables were not normally distributed, log transformation was used and, upon confirmation of normal distribution of the natural logs of each variable, linear regression was conducted. The coefficients from these regressions are presented, along with their 95% confidence intervals. Analysis was based on intent to treat and also adjusted for clustering of effects at the VDC level using a random-effects model.

7. Results

In this section we present first the double difference results of crude logistic and linear regressions for intermediate outcomes along the impact pathways. In other words, we present preliminary findings of some of the contributing factors for which changes were found to be statistically significant in treatment compared to control communities before full adjustment for potential confounders. For this report, only the ultimate outcomes of maternal and child nutritional status have been thoroughly analyzed and controlled for confounders and significant

⁴⁹Upper caste included: Brahmin, Chetri, Giri, or Thakuri; lower caste included: Dalit, disadvantaged Janajatis, relatively advantaged Janajatis, disadvantaged non-Dalit Terai caste, and religious minorities.

differences at baseline. Future reports will include more detailed analysis of the various program components that contribute to program impact.

In addition, we present some of the findings from the process monitoring (LQAS) where these add evidence of uptake of production and nutrition practices. These data are included in Appendix 1.

7.1 Measures of Household Welfare

In initial analysis there are indications that although income differed significantly at baseline, monthly household income increased relatively more among households (HH) in treatment zones compared to control HH. The crude regression showed that, at endline, households in the EHFP intervention were 42% less likely to have no monthly income [OR 0.58 (0.45 – 0.73)] and 39% more likely to have income > 4000 Rs. [1.39 (1.07 – 1.82)] compared to those in control areas. In addition, the odds of owning poultry [OR 2.64 (1.93 – 3.62)], being engaged in HFP [OR 13.13 (8.64 – 19.9)] and owning fruit trees [OR 1.28 (0.79 – 2.08)] were significantly higher at post-intervention in treatment compared to control group. The relevant proportions are presented in Table 2 below.

Table 2. Changes in Assets

	Baseline			Endline		
	Total	Treatment	Control	Total	Treatment	Control
<i>n</i>	2106	1055	1051	2614	1307	1307
<i>Cash income in last month</i>						
<i>No cash income</i>	48.0	46.7	49.2	31.1#	24.3#	38.0*#
<i>≥ Rs. 4,000</i>	21.2	26.5	15.9*	41.3#	52.9#	29.7*#
<i>Production assets</i>						
<i>Has poultry</i>	13.3	11.9	14.7	23.1#	29.5#	16.7*
<i>Has HFP</i>	48.0	44.8	51.2*	88.9#	97.6#	80.2*#
<i>Has fruit trees (% yes)</i>	74.3	79.2	69.4*	81.6#	89.1#	74.1*#

*Different from corresponding treatment group, $P < 0.05$; #Different from baseline value, $P < 0.05$.

7.2 Agricultural Production

The quality of gardens improved markedly in treatment areas; that is, proportions of households with improved gardens (more diversified production) or developed gardens (diversified with year round production) [OR 37.8 (8.38 – 170.2)]. Families in the treatment communities were growing a greater number (almost 60% more) of different types of vegetables [Coefficient (95% CI): 0.59 (0.52 – 0.65); $p < 0.05$], produced a quantity of vegetables (kg) that was 81% greater [0.81 (0.68 – 0.93); $p < 0.05$] and more eggs by almost 40% [0.39 (0.10 – 0.68); $p < 0.05$] than those in control communities. The relevant proportions are presented below. While the changes in poultry production were statistically significant, the increases in production did not meet expectations, mainly due to inadequate use of chicken coops and logistical challenges to delivering reliable vaccines on an on-going basis. These weaknesses are being addressed, but solutions were not scaled up within the research period.

Table 3: Homestead food production by households

	Baseline			Endline		
	Total	Treatment	Control	Total	Treatment	Control
<i>n</i> (with home garden)	839	398	441	2266	1262	1004
Type of home garden						
Traditional	99.0	98.7	99.3	65.7 [#]	40.0 [#]	97.9 [*]
Improved	0.8	1.0	0.7	18.7 [#]	31.9 [#]	2.0 [*]
Developed	0.1	0.3	0.0	15.7 [#]	28.1 [#]	0.1 [*]
Crops grown in home garden						
Number of types of vegetable	4.0 (2.0)	4.0 (2.0)	4.0 (2.0)	6.0 (4.0) [#]	8.0 (4.0) [#]	4.0 (2.0) ^{*#}
Food produced from HFP (last 2 months)						
Vegetables (kg)	10.0 (15.3)	10.0 (15.5)	10.0 (15.5)	20.0 (30.0) [#]	30.0 (30.0) [#]	13.0 (12.0) ^{*#}
Eggs (count) ¹	10.0 (23.0)	8.0 (25.0)	10.0 (20.0)	25.0 (45.0) [#]	30.0 (45.0) [#]	20.0 (30.0) ^{*#}

¹*n*=279 at baseline, *n*=587 at endline; ^{*}Different from corresponding treatment group, *P* < 0.05; [#]Different from baseline value, *P* < 0.05.

The findings of the four rounds of LQAS also consistently showed HH in intervention zones with a greater variety of vegetables under production and a greater proportion with poultry (Appendix 1).

7.3 Household Food Security

Crude analysis of perceptions of HH food security as measured by the FANTA HFIAS index suggest improvements in both zones, but a relatively greater improvement in treatment compared to control communities. The odds of perceiving their HH to be food secure was higher [OR 1.77 (1.31 – 2.37); *p*<0.05] while odds of perceiving severe food insecurity was lower [OR 0.43 (0.33 – 0.56); *p*<0.05] in treatment compared to controls, and the mild and moderate categories moved in similar directions. However, it is important to note that different recall periods were used at baseline (the past 12 months) and endline (the past month), which may have influenced the responses. Nevertheless, since households were randomized to treatment in this study, we believe such differences in recall will be similar in the treatment and control areas and therefore will not significantly influence these findings. We also believe that responses to these questions at baseline likely reflected more recent experiences, but it is not possible to verify this. Table 4 below presents the relevant proportions.

Table 4: Household food insecurity

	Baseline			Endline		
	Total	Treatment	Control	Total	Treatment	Control
<i>n</i>	2025	1055	970	2614	1307	1307
Food insecurity level, %						
Food secure	16.6	20.3	12.6 [*]	34.1 [#]	46.4 [#]	21.7 ^{*#}
Mildly food insecure	20.8	21.7	19.9	16.0 [#]	17.4 [#]	14.5 ^{*#}
Moderately food insecure	12.0	8.8	15.4 [*]	29.6 [#]	23.3 [#]	35.8 ^{*#}
Severely food insecure	50.6	49.2	52.2	20.4 [#]	12.9 [#]	27.9 ^{*#}

^{*}Different from corresponding treatment group, *P* < 0.05; [#]Different from baseline value, *P* < 0.05.

7.4 Primary Caregiver Feeding, Care, and Health Knowledge

A range of significant improvements in caregiver knowledge were recorded, regarding both women's and children's health. Appreciation of the importance of exclusive breastfeeding for six months increased considerably in both treatment and control communities, but still significantly more in the treatment zone [OR 7.45 (5.18 – 19.73); *p*<0.05] than control. Particularly striking is the proportion of mothers who understand the importance of feeding eggs to children from six months, a major message of the program: an increase of 51.5 percentage points between baseline and endline compared to no change in controls [OR 9.48 (7.32 – 12.27); *p*<0.05]. This

achievement is especially important given that poultry raising and consumption was a taboo among much of the population before AAMA. Qualitative research conducted by project staff indicates that while older people still refuse to consume any chicken products, they support feeding these to young children as a way to meet their high nutrient needs.

Women's knowledge of their own nutritional needs also increased in treatment relative to control communities on a number of indicators. Women were more likely to cite the importance of eating eggs [OR 13.22 (10.18 – 17.15); $p < 0.05$] and of being able to cite all three rich sources of nutrients (micronutrient-rich plants, eggs and milk products) [OR 13.50 (10.40 – 17.52); $p < 0.05$]. Women in intervention zones were also significantly more likely to know that a woman should eat more during pregnancy to nourish the fetus [OR 6.30 (4.67 – 8.49); $p < 0.05$].

Table 4: Nutrition and Health Knowledge ¹

	Baseline			Endline		
	Total	Treatment	Control	Total	Treatment	Control
<i>n</i>	2106	1055	1051	2614	1307	1307
Importance of exclusive breastfeeding for 6 months	67.8	63.8	71.8*	89.4 [#]	96.1 [#]	82.7* [#]
<i>Complementary Feeding</i>						
Animal source foods good from 6 months						
Eggs	29.7	28.7	30.7	56.1 [#]	80.2 [#]	32.0*
Milk or yoghurt	84.2	82.7	85.8*	90.6 [#]	92.0 [#]	89.1* [#]
Meat/organ meat	42.8	41.5	44.1	68.8 [#]	80.0 [#]	57.7* [#]
# of animal source foods mentioned as 'best' for young children ²						
None mentioned	10.4	10.5	10.2	2.7 [#]	1.0 [#]	4.4* [#]
1	44.7	46.1	43.3	23.2 [#]	10.8 [#]	35.6* [#]
2	22.8	23.4	22.3	30.1 [#]	23.3	37.0* [#]
All 3	22.1	20.0	24.3*	44.0 [#]	64.9 [#]	23.1*
<i>Foods Recommended for Pregnancy</i>						
Micronutrient-rich fruits/vegetables	71.6	67.2	75.9*	97.2 [#]	99.3 [#]	95.1* [#]
Eggs	35.4	31.8	39.0*	61.3 [#]	85.2 [#]	37.4*
Milk or yoghurt	63.5	60.7	66.3*	87.0 [#]	90.1 [#]	83.8* [#]
Women should eat more during pregnancy	58.0	61.9	54.1*	77.4 [#]	93.3 [#]	61.5* [#]
# of nutritious foods mentioned as 'best' for pregnant women ²						
None mentioned	16.1	16.9	15.4	0.5 [#]	0.0 [#]	1.0* [#]
1	25.3	29.3	21.2*	7.5 [#]	2.9 [#]	12.0* [#]
2	30.6	31.1	30.1	38.1 [#]	19.5 [#]	56.7* [#]
All 3	28.0	22.7	33.3*	53.9 [#]	77.6 [#]	30.3*

¹Values are percent. ²Total number of possible response categories limited to 3 (eggs, milk/yoghurt, and meat/organ meat).

* Different from corresponding treatment group, $P < 0.05$; [#]Different from baseline value $P < 0.05$.

7.5 Maternal Nutrition and Infant and Young Child Feeding Practices

The practices related to breastfeeding practices, including immediate initiation, the feeding of colostrum and avoidance of prelacteals, did not differ across the two zones. Reports of exclusive breastfeeding by mothers of infants <6 months increased from 62.5 to 76.7% among HH in the treatment zone compared to a stagnant 61.6 and 63% in control communities [OR 1.86 (0.83 – 4.20)], but this difference was not significant. Because the study was not powered to test exclusive breastfeeding, the subsample for this variable may have been too small.

By contrast, numerous measures of dietary quality did improve significantly in treatment compared to control communities in crude analysis: at post intervention the odds of receiving a minimum dietary diversity [OR 5.33 (3.50 – 8.11); $p < 0.05$] as well as the odds of receiving a minimum acceptable diet [OR 5.36 (3.53 – 8.14)], both as defined by the World Health Organization (8), was five-fold higher in the treatment than the control groups. In addition, there were significant increases in the odds of being fed vitamin A-rich fruits and vegetables [OR 6.94 (4.14 – 11.61); $p < 0.05$], legumes [OR 5.22 (3.26 – 8.34); $p < 0.05$] and eggs [OR 3.94 (1.20 – 13.0); $p < 0.05$]. As can be seen in Table 6 below, the degree of egg consumption increased far more modestly than expected. (The challenges to scaling up poultry production are discussed in detail in the final evaluation report.) Consumption of animal-source flesh foods did not change in either zone and remained <10% in each. Changes in dairy consumption were also modest [OR 1.80 (1.07 – 3.02); $p < 0.05$], although levels were comparatively high at >75% in both zones.

We did not collect dietary recall data from women, but our subsample of pregnant women ($n=482$) were asked if they ate less, the same quantity or more food during their pregnancy compared to before the pregnancy. Women in the intervention zone were significantly more likely to report eating more [OR 4.45 (1.56 – 12.63); $p < 0.05$].

The findings of the LQAS rounds also consistently showed relatively higher proportions of children 6-23 months fed minimum acceptable diets and plant foods rich in vitamin A and iron in treatment compared to control zones. They also appeared to indicate appreciably higher proportions of children in treatment zones fed iron-rich animal source foods and eggs compared to control zones (Appendix 1).

The feeding practices of mothers of children 12-23 months of age who suffered illness in the two weeks prior to the survey improved with regard to breastfeeding during illness among treatment compared to control communities [OR 4.46 (0.97 – 20.57)], although the change was borderline significant ($P=0.055$), possibly due to the small sample size. Feeding more foods during illness did not change significantly. It is frequently easier for mothers to coax children to eat more after illness; unfortunately, we did not measure this practice. The proportions are presented in Table 7 below.

Table 6: Infant and young child feeding practices of mothers¹

	Baseline			Endline		
	Total	Treatment	Control	Total	Treatment	Control
<i>n</i>	750	371	379	943	412	531
Breastfeeding, %						
Ever breastfed	100.0	100.0	100.0	100.0	100.0	100.0
Currently breastfeeding	95.5	96.5	94.5	92.0 [#]	93.2 [#]	91.1
Breastfed within 1 hour of birth ²	54.7	59.2	50.4 [*]	43.9 [#]	52.2 [#]	37.5 ^{*#}
Fed colostrum	93.3	93.0	93.7	93.7	96.4 [#]	91.7 [*]
Fed pre-lacteals ³	4.0	4.6	3.4	2.7	1.7 [#]	3.4
Exclusive breastfeeding ⁴ , %	62.1	62.5	61.6	69.1	76.7 [#]	63.0 [*]
Complementary feeding, %						
Grains, roots and tubers	98.4	98.1	98.7	99.6 [#]	99.5	99.6
Legumes	54.8	55.5	54.1	74.8 [#]	90.3 [#]	62.7 ^{*#}
Dairy	81.2	78.4	83.9 [*]	85.0 [#]	86.7 [#]	83.8 [*]
Meat/organ/poultry/fish/snails	4.4	4.6	4.2	4.9	5.6	4.3
Eggs	2.1	2.7	1.6	7.7 [#]	14.6 [#]	2.4 [*]
Vitamin A rich fruits and vegetables	65.4	63.1	66.0	79.1 [#]	93.0 [#]	68.4 [*]
Other fruits and vegetables	24.1	27.2	21.1 [*]	27.9	38.1 [#]	20.0 [*]
Fed minimum dietary diversity	41.9	41.5	42.2	62.2 [#]	82.0 [#]	46.9 [*]
Fed minimum meal frequency	85.6	83.8	87.3	93.6 [#]	96.4 [#]	91.5 ^{*#}
Fed minimum acceptable diet	36.7	35.6	37.7	59.5 [#]	79.4 [#]	44.1 [*]

¹ Values are percent. ² n=749 at baseline ³ n=942 at endline ⁴ Study child sibling below 6 months of age, n=203 at baseline and 230 at endline. ^{*} Different from corresponding treatment group, $P < 0.05$; [#] Different from baseline value $P < 0.05$.

Table 7: Breastfeeding and complementary feeding during recent illness of study child 12-23 months of age

	Baseline			Endline		
	Total	Treatment	Control	Total	Treatment	Control
<i>n</i>	70	24	46	117	47	70
Breastfeeding, %						
Breastfed less than usual	44.1	33.3	50.0	20.5 [#]	12.8	25.7 [#]
Breastfed same as usual	37.1	50.0	30.4	23.1 [#]	12.8 [#]	30.0 [*]
Breastfed more than usual	18.3	16.7	19.6	56.4 [#]	74.5 [#]	44.3 ^{*#}
<i>n</i>	65	22	43	121	47	74
Complementary feeding, %						
Less than usual	63.1	68.2	60.5	57.0	53.2	59.5
Same amount	32.3	27.3	34.9	22.3	19.1	24.3
More than usual	4.6	4.5	4.7	20.7 [#]	27.7 [#]	16.2

Illness within two weeks prior to survey; complementary foods defined as solid, semi solid and soft foods

^{*} Different from corresponding treatment group, $P < 0.05$; [#] Different from baseline value $P < 0.05$.

7.6 Maternal and Child Health Practices

The project also sought to increase appropriate health care seeking behaviors among exposed HH. Use of preventive services for children increased considerably yet by similar magnitude in both zones. Among women, however, numerous improvements appeared to be significantly greater in treatment compared to control zones. The odds were significantly higher of making ≥ 4 antenatal visits during their most recent pregnancy [OR 1.50 (1.14 – 1.98); $p < 0.05$], receiving skilled assistance during last delivery [OR 3.72 (2.69 – 5.15); $p < 0.05$], having taken any iron-

folic acid tablets [OR 2.70 (1.95 – 3.73); $p < 0.05$], receiving deworming treatment [OR 4.20 (3.20 – 5.52); $p < 0.05$] during and vitamin A supplementation after [OR 3.06 (2.38 – 3.92); $p < 0.05$] the most recent pregnancy, and reports by currently pregnant women of eating more [OR 4.45 (1.56 – 12.63); $p < 0.05$]. Table 8 presents these proportions.

Table 8: Use of Preventive health services

	Baseline			Endline		
	Total	Treatment	Control	Total	Treatment	Control
<i>n</i>	2106	1055	1051	2614	1307	1307
For children						
Participation in growth monitoring	42.0	50.6	33.3*	63.4#	75.4#	51.4*#
DPT vaccination (3 doses) ^a	76.3	79.7	73.0*	97.4#	98.6#	96.2*#
Deworming (last 6 months) ^b	88.0	85.5	90.6*	93.8#	94.8#	92.8*
Measles vaccination ^c	90.3	90.0	90.5	97.2#	98.3#	96.2*#
Vitamin A supplementation (last 6 months)	94.5	93.6	95.3	96.8#	98.0#	95.6*
For mothers (last completed pregnancy)						
Received antenatal care	70.1	70.0	70.2	89.1#	93.0#	85.2*#
Antenatal visits ^d						
≥ 4 visits	24.8	29.3	20.2*	51.5#	64.2#	38.8*#
Source of antenatal care ^d						
HA/AHW	19.9	10.4	29.3*	34.2#	29.4#	39.4*#
MCHW	40.8	54.8	26.7*	42.2	48.3#	35.5*#
Doctor/staff nurse/ANM	39.2	34.6	43.8*	23.4#	22.1#	24.9#
Other	0.2	0.1	0.1	0.2	0.2	0.3
Took iron-folate tablets	74.7	72.2	77.3*	88.9#	92.3#	85.4*#
Took deworming tablet (s)	50.3	44.6	56.0*	81.4#	88.5#	74.4*#
Received assistance during delivery	76.4	71.8	81.0*	88.3#	92.3#	84.2*#
Received post partum vitamin A supplement	38.5	35.5	41.4*	71.7#	80.3#	63.1*#

^a n= 2,044 at baseline ^b n= 2,105 at baseline ^c n= 2,090 at baseline ^d n=1,474 at baseline and 2,329 at endline. HA/AHW = health assistant/auxiliary health worker. * Different from corresponding treatment group, $P < 0.05$; # Different from baseline value, $P < 0.05$.

7.7 Child Nutritional Status

Despite these many potentially important improvements in both production and nutrition practices in treatment vs. control zones, the adjusted logistical regression model for child anthropometry controlling for significant differences in potentially confounding factors (number of children in household; sex of household head; caste; respondent working outside the home; respondent pregnant; mother's education; mother primary caretaker; child's sex and age; and mother's age) indicates no statistically significant difference in differences in the rates of stunting, underweight or wasting between the two zones (treatment x time variable). There was, however, a borderline significant 23% lower odds of low hemoglobin in the treatment compared to control communities [OR 0.77 (0.60 – 1.00); $p = 0.051$]. Table 9 presents the DID outcomes as well as the other variables included in the adjusted model.

7.8 Maternal Nutritional Status

The results for maternal nutritional status were more encouraging. The adjusted model (controlling for number of children in the HH; sex of HH head; caste; respondent working outside the home; woman's education and mothers age) indicates that women in treatment communities had a 37% significantly reduced odds of underweight [OR 0.63 (0.47 – 0.84; $p < 0.05$) as well as a 41% reduced odds of low hemoglobin (this model also controlled for pregnancy status) [OR 0.59 (0.45 – 0.76); $p < 0.05$]. Table 10 presents the DID outcomes and the variables included in the adjusted model.

Table 9: Adjusted logistic regressions for assessing the effect of EHFP on changes in prevalence of stunting, wasting, underweight and anemia among children¹

	Binary outcome variable ²			
	Stunting ³	Wasting ⁴	Underweight ⁵	Child anemia ⁶
Treatment	0.73 (0.61 – 0.88)*	1.13 (0.84 – 1.50)	0.83 (0.70 – 0.99)*	0.84 (0.69 – 1.02)
Time	0.91 (0.77 – 1.09)	0.93 (0.71 – 1.23)	0.74 (0.62 – 0.87)*	1.55 (1.30 – 1.85)*
Treatment X time	0.93 (0.73 – 1.18)	0.99 (0.68 – 1.45)	1.13 (0.89 – 1.43)	0.77 (0.60 – 1.00)#
Number of children in HH	1.08 (1.03 – 1.14)*	1.03 (0.96 – 1.11)	1.09 (1.04 – 1.14)*	0.98 (0.93 – 1.03)
Male headed HH	1.10 (0.93 – 1.30)	1.19 (0.89 – 1.59)	1.06 (0.90 – 1.26)	0.90 (0.76 – 1.08)
Upper caste	0.66 (0.57 – 0.77)*	0.67 (0.54 – 0.83)*	0.55 (0.48 – 0.64)*	0.69 (0.59 – 0.80)*
Respondent works outside home	0.88 (0.74 – 1.05)	0.89 (0.69 – 1.16)	0.94 (0.79 – 1.11)	0.95 (0.80 – 1.14)
Respondent pregnant	1.09 (0.89 – 1.34)	0.87 (0.61 – 1.22)	1.09 (0.90 – 1.33)	0.84 (0.68 – 1.04)
Mother has no formal edu.	1.10 (0.96 – 1.26)	1.14 (0.91 – 1.43)	0.99 (0.86 – 1.14)	1.05 (0.90 – 1.21)
Child age (m)	1.01 (1.00 – 1.01)*	0.98 (0.97 – 0.99)*	1.01 (1.00 – 1.02)*	0.94 (0.93 – 0.95)*
Child sex (male)	1.02 (0.90 – 1.15)	1.37 (1.13 – 1.66)*	0.95 (0.84 – 1.06)	1.11 (0.98 – 1.26)
Mother primary care-giver	1.07 (0.94 – 1.22)	1.13 (0.91 – 1.40)	1.10 (0.97 – 1.26)	0.95 (0.83 – 1.09)
Constant	1.58*	0.15*	0.86	3.78*

¹ Values are regression coefficients (95% CI) ² Defined in the Analysis section ³ n = 4,692 ⁴ n = 4,703 ⁵ n = 4,717 ⁶ n = 4,717

* $P < 0.05$ # Borderline significant, $P = 0.051$

Table 10. Adjusted logistic regressions for assessing the effect of EHFP on changes in underweight and anemia among mothers¹

	Binary outcome variable ²	
	Maternal underweight ³	Maternal anemia ⁴
Treatment	1.84 (1.47 – 2.31)*	0.97 (0.79 – 1.19)
Time	1.40 (1.12 – 1.74)*	1.82 (1.52 – 2.17)*
Treatment X time	0.63 (0.47 – 0.84)*	0.59 (0.45 – 0.76)*
Number of children in HH	1.04 (0.97 – 1.11)	1.02 (0.95 – 1.09)
Male headed HH	1.01 (0.82 – 1.24)	0.97 (0.81 – 1.16)
Upper caste	0.56 (0.47 – 0.66)*	0.73 (0.62 – 0.85)*
Respondent pregnant	-	1.00 (0.80 – 1.24)
Respondent works outside home	1.02 (0.83 – 1.24)	0.98 (0.82 – 1.17)
Mother has no formal educ.	1.03 (0.87 – 1.23)	0.99 (0.85 – 1.16)
Mother age (y)	1.01 (0.99 – 1.03)	0.99 (0.97 – 1.00)
Constant	0.21*	0.56*

¹ Values are regression coefficients (95% CI) ² All cut-offs for each dependent variable are defined in the Methods section

³ n = 4,236 ⁴ n = 4,716 * $P < 0.05$

8. Discussion

The AAMA project was expected to improve nutritional status of young children and women of reproductive age through two primary impact pathways: increasing the availability of high quality, micronutrient-rich foods through increased household production of these foods (and potentially by increasing income through the sale of surplus production); and increasing knowledge and adoption of optimal health and nutrition-related practices through the health and nutrition behavior change communications strategy. To evaluate the effectiveness of this program we examined the impact of the program on the primary outcome of nutritional status and along a number of intermediate outcomes along the hypothesized program impact pathways: increased ownership of assets, perceptions of food security, more diversified homestead food production, and nutrition knowledge and practices.

The intermediate outcomes indicate that the AAMA program was successful in increasing women's agricultural production in treatment compared to control communities, including increasing the diversity and volume of vegetable production and a modest increase in poultry holdings and production. It also appears to have contributed to increased cash income and improved perceptions of food security. These results are consistent with other studies that have shown an impact of small-scale agriculture interventions on household food production (9, 10).

Women's poultry production, an important objective of the intervention, improved less than hoped. The introduction of improved local breeds required more improved husbandry practices than HFPBs provided and there were high losses due to predators, accidents and disease. Although the project provided fully vaccinated animals to beneficiaries, the logistics of ongoing vaccination services proved quite challenging in light of the limited resources of the government's district livestock offices, supply chain limitations and the difficult terrain. After exploring numerous options, the government and project teams piloted a community-based vaccination approach that shows promise, but was not able to reach scale within the life of the project. Lessons learned that will improve husbandry practices are being taken forward by the government and the USAID-funded Suahaara project.

Although the interventions likely achieved moderate increases in food availability, they appeared to have been sufficient to change perceptions of food security. The challenges to food security in Baitadi are considerable, with most communities located a great distance from markets where they can both sell and buy necessities. Constraints to sustainable production, including water and irrigation resources, input supplies, and extension services remain important, and climate changes appear to be exacerbating these problems (11). Thus additional interventions are needed to address food security comprehensively.

The project also appears to have had a number of significant achievements along the health and nutrition pathway, including both knowledge and practices. Knowledge on a number of health and nutrition practices was significantly higher among women in the intervention villages as compared to the control villages. Most notably, perhaps, was the appreciation of the importance of eggs for meeting the nutritional needs of children starting at six months, overcoming long-standing perceptions of poultry as dirty and unfit for human consumption.

Somewhat surprisingly, the practice of initiation of breastfeeding within one hour of birth did not improve, and the use of prelacteal feeds was already quite low in both study arms and did not change. Increases in the rate of exclusive breastfeeding were not significantly in treatment compared to control communities, possibly due to the small sample size. On the other hand, many of the young child feeding practices that should be influenced by garden production together with BCC did indeed show significant improvements: minimum dietary diversity, minimum acceptable diet, consumption of iron-rich legumes, vitamin-A rich plant foods, dairy

and eggs. Egg consumption was below what we had hoped to achieve due to the obstacles to production noted above. No improvement was seen in feeding of nutrient-dense animal flesh foods, likely because supply is quite limited in these communities, a constraint found in numerous settings (12). Nevertheless, by endline the proportion of children 12-23 months fed a minimum acceptable diet in the treatment arm reached just shy of 80 percent from a baseline of 36 percent, a major accomplishment.

The impact of the program on children's hemoglobin concentrations was borderline significant: the difference in differences indicated the treatment group had a 23% reduced risk of low hemoglobin ($p < 0.051$). It is plausible that the increased dietary diversity, which included legumes, vitamin C and vitamin A-rich plants, contributed to improved anemia status. Research in diverse settings has shown impact on anemia (3, 13). It is likely that other factors such as control of intestinal helminthes and other infections and increased access to iron-rich animal source foods need more attention to have a stronger impact on anemia in children.

We also did not detect any significant impacts of the E-HFP program on children's growth. In a comprehensive review of the impact of interventions conducted in developing countries to improve child growth through various means, including nutrition education with and without food-based strategies, the majority failed to demonstrate a significant impact on growth (14). It is possible that chronic infections that lead to environmental enteropathy reduce the impact of improved dietary intake as additional calories and nutrients are expended fighting infection or are not absorbed due to intestinal permeability (15, 16). It is further possible that our project's relatively modest impact on hygiene behaviors and the nutritional care of the sick and recovering child meant a reduced potential for impact on growth. It is conceivable that the full model of improved food production and nutrition practices did not reach sufficient strength within the period examined to achieve a significant impact on growth, or that the amount of additional food still did not meet energy or certain micronutrient requirements for robust growth. The project did not achieve the targeted increase in poultry production, and animal source foods provide essential nutrients to children in the high growth 6-23 month period; the WHO recommends daily intake. Nevertheless, the prevalence and degree of stunting in this setting were both extremely high, and may have been difficult to reverse. A research trial in four countries with similar rates of undernutrition was also unable to reduce stunting by an intervention providing either meat or fortified cereals (17). By our calculations, due to the extended period of time required to deliver all training and inputs for both HFP and ENA and the short project life, participating households probably benefitted from the full intervention for only 18-24 months before the end line survey was administered. We do continue to expect that over a longer time frame the combination of improved food access and more optimal nutrition and health practices, the strategy can reduce child stunting, wasting and underweight. Stronger hygiene interventions may also be required.

By contrast, the intervention does appear to have had both a statistically and biologically significant impact on women's underweight and on women's anemia. This finding is especially encouraging because these well-nourished women will be more likely to have healthier pregnancy outcomes in the future. It is plausible that mature, non-pregnant women are biologically more responsive to improvements in dietary intake than are growing children, who have intense nutritional needs and small stomachs. The project also aimed to empower women by targeting them for all training. It may be that their increased production capacity and knowledge also translated to greater control over their nutritional needs. Previous research by HKI has found an influence of the program on women's decision-making authority within the household (18). Further analysis of this dataset will explore whether these associations were at play.

Future research will need to reconsider certain aspects of both program and evaluation design. It is likely that longer a life of project is needed for the intervention to have maximum measurable impact. In Burkina Faso, HKI collaborated with IFPRI on an impact evaluation of the EHFP model using a longitudinal design (following a cohort of children who were 3-12 months at baseline) but over an even shorter project life (three years). This evaluation also found no significant impact, and estimated that a large portion of the children aged out of the critical window before the HFP was fully functional. One possibility would be to retain the longitudinal design, which may have more power to detect impact, but delay baseline data collection until HFP training and input has been delivered and gardens are ready to begin producing, and ensure a longer period of exposure. Another option, suggested by IFPRI, would be to target all women of child-bearing age for program participation and conduct a longitudinal study that enrolls children into the impact evaluation as they are born; this design would require a longer-term program with potentially higher costs.

It is also possible that the EHFP model is not enough to address the malnutrition problems in areas where health and hygiene problems are also highly prevalent, and that the program will need to be coupled with health interventions that address the prevention and treatment of diarrhea, environmental enteropathy and other childhood illnesses. Increased feeding after illnesses is crucial to help developing bodies recover lost growth and nutrients, and may need stronger emphasis. In addition, more substantial support to agriculture may be required, such as investment in systems that improve access to water, extension services and other inputs required to improve production as well as market access. Future analysis of our data will include more in depth examinations of the various pathways to help us better understand this lack of detectable impact on children's growth.

Appendix 1: LQAS results- Baitadi

Indicators	LQAS 1	LQAS 2			LQAS 3			LQAS 4		
	Aug 2008	Feb 2011			Aug 2011			Mar 2012		
	AAMA (n=159)	AAMA (n=158)	Non AAMA (n=100)	Total (n=258)	AAMA (n=153)	Non AAMA (n=139)	Total (n=292)	AAMA (n=158)	Non AAMA (n=156)	Total (n=314)
Median number of MN-rich vegetables cultivated by HH	5	5	3	4	6	5	6	6	5	5
Proportion of households that own poultry	77.4	68.4	9	45.3	54.2	5.8	31.2	62	22.4	42.4
HHs received technical support from VMF in last month	65.4	70.3	9	46.5	68	10.1	40.4	79.1	18.6	49
Proportion of HFPBs participating in group meeting in last month	78	72.8	NA		68.6	NA		75.9	NA	
Proportion of children aged 6-24 months fed the minimum meal frequency in the last 24 hours	86.5	90.7	81.7	87.3	97.1	91.3	94.8	96.1	94.3	95.2
Proportion of children aged 6-24 months fed food from four or more food groups in the last 24 hours	49.2	62.4	45.1	56.6	77.9	57	69.9	87.6	72.4	80.3
Proportion of children aged 6-24 months fed iron-rich animal source foods in the last 24 hours	25.4	43.3	12.7	33	42.9	5.9	28.4	50.8	31.7	41.5
Proportion of children aged 6-24 months fed any vitamin-A-rich animal source foods in the last 24 hours	77.8	69	53	62.8	84.3	80.6	82.8	90	83.7	87
Proportion of children aged 6-24 months fed iron-rich plant source foods in the last 24 hours	59.5	70.9	52.1	64.6	89.3	63.4	79	90	68.3	79.4
Proportion of children aged 6-24 months fed vitamin-A-rich plant source foods in the last 24 hours	60.9	72.3	53.5	66	92.9	72	84.5	90.8	70.7	81
Proportion of children aged 6-24 months fed eggs in the last 24 hours	17.6	39.7	9.9	29.7	36.4	5.4	24	42.3	19.5	31.2
Proportion of sick children receiving increased breastfeeding during illness	44.4	50	29.7	43.1	73.7	72	73	75	24.2	43.4
Proportion of sick children 6-24 months old fed more or same during illness	46.1	49.2	29.6	43.5	52.7	71.4	58	82.3	56	66.7

Appendix 2: OR Summary Table

OR Title/Project Name:	Community Randomized Control Trial of HKI's Enhanced Homestead Food Production (EHFP) program in Nepal's Far Western Hills
Report Compiled by (OR Lead Researcher or PI):	Jennifer Nielsen, Ph.D.; Allisa Pries, MA; Akoto Osei, Ph.D., Pooja Pandey, MA; Dale Davis, MA.
Reporting Period:	October 1, 2008 – September 30, 2012
Part 1: Overall Summary	
<p>The objective of the research was to test the impact of EHFP targeted to households with children 0-24 months of age on the prevalence of stunting, underweight, wasting and anemia. The EHFP model supports more diversified, year round production of micronutrient-rich crops as well as improved breeds of poultry and ruminants together with nutrition behavior change communications using the Essential Nutrition Actions (ENA) framework to encourage optimal breastfeeding and the consumption of HFP products, especially by vulnerable household members such as pregnant and lactating women and infants and young children. To best capture children's exposure to the program, the researchers chose to examine those 12-48 months of age, based on the assumption that children in this range at endline would have been exposed to the intervention for at least 12 months (estimated to be sufficient duration to benefit) between the ages of 0 and 24 months of age (the critical window). The study was also designed as cross-sectional rather than longitudinal for practical reasons given the narrow age group to be studied. The research intended to test the following hypotheses:</p> <ul style="list-style-type: none"> – Exposure to the HFP+ENA intervention will reduce rates of stunting (length for age <-2SD WHO 2006 reference) by 10 percentage points, underweight (weight for age <-2 SD WHO 2006 reference) by 10 percentage points, wasting (weight for length <-2SD WHO 2006 reference) by 5 percentage points, and anemia by 15 percentage points in intervention compared to control children 12-48 months of age at endline compared to baseline. 	
Part 2: Major Activities, Process, and Progress	
<ul style="list-style-type: none"> – OR project management and planning activities—see Methods section and timeline. – Research activities see Methods: random assignment to treatment/control; quantitative baseline/endline; qualitative research at baseline to inform behavior change communications (BCC) strategy; four rounds of LQAS process monitoring. – Training: Essential Nutrition Actions, BCC, homestead food production. 	
Part 3: Outputs, Outcomes, and Deliverables (i.e., events, products)	
<ul style="list-style-type: none"> – See Timeline. 	

Part 4: Discussion of Outcomes, Lessons Learned, and Course Correction

- Evidence of change in practices:
 - Significant increase in developed gardening with more diverse, higher volume production year round, vegetable, fruit and poultry.
 - LQAS and mid-term evaluation identified weaknesses in poultry husbandry although also considerable uptake and enthusiasm that reflected cultural shift away from taboos. Logistical challenges for delivery of vaccines were a major obstacle and solutions were found but not brought to scale in the short project time frame. Lessons learned are being taken forward under USAID-funded *Suahaara* project.
 - Significant reduction in perceptions of food insecurity in treatment compared to control HH.
 - Significant improvements in nutrition knowledge, particularly optimal complementary feeding practices and nutrition during pregnancy.
 - Significant increase in multiple complementary feeding practices in treatment vs. control HH: minimum dietary diversity, quality and acceptable diet; consumption of nutrient rich plant foods and eggs; non-significant improvement in feeding of sick child (small sub-sample may have been unable to detect).
 - Strong evidence that improved food security and access combined with nutrition education and BCC can be translated into more diverse diets for young children in critical window.
 - Significant improvements in women's dietary intake during pregnancy, possibly related to women's empowerment attributable to the project as well as to improved food access and nutrition knowledge.
 - Significant improvement in preventive health practices, particularly in prenatal and postnatal care.
 - Significant reductions in women's underweight and anemia; marginally significant reduction in child anemia. No significant changes in child stunting, underweight or wasting.
 - The project timeframe was very short for this ambitious research question. The intervention is lengthy to mount: requires multiple rounds of training on HFP and ENA, establishment of gardens and growing season before production starts, management of baseline & endline surveys by the implementing agency also took time. Window of exposure within the four year project life (maximum 2 years) may not have been sufficient to influence child growth. Women may biologically more likely to benefit quickly from the model. The diversified food production also appears to contribute to reductions in anemia, even without significant increase in animal source food consumption, but more ASF may be necessary to improve child growth. More extensive hygiene & sanitation strategies that reduce infections and environmental enteropathy (which reduces children's ability to utilize nutrients for growth) may also be needed.

Part 5: Supportive Contextual Factors

- Partnership with the government of Nepal was exceptionally strong at local as well as regional and national levels. The project and the high quality of the country team helped enhance HKI's reputation for nutrition expertise and the government's recognition of the promise of the EHFP model.
- USAID/Nepal contributed an additional \$730,000 to the project, which included a governance component to strengthen multisectoral planning; in particular, to promote joint planning at the local level between agricultural and nutrition departments. This initiative also motivated higher local government ownership of and contributions to the EHFP activities.
- It is also probable that global factors (Scaling Up Nutrition movement; the recognition of the importance of agriculture-nutrition linkages) further encouraged government support for EHFP.
- HKI's local implementation partner, NNSWA, was a strong and dedicated NGO that helped ensure quality on the ground.

Part 6: Dissemination and Use of OR Information

- Formative research results have been thoroughly examined by project staff and have led to numerous adjustments to the EHFP model. Results have also been shared with government partners and USAID/Nepal. The following changes are being implemented under the Suahaara project, which is scaling up the EHFP model to 25 districts across the country:
 - Construction of a poultry coop is a pre-condition for receipt of poultry. A community-based system for delivering poultry vaccines within hill districts is being implemented. Research into cold-chain-free vaccines is being conducted by another stakeholder.
 - Village model farmers are selected on the basis of skills, training and leadership capacity, and sensitivity to ethnicity/economic status.
 - Hygiene and sanitation strategies are strengthened, with attention to hygiene practices, latrine construction and use, reducing other sources of environmental contamination, and exploring physical barriers to protect toddlers from exposure.
 - Ratios of field supervisors to population are increased to ensure quality of implementation and quick resolution of difficulties.

Part 7: Contextual Challenges

- Infrastructure limitations remain substantial in Baitadi. Villages are largely connected by footpaths and markets are distant. Although almost 65% of HH have access to electricity and latrines, the practice of keeping animals within the homestead contributes to environmental fecal contamination, which may have consequences for child health and growth.
- Newcastle (poultry) vaccine supply chains are weak (only wholesale quantities available that exceed the needs and resources at the ward level; distances are great, and cold-chain capacity limited).
- Regular political strikes or *bandhs* periodically disrupted implementation and compounded implementation challenges.

Part 8: Stakeholder Engagement for Collaboration and support

- HKI has had a remarkable collaboration from both USAID and from the Government of Nepal
 - All key partners (the Ministries of Health and Agriculture and Livestock as well as Local Development, Women's Affairs and Education; USAID) actively participated in the spectrum of research and project activities (research design; resolving of problems including water constraints, vaccine delivery systems, support for health and agriculture extension). District Agriculture and Health officers actively participated in review meetings and advocated on agriculture and nutrition issues and concerns in the district throughout the OR period.
 - Nepal Health Research Council – provided monitoring on quality of implementation. They also participated in the dissemination workshop for the AAMA Plus and provided valuable feedback
 - USAID provided an additional \$730,000 to support a multisectoral planning component to strengthen government engagement in the project and in developing plans that integrate food security and nutrition strategies to reduce undernutrition. The additional funds also allowed expansion into a third FW region, Bajura.
 - The national government sees the EHFP as a model the merits replication nationwide and is supporting the effort.
 - USAID/Nepal incorporated the model into its Integrated Nutrition Program (now “*Suahaara*,”) which is scaling the EHFP approach across an additional 25 districts (of Nepal's total of 75), as well as into its Feed the Future initiative, covering an additional 20 districts.
 - The World Bank is also investigating ways to support the replication of EHFP through support to the Government.

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Annex 12 Special Publications/Reports

Please contact HKI if you wish to see any of the publications that have come out of AAMA. Those available at the time of submission of this report are listed in Annex 2.

Annex 13 Project Data Form

Provided separately.

Annex 14 Grantee Plans to Address the FE Findings

The comments and recommendations of the evaluator were invaluable to the project team to learn from an objective perspective. The recommendations have provided an opportunity for us to address some important factors and strengthen particular elements of the agriculture, poultry and nutrition in enhanced homestead food production.

Interactive learning for essential nutrition actions

We have now developed a more interactive learning package for the field supervisors, peer educators and female community health volunteers.

- A set of discussion cards is designed to further enhance ENA counseling by providing a range of topics and issues on ENA with methods for stimulating dialogue
- A pictorial booklet has been developed as a counseling aid that will help volunteers recall the key nutrition behaviors and their advantages during household visits and on-the-spot coaching with groups

Poultry management

We have reassessed the poultry management strategy with the help of local poultry experts who have drafted recommendations for poultry management in the mid-upper hills and mountains. Based on the evaluator's comments and our further learning we are:

- Working with the government through the District Livestock Office to establish village campaigns three times a year for vaccination against Newcastle disease along with deworming for all poultry in the district
- Encouraging the improved husbandry of indigenous breeds of poultry at local and district level
- Providing the improved, Nepal-adapted breeds only to households who have prepared acceptable coops and have received orientation on proper feeding and health care practices
- Using an interactive pictorial "coop card" game during the training of homestead food production beneficiaries (HFPB); this training, which was developed by the evaluator, teaches the importance of coops to brood expansion.

Village Model Farms

Village model farms will be established soon after the homestead food production beneficiaries (now defined as all women who are pregnant and/or has a child under two years) have been trained and started their gardens. Village model farmers will be selected from each community based on criteria that includes being an appropriate representative of that community, especially for the most disadvantaged groups; actively participating in the training and HFP establishment; interested in learning additional skills e.g. poultry management, seed production; willingness to support their group of beneficiaries; ready to become an advocate for improving nutrition in women and young children in their community. In order to increase support from family members to HFPBs, male members from the households will also be invited to participate in the training.

Nutrient-dense vegetable seeds

We undertook a review of the most nutrient-dense vegetables and their seasonality and produced a revised planting calendar to maximize the amount of micronutrients available in each season in each homestead garden.

Annex 15 Grantee Response to Final Evaluation

The insights and technical expertise of the evaluator were invaluable to the project team at both mid-term and at endline. There are a few clarifications HKI would like to make, many of which we believe she would agree to, but which we were unable to communicate before submission.

Poultry management

The project was implemented as a continuing learning process, to test a number of new approaches to EHFP in Nepal, evaluating in real time how they work, and drawing on these lessons to inform a stronger model going forward under the Suaahaara project in Nepal and in other countries where HKI works. Process evaluation was conducted using surveys conducted with the LQAS methodology four times over the course of the project, and findings were used for course correction and adjustment of the model. The additional support provided by USAID/Nepal to replicate the model in a third district of the FWR, Bajura, drew directly on these lessons learned. For example, the poultry strategy was revised so that households were required to build a poultry coop prior to receiving their chickens, and additional training was provided to government agriculture and livestock service center providers to that local support for husbandry was reinforced.

After the mid-term evaluation the project team in Baitadi sought to address the challenge of insufficient vaccination services in consultation with the district livestock office (DOLS) by piloting a community-based approach. The strategy improved the supply somewhat, but the government was not able to take it to scale within the remaining life of the project. HKI invited an expert in village poultry production from U.C. Davis, David Bunn, to visit the project sites and advise on further solutions going forward. HKI is following his research in Nepal with Heifer International where he is working with the same poultry breeds as AAMA project used to test a cold-chain-free vaccine for Newcastle disease. If successful, this solution should greatly facilitate vaccine distribution.

We would also note that although the two main breeds of chickens selected were not indigenous, they have been reproduced in Nepal over the past 50 years and are now considered to be fully adapted to the local habitat. They were chosen according to calculations that they would produce more eggs for household consumption. In Suaahaara, HKI is indeed giving greater emphasis to improved poultry management. For example, in collaboration with District Livestock Office (DoLS) the project will hold regular vaccination campaigns at community level and partner with DoLS to develop VMFs as a Local Resource Persons (LRPs) for poultry vaccination.

Village Model Farms

HKI has no intention of eliminating the village model farm (VMF), which has been part of its HFP model in Asia since its inception. Under Suaahaara we are, however, trying a new approach that defers selection of the village model farmers until after the initial training and start-up of production. The project training team will observe all participants and identify those who are most active, interested and have the strongest teaching skills to be nominated for the position, rather than selecting according to landholding or location criteria.

To support the Suaahara's social inclusion strategy, the VMF selection criteria will include the woman's ability to represent the local community. For example, if the community is predominantly a

minority ethnic group or Dalit, then a VMF holder from the same community will be appropriate to serve as their local EHFP representative. This will also allow women from disadvantaged groups the opportunity to develop additional skills. Suaahara will work with many HFP beneficiaries and identify VMFs from that pool, especially from landless and disadvantaged groups. Each VMF will specialize in one area of production: one will become an expert on poultry production, another will become an expert in seed collection, another will be an expert on food preservation, etc.

Communication skills and dissemination of information

Although the evaluation noted that “AAMA relies on the FCHVs and VMF to convey these messages to the HFPBs who are expected to diffuse the messages to others in the community,” we would like to add that project field supervisors provided on-the-job coaching and mentoring to reinforce the volunteers’ nutrition knowledge and counseling skills. Project supervisors also provided coaching as they practiced the new skills in their IYCF support group meetings with beneficiaries.

Data quality

HKI believes the concerns about data quality may have been overstated. We do not believe that the change in research firms and software between baseline and endline introduced problems in comparability of the data. Regarding the concern that homemade pesticide was mis-coded as compost, we have verified that the questions for pesticide use and compost were asked separately.

HKI does have the data from its contractor PHIDReC to verify that the endline sample was selected using PPS methodology. In Kailali, the selection of additional households from adjacent wards was done randomly only if there were insufficient HHs with children under two in the randomly selected communities to achieve the needed sample size. It was by chance that eight of those wards were AAMA intervention wards.

Data analysis

The internal research team in Nepal, HKI’s Asia-Pacific Regional Office and at headquarters was highly qualified and carried out the research and analysis as planned. It was certainly unfortunate that the national M&E advisor departed just prior to the final evaluation, and HKI did, in fact pursue a “Plan B” as soon as we learned of that staff member’s intended departure. Our country director identified and began negotiating with a candidate to serve for three months and support immediate data analysis needs; however, after prolonged negotiations, this person accepted another offer. We are not sure if it is ever possible to fully prepare for the departure of staff. It was always our intention to have the full data analysis conducted by our experienced Regional Nutrition Advisor, who has a PhD in public health nutrition. We also employed a talented Leland Fellow serving in the regional office to support the analysis, and our experienced, PhD trained, Senior Program Manager at HQ to support the write-up of the findings. It was not possible to provide the final evaluation team with fully cleaned data analyzed with carefully constructed variables and completed multivariate outcomes. The data collection was completed barely three weeks before the arrival of the evaluation team, and analysis of such a complex data set is a process that requires months of work.

Lastly, HKI could not agree more with the recommendation in the report, “The role of supervision using well-thought-out checklists in assuring quality of knowledge and skills transfer must be emphasized. The supervisors should be held responsible for behavior change and adoption of new practices.” We used this approach extensively under AAMA and are continuing to do so in Suaahara.

Annex 16 Specific Technical Recommendations and Lessons Learned for Replication in Nepal

Promotion of improved health and nutrition behaviors:

Issue	Recommendation or lesson learned
Quality of sessions	Learning sessions should be creative and practical, using methods to engage the women: hands-on learning for gardens, demonstrations of jaulo and other food preparation or food preservation, games with a learning objective, etc.
Changing social norms	Hold occasional learning sessions for grandmothers to learn about child care and feeding, nutrition during pregnancy and lactation, and preparation of jaulo. Engage fathers in learning about hygiene, nutrition for the family, and HFP.
Specific practices to emphasize	Link hygiene and environmental sanitation closely with ENA Quality and amount of food during and after illness Consumption of animal source foods after formative research to fully understand current beliefs and barriers
Dietary diversity	Assure that field staff know the relative nutrient content of different vegetables and fruits, including local ones. Use games and other activities to reinforce the family's understanding of which foods are most nutritious. Promote consumption of existing local foods that are nutrient dense such as avocado, fruits, green leaves. Use recipes and demonstrations to improve preparation of these foods.
Breastfeeding (Year 3)	Focus on stimulating breastmilk production through frequent and prolonged feedings with less emphasis on mother's nutrition as the solution.

Vegetable production:

Issue	Solution
Control pests through bio-pesticides	<ul style="list-style-type: none"> • First year- common messages to make bio-pesticide • Following years- pest specific knowledge to VMFs/LRPs eg. Controlling tomato fruit borer. • Development of LRP
Seed production	<ul style="list-style-type: none"> • Provide simple knowledge to HFPBs about easy crops (self-pollinated crops) onward from first year • Seed production knowledge to VMF of cross-pollinated crops (hardy ones) /develop LRPs with more knowledge • Develop strong linkages among DADO/seed quality control office/seed producers/private organization for production and marketing
Composting/FYM	<ul style="list-style-type: none"> • Focused FYM improvement (including urine utilization) who have plenty of FYM in their own home • HHs having distance land/garden-focused on composting • Importance of composting to manage domestic waste/ crop waste/ other herbs/weeds
Waste water management	<ul style="list-style-type: none"> • Focused different techniques during training practically • Practice demonstrations during group meetings • Coordination among line agencies/local government for input • Focused demonstration in dry/summer season
Irrigation	<ul style="list-style-type: none"> • Coordination with irrigation department/DADO for micro/macro irrigation/ NGO/INGO • Process of group registration at earlier stage of the project • Process of group registration (group should know)
GESI (DAG)	<ul style="list-style-type: none"> • Pot culture, sac culture • Vine crops could be grown on roofs • Crops grown indoors like mushrooms

	<ul style="list-style-type: none"> • Less space required (bees) • GESI focused HFP intervention training, input supply etc. • Positive discrimination/affirmative actions
Better gardening	<ul style="list-style-type: none"> • Continuous training district to community level • Seed support at the time/last day of training • Focused on district specific seasonal nutrient dense vegetables • Prioritize the nutrient dense vegetables seasonally • Quickly follow up to make good plotting • 2 months for HFP/ENA/EHA follow-up
Capacity building	<ul style="list-style-type: none"> • 4 days training to VMFs not sufficient for all topics (eg. Seed production, disease control) • From first year on, VMFs/LRPs should provide disease pest control training and capacity building activities
Multisectoral coordination	<ul style="list-style-type: none"> • MOU at central level • Coordination at each level • Group registration in line agencies like DADO, DLSSO, WCDO • Activate NFSSC at district level • Initiate and strengthen ORSP concept
Year-round food availability	<ul style="list-style-type: none"> • Processing • Value added • Coordination/linkage with sources of assistance

Poultry:

Issue	Recommendation or lesson learned
Chickens	<ul style="list-style-type: none"> • Focus only on improving management of local chickens. Do not distribute improved breeds because of the high losses and additional requirement of these improved chickens. Simply by care and regeneration of local chickens, egg production will increase.
Poultry Management as permanent behavior change	<ul style="list-style-type: none"> • On the first year of project, start improving management of local chickens, focusing the good management practices like making strong coop, keeping chickens in a coop with a pen, adequate light, ventilation, proper feeding and water. • (if some people like GESI(DAG) have no local chicks, provide local hens as affirmative action, if needed). Procure these from the community, not markets. • Chickens kept in a pen will cause less contamination and their manure/droppings will be more readily available for fertilizer. Also, they will lay eggs in the coop.
Feed	<ul style="list-style-type: none"> • Work with DLSSO in each region to create a formula for nutritionally adequate feed based on local ingredients and their seasonal availability. The feed must contain a source of protein like fish or insects. • Through VMFs, increase demand for mineral mix with agro-vet. VMF can buy the packet and divide it among HFPBs who share the cost. • Have strategies for feed in dry season – local grasses, dried grass/hay, kitchen scraps. • Teach about quantity of feed needed as well as quality.
Coops	<ul style="list-style-type: none"> • Promote building a coop with a pen around it to allow the chickens to come out during the day. (minimizes light and space requirements in the coop itself and chickens can eat and get water outside in the pen). The poultry flip chart has good illustrations of coops with pens. Add weeds with soil attached, insects, kitchen scraps, etc. to the pen daily. • Coops must be strong enough to keep out local predators (jackals, mongoose, etc.) • It would be better to demonstrate the different models of coops during community training, if possible or we have to show different models of strong coops in the flip charts and recommend them based on the discussion with community people what

	<p>are the major predators of poultry in this area and materials of coop construction they have.</p> <ul style="list-style-type: none"> • Have them think ahead to breeding more poultry, hence, need to make a coop and pen that are big to start with, or ones that can be expanded in size to accommodate increases in the flock.
Vaccination	<ul style="list-style-type: none"> • To be discussed further with DLSO and the poultry expert from UC Davis. The poultry expert recommends vaccinating only for Newcastle disease: Chicks at 2 weeks and all poultry three times a year (campaigns). May need to develop a national-level committee to work on this issue. Heifer Project is already working with the government on local production of a thermo-stable vaccine for Newcastle. USAID projects need to support this effort with advocacy and ideas for distribution channels, training, etc.
Hatching	<ul style="list-style-type: none"> • Create a separate space for hatching in the coop or another safe place. • Take eggs away from the hen for two weeks or more to push her to lay more eggs. Some of these eggs can be stored properly to return to her in the nest. • Be careful about the bedding materials, container used and place of hatching along with the number of eggs during hatching. (wood or clay container lined with straw, maize husks, or dried grass is ideal) • Promote cross-breeding between local and improved chickens.
Brooding	<ul style="list-style-type: none"> • Prepare separate brooding chamber within the same coop or may be separate as per the convenience for better rearing of chicks as well as reduce the chick mortality. Chicks should not be able to escape.
Egg production	<ul style="list-style-type: none"> • With improved feed, water and care, local hens may lay up to 70 eggs per year and continue laying for 3 or more years. • Nesting boxes should be built in the coops where the hens will lay their eggs in clean straw or grass. • Families (school children help) keep records of eggs laid, and which hens are laying the most eggs. Poor layers can be eaten or sold.
Incentives	<ul style="list-style-type: none"> • Families and VMFs who adopt good poultry management could be given rewards such as feed or watering container.

Training: The training sequence used for AAMA followed HKI's established pattern of completing all HFP training before providing the ENA training. Under *Suabaara* HKI will be testing whether delivering ENA training first is more effective, as the roll out of this component can be more rapid than for HFP.

The first training to be held for both components is that of master trainers (project staff and local NGO partners who will serve as overall coordinators of implementation, as well as relevant government partners). This training should be at least 10 days in length and cover all the technical topics related to homestead gardening and poultry management as well as training and supervision skills. Training is implemented in cascade, with this group of master trainers supporting each subsequent level of training.

The next round of training reaches the HFP field supervisors, should also be at least 10 days in length, and involve enough participants to ensure one supervisor for every 6-10 VMFs (again depending on geography). Like the MTOT, this training also covers all the technical topics related to homestead gardening and poultry management but through hands-on practice, as well as training and supervision skills. Supervisors may require refresher training or have access to seasoned staff for help in mastering all aspects of this extensive topic. The training for mothers' group members should be at least 5 days in length but delivered in two sessions of 3 and 2 days, respectively, separated by a few months to allow women time to practice the skills and then have them reinforced. Building on this, training for the VMF requires an additional 5-6 days and must cover training skills as well as greater depth in certain technical areas. The VMF will then become the local technical advisor to the mothers' group members and help them consolidate their production practices.

The training of Master Trainers in ENA should be 12 days in length to allow time to cover the technical material, the practice of counseling for behavior change, and the development of training skills. The schedule is conceived as 3 days of presentations and interactive discussions and role plays, 1 day in the field practicing counseling skills with mothers in the 1,000 day window, 2 days to complete the technical presentations, 1 day returning to the field to conduct a follow-on visit with the mothers, then 6 days to practice training and reinforce knowledge and skills. The participants should be project coordinators and government partners (potentially from both local and national levels).

The next level is a 7-day training of trainers for field supervisors. This takes 5 days, covering the technical content and supervision techniques (always with active learning methods and role plays) and 2 days practicing the counseling skills with mothers. This training can be extended to, *inter alia*, government partners in health, agriculture, education, social development, local development, and local water and sanitation committees.

At the community level, training for Female Community Health Volunteers (FCHVs) and village model farmers (VMFs) should be a 4-day program that covers technical content, BCC techniques, and allows one day for action planning and skills in facilitating group discussions of ENA topics. These trainees will become responsible for convening monthly meetings of the mothers' groups to reinforce understanding and practice of ENA and to encourage members to share their new knowledge and habits with other mothers (and grandmothers and fathers) in the community. This training could also include teachers and staff of the Ministry of Education; farmers group members; and others as warranted.

Lastly, the mothers' group members are given a 2-day orientation to ENA with emphasis on the ties to HFP, training that will be reinforced by monthly meetings.