FINAL TECHNICAL REPORT

Project Title:

Nutrition and Food Security in Upland of Thailand

- **IDRC Project Number** *107324* – **Component number** *(if applicable). When submitting a joint final report no component number is necessary.*
- **Research Organizations involved in the study**: Knowledge Support Center-Greater Mekong Sub-region (KSC-GMS), Faculty of Social Sciences, Chiang Mai University
- **Location of Study**: Chiang Mai, Thailand
- **By**: Knowledge Support Center-Greater Mekong Sub-region (KSC-GMS), Faculty of Social Sciences, Chiang Mai University

Period covered by the report: *1 March 2013 –29 February 2016*

Date: *1 March 2016*

World Agroforestry Centre (ICRAF)

Cover page

The report cover page of the Final Technical Report should include the following:

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Executive summary **(2 page max.):**

Provide an informative summary of the key advances, significant research findings, important outcomes and innovative outputs of the project. The focus should be on project achievements in terms of outputs and outcomes. One short paragraph on project purpose or main objective is sufficient and the rest should be on findings.

Malnutrition and food security remain serious problems in Thailand, particularly amongst ethnic minorities living in remote, upland areas. Sustainably improving local food availability through improved agricultural production has the potential to address these issues; however, there was little evidence of effective strategies on how to carry this out, and specifically, how to link improvements in agriculture with corresponding improvements in diet and nutrition. Thus, a central question guiding this research project was: what practices and strategies would result in long-term improvements in local food availability, food consumption, and ultimately nutrition status of populations living in rural upland areas of Thailand?

The official starting of the project was February 2013, however, it took several months to get an ethic clearance from the Human Experimentation Committee of the Research Institute for Health Sciences, Chiang Mai University, Thailand, which was granted on 6 November, 2013. Baseline household surveys (about food security, dietary diversity, and child-feeding practices) were done using questionnaires in participating communities (98 Karen hill-tribe households in 4 villages and 77 Lua hill-tribe households in 4 villages). Focus-group discussions (FDGs) (in female and male groups of both tribes), and in-depth interviews (with agricultural and health officials) were then done to characterize the nutritional situation, nutrition practices and knowledge, and food consumption patterns, and to characterize the local farming practices, including documenting the heterogeneity of agro-ecological practices to identify potential practices that could be tested as nutrition-sensitive agricultural solutions. Baseline anthropometric measurement of children aged 0-5 years old were also done to determine nutrition status of the children. It was found out that the hill tribes practiced both shifting cultivation and permanent-field agriculture, with rice as the main crop. Food was locally grown, bought from the market, and gathered from the vicinity of the villages. It was found out that the studied population is 50% food secure. The studied population's dietary diversity was about 40%. Only 4 % had a minimum acceptable diet. Results of the FGDs showed that the female and the males managed their food systems differently.

Potential nutrition-sensitive agricultural interventions were formulated afterwards, based on the baseline data, and discussed with research partners in Canada and Vietnam. A stakeholder meeting to discuss potential nutrition-sensitive agricultural interventions was held in early 2014. Nutrition-sensitive agricultural interventions (improving chicken raising by providing 5 chicken per household in 98 (58 Karen and 40 Lua) households and home gardens by providing seeds of 5 high-nutritive vegetables of their choices to the intervention villages) and nutrition intervention (educating children's caretakers on nutrition knowledge) were selected and started in November 2014. The intervention villages were randomly pre-

selected to be 4 out of 8, while the other 4 were set to be control villages (77 households) with no agricultural interventions, but the nutrition intervention.

The households were very enthusiastic about the intervention as they perceived it to be beneficial to their children. However, some chicken started to die due primarily to the cold weather during the winter season. Some vegetables did not do well due to seasonal drought. After 1 year, the endline survey (similar to the baseline survey) was done. Endline anthropometric measurement was also done. In addition, focus-group discussions were done on the subjects of affordability (how the villagers perceived the interventions and whether they wanted to continue doing it or not once the project was finished). Most member of the intervention households responded to the affordability question that they want to continue with chicken raising (and support for chicken feed) because they will get eggs for their own consumption and home gardens (with more kinds of vegetables) as it saves time to buy vegetables from the market. They also found the nutrition knowledge training to be useful, and should be continued.

Local and national policy makers will be informed of the results and recommendations for both practical nutrition-sensitive agriculture and further research topics, which are, for example, 1) searching for practical local feeds for chicken, 2) diversification of vegetables (and fruits) for home gardens, 3) water management for highland agriculture, and 4) changing behaviors for proper nutrition practices. Lastly, maps of land use of the 2 studied sub-districts were done, and stories of the projects have been published as blogs, posters, and research newsletters.

The research problem (1 page max.): What was the basic rationale of the project and the research problem or problems being addressed? Often, the researchers' understanding of the problems will have evolved since the project was approved. The report should describe this evolution and the reasons behind it. Did the research process lead to a revised view of the research problem? Provide a synthesized reflection on the **overall progress of the global project** (please include the general objective of the project). Describe the contribution to knowledge that this project represents from a scientific, developmental and/or policy perspective.

Changing agricultural systems, resource degradation, geographical isolation and high levels of poverty threaten food security in upland communities of Thailand, and perpetuate high levels of malnutrition. At present, viable solutions to sustainably address these issues had not been identified. In addition, this project would also address the current gap in the global knowledge base of the importance of and effective strategies for integrating agriculture and nutrition to ensure a positive impact on nutrition. Strengthening this knowledge base was essential for providing practical guidance to donors, NGOs, policy makers and rural farmers themselves to develop and implement solutions that sustainably reduce malnutrition. Given the current limitations of and tension between government policies on natural resources management and small-holder agricultural practitioners in the study areas, the results of this research would also have important local policy implications to ensure that smallholders have an enabling environment for implementing nutrition-sensitive agriculture solutions to sustainably improve their food supply and health.

The main goal of this research project is to study and identify the best strategies to sustainably improve the quantity and quality of local food production and consumption amongst smallholders in rural upland communities in Southeast Asia and, ultimately, improve food security and nutrition status of these populations. Contributing to this over-arching goal, the overall objective of this three-year project is as follows: **Overall objective**: To identify local and practical solutions to improve nutrition and food security amongst smallholder farmers in rural upland communities in Vietnam and Thailand through nutrition-sensitive agriculture solutions. **Specific objectives:** 1. To characterize the nutritional situation, nutrition practices and knowledge, and food consumption patterns in participating communities, 2. To characterize the local farming practices, including documenting the heterogeneity of agro-ecological practices to identify potential practices that could be tested as nutrition-sensitive agricultural solutions, 3. To analyze the relationships between food production, availability, and consumption, and the conditioning factors (e.g. gender dynamics, market infrastructure, natural resources, including local wild foods) that limit or promote healthy diets, 4. To develop and test affordable and sustainable nutrition-sensitive agriculture practices that improve the nutrition and food security of participating households, and 5. To engage multi-stakeholders to promote learning and understanding, and to facilitate broad adoption of solutions, including potential policy impacts.

Progress towards milestones **(5 pages max.):**

Briefly describe achievement of project milestones (as specified in the Grant Agreement) for the entire reporting period. Have a brief section for each milestone (e.g. Milestone 1.1, 1.2, etc.).

Provide evidence that milestones were achieved, and refer to the hard evidence in previous reports and/or attached annexes (as needed). If applicable, explain why any were not achieved.

- Data integrated and analyzed within and across all sites and changes in dietary diversity, household food security and child feeding practices documented. Done. See Annex 2.
- Focus groups held with local community members and feedback on the implementation of the nutrition-sensitive agriculture solutions documented. Done See Annex 3.
- Report produced with key recommendations for improving nutrition and food security through affordable solutions and shared between research team and relevant stakeholders. Done.
- Findings from pilot-testing shared with local community members and relevant local experts/policy makers, and actions for uptake of the solutions identified. This will be done in March 2016.
- Publication of articles in scientific journals and abstracts submitted to relevant conference(s). One manuscript was submitted and revised for Food Security journal. See the section on Project Outputs below for the abstract.
- Reports and policy briefs developed and disseminated to policy makers, decision makers and relevant experts. This will be done in March 2016.

Synthesis of research results and development outcomes **(10 pages max.):**

The analysis of outcomes should take into account social, gender and environmental dimensions wherever appropriate and possible.

By each project research objective:

- Synthesize the main research results during the project, highlighting the progress made by the project. This should be done by listing each specific objective as it is written in your Grant Agreement, highlighting the progress for each one.

  The specific objectives of the project are as follows:
  1. To characterize the nutritional situation, nutrition practices and knowledge, and food consumption patterns in participating upland communities
  Done. See previous interim reports.
  2. To characterize the local farming practices, including documenting the heterogeneity of agro-ecological practices, and to identify potential practices that could be tested as nutrition-sensitive agricultural solutions
  Done. See previous interim reports.

3. To analyze the relationships between food production, availability and consumption, the conditioning factors (e.g. gender dynamics, market infrastructure, natural resources, including local wild foods) that limit or promote healthy diets
Done. See previous interim reports.
4. To develop and test affordable and sustainable nutrition-sensitive agriculture practices that improve nutrition and food security of participating households
Done. See Annexes 2 and 3.
5. To engage multi-stakeholders to promote learning and understanding, and to facilitate broad adoption of solutions, including potential policy impacts.
This is partially done. Reports and policy briefs developed and disseminated to policy makers, decision makers and relevant experts, will be done in March 2016.

- For CIFSRF projects, synthesize under the relevant project objectives the results on a) the scaling up of the most successful innovations and b) the research on testing scaling up models and/or approaches.
- Include the summarized quantitative analysis (summary tables and graphs), which should back up your findings. References to quantitative and qualitative evidence of the results and the raw data (e.g. numbers from surveys and other forms of data collection, statistical tables, maps, etc.) should be included as annexes to this report.
- Highlight any unexpected, surprising or interesting innovative results that you can draw out of the research.
- Research partnerships - as a result of IDRC funding:
    - How has the project contributed to stronger research partnerships for improved food security policies and decision-making (include, where relevant, south-south partnerships, Canadian country-developing country partnerships, other partnerships)?
    - Has capacity improved for each of the organizations involved? If so, how?
    - Have the organizations involved developed any new research networks or research partnerships? If so, which ones?
    - Has there been any formal recognition of organizational or individual achievements? (E.g. an award, letter of recognition, etc.). If so, how?
    - For CIFSRF-funded projects only: is there increased use of Canadian knowledge and resources to address environmentally sustainable agricultural productivity and nutrition problems in developing countries?
- Governance: How has the project provided opportunities to promote principles of good governance, such as participation and inclusion, transparency and accountability, equity and non-discrimination for the needs and priorities of project beneficiaries?
- Research ethics: Has the project collected corporate or personal information? If so, what are the protocols the project put in place to obtain informed consent and maintain confidentiality?
- Use of research results
    - Explain how the research results are being used, and what their impact has been on specific communities or populations in the targeted country(ies) at the end of the project
    - Describe any potential uptake of project results within 3 years of the end of the project.

Synthesis of results towards AFS themes (5 pages max.):

Highlight, where relevant, how the overall project results have directly impacted the following AFS themes (it is **not expected** that the project will respond to **ALL** of the AFS themes) – focus on the most significant). Refer to Annex 1 for a list of questions that you should consider for each of the following AFS themes.

- *Increasing agricultural productivity (Availability). During the project period, the research team provided the intervention households with chicken (for egg production to provide a protein sources for children, and adults if there are extra eggs) and vegetable seeds for home gardens (to add diversity to the diet).*
- *Improving access to resources, and/or markets and income (Accessibility) NA*
- *Improving nutrition (Utilization) During the project period, the research team provided the intervention households with chicken (for egg production to provide a protein sources for children, and adults if there are extra eggs) and vegetable seeds for home gardens (to add diversity to the diet).*
- *Informing policy Local policy makers were informed of the project and its goal and objectives at the beginning of the project. The research team also informed them about the baseline results, and they were consulted about potential intervention options to improve nutrition of the children. They will be informed about the endline results, and will be provided with policy briefs.*

Project outputs **(1/2 page)**

Making reference to the open access dissemination plan, what were the main outputs of the project? Identify any outputs that were planned, but which have yet to materialize. Specify when these outputs will be completed, including plans for any future publications. Specify how you have met the requirements of IDRC's Open Access Policy. If appropriate, highlight any unique or innovative outputs. If appropriate, explain why outputs were not completed or were of poor quality.

At least 2 manuscripts (with HealthBridge and 2 Vietnamese partners) were planned to be submitted to peer-reviewed international journal (s). The first one, entitled "The process of developing a nutrition-sensitive agriculture intervention: a multi-site experience" was submitted, revised, and re-submitted to Food Security journal, and it is being reviewed. The second manuscript is planned to be about intervention results and recommendations. Here is the abstract of the first manuscript: *Nutrition-sensitive agriculture (NSA) interventions are of increasing interest to those working in global health and nutrition. However NSA is a broad concept, and there are numerous candidate NSA interventions that could be implemented in any given setting. While most agriculture interventions can be made "nutrition-sensitive", there are no explicit guidelines for helping to decide what agriculture component should be tried in an NSA intervention. Based on previous models, we developed a framework with explicit questions about community factors (agricultural production, diets, power and gender), project factors (team capacity, budget, timelines) and external factors that helped our team of agriculture scientists, nutritionists and local officials identify NSA interventions that may be feasibly implemented with a reasonable chance of having positive*

agriculture and nutrition impacts. We applied this framework in two settings in upland Vietnam, and one setting in upland Thailand. From an initial list of nineteen interventions that have been tried elsewhere, or may reasonably be expected to be appropriate for NSA, five or six candidate interventions were chosen per site. Based on the criteria, three to four interventions were selected per site and are being implemented. Poultry rearing and home gardening were selected in each site. They, and the other selected interventions, hold promise for capitalizing on underused agricultural potential to improve diets, while working with (or improving) existing gender relationships and power structures. The process for identifying NSA interventions was thorough and identified reasonable candidates, but it was very time consuming. Further efforts should focus on streamlining the process, so that promising and appropriate NSA interventions can be identified quickly and reliably.

Problems and challenges **(1 page):**

Have there been any problems or challenges faced by the project? These could include delays, problems amongst stakeholders, with research activities etc. Highlight any risks that might have emerged in the project, and innovative ways you have found to deal with these risks. Reflect on possible problems and challenges related to ethics.

None.

Overall assessment and recommendations **(1/2 page):**

This section is not about research recommendations, but administrative recommendations for IDRC. What would you do differently as a result of this experience, and what general and useful lessons can be derived for improving future projects?

What recommendations would you make to IDRC with respect to the administration of the project, related to the scope, duration, or budget? Candid observations about the overall experience with the project are encouraged. However, any sensitive or confidential information should be addressed through a direct exchange with the program officer, and documented and filed separately.

Overall, the project was managed smoothly by HealthBridge Foundation offices in Hanoi and Ottawa. There was only one issue about the budget, foreign exchange rates, to be exact. The project was budgeted in dollars, but staffs of the project in Thailand were contracted to be paid in Thai Baht. The situation was the case when the exchange rates were unfavorable. We, therefore, suggest that this part should be managed in a more flexible manner.

Submission of final technical reports

Please follow the instructions on how to submit the final technical report, and associated project outputs, in the project output submission user guide at the *IDRC Connect* webpage.

Annexes

Annex 1: AFS Themes

Other annexes:

Recipients are encouraged to include additional annexes such as photos on key activities and results (Informed consent is required for photos. Contact your IDRC Program Officer for consent forms); tables; graphs; list of participants; etc.

Annex 3 –

Annex 5 – Presentation and publication (……pages)

Annex 1 – AFS Themes

This is a more detailed list of questions you should consider when filling out question #5 "Synthesis towards AFS themes" in the main body of the report. Keep in mind it is not expected that each project will respond to ALL of the AFS themes – focus on the most significant contributions).

Increasing agricultural productivity (Availability)

How is the project:

- leading to new and improved agricultural solutions that increase food productivity? (e.g. new/improved staple crops; crop-livestock interactions; agricultural water management; new seeds and plants, reduced post-harvest losses)
- contributing to better risk-mitigation for food security? (e.g., mechanisms that cope with the impacts of climate change and other shocks such as food price volatility)
- addressing gender specific constraints to agricultural productivity? (e.g. reducing women's drudgery or workload/time spent in agriculture; involving men and women in the development and evaluation of the solutions)
- contributing to environmental sustainability, and considering the potential environmental impacts, both positive and negative, of the applications being developed?

Improving access to resources, and/or markets and income (Accessibility)

How is the project (for the most vulnerable, particularly women and children):

- contributing to improved access to resources? (e.g. land, water, agricultural inputs, finance, extension or credit, ICTs)
- addressing bottlenecks and constraints to markets (e.g. financial, institutional, gender constraints, youth engagement).
- contributing to improved income?
- contributing to successful partnership models? (e.g. public-private sector-partnerships, civil society, NGOs)

Improving nutrition (Utilization)

How is the project contributing to:

- adequate and diversified diets, particularly for women and children? (e.g. balanced diets, improved diet quality, nutrition education, food safety practices, food fortification, addressing underlying factors related to nutritional outcomes);
- improved post-harvest food processing and storage techniques for better nutrition, quality and safety?

- linkages between agriculture to nutrition? (e.g. Pathways from food production, income and women's empowerment to nutritional outcomes)
- equitable intra-household allocation of food?

Informing policy

How is the project informing and/or influencing the development and implementation of food security policies? More specifically:

- How did the project directly engage policymakers and decision-makers at different levels? (Please specify who are the policymakers. E.g. ministers, members of parliament, senior government officials, advisors, technocrats? Please also specify the level of government. National, provincial or regional, local government?).
- Has there been a clear demand for the research results from the policymakers?
- What evidence or research results were presented to policymakers or decision makers? Is there evidence that policymakers or decision makers are *using* the results from your project?
- What were the critical success factors or bottlenecks for engaging with and informing policymakers and decision makers?

ANNEX 2:

a. Baseline-Endline data collection

1. Total number of children at the baseline survey

Group	Number of children					
	Gender			Hill tribe		
	Boy	Girl	Total	Karen	Lua	Total
Control	46	49	95	50	45	95
Intervention	64	48	112	64	48	112
Total	110	97	207	114	93	207

2. Nutrition Data Collection

2.1 Number of children under 5 years old in control and intervention groups

Group	Number of children (Baseline / Endline)					
	Gender			Hill tribe		
	Boy	Girl	Total	Karen	Lua	Total
Control	46 /48	49 / 45	95 / 93	50 / 46	45 / 47	95 / 93
Intervention	64 / 56	48 / 48	112 / 104	64 / 56	48 / 48	112 / 104
Total	110 / 104	97 / 93	207 / 197	114 / 102	93 / 95	207 / 197

Note The number of the households at the endline was less than at the baseline because some households could not participate in some activities during the project period.

2.2 Stunting, underweight and wasting of children under 5 years old in control and intervention groups

Groups / Village	Number of children		Stunting (height for age) No. (%)		Underweight (weight for age) No. (%)		Wasting (weight for height) No. (%)	
	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
Control								
Ban Mae Hae Tai/ Ban Sedosa	28	31	10 (35.7%)	6 (19.4%)	6 (21.4%)	4 (12.9%)	0 (0.0%)	2 (6.5%)
Ban Mued Long	16	16	6 (37.5%)	4 (25.0%)	1 (6.2%)	2 (12.5%)	0 (0.0%)	0 (0.0%)
Ban Pae	29	31	10 (34.5%)	13 (41.9%)	6 (20.7%)	4 (12.9%)	2 (6.9%)	2 (6.5%)
Ban Kong Kai	22	15	2 (9.1%)	1 (6.7%)	0 (0.0%)	0 (0.0%)	2 (9.1%)	0 (0.0%)
Total	95	93	28 (29.5%)	24 (25.8%)	13 (13.7%)	10 (10.8%)	4 (4.2%)	4 (4.3%)
Intervention								
Ban Kok Noi	20	16	1 (5.0%)	1 (6.2%)	2 (10.0%)	2 (12.5%)	1 (5.0%)	0 (0.0%)
Ban Mae Khi Muk Noi	23	21	8 (34.8%)	4 (19.0%)	3 (13.0%)	4 (19.0%)	1 (4.3%)	2 (9.5%)
Ban Ho	28	32	5 (17.9%)	4 (12.5%)	2 (7.1%)	4 (12.5%)	1 (3.6%)	1 (3.1%)
Ban Tung Kae	41	35	19 (46.3%)	11 (31.4%)	11 (26.8%)	9 (25.7%)	1 (2.4%)	2 (5.7%)
Total	112	104	33 (29.5%)	20 (19.2%)	18 (16.1%)	19 (18.3%)	4 (3.6%)	5 (4.8%)

3. Questionnaire for parent's nutrition knowledge assessment

3.1 Assessment of knowledge 0-12 months

3.1.1 Control group

Question	Answer (%)	Ban Mae Hae Tai		Ban Mued Long		Ban Pae		Ban Kong Kai	
		Base (n=19)	End (n=23)	Base (n=14)	End (n=13)	Base (n=15)	End (n=22)	Base (n=16)	End (n=15)
Q1	True	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	False	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q2	True	100.0	82.6	92.9	100.0	100.0	77.3	100.0	93.3
	False	0.0	17.4	7.1	0.0	0.0	13.6	0.0	0.0
	Don't know	0.0	0.0	0.0	0.0	0.0	9.1	0.0	6.7
Q3	True	100.0	87.0	100.0	100.0	86.7	86.4	100.0	100.0
	False	0.0	4.3	0.0	0.0	13.3	4.5	0.0	0.0
	Don't know	0.0	8.7	0.0	0.0	0.0	9.1	0.0	0.0
Q4	True	100.0	78.3	92.9	100.0	80.0	72.7	93.8	73.3
	False	0.0	13.0	7.1	0.0	6.7	18.2	6.3	26.7
	Don't know	0.0	8.7	0.0	0.0	13.3	9.1	0.0	0.0
Q5	True	94.7	82.6	100.0	92.3	100.0	72.7	100.0	86.7
	False	5.3	0.0	0.0	7.7	0.0	18.2	0.0	6.7
	Don't know	0.0	17.4	0.0	0.0	0.0	9.1	0.0	6.7
Q6	True	94.7	82.6	85.7	92.3	93.3	86.4	100.0	100.0
	False	5.3	0.0	0.0	0.0	6.7	4.5	0.0	0.0
	Don't know	0.0	17.4	14.3	7.7	0.0	9.1	0.0	0.0
Q7	True	89.4	95.7	100.0	92.3	80.0	90.9	100.0	100.0
	False	5.3	4.3	0.0	7.7	20.0	9.1	0.0	0.0
	Don't know	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q8	True	100.0	87.0	100.0	69.2	100.0	90.9	100.0	93.3
	False	0.0	13.0	0.0	23.1	0.0	4.5	0.0	6.7
	Don't know	0.0	0.0	0.0	7.7	0.0	4.5	0.0	0.0
Q9	True	100.0	91.3	100.0	76.9	86.7	77.3	100.0	100.0
	False	0.0	8.7	0.0	23.1	13.3	18.2	0.0	0.0
	Don't know	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0
Q10	True	89.5	91.3	100.0	84.6	100.0	72.7	93.8	100.0
	False	10.5	8.7	0.0	15.4	0.0	27.3	6.3	0.0
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q11	True	100.0	100.0	100.0	100.0	100.0	95.5	100.0	100.0
	False	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q12	True	100.0	95.7	100.0	69.2	100.0	90.9	100.0	100.0
	False	0.0	4.3	0.0	30.8	0.0	9.1	0.0	0.0
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3.1.2 Intervention group

Question	Answer (%)	Ban Kok Noi		Ban Mae Ki Muk Noi		Ban Ho		Ban Tung Kae	
		Base (n=9)	End (n=16)	Base (n=21)	End (n=16)	Base (n=14)	End (n=16)	Base (n=27)	End (n=16)
Q1	True	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	False	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q2	True	77.8	100.0	100.0	100.0	85.8	100.0	88.9	94.1
	False	22.2	0.0	0.0	0.0	7.1	0.0	11.1	5.9
	Don't know	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0
Q3	True	44.4	100.0	100.0	100.0	71.4	100.0	81.5	91.2
	False	55.6	0.0	0.0	0.0	28.6	0.0	18.5	2.9
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9
Q4	True	44.4	92.9	85.7	90.0	71.4	87.0	81.5	85.3
	False	55.6	7.1	9.5	10.0	28.6	8.7	18.5	14.7
	Don't know	0.0	0.0	4.8	0.0	0.0	4.3	0.0	0.0
Q5	True	44.4	92.9	95.2	90.0	57.1	95.7	74.1	88.2
	False	55.6	7.1	4.8	10.0	42.9	0.0	18.5	11.8
	Don't know	0.0	0.0	0.0	0.0	0.0	4.3	7.4	0.0
Q6	True	55.6	92.9	95.2	95.0	57.1	87.0	88.9	91.2
	False	44.4	7.1	4.8	5.0	35.8	4.3	11.1	2.9
	Don't know	0.0	0.0	0.0	0.0	7.1	8.7	0.0	5.9
Q7	True	88.9	100.0	100.0	100.0	100.0	95.7	96.3	88.2
	False	11.1	0.0	0.0	0.0	0.0	4.3	3.7	11.8
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q8	True	88.9	100.0	90.5	95.0	85.8	95.7	96.3	100.0
	False	11.1	0.0	0.0	0.0	7.1	0.0	3.7	0.0
	Don't know	0.0	0.0	9.5	5.0	7.1	4.3	0.0	0.0
Q9	True	100.0	85.7	100.0	100.0	100.0	100.0	92.6	94.1
	False	0.0	14.3	0.0	0.0	0.0	0.0	7.4	2.9
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9
Q10	True	100.0	92.9	85.7	90.0	71.4	95.7	96.3	100.0
	False	0.0	7.1	9.5	10.0	28.6	4.3	3.7	0.0
	Don't know	0.0	0.0	4.8	0.0	0.0	0.0	0.0	0.0
Q11	True	88.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	False	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q12	True	100.0	92.9	95.2	100.0	85.8	100.0	96.3	97.1
	False	0.0	7.1	4.8	0.0	7.1	0.0	3.7	2.9
	Don't know	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0

Note:

Q1= Human breast milk is useful for your infant health.

Q2= During 0-6 months you can feed your infant only human breast milk.

Q3= After 6 months you need to feed your infant not only human breast milk but also appropriate complementary food.

Q4= You need to feed your infant one meal of appropriate complementary food if your baby has age > 6 months but < 8months.

Q5= You need to feed your infant two meals of appropriate complementary food if your baby has age = 8 months but < 10 months.

Q6= You need to feed your infant three meals of appropriate complementary food if your baby has age =10 months to 12months.

Q7= There are five groups of food for feeding your infant (meat/egg/milk, rice, vegetables, fruits and fat).

Q8= The quantity and the texture of complementary food are dependent upon infant's age.

Q9= The taste of foods for an infant should not too sweet, fat and salty.

Q10= Soft drinks and sweet drinks are not useful for an infant.

Q11= An infant should drink clean boiled water.

Q12= Dirty container for drinking water and foods can lead to diarrhea in an infant.

3.2 Assessment of knowledge pre-school children 1-5 years

3.2.1 Control group

Question	Answer (%)	Ban Mae Hae Tai		Ban Mued Long		Ban Pae		Ban Kong Kai	
		Base (n=22)	End (n=23)	Base (n=12)	End (n=13)	Base (n=18)	End (n=16)	Base (n=14)	End (n=15)
Q1	True	100.0	100.0	100.0	92.3	94.4	100.0	100.0	100.0
	False	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Don't know	0.0	0.0	0.0	7.7	5.6	0.0	0.0	0.0
Q2	True	91.0	100.0	100.0	100.0	88.9	95.5	100.0	100.0
	False	4.5	0.0	0.0	0.0	5.6	0.0	0.0	0.0
	Don't know	4.5	0.0	0.0	0.0	5.6	4.5	0.0	0.0
Q3	True	100.0	95.7	91.7	92.3	94.4	81.8	100.0	100.0
	False	0.0	0.0	0.0	7.7	0.0	13.6	0.0	0.0
	Don't know	0.0	4.3	8.3	0.0	5.6	4.5	0.0	0.0
Q4	True	95.5	91.3	83.3	84.6	83.3	81.8	92.9	100.0
	False	4.5	0.0	0.0	7.7	5.6	9.1	0.0	0.0
	Don't know	0.0	8.7	16.7	7.7	11.1	9.1	7.1	0.0
Q5	True	95.5	91.3	100.0	100.0	100.0	86.4	100.0	100.0
	False	4.5	0.0	0.0	0.0	0.0	13.6	0.0	0.0
	Don't know	0.0	8.7	0.0	0.0	0.0	0.0	0.0	0.0
Q6	True	77.3	73.9	91.7	61.5	77.8	68.2	92.9	80.0
	False	18.2	8.7	0.0	23.1	16.7	27.3	0.0	20.0
	Don't know	4.5	17.4	8.3	15.4	5.6	4.5	7.1	0.0
Q7	True	77.3	91.3	91.7	92.3	88.9	77.3	100.0	86.7
	False	22.7	4.3	0.0	7.7	11.1	22.7	0.0	13.3
	Don't know	0.0	4.3	8.3	0.0	0.0	0.0	0.0	0.0
Q8	True	95.5	95.7	100.0	76.9	88.9	81.8	100.0	93.3
	False	4.5	4.3	0.0	23.1	11.1	13.6	0.0	6.7
	Don't know	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0
Q9	True	95.5	87.0	83.4	100.0	88.9	90.9	100.0	93.3
	False	0.0	0.0	8.3	0.0	11.1	0.0	0.0	0.0
	Don't know	4.5	13.0	8.3	0.0	0.0	9.1	0.0	6.7
Q10	True	90.9	95.7	100.0	92.3	88.9	100.0	100.0	93.3
	False	4.5	0.0	0.0	0.0	11.1	0.0	0.0	0.0
	Don't know	4.5	4.3	0.0	7.7	0.0	0.0	0.0	6.7

3.2.2 Intervention group

Question	Answer (%)	Ban Kok Noi		Ban Mae Ki Muk Noi		Ban Ho		Ban Tung Kae	
		Base (n=9)	End (n=16)	Base (n=18)	End (n=16)	Base (n=9)	End (n=16)	Base (n=18)	End (n=16)
Q1	True	100.0	100.0	100.0	100.0	100.0	100.0	96.7	100.0
	False	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q2	True	100.0	100.0	100.0	100.0	95.0	100.0	90.0	97.0
	False	0.0	0.0	0.0	0.0	5.0	0.0	6.7	0.0
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	3.3	3.0
Q3	True	75.0	85.8	94.4	100.0	90.0	95.7	96.7	94.0
	False	25.0	7.1	0.0	0.0	5.0	0.0	3.3	3.0
	Don't know	0.0	7.1	5.6	0.0	5.0	4.3	0.0	3.0
Q4	True	62.4	78.6	83.3	90.0	75.0	91.3	96.7	84.8
	False	31.3	21.4	5.6	10.0	20.0	4.3	3.3	6.1
	Don't know	6.3	0.0	11.1	0.0	5.0	4.3	0.0	9.1
Q5	True	87.5	85.8	100.0	100.0	95.0	100.0	86.7	100.0
	False	12.5	7.1	0.0	0.0	5.0	0.0	10.0	0.0
	Don't know	0.0	7.1	0.0	0.0	0.0	0.0	3.3	0.0
Q6	True	62.5	71.4	77.8	80.0	95.0	69.6	73.3	75.8
	False	37.5	21.4	0.0	15.0	5.0	17.4	23.3	21.2
	Don't know	0.0	7.2	22.2	5.0	0.0	13.0	3.4	3.0
Q7	True	75.0	100.0	88.9	95.0	80.0	91.3	86.7	93.9
	False	25.0	0.0	11.1	5.0	20.0	8.7	13.3	6.1
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q8	True	81.2	100.0	83.3	95.0	65.0	100.0	93.3	100.0
	False	18.8	0.0	11.1	5.0	35.0	0.0	6.7	0.0
	Don't know	0.0	0.0	5.6	0.0	0.0	0.0	0.0	0.0
Q9	True	93.8	92.9	94.4	95.0	100.0	100.0	93.3	93.9
	False	0.0	0.0	0.0	5.0	0.0	0.0	6.7	3.0
	Don't know	6.2	7.1	5.6	0.0	0.0	0.0	0.0	3.0
Q10	True	81.2	100.0	100.0	100.0	95.0	95.7	96.7	100.0
	False	18.8	0.0	0.0	0.0	5.0	4.3	3.3	0.0
	Don't know	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note:
Q1= Your children will have good health if they have three meals a day.
Q2= In every day, your children should eat 5 groups of food (meat/egg/milk, rice, vegetables, fruits and fat).
Q3= Your children should eat foods which have low sugar, fat and salt contents.
Q4= Your children should have snack (low sugar, fat and salt contents) not more than 2 meals a day.
Q5= Your children should eat vegetables and fruits every day.
Q6= Your children should drink 8-10 glasses of clean water a day.
Q7= Your children should drink 2-3 glasses of fresh milk a day.
Q8= Your children should not drink soft and sweet drinks.
Q9= Iodized salt is useful for your children's health.
Q10= Your children will have good development if they learn to eat by themselves.

4. Food Security

4.1 Information

Category	Baseline (N)	Endline (N)
Number of surveyed household	172	156
Number of children under 5 years old	207	151
Number of children more 5 years old	0	46
Age of children (month)	0-59	15-83

4.2 Data collection Food Security

Indicator	Baseline (N=172, %)	Endline (N=156, %)
Household Food Insecurity Access-related Conditions		
Household experiencing condition at any time	74 (43.0)	61 (39.1)
Household experiencing condition at a given frequency	7 (4.1)	6 (3.8)
Household Food Insecurity Access-related Domains		
Unable to eat preferred foods	94 (54.7)	77 (49.4)
Eat just a few kinds of foods	99 (57.6)	98 (62.8)
Eat foods the really don't want eat	90 (52.3)	90 (57.7)
Household Food Insecurity Access-related Scale Score	4.9 (0-22)	4.5±3.8 (0-19)
Household Food Insecurity Access-related Prevalence		
Food Secure	44 (25.6)	26 (16.7)
Mildly Food Insecure Access	24 (13.9)	30 (19.2)
Moderately Food Insecure Access	23 (13.4)	33 (21.2)
Severely Food Insecure Access	81 (47.1)	67 (42.9)

5. Dietary Diversity

Indicator	Baseline (n, (%))	Endline (n, (%))
Introduction of solid semi-solid or soft food	3 (50.0)	NA*
Minimum dietary diversity (7 food groups)	27 (39.7)	16 (84.2)
Minimum meal frequency	14 (20.6)	4 (21.1)
Minimum acceptable diet	3 (4.4)	3 (15.8)
Consumption of iron-rich or iron-fortified foods	22 (32.4)	13 (68.4)
Early initiation of breastfeeding	74 (77.9)	20 (83.3)
Exclusive breastfeeding under 6 months	3 (12.0)	NA**
Continued breastfeeding at 1 year	12 (85.7)	1 (50.0)***
Children ever breastfed	93 (97.9)	25 (100.0)
Continued breastfeeding at 2 years	17 (94.4)	11 (78.6)

** No children 6-8 months of age, ** No children < 6 months of age, and *** Only 2 children 12-15 months of age*

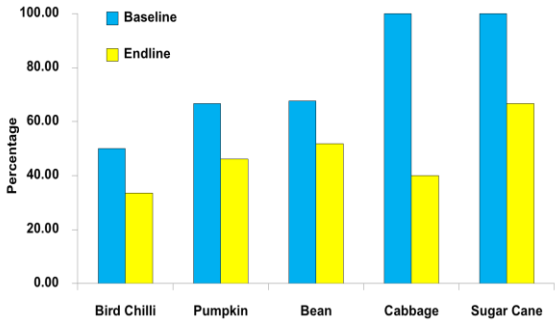
6. Breastfeeding

Indicator	Baseline (n (%))	Endline (n (%))
Early initiation of breastfeeding	74 (77.9)	20 (83.3)
Exclusive breastfeeding under 6 months	3 (12.0)	NA**
Continued breastfeeding at 1 year	12 (85.7)	1 (50.0)***
Children ever breastfed	93 (97.9)	25 (100.0)
Continued breastfeeding at 2 years	17 (94.4)	11 (78.6)

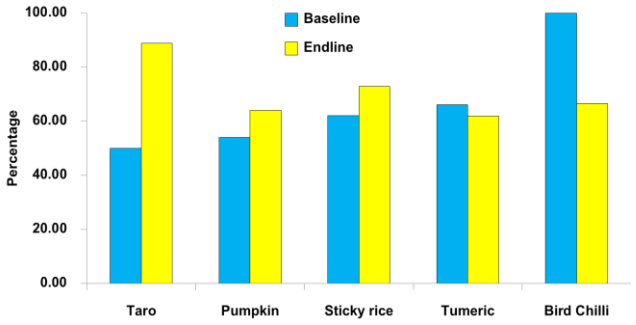
*** No children < 6 months of age, and *** Only 2 children 12-15 months of age*

5. Crop productivity in 2 groups (Control and Intervention group)

5.1. Number of cultivated household

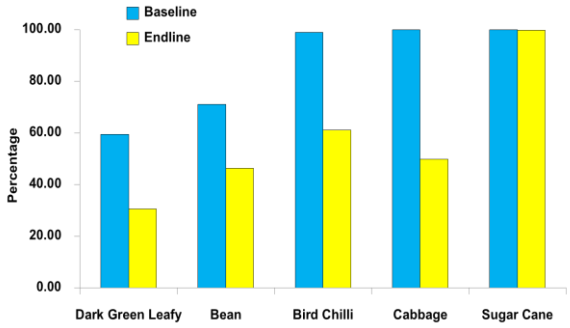


Control group

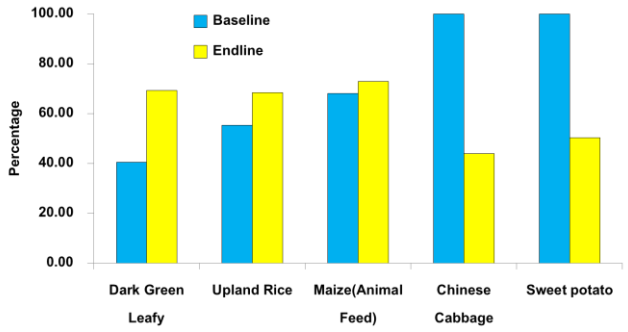


Intervention group

5.2. The vegetable growing area

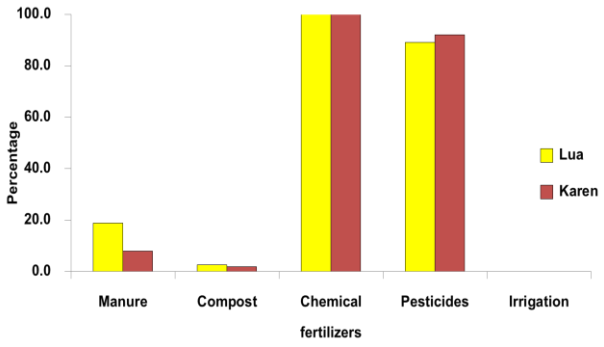


Control group

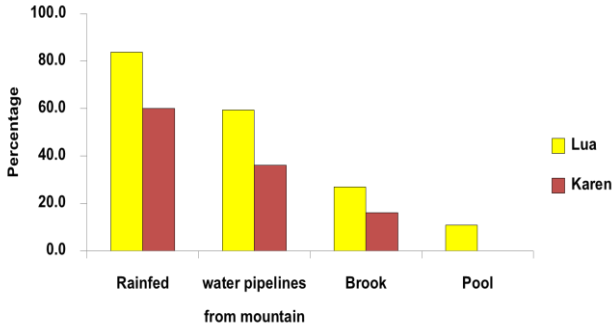


Intervention group

5.3 The farming practices and source of water supplied (Intervention group)



Control group



Intervention group

5.4 Who work most on the crop (land preparation to sell/consumption)

Group	Hill Tribe	Male	Female	Both
Control	Lua	Pumpkin, Upland Rice, Mung Bean, Chinese Cabbage, Kidney Bean, Galangal	Galangal, Black Sesame, Cucumber, Ginger, Leech lime, Phak ee luen (Chiang Mai), Soybean , Sweet potato, Turmeric, Wild Yam, Yard long Bean, Bird Chili, Dill, False Pakchoi, Lemon Grass, Wax Gourd, Spring Onion	Groundnut, Maize(Animal Feed), Shallot, Pumpkin, Upland Rice, Chinese Cabbage, Kidney Bean, Bird Chili, Dill, False Pakchoi, Lemon Grass, Wax Gourd
	Karen	Paddy Rice, Angled Loofah, Cabbage, Cassava Root, Climbing Wattle, Coffee, Groundnut, Ginger, Shallot, Spring Onion, False Pakchoi, Lemon Grass, Sugar Cane, Cucumber, water convolvulus, Taro, Dill, Galangal	Ivy Gourd, Phak ee luen (Chiang Mai), False Pakchoi, Lemon Grass, Cucumber, water convolvulus, Taro, Dill, Holy basil, Chinese Cabbage, Galangal, Yard long Bean	Bird Chili, Kidney Bean, Maize(Animal Feed), Pumpkin, Turmeric, Upland Rice, Wax Gourd, Paddy Rice, Ginger, Shallot, Spring Onion , False Pakchoi, Lemon Grass, Sugar Cane, Cucumber, Dill, Holy basil, Chinese Cabbage, Galangal
Intervention	Lua	Cucumber, Paddy Rice, Ivy Gourd	Chinese Cabbage, Eggplant, Galangal, Ginger, Holy basil, Kale, Lemon Grass, Turmeric, water convolvulus, Bird Chili, Black Sesame, Cassava Root, Dill, False Pakchoi, Spring Onion, Sweet potato, Thai eggplant, Yard long Bean, Ivy Gourd	Angled Loofah, Cabbage, Groundnut, Kidney Bean, Maize(Animal Feed), Pumpkin, Shallot, Soybean , Taro, Upland Rice, Wax Gourd, Waxy Corn, Cucumber, Paddy Rice, Chinese Cabbage, Eggplant, Galangal, Ginger, Holy basil, Kale, Lemon Grass, Turmeric, water convolvulus, Bird Chili, Black Sesame, Cassava Root, Dill, False Pakchoi, Spring Onion , Sweet potato, Thai eggplant, Yard long Bean, Ivy Gourd
	Karen	Cauliflower, Chinese Cabbage, Holy basil, Dill, Shallot, Sweet potato, Lemon Grass, Kidney Bean	Bird Chili, Cassava Root, Common lime, Cucumber, False Pakchoi, Pumpkin, Spring Onion, Taro, Thai eggplant, Wax Gourd, Yard long Bean, Cabbage, Sugar Cane, Lemon Grass, Black Gram, Garlic, Leaf Mustard, Phak ee luen (Chiang Mai), Turmeric, Kidney Bean, Galangal	Ginger, Ivy Gourd, Maize(Animal Feed), Paddy Rice, Upland Rice, Bird Chili, Cassava Root, Common lime, Cucumber, False Pakchoi, Pumpkin, Spring Onion , Taro, Thai eggplant, Wax Gourd, Yard long Bean, Cabbage, Dill, Shallot, Sweet potato, Lemon Grass, Galangal

5.5 The labor demand on the crop cultivation? (within last year crop production for all vegetables)

Group	Increased	Remained	Reduce
Control	Cauliflower, Cabbage, Cucumber, Groundnut, Kidney Bean, Maize(Animal Feed), Paddy Rice, Pumpkin, Shallot, Soybean , Upland Rice	Cabbage, Cucumber, Groundnut, Kidney Bean, Maize(Animal Feed), Paddy Rice, Pumpkin, Shallot, Soybean , Upland Rice, Bird Chili, Black Gram, Black Sesame, Cassava Root, Chinese Cabbage, Common lime, Dill, Eggplant, False Pakchoi, Galangal, Garlic, Ginger, Holy basil, Ivy Gourd, Kale, Leaf Mustard, Lemon Grass, Phak ee luen (Chiang Mai), Spring Onion , Sugar Cane, Sweet potato, Taro, Thai eggplant, Turmeric, water convolvulus, Wax Gourd, Waxy Corn, Yard long Bean	-
Intervention	Groundnut, Kidney Bean, Paddy Rice, Shallot, Spring Onion , Upland Rice, Yard long Bean	Angled Loofah, Bird Chili, Black Sesame, Cabbage, Cassava Root, Chinese Cabbage, Climbing Wattle, Coffee, Cucumber, Dill, False Pakchoi, Galangal, Ginger, Holy basil, Ivy Gourd, Leech lime, Lemon Grass, Maize(Animal Feed), Mung Bean, Phak ee luen (Chiang Mai), Pumpkin, Soybean , Sweet potato, Taro, Turmeric, water convolvulus, Wax Gourd, Wild Yam, Groundnut, Kidney Bean, Paddy Rice, Shallot, Spring Onion , Upland Rice, Yard long Bean, Sugar Cane	Sugar Cane (Hire)

5.6 Vegetable and crop consumption

Hill Tribe	All for eating	Most for eating	Half for eating	Part for eating	No eating
Lua	Holy basil, Turmeric, Galangal, Paddy Rice, Waxy Corn, Upland Rice, Ginger, Kale, Black Sesame, Spring Onion , Lemon Grass, Ivy Gourd, Cucumber, Yard long Bean, False Pakchoi, Taro, Bird Chilli, Wax Gourd, Pumpkin, Thai eggplant, Eggplant, Sweet potato, Cassava Root, Dill, water convolvulus, Chinese Cabbage, Shallot	Water convolvulus		Cabbage	Maize(Animal Feed), Kidney Bean, Chinese Cabbage, Shallot, Cabbage
Karen	Garlic, Holy basil, Turmeric, Galangal, Paddy Rice, Ginger, Spring Onion , Lemon Grass, Ivy Gourd, Cucumber, Black Gram, Yard long Bean, False Pakchoi, Chinese Cabbage, Leaf Mustard, Phak ee luen (Chiang Mai), Taro, Bird Chilli, Wax Gourd, Pumpkin, Thai eggplant, Common lime, Sweet potato, Cassava Root, Dill, Sugar Cane, Upland Rice, Kidney Bean	Upland Rice		Cauliflower, Shallot	Maize(Animal Feed), Kidney Bean, Cabbage

5.7 Marketing of crop

Hill Tribe	All for sell	Most for sell	Half for sell	Part for sell	No sell
Lua	Maize(Animal Feed), Shallot, Cabbage, Kidney bean	Cabbage, Kidney bean, Groundnut	-	Upland rice	Holy basil, Tumeric, Galangal, Paddy rice, Waxy corn, Ginger, Kale, Black sesame, Spring onion , Lemon Grass, Ivy Gourd, Cucumber, Yard long Bean, Soybean , False Pakchoi, water convolvulus, Taro, Bird Chilli, Wax gourd, Pumpkin, Thai eggplant, Eggplant, Sweet potato, Cassava Root, Dill, Upland rice
Karen	Maize(Animal Feed), Cabbage, Shallot	Cabbage, Shallot	-	Paddy rice, Upland rice	Holy basil, Tumeric, Galangal, Ginger, Spring onion , Lemon Grass, Ivy Gourd, Cucumber, Black Gram, Yard long Bean, False Pakchoi, Chinese Cabbage, Leaf Mustard, Phak ee luen (Chiang Mai), Taro, Bird Chilli, Wax gourd, Pumpkin, Thai eggplant, Common lime, Sweet potato Cassava Root, Dill, Sugar Cane, Garlic, Paddy rice, Upland rice

6. Animal raising

6.1 Number of chicken raising (from project)

Hill tribe	Chicken Raising (from project) (Intervention)		Total HHs of Intervention (Endline)	Chicken Raising (from project) (Endline)	
	No. HHs of raising (n)	No. Chicken (n)		No. HHs of raising (n, %)	No. Chicken (n)
Lua	40	200	37	5 (13.5%)	6
Karen	64	320	50	8 (16.0%)	26
Total	104	520	87	13 (14.9%)	32

6.2 Type of raising practices

Animal	Types of Raising (Intervention HH; N=87)	
	Lua	Karen
Chicken (farmer's own)	Free ranging	Free ranging or Cage-based
Chicken (from project)	Cage-based	
Catfish	-	Cage-based
Musk duck	-	Free ranging
Nile tilapia	-	Cage-based
Silver barts	-	Cage-based

6.3 Feeding practices

Animal	Feeding practices (Intervention HH; N=87)	
	Lua	Karen
Chicken (farmer's own)	Local feeds only	
Chicken (from project)	Combined	
catfish	-	Combined
Musk duck	-	Local feeds only
Nile tilapia	-	Combined
Silver barts		Local feeds only

6.4 Who work most on the animal?

Animal	Control		Intervention	
	Lua	Karen	Lua	Karen
Chicken (farmer's own)	Female	Female	Female	Female
Chicken (from project)	-	-	Both	Female
Geese	Female	Both	-	Both
Catfish	-	Male	-	Male
Musk duck	Male or Female	Female	-	Both
Nile tilapia	Both	Male or Female	-	Male
Parrot	-	Male or Female	-	-
Silver barts	-	-	-	Male

6.5 How labor demand on the animal? (Within last year crop production)

Animal	Control (N= 69)		Intervention (N=87)	
	Lua	Karen	Lua	Karen
Chicken (farmer's own)	Remained		Remained	
Chicken (from project)	-		Remained	
Geese	-	Remained	-	-
Catfish	-	Remained	-	Remained
Musk duck	Remained	Remained	-	Remained
Nile tilapia	-	Remained	-	Remained
Parrot	-	Remained	-	-
Silver barts	-	-	-	Remained

6.6 Veterinary and who do the veterinary job?

Animal	Control (N= 69)		Intervention (N=87)	
	Lua	Karen	Lua	Karen
Chicken (farmer's own)	No veterinary			
Chicken (from project)	-	-	Periodical vaccination (VET staff)	
Geese	No veterinary			
catfish	-	No veterinary	-	No veterinary
Musk duck	No veterinary		-	No veterinary
Nile tilapia	-	No veterinary	-	No veterinary
Parrot	-	No veterinary	-	-
Silver barts	-	-	-	No veterinary

6.7 Chicken for meat? (consume per month in recent 4-5 months)

Animal	Intervention HH (consumption) (n,%)		Chicken Meat Consume (Chicken/Month in recent 4-5 months) (n,%)	
	Lua (N=37 HHs)	Karen (N=50 HHs)	Lua (N=37 HHs)	Karen (N=50 HHs)
Chicken (farmer's own)	30 (81.1%)	36 (72%)	1 (43.24%)	1 (36%)
Chicken (from project)	19 (51.3%)	38 (76%)	1 (43.24%)	1 (46%)

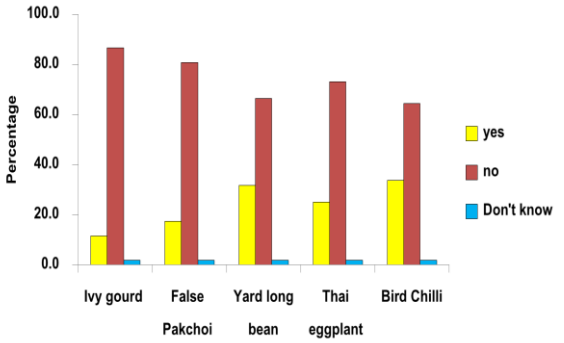
6.8 Number of eggs produced as concrete as possible for average number of egg/day (for the last 30 days)

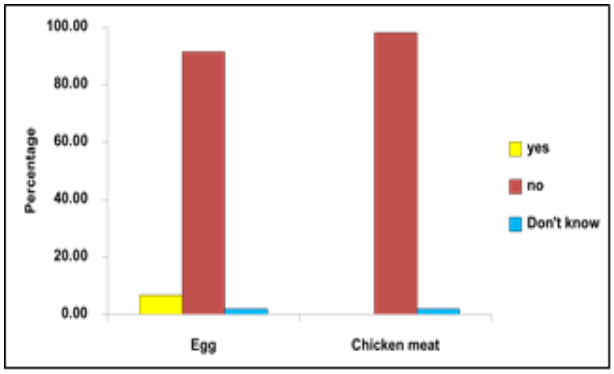
Animal	No. Intervention HH (n,%)		Average of Egg Produced for last 1 month (egg/day)	
	Lua (37 HHs)	Karen (50 HHs)	Lua (37 HHs)	Karen (50 HHs)
Chicken (farmer's own)	34 (91.9%)	27 (54.0%)	2	2
Chicken (from project)	10 (27.0%)	5 (10.0%)	2	2
Musk Duck	0 (0.0%)	2 (4.0%)	0	0

6.9 Number of eggs marketed as concrete as possible for the last 30 day

Animal	No. Intervention HH (consumption) (n, %)		Average of egg consumed for last 1 month (egg/day)	
	Lua (37 HHs)	Karen (50 HHs)	Lua (37 HHs)	Karen (50 HHs)
Chicken (farmer's own)	6 (16.2%)	4 (8.0%)	0.4	1
Chicken (from project)	16 (43.2%)	5 (10.0%)	2	1

7. Consumptions of vegetables and eggs during October – November (Endline data collection) 2015





Annex 3: Focus Group Discussion on Gender Role and Affordability

1. Gender Role

Question	Karen		Lua	
	Female	**Male**	**Female**	**Male**
Has participation in the project interventions affected how men and women allocate their time?				
a. Have men/ women taken on new tasks? If so, what?	Yes			No
b. Have men/women had to stop or spend less time doing other tasks? If so, what?	No			
c. Has the distribution of household or childcare tasks changed between men and women? If so, how?	Yes	No	Yes	No
d. How do men/women feel about any changes to their roles/tasks? In their perception, is it manageable?	Yes, and manageable	No change	Yes, and manageable	No change
Has participation in the project affected men's and women's access and control over agricultural and food resources?				
a. Can men/women make the decision to purchase agricultural inputs if they wanted to? If not, why not? Who makes the decision?	Both			
b. When crops/animals are harvested, who decides whether/how much are sold for cash?	Both			
c. If revenue is generated, who decides how money is spent?	Both		Female	Both
d. Have there been any changes since baseline? If so, what?	Yes (Both sexes help to plant vegetables. Some men help watering the vegetable when the women take care of the children. Most of the men harvest the vegetables.)	No change	Yes (They save the money that's supposed to be used for purchasing eggs. They have more knowledge about home garden.)	

Question	Karen		Lua	
	Female	**Male**	**Female**	**Male**
Has participation in the project affected men's and women's access and control over food?				
a. Who makes the decision about how much money to spend on food?	Wife	Both	Wife	Both
b. Who has access to money to spend on food?	Wife	Husband	Most of women	Wife
c. Who is responsible for purchasing food?	Most of women	Husband	Most of women	Both
d. Who prepares and cooks the food for children?	Most of wife	Wife	Women	
e. Have there been any changes since baseline? If so, what?	Yes -Husbands help more. -They change to purchase food that are more beneficial to their health. -The purchase milk for snack instead of sweets. -They do not purchase eggs during the time of the project -Before the project, their children eat 1 egg per 2 or 3 days but now they eat eggs every day. -The purchase less vegetables because they grow more of vegetables than before the project come in. -Their diets are more diverse. -Their children eat more fruits.	Yes -Men harvest the vegetables to be used as raw materials for food.	Yes -Women cook the food with eggs because the benefits of eggs. -Decreasing in eating snack and candy and eat more fruits. -They change to cook food that are less sweet, greasy, salty, and spicy. -They purchase milk for snack instead. -Husbands change to accept the wives' decision on choosing healthier food and snacks (less sweets) for children.	Yes -They have eggs and vegetables for consumption in their home and diets are more diverse. -They increase nutrition knowledge and often to cook food with eggs.
Differences in feeding practices for boys and girls	Not different			
Has knowledge increased for both men and women?				
a. Do both men and women have good understanding of the agricultural techniques provided by the project?	Yes			

b. Do both men and women have good understanding of the nutrition concepts provided by the project?	Yes

2. Affordability

2.1. The main benefits of this intervention

No.	The main benefit(good things)	Score			
		Karen		Lua	
		Female	Male	Female	Male
Chicken raising					
1	Saving cost to buy eggs	Very High	High	Very High	High
2	Saving time to buy eggs	-	Very High	-	Moderate
3	Having variety eggs menu for children	-	High	-	-
4	Having eggs for consumption	Very High	-	Very High	-
5	Nutrients for children	Very High	-	Very High	-
6	Both children and adults had more eggs for consumption	-	-	High	High
Home garden					
1	Having vegetable for consumption	Very High	High	-	-
2	Saving cost to buy vegetables	Very High	Moderate	Very High	Moderate
3	Having enough vegetables for children's consumption	-	Moderate	-	-
4	Saving time to buy vegetables	Very High	-	-	High
5	Benefits for household members	Very High	-	Very High	-
6	Having fresh vegetable for cooking	-	-	-	High
7	Having several food recipes	-	-	Very High	-
Training for Nutrition knowledge					
1	To gain knowledge about food consumption that is nutritious for children	-	High	-	-
2	To learn about cooking	Very High	-	-	-
3	To learn how to take care of children	Very High	-	-	-
4	Saving money because of having knowledge about chicken raising and growing vegetables for cooking	Very High	-	-	-
5	Learning cooking process in household such as food preparing, raw materials/food separating for eggs and vegetables recipes	-	-	-	High
6	To gain knowledge about the benefit of vegetables and egg	-	-	-	High
7	Can transfer the knowledge to household members	-	-	Very High	NA
8	Can transfer the knowledge to neighbors	-	-	Moderate	-
9	Children had healthy foods for consumption	-	-	Very High	-
10	Reducing junk foods consumption such as candy, soft drink and snack	-	-	Very High	-
11	More child care such as brushing teeth	-	-	Very High	-
12	Purchasing healthy foods such as milk and others	-	-	Very High	-
13	More child care such as more clean fresh water and milk drinking	-	-	Very High	-
14	More time for playing with children	-	-	Very High	-

2.2 The main inputs you invested in this intervention

No.	The main benefit(good things)	Score			
		Karen		Lua	
		Female	Male	Female	Male
Chicken raising					
1	Finding bamboo for building chicken coop	Very Low	Very High	Low	-
2	Purchasing equipment for building chicken coop such as nails, galvanized iron and bottle of water for chicken	Moderate or Very Low	Low	Moderate and Very High	-
3	Spending the day for building chicken coop	Very Low	-	Moderate	Moderate
4	Finding optimal area for building chicken coop	-	-	High	Moderate
Home garden					
1	Purchasing equipment for preparing home garden area such as slam canvas, nails, springer, and rubber tube	-	Low	-	High
2	Spending two days	-	-	Moderate	-
3	Using 2workers	Low	-	Very High	-
4	Preparing for planting area	-	-	-	Moderate
5	Cutting wood (e.g. bamboo) for surrounding the home garden area	-	-	Low	High
6	Labor for watering	-	-	Moderate	-
Training for Nutrition knowledge					
1	Spending time for training	Very low	-	-	-
2	Spending time for transferring knowledge to others	Very low	-	Very low	-

2.3 The main challenges when applying this

Interventions	Karen		Lua	
	Female	**Male**	**Female**	**Male**
Raising chicken	-No challenge. It is the same as raising local chicken.	-None	-Concerning about chicken feed, chicken coop and chicken caring that might be not correct or not good enough. -Afraid that lacking of chicken food from the project. It was not the same as local chicken that the decrease of chicken food might lead to the lower eggs producing by a chicken. because they had never done it before.	-Using local foods mixed with chicken food from the project could not make chicken to produce egg as many as when it was compared with the chicken having only food from the project.
Home garden	-No, it's normal.	-None	-Concerning that the vegetable would not grow. -Concerning that there was not enough water for using in household because they had to use water for watering vegetables. -No experience on growing intervention vegetable species. They only bought them. -Concerning that the growing vegetables would be destroyed by chicken.	-They faced problems with pests, but they could solve the problems by using water sprinkler for repelling pests.
Training for nutrition knowledge	-Changing some traditional beliefs.	-None	-Never knew about this before, it was hard to understand at the beginning. However, they were interesting issues, so they could have more understanding later. -At the beginning, it was hard to change their behaviors following the lesson.	-They could apply in real life such as cooking various egg dishes for children from the project staff because they only know the easy menu such as boiling and frying.

2.4 Do you want to continue applying this intervention? Why yes, why no?

Interventions	Karen		Lua	
	Female	**Male**	**Female**	**Male**
Raising chicken	-Yes, they will do if they receive the chicken because they will have eggs for consumption, save their money and more benefits for their children.	-Yes, they will do it because it can save cost and time for buying eggs from the market.	-Yes, they will do it because it is useful and saves cost. Several recipes can be produced from eggs. Their children will have eggs, which are easy to eat	-Yes, they will do it because there are more benefits to both children and adults who consume eggs, regularly and every day. It can save cost for a household.
Home garden	-Yes, they will do it because they will have vegetables for consuming, save not only money, but also the time for buying.	-Yes, they will do it because it can save cost and time for buying vegetables from the market.	-Yes, they will do it because it is cost saving. Egg is a useful food and it can be used to cook the varieties of food for children.	-Yes, they will do it because there are more useful vegetables for the children to consume. The other benefits are saving cost and time.
Training for nutrition knowledge	-Yes, they will do it because the training is an advantage for them.	-No, they will not do it because they don't have time for training.	-Yes, they will do it because it is useful. They need that their newborn babies will be healthy and strong. They will be proud of themselves to transfer their knowledge received to other people around them.	-Yes, they will do it because they need their family to have benefits from the training.

2.5 What changes do you want to have this more effective?

Interventions	Karen		Lua	
	Female	**Male**	**Female**	**Male**
Chicken raising	- More chickens and chicken food in order to have more eggs.	-They want not only enough chicken food but also the knowledge for raising chicken.	-They want more chicken food.	-They need to have more chicken food regularly and vaccination for chicken.
Home garden	- More other vegetable seeds such as morning glory, Chinese broccoli, winged bean, and roselle.	-They want more other vegetable seeds and knowledge about home garden caring.	-They want more other vegetable seeds to substitute other varies that cannot grow in the area, for example, spring onion, coriander, Pak-Phluk (Lua), tomato and morning glory.	-They want more other vegetable seeds.
Training for nutrition knowledge	-They want cookbook and to learn how to preserve foods.	-None.	-They want more knowledge about cooking, know more children's menu. – They want cookbooks. -They want a book teaching about food processing such as century egg.	-They want to be trained to review about nutrition knowledge at least once a month.

2.6 What support do you need to continue applying this?

Interventions	Karen		Lua	
	Female	**Male**	**Female**	**Male**
Chicken raising	-Need chickens and chicken feed.	-Need chicken experts to teach them.	-Need more chickens and chicken feed.	-Need money for investment, chicken feed, standard equipment for chicken coop, more chickens, both hen and rooster.
Home garden	-Need vegetable seeds.	-Need other vegetable seeds that can grow in upland areas.	-Need more planting equipment such as hoe and shovel because there was not enough and normally this equipment belonging to men. -Need other vegetable seeds such as eggplant -Need shading material.	-Need more vegetable seeds, and equipment such as shading material, and standard equipment.
Training for nutrition knowledge	-Need lecturers, cooking book, cooking course, and knowledge about food preservation.	-None	- Need cooking book. and cooking course and repeat training on nutrition knowledge. - Need more teaching	-None

ANNEX 4: Presentation and publication

1. Re-form (Chiang Mai University Research Affairs publication) (2014 and 2015)

1.1 Malnutrition and child care among children under 5 years in uplands of Mae Chaem District, Chiang Mai Province by *Palika Chaem Prasert, Prasit Wangpakapattanawong, and Sakda Pruenglampoo (Vol.12/2014)*

1.2 Complementary feeding as part of better nutrition for upland communities by *Surachet Jinakaew, Posri Leelapat, and Anna Roesler (Vol.03/2015)*

1.3 The role of male and female relationships in Lua and Karen Hill tribe on children under 5 years old's nutrition in Mae Chaem Sub-district, Chiang Mai by *Palika Chaem Prasert, Prasit Wangpakapattanawong, Sakda Pruenglampoo, and Anantika Ratnamhin (Vol.05/2015)*

2. Agroforestry world blog (2014)

2.1 Fields, forks and breast milk by *Rob Finlayson (August 5, 2014)*(Left picture)

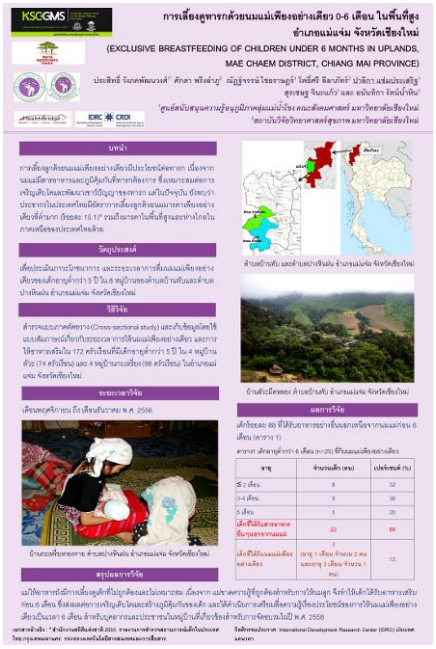
2.2 Complementary feeding as part of better nutrition for upland communities *by Rob Finlayson (August 11, 2014)* (Right picture)

3. The 8th Thailand Congress of Nutrition 2014 at Bangkok International Trade & Exhibition, Bang Na, Bangkok, Thailand, 6-8 October 2014 (Poster Presentation)

3.1 Exclusive Breastfeeding of children under 6 months in uplands, Mae Chaem district, Chiang Mai Province. *Prasit Wangpakapattanawong , Sakda Pruenglampoo, Posri Leelapat, Natjan Chairat, Palika Champrasert, Surachet Jinakeaw, and Anantika Ratnamhin*.(Left picture)

3.2 Nutritional status, food security and dietary diversity, Chiang Mai province. *Prasit Wangpakapattanawong , Sakda Pruenglampoo, Posri Leelapat, Natjan Chairat, Palika Champrasert, Surachet Jinakeaw, and Anantika Ratnamhin*.(Middle picture)

4. Poster presentation at International Symposium on Agroecology for Food Secutiry and Nutrition, 18-19 September, 2014 (Poster Presentation) (Right picture)


การเลี้ยงลูกทารกด้วยนมแม่เพียงอย่างเดียว 0-6 เดือน ในพื้นที่สูง อำเภอแม่แจ่ม จังหวัดเชียงใหม่
(EXCLUSIVE BREASTFEEDING OF CHILDREN UNDER 6 MONTHS IN UPLANDS, MAE CHAEM DISTRICT, CHIANG MAI PROVINCE)


ภาวะโภชนาการ ความมั่นคงและความหลากหลายของอาหาร ในเด็กอายุต่ำกว่า 5 ปี ในพื้นที่สูง อำเภอแม่แจ่ม จังหวัดเชียงใหม่
(Nutritional status, food security and dietary diversity among children under 5 years in uplands, Mae Chaem district, Chiang Mai province)

Activities of Endline evaluation

1. Anthropometric measurement (Height and weight)

2. Household surveys using questionnaires

3. Focus Group Discussion (Gender Role and Affordability)