

Final Report

on

**Rebuilding Nutritional Security of Golden 1000 Days Families in
Earthquake Affected Districts in Nepal**

Submitted to

UNICEF Nepal

Submitted by

**Asta-Ja Research and Development Center (Asta-Ja RDC)
Kathmandu, Nepal**

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1. BACKGROUND

Malnutrition is a major threat to the health of children and mothers in Nepal, where over 40% of children under age five suffer from stunting, 11% suffer from wasting, and 29% are underweight (NDHS, 2011). Malnutrition adversely affects the children and maternal health and their immune system, making them susceptible to non-communicable diseases and subsequently leading to the vicious cycle of poverty and hunger. Major causes of malnutrition include: 1) low birth weight of below 2.5 kg due to poor maternal nutrition, 2) inadequate dietary intake, 3) frequent infections, 4) household food insecurity, and 5) poor feeding practices.

There have been many projects implemented to address the root causes of malnutrition in Nepal. These projects are mainly focusing on increasing food intake, food supply, sanitation and hygiene, and mothers' education. However, poor quality of stored food also leads to food intake resulting into malnutrition. Due to improper method of food storage, a significant portion of the foods and thus the nutrients are damaged or lost.

Considering the prevalence of very poor food storage conditions in Nepal, there is urgent need to improve food storage conditions, minimize food and nutrient losses, prevent food from mold infestation, and increase nutrient intake by the children and mothers. Therefore, this project "Rebuilding Nutritional Security of Golden 1000 Days Families in Earthquake Affected Districts in Nepal" was implemented in Banepa Municipality (formerly Ugrachandi Nala VDC) in Kavre district of Nepal from February 1, 2017 - March 31, 2018 with the financial support of UNICEF Nepal.

2. OBJECTIVES

The overall objective of the project was to contribute to the reduction of malnutrition in earthquake affected children and mothers by using simple and scientific method of food storage for minimizing nutrient losses. The specific objectives were: 1) to minimize food and nutrient losses through preventive measures to control molds, insects and rodents using a new Dry Chain technology, 2) to raise awareness about the Dry Chain in local communities through trainings, and 3) to increase national awareness by organizing a national conference of food stakeholders.

3. IMPLEMENTATION APPROACH

Triple layer hermetic (airtight/moisture proof) bags were provided to 1055 households to store foods (rice, maize) after drying to suitability for processing or milling moisture content. Maize was shelled before hermetic packaging. For this, the project distributed 29 electric corn shellers by organizing user groups in the project communities. The project also provided education on nutrition and food hygiene to the target households.

Table 1. Summary of distribution of PICS hermetic bags, corn shellers and cotton bag to households (HH) of Banepa Municipality (BM) (formerly Ugrachandi Nala VDC).

Current ward # of BM	Former ward # Nala VDC	Total HHs	Golden 1000 Days	Sample HHs	PICS hermetic bags	Corn sheller	Cotton bag
4	4	55	12	3	440	2	3
4	5	246	43	6	2000	6	6
3	6	194	16	6	1182	5	6
3	7	210	24	6	1696	6	6
3	8	184	28	6	1400	5	6
3	9	166	23	6	1280	5	6
Total		1055	146	33	7998	29	33

In order to assess impacts of the improved method of food storage that minimizes food and nutrient losses from rice and maize, the project households were divided into intervention and control groups. Intervention groups had used hermetic bags, while the control groups used traditional method of food storage. The measurements were taken before and after the intervention from both groups of households.

4. ACHIEVEMENTS

Achievements are described by the expected results specified in the project proposal as follow:

1. 100% increase in awareness on Dry Chain concept in target groups to minimize food and nutrient loss.

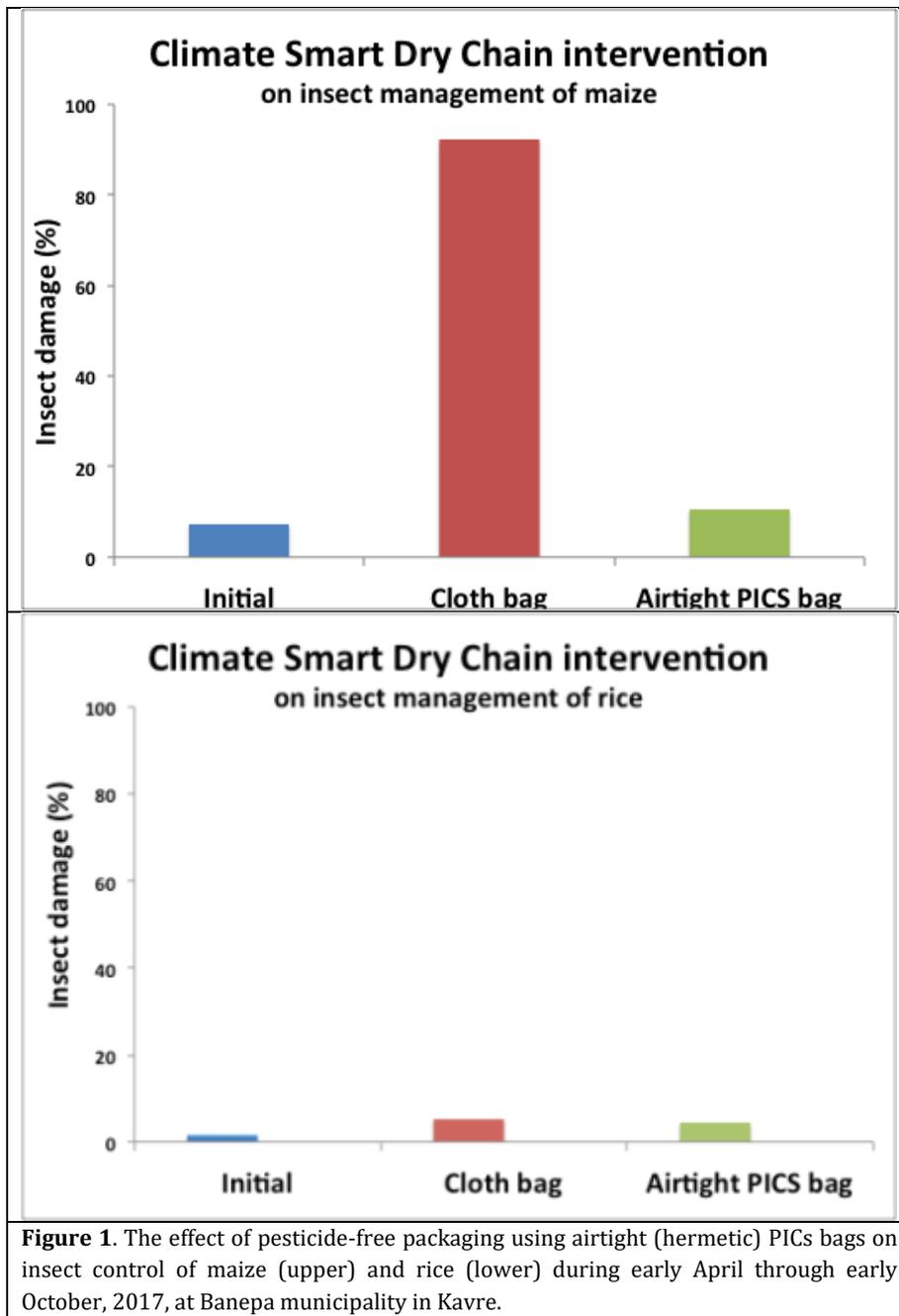
All the target households became aware about the effectiveness of Dry Chain technologies on mold and insect damage minimization on food grains. They understood and experienced the usefulness of hermetic bags in minimizing food and nutrient losses by controlling molds, insects and rodents.

2. 40% decrease on food (rice and maize) loss from molds, insects and rodents.

Insect damage

The laboratory test of stored food indicated that insect damage of maize was 71% to 99% (average 86%) in traditional storage (porous cloth bag) as opposed to 10.5% in airtight hermetic PICS bag (Fig. 1). It is noted that initial moisture content of both rice and maize in April 2017 was closer to 14% which is the processing moisture content. Maize storage insects were killed within a week of airtight packaging. FAO estimates cereal loss at 30%. Other annual global losses include 40-50% for root crops, fruits and vegetables; 20% for oilseeds, meat and dairy, and 30% for fish (9). Most cereals losses are related to insect damage.

Rice was more tolerant to insect damage than maize where losses were closer to 5%. In the intervention group households where hermetic bags were used to store food, the losses of food due to insects were completely eliminated during 6-month long storage. Likewise, rodent damage was minimum in the intervention groups as reported by the beneficiary households.



Nutrient and anti-nutrient contents

A quick look at the changes in nutrients in paddy showed decline on Vitamin B1 declined in both control and intervention samples as compared to the baseline samples. As the decline on Vitamin B1 was associated with lack of drying immediately after crop harvesting, further decline could not be arrested even by using hermetic bags. This is similar to seed germination event where a decline on seed germination cannot be arrested once germination decline begins. Drying cereals soon after harvest could arrest such declines on nutrients. Further tests should be done to confirm the changes in reducing sugars in paddy (Table 2 and 3).

Trends of Vitamin B1 loss in rice are consistent with reported decline in cereals. However, there was massive insect damage in maize making the assays biased. Efforts should be made to control the insects and estimate Vitamin quantities soon after the harvest of the food. Our intervention prevented further insect damage as compared to control samples, resulting a remarkable saving of nutrients on maize through Dry Chain intervention.

Table 2. Nutrients (Reducing sugars, Vit B1) and anti-nutrient (total aflatoxins (B1, B2, G1, G2); ranges of values inside parenthesis) of paddy during food storage at household level in Banepa, Kavre, during early April, 2017 through early October, 2017.

Nutrient/anti-nutrient parameters	Initial	Final	
		Cloth bag	PICS bag
Reducing Sugar as maltose, (%w/w)	0.382 (0.2- 0.51)	0.294 (0.15-0.43)	0.35 (0-0.71)
Vit B1 (mg/kg)	2.36 (0.84-3.53)	1.21 (0.7-1.9)	1.55 (1- 3.5)
Total aflatoxins (ppb)	12.19 (0 - 26)	20 (0.8- 93)	11 (0-43)

Table 3. Nutrients (Reducing sugars, Vit B1) and anti-nutrient (total aflatoxins (B1, B2, G1, G2); ranges of values inside parenthesis) of maize during storage at household level in Banepa, Kavre, during early April, 2017 through early October, 2017.

Nutrient/anti-nutrient parameters	Before (Cloth bag)	After	
		Cloth bag	PICS bag
Reducing sugar as maltose equivalent, (%w/w)	0.45 (0.28 - 0.74)	0.52 (0.3 - 0.86)	0.51 (0.36 - 0.76)
Vit B1 (mg/kg or PPM)	1.77 (0.54 - 3.18)	1.59 (0.7-1.9)	1.83 (1-3.5)
Total aflatoxins (ppb)	13.06 (1.09- 31.0)	13.65 (0 - 30)	13.65 (0 - 30)

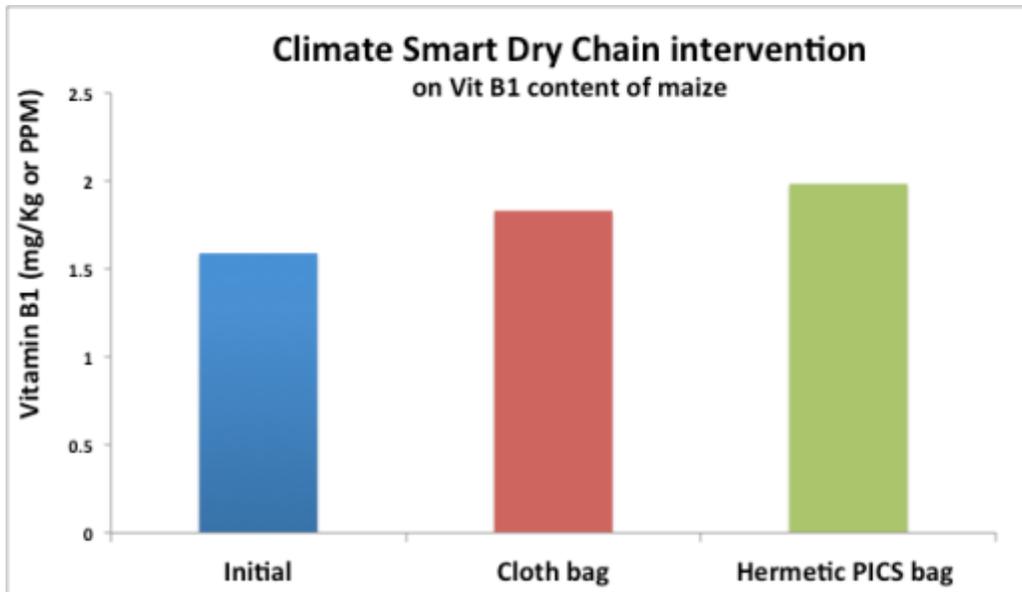
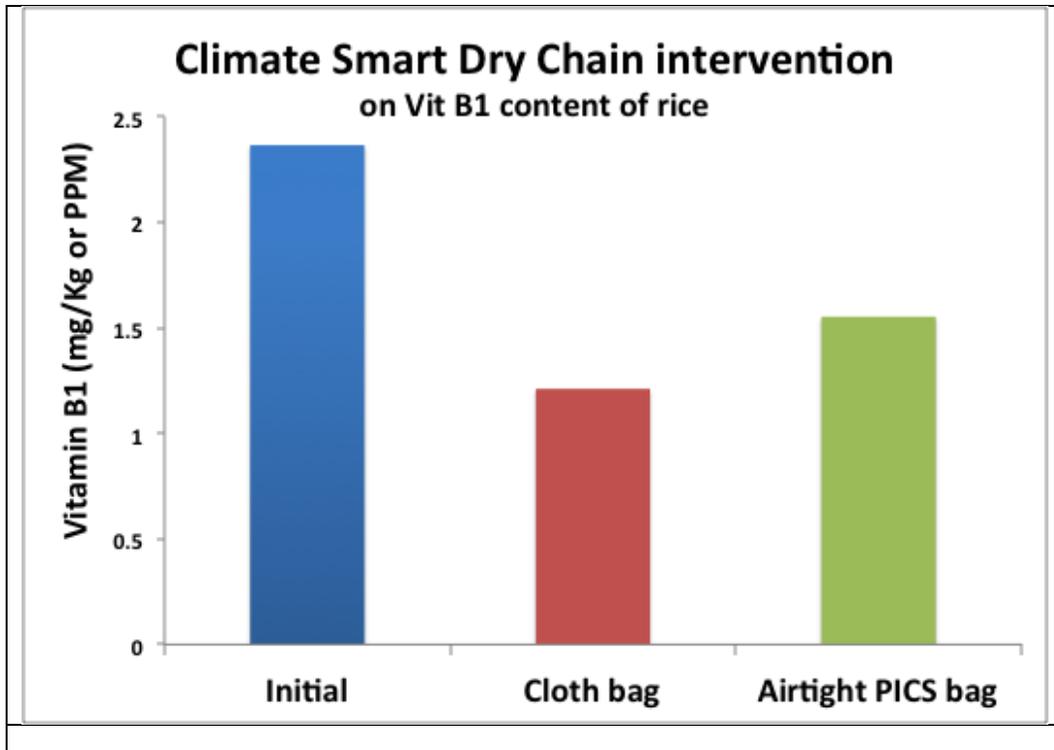


Figure 2 . Change in Vitamin B1 during storage of maize (upper) and rice (lower) at Banepa Municipality in Kavre, Nepal.

Anti-nutrients (Aflatoxins)

Laboratory tests at Zest Laboratory in Nepal detected aflatoxins in baseline samples in both maize and paddy. However, not much change was observed in 6-month samples in both intervention

(hermetic) and porous bags. This suggests that lack of rapid drying after the harvest was the main factor for the growth of toxigenic molds in baseline samples. Subsequent environment inside the house seemed to prevent further increase in the aflatoxins in the porous bags. The laboratory in Belgium could not detect AFs in the samples after 6 months of storage. However, they detected other field derived *Fusarium* mycotoxins that do not proliferate in the storage. So, these mycotoxins are not included in laboratory analysis of baseline samples in Nepal. It is difficult to ascertain why AFs were not detected at the Belgian Laboratory until we repeat the studies. Notably, AFs were detected in blood serum of both health workers and patients in Banepa in 1990. Recently, chronic AFs exposure was detected in children in nearby Bhaktapur district suggesting that there should be AFs in the food systems in Kavre too .

3. Effects on malnutrition

Expected results:

- 10% decrease on children under age five suffering from stunting in the target VDC,
- 5% decrease on children under age five suffering from wasting in the target VDC, and
- 10% decrease on children under age five suffering from underweight in the target VDC.

Changes on above indicators can only be seen in the long-term, at least 2-3 years after the project ends. However, it can be said now that the project intervention has contributed to the reduction in above malnutrition indicators.

5. CONCLUSIONS AND RECOMMENDATIONS

The project was very helpful in raising awareness among the target communities on the usefulness of hermetic bags in food storage and minimization of nutrient losses from insect and mold damages. It was evident that Dry Chain intervention using hermetic bags, especially during dry season, could protect food completely from insect damages. Collective scaling-up efforts are needed to protect foods from molds and insects damages, which are harvested especially during the rainy season. In relation to food quality, there was a clear evidence that food quality declined remarkably in traditional storage due to molds and insects infestations, but nutrient assays did not reflect nutritional differences on food items stored in traditional storage system and in airtight hermetic bags. Future studies should quantify nutrient contents soon after harvest and see the effect of climate smart dry chain intervention. However, the main quality culprit is the high moisture content of the dry foods that asks for rapid drying especially during the rainy season. The available resources in the current project were not meant to address rapid artificial drying of about 20% foods harvested during the rainy season. Concerted efforts should be made to minimize nutrient loss and molds and insect infestations using rapid drying tools and hermetic packaging (Dry Chain) to improve food quality. Only toxin-free and nutrient rich food should be used in nutrient fortification programs in MSNP_II as proposed by the Government of Nepal. As poor quality food (toxins) is often used in the feed; the toxins enter the food cycle with adverse health consequences. FCHVS realized such learning as additional health message to share with mothers and children. Large scale information dissemination through education, health and agriculture sectors will be essential to bring national awareness to improve nutrition and health.

ANNEX -1

Implementation Activities

1. Orientation meeting with district level stakeholders.

We organized the meeting with district level stakeholders on March 2, 2017 as reported in inception and mid-term reports. The orientation was delayed due to strike in the health sector and we had to organize the meeting at District Agriculture Development Office (DADO).

2. Select the project Village Development Committee (VDC) in consultation with DADO and other stakeholders.

We selected Nala VDC in Kavre based on a pre-survey of food storage problems in coordination to DADO office in Dhulikhel, Kavre. This village was endorsed at the meeting of district level stakeholders.

3. Select the target households in consultation with the VDC stakeholders.

We got connected to the Female Child Health Volunteer (FCJV) at the VDC health post. We selected 1055 households in consultation with FCHVs. We decided to limit the program to wards 4 (partial) and wards 5-9 in Nala VDC. Wards 4 and 5 of Nala VDC are in Ward 4 of Banepa municipality whereas wards 6-9 fall under ward 3 of new Banepa administrative structure.

4. Provide orientation on the pesticide-free Dry Chain technology and use of hermetic bags for food storage.

We provided orientation on the pesticide-free dry chain technology to FCHVs and convinced them on the utility of the new nutrition approach. These FCHVs were instrumental to reach out to other households in their areas.

5. Supply hermetic bags and electric corn shellers to the selected households.

We supplied hermetic bags to 1055. Furthermore, 29 electric corn shellers were also distributed by organizing user groups that were selected by FCHVs.

6. Conduct baseline study by collecting the grain samples and household information.

With the assistance of FCHVs, we surveyed the food status of the households (HH). We found out during the survey that the households had already harvested and stored the maize and rice for 6-7 month using traditional methods. We identified the HHs who had additional foods available for storage studies. A total of 33 HHs were selected, 18 HHs for maize and 15 HHs for rice. We provided porous cotton bags to selected HHs to store control samples as well.

7. Laboratory tests for nutrient and quality analysis.

One kg sample of rice/maize was collected in plastic bags with sample information in April and submitted to Zest laboratory, Balkot, Bhaktapur. Similarly, samples were collected from stored foods in both types of containers during early October, 2017. We identified Zest Laboratory for analysis of the grains samples. Initially, we had planned to use another laboratory at ICRISAT, Hyderabad in India for aflatoxin tests, but we got connected to a laboratory in Belgium through UNICEF Chief Mr. Stanley Chitekwe. We had submitted the results of the first analysis to UNICEF during August 2017. In order to have better confidence in the laboratory tests at Nepal, we verified some samples with MYTOX-SOUTH coordinator, Department of Bioanalysis, Laboratory

of Food Analysis, Campus Heymans, Faculty of Pharmaceutical Sciences, Ottergemsesteenweg 460, B-9000 Ghent, Belgium.

8. Monitoring visits twice to ensure proper use of hermetic containers and collect samples.

In contrast to proposed two monitoring visits, frequent visits were done to ensure proper use of the hermetic bags. This was essential as these PICS bags were new to most households. One of the monitoring visits by UNICEF chief and team on July 12, 2017 appreciated the ongoing program. Similarly, Dr. Krishna Belbase, former Nutrition Evaluation Specialist at UNICEF, appreciated the intervention technology during early October, 2017.

9. Conduct endline study of the sample households. We focused on 33 households that had stored foods and provided baseline samples. There was about 86% % damage of maize stored in traditional cloth bags where as hermetic PICS bags prevented further loss of quality of baseline samples. Rice was damaged to about 5% in control bags and no further visible insects damage was observed in intervention treatment (PICS bags). In the absence of the hermetic bags, the households were using pesticides to control the insects. We presented the endline survey with field level data observed during the final monitoring (Agri TV Banepa Naala Report.mp4).

10. Field level program and monitoring:

We had laid out the household level experiments in April-May, 2017 to see the effect of nutrient sensitive climate smart Dry Chain intervention on the quality of stored foods at Nala Village Development Committee (VDC) in Kavre. Soon after we started the program, elections were held under a new administrative set up. We note that the previous wards 4, 5 of Nala VDC are part of ward 4 in the newly formed administrative structure whereas older wards 6 through 9 are under ward 3 of the new Banepa municipality. We will refer to both older and new numbers while presenting information about the household level experiments. We had envisioned a quasi-experimental design due to varied nature of traditional storage structures. We noticed during monitoring that the households started using the foods from the control or baseline treatments. Thus, we stored foods in porous cloth bags for the control treatments in all households and requested them not to open until next visit. We monitored the field experiments several times including team visits in May, July and September. One of the monitoring visits included UNICEF Chief and nutrition specialist Anirudra Sharma on July 12, 2017 when UNICEF appreciated ongoing implementation of dry chain technology (**Picture 1**). We demonstrate below that hermetic packaging minimizes insect infestations as compared to traditional storage in porous bags. We also use laboratory assays to see nutrient changes in stored foods as well.



Picture 1. Field monitoring by UNICEF Chief Mr. Stanley Chitekwe and nutrition specialist Mr. Anirudra Sharma on July 12, 2017. Note that some maize was harvested even before the onset of rains and the food can be easily sun dried to processig moisture content as seen in the picture. Molds and insects proliferate while storing such dry food in traditional porous bags. The local practice is to store the foods in porous bags that allows builds up and concomitant increase in molds and insect infestations.

11. Final monitoring:

We monitored and evaluated the experiments during early October, 2017. During this time, we collected the samples for laboratory analysis as well. We invited former UNICEF evaluation specialist and current Asta Ja RDC advisor Dr. Krishna Belbase to one of these visits. Dr. Peetambar Dahal joined from California, USA as well. Others present during the final monitoring and sharing the results included Dr. Jwala Bajracharya, Hari Bhusal and Asmita Sharma. We shared the results with elected officials of Banepa municipality, representatives of District Agri Development Office and Post Harvest Directorate (PHMD) and Agri TV.

A typical experiment set up is shown in **Picture 2**:



Picture 2. A typical experiment showing food storage in porous cloth bag and hermetic bag in the house of Uddhab Bajgain (left) and Ambika Sanjel (right), Ward no 4, Banepa municipality. Note the smaller cloth bag for the controls and the triple layer hermetic PICS bags used for the intervention.

When both control and intervention treatments were open in front of the villagers, dramatic effect of the intervention was observed. It is noted that we did not inoculate any insects into the food in porous bags as is done in most laboratory experiments.

Below is documentation of sample households that shows dramatic effect of hermetic PICS bag in insect and mold control after 5 months.



Picture 3. Shyam Kaji Shrestha, Ward 4, (ward 4 old) Banepa municipality; maize in cloth bag; code 07221 (left) and in PICS bag; code 07222 (right).



Picture 4. Khil Pd Bajgain/Shubhadra Bajgai, FCHV Ward 4 new (ward 5 old) - corn in control bag; code 145221 (left) and in PICS bag; code 145222 (right)



Picture 5. Uddhav Bajgai, ward 4 new (ward 5 old) - corn in control bag (left); code 176221 and in PICS bags code 176222 (right)



Picture 6. Lal P Sapkota, ward 3 new (ward 6 old) corn in control bag (left); code 289221 and in PICS bag; code 289222 (right)



Picture 7. Ram K Parajuli, ward 3 new (ward 7 old) rice in control bag: code 589121 (left) and in PICS bag: code 589122 (right)



Picture 8. Kumar Sapkota, ward 3 new (ward 6 old) corn in control bag: code 287221 (left) and corn in PICS bag; code 287222 (right). Note the discoloration of food by heavy insect activities (left).

9.3. Sharing the knowledge of household level storage experiments with community members:

When we observed the experiments and collected the final samples for the laboratory tests, we shared the field results with the neighbors as well as with other stakeholders (**Picture 9**). Dr. Krishna Belbase, former UNICEF program evaluation specialist and current advisor of Asta Ja ICC, also accompanied the monitoring team in one of the field visits (**Picture 9**).



Picture 9. Sharing the results of storage experiments with neighbors of Khil P Bajgain/Shubhadra Bajgain, FCHV, ward 4, Banepa municipality (left). The monitoring program was also attended by Asta Ja RDC advisor and former UNICEF nutrition evaluation specialist Dr. Krishna Belbase (Far right in left figure). Similarly, result was also shared in the area of FCHV Mrs. Shanta Tamang in Ward 3 (former ward 9).

12 Deputy Mayor visits experimental sites

In order to give continuity to ongoing program through local resources, we reached out the Mayor's office in Banepa municipality. Deputy Mayor Mrs. Rekha Sapkota Dahal, Mr. Krishna Dhital, agriculture officer in the municipality and Mrs. Kamala Humagain (agriculture representative for both wards 3 and 4) visited our field experiments on October 15, 2017. Although we had not planned this outreach initially, sharing the information with newly elected representatives became essential as the organization structure of local government at the time of project implementation was changed following elections. We invited Agri TV anchorman Mr. Govind Sharma who captured the moments with Dy. Mayor and directly interacted with the households in both wards 3,4 of Banepa municipality (**Picture 10**).



Picture 10. Dy. Mayor Rekha Dahal, Mrs. Shubhadra Bajgain, FCHV and elected female representative in ward 4; Mrs. Kamal Humagain (agri technical for wards 3 and 4) look at the control experiment in the house of Uddhab Bajgain (left). Mrs Bajgain happily explains the experiments showing the difference between food stored in porous (control) and hermetic (intervention) bags (right), Dr. Jwala Bajracharya further explains the experiment to Dy Mayor (right).



Picture 11. Govind Sharma, Anchor person of Agri TV, holds a direct talk with the Mr. Lal Pd Sapkota (house hold #289) in ward 3, Banepa municipality (formerly ward 6) in the presence of Dy Mayor Mrs. Rekha Dahal (left). After observing massive insect build up in food stored in the control and complete pesticide-free control of insects in the hermetic bags, TV crew member focusses on the food stored in the porous bag (right).

13. Dissemination of knowledge through national AGri TV.

Mr. Govind Sharma, Agri TV asks Dy mayor about the usefulness of ongoing nutrition sensitive intervention experiments (**Pictures 11,12**). The first step in dissemination is sharing the information with media person. As they cover so many areas of food system, we shared the intricacies of the Dry Chain program with Agri TV.



Picture 12. Govind Sharma, Anchor person in Agri TV interacts with Deputy Mayor of Banepa Municipality about the nutrition sensitive storage experiments at the house of Mr. Lal Pd. Sapkota (HH #289) in ward # 3 (previously ward 6). Mrs. Dahal said that she also stored oilseeds in the bags provided by the project whose quality seemed better than earlier years.

14. Reaching out to Chairs in wards 3 and 4 in Banepa municipality.

We had initiated the program in wards 4 (partial) and 5-9 of Nala VDC. However, several VDCs were incorporated into one ward in the new administrative set up. Thus, we reached out to ward Chairmen of 3 and 4 who have considerable flexibility to prioritize development activities. Ward 3 Chairman Mr. Krishna Pd Dahal opined that he would like to develop programs that would attract the tourists. However, he was not aware of the food quality issues and he would support

ongoing programs if demanded by the local residents (**Picture 13**, left). It is noted that Deputy Mayor also hails from this ward 3. Ward 4 chairman Mr. Shrestha opined to support the programs partially if UNICEF-Asta Ja continue ongoing project (**Picture 13**, right).



Picture 13. We shared the results with Chairman of (left) ward 3, Krishna Pd. Dahal, third from left in the left picture, (right) ward 4, Mr. Shyam Sundar Shrestha (right).

15. Sharing knowledge with Post Harvest Management Directorate (PHMD), Dept of Agri, Ministry of Agricultural Development:

Dr. Krishna Belbase and Dr. Peetambar Dahal had previously consulted with Mrs. Sabnam Shivakoti, Chief of PHMD (www.phmd.gov.np), Dept. of Agri, Ministry of Agricultural Development. Although PHMD was involved in distribution of food storage hermetic bags in the aftermath of the earthquake, a follow up program had not been initiated due to lack of resources. Thus, we took PHMD into confidence and shared our results (**Picture 14**). Mr. Bishnu B. Adhikari is flanked by Ms. Kamala Humagain, agri representative to both wards 3 and 4 and FCHV Shubhadra Bajgain in a visit to the chairman in ward 4. Gautam Mahrajan from NAFseeds who supplied PICS Bag also attended above information sharing program on October 5, 2017.



Picture 14. Representative from PHMD joins the final monitoring and evaluation on October 15, 2017. Ms. Kamala Humagain, agri representative to both wards 3 and 4 and FCHV Shubhadra Bajgain also participated in the interaction.

16. Dissemination through national Agri TV

Our project was not limited to the households that were participants of the nutrition sensitive food storage technology. We disseminated the novel knowledge to the national audience using TV programs. Following a day-long interaction with Mr. Govind Sharma about the nutrition sensitive food storage studies on October 15, 2017, Dr. Peetambar Dahal was invited to interact to the national audience of Agri TV on October 26, 2017 (**Picture 15**). The nutrition aspect during food storage was new to Mr. Sharma that he learned during the visit to Banepa, Kavre. Thus, while introducing Dr. Dahal to the audience of Agri TV, Mr. Sharma set up the stage for a nutrition awareness dialogue. In fact, molds and insects are visible to our eyes if the infection is severe. However, a distinct third eye is needed to realize the nutrition change during food storage. For example, efforts to minimize loss of nutrients in stored foods will need to be initiated sooner after harvest when nutrients are at maximum level. Rapid drying equipment would be needed to manage food quality harvested during 3-month rainy season at Nepal. However, a climate smart nutrition sensitive dry chain approach being used in the current program would be suitable for foods harvested during 9 month-long dry season and is pre-requisite to using rapid drying and packaging for the rainy season. In both cases, drying to traditional processing or milling moisture contents before hermetic packaging is the key feature to thwart the threats of insects, molds and nutrient losses.



Picture 15 . Dr. Peetambar Dahal interacts with Mr. Govind Sharma and speaks to the national audience of Agri TV on October 26, 2017. The changes in nutrients during food storage was anew to Mr. Sharma. He learnt this issue during interaction with our group and households in Kavre. Details of the interview: <https://www.facebook.com/krishitvnepal/videos/783099208539493/>.

17. Local level conference

As proposed in the program, we organized a local level conference to disseminate the learning from the project at ward 4 in Banepa Municipality on February 18, 2018.

The program was chaired by Ms. Parbati Bajagain (Banepa-3, leader woman and FCHV) and moderated by Dr. Jwala Bajracharya. Dr. Bishnu Chapagain presented the project findings and Dr. Krishna Belbase summarized the learning from the project.

Remarks by the participants:

Bed P. Dahal:

- I like the project very much because the project talked about keeping food quality by minimizing loss that is additional information to producing mere more food. I never thought that the moldy grain is carcinogenic and can cause health problems.
- People have tendency to feed rotten and moldy grains to the animals. Now, I understand that toxins could be transferred from the animals into the food system.
- I wonder if the death of 4 cows and 2 buffaloes in my community could be due to eating moldy grains.
- The hermetic bags proved very useful to protect grains. The bags provided were not enough for me. I do not know how to procure at the local market.

Ambika Sanjel, FCHV:

- As a FCHV, I have been working with children for quite sometime. I feel that lots of children have malnutrition and I am now asking myself, “ Is this due to food quality due to improper storage?”
- We give rotten corn to animals. Now, I understand the danger.
- I buy rice. Now, I realize that it is not stored in proper bag.
- I think the airtight PICS bags distributed by the project are very good to protect the grains.
- As the project covered my ward partially, more households are inquiring about the project this year. I opine that the bags should not be provided totally FREE but on some kind of subsidy only.

Bhimsen Dahal

- Now, I am wondering why such a simple technology could not come to my place earlier. The hermetic bag is a cheap and very simple technology for grain storage.
- During the maize harvest time, the farmers are so busy and they do not pay attention to dry and store properly. So, a simple technology for drying would very good. **(We note that artificial drying to processing moisture content during rainy season is prerequisite to bagging in PICS bags).**
- I have kept all maize for human consumption inside hermetic bags. However, I am using conventional bags for animal feed. Now, I understand that moldy grains are equally dangerous to animals.

Mukunda KC (Agriculture Section, Banepa Municipality)

- Earlier I was not that much familiar about this project. Agriculture Officer of the municipality Mr Krishna Dhital used to come to this project. I am surprised after hearing so many positives about the project from the household themselves. I could not believe that a small NGO can make such impact. I really like to thank Asta-Ja RDC team and UNICEF for the support.
- I have noted down all the issues, challenges and demand of farmers. I will present to the municipality – agri section and Mayor and Dy-Mayor. There is special budget for subsidy which could be used next year. I also suggest that the local residents to talk to the respective ward offices and the ward chairs too.
- I am also a resident of Banepa Municipality. I believe that we can protect the food and nutrition and improve the health of mother and children by working together.

Dr. Krishna Belbase

- It was very good interaction program. I personally learned a lot from this interaction and the home visits a few months ago.
- My long experience working with community and developing countries tells that first we should bring awareness about the problem and then we need to execute the program. Asta-Ja and UNICEF have done very good job here in awareness and demonstration. Now it is time to go forward and use this technology.
- During the interaction many community people said, “They want more hermetic bags” but a social development organization like Asta Ja RDC cannot provide the materials always. If the community realizes the importance of the technology, then they should invest on the technology. He heard about expensive and difficult to afford and not available in village. It is better to discuss and demand from local municipality. As the Mayor/Dy Mayor or ward chairs could not participate, community should pressure them about scaling up the technology.

Ms Parbati Bajagain, session chair, **FCHV**, lead farmer, local leader

- I have been involved from the very beginning of the project. The community has learnt very important lesson from this project.
- They learnt how to keep quality of grains by protecting from insect infestation and rotting in just one year project.
- They did not realize before that milk from diseased animals could affect human and toxins from animal could be transferred to foods. They used to feed rotten and moldy feed to the animals.
- I believe that local authority should subsidize the food storage bags but **SHOULD NOT** give totally free.
- I like to thank the Asta-Ja Team and donor too for helping my community.
- I and other FCHV generally go to mothers in the community and share message on **children and reproductive health**. Now, we have a new message on **maintaining food quality and the danger of eating moldy food that affect health too**. **This should be key message to UNICEF and others.**

Some of the pictures of the program are presented below (**Picture 16**):





Picture 16. Local level conference at Banepa Municipality on February 18, 2018. Dr. Jwala Bajracharya (upper left) moderated the program to the audience (upper right). Dr. Bishnu Chapagain presented the background and finding of the project (lower left) and Dr. Krishna Belbase summarized for scaling up efforts (lower right).

18. Organize a national awareness workshop on multi-sectoral nutrition sensitive Dry Chain for the key stakeholders.

We tried to organize the national awareness workshop during August 2017. We got the feed back from UNICEF that “there are still lots of questions which we need to answer before the conference”. Although our concepts were novel, we did not have the laboratory results from the ongoing program to organize a national meeting. Coincidentally, a massive flooding hit the Terai region in Nepal where Dry Chain concepts could have minimized food safety, security and nutrition issues (13). We raised this issue in the national daily and other presentations (3-7). We asked UNICEF to communicate to Nepal Planning Commission and other agencies to integrate nutrient sensitive Dry Chain into MSNP-II (Attached). Based on above activities, we feel that we have enough data to present at the national forum. Thus, we proposed to UNICEF to facilitate such meeting on March 5, 2018 by extending the program. Dr. Dahal met UNICEF team on February 16, 2018. By this time, we had received laboratory reports from both Nepal and Belgian laboratories. It was clear that there was massive insect damage in corn stored in cloth bags that would make data about other quality parameters less informative. We noticed that that Belgian laboratory did not detect aflatoxins in the samples that were positive for aflatoxins in baseline samples tested at Zest laboratory in Nepal. However, Belgian laboratory detected other mycotoxins that were not tested in both baseline and 6 month samples in Nepal. Although massive nutrient loss due to insect damage could be the overriding message as appreciated by Vice Chancellor of Nepal Academy of Science and Technology who offered the venue to hold the conference, UNICEF advised that future efforts should be made to confirm these discrepancies. Thus, a national awareness meeting could not be organized. We consulted UNICEF to divert the resources to making YouTube from several videos captured during the implementation of the project (Email attached). As we did not hear further, we are returning Rs. 60000 allocated for this activity.