Final Report

We present the summary, laboratory analysis, monitoring and dissemination of the learning from the project.

1. Summary

Our studies utilized recent finding that high moisture is the culprit for loss in storage food quality. The current project was meant to demonstrate nutrition sensitive "Climate Smart Dry Chain" (natural drying and hermetic packaging) for foods harvested during the dry season that involved change in the tradition of packaging. The project was helpful to raise awareness among the target communities on the usefulness of Dry Chain for food storage for minimizing losses to insects and molds. The Dry Chain intervention protected the food completely from the insect damage resulting into saving nutrients.

Using FAO's data of 25% global dry food loss, annual storage cereal loss for Nepal is 3 times than the quantity imported in first 9 months in 2017. In other words, if food loss could be reduced to about 8.33%, Nepal would not need to import cereals. Implementation of Dry Chain could have protected the quality of dry foods lost to disasters like floods in August 2017. Even in flood-free mid hills, the initial quality of maize before initiating the studies had become poor due to 6 month prior traditional storage. Although we can see food quality after severe mold and insect infestation, nutrient losses cannot be visualized. Our study suggests that nutrients had already declined to low levels in baseline samples in agreement with reported nutrient loss following traditional maize storage at different elevation in Ethiopia. **Future studies should estimate the nutrients at peak quality time or the harvest time by minimizing development of insects and molds.**

Nutrient fortification program proposed by the Govt of Nepal as in MSNP II should be continued but toxin and nutrient loss minimization "Dry Chain" strategies should be implemented simultaneously. As the poor quality dry food with toxins is often used as feed, the toxins enter the "Cold Chain" food system with adverse health consequences. We have shared such **health messages** like, (i) Toxigenic and carcinogenic molds develop in the open storage of dry grains, especially corn, (ii) Animals feeding on moldy corn transmit carcinogenic toxin to milk and animal products. Climate Smart Dry Chain intervention to improve food/feed quality could be refined when assured resources are available. Collective efforts as in MSNP II are urgently needed to implement Dry Chain during the rainy season where both rapid artificial drying and hermetic packaging are needed. Interdisciplinary implementation following dissemination through education, health, food and communication sectors will be essential to improve nutrition and health of children and mothers.

2. Laboratory 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 duplicate the laboratory tests at Nepal, some samples that tested positive for aflatoxins at Nepal were sent to MYTOX-SOUTH coordinator, Department of Bioanalysis, Laboratory of Food Analysis, Campus Heymans, Faculty of Pharmaceutical Sciences, Ottergemsesteenweg 460, B-9000 Ghent, Belgium.

2.1. Physical parameters

Maize

Airtight packaging maintained initial moisture content as measured by both change in 100-grain weight (g) and moisture % (Wile 55 measurement). 100-grain weight and moisture contents were both lower in cloth bags (**Table 1**). However, we show in Fig. 1 below that there was massive insect damage that would bias moisture measurements in the cloth bags.

Table 1. Physical parameters 100-grain weight, and moisture contents (±1S.D) of **maize** food during storage at household level in wards 3, 4 of Banepa Municipality (formerly Nala VDC) during early April, 2017 through early October, 2017.

Physical parameters	Initial (N=18)	Final	
		Cloth bag (N=15)	PICS bag (N=15)
100 - grain weight (g)	33.8 ±4.30	27.2 ±5.57	33.3 ±4.07
Moisture % (Wile 55 measurement)	13.5 ±1.80	12 ±2.0	13.8 ±1.7

Paddy

The environment conditions at Banepa closely match to observed parameters in nearby Kathmandu city. Average T (23 °C) and average RH (74%) during experimental period predicts rice MC at 14.9% that is very close to observed 15% MC after 6 month storage in porous bags (Bradford et al., 2018). Moisture content is the most important parameter affecting stability of the grain during storage, (Bradford et al., 2018; McKevith, 2004) that was maintained in hermetic bags.

Airtight packaging maintained initial moisture content as measured by both change in 100-grain weight (g) and moisture % (Wile 55 measurement) in paddy as well. In contrast with maize, 100-grain weight and moisture contents tended to be higher in cloth bags as compared to airtight bags. This would be expected as grains in cloth bag absorbed moisture during the

rainy season. However, the moisture level was not much higher as the food was stored inside the houses (**Table 2**).

Table 2. Physical parameters (100-grain weight and moisture content) (± 1 S.D) of **rice** during food storage at household level in wards 3, 4 in Banepa Kavre (formerly Nala VDC) during early April, 2017 through early October, 2017.

Quality parameters	Initial (N=15)	Final	
		Cloth bag (N=13)	PICS bag (N=13)
100 - grain weight (g)	2.4 ±0.34	2.46 ±0.4	2.4 ±0.4
Moisture % (Wile 55 measurement)	14.1 ±1.54	15.08 ±1.03	13.61 ±1.73

2.2 Insect damage

Rice was more tolerant to insect damage than maize where losses were closer to 5%. In the intervention group that used hermetic bags, the food losses due to insects were **completely** eliminated during 6-month long storage **(Fig. 1**, left). Likewise, rodent damage was minimum in the intervention groups as reported by the target households.

Insect damage in maize stored for 6 months in traditional porous containers was 86% (±8.21) that was minimized by using airtight PICS bag (**Fig. 1,** right). It is noted that initial moisture content of both rice and maize before storage in April 2017 was closer to 14% which is the processing moisture content. Maize storage insects were seen suffocated and moved to the top portion inside the hermetic bag when monitored 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 (Gustavsson et al., 2011). Most cereals losses are related to insect damage (Soujanya et al., 2013).

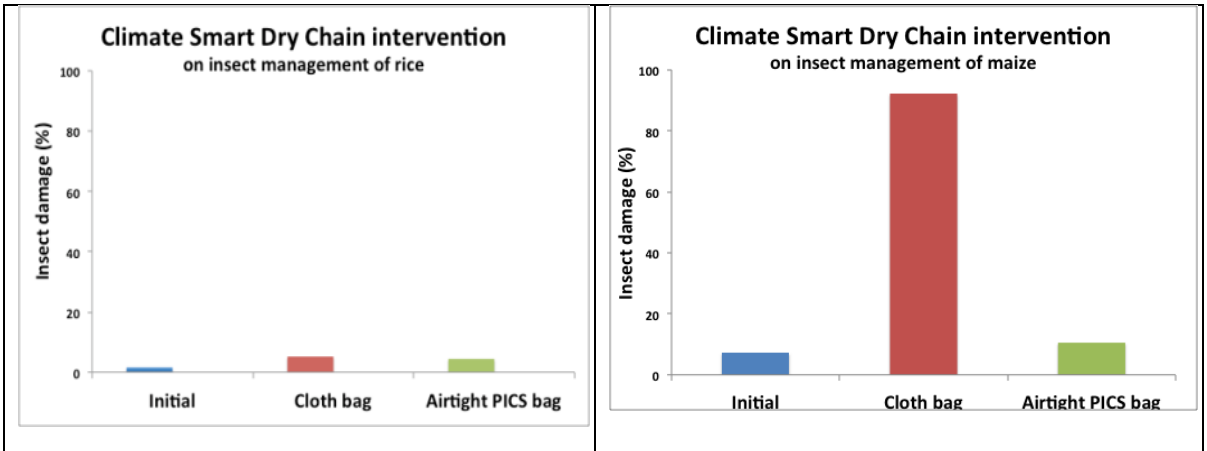

Figure 1. The effect of pesticide-free packaging using Triple layer airtight (hermetic) PICs bags on insect control of rice (left) and maize (right) during early April through early October, 2017 at Banepa Municipality in Kavre.

National perspective: We present national perspective of minimizing insect damage using nutrient sensitive dry chain intervention used at Kavre that has the potential to improve nutrition and food security in Nepal and elsewhere. We have used FAO's conservative data on postharvest loss (10) to compare with national production and import of the cereals (**Fig. 2**). In other words, if we could reduce storage loss to 8.3%, import of cereals could be avoided.

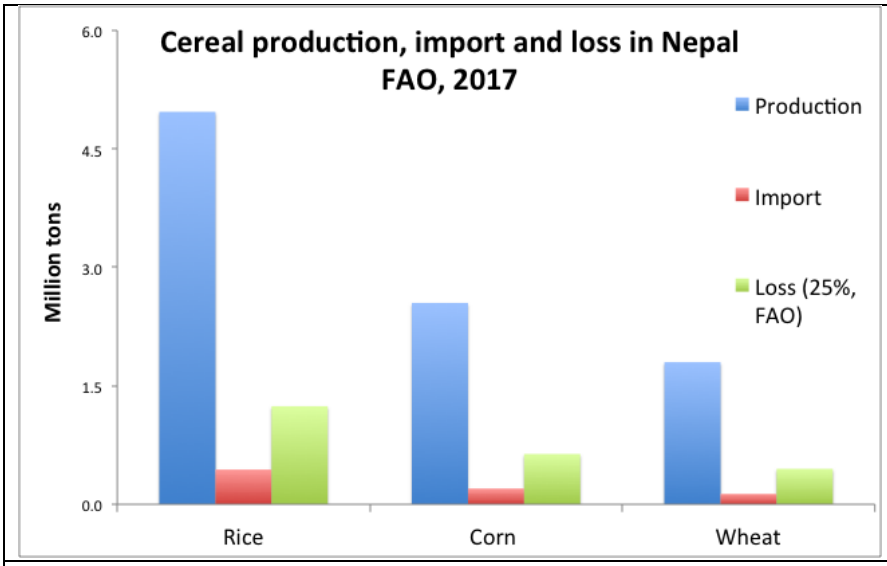

Figure 2. National perspective of minimizing post harvest losses that are mainly due to insects. Using FAO's data of 25% global loss (10), storage loss data for Nepal shows that there is 3 times more loss than cereals imported (http://www.fao.org/giews/countrybrief/country.jsp?code=NPL). Our pesticide-free dry chain intervention program during dry season could protect the food completely from the insects. Collective scaling up effort is urgently needed to protect foods harvested during the rainy season.

2.3 Nutrients

Paddy

Nutrients change in paddy shows that Vitamin B1 declined in both control and intervention samples after 6 months as compared to the baseline samples indicating further decline in Vitamin B1 could not be arrested by using hermetic bags (**Table 3**). This phenomenon is similar to seed germination event when the decline cannot be arrested after the initiation of loss in seed vigor. **Drying sooner after harvest could have arrested the decline in Vitamin B1 contents**. Trends of Vitamin B1 loss in rice are consistent with reported decline in cereals. Nutrients like Vit B1 contents decreased by 16.7%, 17.2% and 21.4% respectively in wheat, maize and rice at 25 °C. Other nutrients like amino acid lysine decreased by 6.5% in wheat, 14.3% in maize and 23.7% in rice at 25 C during 6 month long storage. About 20% decline in protein nutrient was observed under natural storage conditions (Garbaba et al., 2017).

Reducing sugars are indicators of food quality in high moisture foods like juices, wines and sugarcane. In low moisture products like seeds, a negative correlation has been reported between reducing sugars and quality parameters as well (Cao et al., 2008). Rice reducing sugars were similar to baseline samples in both porous and hermetic bags at six months. It is noted that rice

was stored by the traditional methods before the baseline samples were monitored. There was a decrease of total soluble sugars by 36-44% at 45 °C but these sugars increased upto 31.8% at 25 °C. No significant changes in the **nutritional** quality were observed during storage of cereal grains at temperatures less than 20°C and moisture of **stored** product up to 14% (Rehman et al. 2006). Clearly, these experiments were performed in controlled laboratory set up and temperature can not be regulated in the storage of foods in low income settings. Initial drying at harvest could have revealed more differences in reducing sugars of rice in porous and hermetic containers (**Table 3**).

Table 3. Nutrients (Reducing sugars, Vit B1) and anti-nutrient (total aflatoxins (B1, B2, G1, G2) (± 1 S.D) of paddy during food storage at household level in in Banepa, Kavre during early April, 2017 through early October, 2017.

Nutrient/anti-nutrient parameters	Initial (N=15)	Final	
		Cloth bag (N=13)	PICS bag (N=13)
Reducing sugar, maltose, (%w/w)	0.382 ±0.08	0.294 ±0.09	0.35 ±0.14
Vit B1 (mg/kg or ppm)	2.36 ±0.09	1.21 ±0.37	1.55 ±0.56
Total aflatoxins (ppb)	12.19 ±7.75	20 ±25.8	11 ±7.93

Maize

Vit B1 observed in baseline samples was within the range observed for maize cultivars (Dun et al., 2014). The hermetic bags seemed to maintain reducing sugar levels of baseline samples. We documented in **Fig. 1** above that an average of 86% insect damage occured in traditional storage bags during 6 month storage. Thus, any exptrapolation on nutrients change in maize stored in porous bags would not be accurate (**Table 4**). Efforts should rather be made to control the insects and estimate nutrients quantities soon after the harvest of the food. Our intervention prevented further insect damage as compared to control samples. Clearly, this was dramatic saving of nutrients in maize following the intervention.

Table 4. Nutrients (Reducing sugars, Vit B1) and anti-nutrient (total aflatoxins (B1, B2, G1, G2) (± 1 S.D) of maize during storage at household level in Banepa, Kavre during early April, 2017 through early October, 2017.

Nutrient/anti-nutrient parameters	Initial (N=18)	Final	
		Cloth bag (N=15)	PICS bag (N=15)
Reducing sugar as maltose equivalent, (%w/w)	0.45 ±0.11	0.52 ±/0.13	0.51 ± 0.11
Vit B1 (mg/kg or PPM)	1.77 ±0.72	1.59 ±0.67	1.83 ±0.53
Total aflatoxins (ppb)	13.06 ±12.14	13.65 ±11.8	13.65 ±12.63

2.4 Anti-nutrients (mycotoxins)

Laboratory tests at Zest Laboratory in Nepal detected total aflatoxins in baseline samples in both maize and paddy. There was a wide distribution of AFs as indicated by high standard

deviation values (**Tables 2, 4**). About 13% and 86% of rice samples had total AFs higher than 20 ppb and less than 20 ppb respectively. Similarly, 27% of maize samples had AFs between 20-30ppb. Rest of maize samples had AFs lower than 20 ppb. However, not much change was observed in 6-month stored samples in both intervention (hermetic) and porous bags. This suggests that toxigenic molds were either derived from the field or developed in the storage in baseline samples. It has been long known that *Aspergillu*s and *Penicillium* sp. mostly proliferate in the storage under high humidity and T conditions. Clearly, the environment inside the house seemed to prevent further increase in the aflatoxins even in porous bags in the next rainy season. However, we could not detect AFs in 6 month stored samples using LC MS/MS equipment at Belgium where other field derived *Fusarium* related mycotoxins were rather detected. We did not test Fusarium related mycotoxin in the baseline samples at Zest Lab in Nepal due to lack of resources. It is difficult to ascertain discrepancies of the results between two laboratories until we repeat the studies. Recently, AF was detected in blood serum of children in nearby Bhaktapur district (Mitchel et a., 2017). Prevalence of AFs in Nepalese maize system has been recently reviewed (Pokhrel, 2016)**).**

3. Field monitoring:

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 nutrition sensitive dry chain technology (**Picture 1**). We demonstrate below that hermetic packaging at the processing moisture content minimizes insect infestations as compared to traditional storage in porous bags. We also use laboratory assays to see nutrient changes in stored maize and rice..

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.

Final monitoring

We reported initial monitoring in the inception reports. We monitored and evaluated the experiments in the final visit 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 evaluate the program. 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. There was about 7% insect damage in the baseline samples. Thus, the insects proliferated during the storage in the porous cloth bags and the damage reached to 71%-99%. However, the corn stored in triple layer hermetic PICS bags suffered damage to about 10% only. The slight increase in damage could be due to the time required for insect control within the hermetic bags.

Below is documentation of sample households that shows dramatic effect of hermetic PICS bag in insect and mold control after 6 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).

P**icture 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).

4. Dissemination

4.1 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 muncipality (left).The monitoring program was also attended by Asta Ja RDC advisor and former UNICEF nutrion 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).

4.2 Deputy Mayor visits experimental sites with Agri TV

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 technicial 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).

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.

4.3 Chairmen 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).

4.4 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 joined 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.

4.5 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 his 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 in 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/.

4.6 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).

4.7. National awareness conference

We tried to organize a national awareness workshop during August 2017. 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 (UNICEF, 2017) where Dry Chain concepts could have minimized food safety, security and nutrition issues. We raised this issue in the national daily and other presentations (Dahal et al. 2017, Dahal, 2017). Vice Chancellor of Nepal Academy of Science and Technology realized massive nutrient saved through intervention and offered TV and the venue to hold the conference. We hope to get discern the discrepancies between laboratories before holding the national conference.

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