



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

Aquaculture and Horticulture: Pathways to improved income, diet diversity, and nutrition

Webinar Transcript

Hannah J. Koehn

Good morning, good afternoon, good evening. Thank you all for joining today for the first Innovation Lab for Nutrition webinar. My name is Hannah J. Koehn, and I'm going to be your MC today. As more attendees are joining the webinar, I will begin by going over some of the housekeeping, and then I'll introduce our moderator, Dr. Shibani Ghosh. I would like to direct all the attendees to a few functions on the Zoom call. At the bottom of your screen, you should see a chat icon and a Q&A icon. Please use the chat feature to engage in relevant conversation with the other attendees. You can also bring up anything you'd like for me to address or respond to, but please do keep all comments appropriate. If you have a question for one of the panelists, please use the Q&A feature. We have allotted the final 15 minutes of this webinar for the Q&A, at which point the panelists will respond to as many of the remaining questions from the audience as they can. We will not use the 'raise hand' feature on this webinar. I will repeat these technical housekeeping items in the chat throughout the webinar as people may be joining in at later times. Thank you again for joining us today. And now, I would like to introduce our moderator, Dr. Shibani Ghosh, who is the Associate Director of the Feed the Future Innovation Lab for Nutrition. Dr. Ghosh, over to you. Dr. Ghosh, you're on mute.

Shibani Ghosh

This is typical on Zoom. Good morning, afternoon, evening everybody. I am excited to welcome you all to the first of a series of webinars that are going to be... excuse me... held by the Nutrition Innovation Lab. And please keep an eye out for other webinars that will be coming your way. But before I go on, let me just share my screen... Hannah just to confirm you're seeing the screen. Perfect, thank you. So, the

first of our webinars is going to be on Aquaculture and Horticulture Pathways to Improve Income, Diet Diversity and Nutrition. But before we jump into that, let me just give you a little bit of a background. The Nutrition Innovation Lab is a USAID program that is supported by the USAID Bureau for Resilience and Food Security. And it is one of over 20 Innovation Labs that work across the globe, focusing on research and capacity building. The mandate of our lab is to focus on doing research and capacity-building in the areas of agriculture, nutrition, and health. And as you can see from this map, we are active in over 10 countries in sub-Saharan Africa and South Asia. We have a series of global and local partners. Our core partners in the United States are Purdue University, Harvard School of Public Health, Johns Hopkins, Tuskegee, along with University of Georgia, Georgia State, Cornell. In terms of the seminar itself in order of business, this was just my brief introduction, because we have very little time. We want to make sure we give time to our speakers to talk about our work in Bangladesh, and first is going to be Patrick Webb, who is going to be talking about the research project itself and the findings. Patrick is the director of the Nutrition Innovation Lab. He will be followed by Robin Shrestha, who will be presenting findings on the cost-effectiveness of a specific sub-study that was done on innovative value chain technologies within our Bangladesh project. And then, we will return back to Patrick Webb, who will present the preliminary findings on food safety concerns and demand for processed packaged foods. As Hannah has already mentioned, we will have a Q&A, which will be moderated by Hannah. We hope to have the last 15 minutes of this hour for the Q&A, and I'm going to hand over to Patrick. The floor is yours.

Patrick Webb

Thank you. So, Shibani, so you are stopping sharing your screen, I will share mine. Good day everyone. I trust that everyone is safe and well, wherever you are in the world. We have great pleasure in starting this series of seminars/webinars that are intended to share both published and preliminary findings from work across the world, in which the Nutrition Innovation Lab has been working with so many important partners to further understanding of key issues that relate to the linkages between agriculture, primarily agriculture and nutrition. Now I am having some trouble...I'm going to now to share my screen, I hope. Yes, is everyone seeing that now?

Hannah J. Koehn

Yes, it's okay.

Patrick Webb

Okay. So, the point of this particular research, I'm not... because of constraints of time and potentially of interest, this isn't going to be conventional academic presentations with lots of emphasis on methodology and sampling, and so on. We are more than happy to engage with interested people on the details of the modeling, the sampling, and so on. I am going to really focus on the bigger pictures to the extent that I can. And there's really a fundamental element of this particular research from relating to Bangladesh. One is ... relates to the combined benefits. What we're trying to understand is when seeking to improve the diet and therefore the health and nutrition of smallholder farmers and consumers in rural areas who don't necessarily produce these foods, they get them from the market, if one promotes aquaculture that in theory can put many more fish, and shrimp, and other aquatic products into the market or into the diet, horticulture can do the same for fruits and veg. But what do you get? Do you get additive combined benefits of seeking to promote health in the same farm, but also into the same markets? So, combined benefits in relation to nutrient-rich foods. Actually at the same time, this was a reflection of combined benefits of joint activity. This was funded both from the Washington USAID resources, but also from Bangladesh mission, combining their interests, and this activity was very much in collaboration not just with the partners of the Nutrition Innovation Lab, but also the Horticulture Innovation Lab, and also World Fish in the early days. So, UC Davis and Helen Keller, and others and academic institutions in Bangladesh very much involved. UC Davis was particularly focused in that second question around the costs and constraints relating to uptake, and scaling, and profitability of various value chain technologies, innovations aimed at improving... reducing the perishability, and improving the net returns from nutrient-rich foods, be they on the fish-side or the horticulture-side. I am actually not going to spend much time at all on the food safety and the process package foods questions. We have so much more that we can talk about. That will have to be for another day. The research approach... this is based on a panel survey... repeat panel of the same + 3000 households. This is in the Southwest of Bangladesh, in the zone of influence of Feed the Future. And the same households were visited three times in the same period... no twice in the same period: one in the off-season over two years ... a range of structured questionnaire surveys relating to all aspects of production, to market into consumption. Not every household was involved in all aspects of either aquaculture or horticulture. And I think it's important that I emphasize that this is not intended to be a conventional impact evaluation of any one kind of project. What you see in Bangladesh, but certainly in many countries around the world these days, is a multiplication... multiplicity of similar, but rarely the same types of interventions, sometimes in overlapping geographies, sometimes in overlapping households, but not always. And teasing out the specific impacts of one intervention when others are

happening nearby is quite challenging, of course. And in Bangladesh, in this zone of influence, which is where the colors are, at the union level, which is where the smallest administrative area, one could have no projects working in either aquaculture or horticulture, up to four sometimes more activities in aquaculture and/or horticulture. So, I won't go much further than that other than saying what we were looking at was taking a sample frame that was based on the 2011 pre-baseline survey for that region. We went to the same unions, the same communities, not the same households necessarily. So, we could compare conditions five years later from that baseline in 2011. But what we did was look at which households were exposed or engaged in 0, 1 or lower activities ... program activities that related to agriculture, through aquaculture and/or horticulture. So, I am not going to spend any more time on details, because each activity, be it focused by IAI, FAO, SEEP, SPRING, and so on, had different dimensions. But they were all seeking to promote enhanced farm diversity of horticulture and aquaculture products, and then see what happens next. So, I am going to dive straight in to some of the findings, again not going to dwell on the methods. What we did was repeat sample of those 3,000 households, looked at change over time, compared those households that had zero exposure to these various programs versus multiple exposures, and so on. And these are the results through econometric modeling. So, and I am going to go through this quite quickly to simply develop the narrative, the story of what we what we found ... what we seem to be finding. Those...the blue lines... those who had exposure to USAID programs of some kind, the blue, be it in aquaculture on the one hand or horticulture on the other hand, had more diversity of the crops or the fish species that were ... that are common in those areas. So, being exposed to the programs meant that those households either produced more horticultural products, more diversity of those products, orange fresh sweet potato, for example, and then on the aquaculture rather than just produce carp let's say, also produced mola, small fish, and or crayfish, and or other diversity. And what you saw linked directly to that was the more... diversity of the types of property farmed in those households was associated statistically significantly with higher *net* income. And I emphasize the word '*net*' not just increased income, but increased profit from taking into account inputs. So, that's what we see. That's what we want to see in this kind of broad intervention space. Now so, the households ... most engaged... most exposed to the programs, especially to multiple US programs, had more production diversity, they had more net income, and that was associated with higher or an increase, a change in household expenditure, both total household expenditure, and total household food expenditure. Significantly and while we all know that poverty is associated with high spending on food, and we actually want to reduce total spending on food as a share of total food expenditure, what we want to see actually is that that food expenditure gets shifted towards nutrient-rich foods away from starchy staples and the basic grains. So, we're seeing that net profitability, the net income from agriculture, being associated with more spending... more spending on

food. And that seems to be having the effect that was desired. In those same households, whether it's at household level, the child level, these households were selected to have a child under five at baseline, and or the female caregiver, usually the mother, what we're seeing is that those households engaged in both agriculture and horticulture right. Sometimes it was a pond and a garden separately. Sometimes it was a pond with a garden growing around the edges of the pond. Sometimes hanging over right, but trying to amplify the effects of agriculture in limited space, but those households we saw an improvement in diet diversity at the household level, the adult female level, and the child level. Part of that is therefore coming from own production and part of it is likely to be coming from food purchases from the higher food expenditure. One of the things you'd want to see is because... is more intake of animal source foods... let's say from young children, this is in children under two years old to 24 months across the three broad districts and it differs by district, but overall... over the period of the three rounds of this particular survey, we did see quite a significant... quite a big increase in fish intake in children. And that was from a baseline where the original aquaculture programs were largely focused on large fish, carp and others, destined for the market, and the shift towards diversification in agriculture does seem to have resulted in fish intake by children involved in those households. We also though saw increased fish intake among those non-producing households. So, they're getting it from the market. And what the additive, the combined effect was not just combining horticulture and agriculture. Those households exposed to multiple kinds of USAID programs that related in one way or another to these farm diversification activities, we see small fish... small fish, they're the nutrient... they're even more nutrient-dense ones, more likely to be consumed at home, quite a strong increase there... multiple exposure to programs in terms of small fish consumption over those three years by children and adult caregivers in those same households. The reference in each of these cases being not exposed to any of these particular programs. But it's not just about fish right. So, we would like to see increase in all kinds of nutrients-rich foods and in the third wave...so, the red is the first round, green the second round, purple the third round in the same households, and so, we are seeing ... the data are converging and telling the same story that home production is more diverse, spending on food is more diverse, intake is more diverse. So, across these food groups, we're seeing increased intake, which is what you want to see. It includes the staple, grains, roots, and tubers, fish yes. There was also increase in meat, eggs, dairy, fruits, and vegetables, yes. We saw that increase. So, what is happening over time, including non-producers in this case, right this is across the 3,000 households. So, there's more in the market. So, non-producers are getting access to products and we're seeing intake increase. The one negative is the red circle that I've put across the top there other; oils, snacks, sweets, processed packaged foods, sugar sweetened beverages. I am not going to dwell on that. For lack of time, we may have a separate seminar later in the year on this, but what we are seeing in addition to more purchase and intake of nutrient-rich

foods, we're seeing an increased purchase and intake of processed packaged foods, sugar sweetened beverages, and other products that maybe we should be a little concerned about. These are in rural quite remote markets not just urban areas. If you have questions about that we can certainly ... Well animal source foods are not just fish, as I mentioned, it is fish, meat, eggs, dairy. What we were able to do because of the three rounds was to take a look at recent work that was done by Derek Headey, which was looking at Demographic and Health Survey data across the world. Derek Headey and others showed that animal source foods were associated with reduced stunting and improved linear growth in association a cross-sectional way, but they also found that two different kinds of animal source foods in the diet had a much stronger effect than just one. Now we found that in two ways: 1) first, that children consuming two different types of animal source food in the previous hours had significantly less stunting and higher length-for-age z scores, that was yesterday the previous 24 hours. 2) But we were also able to show that doing that six months prior, so the continuity of diversity in the diet and quality of the diet over time matters. Right, it's not just the immediate hours. Growth is a cumulative thing that happens over time. So, to improve quality of diet, you want that diet quality and diversity to improve over time as well. And we're seeing that. We're seeing that animal source foods agnostic to the type of food yesterday and six months ago was associated with stunting and better animal growth... better child growth. So, the summary slide here. Again, we did not include the type of program that included various elements of promotion of aquaculture or horticulture. Some included WASH activities, some promoted market access and literacy, some had SBCC, but exposure to more programs relating to these different elements did. And everything here is statistically significant across these three rounds – 3,000 households - did increase the diversity of farm production, which, led to market engagement, which means more sale of those products, but at the same time was associated with higher dietary diversity at all the levels: household, mother, and child. Very significant, that market engagement was associated with income growth: so profitability from sales net, but also net food expenditure and so part of that improved diversity was coming from home production, but part of it was from the market. And we particularly were pleased to see that there was small fish, fruit, veg, and animal source food intake increases across the board, and we were able to [] that with a reduced likelihood of reduced risk of stunting, especially when we were looking at dairy, meat, and eggs, obviously fish as well, when you control for potential confounders of wealth, education, water, and so on. So, this is actually very strong and very good to see. This is strong evidence not that the perfect project by design results in the kind of behavior...the kind of outcomes you want to see, but exposure by households and uptake of a variety of resources from information and services and inputs can result in improved agricultural production and productivity that results in the win we want to see, which is improved diet and child health. So, findings so far. Positive multipliers from these combined concentrated investments by geography and over time. I

emphasize that kind these elements don't happen quickly, these combinations need to reinforce each other by geography and time. So, we have to think about: Do we seek to expand coverage by separating all projects or do we seek to enhance and aggregate the effects by at least allowing some overlap over time? SBCC: we did see that through information I didn't present on this, but promotion of orange, fresh sweet potato, but also promotion of small fish intake by children, as well as dairy, does seem to have had some contribution to enhancing diets. There's much more to be done on that. I have to emphasize, of course, horticulture products are... were are common across Bangladesh, aquaculture is not because aquaculture ... pond aquaculture requires a pond and good management. And those most successful households in agriculture were more educated, had more income to invest, they were less poor, they had more labor, and they were self-training, they had access to a Tuk-Tuk or a motorbike or a truck to sell their products at more distant markets, not at the farm gate to get more income that requires information flows and so on. That said, I think we can say already that farm diversification through a variety of mechanisms can impact stunting with access to markets, right. There's been some literature recently suggesting that farm diversification will only impact stunting, where you are not actually... you have little access to markets. What we're finding actually in this case is the opposite, where with access to markets, you are seeing important gains. So, I am going to stop there, hand over to Dr. Shrestha to talk about supply chain technologies that were tested in the context of this study, but in a small sub-sample of households in this same region. So, I'll take it over to you Robin.

[Robin Shrestha](#)

Thank you Patrick. I've got to stop sharing my... yeah Hannah, is it working the sharing of screen?

[Hannah J. Koehn](#)

Yes.

[Robin Shrestha](#)

Okay, good morning, good afternoon everyone. I am Robin Shrestha, Regional Project Coordinator for the Nutrition Innovation Lab, and as Patrick mentioned in his earlier slides, pilot research was embedded within the larger panel survey, with an aim to understand the cost-effectiveness of [] scaling and profitability of three supplies and technologies in rural Bangladesh. So, in my next few slides, I'll be presenting some of the key findings from this pilot research. The sub study was implemented in collaboration with the Horticulture Innovation Lab at UC Davis and partners in Bangladesh, such as

[BEU], Patuakhali Science and Technology University to understand the cost-effectiveness and adoption of technologies, to improve access to higher quality diet in rural Bangladeshi households. Three technologies, floating gardens on small holder fish ponds, coolbot cool rooms, and UC Davis chimney dryers were tested in 107 participating household in southwestern Bangladesh. Data was collected on technology implementation and utilization on a bi-weekly basis over the project period, and a cost benefit analysis was done using a land use system approach, also known as LUS, that used field label data as well as historic market price data to predict future prices. Our net present values were calculated using difference in discounted inputs and outputs, and were analyzed ... and were used to analyze profitability of the technologies. So, the first technology tested was the UC Davis chimney dryer, which is an improved solar drying method for horticulture and aquaculture products. The key feature of the dryer is a clear plastic tunnel with the products located in the top of the tunnel and a chimney at one end to draw over the product, as shown in the animated figure here. The tunnel increases solar energy collection when the sun is low, usually in the mornings and evenings, and the food products at the top places them in the warmest air and concentrates air flow around the drying product. And that provides the higher velocity and increases the speed of drying. So, in total three dryers were set up in three sub-districts of body cell division. One was used for drying fish, while the other two were used for drying vegetables and fruits. The establishment cost for each dryer was about 138 USD, and the maintenance and operations cost was about 64 USD on average per year. And these costs were covered by the project. In total, 48 farmers and local traders were trained on construction maintenance of the dryer, and processing and packaging of the dried commodities. The dryers were in full operation for about four to eight months per year. The chimney dryer's effect on quality of dried products was compared to the traditional open sun drying method by colleagues at the Bangladesh Agriculture University, and drying time for products like carrots and fish were tested in the chimney dryer. And they found that about one-third time was reduced as compared to the traditional sun drying, and that was mostly due to the lower relative humidity and increased moisture loss. Weight loss was minimal even after storing the dried products for over two months, and the products had better visual quality as shown on the figure here on your right. One key finding in terms of improved food safety practice was that the farmers who were previously used to washing the fish in chemical water prior to drying, which is quite a common practice in Bangladesh, stopped doing so once they started using the chimney dryers, and other beneficial consequences were that the flies and other insects could no longer smell the drying product, and this greatly reduced the risk of contamination. A cost-benefits analysis using LUS data was conducted jointly with the UC Davis team, and as shown in the figure here, the dryers in Srirampur and Parehat sub-districts saw positive benefits starting on from the second year of the project, and would have recovered the capital cost in almost about three-years' time, while the one in Bagherpara, shown in

the gray line, didn't perform well economically. The analysis suggested a relatively low startup cost of the dryer, and a larger gain in value for dried products as key factors for its profitability. So, for example the dryers in Srirampur dried pulses, groundnuts, and chilies; and the dryer in Parehat dried fish that have larger gain in value due to drying. And although the dryer in Bagherpara was being used for a maximum amount of time and dry diverse list of products, the value added to the dried product was not sufficient to offset the loss in weight from drying. Market access was key as participants in Bagherpara and Srirampur were mostly traders and had better market knowledge and access to a market for sales, compared to the farmers in Bagherpara. So, after seeing the benefits of the dryer, the participants engaged in fish trading, also called for scaling up the dryers with larger commercial chimney dryers. However this meant a higher establishment cost for households and only limited households in Bangladesh have that economic capacity to build larger dryers. The next technology that was tested was the coolbot cold rooms, which is an affordable alternative method for small-scale cold storage. Although refrigeration in Bangladesh is available, they are largely focused on roots and tubers, such as potatoes. The introduction of cold rooms allowed the storage of fruits and vegetables, and extended their shelf-life, and increased their availability for consumption and sales, and also allowed farmers to store their products and sell them when the market was most favorable, rather than having to sell them immediately after harvest and whatever price they were offered. So, in total three cold rooms were set up in three sub-districts of Barisal division. The establishment cost was high, about 13,000 USD, and this did not account for the cost of the land, where they were set up. The operations and maintenance costs on an average was around 278 USD per year, and these costs were all covered by the project again. The lab team engaged 34 participants, mostly farmers, in building these cold rooms, so they could understand more about the insulation and cooling process and how the technology works. Post-harvest training and refreshers were provided on cold room management, effects of temperature, and relative humidity during storage of different types of horticulture products. The cold room was in operation for around three to eight months per year, and one key finding from this research on cold rooms was the low capacity utilization of all three coolers. The cold room has a capacity of around 31 kilograms per week... that can store about 31,000 kilograms per week, but only about 2 to 7 percent of its total capacity was utilized throughout the project period, and potential reasons for this was that the cold rooms were farther away from the market, and that the farmers and producers had inadequate technical knowledge on what products to store and for how long. Similar to the UCD chimney dryers, the Hort. Lab and its partners also tested the effect of cooling methods on stored communities, and compared them to the products stored in ambient temperature, as shown by the green line T3 in the figure on your right. T1 are products stored in cold room with plastic wrapping, whereas T2 are those stored in

cold room, but without the plastic wrapping. After more than four weeks of storage, weight loss was significantly less in commodities like apples **[sound lost]**

Hannah J. Koehn

Robin, it seems that your connection has been paused. Could you please repeat the past 10 seconds or so?

Robin Shrestha

Oh, the same slide you mean?

Hannah J. Koehn

Yes

Robin Shrestha

So, let me go through the slide again.

Hannah J. Koehn

Robin I am sorry. It seems that your connection has been paused again. We're going to give just a moment for Robin... Dr. Shrestha's presentation to begin again. Just as a reminder, you can use the Q&A feature to ask any questions to the panelists. We will allot the last 15 minutes of this webinar to answer some of those questions Dr. Webb is responding to some of those questions inside the chat, but if you ask them inside the Q&A feature, we'll also respond to them live at the end. Dr. Shrestha, could you see if your video is working again?

Patrick Webb

If not, maybe I would just carry on from where he left off.

Hannah J. Koehn

Yes Dr. Webb, that sounds good. It looks like Dr. Shrestha's connection might have been lost.

Patrick Webb

Then I will endeavor to do his work some justice. You are now seeing the shared screen?

Hannah J. Koehn

Yes your screen is being shared, thank you.

Patrick Webb

So, apologies for the technical difficulties there. I won't spend any more time. Just what Dr. Shrestha was pointing out that one of the key elements of improving... well several key elements to improving the value of perishable products is to reduce weight loss, but it's...but it's also to preserve in a sense... preserve products, reduce weight loss, preserving firmness, which is very important for visual quality. Very important is reduced need for insecticide or any other chemical contaminants. And as I said, I am not going to go into consumer perceptions of food safety issues, but they are very serious and growing, not just in Bangladesh, but in many other parts of the world. Concerns about insecticides, herbicides, formaldehyde, and other chemical contaminants is quite a significant new dimension of food security that needs to be taken into account. And consumer versus producer's perceptions of those are important. So, just to finalize what Robin was talking about was the economic assessment, these cool rooms... coolbots have a lot of value, because clearly they reduce perishability, and off-season when there's rain and high temperature and humidity, they can play a role. But in this instance, in this context their startup costs are very significant, and because of limited understanding and prior engagement with these kind of technologies, in this instance their capacity use was very low, and as a result of that with low capacity, you could not make it profitable. You would absolutely need + 50 percent capacity utilization throughout to make it an economically viable proposition. For that, we had a fairly clear sense that market access once again is an important driver of that. And most of these value chain innovations were focused on the communities themselves, close to the farmer. Something like this may need to be actually close to marketplaces and managed through a different kind of business model. That's something to be explored. The third activity not entirely novel - floating gardens have been around in Bangladesh in various forms, traditional hyacinth based and vine based floating gardens for some time, this third activity - floating gardens - was generating new types of floating gardens that literally, as you can see they float, using a coconut coil medium... growing medium, that would require no chemicals, no insecticides... could be used to produce whatever the farmer wanted , vegetables seedlings, fruits, herbs

on ponds... a different approach... one additional approach to combining aquaculture with horticulture. This was tried with about 40 farmers, it was about 120 USD to set up one of these floating gardens with some maintenance... not insignificant. That said, although relatively low startup cost was, it was more or less feasible however again market conditions... what farmers chose to grow was not necessarily what had most market demand. Certain herbs would probably have been preferable to certain vegetables to be able to generate profit. So, the maintenance and the low prices derived did not allow for profit, *and* in this instance during the rainy season, that particular medium got waterlogged, and didn't allow for year-round use. So, there were some issues with the technology itself, but many lessons learned. So, the takeaways from Robin's work with UC Davis and the Hort. Lab, technologies... we have to keep trying. We have to work with local academic and non-academic commercial partners to test different types of innovations, in this case the chimney dryer showed not just most promise in terms of adoption, and scaling, and profitability, but in terms of excitement by the farmers themselves. And while they were originally designed for drying fruits and veg, and they certainly do that, they were quickly used for drying fish and shrimp because of higher potential profitability. If you don't dry them in the sun fewer flies fly and fewer degradation less degradation, but scale was an issue. All the farmers, all the communities involved said *'these are great, but we want them to be ten times bigger'*. Right, these were designed to be quite small for small groups of farmers, but there was an immediate reaction: *'No, for this to work it has to be at a larger scale of technology'*. So, many insights, many things to explore further in this domain. Final thoughts overall, not just from the technology innovations. But so, investments in agriculture. Yes, they still matter. The idea that we're just exploring these issues ... we're far from that ... we are we're now seeing an exponential rise in. solid empirical rigorous studies that document how different investments in agriculture can translate through value chains to improved net incomes, improved diets, and nutrition outcomes. In this case, improved diets increased animal source food consumption and horticulture products as well as other foods all contributed to sustained diet quality and to reduce stunting, even in the context of secular decline in stunting across Bangladesh. The additionality, the combined effects of multiple entry points, I think is something that we need to explore much further, right. We tend to design and implement programs, and we want to see theory of change of that program, and document inputs against outputs and outcomes of that program, but in fact households don't work by programs. They work by testing and dipping into and out of various activities and resources and services that they find useful. And what they find useful may vary over time and space. So, the reinforcement of messages through multiple activities overlapping, building, combining, seems to generate not just knowledge, but an appetite for more at the household level, an appetite for innovation. I think we need to think more carefully about this. How to promote consciously integration and cumulative effects of various kinds of programs that were originally intended to be free-standing and unfortunately siloed. Market literacy,

credit access all of that matters, but going forward we need to build on these successes, we need to go even further to look at the cost effectiveness of innovation uptake, as we've started here with these technologies. There's a very big difference between setup and startup costs and maintenance costs. There's a big difference between income and profit. So, net income from engagement. We need to know much more about how farmers...the drivers of uptake and scale at the farmer level and across whole regions, the time of delivery of interventions to achieving specific nutrition outcomes. We need to be a bit more careful, a bit more articulate about expectations. These things don't happen over time, they don't happen quickly, and we need to better understand timing and expectations of impacts. And then look at costing of cross-program effects. We need to better understand not project by project, but overall strategy approaches to improving agriculture diets and nutrition across regions, across populations, across agro-ecologies, which again will not only happen project by project, but through strategic combinations and cumulative effects. We're very grateful for the strong support from our various US government partners and partners in Bangladesh. This work continues. We will have many papers coming out of this activity. We're happy to engage with those of you who are interested in this work further going forward, but with that, I will stop, say thank you, and hopefully answer some questions.

Hannah J. Koehn

Thank you much Dr. Webb and Dr. Shrestha for your presentations Dr. Shrestha is back with us. So, we will go over questions and both Dr. Webb and Dr. Shrestha can answer. I am going to go through the Q&A now. And we have a question to both you Dr. Webb and Dr. Shrestha about providing any additional details that you might know about goat farming in this aspect.

Patrick Webb

Goat?

Hannah J. Koehn

Goat farming.

Patrick Webb

Interesting question. So, we would have to explore the data. We have we have a very detailed data about what species of livestock were produced. We're being yeah ... we're being held by these households and the kind of products produced. We certainly saw goats, but that's not something I've focused on in the analytical data, since none of these programs were focused on goat production. But it is certainly something we could we could look at. I certainly know that the USAID mission there in Bangladesh is very concerned... not concerned so much as ... sees great potential for building not beyond aquaculture, for looking at livestock – ruminants, small ruminants, and large ruminant livestock production - as an area that's under explored and underexploited in Bangladesh, which could further enhance the availability of milk, dairy, and meat in those in those communities.

Hannah J. Koehn

Thank you. So, much we have an additional question about whether or not you noticed any increment of small fish consumption by the non-producer households.

Patrick Webb

We did. There were a small amount. We still have to look at that by... more by location, because, where small fish were sold, they tended to be sold on more local markets. It was the larger value-added fish, the large fish, the carp, and the crayfish, and the shrimp, where that was included... tended to go to the more distant markets by, which I mean 10 kilometers up to 25 kilometers distant from production. The additive, the diversification of aquaculture tended to be a shift from in single fish grown to full capacity, harvested once, and then start again - the traditional model - to polyculture, where you had combined in the same pond two, three, five different types of fish, and there was harvesting ongoing on an ongoing basis. So, where the farmer decided to sell large fish, they would go in, catch the large fish, and put everything else back in, and send those to a distant market. Where it was more for own consumption and local sale, it was more a diversity of the smaller products. So, yes they were ending on the market and yes we were seeing a small increment in fish intake among young producers, not nearly as significant as those among producers. But it's getting into the market, which... and so you do want to do both. You want to enhance the diet of the producers, but also the non-producing rural poor households in those same locations.

Hannah J. Koehn

Thank you and we actually have a question that kind of bounces right off of that. So, since we want to promote all these different commodities, how do we integrate all those sub-sectors in targeting a single household?

Patrick Webb

Right well that's the great... that's a six million dollar question, right. I think we should avoid believing that we can do we can do everything. This is not a search for the perfect multi-sector program, but it is a search for more rigorous evidence of how households make their choices, on what to do with their time and their resources, whether it's in agriculture or non-agriculture. We can't just assume because it's a rural area, most of their interest in activities are in agriculture, it's not. So, the goal has to be to be better informed about the diversity of options for income sources, and food sources for these kinds of households, and the constraints. What are the hurdles if they wanted to diversify production? What are the hurdles? Is it information? Is it technology? Is it credit? Is it not understanding market opportunities? It's all usually all of the above. And different interventions can be done to fix different problems in different places, but at the end of the day the households adopt or not. They take up or not. They engage or not, depending on what is rational for them in their context, and their current resource constraints, and knowledge constraints, and expectation constraints. So, rather than try and design a perfect multi-sector program that does everything, we should be focusing our efforts on better understanding those constraints, and figuring out cost-effective ways to remove those or limit those to give those households more options and more opportunities for choice.

Hannah J. Koehn

Thank you. Robin we have ...Dr. Shrestha we have a question directed at you. There's a shown interest in the coolbot technology, and we have someone who's interested in learning a bit more about how or what your suggestions might be for using the coolbot technology or having small holder farmers use the coolbot technology for the storage of fruit mainly, oranges and apples.

Robin Shrestha

Thank you Hannah and sorry about the glitch there. Thank you Patrick for covering up.

Thanks Hannah. I think is it [] that asks this question? So, as I said in my presentation, as I was in the in the middle of explaining how cold rooms can be beneficial in terms of improving the quality of the stored commodities, there is a potential in Nepal, and from our experience working in Nepal, we have

seen the coolbot system being implemented in Nepal. I think one of the key factors for smallholders would be the high establishment cost and trying to offset that. If that can be done, then yes there is potential in having smallholders use the technology for storing fruits and vegetables. And also from our experience in Bangladesh; we have seen that if there is a market outlet close by, which is very key, which is key for coolbot system to work perfectly, because most of the technology is driven by the relative prices of what the farmers receive in the market. So, I think those are the two key factors that would determine whether coolbot technology would work in Nepal.

[Hannah J. Koehn](#)

Thank you for your response. We have a few questions about the relationship between this research and our current situation with COVID-19. How might you explain the relationship between food preservation with COVID-19 more effectively? And what can some of these technologies do to improve nutrition access during times like this global pandemic? Thank you.

[Patrick Webb](#)

Yes. A very personal question. It does relate to some of the food safety concerns that I was alluding to, that consumers already... smallholder consumers are already expressing. I think that deserves its own seminar, its own webinar. I think we need to... we do as I already said... we need to better understand this really quite important dimension of food security, because it relates to two key drivers of dietary choice: one is information, informed choice, what do people know or think they know, or what are they being told, rightly or wrongly about the quality, the safety, the nutrient value, the healthiness of foods right. So, what people know is one thing, but that drives very much what they believe. But what can they do even when they even if they believe a product is no longer healthy or safe, but they have no choice, because of price and low income. What does that mean for their dietary patterns, right? So, we absolutely ... this isn't just about COVID. It relates to mycotoxin contamination of the food supplies and natural toxic mold growth on products that is invisible, E.coli. Obviously some of these are new threats, some of them are very well known long established threats, but we're only just now beginning to understand that even the poorest households in remote parts of Bangladesh are quite concerned about the safety of the food that they are feeding their children and feeding themselves. So, I think we're ... COVID has shun a light on this thankfully, because this is a big and growing domain of both research and programming that needs much more attention. And if we see that... it comes back to choice, my point earlier... if poor households see fish that they think have been dipped in formaldehyde to make them look like they're still fresh, but they're not, they're rotten, but they have no choice, but to buy it

and serve it to their child. That represents an inequity and a health disparity in its own right that has serious implications for both health and nutrition. And so, the whole food security, food safety, food knowledge, and food practices and behaviors, they're all finally coming together around these issues. We can do so much more, but the first place to start is to actually understand what's happening on the ground in rural markets in remote parts of the world, all around the world, not just Bangladesh. Maybe Robin has something to add there.

[Robin Shrestha](#)

No, I think you put it right. I think just not looking from a COVID-19 perspective, but from a broader foods safety perspective, yes. We did see some positive findings from some of the technologies like chimney dryers, for example, where there was an improved practice in terms of even drying fish, which is quite common in Bangladesh that they did the fish in formaldehyde before drying them. So, small practices like that does impact the introduction of technologies like chimney dryer or coolbot. So, yes we have to look at it from a broader food safety perspective, like you said, Patrick.

[Hannah J. Koehn](#)

Thank you so much. And the last thing we have is Dr. Ghosh would like to respond to a question live, about how much of the food ended at the local level rather than exported to other areas of Bangladesh.

[Shibani Ghosh](#)

Hannah my apologies. I was trying to type an answer to [Florence], I think Patrick has already done that. So, I just pressed the wrong button. So, apologies, but I believe Patrick has just responded to Florence in the chat box.

[Hannah J. Koehn](#)

Okay, not a problem. Thank you. We might be able to squeeze in one more answer to a question and I am trying to summarize. Multiple people have asked about the customer base. So, all this food is being produced, but how is it going to be promoted? And exactly who is the customer base? Kind of like Florence was just saying, is it the greater area of Bangladesh? Or is it more local area? And are you promoting to individuals under 15, and how is it going to be...

Patrick Webb

Okay well I would turn that around slightly. Where promotion was focused was on the producer base, right, to diversify the supply side, and encourage the producer to consume more of the nutrient-rich foods, more of the diversity themselves, not just by buying it from the market. When I say distant markets, I don't mean the rest of Bangladesh, as I said. We're talking 10 to 20 kilometers, hinterlands around the production areas. So, not far... not even large towns. Some of the larger fish will make its way to the larger towns. But we're talking rural markets, marketplaces, and the products were all already local. None of these were newly introduced types of fish or types of veg. So, it wasn't about promoting demand in the marketplace. This was responding to ... ideally, hopefully pent up demand for these products and generating supply that non-producers would be able to access. So, none of this was about introducing new species, or new animals, or new crops. It was about how to *enhance* the availability through enhanced supply. Promoting consumption or feeding of these kinds of nutritional products by adolescent girls, pregnant, lactating women, and children under two, *that* part of SBCC still needs to be supported across the board, not just consumers or producers, but across the board. And that's part of the information constraints that we want to overcome. I will stop there, because obviously we're out of time. And I am really grateful for all the interest and all the questions, really important questions that people are raising. Thank you.

Hannah J. Koehn

Thank you so much for all your responses. Yes thank and there are so many questions that are still remaining to be answered. We will continue this conversation. We will also have this webinar live and we'll have it put up on our website later and hopefully we can continue this discussion there further.

Dr. Ghosh, would you like to say some closing words?

Sorry, you're on mute.

Shibani Ghosh

I obviously forgot that the video and the mute are on. So, yes. So thank you so much. I've been like going through the Q&A and the chat. And I know that Patrick has been a lot faster in responding, despite the presentations he's been making. And we apologize that we are not able to answer all the questions verbally. What we have here with the Bangladesh work is a very, very rich data set. We have several different analyses that are coming out. And we will continue sharing with all of you, and thanks again everybody for joining. We will be hosting several webinars as we move forward over the next six

months, and some of these webinars will be co-hosted by our colleagues at USAID Advancing Nutrition. So, please keep an eye out on your mailing list, either from us directly or from Agrilinks or from USAID Advancing Nutrition. We hope you will join us to listen to the research findings of some of our other projects. So, thank you everybody for joining us today, and with that we will end this session.

Hannah J. Koehn

Thank you



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