PROLINNOVA Ghana
PROmoting Local INNOVAtion
in ecologically-oriented agriculture and natural resource management

EXPANDING THE PROMOTION OF LOCAL INNOVATIONS FOR FOOD SECURITY AND HEALTHY NUTRITION PROJECT (ELI-FaNS)
LOCAL INNOVATIONS FROM WALEWALE, NORTH-EAST GONJA AND BONGO ACTION-LEARNING SITES

Innovators share their innovations on local nutritious foods with community members

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INTRODUCTION

"Expanding the promotion of local innovation for food security and healthy nutrition to strengthen resilience with focus on women"

(ELI-FaNS 2023-25) is a follow-on project with particular focus on institutionalizing local innovation (LI) and participatory innovation development (PID) approach within formal agricultural research and development (ARD). The specific objectives are:

1. Small-scale farmers (especially women & youth) actively innovate to improve the food & nutrition security and livelihoods of rural communities;
2. Researchers, university lecturers & other relevant decision makers at local, national, subregional & regional levels pay more attention to participatory innovation development (PID) approaches and engage in activities to promote PID;
3. Prolinnova structures at all levels are functional and convincingly promote farmer-led joint innovation at local, national & subregional/regional levels.

Farmer-level activities are implemented in 10 action-learning sites in five African Countries within the international Prolinnova (*Promoting local innovation in ecologically oriented agriculture and natural resource management*) network, namely: Benin, Burkina Faso, Ghana, Kenya, and South Africa. In all the learning sites, the focus is on promoting farmer-led participatory innovation in production, processing, marketing, and consumption of crop and/or livestock products.

In Ghana, the project is coordinated by the Association of Church-based Development Projects (ACDEP) with field activities implemented in partnership with three local lead NGOs. They are Presbyterian Agricultural Services leading the implementation in the North-East Gonja learning site, Centre for Ecological Agriculture and Livelihoods (CEAL) leading the implementation in Walewale learning site, and NABOCADO leading the implementation in the Bongo learning site. Other key local stakeholders participating in project activities at the learning sites include local government authorities (District Assemblies), Department of Food & Agriculture, Forest Services Department, Traditional rulers, and Farmers groups. The rest are the Savanna Agricultural Research Institute (CSIR-SARI), Animal Research Institute (CSIR-ARI), and the University for Development Studies (UDS).

This report is a documentation of twenty three (23) local innovations that were identified in the three learning sites and are being promoted to achieve the project objectives.

PROFILES OF THE LOCAL INNOVATIONS IN NORTH-EAST GONJA LEARNING SITE

1. Using sugar solution to preserve yam sets by Tia Nantogmah in Tantuani Community

Innovator with Yam and Sugar material.
Photo by Isaiah Nasir

Background of the Innovator

Mr. Tia Nantogma is 59 years old and lives in the Tantuani community of the North-East Gonja District of the Savannah region of Ghana. He heads a household of 8 members and has no formal education. Nantogmah is a medium-scale farmer, with a farm size of about 40 acres of land, but can only farm 24 acres in a growing season. He farms yam, maize, rice, and groundnuts. He also rears goats, sheep, and fowls. He is a good mason who builds local houses using mud, from which he earns some income. Though his wife is not directly involved in the innovation activities, he gets some money from her to buy the main input (sugar) of the innovation when he is in need.

Brief description of the innovation

The process of storing the yam and/or yam sets with sugar involves the following steps:

a. Innovator prepares sugar solution to preserve yam and yam sets.
b. He uses 1-2bowls (2.5-5kg) of sugar for 1000 yam sets.
c. First, 12.5litres of clean water is fetched into a container.
d. 2.5-5kg of sugar is poured into the container of 12.5litres of water.
e. Innovator uses a ladle to stir the content until the sugar is well dissolved.
f. Then adds another 12.5litres of water to the dissolved content.
g. He continues to stir the content again until it is well mixed.
h. He spreads 1000 yam sets and sprinkles half of the sugar solution on the sets, making sure that every yam set is soaked with the solution.
i. After 10 minutes, he turns the yam sets and sprinkles the solution on them. The yam sets are then stored, mostly in a cool, dry location of the farm.
j. During storage, the yam sets attract some reddish insects (*zim* in Dagbani language) because of the sugar content. The reddish insects protect the yam sets against storage pest (usually whitish in nature). The reddish insects do not destroy the yam sets but eat up any yam pest during storage.
k. This method is enough to preserve the yam sets from final harvesting (in December) to the next planting season (in March or April)

Motivation for the Innovation

Innovator was motivated by the quest to preserve yam and yam sets that are being destroyed by insects (whitish in colour). About 5 years back, the whitish insect pests that used to attack yam in storage were not so many, so farmers could control them physically by picking and killing them. However, due to the rapid increase in the population of the insects, it has become very difficult and almost impossible to control them physically again, hence the need to control them through other means. Knowing that the reddish insects, which are not harmful to the yam but rather feed on the whitish insect pests, are always attracted by sweet substances, the innovator experimented using of sugar solution to soak the yams. The method has since served effectively in preserving his yam for planting and for food.

Benefits from innovation

The innovator derives the following benefits from his innovation:

- It preserves the nutrient content of the yam for consumption.
- It improves/protect the quality of the yam for higher prices at the market.
- It ensures good productivity as the yam sets are able to sprout or germinate well

Gender Issues

The significant gender issue addressed by the innovation is inclusion of women in household decision making regarding their household food production, particularly yam. This is because his wife has often supported him with money to acquire sugar for the storage process, hence enhancing household food security.

Questions being further explored by innovator

Innovator is exploring substituting the sugar with another suitable material since the cost of sugar keeps rising.

Spread of Innovation

Innovator has shared the innovation with other members of his community and beyond, specifically Komlanyilli community. The innovator has also shared it with 4 different farmers through farmer-to-farmer extension.

2. Using *"special bean"* to prepare *Kooshe or Tuubani* or Soup by Ms Rakiya Alhassan in Tantuani Community

Innovator with the special bean Spp.
Photo by Isaiah Nasir

Background of the Innovator

Ms Rakiya is a 43-year old medium-scale farmer and lives in Tantuani community of the North-East Gonja District of the Savannah region of Ghana. She has a household size of 12 including her husband and children. The main crops she cultivates are maize (10 acres), soya beans (2 acres), groundnut (5 acres), and rice (9 acres) on a 29-acre plot of land with help from her children. She has no formal education. Apart from farming as her main source of income and food, she engages in shea nut picking and processing as additional source of income. She also rears animals such as goats and fowls. Her daughter in-law supports her innovation by milling and kneading the flour into dough or sometimes helping to prepare the tuubani and koose cakes.

Brief description of the innovation

(a) Innovator threshes the dry pods of the bean to obtain the multi-colored bean.
(b) She removes the hard outer shells by crushing
(c) She pounds the bean nuts in a mortar and mills into flour
(d) She then sieves the milled product to obtain fine flour.
(e) She mixes the bean flour with water in a container to knead it to form a fine solution.
(f) During kneading, salt peter, salt and slashed onion are added and mixed to obtain a fine paste.

(g) Innovator conducts sensory tasting with her household member to ensure that the added ingredients, including the salt are adequate.

(h) She pours cooking oil into a pan and fries the paste into a cakes. She does this by using a small ladle to fetch the paste into the heated oil each time and turning with a big ladle, and producing the balled cakes ready for eating

Kooshe cake from the special bean

Motivation for the innovation

The "special bean" was introduced to the innovator and other members of the community in 2022 as an ingredient for preparing soup. With the quest to improve food security of her household, the innovator devised that just like cowpea (the well-known crop produces for making Tuubaani, Kooshe, etc), the special bean could also be used to serve the purpose of the cowpea. She first attempted the processing of Kooshe with sheabutter oil. When she and her household ate the Kooshe, they experienced diarrhoea. Motivated by curiosity, she then decided to use frytol oil to process the Kooshe and that worked for her and family members without problem when consumed.

Benefits gained from the innovation

It improves nutrition and health. The innovation helps reduce hunger in her home by serving as an alternative to 'TZ', her major food staple. Serving as an alternative, it reduces the stress on her little income for buying food to support her family. The bean species is high yielding and can be relied on for her future food needs.

Gender issues: The innovator, together with her male children, produces the bean in their farms, which contributes to food and nutrition security.

Further questions being explored: The innovation is currently being used at the family level. The innovator is thinking of how to take it up as a small-scale business by producing and selling the cakes in the community and local market.

Spread of Innovation: The innovator has shared the innovation with her daughter-law in the same household and with 10 other women in the community.

3. Improving *dawadawa* condiment with *dosim chisi* by-product by Ms Kasim Asimawu in Kpanshegu community

Innovator preparing the product

Final dawadawa condiment

Background of the Innovator

Asimawu Kasim is a 52 year-old married woman with three children. With no formal education, she lives in the Kpanshegu community of the North-East Gonja District of the Savannah region of Ghana. Asimawu is a small-scale farmer and farms soybeans (1 acre) and rice (2 acres). She produces charcoal to sell and can produce about 20 bags of charcoal in a year to sell as an additional source of income.

Brief description of the innovation

Dawadawa is a major ingredient in the preparation of food, especially soups. This innovator has improved its taste, nutritive content, and quantity by adding a by-product of dawadawa flour to the dawadawa. The following is the step-by-step process of how she makes the special dawadawa by the addition of the dawadawa flour by-product – *dosim chisi.*

a) Innovator usually boils 6kgs of dawadawa seeds for about 8-9 hours.
b) She adds a handful of Tuo-zaafi (TZ) - a solidified paste food made from maize, to the boiled dawadawa, and leaves it to stay overnight. *As a cultural belief, if the TZ is not added, the dawadawa will go out to beg for TZ to reduce its quantity*. The following day, the TZ is removed and thrown away.

c) Fine ash is added to the boiled seeds to aid the removal of the seed covers during pounding.
d) Innovator washes the pounded material to obtain a fine grade of the dawadawa seeds
e) She boils the seeds again for about 2-3 hours.
f) After boiling, she sieves the boiled seeds from the water.
g) Innovator keeps the seeds in a pan and heat is created on the seeds by spreading rubber on the pan and kept in a room for 3 days. The heat makes the seeds to break even with little squeeze between the fingers.
h) At this stage, the innovator dries the seeds in the hot sun for a day.
   She pounds the dried seeds again, and it is ready to be used as a seasoning ingredient for soup or stew preparation. However, points (a) to (h) are what is common in many places. The innovativeness of the dawadawa is being introduced from (i) to (l)
i) Innovator measures 700grams of dawadawa into a mortar.
j) She measures again 90grams of dawadawa flour by-product (*dozim chisi*), mixes together in a mortar, and pounds with the pestle for 5 minutes to obtain a good mixture of the two products.
k) The Innovator rolls the mixture into balls of 100grams.
l) The dawadawa balls are then dried in the hot sun consecutively for 7 days to properly dry it to prevent it from breeding maggots. At this stage, the fortified dawadawa is ready to be used to prepare soups, jollof rice, and other local foods.

Motivation for the innovation

Groundnut is usually an ingredient used in the processing of dawadawa. But generally, groundnut is a costly crop product, and getting it all the time to add to the dawadawa making process is not an easy task for many poor households in rural areas. To find a substitute for groundnut while still maintaining a good taste of dawadawa, the innovator decided to add the dawadawa flour by-product (dozim chisi) to improve the taste and nutritive value of the dawadawa.

Benefits of the innovation:

- The innovator meets the nutritional and health needs of the family through the production of dawadawa condiment.
- The innovation is cost-effective since the groundnut is being replaced by the dawadawa flour by-product.

Gender Issues:

In terms of cost sharing and contributing to running the household, the innovator is able to handle her 'housewife's' roles by taking care of her own ingredients with little difficulty. Largely, in rural communities, it is usually the responsibility of women to take charge of ingredients for cooking. The man provides the main staple food. Thus, the addition of dawadawa flour by-product, instead of groundnuts, a usually costly product, has helped her economically over the 30-year period of marriage.

Further improvement of the innovation: Innovator has engaged with nutrition experts in joint experimentation that led to substituting soya beans and yellow maize as alternatives. The joint improvement process has also helped to determine the right proportions of mixing dawadawa with dozim chisi, dawadawa with soybean flour, and dawadawa with yellow maize for improving its nutritional value and diversifying the condiment.

Spread of Innovation

The innovator has shared her innovation with other women who are also preparing and using it.

4. Using Pigeon pea to make *Tuubani* by Ms Adam Abiba in Takpuli community

Innovator display materials for the Tuubani food. Photo by Isaiah Nasir

Background of the Innovator

Ms. Adam Abiba is a 63-year old farmer in the Takpuli community of the North-East Gonja District of the Savannah region. She is a widow and has no formal education. She farms maize (2 acres) with pigeon pea intercropped, and groundnuts (1.5 acres). She gets support for her innovation by planting the pigeon pea (the main material of her innovation) in the boundaries of maize farms of other household members.

Brief description of the innovation

To prepare the Tuubani, the innovator uses the following food items: pigeon pea flour, cassava flour, maize flour, salt petre, frytol oil, *Bungu*, onion, salt, and pepper. The following steps are followed in the preparation of the Tuubani:

a. Fetch 5 litres of water into a pot and boil until it reaches 100 degrees Celsius

b. Measure 1.42 kg of pigeon pea flour, 1.02 kg of Cassava flour, and 1.02 kg of maize flour
c. Mix uniformly with clean hands, the pigeon pea flour with 2 litres of water until no balls are formed.
d. Add the salt petre and uniformly mix it together with the pigeon pea flour.
e. Add the cassava flour to the contents and continue to mix it together with another 2 litres of water until a uniform mixture is obtained.
f. Add the maize flour to the contents and continue to mix together with 2 litres of water until a uniform paste is formed.
g. Innovator, with additional hand(s), molds in small quantities (the size of which can be put into a person's mouth) of the uniform paste into the pot of boiling water.
h. Innovator covers the pot for about 20-30 minutes, after which it is ready as food.
i. Now the innovator measures about 0.25 litres of the frytol oil into a cooking pan and puts it on fire to boil
j. Innovator adds slices of onion to the oil on the fire.
k. She mixes the "bungu" with the salt and pepper. This mixture, together with the heated oil, is a stew/ sauce to serve with the Tuubani food (in "h") and eaten.

Motivation for the Innovation

With Tuo-Zaafi (prepared by using maize) being the food staple of the people of Takpuli, there was a time when her household did not have enough maize to keep them till the next harvesting season. Madam Abiba then thought of how she could minimize or manage the maize they had in stock to take the household into the next harvesting season. At the same period, they had pigeon pea in abundance. Motivated by curiosity, she then decided to try using the pigeon pea as one of the main ingredients to prepare Tuubani instead of cowpea, which they lacked at the time. With the flours of maize, cassava, and pigeon pea, Madam Abiba has been able to produce a nutritious Tuubani food.

Benefits from the Innovation:

- It has improved the nutrition and health of household members.
- It has contributed to household dietary diversity instead of eating Tuo-zaafi continuously.

Gender Issues: Women, generally, in northern Ghana contribute largely to the household food needs. Therefore, the innovator is able to participate in farming and is able to duly play her role as a housewife before becoming a widow.

Spread of Innovation: She has shared and trained 4 female household members on her innovation, who are also using it.

5. Using yam peels to prepare *Yama food* by Ms Sharatu Issahaku in Takpili Community

Innovator with her 'Yama' food product. Photo by Isaiah Nasir

Background of innovator:

Madam Sharatu is a small scale farmer in the North-East Gonja district of the Savanah region of Ghana. She is 46 years old and a mother of 5 children. She has a 7-member household. She farms maize (2 acres), soya (2 acres) and groundnut (2 acres). In all, she farms 6 acres. Farming is her main livelihood, followed by selling shea nuts and firewood.

Brief description of the innovation:

"Yama" food is made from a yam peel, which is usually thrown away as waste or fed to animals. A part of the yam head is sliced when peeling yam, these peels are washed and dried. The dried peels are pounded in a mortar until they become rough flour. This is milled into a fine flour and used for the "yama". The yama is of two types: the hard one and the soft one. Different measurements are used when preparing any of the "yama" types. Generally, you need some quantity of cassava and maize flours for the "yama". The quantity of the maize flour or cassava flour added determines whether it is soft or hard yama. When the maize flour is more, it gives you hard yama, and when the cassava flour is more, you get the soft yama. The same process is used for preparing both soft and hard yama.

To prepare the yama, the following quantities are used for the hard type:

a. Use 557g of the yam peel flour, 351g of the maize flour, and 148g of the cassava flour.
b. Mix these together with a discretionary measure of saltpetre to get a dough.
c. The dough is made into small balls (size is subjective to individual preference) and boiled.
d. To eat the "Yama", roasted groundnut powder (*kulikuli-zim*) is spread all over the yama, and then a reasonable oil stew is added to it.
e. Same steps are repeated for the soft but with the following quantity measures: 557g of the yam peel flour, 208g of the cassava flour, and 191g of the maize flour.

Motivation behind the innovation:

The innovation was motivated by the difficulty of feeding the family in her early years of marriage. She had seen people use the peels to make *wasawasa* food (black jollof) and thought of it to use the peels for "Yama".

Benefits of the innovation:

- The innovation has improved their food security since a small quantity of the flour can be used to feed the entire family per meal.
- The burden of buying food for the family has also been reduced since they just need a little money to prepare "yama" by buying the yam peels.

Gender issues addressed: The innovation has made her a key member in making decisions for the household since the husband now consults her in matters relating to feeding the family.

Spread of innovation: The innovation has not been spread or shared with others yet.

6. Using Orange-fleshed potato for porridge by Mahamadu Fuseini in Takpuli Community

Innovator Mahamadu Fuseini: Photo by Isaiah Nasir

Background of the innovator

The innovator is a 52-year-old small scale farmer from Takpuli community in the North-East Gonja district of the Savanah region. His major crops and acreages are maize (4 acres), yam (2 acres), cassava (1 acre), and guinea-corn (2 acres). He also rears domestic fowls, sheep, and goats. He has no formal education, and farming is his only source of livelihood. His wife plays the role of cooking, going to the grinding mill, and drying the potatoes. The children help in cultivating the potato.

Brief description of the innovation

Porridge is a local breakfast meal and is normally prepared from maize, millet, or sorghum, but the innovator adds sweet potato to his porridge to make it tastier. The potato's flesh is peeled off, then chopped with a knife into minute pieces and dried. The dried potato is then added to

any of the grains: maize, millet, or sorghum, and milled into flour. The flour is made into a dough, left to stand overnight to cool. The next day, it is used for the porridge. To make the porridge, he boils water to some point (100 °C), then adds a little water to the dough to make it fluid. This is now added to the boiling water bit by bit while stirring until the mixture becomes thick. At this point, the porridge is ready to serve.

Motivation for the innovation

He uses it as a substitute for sugar in porridge, as sugar is usually expensive and not readily available. Porridge is a main breakfast eaten every day. To make porridge tastier for everyone, the idea came to him to add sweet potato, which really improved the taste.

Benefits from the innovation: It enhances the nutrition of the household members

Problems with the innovation

- Seasonality of the potato makes it difficult to prepare porridge with it when it's out of season.
- The grinding mill is not found in his community; they have to travel a long distance to get to other communities to mill the flour.

Spread of innovation: The innovation has spread among members of the community, and a considerable number of the community members are practicing it.

7. Using *Paliga* plant to preserve grain by Sulemana Osman in Chambuligu Community

Innovator with paliga (Securidaca longepedunculata) materials

Background of the Innovator

Mr. Osman is 45 years old small-scale farmer in the Chambuligu community of the North-east Gonja district of the Savanah region, with no formal education. He has a family of 9 members. He farms mainly maize (5 acres), yam (1.5 acres), groundnut (2 acres), rice (2.5 acres), but cassava is intercropped with the yam. Farming is his major source of livelihood, with the sale of provisions as an additional source of income.

Brief Description of the innovation:

a. He digs the *paliga* plants for its roots and cleans the soil stains, peels off the bark with a knife and then cuts the roots into pieces of about 3 cm long, using 8-12 pieces to preserve one bag of grain.
b. The roots are first laid in the storage sack, and the grains are poured on it as the first layer.
c. The roots are again laid on the grain, and another layer of the grain is added; this is done repeatedly until the storage sack is filled up.
d. The strong scent from the *paliga* roots drives the storage pests away from the grain.
e. Alternatively, after peeling off the bark from the roots, he dries and pounds this material into powder and mixes it uniformly with the grains stored in sacks.

Motivation behind the innovation

The innovation was motivated by the problem of pest infestation of grains during storage. The high cost of chemicals to store grains and also the risk of poisoning in the use of chemicals for food storage triggered the innovator to experiment and discover this organic post-harvest storage method.

Benefits of the Innovation

- It is an organic storage method that is safer and cheaper
- It solves post-harvest losses in storage in place of chemical storage, which is expensive and unsafe
- Other alternative storage methods may be more expensive and less effective
- The material used for this storage is readily available in the community

Further development of the innovation.

The innovation has undergone farmer-joint experiment with formal researchers, enabling the farmer to determine the right quantity of the raw roots and the powdered form for effective control of storage pests in maize grains. It has also enabled the determination of the efficacy between using the roots and powder for effective control of the pests, revealing powdered form as more effective than the raw roots. He plans to commercialize his product in the next few years.

Problems faced with the innovation:

The ‘paliga’ shrub is threatened by over-harvesting due to its multifunctional purposes, making it scarce because of too much extraction of the shrub from the bush.

Spread of the innovation

He has also exhibited and shared it at the 2024 District level National Farmers Day celebration held Kpalbe, the District capital, where he was awarded a certificate and farm inputs by the Ministry of Food and Agriculture for his outstanding innovation. As a result over 50 farmers from his community and two adjoining communities have adopted and using the innovation for preserving their grains.

8. Kpanshegu community VSLA Group social fund to support its members, led by Ms Salamatu Issahaku

Ms Salamatu Issahaku, leader of the VSLA group:

Photo by Naomi Zaato

Background of the innovator and the group

Madam Salamatu Issahaku is a small-scale farmer in the Kpanshegu community in the North-East Gonja district of the Savanah Region. She is a 43-year old with a household size of 12. She has no formal education. Her primary source of income is farming, and she has 2 acres of maize, 2 acres of groundnuts, and 1 acre of rice. She is the leader of a Village Savings and Loans Association (VSLA) group made up of 25 females and a male secretary. Most members depend on farming, with a few others engaged in other income-generating activities, such as processing groundnuts into groundnut paste and 'kulikuli' snacks, shea nut trading, and the sale of provisions. The average age of the group is 35 years, indicating most of them are still of the childbearing age.

Brief description of the social innovation:

The innovation is akin to the normal VSLA model, where all members contribute for 52 weeks to complete the cycle for sharing out. However, unlike the conventional VSLA, with this model, members contribute on a regular basis to give to other members in turns. The order of benefit depends on the current needs or demands of members. This is used mostly to support members who are in dire need to solve issues such as buying farm inputs, funerals, wedding or naming ceremony responsibilities, hospital bills, and also payment of children in school. Also, members who need support for their small businesses can access the funds on a small interest basis. Contributions from members are not saved in boxes like the conventional VSLA but given out to a member with immediate or urgent need. A fixed amount of Five Ghana Cedis (GHS 5.00) per person is contributed to support a member in need, and some members who can even give more, depending on the problem, are allowed to do so. The need is often communicated to the secretary by the needy member, who, in turn, informs the whole group and mobilizes the contributions from members. When the contributions are ready, the leader presents them to the needy member on behalf of the group.

Motivation for the innovation

The hardships and distress members face with funerals, outdooring, education, and health care challenges were the main problems the group sought to help reduce. But the model was mainly motivated by the VSLA welfare fund but which was not always enough for members to cope with shocks when problems arise. Most members also have no income generating activities, so even their participation in the VSLA has always been low, and their loan repayments have not been effective. The group therefore came out with this idea to contribute extra to support each other to reduce the various burdens.

Benefits of the innovation

- Nutrition: members have been able to get money to supplement the food needs of their family since the support from the innovation helps them to start a small business, from which the profits are used to supplement household food.
- Health: many members were supported to pay for their health service bills and buy drugs.

- Productivity: members use the funds to engage in farming and in their businesses, which helps to increase their productivity of food and other resources to support themselves and their families.
- Economic empowerment of women: members using the support to do businesses are able to make profits, with which their incomes are improving.

Gender issues

- The women engaged in businesses through the innovation are doing well and improving members' income generation and hence achieving women's economic empowerment.
- The social needs support of the innovation are inclined towards addressing women's overdependence on their husbands

Questions being explored: The group is still exploring to identify ways by which the fund can be increased and sustained to a level where members can be supported to do business on a large scale.

Spread of innovation: The innovation has been shared with a VSLA group in the neighboring community, Changbuni.

PROFILES OF THE LOCAL INNOVATIONS IN WALEWALE LEARNING SITE

1. Social innovation to restore *Kundunvori* biodiversity site in Zanguga community, led by Mr. John Basigi

Mr. Basigi Leader of Kunduuvori restoration innovation group at the site.

Photo by Issifu Sulemana

Background of the innovation

Zanguga and its surrounding communities are endowed with a natural resource conservation area known as '*Kundunvori'*, which is of cultural, spiritual, and economic significance to the inhabitants. The *Kundunvori* has sacred rocks, a groove, and caves where the community chief performs traditional rituals and sacrifices to their ancestral gods for their spiritual protection and development. This enables the people of Zanguga to continue bonding with their local gods in the community. During the *Kundunvori* ritual performance, the people of Zanguga pray for long lives, prosperity, good harvest, community protection, and good behavior, which help build their community, maintain peace, and promote communal harmony. *Kundunvori* also provides natural resources supporting livelihoods in the community and its surrounding areas. Its large stretch of vegetation is partly inhabited by wild bees for honey production, reptiles, and small wildlife of different species, and medicinal plants. It also has a perennial stream with fish and providing water for livestock and dry season vegetable production. Hence, the

inhabitants are able to fish, hunt, harvest honey, farm, and harvest herbs to support their food, incomes, and social needs.

Despite the social, cultural, and economic benefits of *Kundunvori* to the people of Zanguga and its surrounding communities, the resource in the last 8-10 years has experienced a rapid decline in physical /natural resources. The degradation of the common resources at the *Kundunvori* is caused by many factors, including population increase in recent times in the communities, thereby putting tremendous pressure on the natural resources base and threatening the entire existence of *Kundunvori*. The people of Zanguga and its fringe communities are also using unsustainable practices such as indiscriminate cutting of the trees and shrubs for fuel wood and roofing, encroachment at the sacred site for agricultural purposes, chemical usage at the site affecting biodiversity and beekeeping, farming at the banks of the stream that supplies water, causing siltation of the river, among others. Wild annual bushfires destroy both the fauna and flora resources at the site and consequently deplete them. Yet still, there are no proper local by-laws established by the community and its leadership to protect and regulate the sustainable use of the resources in the *Kundunvori.*

Description of the Innovation

Given the importance and relevance of *Kundunvori* to livelihoods, the community has organized itself to protect and regulate the use of resources through the ***Zanguga Kundunvori Development Group.*** The group is composed of three stakeholder categories of people playing complementary roles under the control and supervision of the community chief, who is assisted by his council of elders. The three categories and their roles in managing and regulating the resource for its sustainability are described as follows.

Kundunvori sacred protection: This role is assigned to the chief of the community, who performs the necessary rituals and libations that keep the place sacred in providing spiritual protection to the community, as well as maintaining its aesthetic and cultural functions. This enables them to continue binding with their ancestors while protecting the valuable *Kundunvori* natural resources for the current and future generations. The power of controlling the place emanates from him because he is believed to be the embodiment and link between the people and the ancestors in the community. To this effect, the chief has the power to apply sanctions and punish offenders who misuse *Kundunvori's* natural resources. He also promotes best practices that enhance its value and benefits.

Kundunvori regulatory concept: This role is assigned by the chief to a caretaker who is responsible for the day-to-day monitoring, maintenance, and regulation of the resource and reports back to the chief. The caretaker is a trustworthy person who knows the local history and customs and applies these in his functions. He takes instructions, carries messages, and performs daily duties, including monitoring and supervision of all activities in the *Kundunvori* on behalf of the chief of the community.

Zanguga Beekeeping group – They are wild beekeepers of about 30 seeking to develop their livelihood in honey production, which is connected to the *Kundunvori* resource. The members have a collective alliance that helps to protect the surrounding areas of the *Kundunvori* to enhance wild beekeeping. They ensure that any activity endangering the bee population is prevented, such as indiscriminate tree cutting, bush fires, and the use of agrochemicals on crops. The group is formed by the wild honey harvesting farmers whose prime interest is to protect the resource area and the safety of bees, which is being threatened by unsustainable farming and livelihood activities. They are a loose network/association working together towards protecting the resource in order to continue harvesting honey for food and income.

Motivation for the innovation

Population increase in recent times in the communities is putting tremendous pressure on the natural resources base and threatening the entire existence of *Kundunvori*. This phenomenon, coupled with unsustainable use of the common natural resources, is depleting the resource base and undermining the *Kundunvori* as a common, reliable, and dependent natural resource for the Zanguga and its surrounding communities. Therefore, the *Kundunvori* resource has to be protected and restored sustainably through participatory innovative community social organisation and arrangements.

Current problems with the innovation

The group is doing well, but is challenged in terms of capacity to properly develop the resource to sustain livelihoods. They are expecting external partnerships with relevant institutions to further develop the concept to work more effectively. Their needs include supporting the development of community by-laws to govern the operations of the resource, training the community on natural conservation practices, as well as on skills for alternative livelihoods for community stakeholders.

Gender issues

Both men's and women's livelihoods are equally connected to the common pool of natural resources in the community. Women undertake firewood collection, harvest wild fruits such as dawadawa, shea fruits, and other non-timber products from the *Kundunvori* natural resources, which helps them to enhance their well-being in the community. Men do farming, harvest wood, fish, collect herbs, etc, which also helps them to play their roles as heads of the families. The beekeeping group that emerged and has become a key stakeholder in the protection of *Kundunvori* natural resources has both women and men members, signifying and recognizing the contribution of both men and women in the management and protection of the *Kundunvori* natural resources. During the ritual performance, both men and women have their key ascribed roles which contribute to the maintenance of the *Kundunvori* natural resources. During this period, the women remained home and prepared sacrificed animals for the meals for distribution while the male counterparts performed the rituals. In addition, constant monitoring of the place is done by both men and women, especially the beekeeping group, indicating how more women are now taking an active role in the management and protection of natural resources in the community.

Further questions being explored by the innovation group

The group is further seeking to streamline the roles and responsibilities of community stakeholders in the management of *Kundunvori*, and develop proper guidelines and by-laws to govern the operations and use of the place. It wants to explore capacity building opportunities for alternative livelihoods for the community stakeholder groups who depend on the resource for immediate livelihoods, such as beekeepers, farmers, charcoal producers, fire wood collectors, herbalists etc

Spread of innovation

Neighboring communities such Kpabgu, Tinguri, Guabuliga and Sagadugu which share boundaries with Zanguga and also use *Kundunvori* natural resources are beginning to learn and are applying measures that contributes in protecting *Kundunvori* natural resources. They participate during the ritual performance and caution people against the misuse of the *Kundunvori* natural resources. In addition, the bee-keeping group have also grown from 10 to 40 members due to the benefits accruing to them from their bee keeping practice.

2. Controlling Striga weed using *false groundnut* plant by Ms Atika Zakaria in Zanguga community

Ms Atika with the striga control plant. Photo by Sulemana Issifu

Background of the innovator

Ms Atika Zakaria is a 35-year smallholder farmer with no formal education. She is a mother of 5 kids, with 3 of them being female and 2 of them being male. She lives with her kids in the Zanguga community in the West Mamprusi Municipality. She cultivates staple crops such as maize, soya beans, cowpea, leafy vegetables, etc. She also engages in the rearing of goats, sheep, and local fowls. Her other sources of income include the sale of food ingredients and spices for soup and stew preparation. Her husband extends support by helping her with land and labour to support her innovation in the farming season in the community

Brief description of the innovation:

The innovator uses a leguminous plant (*false groundnut)* to suppress and control striga weed on her farm. Striga weed is very hostile to many food crops during production. Maize and other cereal crops do not perform well in fields where the weed is found. It is quite difficult to control due to its numerous tiny venous root systems. The innovator has identified a plant that she uses to effectively suppress and control striga on her farm. The innovator does that by broadcasting

the seeds of the false groundnut on her field before ploughing. Once this is done and there are rains, the plant sprouts and thus suppresses the emergence of Striga weed on the farm.

Motivation for the innovation

The striga weed is mostly controlled by the use of chemical weedicides. This sometimes leaves harmful residual effects on the crops and pollutes the land as well. The innovator gives accounts of how, sometimes, she could feel the scent of the chemical residue in her cultivated crops. Additionally, it is expensive to buy chemical weedicides for large acreages. This drove the innovator to be keen and observant of her environment, and then she decided to come out with her innovation, which eventually worked for her and her family in the community.

Benefits of the innovation

She has been more food-secure since she started using her innovation. She has also been able to produce food at less cost. Her innovation is cost-effective and supports organic and ecological farming, which is sustainable in the long term. Through her initiative, she has been able to increase yields, produce her food in a healthier way, and improve her farming environment in the community. It is contributing to the food and nutrition security in the community as more farmers are learning and applying the innovative technique on their farms.

Gender issues

Through her innovation, she has become more visible, gained popularity, and is respected by men and women in the community. Both men and women now hold her in high esteem because of her innovation. She now gets more support from her husband than before, as her husband and children support her activities by providing needed labor for the collection of the seeds and their application at the household level.

Further questions being explored by innovator: The innovator wishes to explore further and experiment with scientists to establish the effectiveness and efficacy of her innovation.

3. Preparing improved *Tuubani* food using partially-riped dried mangoes with Bambara beans flour by Ms Inusah Alimatu in Zanguga communty

Innovator Ms Alimatu: Photo by Issifu Sulemana

Background of the innovator

Inusah Alimatu is a 30-year-old smallholder farmer from Zanguga community in the West Mamprusi Municipality of the North East Region of Ghana. She is a housewife with 3 children and lives with her husband's nuclear family members as well. She has 2 acres of farmland on which she cultivates maize, Bambara beans, soya beans, cowpea, and leafy vegetables. She also rears goats and local fowls as part of her farming activities. Additionally, she engages in collection and processing of shea butter for a livelihood in the community. She is also currently learning as an apprentice in hair dressing. She is seen as always trying her hands at new things. This spirited attitude is what led to her to discover her innovation of making nutritious tuubani food.

Brief description of the innovation

Tuubani is delicious and is widely consumed in the community. It is usually prepared using cowpea, soybeans, and maize, which are known to all households. The innovator decided to prepare hers differently to improve the taste but with less ingredients. She came up with the

improved tuubani using partially ripe dried mangoes to mix with Bambara beans flour. Since unripe mangoes are notably sour as a result of high vitamin C content, she opts for the partially ripened mangoes to tone down this sourness but also benefit from the rich vitamin C present in them. Again, mangoes are fruits that are prominent and readily available in the Zanguga community, thus creating a low-cost budget for her innovation. Bambara beans are another cheaper substitute for making Tuubani. In this innovation, the innovator adds dried mangoes to the regular tuubani flour, making it partially sweetened, which makes it liked by children.

During preparation of the flour, she adds1kg of dry mango flesh to 2.5kg of Bambara beans. This mixture is milled into flour for preparing the nutritious tuubani. Through her initiatives, the innovator is able to come out with substitutes that are cheaper, nutritious, and good-tasting tuubani for children and adults in the Zanguga community.

Motivation for the innovation

The innovator realized that mango is abundant in the community throughout the year and more so at the lean season, and has the sweetening properties that can help to improve the taste and nutritive content of tuubani. This innovation, adding sweet dried mangoes to make the raw Tuubani sweetened fruit, can be eaten even without its usual accompaniment. Mangoes are readily available in her community during their harvest season,

Benefits of the innovation

The enriched tuubani is a great source of protein as the added mango fruit provides extra vitamins and minerals to this meal. In addition, it is less costly and easy to prepare in the community. Therefore, benefits gained include consumption of improved nutritious diet by her household and income from the sale of the flour. Community members also benefit from the consumption of the flour, which is nutritious through her innovation.

Gender issues addressed through the innovation

Through her innovation, Ms Alimatu has earned increased respect from her husband and in-laws as she has been tipped for making delicious and nutritious delicacies. In terms of house decision making, her innovation has resulted in her becoming self-reliant and participating effectively in the household decision making process. She has also improved the nutritional

status of her household, which makes her feel more relevant in the husband's family. The adoption of this innovation by her household and peers has also made them more food secure.

Current problems with the innovation: The seasonality of mango fruits requires adequate quantities to be harvested, dried, and preserved for year-round usage. In addition, the innovator requires additional knowledge and skills on general food nutrition and fortification practices.

Further questions explored by the innovator: The innovator is thinking of how to improve her innovation further and also commercialize it, hence she is seeking the right approach and ideas for this.

4. Preparing *Kulikuli* snack using dawadawa yellow powder and corn flour by Ms Musah Aheei in Zanguga community

Innovator Aheei displays her improved kulikuli snack "biscuits". Photo by Issifu Sulemana

Background of the innovator

The innovator is a 66-year-old woman from Zanguga community. She is a mother of 6 children and 9 grandchildren, 4 of the grandchildren are girls and the rest are boys. The innovator engages in small-scale farming of maize, soya, Bambara beans, and leafy vegetables on her 4-acre farmland. She also rears goats, sheep, and local fowls as a social security avenue and income. In addition to crop/livestock farming, the innovator is into the collection and processing of wild fruits like the African locust bean fruit, also known as Dawadawa (*Doore* in the local language), sheabutter etc. from which she earns extra income. She is committed to giving her household the motherly care that she exudes in the manner in which she cares for her grandchildren

Brief description of the innovation

The innovator uses dawadawa fruit powder, mixes it with corn flour, and fries it to get an enriched *kulikuli* as compared to the type made from groundnuts. *Kulikuli* is a hard, crunchy cake made from partially cooked groundnut paste that is molded into cylindrical shapes and then allowed to go through deep frying in hot oil. This crunchy delicacy is mostly combined as an accompaniment in beverages, and both children and adults enjoy it. The yellow powder of the dawadawa fruit is very sweet when mixed with water. The innovator uses this powder,

mixed with corn flour, then spices it with salt into a paste. She then molds it into cylindrical shapes and deep fries them in hot oil. Her innovation process involves the following Steps:

1. For every 1 litre quantity of yellow powder, she adds ¼ of corn flour
2. About a gram of salt is added for taste enhancement
3. Mixed thoroughly while still dry to get uniform content.
4. This is finally mixed together with adequate water into a thick paste, molded, and then fried in hot oil to get the *Kulikuli* for both household consumption and to sell.

Motivation for the innovation

Kulikuli is delicious and mostly cherished and consumed by kids in the community. The year 2020 came with its challenges of COVID-19, compelling the innovator to come up with her innovation during the peak of the pandemic, when food prices hiked. It had become expensive to buy kulikuli for her many grandchildren anytime she is returning home from the market or travels. She started exploring cheaper substitutes to prepare kulikuli that maintains its delicious taste. She realized dawadawa powder, which was readily available, did the trick.

Benefits of the innovation

Not only is this product tasty, especially for children due to the sweetness of the dawadawa powder, but it also serves as a readily available snack for the children. Dawadawa yellow powder is also rich in vitamin E, which is good for children's sight development. Other benefits being derived:

- It has saved her some money that would have otherwise been spent on purchasing kulikuli for her grandchildren
- It has also added another diversity to their household diets
- The prepared food can last between 3 weeks and a month before going bad, hence it has afforded her more time for herself

Gender issues addressed

Her innovation is seen by her colleagues as a major breakthrough and earns considerable respect in the community. The innovation has made use of a key ingredient that comes from off-farm activities. This has made her and other women in the community more food secure

Further questions she is exploring about her innovation: The innovator is thinking of how to improve her innovation further and make it a commercial one, but is challenged with the requisite skill and capacity to move to that level.

Spread of Innovation: Members of her household have learned from her and are applying the innovation in the community. Four other women in the community have learnt and are using it to enhance family nutrition.

5. Innovative collection and recycling of water sachet plastic waste by Zee Neiya Fongu women's Group in Kukua, led by Ms Barikisu Yahaya

Group leader Barikisu (right) and her innovation group (left). Photo by Issifu Sulemana

Background of the Group

Kukua Zee Neiya Fongu group is an emerging social development group made up of 33 women living in Kukua community and working together to clean up their surroundings to protect and save their livestock from eating/swallowing littered rubber and other plastics in the community. 25 of them are between the ages of 20-45 years of ages while the rest of the 8 are aged 46 and above. Members of the group are married women in the community with little or no formal education. Three (3) of the group members are widows and are household heads in the community. Some of the group members belong to Mamprusi and Gurusi ethnic groups. Farming is the main economic activity of all group members, with each cultivating maize, groundnuts, soybeans, and millet on not more than 4 acres of land, while rearing sheep, goats, and local fowls in addition.

Apart from farming, the group members also engage in buying, stocking, and processing foodstuffs for income. Petty trading equally forms an important part of some of the group members' village-level business. The group also now operates a savings and loans scheme known as *'adaka billa'* in the local language, which helps them to save and invest in their farming activities in the community. The group started as an ad hoc group to control constant dangers posed to their livestock, which consume littered rubbers and plastics in the community,

but has now transformed into a more social community-level movement working together to protect the environment, safeguard women's livelihoods (livestock), and improve the economic well-being of members in the community. Five women started the idea, but it has grown in size and strength over the years to become a recognized and functional group of many community members, including men expressing interest in joining. It's now becoming a sanitation movement - *Kukua Zee Neiya Fongu group*- in the community.

Description of the innovation

This is a self-help group that emerged as a social development force with group members working together to secure a healthy and sound environment in the community. Under this concept, group members meet to work together to clean up their surroundings to protect and save their livestock from eating/swallowing littered rubber and other plastics in the community. The group noticed that improper disposal of waste, especially plastics and rubbers, is a critical issue and a worry to them as women. "*It is killing our livestock; the animals are now our key source of livelihood and incomes,"* according to the group. The group noticed that rubbers are now part and parcel of the community's daily life. They serve food, water, drinks, and other commodities in them as packaging materials. But the rubbers, when not properly disposed of, pose a danger, especially those (polyethene) used to serve food, water, and drinks, provide a taste and aroma which attracts livestock to eat/ chew, and swallow.

The group emerged as a voluntary movement of women's association with norms (few unwritten guidelines), structures (leadership), and functions (roles and responsibilities) to address the challenge that is affecting their interests in the community. The group works in different forms to protect their interest and improve their economic well-being in the community, as described below.

Sound environment: This component focuses on clean-up exercises to provide a sound environment in the community. The group, realizing the importance of good sanitation to the health of the livestock, undertakes the clean-up exercise to create local awareness and improve sanitation in the community. They come together once every week or two weeks during the farming season, to collect and dispose of rubbers, plastic containers, and other lethal waste material in the community. They do it in their sections in the community. They also meet to discuss how to move forward with issues of sanitation, how to engage with the community to promote good sanitation behavior among members of the community, and encourage its individual members to take up regular cleaning in the households in the community.

Livestock protection: This component of the concept focuses on the governance aspects, i.e, engaging with people who matter regarding promoting good sanitation to protect their livestock in the community. It includes an unwritten framework for engaging their husbands, chiefs, opinion leaders, elders, assembly persons, etc, in the community. They lobby, demand measures, enforcement, and sanctions around the indiscriminate disposal of plastic waste to protect the environment and save their livestock in the community.

Economic empowerment: –This component of the concept focuses on improving the livelihoods, income generation, food and nutrition opportunities that come as a result of the formation and operation of the group in the community. What started as a women's development social movement has now transformed itself to incorporate economic empowerment for group members as motivation with real economic gains as they participate in the group activities. During their weekly or fortnightly meetings, the group discusses business opportunities, including individual members' petty trades, new emerging businesses, and how to innovate and come out with new ideas that they could work together to promote among themselves. To help finance this, they established and operate a village savings and loans scheme (VSLA) to support their economic empowerment. VSLA allows them to make a periodic contribution and borrow to start or expand already existing businesses in the community. 36 out of the 51 group members have identified and are operating their own small-scale businesses because of this component of the concept.

One outstanding result is the innovation of Madam Bariksu, who explored further to collect the rubber waste of her colleagues and convert it into useful products using her technical skills and knowledge. This innovative and enterprising woman among the group worked with some of the group members to convert sachet water rubbers into ropes for tethering ruminants, drying lines, water-drawing rope, etc. The innovator is currently training her colleagues to transform the littered plastic rubbers from trash into wealth in the community.

These 3 focus areas of the concept are making impacts in the community. They contribute to good sanitation, behavioral change, livestock protection, and women's economic empowerment in the community

Group collecting the sacket rubbers to process into ropes for use: Photo by Issifu Sulemana

Motivation for the innovation

The group was motivated by an attempt to find solutions to protect their livestock, improve environmental cleanliness, create economic opportunities/incentives, and promote unity and harmony among the group members in the community. It all started as a small group of women discussing among themselves how to protect and save their livestock from dying as a result of plastic and rubber choking in the community. According to the group, women in the Kukua community are mostly peasant farmers cultivating staple crops and rearing livestock. But in recent times the crop farming is no longer viable as it used to be because of Climate change impacts, poor soil fertility, and limited access to land for women in the community. Therefore, their hope is in the livestock whose rearing has been challenged by the consumption of littered plastics, causing their deaths in the community. Hence, the women's group mobilized to clean the surroundings, get rid of the rubbers in the community, and protect their environment.

Benefits of the innovation

The initiative has yielded a lot of results and benefits to the group and community:

- Livestock, especially small ruminants, ie, goats, sheep, are no longer consuming plastic rubbers, leading to a reduction of livestock deaths from the rubbers.
- In addition, rubbers collected are being converted into dry lines and other products, giving women the opportunity to earn additional income.

- They also operate a Village Savings scheme where they contribute specific amounts for individual members monthly. This not only brings financial benefits but also unity and harmony among group members
- Some women within the group are emerging as local female entrepreneurs with new business ideas and operating small scale businesses in the community.
- Financial independence was created by VSLA, technical skill training, and increased livestock production.

Gender issues have been addressed through this innovation:

- Through this initiative, the women in the community are being emboldened over time to take up their own development process. A 'social force' or movement recognized in the community and is working together with key community opinion leaders, chiefs, and other stakeholders to regulate how plastics, including rubbers are disposed of in their area.
- They also assumed the power to report and seek minimal punishment for offenders from the chief and elders in the community, apart from undertaking a clean-up exercise periodically.
- The group is gaining recognition in the community as valuable contributors to the development of society.
- Through their VSLA support component, the individual woman is respected by their husbands and other people in the community. They are able to participate effectively in household decision making process. They are better positioned to support their families with less economic dependence on their husbands because they have practically become entrepreneurs, running small scale businesses and generating incomes from the sale of the products they developed with the help of VSLA support, technical skills trainings, and knowledge sharing.
- Additional gender issues addressed include improving household income, food, and nutrition security, which has made them proud and boosted their morale in the community. This lifts their spirits and makes them continue the good work that the group was established for.

Questions the group is further exploring: The group is thinking of further developing the concept into a much stronger social movement, mobilizing and expanding its operation to cover the entire community and beyond.

Spread of Innovation:

Women from other sections of the community are consulting them, and they are sharing their experience with these other women and encouraging them to join in scaling the innovation.

6. Multipurpose compost preparation by Ms RAHINA YUSSIF in Kukua community

Innovator's multipurpose compost materials

Innovator Ms Rahina. Photos by Issifu Sulemana

Background of the innovator

The innovator is a small scale farmer from Kukua community in the West Mamprusi Municipal of the North East Region. She is a middle-aged woman of 45 years with no formal education. She is married with 5 biological children and 2 grandchildren. Her primary occupation is farming and petty trading during the dry season. She is entrusted with a 2-acre land by her husband to which she cultivates maize, groundnuts, soybeans, and millet for household consumption, and little is sold to meet dire financial needs, while helping her husband on the family land during the farming season. She also rears sheep, goats, fowls, and guinea fowls. Madam Rahina Yussif has benefited from agricultural trainings and technology transfers before, which gave her basic skills in farming in the community. She is a member of a VSLA group that supports personal development and creative thinking in solving problems.

Description of the innovation:

The innovator experimented on her own and came out with a unique way of producing her compost and multi-purpose compost product in the community. The compost produced by the innovator provides fast soil fertility recovery and prevents crop diseases. She prepares her Compost using the following materials:

- Grasses/crop residue, animal droppings, and ashes.

- Waste water from shea butter processing, dawadawa husk-soaked water, and human urine

This innovation is unique because, unlike the conventional compost, where large quantities are required to generate results, with her formulation, she uses less of the materials. The innovator employs the following procedure:

- Sorting and separation of plastic and other non-degradable waste from the domestic and agricultural residues
- Shredded/chopped crop residue or grasses (carbon source) into smaller pieces and arrange them in layers, or in some cases, a uniform mixture with the largest proportion spread on the ground
- She adds animal droppings, either from chicken, goats, and in some cases cattle, to this and mixes them together
- Ashes from household cooking are added to make up the component of potash
- The innovator then adds water, solution from dawadawa husk, and waste solution from extracted shea butter (kpabulugu) are used as mixing solutions for the preparation of the compost.
- The innovator then fortified her compost with human urine.

According to the innovator, the shea butter liquid wastehelps to retain and hold moisture in thesoil. The dawadawa husk liquid waste soaks the materials, improves the fertility content, and catalyzes the release of nutrients from the compost.

Innovator in compost preparation process. Photo by Issifu Sulemana

Motivation for the innovation

The innovator realized that farmers in the area are using normal compost made from grasses/crop residue, animal droppings, and ashes. But she experienced that the highly deteriorated soil conditions in the Kukua community render such compost ineffective in the short term. The soils are too exhausted because of continuous cultivation and frequent use of chemical fertilizers. Such exhausted soils require huge volumes of compost, which is difficult for her to meet because of the labor and time involved. Chemical fertilizers are scarce and expensive for most small-scale farmers. Hence, she started experimenting with locally available materials and eventually came up with her multipurpose and quick-action compost

Benefits of the innovation

This innovation lessens the quantity of materials needed for preparing effective compost. It also provides a quick soil restoration while guaranteeing long-term impact. Quick soil recovery translates to better crop yields to improve food security, according to the innovator. Her innovation enables her to use less labor, cut costs, and avoid the use of chemical fertilizer in recovering poor soils in the community.

Gender issues addressed

- Through her innovation, she is held in high esteem by the farming population, including her husband in the Kukua community.
- She has gained recognition and has become more visible in the eyes of her colleagues in Kukua community. This is inspiring more women to start experimenting with different ideas to find local solutions to their problems in the community. She has been empowered to maximize her limited resources for sustainable use.
- Through her innovation, she and her household are more food secure than before. She is economically empowered through better yields, thus saving money on foodstuff purchases.
- Her innovation has helped her save money to pay for her children's school fees and other household expenses. She is economically empowered and now plays key roles in household decision making process on matters such as when and how basic necessities for the household upkeep, feeding her school children, among others, are managed.
- The innovation has helped to reduce dependence on her husband for food, lessening marital conflicts, and improving household harmony.

Further joint development of the innovation.

The innovation has undergone joint experimentation with formal researchers through field trials to validate and improve its efficacy and to standardize the product for future commercialization by the innovator.

Spread of innovation

Madam Rahina Yussif has trained 20 women and 40 men in the community who are now using and adapting it to improve crop production. She also shared the innovation and PID results with 3 other communities in the Walewale learning site. She also participated in a Farmer Innovation Fair in December 2024, where she exhibited the products and shared her innovation with the general public, policymakers, and institutional stakeholders.

7. Preparing a local condinment using kenaf seeds and soybean by Ms Yahaya Dahamata in Kukua community.

Innovator and her condiment: Photo by Issifu Sulemana

Background of the innovator

Madam Dahamata lives in the Kukua community of the West Mamprusi Municipality of the North East Region of Ghana. She has 4 biological children, 2 are male and the other 2 are female. She also has 8 grandchildren. She is popularly known in the community as an old woman who is very familiar with development work, especially farmer-based organization (FBO) facilitation and formation. She is a small-scale farmer who engages in the rearing of domestic livestock and also runs petty trading to generate income. She cultivates maize, millet, cowpea, and soybeans. She also keeps a backyard garden where she grows pepper, okra, jute mallow, amaranthus, etc, for her household consumption. She has had formal education up to the ordinary level (O' Level). In her maiden days, she has been an active women's leader in her community and is still performing a leading role in community mobilization and trainings. She has seen to the formation of many FBO groups in her community and has also trained several women in agricultural value chain activities, business enterprises development, and has been a strong women anchor in her community.

Description of the innovation

The innovator came out with two sets of condiment preparation using Soya beans and kenaf seeds for both human and livestock consumption. For human consumption, she prepares her Dawadawa condiment using Kenaf seeds and Soybean as a substitute to Dawadawa seeds. Dawadawa is a condiment predominantly made from the seed of the African locust bean tree,

also known as dawadawa tree, and it's been largely used to produce condiments by local women. Soya beans have also gained popularity in this regard on the grounds of being a substitute element and offering equal nutritional benefits. However, this innovator prepares her dawadawa condiment using the following ingredients: Kenaf seeds and Soybean to come out with a new form of condiment, giving women in the community an alternative, but rich in nutrients, and cheaper to augment shortages of Dawadawa seeds in certain parts of the year. In preparing this condiment, she uses equal proportions of soybeans and the kenaf seeds through the following steps:

- She first roasts them (kenaf and soyabeans) in a hot pot separately
- Boil them separately with hot water
- Add bitter salt to soften and reduce bloating when consumed
- Cover and store them separately for 3 days to allow for fermentation
- Dry them for a day to make them moist, and allow air to pass through them
- Then mix and mold the condiment into the preferred shape and size

For livestock consumption, she uses only kenaf seeds with the following steps: Roast the kenaf seeds. Boil and dry it for a day. Then mold them into the preferred sizes and shapes. Add salt petre to soften and which also serves as a de-wormer for animals.

Motivation behind the innovation

The innovator initially coined the idea from her mother who used to use just the seeds of Kenaf in making the local condiment as a substitute for the African locust bean. The innovator is motivated by the fact that, Dawadawa seeds are not readily available throughout the year and sometimes expensive at certain times of year. Also, due to rising popularity in the sensitization on the need to eat soya bean meal and leafy vegetables as a healthy practice. She therefore substituted dawadawa with soya bean and kenaf seeds to give her nutrient packed condiment. The innovator was also motivated by the fact that more women had taken to the patronage and consumption of other forms of condiments, including industrially made ones (Maggi), and these had become scarce and expensive during the COVID-19 pandemic and the subsequent lockdown period.

Benefits of the innovation

- Benefit to the family: Noticing that her product is very nutritious, healthy, and organic, the innovator and her household have been using this innovation for the past 3 years, which has served the same purpose as the popularly known dawadawa condiment.
- She also makes extra income from the sale of her product, which enables her to pay for household basic needs like soap and to meet the cost of grinding mill for food, etc.
- To the larger community, in terms of food and nutritional security, through this initiative, the innovator is able to solve community-level malnutrition challenges. Her product is nutritious, boosts the immune system, and has the potential to prevent diseases among children.
- Ever since using the innovation, the innovator has realized improved health benefits with respect to the frequency of visits to the doctors, and has also noticed a healthier lifestyle in her grandchildren, most especially.

Gender issues addressed

- The innovator makes extra income as a woman. She is better empowered to support herself and the grandchildren in the family with less economic dependence on her children.
- Due to the innovation, the innovator has been able to save money on foodstuff, which has increased her savings capacity
- She has contributed to making her household to become more food secure
- She is able to support in payment of her grandchildren's shelter, school fees, and clothing
- She has also become a model and champion of learning in the community.

Current problems with the innovation

- Her major problem currently is packaging. She wishes she could package it in a way that would be more attractive for sale.
- She also needs additional skills to improve the nutritional values and quality of her products
- She further wishes to acquire business and marketing skills to increase sales of her products

Spread of the Innovation

The innovator has shared the knowledge of her innovation with her VSLA group members, numbering 35, who are using her product.

8. Preparing *Sobolo* drink with rice, coconut juice and *bissapi* (Dried Sorrel Leaves) by Ms Yahaya Barikisu in Kukua community

Innovator showing her nutritious sobolo drink. Photo by Issifu Sulemana

Background of the innovator:

Ms Yahaya Barikisu is a middle-aged (39-year-old) woman in Kukua, a farming community in West Mamprusi Municipality in the North East Region of Ghana. She is married to a farmer and has 6 children (4 females and 2 males). She is a smallholder farmer with a total of 4 acres of land. She practices mixed farming, ie, rearing of small ruminants and cultivating crops in the rainy season. She is also a women's leader and wields considerable influence over her colleagues in the community. She undertakes petty trading in the community. She likes trying her hand on things to address issues and, as a result, has come out with a number of products (including converting plastics into useful products and the nutritious *Sobolo* drink). She is also a community volunteer for the Ghana Health Service (GHS) and supports their community sensitization, mobilization, and immunization activities.

Description of the innovation:

The innovator, Yahaya Barikisu prepares her Sobolo drink by combining rice, coconut juice, and Bissapi (dried sorrel leaves) to improve the nutritional benefits of a locally prepared drink - Sobolo. In recent times, rice drink is also gaining prominence in the catering industry. The innovator decided to use these two ingredients in addition to coconut in this drink, enjoyed by

many, including children in the community. In preparation, the innovator takes the following steps:

1. A kilogram of dried sorrel leaves is boiled in 5litres of water, cooled, and strained into a clean container.
2. Half a kilogram of local rice is washed and soaked overnight, and blended into a smooth paste. Then diluted with 2litres of water and sieved to get a fine creamy solution, then added to the wine-looking Sobolo solution.
3. 50 grams of ginger, 5 grams of cloves, and a gram of black pepper are blended and sieved, then added to the rice and Sobolo mixture.
4. One large coconut fruit is blended, sieved, and added to the mixture.
5. Add just enough sugar/natural honey to improve taste.
6. The end product is then packaged into smaller bottles and rubbers and chilled for sale in the community. Both old and children like it so much in the community.

Motivation for the innovation:

She has worked towards improving her Sobolo to cut down costs, increase the nutritional value, and capture the market in the community. Sorrel leaves are very rich in vitamin C and taste very sour too. This usually leads to the use of more sugar to tone down the sourness. The innovator realized that milk is very effective in toning down sourness as well as improving the taste of the drink. She therefore decided to experiment on her small business in Sobolo by adding milk extracted from coconut and soaked unparboiled rice to give her nutritious drink of refreshing taste to improve the nutritional benefits.

Benefits of the innovation:

The drink of Madam Barikisu is a great source of vitamin C in particular. It is thus very healthy for children. Through this initiative, the innovator is able to solve community level malnutrition challenges as it is nutritious, boosts the immune system, and has the potential to prevent diseases among children. In addition, the innovator is able to make a good economic income for her family. The income obtained enables her to pay for household basic needs like soap, soup ingredients, and income to support food.

Gender issues addressed.

- As a community influencer, her innovation has increased her social status, where she has become an avenue and icon for learning from both her peers and the youth
- She is better empowered to support her family with less economic dependence on her husband. The Innovator uses the income from the sale of the drink to buy foodstuffs, books, and pens, and prepares the children for school, which makes her earn more love and affection from both the children and her husband

Further plans for the innovation: She is thinking of working further to improve the nutritional content and packaging of her product. She is thinking of working to upscale and commercialize her Sobolo products to boost her profit margin.

Spread of the innovation: She has shared the innovation with her VSLA group members of about 6, and also with her customers.

PROFILES OF LOCAL INNOVATIONS IN BONGO LEARNING SITE

1. Using flowers of *Kemkem* plant to store crop produce by Ayamdoo Joram Asampana from Tamolga Community in Bongo District

Innovator with the kemkem plant and grains

(Photo: Albert Avoka, NABOCADO NGO)

Background of Innovator

Ayamdoo Joram Asampana is a farmer from the Tamolga community of Bongo District, born in 1989. He has completed his tertiary education at the university level, which has equipped him with valuable knowledge and skills and empowered him for his livelihood. Ayamdoo lives with his mother, four brothers, and his wife. By profession, he is a teacher, a role that provides him with a stable source of income. In addition to his teaching career, Ayamdoo is an enthusiastic medium-scale farmer, cultivating maize, groundnuts, beans, and Bambara beans. He also has 7 goats, 5 sheep, 25 guinea fowls, and 15 local fowls, for economic, food security, and cultural purposes.

Brief description of the innovation

Ayamdoo Joram Asampana's local innovation is a game-changer in crop protection and storage of grains and seeds. The innovation process is as follows:

a. He harvests the fresh *Kemkem* flowers from the field, which are air-dried completely, ensuring that the flowers retain their potency and effectiveness in repelling pests.
b. Once the *Kemkem* flowers are dry, he uses them in two innovative ways. Firstly, he layers the dried flowers with cereal and legume produce (grains or seeds), creating a barrier that repels pests. This simple method has proven to be highly effective in protecting produce during storage.
c. Alternatively, he pounds the dried *Kemkem* flowers into a powder form, which he mixes with the grains in bags and seals the bags. The powder acts as a natural pesticide, controlling pests that can damage the stored produce.
d. This airtight storage system with *Kemkem* flower treatment ensures that the crops remain free from pest attack for an extended period of over six months.

One of the significant advantages of Ayamdoo's innovation is that it doesn't require any extra financial investment. The materials needed are available in the community, and the process is relatively simple, making the innovation accessible to farmers.

Motivation for the innovation

The motivation behind Ayamdoo's innovation was the recurring problem of crop losses during household storage, particularly with seeds. He encountered significant challenges in preserving the quality and quantity of his crop produce, which led him to seek local solutions through innovation and self-experimentation, ultimately resulting in the development of his *Kemkem*-based innovation. He didn't rely on external guidance or expertise but instead used his own creativity and resourcefulness to develop the innovation. His experience and knowledge of local resources played a significant role in developing the innovation.

Benefits from the innovation

Ayamdoo has achieved numerous benefits from his innovation, particularly in preserving his crop produce without significant losses as before. By controlling pests during storage, he's able to preserve the quality and quantity of his produce, ensuring a constant supply of food for his household. The benefits of Ayamdoo's innovation extend beyond food security, as it has also improved his livelihood and reduced the drudgery associated with crop storage. His innovation has become an integral part of his farming practice, and he continues to refine and improve it.

Gender Issues

Both men and women in the community have benefited from his innovation, and it has not created any unintended gender-related issues. Instead, women who are at the center of ensuring household food security now have a reliable method of reducing losses in grain storage, making more food available to the family.

Problems faced and solutions

The only challenge Ayamdoo faces is the scarcity of *Kemkem* plants during the dry season, when the plants wither away as an annual plant. This can make it difficult to maintain a sustainable supply. To this end, he is planning to harvest and store adequate quantities when the plants are in season.

Spread of the innovation

The innovation has been adopted by at least 30 households in his community, comprising 12 male-headed households and 18 female-headed households. This widespread adoption is a testament to the effectiveness and potential of his innovation to benefit a larger population. The households that have adopted Ayamdoo's innovation have reported significant improvements in crop storage and reduced losses from pests. This has had a positive impact on their food security and overall well-being in the community.

2.0 Treatment of maize seed with tobacco extract by Azure Issifu from Ayelbia Community in Bongo District

Innovator and wife display tobacco material and grain
(Photo by Albert Avoka, NABOCADO NGO)

Background of Innovator

Azure Issifu, born in July 1968, is a dedicated farmer from the Ayelbia community who has been making a living from farming for many years. He has a wife and five children. Azure's farm is his pride and joy, spanning 8 acres of land where he cultivates maize, sorghum, groundnuts, soybeans, and rice. In addition to crop farming, he also engages in livestock rearing, with a diverse range of animals including 5 cattle, 4 sheep, 8 goats, 24 guinea fowls, and 15 fowls. His farm is a thriving enterprise, generating surplus produce which he sells to support his family and improve his livelihood. His commitment to his community is evident in his role as chairman of a village savings group. This position enables him to contribute to the development of his community and support his fellow farmers. Through his hard work and dedication, Azure has become a respected member of the community.

Brief description of the innovation

This innovation utilizes tobacco extracts to repel pests and diseases when the seeds are planted.

a. Innovator soaks tobacco in water and extracts the liquid for seed dressing. Sometimes, he harvests fresh tobacco leaves, pounds them, and squeezes the liquid extract for dressing seeds before storage.
b. He uses 2 bottles (1,200 mls) of the extract to mix with a 100 kg bag of local beans and when it is maize or other cereals, he uses 1 bottle (600mls) for dressing.
c. He only uses dried tobacco products for storage when fresh tobacco leaves are not available to extract the solution for use.

Tobacco products used to preserve maize and millet seeds

(Photo by Albert Avoka)

Motivation for the innovation

The innovator was faced with significant poor germination of seeds each year due to soil pests' damage. The pests were not only affecting crop yields but also causing him significant stress and financial losses. He was determined to find a solution to this problem, which led him to experiment with different methods until he finally succeeded in using tobacco leaf extract or dried tobacco product to dress the seeds before storing. He noticed that the tobacco product repelled the soil pests that eat up his seed when planted. According to him, his innovation has helped increase his crop yields significantly.

Benefits from the innovation

The tobacco extract helps to protect the seeds from pests and diseases in the soil and increases germination rates. He has recorded a significant increase in crop yields from 2 bags per acre to 7 bags per acre of maize crop through the innovation. The benefits extend to being environmentally friendly, economically sound, and attractive to both men and women in the community. One of the important advantages of the innovation is that it doesn't require any extra investment. The materials needed are readily available, and the process is relatively simple, making the innovation accessible to many farmers. This innovation is particularly important for small-scale farmers, who often face challenges in preserving their crops due to limited resources and funds to buy chemical pesticides. By adopting this innovation, farmers can improve their livelihoods and contribute to the well-being of their communities

Gender Issues

Women in the community have adopted the innovation, as they found it to be beneficial for their farming activities. The innovation is working effectively for both men and women farmers, and the innovator is proud to contribute to the empowerment of women in his community.

Problems faced with the innovation

No significant problems have been encountered with the innovation, except for the scarcity of tobacco leaves or products all year. However, the benefits of the innovation far outweigh the challenges, and the innovator is committed to improving the method for enhanced benefits to himself and the community.

Spread of the Innovation

Ten (10) farmers have adopted the innovation, comprising 4 males and 6 females. It is a pride and relief to see the innovation working effectively for others, and the innovator is happy to have been able to share his knowledge and skills with others.

3. Storage of cereals and legumes produce with “dabokuka” plant by Nmaale Peter from Tamolga Community in Bongo District

Innovator displays the Dabokuka plant

(Photo by Anane Kaarayir, Dept of Agric)

Background of the innovator

Nmaale Peter is a 25-year-old secondary school student and smallholder farmer from Tamolga, a farming community in the Bongo district of Ghana's Upper East region. As a young farmer, Peter cultivates a variety of indigenous crops, including millet, maize, sorghum, rice, groundnuts, and cowpea, alongside rearing small ruminants and poultry. However, like many farmers in his community, Peter struggled with storage pests that damaged his crops, particularly cowpea and Bambara beans. These pests not only reduce his crop yields but also affect the quality of his produce, leading to losses in income and food security.

Brief description of the innovation

Peter's journey to developing a natural pest control solution began in 2018, when he started experimenting with boiling the leaves of the *dabokuka* herb to create an extract that may protect his stored cowpeas from pests. Through several trials and adjustments, he found a remedy that proved effective in preserving his cereals and legumes from storage pests. The innovation

involves using the extract from the *dabokuka* plant to protect stored cereals and legumes from pests, providing a cost-effective and sustainable solution for smallholder farmers.

a. To prepare the protective solution, 2kg of *dabokuka* leaves are boiled in 2 liters of water for 5-8 minutes, extracting the plant's natural insect-repelling properties.
b. The resulting solution is then sieved to remove the leaves, and 8-10g of salt is added to the liquid, stirring until the salt is completely dissolved. The addition of salt enhances its efficacy in repelling pests.
c. After allowing the solution to cool down, it is sprinkled and thoroughly mixed with half a bag (40kg) of cowpea, Bambara nut, or maize. The treated seeds are then air-dried to prevent moisture buildup, which can attract pests, before being bagged or potted for storage.
d. This innovative method has proved to be highly effective in protecting stored produce from pests for an extended period of at least one year.

Innovator displays the Dabokuka plant and grains stored
(Photo by Anane Kaarayir)

Motivation for the innovation

Nmaale Peter's innovation was driven by the need to address significant losses during storage and the risks associated with using agrochemicals to preserve food produce. Recognizing the dangers of chemical residues in food and the risks/dangers they pose to stored food stocks, Peter sought an eco-friendlier solution. Through experimentation, he developed a natural storage method using *dabokuka* leaves, which not only protects his crops but also ensures food security for his small family of five. This innovative approach offers multiple benefits. The

stored food is safe from pests, readily available for consumption, and medicinal for animal and human diseases. By developing the innovation, Peter has reduced his reliance on agrochemicals, minimized post-harvest losses, and improved the quality and safety of his stored food.

Benefits from the innovation

The *dabokuka* storage innovation has brought significant benefits to local farmers. By using the extract from the plant, the farmer effectively protects stored cereals and legumes from pests, reducing losses and improving food security. This natural and cost-effective solution has empowered farmers to address storage challenges, preserving harvests and improving their overall food security and livelihoods. By utilizing this natural and eco-friendly solution, farmers can significantly reduce their reliance on chemical pesticides, which are harmful to human health and the environment. The *dabokuka* solution offers a cost-effective and sustainable alternative, making it an attractive option for smallholder farmers who often have limited resources. Additionally, this approach can help farmers minimize post-harvest losses, improve food security, and increase their income by ensuring that their crops remain pest-free and of high quality. The innovation presents a practical and environmentally friendly solution to a common problem facing many farmers, thus demonstrating the potential of traditional knowledge and local innovation in addressing agricultural problems.

Gender issues

The adoption and implementation of the local innovation using the *dabokuka* plant did not encounter any noticeable gender-related issues, as both male and female farmers are able to use it. The innovation is particularly cost-saving for women who stock and sell grains as a trade and also helps them to ensure the food security of their families.

Problems faced with the innovation

Dabokuka is an annual plant that is abundant during the rainy season but becomes very scarce in the dry season. It primarily grows along riverbanks, making it difficult to find during the dry season when most crops are harvested to be stored.

Spread of the innovation

More than 17 smallholder farmers, comprising 12 females and 5 males, have adopted the innovation, demonstrating the growing interest in sustainable agricultural practices among smallholder farmers. The adoption of sustainable practices can contribute to improved

productivity, income, food security, and resilience to climate change, ultimately empowering farmers and driving rural development.

4. Incorporation of Shea Waste (*Bruuma*) into pig feed for fattening by Akugre Adongo of Ayelbia Community in Bongo District

Innovator with Shea waste, maize flour, and rice bran to prepare pig feed (Photo: Anane Kaarayir)

Background of the innovator

Akugre Adongo was born in 1985, a smallholder farmer in Ayelbia, a community renowned for its rich agricultural land and diverse crop production. He is a married man with 4 children (2 males and 2 females). For years, pig farmers in Ayelbia have relied on groundnut cake as a crucial protein source in feed, but its scarcity and high cost have posed significant challenges. However, Adongo's keen observation and innovative spirit led him to explore alternative solutions. Noticing that pigs in his community would feed on shea-nuts during harvest times and subsequently become fattened, he imagined that the solid waste from shea butter extraction (Bruuma) could serve as a viable substitute for groundnut cake.

Description of the innovation

In 2015, Adongo identified and established an experiment incorporating *Bruuma* into his pig feed formulation. The outcome was remarkable as the material provided a protein source, enabling his pigs to thrive while significantly reducing feed costs.

Akugre Adongo's innovative pig feeding approach involves mixing 2 parts of rice bran with 1 part of maize flour and 1 part of dried *bruuma* crushed into a powder. To feed the pigs, he mixes the ingredients thoroughly. He then dilutes the mixture with an appropriate amount of water and feeds it to his pigs on a daily basis. This approach has enabled Adongo to improve the health and productivity of his pigs while reducing his reliance on expensive commercial feeds.

The innovation inputs displayed,
with sheabutter waste cake in the middle

Motivation for the innovation

Pig farming in many communities is hindered by the high cost and scarcity of groundnut cake, a key protein source in traditional pig feed formulations. Recognizing this challenge, Akugre Adongo, a smallholder farmer, leveraged local knowledge and observation to develop his innovative solution. *Bruuma* is not only cheaper but is also readily available and accessible, drastically reducing the cost of production and increasing profitability in the pig production

business. This innovation can be replicated by other farmers, contributing to the growth and development of the pig farming industry in the region.

Benefits of the innovation

The pig feed innovation offers several benefits, including improved pig nutrition and health, increased productivity and growth rate, and enhanced incomes and livelihoods for farmers. The combination of rice bran, maize flour, and *bruuma* provides a balanced diet for pigs, supporting their overall health and growth. By utilizing local ingredients, farmers can potentially reduce costs while also increasing efficiency in their pig farming operations. These benefits can contribute to improved food security and income generation for households involved in pig farming.

Gender issues

Gender problems in pig farming include limited access to resources, unequal division of labor, and restricted decision-making power for women. These challenges can hinder women's ability to adopt and benefit from innovations, including new feed solutions. Solving these issues partly through innovation is crucial for promoting equal opportunities and benefits for both men and women in pig farming.

Problems faced with the innovation

One of the challenges associated *bruuma* as a substitute for groundnut cake in pig feed is its watery nature after shea butter extraction. To make it suitable for use, the *bruuma* needs to be dried adequately, which requires a large cemented floor or tarpaulin. Additionally, good sunlight and heat are essential for proper drying. However, these conditions are not always available during the rainy season, particularly from July to September. The lack of sunlight and heat during this period poses a significant difficulty for farmers who want to adopt this innovation, as it hinders the drying process and makes it challenging to produce high-quality *bruuma* for pig feed. This limitation highlights the need for alternative drying methods or strategies to overcome the seasonal constraints and ensure a consistent supply of *bruuma* for pig farming.

Potential spread of the innovation.

The pig feed innovation has the potential for widespread adoption in households involved in pig farming. This adoption can lead to improved pig nutrition, increased productivity, and enhanced livelihoods for farmers.

5. Incorporation of sesame and groundnut into weaning mix (children's porridge flour) by Madam Asobuno Mavis of Tamolga Community in Bongo District

Innovator shows the feed ingredients

(Photo by Ms Muniratu Gariba, Dept of Agric)

Background of the innovator

Madam Asobuno Mavis is a married teacher with four children (one male and three females), and a smallholder farmer in Tamolga in Bongo District in the Upper East Region. She has developed an innovative solution to address the challenges of producing Weanimix, a popular baby food. Traditionally, her weanimix recipe consisted of maize, groundnuts, and soybeans. However, in 2019, soya beans became expensive and scarce, prompting Mavis to seek an alternative. She replaced soya beans with sesame, a protein-rich ingredient that is abundantly produced in her area and relatively cheaper. This substitution not only ensures the continuity of her weanimix production but also results in a better-tasting and nutritionally enriched product.

Description of Innovation

The innovative product involves combining 2 parts of maize, 1 part of groundnut, and 1 part of sesame to create a balanced and healthy diet for infants.

a. To prepare the weanimix, Mavis first roasts each ingredient separately, enhancing their flavor and nutritional value.
b. She then mixes the roasted ingredients for grinding, creating a smooth flour mixture. To ensure the mixture cools properly, Mavis spreads it in a pan overnight, allowing it to lose excess heat.
c. Finally, the weanimix flour is parceled and sealed in transparent plastic bags, ready for sale.
d. This meticulous process showcases Mavis's commitment to producing high-quality weanimix that meets the nutritional needs of babies in her community.
e. By leveraging local ingredients and a simple yet effective production process, Mavis is making a positive impact on the lives of many families.

Motivation for the innovation

Mavis started her innovation in 2019 when soya beans became expensive and scarce, prompting her to substitute them with sesame, a locally abundant and cost-effective protein-rich ingredient. As an entrepreneur, she was motivated to innovate her weanimix recipe due to the encounters she faced with soya beans, a key ingredient in her baby food product. Soya beans, which provide essential protein and carbohydrates, were often scarce and expensive during the lean season, hindering the growth of her small business. With her teaching background and knowledge of nutrition, Mavis recognized that sesame could be a suitable substitute for soya beans. Sesame is not only a good source of protein but also more affordable and readily available than soybeans in her area. By substituting soya beans with sesame, Mavis intended to reduce the production costs of her weanimix and increase her profit margins. As a result, Mavis's small business became more resilient and competitive, allowing her to better serve her customers and contribute to the well-being of families in her community.

Benefits from the innovation

The benefits of using sesame in weanimix include improved nutritional value, enhanced taste, and cost-effectiveness. Sesame serves as a protein-rich substitute for soya beans, ensuring continuity of production despite supply chain challenges. This substitution also leverages locally abundant resources, supporting local farmers and potentially boosting the local economy. The resulting weanimix product is not only nutritious but also better-tasting, which can increase consumer satisfaction and demand**.** The impact of Mavis's innovation extends beyond her business, as it also contributes to the local economy and food security of households. By using locally sourced ingredients, Mavis is supporting smallholder farmers in her community and promoting sustainable agricultural practices. Also, her weanimix product provides a nutritious and affordable food option for families in the area, particularly for young children who require a balanced diet for optimal growth and development. As Mavis's business continues to thrive, she is an example of how innovation and entrepreneurship can have a positive impact on individuals, communities, and the broader economy.

Gender Issues

Gender issues in sesame production include unequal access to resources, such as land, credit, and training, which can hinder women's participation and benefits. Women often play a significant role in processing and marketing sesame, but may face challenges in decision-making and control over income. Addressing these gender disparities through targeted interventions and support can help ensure that both men and women farmers can equally participate in and benefit from sesame production to support scaling of the innovation.

Problems faced with the innovation

Asobuno Mavis's innovative weanimix production faces a significant challenge in accessing sesame, a key ingredient of her product. Despite Tamolga cultivating sesame in large acreages, the produce is often sold in bulk at the nearby Yelewongo market, which offers higher prices per bowl compared to the local Soe market. As a result, Mavis has to travel long distances to purchase sesame at a reasonable price, adding to her production costs and time. This challenge highlights the need for a more efficient and accessible market system for sesame producers and buyers in the region. By addressing this issue, Mavis and other entrepreneurs can focus on developing their products without worrying about the logistics of sourcing ingredients.

Potential spread of the innovation

Household adoption of sesame production is influenced by factors such as education level, farm size, and access to credit. Higher education levels and larger farm sizes can increase the likelihood of adopting improved sesame production practices to support scaling up the innovation. Access to credit can also help farmers overcome initial investment barriers. Sesame production can benefit households by improving income, contributing to food security, and providing resilience to climate change due to its drought-tolerant nature. Organizations like SNV are promoting sesame production by providing training, demonstrations, and access to markets, helping farmers adopt best practices and secure a reliable market for their produce to support the innovation.

6. Storage of Bambara beans using salt petre from maize cobs by Akugre Adongo from Ayelbia community in Bongo District

Innovator with maize cobs processed into saltpetre

(Photo by Anane Kaarayir)

Background of the innovator

Akugre Adongo is a 40-year-old smallholder farmer born in 1985 from the Ayelbia community, which is renowned for its rich agricultural heritage. He has a wife, 4 children (2 males and 2 females). The fertile lands of Ayelbia support the cultivation of various indigenous crops, including sesame, millet, sorghum, rice, cowpea, groundnuts, and maize. The community is also known for its livestock, with many farmers rearing cattle, sheep, goats, poultry, pigs, and donkeys. Adongo combines crop cultivation with animal rearing, growing crops such as millet, sorghum, maize, groundnuts, and bambara nuts. However, crop losses during storage have posed a significant threat to the food security of his family and the community, particularly for legumes, which are vulnerable to storage pests. Adongo's experience with agrochemicals has raised concerns about their safety, as he has witnessed instances of food poisoning, hence pushed him to innovate for a solution.

Description of the innovation

The innovator began experimenting with using ash as a natural pest control method in 2017 after observing its effectiveness in protecting his crops. This experience triggered the development of his innovation for preserving crops for food security in his community, which involves using a solution made from the ash of burnt corn cobs (saltpetre solution) to treat Bambara beans or maize produce before storage. The process is as follows:

a. He collects corn cobs from his farm and from neighbors and burns them to obtain ash.
b. He mixes about a litre of water with 2.5kg of the ash and allows it to drain.
c. The drained solution is further sieved to make it clearer.
d. The sieved liquid is sprinkled or thoroughly mixed with half a bag (40-45kg) of Bambara beans or maize and air dried.
e. The grains are then bagged and stored to protect them from storage insect attack.

This innovative method provides a natural and effective way for controlling storage pests, reducing the need for chemical pesticides, and promoting sustainable agricultural practices. By utilizing locally available materials like corn cobs, the innovator has developed a cost-effective solution that can be easily adopted by smallholder farmers.

Motivation for the innovation

The innovator's motivation for developing this solution stemmed from the persistent challenge of food losses due to storage insect attacks. Drawing from previous knowledge about the protective properties of wood ash on stored produce, the innovator experimented with corn cob ash, which is believed traditionally to possess strong storage properties. Through harnessing the inherent properties of corn cob ash, the innovator had developed a natural and effective method for controlling storage pests, thereby reducing post-harvest losses and enhancing household food security. This approach not only demonstrates the innovator's innovativeness but also highlights the potential for traditional knowledge to improve or complement modern farming technologies.

Benefits from the innovation

The ash-based pest control method offers several benefits, including effective protection of stored crops from insect damage, cost-effectiveness, and eco-friendliness. By utilizing locally available materials and simple processing techniques, this approach promotes food security and reduces crop losses. The ease of use and minimal investment requirements make it a practical

solution for households and farmers, contributing to sustainable agriculture practices and improved livelihoods. This approach has not only improved food security but also enhanced the economic viability of smallholder farming, as farmers can now store their produce for longer periods without significant losses. The innovative method of storage has the potential to benefit a wide range of farmers, particularly in rural communities where access to modern pest control measures may be limited. The innovation requires minimal extra investment and is cost-effective.

Gender issues

The process described doesn't inherently suggest specific gender effects or related issues. However, since women are primarily responsible for farming or processing Bambara beans and maize, they will also benefit from using the innovation.

Problems faced with the Innovation

The seasonality of corn cobs poses a challenge to the adoption of the innovation, as they are abundant during the late part of the year but scarce at the beginning of the next farming season. This inconsistency in supply can hinder widespread adoption, especially for farmers who need to protect crops during periods of scarcity of the materials. However, farmers can mitigate this challenge by collecting and storing corn cobs during harvest seasons to enhance a year's supply.

Spread of the innovation

So far, 40 farmers are known to be using this method in the community.

7. Adding onion leaves and ginger to improve the nutritive value of *dawadawa* condiment by Madam Asoke Rita from Sanabisi community in Bongo District

Innovator with Ginger, Onion leaves for enriching dawadawa condiment (photo by Anane Kaarayir)

Background of the Innovator

Madam Asoke Rita was born in 1990 and lives Sanabisi community in the Bongo District of the Upper East Region. She is married with 2 female children. As a smallholder farmer, Asoke Rita has leveraged her knowledge of local crops to create an innovative dawadawa condiment made from the seeds of *Parkia biglobosa* (dawadawa tree), demonstrating her entrepreneurial skill and creativity. Through incorporating onion leaves and ginger into its preparation, she enhances the aroma and palatability of the condiment and increases its nutritional value and making it a healthier option for consumers.

Description of the Innovation

Asoke Rita's innovation involves adding a mixture of onion leaves and ginger to enhance the flavor and nutritional value of this traditional condiment. This addition not only boosts the

nutritional profile of dawadawa but also infuses it with antioxidants, fiber, and vitamins from the onions and ginger. The preparation process is as follows:

a. Onion leaves and ginger are cleaned, chopped, and dried in the sun. After drying, they are then milled into powder or flour.
b. The seeds of the dawadawa are boiled for 3-4 hours and pounded in a mortar or rubbed vigorously between palms to remove the hard coats (testa).
c. When the testa are removed, the seeds are then poured into an airtight container and kept for 3-4 days for fermentation to take place.
d. After fermentation, the seeds are poured into a pan and mixed thoroughly with the powdered ginger and onion leaves, and kept for 2 days.
e. The mixture is finally made into balls and dried slightly to further dehydrate it before eating, packaging, or selling.

Ingredients for improving the dawadawa condiment
(Photo by Muniratu Gariba, Dept of Agric)

Motivation for the innovation

Many women sell *dawadawa* condiment in the market. The innovator was trying to make her product more nutritious by adding onion leaves and ginger to increase the nutrients to attract more customers for higher income. It worked perfectly as she now prepares the condiment on orders. She therefore introduced her innovative condiment product in 2023 to the public, aiming to gain a competitive edge in the Soe market by offering a healthier, nutritionally enhanced option to customers

Benefits from the Innovation

Asoke Rita's innovative *dawadawa* condiment offers nutritional benefits, including a unique flavor and aroma that sets it apart from traditional products. The product's enhanced nutritional value adds to its appeal, making it a desirable choice for consumers. Additionally, it has increased market demand and created opportunities for the economic growth of other women (adopters). By improving her product, the innovator has expanded her customer base and increased her profitability and livelihood.

Gender Issues

The innovation enhances the nutrition of her family and economically empowers her to support her husband to cater for the family, without having to depend solely on her husband.

Problems faced with the Innovation

The innovation faces a challenge from the scarcity of the *dawadawa* seeds. Bush burning and deforestation have led to a decline in the dawadawa tree population, making it difficult to obtain a sustained supply and adequate quantities needed for production.

Potential Spread of the innovation

In the Sanabisi community the adoption of innovative farming and food processing practices can improve food security and livelihoods sustainably, as exemplified by Madam Asoke Rita's innovation of adding onion leaves and ginger to traditional *dawadawa* condiment.

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