

Consumer Perceptions and Acceptability of Egg Powder as a Preservation Technique for Rural Household Food Security in Impendle, KwaZulu-Natal, South Africa

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ABSTRACT The acceptability of egg powder to rural households was investigated. A survey was conducted using 120 community members to assess egg utilisation. Sixty three of the survey participants evaluated the sensory acceptability of a scrambled commercial egg powder compared to a fresh scrambled egg and also participated in a complementary Focus Group Discussion. Egg-laying chickens were owned by 88% households. All the household members consumed and valued eggs for their nutritional benefits, although, culture made egg consumption limited for girls and young women. Households largely used commercial eggs due to a limited availability of home-produced eggs, which were significantly lost through deterioration. Sensory analysis indicated that the egg powder was significantly ($p < 0.05$) less acceptable relative to fresh egg due to its bad aroma, therefore it should be improved. However, the consumer panel reflected interest to explore the processing of egg powder indicating a potential for improving rural household food security.

INTRODUCTION

Eggs are a cost effective animal proteins with a potential to contribute to food and nutrition security and generate rural household livelihoods (Iannotti et al. 2014). The potential contribution of eggs in rural households is hindered by several challenges associated with rural egg production; affecting their optimal utilisation (Nyoni and Masika 2012; Iannotti et al. 2014). Underutilisation of eggs as a source of protein for rural households is due to perishability, in hot, humid and wet season, rural farmers are not able to use eggs for a longer period of time because of rapid deterioration (Jirangrat et al. 2010; Moges et al. 2010b; Mosisi 2010; Sujata 2014). Seasonal variations in egg production and limited availability of quality feed presents a challenge to rural farmers, thus households experience a limited supply of home-produced eggs during winter when production is low (Okeno et

al. 2012). Production and market access challenges restrict the potential of rural households from actively participating in developing livelihood options. Generally, rural households are resource limited; struggle to provide sufficient shelter, food and treatment for their flocks, hence the flock is lost due to disease, parasites and predators thereby reducing egg production and egg availability (Nyoni and Masika 2012). Further, they have limited access to markets due to poor infrastructure and supporting services, and the manipulation of fresh egg markets by the well-established commercial farmers (Hendriks et al. 2009). Out of these market challenges, small farmers lose some of their eggs to deterioration and/or breakage.

Eggs availability, accessibility and better livelihood options throughout the year require appropriate storage and preservation technologies suitable to rural household. Egg drying technology offers a longer-shelf life, no breakage and easy to transport benefits compared to fresh egg. Drying is a widely used food preservation method applied in several foods including meat, cereals, fruits and vegetables by rural households (Sagar and Suresh Kumar 2010). It is simple process that requires limited inputs such as sun and or solar energy. Egg powder production has been implemented by small and medium enterprises in Nigeria (Ugwu 2009) and in Asia (Bal-

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akrishnan 2004). At the industrial level, eggs are preserved by processing them through spray drying, into egg powder (Dixit et al. 2010; Kumaravel et al. 2012; Rannou et al. 2013). In South Africa, sun-drying is not being applied these days in the processing of eggs into powder. Thus, consumer perceptions and acceptability of sun-dried egg powder as a preservation technology should be investigated.

Objectives

The objectives of the present study were to assess the utilisation of eggs in rural Impendle, KwaZulu-Natal, South Africa and determine the acceptability of egg powder compared to fresh egg by the rural community.

RESEARCH METHODOLOGY

Study Area

The research investigation was carried out in the rural areas of Impendle in KwaZulu-Natal Province of South Africa. Three villages were chosen, namely Gomane, Swampu and Nguge. To access the community, the researcher consulted the local municipality office. The researcher was allocated a municipal official to seek permission from the traditional chief to conduct the study, organise research meetings and venues.

Sampling Technique

The selection of study villages was based on accessibility, availability of egg laying chickens and active chicken egg layer projects. Purposive and quota sampling were applied. Purposive sampling is the deliberate choice of an informant based on the qualities the informant possesses (Cochran 2007). Quota sampling is more specific with respect to proportions of subgroups chosen to reflect corresponding proportions in the population.

A survey was conducted using a questionnaire to 120 participants. Out of the 120 survey participants, 63 voluntarily participated in the sensory evaluation of egg powder. The same sensory evaluation panellists participated in focus group discussions (FGD). The focus group discussions were used to complement the survey in exploring the consumption of eggs, perceptions about egg as a food source and gender

dynamics around egg consumption. The composition of consumer panel was such that it was representative of the community's adult demographic profile.

Validity, Reliability and Trustworthiness of the Methods

The services of trained field workers were used to administer the questionnaire. The questionnaire was translated from English to isiZulu by two of the field workers who were proficient in both English and isiZulu the local language. The researcher piloted the questionnaire on 10 community members from the study area and this group was excluded from the actual study. Focus group discussions were conducted by a trained facilitator in isiZulu. Sensory evaluation validity and reliability was ensured by using a pictorial scale which was appropriate for less literate participants. The participation in the study was voluntary, participants signed consent forms and they were verbally reminded every time before the beginning of each study session. Ethical clearance for the use of human subjects was obtained from the University of KwaZulu-Natal Research Office.

Survey

A survey was conducted in the selected study area. A questionnaire written in isiZulu was administered to 120 respondents. The respondents were made to sit individually and handed over a questionnaire and the trained field workers assisted the respondents in filling out the questionnaire. The questionnaire had 14 questions to inquire about ownership of egg laying chickens, egg consumption, egg acquisition methods, egg storage and preservation challenges.

Focus Group Discussion

Nine focus group discussions were conducted in the study area. Each focus group consisted of between 8 to 12 participants. Three focus group discussions were administered in each of the three villages. The participants were divided into three demographic groups, the youth (16-25 years), adult women and adult men to obtain an unbiased perception from each group. A focus group discussion guide was used to direct the discussion.

Sensory Evaluation

Egg powder was reconstituted with water following a method described by Ross (2008). A standard method used by the local community of the study area was used to prepare scrambled egg samples using fresh eggs and the reconstituted egg powder, separately.

The consumer panel was composed of equal numbers of the youth (16- 25 years), adult women and men. The panellists were made to sit in a back to back position to avoid interaction. The sensory evaluation questionnaire was in the form of a 5-point pictorial hedonic scale written in isiZulu. The 5-point pictorial hedonic ranged from 1= very bad to 5= very good (Table 9). The panellists were asked to rate the acceptability of each sensory attribute of the egg samples by marking an 'X' on the face which best described their sensory perception of the egg sample. Two samples of scrambled egg, one made from egg powder and the other from fresh egg, were coded with three digit numbers obtained from a Table of Random Numbers. The samples were tested in a randomised order from left to right. Randomisation of the serving order of the egg samples was done using a Table of Random Permutations of Nine. Before and after tasting each egg sample, the panellists were requested to gargle.

Data Analysis

Descriptive statistical analysis was performed on the survey data using International Business Machines Statistical Package for Social Sciences (IBM SPSS) version 21. Content analysis was used for FGD data, transcribed to identify themes and verbatim quotes. Sensory evaluation data were analysed through the analysis variance (ANOVA) (Castro et al. 1993) and the Chi-square test.

RESULTS AND DISCUSSION

Demographic Information of the Study Participants

A total of 120 respondents were interviewed, of which 54% were female and 46% were male. The majority (49%) of the respondents were aged 40 years and above. Table 1 summarises the demographic profile of the sampled households.

The demographics also showed that more than half (53%) of the respondents were single, whilst 30% were married. The demographics demonstrate that there was more or less equal gender distribution. Most of the study participants had primary (29%) and secondary (31%) school education and few (4%) had tertiary education.

Table 1: Demographic profile of the sampled households

	<i>Demographic characteristic</i>	<i>Percentage value (%)</i>
<i>Gender</i>	Male	46
	Female	54
<i>Marital Status</i>	Married	30
	Divorced	3
	Widowed	13
	Single	53
	Separated	1
<i>Level of Education</i>	No education	13
	Primary education	29
	Secondary education	31
	High school	28
	Tertiary education	4
<i>Age Category</i>	16-25 years	26
	26-40 years	25
	40+ years	49

Ownership of Chickens

Up to 87% of the respondents indicated that they had egg-laying chickens (Table 2). Chickens were owned mainly by women (70%). This concurs with what is found in the literature, in which women are reported to be the majority owners of chickens (Bwalya and Kalinda 2014; Garba et al. 2014; Quisumbing et al. 2014). Chickens are a small-livestock commonly owned by women and decisions about the use of poultry and poultry products are made by women. In another study conducted in north-west Ethiopia, Halima et al. (2007) concluded that women, whether in male-headed or female-headed households, were responsible for chicken rearing, whilst men were responsible for crop cultivation.

Table 2: Egg-laying chicken ownership in Impen-dle

<i>Number of chickens</i>	<i>Percentage (%)</i>
No chickens	13
Less than 5 chickens	36
More than 5 chickens but less than 10	26
More than 10 chickens	25

and other off-farm activities. This is mainly because chickens have a low socio-economic status according to African culture; hence they have a societal attachment to women whose social status is often considered lower than that of men (Nyoni and Masika 2012; Alem et al. 2014; Bwalya and Kalinda 2014). As a result, chicken breeding receives minimal family investment, if any, which adversely affect their contribution to household food security.

Importance of Eggs in Rural Households of Impendle

Research findings indicated that each household's food basket contained eggs. Some households partly generated income through selling eggs, while others used them for flock multiplication.

Table 3 shows a summary of the most important focus group discussion findings. Almost all participants from Impendle knew that eggs were important for nutritional reasons. Eggs, therefore, form an integral part of rural households' food basket and can be utilized for various purposes. In view of this, eggs are important for households since they contribute to household dietary diversity and access to income. Despite the fact that eggs were kept mostly for consumption in Impendle, other researchers

have found that among other communities eggs were kept mainly for chicken breeding (Alders and Pym 2009; Moges et al. 2010a; Moreki and Montsho 2011). In other studies, eggs meant more than gaining nutritional benefits, as they also carried socio-economic-cultural status and beliefs for both men and women (Leta and Bekana 2010; Nyoni and Masika 2012; Iannotti et al. 2014). Eggs also contributed towards an increase in household income, household consumption, and were also used for traditional ceremonies and sacrifice (Leta and Bekana 2010; Alem et al. 2014).

Egg Consumption Patterns in Impendle

There were no major differences in egg consumption patterns based on gender. About 80.8% of the respondents indicated that eggs were consumed by the whole family, whilst 3.2% to 5.5 % of the respondents indicated that they did not eat eggs, but did not provide reasons with regard to the latter. Most of the respondents, including girls, consumed eggs about three times a week and most preferred them fried. Participants also added tomatoes and onions to eggs to prepare a relish that would be eaten with *phuthu* (crumbled stiff maize porridge) or rice.

In Impendle, eggs were more frequently consumed relative to other rural areas of other coun-

Table 3: Importance of eggs in rural households of Impendle

Question	Theme	Concept	Quotes	Discussion
Importance of eggs	Basic food basket item	Nutritional benefit	<i>'We eat eggs because they are nutritious'</i>	Eggs are included in the food grocery list were not only valued for their health benefits as food but they also carried strong societal cultural values. Eggs were also important for purposes of flock increase/chicken breeding. Eggs can also be a source of income for the rural communities
	Socio-economic-cultural status	Perceived cultural-value Economic benefits	<i>'As chickens lay eggs, we leave the eggs to hatch multiply the flock and we also give eggs to our children'</i> <i>'If we have excess sometimes we sell them'</i>	
	Socio-cultural myths	Beliefs	<i>'The teenage girls cannot eat eggs; even those who are just married, they should wait to be given permission to eat eggs'</i>	

tries in Africa studied. Studies conducted in Zimbabwe revealed that egg consumption was low and similar across seasons, regardless of the availability of eggs (Muchadeyi et al. 2005). Akililu et al. (2008) reported that egg consumption was uncommon in the poor Ethiopian community as it was considered a luxury. In other areas of Ethiopia, eggs were consumed for religious and medical reasons, whilst 2.2% of the study participants reported to not have eaten eggs (Moges et al. 2010a). Alem et al. (2014) reported that the main purpose for chicken rearing in Tigary, Ethiopia was for consumption.

Focus group discussions confirmed that cultural factors discouraged the consumption of eggs by certain demographic groups based on gender and age. However, according to culture, teenage girls and newly married couples were not allowed to consume eggs (Table 4). Taboos about egg consumption have been also reported by other researchers. According to a study carried out by IRIN (2012) in Mali, there is a belief that children and expectant mothers would have bad luck if they ate too many eggs. Limitations to egg consumption were also reported among the Baitadi and Brahmin ethnic groups who do not consume eggs as they are considered unclean (Locks et al. 2013). Iannotti et al. (2014) agreed that women in Ethiopia and Vietnam believe that infants cannot eat eggs as they are difficult to digest, but in countries like Zimbabwe, Mali and Peru, eggs are considered as a food of good health among children.

Table 4 shows a summary of the most important egg consumption beliefs derived from focus group discussions. The results indicate that egg consumption restriction on the basis of gender exists especially among women and girls in Impendle. This deprives them of this valuable protein source and this could obviously com-

promise with their nutrition. Intervention such as education programmes on egg consumption would be appropriate to impart change on these socio-cultural stereotypes.

Ways in Which Eggs were Acquired for Consumption in Impendle

About 80% of the interviewed participants indicated that they bought eggs from local formal market retailers compared to 20% who got them from household rural chickens. This was because home-produced eggs were not always available and if they were available they would be insufficient for the whole family as some were kept for breeding. The limited availability of home-produced eggs was due to production challenges and losses as will be explained later. There was a concern raised with regard to the quality of indigenous eggs. Some of the respondents believed that eggs from shops were credible with respect to food safety compared to local eggs. They indicated that eggs obtained from the store were 'tested' for various 'diseases' before they were sold to them. Participants also preferred eggs from the store because they were bigger. The consumers also pointed out those indigenous eggs were not readily available due to the slow maturing rate of egg laying chickens. To support this, Moges et al. (2010a) attributed low egg productivity to the slow maturing rate of local traditional indigenous chickens in Ethiopia. In the present study, some participants also felt that collecting eggs from the egg laying chickens stressed them the same way a woman would get stressed if their child was stolen. This perception tended to reduce the number of households engaged in rearing chickens for egg production and consumption. Purchasing of eggs reduces household income, which could

Table 4: Egg consumption patterns in rural households of Impendle

Question	Theme	Concept	Quotes	Discussion
Who should eat eggs	Socio-cultural norms	Gender barriers	<i>'Men should eat eggs to increase their strength in bed and also to boost fertility'</i>	There is a relationship between egg consumption and gender based on cultural beliefs. But children were allowed to consume eggs regardless of gender. However, teenage girls and young couples should be granted permission to start consuming eggs.
		Age standards	<i>'If teenage girls eat eggs they will develop a high sex desire when they are still young'</i>	

be used for other purposes. Additionally, the perceptions reflected by participants indicate that this rural community lacks information about the quality of indigenous eggs compared to commercial eggs.

Egg Storage Methods in Impendle

As shown in Table 5a, the respondents in the survey indicated that they stored eggs in different ways, 57% stored eggs in the fridge, whilst 32% kept them in a basket in a cool room and 7% of the respondents indicated that they used other methods such as placing the eggs on the floor or on sand in a cool room. Storage methods vary across countries. In a study in Ethiopia, Molla (2010) found that about 57.1% of the survey respondents stored eggs on nests, 18.5% in baskets and 5.6% in iron dishes. The storage methods identified in the present study resulted in the eggs keeping their quality for an average time of one to two weeks (Table 5b). It is important to note that most of the storage methods resulted in the eggs keeping their quality for a short time. These findings highlight the need to develop effective and appropriate egg preservation methods that result in shelf-stable egg products, such as drying eggs into powder.

Challenges in Egg Production and Storage in Impendle

There are a number of challenges faced in egg production and storage among Impendle

rural households as reflected by the respondents in the survey. The research analysis informed that respondents (48%), egg deterioration was the main challenge followed by losses due to predators, such as dogs, cats and wild birds which were reported by about 21% of the respondents. Sixty-two percent of the respondents indicated that eggs maintained their quality for one week, at most before they deteriorated (Table 5b). The deterioration of eggs during storage does not only result in produce loss, but may also result in the eggs becoming unsafe for human consumption due to toxic substances that can be produced from the deterioration reactions and by spoilage microorganisms.

Table 5c and Table 6 present the challenges in egg production and storage among households of Impendle according to focus group discussions. The focus group discussions indicated that the community members perceived commercial eggs as having less safety risks compared to indigenous eggs. This negative perception about indigenous eggs has partly led to the community underutilising their indigenous eggs, the study participants stated that they were watery, and had a weak shell resulting their fragility.

Consumer Perceptions and Sensory Acceptability of Egg Powder

The findings of the focus group discussions are presented in Table 7. The focus group par-

Table 5: (a) Egg storage methods used by rural households of Impendle (b) Keeping qualities of eggs in rural Impendle (c) Egg storage challenges experienced by rural households of Impendle

	(a) Storage Methods				
	Basket in a cool room	Fridge	Other	They do not keep eggs	
Storage length (%)	32	57	7	5	
	(b) Shelf-life of Eggs				
	One week	Two weeks	>2 weeks	N/A	
Keep quality (%)	63	29	4	4	
N/A = Not applicable; that is, participants do not keep eggs or do not eat eggs at all					
	(c) Egg Storage Challenges				
	Theft	Rotting	Predators	Becoming watery	N/A
Percentage loss (%)	8	48	21	13	11

N/A = Not applicable; that is, participants do not keep eggs or do not eat eggs at all

Table 6: Challenges in egg production and storage among households of Impendle

Question	Theme	Concept	Quotes	Discussion
Challenges	Commercial eggs	Quality and constant supply	<i>'They are very watery with a pungent smell' The eggs we buy from shops last for a week only</i>	'Commercial eggs were preferred to home-produced eggs due to their perceived superior quality. Whilst the constant supply of commercial eggs was an advantage, the challenge was that they were sourced from far which often resulted in breakages during transportation. Commercial eggs also have a limited shelf-life. The households experienced produce losses due to poor or limited storage and preservation technologies.
	Indigenous eggs	Storage and preservation of eggs Preferences influenced by culture	<i>'They break even before we get home because we buy them from very far' 'The eggs rot even before we see them because our chickens do not have designated places for hatching' 'Wild cats and snakes eat the eggs' 'Even though we keep indigenous eggs they do not last, it is better to eat them all at once or leave the chickens to hatch' 'We do not like to eat indigenous eggs because we want the chickens to multiply' 'We do not take eggs away from the chickens because we will stress them'</i>	The participants also preferred to keep the eggs to grow their flock; culturally the wealthy of a rural household is determined by number of animals owned including chickens.

ticipants expressed willingness to learn about egg powder and aspired to begin their own egg drying projects. Sensory attributes are the key determinants influencing the preferences and acceptability of a food. Table 8 shows that, for all the sensory attributes evaluated, the acceptability of the scrambled egg made from fresh eggs scored higher than that from the egg powder. Table 9 shows proportions of respondents who gave different acceptability ratings of the egg samples along the 5-point hedonic scale. As already stated, generally, higher acceptability scores were given to the fresh eggs for all attributes. The highest differences in acceptability were in the appearance and aroma of the two egg samples. The aroma of the egg powder was rated 'very bad'. The panellists commented that the scrambled egg powder had an unusual aroma, which was not present in the scrambled fresh egg. The odd aroma from the egg powder could

have been produced during the processing of the fresh eggs into egg powder. The high processing temperatures could have caused chemical reactions, such as the Maillard reaction, that produced odour substances. However, substances produced during processing would unlikely cause the egg powder to be unsafe for consumption. The reluctance towards aroma of the egg powder may be made favourable by adding other ingredients, such as tomatoes, onions and spices to the egg powder to mask it.

The panellists also commented that the colour of the sample made with the egg powder resembled that of a Zulu egg, which is typically dark yellow, but the colour seemed not to negatively affect the acceptability of the egg powder. From the focus group discussions, it was established that the participants were interested in learning how to make the egg powder as they believed that it could be a good substitute for

Table 7: Consumer perceptions and acceptability of egg powder

Question	Theme	Concept	Quotes	Discussion
What is your view of egg powder?	New experience	Excitement	<i>'I have never seen something like this'</i> <i>'It is my first time to see this'</i> <i>'I do not believe that you can make an egg a powder'</i>	The participants were amazed as this was their first time to see egg powder. The health benefit was not the key factor but the excitement was more about what they could do with the egg powder to start generating cash income as well as improve household food security.
Views towards egg powder scrambled egg vs fresh egg scrambled egg	Sensory acceptability of powdered egg vs fresh egg	Colour	<i>'This egg looks like a Zulu egg(colour) but the aroma is different from that of eggs'</i>	Appearance is the most importantly used sensory attribute for egg powder which was associated with the indigenous egg. Rural areas have a challenge of high rate of unemployment; the egg powder presented an opportunity for entrepreneurship for the youth. The participants showed interest and eagerness to learn more about egg drying preservation technique. As evidence the participants started to talk about how they can organise themselves, suggested who should be targeted and which venue could be used for education and training on this technique. They also thought about the importance of rearing egg layers and how value adding of the egg powder could be done through baking. The findings of this study showed the eagerness and willingness of the participants to gain competence on egg drying and to practice the technique to generate livelihoods for household food security.
Would you like to learn about it?	Livelihood-opportunities	Self-employment for youth Willingness to learn about the egg drying techniques	<i>'It will help us to generate money for our expenses'</i> <i>'It should be a project for the unemployed youths and the orphans so that they help the aged'</i>	

Table 8: Sensory acceptability rating of scrambled egg made from egg powder compared to scrambled fresh egg (N=63)

	Appearance	Aroma	Taste	Colour	Overall acceptability
Fresh egg	4.1 ^a ± 0.9	3.9 ^a ± 1.1	4.3 ^a ± 0.8	4.1 ^a ± 1.0	4.5 ^a ± 0.8
Egg powder	3.5 ^b ± 1.1	3.2 ^b ± 1.2	3.6 ^b ± 1.3	3.7 ^b ± 1.2	3.9 ^b ± 1.3

Means with different superscript letters in the same column are significantly different (p < 0.05). Numeric figures without brackets are mean scores and numeric figures in brackets =Standard Deviation

fresh eggs. The FGD participants also believed that when blended with other ingredients, the egg powder could be processed into a relish that was the same as that of fresh eggs; the unusual aroma of the egg powder would be presumably masked by the other ingredients. The Chi-square test revealed that there was no association (Table 10) between the acceptability of the egg powder and gender (P<0.05). The findings of the research suggest that if the egg powder was to be introduced in rural households,

there would not be acceptance barriers associated with gender. Mothers are known to influence the choice of foods for a household, but that was not detected in the current study.

CONCLUSION

The present study demonstrated that eggs form an integral part of the household food basket in Impendle. The eggs are produced locally by the same community, but storage technolo-

Table 9: Acceptability of scrambled eggs made from egg powder compared to scrambled eggs made from fresh eggs (N=63)

<i>Sensory attribute</i>	<i>Rating</i>	<i>Egg powder % of respondents who gave the rating</i>	<i>Fresh Egg % of respondents who gave the rating</i>
<i>Overall Acceptability</i>	Very bad	6.3	0
	Bad	12.7	4.8
	Neutral	6.3	4.8
	Good	30.0	23.8
	Very good	44.4	66.7
<i>Appearance</i>	Very bad	4.7	0
	Bad	14.3	0
	Neutral	22.2	7.9
	Good	42.9	19.0
	Very good	15.9	73
<i>Aroma</i>	Very bad	42.9	1.9
	Bad	22.2	14.3
	Neutral	14.3	15.9
	Good	9.5	30.2
	Very good	11.1	38.1
<i>Taste</i>	Very bad	11.1	0
	Bad	12.7	3.2
	Neutral	6.3	12.7
	Good	46.0	31.7
	Very good	23.8	52.4
<i>Colour</i>	Very bad	4.8	1.6
	Bad	15.9	6.3
	Neutral	9.5	12.7
	Good	46.0	36.5
	Very good	23.8	42.9

Table 10: Association between gender and acceptability of egg powder

	<i>Variable</i>	<i>Chi-square value</i>	<i>P value</i>
<i>Gender</i>	Appearance	0.8	0.9 ^{ns}
	Aroma	5.1	0.3 ^{ns}
	Taste	2.9	0.6 ^{ns}
	Colour	5.1	0.3 ^{ns}
	Overall acceptability	4.7	0.3 ^{ns}

^{ns} not significant at $p < 0.05$

gies are poor leading to significant losses due to deterioration. Generally, eggs were consumed on an average of three days per week and were used as part of dietary diversification. The community of the study area believes that eggs are a symbol of a high socio-economic status for the household; hence this community needs education on the importance of eggs as a nutritive food source. Regardless of the socio-cultural beliefs, the majority of the household members, including girls, were readily consuming eggs and were more than keen to explore innovative egg preservation technologies, such as sun drying. This highlights the opportunity to introduce egg drying in this particular area.

Although, the results displayed that in the form of scrambled egg, egg powder was less

acceptable than fresh egg, there is an opportunity to improve the acceptability of egg powder by processing it into other egg food types in which the less acceptable sensory attributes are masked. It is imperative to address the currently existing egg storage and preservation challenges through the introduction of sun drying to ensure that eggs are well utilised by rural communities and thereby improve household food security.

RECOMMENDATIONS

There is a need to improve the capacity of rural communities to produce sufficient eggs to meet their consumption needs and if possible a surplus for sale. Capacity building may include

training on poultry husbandry and management. A rigorous research to investigate the safety of producing egg powder through sun-drying at household level is recommended. To enhance the acceptability of egg powder for food security a research on masking the acceptability of egg powder is required.

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