

LEADING QUESTIONS THIRD WEEK

Q15. What role do you see for researchers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q16. What role do you see for researchers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q17. What role do you see for NGOs and Civil Societies in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q18. What role do you see for NGOs and Civil Societies in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q19. What role do you see for the policy makers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q20. What role do you see for the policy makers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q21. What role do you see for farmers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Third week, message 172: Opinion on questions

Jafarou Sanda Altine from the Ministry of Livestock of Niger

Q15 Researchers should play an important role by:

- Analyzing food loss and waste to determine its safety and quality.
- Training farmers in techniques that minimize food loss and waste.
- Making available techniques that add values to food loss and waste.

Q16 Same approach to Q15.

Q17 NGOS and Civil Societies should:

- Train farmers to be aware of food loss and waste.
- Train farmers to be able to quantify food loss and waste.

Q18 Same approach as in Q17

Q19 Policy makers should establish some legislations regarding to food loss and waste quality.

Q20 Same approach as in Q19

Q21 Farmer must take into consideration the quality of food loss and waste.

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Third week, message 173: Opinion on questions

I am Budi from Indonesia. I would like to contribute the following notes to all participants of the conference:

Q15. What role do you see for researchers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

The researchers should try to calculate the potential of 'food loss and waste' that can be used as animal feed, either in the stages of harvesting, post-harvesting, processing, distribution and consumption. Then try to chemically analyzed the nutritive value of each 'food loss and waste' and further estimate the possibility of formulating ration using these components as parts of the total mixed ration. Collaborating with the extension workers, researchers should socialize the technologies being developed to formulate ration using those 'food loss and waste' to farmers or other stakeholders so that the 'food loss and waste' can be converted to animal products with higher nutritive value for humans.

Q16. What role do you see for researchers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

For the 'non-food parts', the problem during the harvesting time, especially with paddy, is that the labor to collect the by-products (straws) is limited because farmers will focus on collecting the grains. Therefore, it is suggested that farmers groups have an extra unit of business in the farmers' institution, to handle the collection of these straws and do the processes of fermentation or ensilage and storage either to be sold or used later on by group members who have livestock with them. A lot of technologies have been developed by researchers to increase the nutritive value of rice straw or other food crop by-products. However, the adoption of these technologies is generally very limited. Within the last 1-2 decades, researchers have developed technology for aerobic fermentation of

rice straws or corn cobs which is more practical and relatively cheaper than chemical treatments or ammonia treatment.

Q17. What role do you see for NGOs and Civil Societies in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

NGOs and Civil Societies may educate people to reduce the potentially 'food loss and waste' through extension works rather than handling the 'food loss and waste'; however, if there is already available, the 'food loss and waste' can be collected, treated and stored before sending it to or sell it to feed manufacturing industry. It has to be socialization to the feed manufacturing industry as well so that they will accept these 'food loss and waste' as parts of the feed formula.

Q18. What role do you see for NGOs and Civil Societies in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

In the case of food crop byproducts which are varied in the physical characteristics and availability, the NGOs may develop activities in helping farmers and livestock holders to use these 'non-food parts' as animal/livestock feed.

Q19. What role do you see for the policy makers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

The policy makers should develop regulation and endorsement to people to minimize the food loss and waste; but if the 'food loss and waste' has been occurred, then the policy makers may develop or suggest mechanisms to collect and use them as animal feeds.

Q20. What role do you see for the policy makers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

For the 'non-food parts', the policy makers should support the research institutions to develop appropriate technologies to handle those 'non-food parts' either in stages of harvesting, post-harvesting, processing, distribution and consumption. Research funds should be supported through the role of policy makers in planning annual budget of the country.

Q21. What role do you see for farmers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Farmers should learn how to handle those 'food loss and waste' based on the technologies being developed by researchers; allocation of time to take care of the 'non-food parts' such as straws of food crops should be carried out. The farmers' institution should pay more attention on the use of that have potential as animal feed. Tropical countries with rainy and dry seasons are usually deficient of feed supply for the animal during the dry seasons even though abundant feeds are available during the rainy season (wet season).

With best regards,

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Third week, message 174: Opinion on questions

Hello I am Manju WADHWA from INDIA

Q15 & Q16

The role of a researcher is to keep eyes open and a heart to work. What I mean to say is, a researcher can better understand the importance of *food loss or waste*, as s/he knows how much nutrients are being wasted, if not channeled into the food chain (through animal feeding). At all stages (harvesting, post-harvesting, processing, distribution and consumption stages) a researcher may find out the nutritive value of the product available at each stage and workout the optimum utilization of that particular product for a particular category of animal e.g. production of *peas* (for human in most of the countries); during harvesting (analyze and use *pea wines, straw*), post harvesting (wasted due to natural calamities, transportation loss etc.), processing (empty *pea pods*), distribution in local market (every consumer will select the best and leftover will be there in the market/roadside and so on) and consumption (unused or leftover). Tomato (Cull tomatoes, tomato pomace-processing), baby corn (plant after picking up baby corns, baby corn husk after taking out baby corn for human consumption), carrot (tops during harvesting, carrot pomace-processing waste), sugar beet (leaves, pomace), pineapple (skin, crown, pomace) and many more fruit and vegetable waste, which are available during their journey from farm to table can be exploited as a source of energy, protein, organic minerals, phenolics, essential oils, antioxidants, antimicrobial etc. (Wadhwa et al., 2013 FAO Publication:

<http://www.fao.org/docrep/018/i3273e/i3273e.pdf>).

It's because of researchers' vision FLWs are being used as livestock feed and other value added products.

Q17 & Q18

NGOs and local civil societies can play a big role in preventing the loss of both the *foods as well as non-food parts* by acting as a liaison between the agricultural farms, research centers and livestock farmers. These organizations can actually have a chain or employ people to collect the food and non-food parts separately and supply to the end user.

Q19 & Q20

Policy makers are the real decisive force to make it possible, to make it actually happen. They can put in place measures that encourage "*NO LOSS OF FOOD and NON-FOOD PARTS*" and provide funds for R&D, putting in place good infrastructure (solar drying systems close to farms & storage houses), and setting up of quality control labs etc. to ensure quality animal feed production.

Q21.

Farmers are intelligent in using various resources. In India we have been seeing them feeding their animals *baasi/stale chapaties (left over home-made Indian breads), brans, chuni, husk* etc., fruit and vegetable available in abundance, fruit and vegetable wastes; peels etc. The only difference is that they have no idea about the nutritive value of the *food and non-food parts*. Based on their experience they may say that by feeding *pea pods*, the milk production has increased or they will simply say we feed *potatoes, sugarcane tops* etc. to our animals. The role of scientists is to advise them what it contains, with which ingredient it can be replaced to make the ration economical, how much is to be fed i.e. optimum level of inclusion, so that it doesn't affect the productive and reproductive performance of the animals and gives maximum economic returns.

Dr. Manju Wadhwa Sr. Nutritionist -cum- Head Dept. of Animal Nutrition GADVASU, Ludhiana.

Third week, message 176: Opinion on questions

I am Dr. Mandal, A.B. from India

Q15. What role do you see for researchers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

1. With the increase in human population at a situation when agricultural production has come more or less to a plateau there is need for utilizing more and more food loss and waste in animal feeding considering environment, safety and animal welfare issues.
2. Identification of food loss and wastes at various stages (harvesting, post-harvesting, processing, distribution and consumption stages) of supply chain, accounting the amount of loss and waste available, evaluation of their nutritive value including incriminating factors and effective/ safe level of inclusion based on long term study in different species depending upon the type of waste in experimental farm and then in field.
3. Searching scope/need for value addition through processing and/or supplementation.

Q16. What role do you see for researchers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

The various non-food parts have been experimented and are being fed to different species. The newer non-food parts available due to processing should be experimented as discussed in Q. 15.

Q17. What role do you see for NGOs and Civil Societies in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

1. Demonstration in farmers' field and propagation.
2. Collection and distribution of food losses/waste to the farmers.
3. Processing of food loss and waste, if required, for value addition.
4. Identifying social, economical and environmental impacts of using such losses/wastes.

Q18. What role do you see for NGOs and Civil Societies in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

As in question 17 (Q. No. 17 & 18 seem to be similar)

Q19. What role do you see for the policy makers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

1. Legislation to ensure that food losses/wastes are processed for feed at production site to minimize environmental pollution (as in breweries), and for quality assurance.

Q20. What role do you see for the policy makers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

As in question 19 (Q. No. 19 & 20 seem to be similar)

Q21. What role do you see for farmers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

1. Farmers should be convinced on the aesthetic quality of the food loss/waste; impact on animal health, production and reproduction; quality of the produce and economics of feeding.

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Third week, message 177: Opinion on questions

As my contribution to week 3, kindly see the following excerpts from the FAO (2012) publication titled "OPTIMIZATION OF FEED USE EFFICIENCY IN RUMINANT PRODUCTION SYSTEMS"

"The simple indicator of feed efficiency as food out vs feed in is no longer sufficient to inform decision-making in the twenty-first century, and additional dimensions need to be considered. Increased efficiency of individual farms then needs to be incentivized in ways that avoid unintended consequences; this will require closer co-operation between the farming, research, private sector [feed and food industries added by me] and policy communities. Research needs to focus on answering the big questions, which will help to solve these challenges (food loss and waste added by me) for the sector as a whole, and hence, requires more interaction between disciplines. This is an exciting time to work in animal science, as the challenges are great but scientists have many new tools at their disposal, ranging from new biotechnologies to new numerical applications and advances in data accessibility, which should help to overcome those challenges".

For further reading, you can find this publication here:

<http://www.fao.org/docrep/018/i3331e/i3331e.pdf>

Best regards,

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Third week, message 178: Opinion on questions

Hi, I am Dr. ASHOK KUMAR NAGPAL, Principal Scientist (Animal Nutrition), ICAR-National Research Centre on Camel, Bikaner, Rajasthan, India

Q15. What role do you see for researchers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q16. What role do you see for researchers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q15 & 16

Researchers here have a major role to play, rather they have been playing great role in this subject area and done wonderful work and justified their existence and they are, now, better equipped to deal with coming situations. Some of the following points for Researchers are:

1. Knowledge on type, production level and number of livestock.

2. Assessment of availability of type and quantity of food loss & waste, food & non food parts from production and harvesting point (field), to processing point (flour mill, rice mill, breweries, bakery, pulse industries, oilseed industries, vegetable & fruit industries, feed pellet and feed block industries) to consumption point (human and livestock).
3. Nutritional value of food loss & waste, food and non-food parts, grasslands, forest lands and top feeds for livestock.
4. Dry matter and nutrient requirements of livestock means feeding standards for different livestock.
5. Exploring the feasibility of conservation and utilization of food loss & waste, food and non food parts grasslands, forest lands and top feeds through physical (drying, chaffing, grinding, mixing), chemical (ammonia treatment) and biological methods (silage making) and further processing into complete feed pellet / complete feed blocks. Complete Feed Block making machine was the outcome of combine efforts of animal nutritionists and agricultural engineers during the course of National Agricultural Technology Project funded by the ICAR during 2000-2004.
6. Development of feeding practices of food loss & waste, food and non food parts grasslands, forest lands and top feeds for livestock. Preparation of feeding charts based on the availability of feed resources for better understanding of farmers.
7. Exploration of new feed resources to bridge the gap of feed demand and supply.
8. Dissemination of animal nutrition information among farmers and feed industries, farmers and NGO to promote better utilization of nutrition resources as well as higher animal productivity.

Q17. What role do you see for NGOs and Civil Societies in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q18. What role do you see for NGOs and Civil Societies in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q17 & 18

NGOs and Civil Societies should interact with researchers to know about the latest information and can play important role and contribute by organizing awareness programs among public/farmers for securing food and loss and waste and non-food parts for livestock feeding.

Q19. What role do you see for the policy makers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q20. What role do you see for the policy makers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q19 and Q20

1. Policy makers should develop policies/guidelines on eliminating food loss & waste and food and non-food parts, grasslands, forest and top feed resources for incorporation in animal feeds for food, nutrition security of human beings and livestock.
2. Policy makers need to promote the development of machinery for effective harvesting, processing and storage of the feed resources.
3. Should provide financial incentives on machinery development and warehouses. There is urgent need to establish Feed Corporation at the national level to fight effectively the

national disasters like heavy rains, hail storms, droughts so the feed is sent to livestock timely.

4. Policy makers need to provide insurance cover to crops/livestock so that farmers are able to survive the natural calamities.

5. Government needs to promote and encourage the development of drought resistant crop varieties to withstand global warming.

6. Policy makers should discourage those agricultural implements /machinery where food and non food parts losses are high.

7. A course on food loss & waste, food & non food parts, national food, feed, nutrition security and environmental pollution, green house gases and implications of global warming needs to be introduced in the syllabus curriculum at the school / college level so that the new generation is aware of the current problems faced by the human/ livestock community.

Q21. What role do you see for farmers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Farmers/ livestock owners need to be educated and can play an important role for the effective utilization of food & food loss, food & non food parts for feeding livestock in the interest of their own employment, income generation, food/feed nutritional security of themselves/livestock as well as the national economy.

With regards

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Third week, message 179: Opinion on questions

I am Dr. Oluwatosin Kennedy Oko, Former Head, Department of Animal Science, University of Calabar, Nigeria.

I strongly agree with most points given by previous respondent especially that of message 178 by Dr. Ashok Kumar Nagpal.

Let me add some points as follows:

Q15 and Q16

The role of researchers is very enormous and multi-disciplinary approach should be adopted in addressing the utilization of food waste and loss as animal feed. Researchers including environmentalists, soil scientists, crop scientists, botanists, animal scientists, health workers, pathologists, veterinarians, extension officers and others should work in synergy to utilize these potential feed resources.

Specifically, emphasis should be placed on researches that define:

1. The impact of climate and natural occurrences on the amount of food waste and loss encountered in different regions of the world.

2. How to prevent and mitigate these natural disasters.

3. The identification of regions with potential food loss and waste, so that efforts are geared towards the collection and processing of these materials into animal feed at any point in the production cycle.

4. Conduct baseline surveys on the type of crops that can be utilize as animal feed.

5. The analyses of the nutritive composition of available plant materials considered as waste, non-food parts or weeds.

6. The possibilities of improving their nutritive qualities.

7. The Development of appropriate technologies for preserving these materials in forms suitable as animal feeds

8. Appropriate methods of disseminate findings to farmers and other stakeholders for effective adoption, with the use of demonstration farms.

I think most research conducted in our Universities and Research Stations is focused on these aspects.

Q17 and Q18

NGOs and Civil Societies should act as advocacy group for dissemination of latest research information to the public.

Q19 and Q20.

The role of Policy makers should include:

1. Development of policies/guidelines that will prevent or minimise the incidence of natural disasters.

2. Promote the detection of early disaster signals and appropriate technologies.

3. Promulgate appropriate legislature that protects the farmers from losses in order to encourage them to continue the farming business after disasters.

4. Development of machinery for effective harvesting, processing and storage of the feed resources.

5. Development of legislature that will adequately fund research at for all parts of the production cycle.

6. Development of processing plants that will utilize excess food products especially those that are perishable items and useful to animals.

7. Promote the study of courses that are relevant to food production and management.

Q21.

Farmers, both crop and livestock owners have a major role to play in the utilization of these food materials:

1. The farmers need to be receptive to new ideas and be willing to adopt them.

2. They can use the traditional methods to preserve excess food resources for future use.

3. Must interact with the researchers, Civil society and policy makers in order to spread appropriate information.

4. Must adapt to the current trend of production in the face of climate change and stick to old practices, at most combine both methods to produce good quality food products at least cost for a sustainable production.

5. Must consider the feed resources in order to meet their consumers' preference.

Best Wishes,

Oluwatosin Kennedy Oko

Third week, message 180: Opinion on questions

I am Khan Shahidul HUQUE from Bangladesh. My opinions on the question are submitted below.

Q15. What role do you see for researchers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Researchers are think tanks, and their role is vividly described in different messages (Messages 170, 178 etc). Agreeing with them let me share my opinion on some limitations of researchers (not very much related as answer to the question but, very much related to the role of researchers), especially, in a country like Bangladesh.

i) **Research** on feed development must be directed to development of market-oriented technology/practice/processes based on locally available biomass. But, in many cases, researchers' attitudes are confined to basic or desk research, and article publication. Applied research, gaining of knowledge or understanding for developing ideas into operational forms in existing system, on the other hand, often remain unattended or neglected. They must have target oriented basic, desk and/or applied researches for discovering solutions to problems or creating new goods/practices and knowledge. This needs capacity building of researchers of feeds, feeding and nutrition, especially, of the developing countries.

ii) **Development** in experimental condition is basically designing and development of prototypes or processes, and it reflects systematic works using existing knowledge gained through research and practical experience directed to producing new materials, products, devices or systems/methods, and often it is not taken care of by researchers and/or limited access to infrastructural facilities for experimental development in a research institute keep them reluctant to perform their responsibilities. Researchers' awareness and availability of infrastructural facilities for experimental development are important for supporting feed development based on locally available biomass.

iii) **Limitations of public rules and regulations** to work with private sectors and reluctance of private sector to invest in R&D are a few of the bars that are not conducive to faster value added feed developments. Any barriers of rules and regulations of R&D organization to have access of researchers to working with private sector may be removed taking examples of regional and/or international organization.

iv) **Private sector's investment** in feed R&D is important to establish linkages between different stakeholders of feed development (researchers, private sector, financial organization, public organization, policy actors) and this practice has to be developed, at least in land hungry developing countries.

Q16. What role do you see for researchers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Again researchers must take leading roles for linking producers with users, in between the two there should be role of organization of finance, quality control, and private sector. Public regulations are also important here; researchers have to take ice breaking initiatives for building relations between these organizations, removing barriers to awareness, and most importantly for convincing policy makers to some extent. This is true for both non-food parts and food loss and wastes use as feeds.

Q17. What role do you see for NGOs and Civil Societies in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

The major role for NGOs and Civil societies will be to making investment and raising their voice on using food loss and waste as animal feed. But, researchers must work as linkers, may be not in all cases but, at least in some demonstrations at different stages.

Q18. What role do you see for NGOs and Civil Societies in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Using non-food parts as animal feed is traditionally in place, this traditional system is not very much effective sometimes in avoiding seasonal and regional problems or differences in livestock keepers and feed producers. For making an effective match with demand and

supply both backward and forward linkages must be in place with a view to achieve market led feed product development using non-food parts.

Q19. What role do you see for the policy makers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Policy makers play a great role at least in developing countries. They have to be convinced on the economic use of food loss and waste as animal feed, and this is the task of researchers. Without their support development of market oriented practices for turning food loss and waste into feeds will be impossible.

Q20. What role do you see for the policy makers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

The answer is similar to that is given for Q19.

Q21. What role do you see for farmers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Farmers have great roles and processes of money generation are the major answer to have farmers support in place. They should be approached with the messages on how they can make their practices sustainable and profitable.

Khan Shahidul Huque, PhD

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Third week, message 181: General opinion

I am Gbemenou Joselin Benoit Gnonlonfin, PhD. International Consultant.

I strongly agree with most points given by previous colleagues. I do not want to repeat but would like to add some ideas as follows:

Multidisciplinary teams are critical in addressing these issues. Food safety and nutrition security specialists are key in the team. Another component should be strong emphasis on training, awareness, among the small holder farmers primarily. Impact assessment, monitoring and evaluation should also be taking into account, therefore specialists in those fields of research and development will add value.

Private sector should not be left out. There are key stakeholders.

Policy makers have key role to play. By developing or establishing standards and guidelines following the Codex Alimentarius Commission procedures or adopting Codex Alimentarius Commission standards and guidelines. Strong emphasis on advocacy in the high political arena to have their buy-in and supports is paramount especially in the developing world including Africa, Latin America, etc.

Regards

Benoit

Third week, message 182: Opinion on questions

My name is Paul FEATHERSTONE, United Kingdom. I am President of EFFPA, the European Former Foodstuff Processors Association and President of UKFFPA, the UK Former Foodstuff Processors Association and Procurement Director at SugaRich Ltd.

QUESTIONS FOR WEEK 3

Q15. What role do you see for researchers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q16. What role do you see for researchers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q17. What role do you see for NGOs and Civil Societies in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Processing: NGOs and Civil Societies involved in the food waste debate could show public support for the feed use of former foodstuffs for food-producing animals. It cannot be expected from food manufacturers to be 'proud' of this, as their initial intention is to have their products reach the human consumption market.

Consumption: On the other hand NGOs and Civil Societies should try not to get carried away with reducing food waste through animal feed. In the UK a campaign called the Pig Idea, supported by several celebrities, lobbies for the reauthorization of catering waste as pig feed. The EU livestock industry has had to live through several devastating feed-borne crises over the past few decades, due to lapses in feed ingredient safety and integrity. The current EU approach is that feed safety always overrides environmental and economic gains that could be made. Intentions to break down EU regulations on feed safety (such as catering waste, ban on animal proteins, intra-species recycling ban) on which no government would be willing to negotiate only creates confusion at consumer level.

Q18. What role do you see for NGOs and Civil Societies in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q19. What role do you see for the policy makers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Processing: This is the very reason EFFPA was established in January 2014, therefore forgive me for being very EU-specific. One of the most important requests we have made to the EU policy makers is to create a harmonized non-waste legal status for former foodstuffs destined to animal feed. Currently former foodstuff processors depend on the interpretation of by-product criteria (Art 5 Waste Framework Directive) for the former foodstuffs or vegetable origin. This can be a problem for example when environmental authorities decide that former foodstuffs are "waste", therefore not fit for animal feed, and interfere with a functioning operation. Policy makers (worldwide) should make clear that former foodstuff processing for feed is an operation within the food chain that fully falls under food and feed regulations, leaving no room for environmental authorities to interfere on the basis of by-product criteria interpretation. DG SANTE Commissioner Vytenis Andriukaitis publicly committed to resolve this situation in his speech at the EXPO Milano Food Waste Conference of 15 October.

EU policy makers should also remove any financial incentives for bioenergy producers to use former foodstuffs as a source of renewable energy. EFFPA members occasionally find themselves outcompeted by subsidized bioenergy producers, which is in clear disrespect of all existing food waste hierarchies. Another specific problem is that ruminant gelatin is not allowed in feed, despite EFSA confirmation of its safety. In practice this means that only the sweets produced with gelatin of porcine origin may be used by former foodstuff processors in the EU.

Q20. What role do you see for the policy makers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q21. What role do you see for farmers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

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Third week, message 183: General comment on feed safety

I am K S Prasad from India

Post harvesting crop storage may include pesticides/insecticides used injudiciously, hence before using them for animal feeding, it has to ensured to be free of contaminants. Feed safety is very important for animal health and their products for human consumption. In the countries there should be a central feed regulatory body to evaluate and monitor feed safety strictly. It has to act well under the situations where we use food loss & waste, particularly 'non-food parts' as animal feed.

Dr K. S. Prasad Principal Scientist
Animal Nutrition Division, National Institute of Animal Nutrition and Physiology
Adugodi, Bangalore,
India-560030

Third week, message 184: Opinion on questions

Hi everybody, this is Dr. Manpal Sridhar from Bangalore, India.

Q15. What role do you see for researchers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q16. What role do you see for researchers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

A researcher plays a pivotal role in both making use of 'food loss and waste' as animal feed as well as making use of 'non-food parts' as animal feed. He or she is well aware of the availability of type and quantity of food loss & waste ,food & non food parts from production and harvesting point in the fields right to processing point (grain processing mills, breweries, bakeries ,oil extraction industries, vegetable & fruit juice processing units, animal feed industries) and finally to utilization by humans and livestock. Along with this the researchers are thoroughly knowledgeable with regard to the nutritional value of each of these items. Based on the nutritional requirements of various categories of livestock the researchers can formulate methods for preserving and feeding livestock with all this rich material in an appropriate manner, be it drying with help of some fillers and extenders to take care of excessive moisture (fruit pulps etc), treatment with enzymes/silaging or making complete feed blocks. Also for developing and disseminating packages of practices with regard to food loss& waste to farmers, utilize non conventional feed ingredients during feed scarcity to enhance productivity of their livestock.

Q17. What role do you see for NGOs and Civil Societies in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during harvesting, post-harvesting, processing, distribution and consumption stages.

Q18. What role do you see for NGOs and Civil Societies in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

NGOs and Civil Societies can play a very vital role by forming a link between the laboratory and farmers by interacting with researchers and passing on first hand information to them with regard to preventing the loss of food as well as non-food parts and utilizing the same judiciously for livestock feeding.

Q19. What role do you see for the policy makers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q20. What role do you see for the policy makers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Policy makers should develop effective policies/guidelines for eliminating food loss & waste and food and non-food parts, grasslands, forest and top feed resources for incorporation into animal feeds for food, and nutritional security of both human beings and livestock. Low cost machinery and equipment for effective harvesting, processing and storage of the feed resources should be developed with ease of operation for farmers. Feed Corporation and chain should be strengthened to meet the needs of livestock in situations like heavy rains, droughts, floods etc. Facilities like insurance cover for crops and livestock should be made available to farmers.

Q21. What role do you see for farmers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Farmers/livestock owners are quite knowledgeable and experienced knowing what to feed their livestock. However with additional training they can play an effective role in enhancing the utilization of food & non food parts for feeding livestock, minimizing food loss and providing feed nutritional security for them, and their livestock.

Dr (Mrs.) Manpal Sridhar, Principal Scientist
NIANP, Bangalore, India

Third week, message 185: View on questions and response to message 181

I am Ghulam Habib Professor of Animal Nutrition and Livestock Consultant, Pakistan

I strongly endorse the concerns of Gbemenou Joselin Benoit Gnonlonfin (message #181).

Research in developing countries is often performed in isolation that seldom finds adoption by farmers or industry. Multidisciplinary teams are important to address technical, social and economic aspects of the issues, in this case food losses and animal feeding. There may several aspects other than technical such as environmental, legislative, economic, and social (in case of diverting food losses to animal feed) that need to be addressed. Citing an example of producing better quality crop residues for animal feeding require collective research of animal nutritionist, agronomist, plant breeder and market players that seldom happen. Whatever research findings are applied in the field, it requires stringent monitoring and evaluation in broader perspectives.

Awareness raising of farmers is important. These days the mobile phone technology can be utilized to provide extension messages and get feedback of farmers.

Constant feeding of evidence based data/information to policy makers is very important. The on-going research in local universities in developing world is mostly academic and basic in nature for producing publications and seldom geared towards measurements of economic impact of challenges being faced by the sector and of the respective government interventions; thus fails to provide valuable inputs to policy makers.

Legislative and policy reforms must be backed up by applied research with strong economic analysis. This necessitate the presence of a specialized Livestock Policy Research Institute that can undertake policy research and help formulate and update policy and institutional reforms in the livestock sector in line with local and international needs. Unfortunately in Pakistan, similar to other countries in the region, there has been no focus on establishing Livestock Policy Centers in the universities.

Taking on board the wide spectrum of stakeholders with strong presence of private sector including industry for consultation shall form basis of advocacy campaigns to raise the problem and its advocate possible solutions to policy makers and politicians.

Regards

Ghulam Habib

Third week, message 186: General information related to the questions discussed

I am Sarah Kahn from the OIE (World Organisation for Animal Health)

As part of the background to the discussion, I would like to draw attention to the relevant standards adopted by the 180 Member Countries of the World Organisation for Animal Health (OIE). The OIE is the international standard setting organisation referenced in the WTO Agreement on the Application of Sanitary and Phytosanitary measures (SPS Agreement), with respect to measures to prevent the entry and spread of animal diseases and zoonoses. Under the SPS Agreement, the Codex Alimentarius Commission plays a similar role in relation to measures for assuring food safety. The OIE and Codex collaborate closely to ensure that standards cover the entire food production chain in a seamless and well-coordinated manner. The OIE's work in Animal Production Food Safety (i.e. the 'on farm' aspects of food safety), including OIE/Codex collaboration, is described at

<http://www.oie.int/en/food-safety/food-safety-key-themes/>

With respect to animal feed, the relevant OIE standards are:

the [Terrestrial Animal Health Code](#) Chapter 6.3 The Control of Hazards of Animal Health and Public Health Importance in feed

http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_control_feed_hazard.htm

the [Aquatic Animal Health Code](#) Chapter 4.8 The Control of Pathogenic Agents in Aquatic Animal Feed

<http://www.oie.int/en/international-standard-setting/aquatic-code/access-online/>

In terms of general guidance, in 2010 the OIE and FAO jointly published A Guide to Good Farming Practices, which contains some general recommendations on animal feeding.

http://www.oie.int/fileadmin/Home/eng/Food_Safety/docs/pdf/3_Lang_Good_farming_practices.pdf

FAO and Codex have several relevant publications, including the Codex Code of Practice on Good Animal Feeding [CAC/RCP 54-2004] but I leave it to FAO colleagues to provide more detailed information.

I am not sure whether waste products of **aquatic animals** and feed for **aquatic animals** are within scope of the discussion. Some known practices may present disease hazards - notably the recycling of aquatic animals that are dead and moribund for use in feed for aquatic and other animals. Perhaps this is out of scope of the present discussion but I mention it as an example of the concerns that the OIE addresses in its standards and recommendations.

Best wishes, Sarah

Third week, message 187: Opinion on question

My name is Ricardo Luis SAGER, from Argentina.

Q15 and Q16

These questions deserve the same answer, because no matter what it is, food loss, waste or non-food parts of crops they should receive the same attention. Researchers should work on:

A- Identifying, describing and quantifying residues that could be available in different value chains of their countries or in the region where they develop their research.

B- Analyze its chemical composition; nutrients, xenobiotics, ensure safety and so on.

C- Evaluate different treatments/processes for conservation

D- Evaluate animal feeding behavior and feeding response.

E- Investigate effect (smell, taste, fatty acid composition, palatability, etc.) on fresh or processed food products (milk, meat, eggs)

F- Publish information in different formats (Research paper, Technical information, massive media articles, etc.)

G- Train professionals, consultants and producers

Q17 and Q18

NGOs and Civil Societies should be involved directly from the start, bringing information, questions, concerns and needs to the researchers and should help them to search for funding, since it is not easy to find.

In addition, these groups are key to disseminate and adopt results obtained and to sensitize decision makers. They should finance training and information dissemination.

Q19 and Q20

Policy makers could be divided into political and institutional.

Political policy makers should support; through laws, state programs, regulations and so on every activity focus on food security, including like as main task the reduction of food loss and waste.

Institutional policy makers should develop strategies to give academic support to state programs dealing with this subject, through financing special programs and projects, improving researcher formation, interacting with different links of the value chain.

Q21

Farmers need to be aware of the problem and possible solutions to manage food loss and waste as animal feed. They should be the first beneficiaries of implementing solutions since they could be more efficient in using their resources or at least to know that there are some other feed alternatives to use that could reduce production cost. From the

environmental point of view, they could be rewarded / recognized if they manage losses and waste in an environmental friendly way and could become a "demonstrator farm" as an example of what and how things should be done.

Dr. Ricardo L. Sager

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Argentina

Second week, message 189: Suggestion for further reading

I am Jan Dijkstra from Wageningen University

Dear participants

Just briefly, for discussion it may be useful to also read the contribution of Paul Featherstone

at:

<http://www.allaboutfeed.net/Nutrition/General/2015/10/Feed-solution-for-foodstuff-waste-2704383W/?cmpid=NLC|allaboutfeed|2015-10-19|Feed: solution for foodstuff waste.>

That was part of the EU Fight Food Waste, Feed the Planet conference

http://ec.europa.eu/dgs/health_food-safety/information_sources/events/20151015_safety_food_waste_en.htm

Best wishes, Jan

Third week, message 190: Opinion on questions

Dear all, Greetings.

I am Dr. A. Bharathidhasan from Madras Veterinary College, TANUVAS, Chennai, Tamil Nadu, India

Q15. What role do you see for researchers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q16. What role do you see for researchers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

The researcher should focus on quality assurance of feeds while making use of food loss and waste considered for animal feeding during all stages in harvesting, post-harvesting, processing, distribution and consumption stages. Also pilot study should be carried out in small number of animals and expanded to large numbers of animals for sustainable animal production.

Non food parts like fruit industry waste (apple, tomato, pine apple waste and vegetable waste etc,) may be used for animal feeding by applying suitable physical, chemical and biological processing. Also silage making of this waste might be very helpful for long term usage. The sugarcane tops can also be preserved as silage for longer period. The paddy

straw and wheat straw can be enriched with urea and paddy straw block can also be prepared for the benefit of livestock farmers. This entire thing should be done by academic and transferred to the needy farmers.

Q17. What role do you see for NGOs and Civil Societies in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q18. What role do you see for NGOs and Civil Societies in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

The NGOs and Civil Societies should work together with academic to check the quality assurance of food loss/waste considered for animal feeding. They should make the feed available for livestock by doing various field nutritional trials. Also by providing suitable training to the needy farmers to utilize the food loss/waste considered as feed for livestock feed.

The NGOs and Civil Societies should also carry out field trials to utilize the 'non food parts' like paddy straw, vegetable waste and fruit waste etc, and the suitable technology should be transferred to the needy farmers.

Q19. What role do you see for the policy makers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q20. What role do you see for the policy makers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

The policy makers should prepare an agenda to reduce the food loss and also to regulate the utilization of 'food loss/waste' by providing suitable quality checks and other feed safety measures for those feed loss /wastes. The policy makers can also follow the quality and safety measures for the use of non food parts for livestock.

Q21. What role do you see for farmers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

The farmers themselves should know the food loss/waste and non food parts that could be considered for animal feeding. The farmers should also be taught the latest technologies like urea enrichment of paddy straw, sugarcane tops silage and fruits and vegetable waste silage, feed block etc., used to make the use of non food parts for animals.

With regards

Dr. A. Bharathidhasan, M.V.Sc., PhD., Assistant Professor, Department of Animal Nutrition, Madras Veterinary College, Chennai -600 007. Mobile:91-9841092427

Email ID: bdhasanvets@yahoo.co.in

Third week, message 191: Opinion on questions

I am P L SHERASIA, from INDIA.

I would like to share my views on questions for week 3 as under:

Q15. What role do you see for researchers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q16. What role do you see for researchers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

The researchers play a dynamic role in making use of 'food loss and waste' and 'non-food parts' as animal feed. The research should not be confined to laboratory only; it should transfer from LAB to LAND. A platform at regional/central level should be formed including multidisciplinary researchers, with researchers of climate change for judicious utilization of these potential feed resources:

- Identification of 'food loss and waste' and 'non-food part' in different area.
- Laboratory analysis of toxic/anti-nutritional factors.
- Developing effective technology for storage at farmers' level.
- Enrichment and densification for improving their nutritive values.
- Optimizing the level of their inclusion in the ration of different categories of animals.
- Research on excretion of toxic substances from the animals and their environmental effects.
- Effects on animal health, production and reproduction.
- Effects on animal health and environment should also be considered in short and
- Development of FARMERS FRIENDLY TECHNOLOGY should be the goal of researchers.

Q17. What role do you see for NGOs and Civil Societies in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q18. What role do you see for NGOs and Civil Societies in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

For transferring the research from LAB to LAND, the NGOs and Civil Societies play an important role. Researchers should tie up with local NGOs for dissemination of their research outcomes. The NGOs and Civil Societies can become a BRIDGE between the researchers and farmers for proper use of latest research and technology at farmers' doorsteps. NGOs can also involve in collection, storage, distribution, and field demonstration for use of 'food loss and waste' and 'non-food parts' as animal feed.

Q19. What role do you see for the policy makers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q20. What role do you see for the policy makers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Strict policy regulation becomes centre for practical use of 'food loss and waste' and 'non-food parts' as animal feed. Policy makers should think about developing following guidelines/policies:

- To minimize 'food loss and waste', and use of cost effective machineries at different stages of food chain.
- The policy should encourage feed processing plant to set up near by the areas, where large quantity of 'food loss and waste' and 'non-food parts' are available so as to minimize transportation cost.
- Farmers should be encouraged by incentive based policy for NO or MINIMUM loss.

- Policy should be in place for transferring LAB RESEARCH to LAND APPLICATION.
- Policy should educate the farmers for use of these potential feed resources.
- Some environmental regulation/policy should be in place, so as to minimize environmental burden and maximize the use of 'food loss and waste' and 'non-food parts' as animal feed in an environmentally sustainable manner.
- The farmers nearby food processing plants are encouraged to utilize these potential feed resources, comes out from the plant.
- Policies on animal and human health regulation should be in place.
- Imbalance in availability of feeds and fodder exists in different part of India. Therefore, there is an urgent need to have a policy to encourage the private entrepreneurs in fodder surplus area for agreement with NGOs in fodder deficit area for collecting, processing (in the form of blocks/briquettes/bales/silage by enrichment and densification), and distribution of these 'food loss and waste' and 'non-food parts' in fodder deficit area.

Q21. What role do you see for farmers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Trainings, field demonstrations, use of extension materials like pamphlets, leaflets, audio-visuals etc help the farmers for accepting new research findings and technologies. In India, generally poor and uneducated women/ landless farmers keep the dairy animals for their livelihood. These women/farmers lack the knowledge and skill to feed their animals as per their nutrient requirements. This is one of the most important causes for low productivity of dairy animals in India. These women/ farmers should be educated about least cost balanced feeding, so that the milk production can be improved in an environmentally sustainable manner to meet the growing demand of milk and milk products in India and other developing countries as well.

Regards,
Pankaj L Sherasia,
National Dairy Development Board, INDIA

Third week, message 192: Suggestion for further reading

Dear Participants,

we like to share with you information from a "**Joint FAO/WHO Expert Meeting on Hazards Associated with Animal Feed**" that is relevant to the topics of the e-conference. The relevant passage says:

"Food waste and former food products

The worldwide trend for food waste reduction has led to an increase in the recycling and reuse of former food and food processing by-products in the feed chain, which, if not well managed can lead to a greater potential risk of emerging hazards in animal feed. While this can be an important pathway for waste conversion, it is critical from a safety perspective that the feed chain is not used as a means to dispose of degraded or contaminated foodstuffs. Given the diversity of inputs, the range of hazards relevant to feed from these sources could be very broad ranging from heavy metals, pesticides, dioxins and polychlorinated dibenzo-furans, mycotoxins, and residual processing aids, packaging materials, particularly from former food products, and microbial hazards, which can increase particularly in high moisture former food. With the lack of traceability associated with some of these inputs, particularly in the case of post-consumer waste, the expert meeting highlighted that there is potentially an increased risk of animal products being fed back to animals and cycling of hazards in the feed-food chain. The expert meeting noted the need for increased communication between food and feed

regulators and industries on the importance of the feed to food continuum and how to limit the diversion of contaminated food products to feed.”

You may access the full executive summary of the Joint FAO/WHO Expert Meeting at:

<http://www.fao.org/3/a-az851e.pdf>

We like to thank Daniela Battaglia, FAO Animal Production Officer for sharing this information.

Your Moderators

Third week, message 193: Opinion on questions

I am Dr NWORGU Friday Chima from Nigeria.

I am a Chief lecturer at Federal College of Animal Health and Production Technology, Moor Plantation, Ibadan, Nigeria.

The answers to the questions are as follows:

Q15

Researchers in Nigeria have not done much research works In terms of food loss and waste as animal feed. However, some works had been done for the processing stage of the food chain. A lot of research work need to be done with respect to the harvesting, post-harvest, distribution and consumption stages of food value chain. Research at consumption stage is mainly suitable for local chickens, goats and pigs. However, there will be problems of funding, uniformity, quality, preservation and food/feed safety. Local farmers who keep livestock normally feed their farm animals during harvesting, post-harvest, processing and consumption stages at small scale levels.

Q16

Researchers in Nigeria have done a lot of research on non-food parts as animal feed. A lot of work has been done on cocoa husk, yam/cassava peels, banana/plantain peels, palm kernel cake, rice husk, Indomie waste, breweries dry grain, cowpea waste, among others. However, a lot more needs to be done, as so many non-food parts have not been researched upon. Major problems are funding, infrastructure, logistics and government policy.

Role of researchers for questions 15 and 16 include:

- I. Surveying the areas where food waste, food loss and non-food parts are available.
- II. Quality and quantity determination.
- III. Organize seminars and workshops for farmers, students and other stakeholders.
- IV. Develop appropriate technologies.
- V. Publication of proven research findings.

Q17 and Q18

The NGO's and civil societies will act as pressure groups in forcing the government to make appropriate laws, provision of infrastructures, provision of basic farm inputs and evaluation of food wastes and non-food parts from areas of production to areas of utilization and to minimize environmental pollution. They can also give research grants to researchers based on the subject matter. They can equally organize seminars, workshops, and training sessions for the farmers, students, community elders, government officials and researchers and other stakeholders. They can also disseminate information generated to the public and stakeholders.

Q19 and Q20

The major roles of the policy makers (Government) include facilitation, creating enabling environment, formulation of appropriate policies, legislation, provide adequate and standard infrastructural facilities, security and enforcement of laws that will help in the production of food/feed and the utilization of food waste and non-food parts in livestock nutrition and production and minimize food loss. This also includes formulation of laws with reference to food/feed safety, quality and transportation. The policy makers should also formulate appropriate laws for adequate funding of research works, reward for best scientific breakthrough, formulate laws for research and development in the country(ies) (I.e. 1% or 0.5% of profits after tax of banks, oil companies and other companies for R&D for food/feed production and utilization and minimizing environmental degradation associated with food/feed production and utilization with particular reference to food loss, food waste and production of non-food parts).

Q21.

The small scale farmers in developing countries make use of food loss and waste as animal feed due to high cost of feed ingredients and feeds from feed companies. However, the farmers' livestock do not attain the required growth rate as a result of this, the farmers need training and financial assistance to increase production of livestock products.

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Third week, message 194: Opinion on questions 15 and 16

Hi, this is Steve Bartle from Kansas State University, US

I agree with many of the earlier responses as to the contributions of the research community to food waste utilization. I will respond to questions 15 and 16 with a brief story of the research efforts concerning distillers grains with solubles (DGS) in the US.

Fifteen years ago DGS was a very minor feed ingredient fed only near the few ethanol plants in operation. A change in government policy towards the production of ethanol from maize and other grains (a controversial policy) increased the supply of DGS tremendously. The ethanol production process converts the starch and sugars in the grain into ethanol, and concentrates the remaining components of the kernel about 3 times. The first step, laboratory analysis, confirmed the 3X concentration of components such as protein (about 9 to 28%), fats, and minerals. Fat levels indicated that DGS could have higher energy values than maize grain. Laboratory analysis also showed that sulfur levels were much higher than the 3X because of sulfur additions to control pH during fermentation, and during the cleaning of the production equipment.

Early in the use of DGS there were cases of sulfur toxicity in cattle, often in truck loads coming from the first batches after a cleaning of the systems, which were extremely high in sulfur. As time has passed ethanol plants have seen DGS as a product instead of a by-product and improved their quality control of DGS. Also, many plants have instituted the analysis of every truckload of DGS before it leaves the plant. The incidence of high sulfur product leaving the plants has largely been eliminated.

Universities and producers conducted many experiments using DGS in different diets, for different classes of cattle, and different management systems. The laboratory analysis of the energy content of DGS relative to maize grain was confirmed. For a period of time, energy from DGS was more economical than energy for maize grain, and the levels of inclusion in diets increased. This led to sulfur toxicity concerns in DGS with "typical" sulfur levels. A large number of dose-response type experiments were conducted to determine the levels of DGS that could be included. It was learned that the maximum

tolerable amount of sulfur listed in the NRC was low and that the actual level was considerably higher than previously thought.

Because the ethanol production processes vary somewhat among plants, the DGS they produce are somewhat different. Universities have generated data bases of the nutrient profiles of the DGS from plants within their area for producer use. Ethanol plants have begun to install equipment that removes the fat from the grain. The fat is then sold into higher value markets. The resulting DGS is lower energy, and new round of experiments is ongoing to define the feeding value of the new DGS product(s).

The use of grains that could be used to produce ethanol remains controversial. The plants are all in rural areas, and the policy has brought jobs to rural America. Cattle feeders are somewhat split in their view of DGS. Distiller's grains are an excellent feed ingredient from a nutritional and management perspective. However, ethanol production probably increases the cost of maize grain.

Third week, message 195: Comments on using food waste as feed

I am Jorge Luis Gil Llanos from Colombia

I am Research Assistant, Cassava Program

In Colombia and elsewhere in the world, farmers recycled products for use as food for their livestock, but most do not have expert consultations to determine the origin of the product and how to use it. In the International Center for Tropical Agriculture (CIAT), we are working how to use waste from root tubers and bananas such as banana peel and cassava leaves. The works are aimed at conservation through silage and subsequent use in feeding dairy cows. Our role here is to determine the best system of residue conservation and how to supply these products to the animals, taking into account the cost of the final product and finding the best combinations of banana peel and cassava leaves. There is no local government support, apart from those of the Consultative Group on International Agricultural Research (CGIAR).

In effect, the recycling of food for use as feed for animals creates a high risk if one ignores the origin of the products and the type of processing to which they were subjected. The risk of heavy metals and chemical residues may alter the final livestock product such as milk and meat. We need traceability to reuse food waste as feed.

Jorge Luis Gil

Email: j.l.gil@cgiar.org

Cali, Colombia

Third week, message 196: Opinion on questions

I am DADDEY-ADJEI, Roderick working with the FOOD AND DRUGS AUTHORITY (FDA) and sending the below comments on behalf of the FDA Team consisting of

1. AGRA, Isabella Mansa (Ag Deputy CEO, Food Inspectorate Division)
2. LARTEY, Maureen (Head, Animal Products Department)
3. DADDEY-ADJEI, Roderick (Head, Agro Products and Biosafety Department)

Q15. What role do you see for researchers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q16. What role do you see for researchers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Answers Q15 and Q16:

Research must be conducted to investigate the potential of various food loss and waste for use as animal feed ingredients from harvesting, post-harvesting, processing, distribution and consumption stages. Researchers' role also include educating necessary stakeholders on which portions of food loss and waste that may be incorporated into animal feed. For example, in Ghana, there are knowledge gaps of how much of certain specific food loss, waste and non-food parts can be incorporated into a diet. Many tertiary institutions have done a lot of research into many food loss and waste items with nutritive potential. How to commercialize research findings for use as animal feed has been the difficulty plaguing the benefits that could have been gained over the years.

Q17. What role do you see for NGOs and Civil Societies in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q18. What role do you see for NGOs and Civil Societies in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Answers Q17 and Q18:

NGOs and Civil Societies need to play advocacy roles i.e. bring government / policy makers / regulatory agencies like Food and Drugs Authority (Ghana)/ farmers / researchers. The disconnect between research findings and intended users can be resolved effectively when NGOs and Civil Societies bridge knowledge gaps through workshop sponsorship, conferences and other innovative forms of information dissemination to farmers.

Q19. What role do you see for the policy makers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Q20. What role do you see for the policy makers in making use of 'non-food parts' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Answers Q19 and Q20:

Policy makers need to sponsor and put in place economic policies and set up an enabling industrial environment through enactment of appropriate legislation that encourage investors to support research findings that can be incorporated into animal feed.

Q21. What role do you see for farmers in making use of 'food loss and waste' as animal feed? While answering the question you may wish to divide the food supply chain as during: harvesting, post-harvesting, processing, distribution and consumption stages.

Answer Question 21:

By attending feed trials workshops and using the developed feed products, discussing and comparing observations gathered with peers would complete a good feedback cycle to researchers, policy makers, NGOs and Civil Societies.