



Food and Agriculture  
Organization of the  
United Nations

# FAO assistance towards feed analysis

Increasing incomes, improving food safety  
and safeguarding the environment





# Providing safe, environment-friendly, nutritious animal feed

## The challenge

The global demand for livestock products is expected to increase by over 60 percent by 2050. FAO estimates present global livestock populations at around 22 billion poultry, 1 billion pigs, 1.6 billion cattle and buffalo, 2 billion sheep and goats. Those populations are needed to satisfy today's demand for such products, so the livestock sector is under significant pressure to greatly increase the amount of safe, nutritious feed available to animals to provide the products needed in the future.

Providing animals with adequate, balanced diets, free of toxins and contaminants is essential to enhancing their productivity and welfare. An adequate, balanced diet is one that meets the nutritional needs of the animal, based on its physiological stage and targeted production level. Good quality feed also increases the incomes of producers, ensures a better quality product and a cleaner, greener environment.

The safety and quality of animal feed is also vital for preventing hazardous substances entering the food chain and affecting human health. Contaminated feed has often resulted in the same feed – or food of animal origin – being recalled and/or destroyed with significant economic losses for the livestock industry, the producer and food security.

## The solution

Feed analysis laboratories are essential for ensuring accurate information on the composition of feed ingredients and determining the level of desirable and undesirable substances, enabling the production of safe, balanced diets for livestock. Without them, it is almost impossible to control what animals eat.



# Reducing costs, boosting profitability and strengthening local economies

Feed costs can be as high as 70 percent of the cost of producing an animal product. One way to reduce these costs is to ensure the animal has a balanced diet so nothing is wasted. To ensure a diet is balanced, feed analysis laboratories:

1. Generate reliable data on chemical constituents;
2. Help ensure the more efficient use of available feed resources in each diet;
3. Help producers reduce the cost of inputs by identifying least-cost rations, thereby increasing profits.

Additionally, good laboratory data can help promote the use of locally available feed resources and create employment, giving a boost to local economies. Good feed analysis also helps researchers develop more cost-effective and sustainable feeding strategies that can then be commercialized or directly used by farmers.

At a regional and international level, the reliable and accurate analysis of feed promotes trade and economic growth, not just involving livestock but also the feed itself.



# Improving the safety and quality of food and the welfare of the animals

Poor nutrition not only affects the productivity of the animal, but also its health, behaviour and welfare. Just as importantly, the safety and quality of the food chain can be affected because of the close link between feed and food-borne pathogens such as *Escherichia coli*, *Salmonella* and *Campylobacter*.

The presence of mycotoxins, heavy metals and pesticides in feed can also adversely affect animal and human health and product quality and safety. Because of this, feed analysis laboratories play an important role in ensuring animal product quality via the accurate and regular measurement of contaminants and toxins.



# Safeguarding the environment

A large part of what an animal eats (50 to 90 percent of feed carbon, nitrogen and phosphorus) is excreted. If not managed properly, these constituents can pollute the environment. The feeding of balanced diets decreases the level of excretion of feed nutrients. Feed analysis laboratories, therefore, assist in reducing the environmental pollution caused by animal production by more reliably determining the chemical constituents of feed ingredients and ensuring they are not excessive or unnecessary in the diets.



# FAO in action

FAO provides assistance to government and non-government organizations to:

- o Integrate quality control systems and good management practices into feed analysis laboratories by developing capacity and providing tools and manuals;
- o Participate in the Proficiency Test (Ring Test) for feed chemical constituents and aflatoxins;
- o Facilitate in-person and remote third party auditing of systems and procedures in feed analysis laboratories;
- o Develop capacity for determination of nutritional value and chemical composition of feeds including quantification of hazards such as mycotoxins, heavy metals and pesticides;
- o Establish networks and associations of feed analysis laboratories to strengthen the quality of the data emerging from the laboratories;
- o Integrate the activities of feed analysis laboratories into public policies on livestock production, environment, food safety and quality, and animal welfare;
- o Make the feed industry more profitable and better equip public and private institutions to meet local and global food-feed security challenges;
- o Support the self-assessment of the quality control status of feed analysis laboratories through the provision of special tools;
- o Introduce non-destructive, environmentally friendly and fast techniques such as Near Infrared Spectroscopy (NIRS) for the analysis of feed constituents and nutritional value (also included are portable NIRS for in situ determination of chemical constituents and the nutritional value of the crops in the field, before harvesting).



## FAO Publications

**FAO 2011.** *Quality assurance for animal feed analysis laboratories.* Animal Production and Health Manual 14. [www.fao.org/3/i2441e.pdf](http://www.fao.org/3/i2441e.pdf)

**FAO 2013.** *The feed analysis laboratory: Establishment and quality control.* Animal Production and Health Guidelines 15. [www.fao.org/3/i3535e.pdf](http://www.fao.org/3/i3535e.pdf)

**FAO 2013.** *Quality assurance for microbiology in feed analysis laboratories.* Animal Production and Health Manual 16. [www.fao.org/3/i3287e.pdf](http://www.fao.org/3/i3287e.pdf)

**FAO 2011-2016.** *Experts' Network: Strengthening quality control systems in animal feed analysis laboratory in developing countries* [www.fao.org/ag/againfo/home/documents/Network\\_Quality-control.pdf](http://www.fao.org/ag/againfo/home/documents/Network_Quality-control.pdf)

## Forthcoming

FAO is finalizing a web-based tool to facilitate in-person or remote auditing of systems and procedures in feed analysis laboratories

Proficiency testing of feed constituents: a comparative evaluation of European and developing country laboratories and its implications for animal production. *Journal of Agricultural and Food Chemistry*. <http://dx.doi.org/10.1021/acs.jafc.6b02452>

## For further information

Harinder P.S. Makkar  
Email: [Harinder.makkar@fao.org](mailto:Harinder.makkar@fao.org)  
Livestock Production Systems Branch  
Animal Production and Health Division  
FAO, Rome, Italy

