



Food and Agriculture Organization of the United Nations



Some Activities of Animal Nutrition Programme of FAO

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Animal Nutrition Programme

Aims to

Enhance livestock productivity to increase availability of safe animal products using sustainable animal diets and feeding strategies, while conserving the environment, biodiversity and natural resources



Activities

- Search for novel feeds
- Efficient use of the available feed resources
- Collation, synthesis and analysis of feed related information
- Capacity building



Projected consumption of meat & dairy products

	2010 (million tonnes)	2050/2010
World		
Meat	268.7	173%
Dairy not butter	657.3	158%

	2010 (million tonnes)	2050/2010
Developing countries		
Meat	158.3	209%
Dairy not butter	296.2	216%



Quest for novel feeds

	Meat production by monogastrics (million tonnes)	Protein required (million tonnes)	Increase in protein requirement
2009			
	200	157	-
2050			
	360	280	1.8 fold

Challenges

- Increase in population to 9 billion in 2050
- Decrease in arable land for crop production
- Water shortage
- Food-feed-fuel competition
- Frequent climate extremes

What role insect proteins could play in meeting this feed protein demand??



Identification of lesser-known feeds

Aims

- Enlarge feed resource base
- Prevent biodiversity erosion

Tapped local knowledge

Identified:

8 feed resources containing 16-30% protein

Psophocarpus scandens, *Urtica Angustifolia*, *Urtica dioica*,
Sesbania grandiflora, *Colocasia esculenta*, *Alysicarpus vaginalis*,
Pithecellobium dulce, *Bromus auleticus*

6 feed resources containing 8-15% protein

Paspalum dilatatum, *Desmodium heterocarpon*, *Adesmia latifolia*



Co-products of biofuel industry as feed

Opportunities and Challenges in Utilization of Co-products of the Biofuel Industry as Livestock Feed

Novel feed resources

- Distillers grains from maize, wheat, barley
- Glycerol
- Gluten meal
- Cassava residue
- *Camelina sativa* meal
- Sweet sorghum residue
- Toxic and non-toxic Jatropha
- Pongamia meal
- Castor meal
- Palm kernel meal
- Algae residue

Guideline for safe use
Future research areas



Identification of novel feeds and successful technologies

E-Conference: Successes and Failures in Application of Animal Nutrition Practices and Approaches, September 2010

Feeds

- *Spine-less Cactus as animal feed*
- *Azolla*
- *Tree leaves in Silvopastoral Systems*
- *Moringa oleifera leaves/meal*

Technologies

- *Complete Feed Block Technology*
- *Site Specific Mineral Mixture*
- *By-pass Protein Technology*



Improving feeding quality of food-feed crops

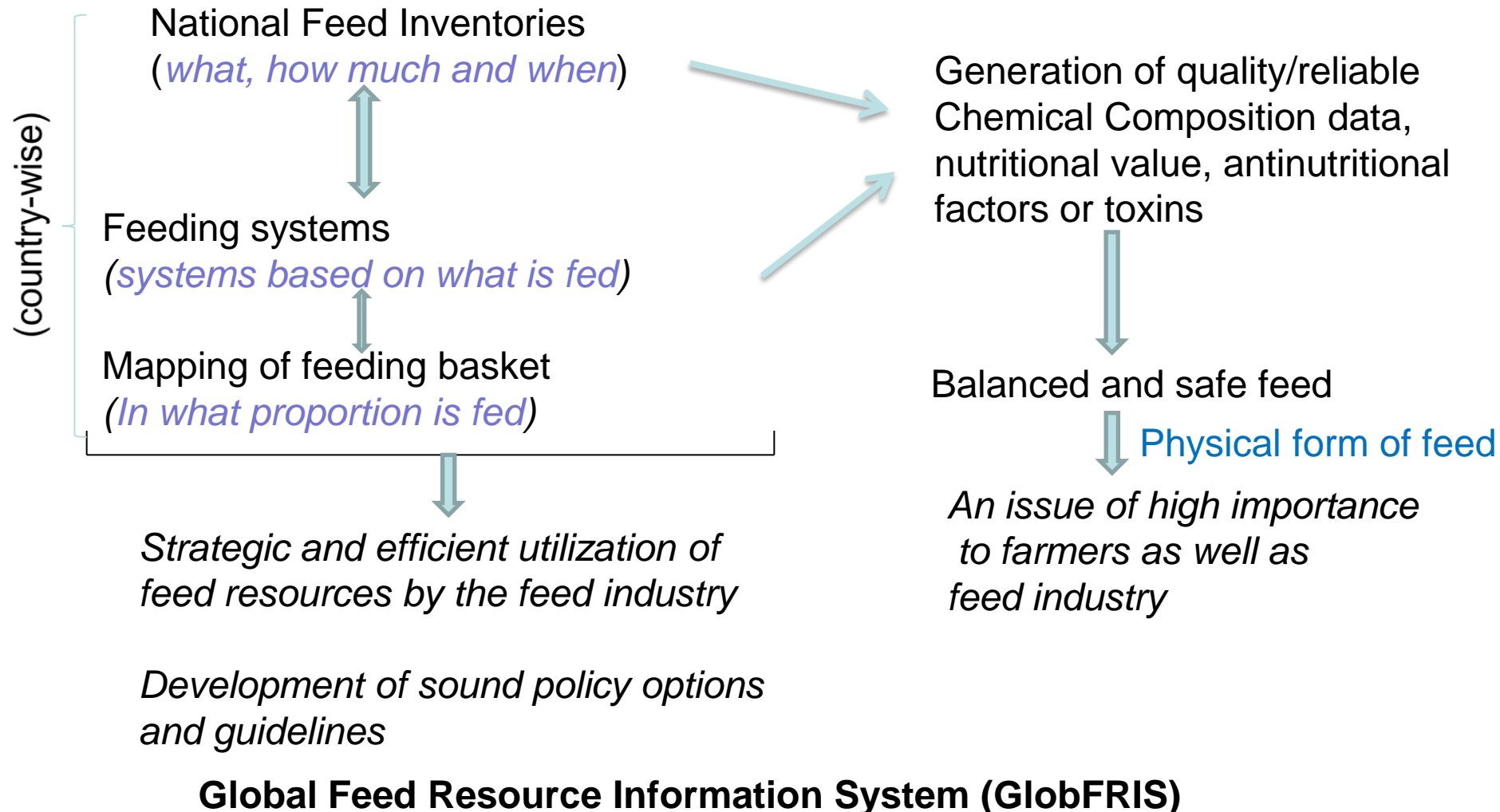
Novel feeds using nuclear and biotechnologies

Improve barley crop residue quality

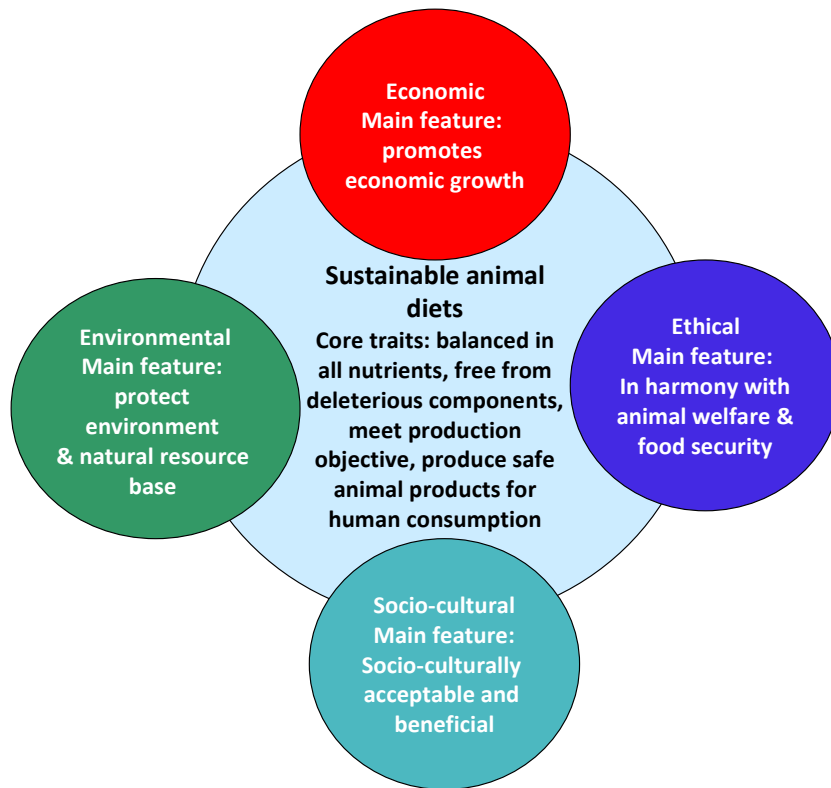
- Low lignin in crop residues *using the rob1 mutants*
- Removal of awns *using the Kap1 mutant*
- Reduces lodging *using mutant sdw4*
- Increase in protein quality (*high lysine and methionine*)



Efficient use of available feed resources, Synthesis & analysis of data and Capacity building



Conceptual framework on sustainable animal diets



Non-food insects or protein isolates, protein concentrate from non-food insects have a place in the concept

1. No ingredients in ruminant feed that competed with human food
2. Addition of non-food grade grains only in the monogastric diets



Insects as livestock feed...^{1/3}

Unconventional/alternate plant-based feed resources

- *High in anti-nutritional factors,*
- *Some contain toxins and allergens*
- *Low in essential amino acids*
- *Low in omega fatty acids*

Insect proteins/insects

- *High in essential amino acids*
- *High in protein and fat*
- *High in minerals, vitamins and omega fatty acids*
- *Less likely to be affected by cultural inhibitions and taboos*
- *Anti-nutritional factors, allergens, heavy metals, toxins*
- *Hosts of pathogens such as bacteria, protozoa, viruses or helminths*



Insects as livestock feed...2/3

Literature

- *Fish > Poultry > Pigs*

Constraint

- *Low quantity available*

Mass rearing is the key

Issue related to toxicity and transfer of diseases

Opportunity cost of the raw material on which insects are grown



Insects and livestock feed...^{3/3}

Insects as a source of bioactive compounds

- *Antioxidants*
- *Feed additives*
(micorobial ecology in gut, immono-modulators, antibiotic substitutes)

(rumen modifiers, animal product quality and shelf life enhancers, egg product enhancers)
- *Peptide antibiotics*
- *Bypass protein*
- *Intermediates in synthesis of drugs*



Thanks for your attention