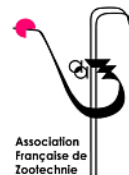


# Updating and renovating the INRA-AFZ multispecies feed tables

*G. Tran<sup>3</sup>, V. Heuzé<sup>3</sup>, P. Chapoutot<sup>1,2,3</sup> and D. Sauvant<sup>1,2,3</sup>*

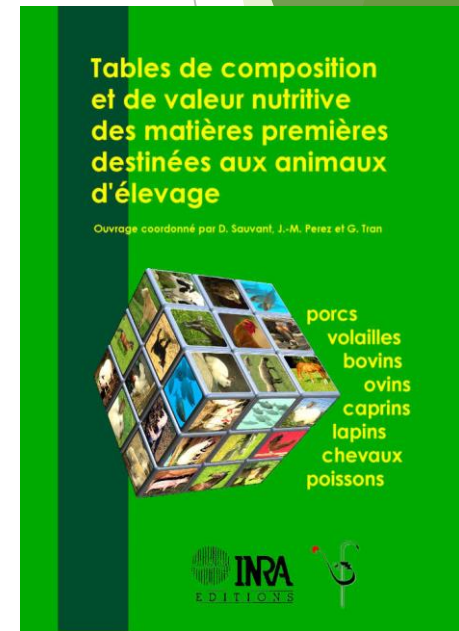
<sup>1</sup>AgroParisTech UMR 791 MoSAR, Paris, France; <sup>2</sup>INRA UMR 791 MoSAR, Paris, France; <sup>3</sup>AFZ (Association Française de Zootechnie)



# The INRA-AFZ multispecies feed tables

In the late 1990s, INRA and AFZ created feed tables with the following features:

- ▶ Feed materials (ingredients) only
  - Target: compound feed industry
- ▶ Main livestock species (rather than species-specific tables)
- ▶ State-of-the-art nutritional concepts
  - Energy and protein values for ruminants (UF, PDI, AADI)
  - Starch degradability, mineral balance for ruminants
  - Amino acid digestibilities in pigs and poultry



# The INRA-AFZ multispecies feed tables

The INRA-AFZ feed tables of 2002 were based on:

- ▶ Data collected from feed companies and R&D organisations by AFZ since 1989
- ▶ Scientific input from INRA researchers
  - Nutritional concepts
  - Equations for predicting the nutritional values

The screenshot shows a software interface for managing feed tables. At the top, there are navigation buttons for 'Consolidated data', 'Zone', 'Samples', 'Individual data', 'Search by terms', 'Display all feeds', and 'Export Zone'. A search bar is present, and the 'Feed class' is set to 'Féverole' with a count of 202. The selected feed is '273 Féverole à fleurs colorées'. Below this is a table with columns: Parameter, Animal class, /fresh, /DM, Unit, Other, Unit, and Use. The table lists various nutritional parameters such as 'Matière sèche', 'Protéines brutes', 'Cellulose brute', etc. At the bottom, there is a 'Calculated' section with a date of '01/11/2013' and a 'Normalise the DM values' button. It also shows statistical values for 'StDev', 'Min', 'Max', and 'Count' for the selected feed.

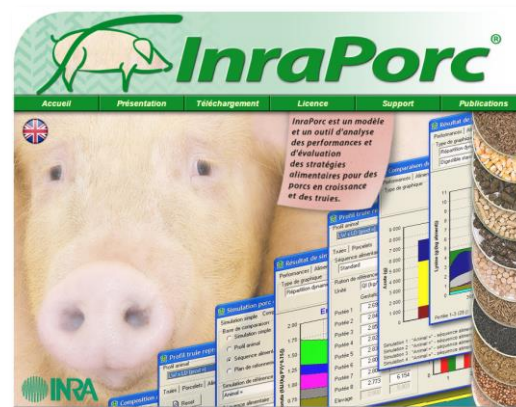
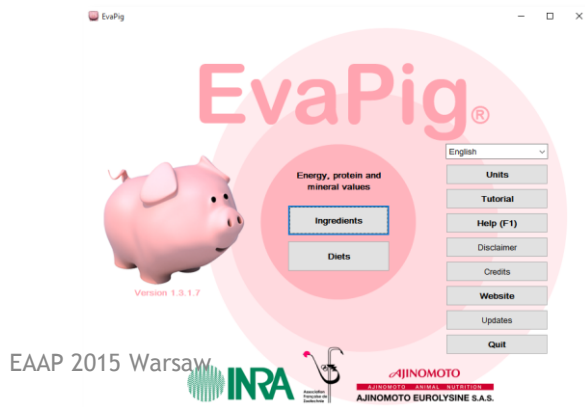
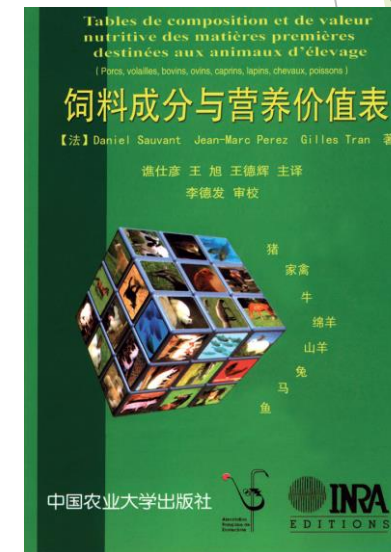
Parameter	Animal class	/fresh	/DM	Unit	Other	Unit	Use
Matière sèche	-	86.68		%		-	✓
Protéines brutes	-	25.51	29.46	%		-	✓
Cellulose brute	-	7.79	9.00	%		-	✓
Matières grasses brutes	-	1.32	1.52	%		-	✓
Matières grasses brutes (hydrolyse)	-	1.53	1.76	%		-	✓
Cendres brutes	-	3.33	3.85	%		-	✓
Calcium	-	0.12	0.13	%		-	✓
Phosphore	-	0.46	0.53	%		-	✓
Potassium	-	0.96	1.11	%		-	✓

Calculated 01/11/2013 Normalise the DM values 273

StDev	1.98	StDev	
Min	79.50	Min	
Max	92.49	Max	
Count	144	Count	0.00

# The INRA-AFZ multispecies feed tables

- ▶ The INRA-AFZ feed tables were successful
  - 2 French editions (2002 and 2004)
  - Translation in English, Spanish and Chinese
  - 14.000 copies sold
- ▶ The INRA-AFZ data have been used in many technical publications, tables and software



19/2015

# Why new tables?

- ▶ A repeated request from feed professionals
- ▶ Technical and scientific advances
  - New nutritional concepts (Systali system for ruminants)
  - New feeds (biofuel by-products...)
  - New types of data (environmental footprint)
- ▶ Massive increase in available data
  - AFZ 's French Feed database contains twice more data than in 2002
  - More data from scientific publications
- ▶ Globalisation of the demand for feed information
  - Need for harmonization of European feed units
  - Demand from emerging countries and for the overseas/outermost regions of Europe
  - A new partner with experience in tropical countries:

# Why new tables?

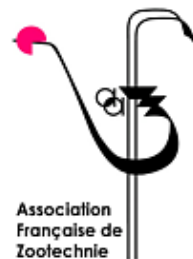
- ▶ The internet has become mandatory for optimal dissemination
  - Large, worldwide audience
  - Adaptable, reactive, flexible, no size constraints
- ▶ Success of Feedipedia.org, the on-line feed encyclopedia managed by INRA, CIRAD, AFZ and FAO
  - 1 million unique Feedipedia users in 3 years vs 14.000 copies of the INRA-AFZ tables in 12 years
- ▶ Developing Feedipedia was also useful for identifying areas of interest in feed information worldwide





# The INRA-CIRAD-AFZ tables

- ▶ Project started in 2015
- ▶ Developed by researchers and engineers of INRA, CIRAD and AFZ
- ▶ With the support of
  - Ajinomoto Eurolysine
  - INRA, CIRAD, AFZ, EAAP



# The INRA-CIRAD-AFZ tables

- ▶ Chemical composition and nutritive data on ruminants, pigs, poultry, rabbits, horses and fish
- ▶ Chemical data calculated from the data of the French Feed Database (> 2.3 million raw data)
  - Updated regressions between proximate analysis components
- ▶ Nutritional values for energy and protein calculated from updated equations
  - Those equations will be made available to users



# The INRA-CIRAD-AFZ tables

- ▶ New products
  - Biofuel by-products
  - Feeds for emerging and overseas/outermost regions, such as fruit by-products, sugarcane byproducts or rice byproducts
- ▶ The new INRA feed unit system for ruminants (Systali)
  - UF, PDI and AADI values provided for 3 combinations of feeding levels and proportions of concentrate in the diet (low, medium, high)
- ▶ Inclusion of other European feed unit systems
- ▶ Under consideration: environmental footprint data
  - Cumulative Energy Demand, Eutrophication, Acidification, Land competition, Climate change

# The INRA-CIRAD-AFZ tables

## ► Website

- Table values will be available online (including on mobile devices)
- E-book and print versions are also planned

## ► Developed in French and English

- Other languages are possible

## ► Free access to the tables

- Certain high value-added features will be available on subscription

# Under developement: database

- New data, new parameters, new equations, new feeds

Feed list Feeds Parameters

Matières premières Chercher  Tout montrer Calculer mp courante Mps manquantes Calculer toutes mps Ajuster courante Tout ajuster Insérer liste

65 Maïs Maize N 2634 Synonym (North America): corn. Expanded maize, extruded maize, flaked maize, high

Grain de maïs (Zea mays L.) Maize grain (Zea mays L.) Céréales

Général Systali INRA 2004 Feeds and Rules

Paramètre	65	Relation	Ordre	Valeur 1	Valeur 2	Valeur 3	Standard value
NI	-		1	1	2	4	
PCO	-		2	0	0	25	
dMOs_Ruminant	DMO Systali via DMO et NI		3	87.1366	89.8766	95.3566	88.5066
dEs_Ruminant	DE Systali par DMO Systali		4	84.73286	87.47286	92.95286	86.10286
EDs_Ruminant	ED Systali par DE Systali		5	3781.846	3904.14	4148.726	
EMs_Ruminant	EM Systali par ED Systali, NI, PCO, MM, MAT		6	3177.675	3356.443	3687.928	3237.944
ENLs_Ruminant	EN Lait Systali via EM Systali		7	2129.82	2282.844	2575.954	
ENVs_Ruminant	EN Viande Systali via EM Systali		8	2157.358	2349.607	2721.547	
DTNs_Ruminant	DT Azote ruminant Systali par a, b, c, NI et PCO		11	52.55228	46.59277	38.80686	43
DTAmis_Ruminant	DT amidon ruminant Systali par a, b, c, NI et PCO		12	67.17316	61.41326	53.38689	60
UFLs	UFL Systali par ENL Systali		9	1.210125	1.297071	1.46361	1.221988
UFVs	UFV Systali par ENV Systali		10	1.225772	1.335004	1.546334	1.230613
PDIAs	PDIA Systali par MAT DTN Systali dr		13	40.25335	45.30923	51.91458	53.67653
PDINs	PDIN Systali par MAT, PDIA et DT Systali		14	71.95747	73.41805	75.32626	73.58501
PDIEs	PDIE Systali par PDIA, PDIA, MM, dMO, AMI, DTA		15	94.03173	98.50601	105.1535	96.96046
LysDIs	LYS digestible Systali Ruminants par PDIA, PDIE e		20	6.173082	6.057361	5.934866	5.71735
ThrDIs	THR digestible Systali Ruminants par PDIA, PDIE e		21	4.957229	4.924115	4.889063	4.82682
MetDIs	MET digestible Systali Ruminants par PDIA, PDIE e		22	1.967638	1.959537	1.950962	1.935736
IleDIs	ILE digestible Systali Ruminants par PDIA, PDIE e		23	4.919154	4.919154	4.919154	4.919154
ValDIs	VAL digestible Systali Ruminants par PDIA, PDIE e		24	5.60502	5.582829	5.55934	5.51763
LeuDIs	LEU digestible Systali Ruminants par PDIA, PDIE e		25	9.766529	9.888441	10.01749	10.24665
PheDIs	PHE digestible Systali Ruminants par PDIA, PDIE e		26	5.014019	5.00623	4.997985	4.983345
HisDIs	HIS digestible Systali Ruminants par PDIA, PDIE e		27	2.191335	2.212274	2.234438	2.273797
ArgDIs	ARG digestible Systali Ruminants par PDIA, PDIE e		28	4.615074	4.614422	4.613733	4.613251

Enr: 1 sur 24

# Under development: website

## ► Front page

The screenshot shows the front page of a website. At the top, there is a header with a grid of images on the left, followed by the text 'Tables de composition et de valeur nutritive des matières premières destinées aux animaux d'élevage' and 'Tables of composition and nutritive values of feed materials'. To the right of the header are logos for INRA (Science & Impact) and CIRAD (Association pour le Développement Rural International). Below the header is a navigation menu with 'Home', 'Description', 'Authors', and 'About' buttons.

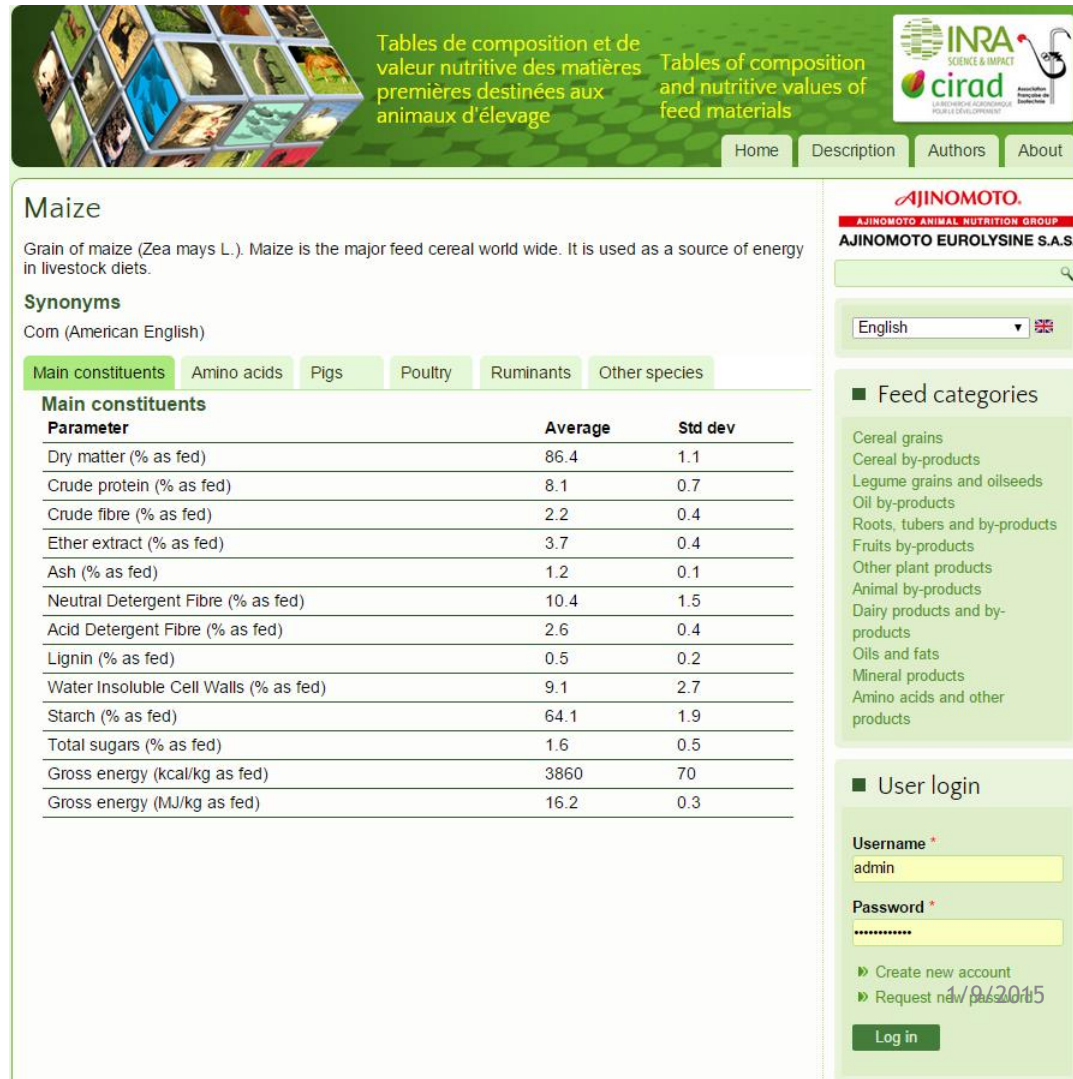
The main content area is titled 'Tables of composition and nutritive values of feed materials INRA-CIRAD-AFZ'. Below the title, it says 'Choose a feed category below to access the tables'. There is a 3x4 grid of images representing different feed categories, each with a caption below it:

- Cereal grains
- Cereal by-products
- Legume grains and oilseeds
- Oil by-products
- Roots, tubers and by-products
- Fruits by-products
- Other plant products
- Animal by-products
- Dairy products and by-products
- Oils and fats
- Mineral products
- Amino acids and other products

On the right side of the page, there is a sidebar for 'AJINOMOTO ANIMAL NUTRITION GROUP' and 'AJINOMOTO EUROLYSINE S.A.S.'. It includes a search bar, a language dropdown menu set to 'English', a 'Feed categories' list, and a 'User login' section with fields for 'Username' (admin) and 'Password', and buttons for 'Create new account', 'Request new password', and 'Log in'.

# Under development: website

## ► Tables: main constituents



The screenshot shows a website interface for feed materials composition tables. The header features logos for INRA (Science & Impact) and CIRAD (Association Française de Recherche pour le Développement), along with the text 'Tables de composition et de valeur nutritive des matières premières destinées aux animaux d'élevage' and 'Tables of composition and nutritive values of feed materials'. Navigation tabs include Home, Description, Authors, and About.

The main content area is titled 'Maize' and includes a description: 'Grain of maize (Zea mays L.). Maize is the major feed cereal world wide. It is used as a source of energy in livestock diets.' It also lists synonyms: 'Corn (American English)'.

Below the synonyms are tabs for 'Main constituents', 'Amino acids', 'Pigs', 'Poultry', 'Ruminants', and 'Other species'. The 'Main constituents' tab is active, displaying a table with the following data:

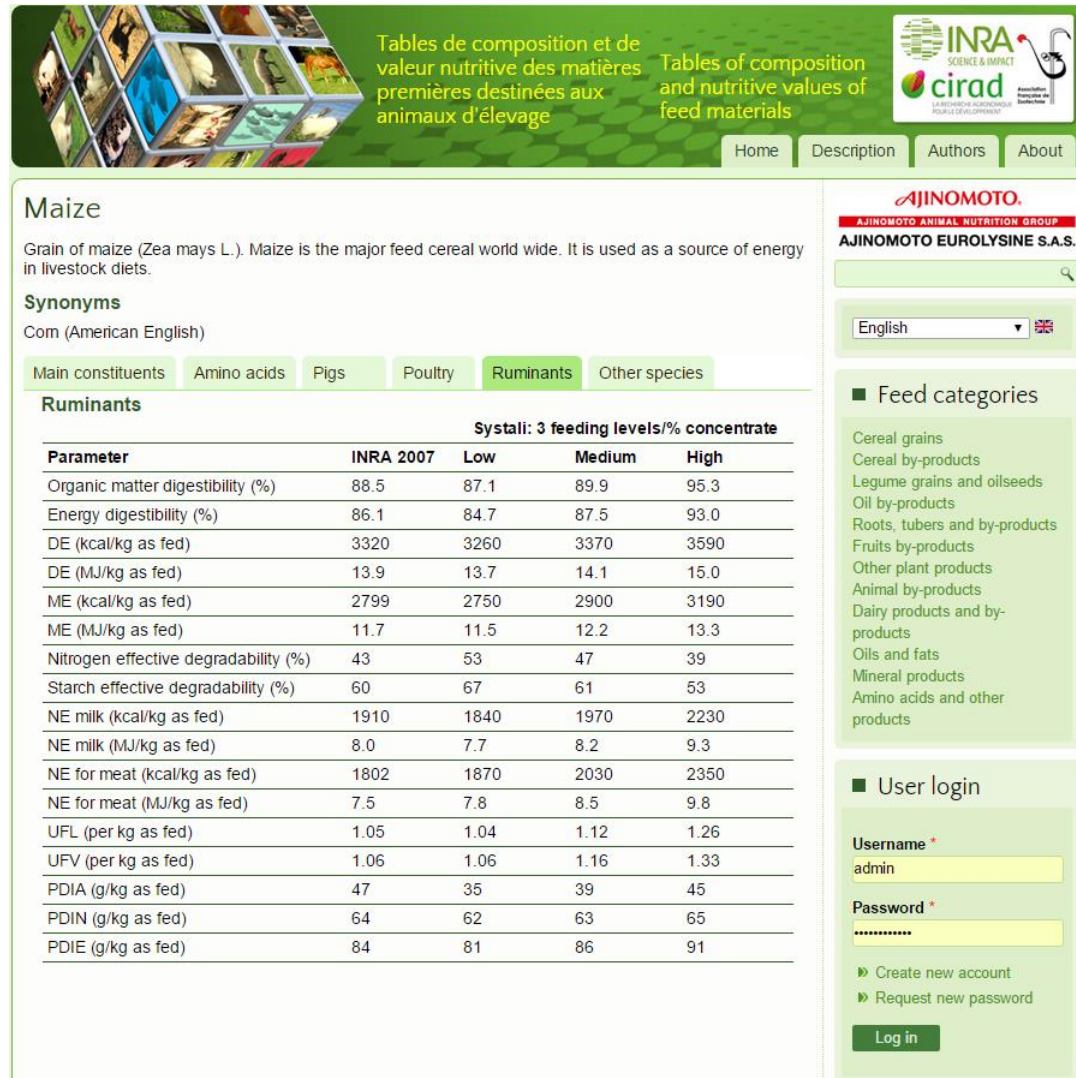
Parameter	Average	Std dev
Dry matter (% as fed)	86.4	1.1
Crude protein (% as fed)	8.1	0.7
Crude fibre (% as fed)	2.2	0.4
Ether extract (% as fed)	3.7	0.4
Ash (% as fed)	1.2	0.1
Neutral Detergent Fibre (% as fed)	10.4	1.5
Acid Detergent Fibre (% as fed)	2.6	0.4
Lignin (% as fed)	0.5	0.2
Water Insoluble Cell Walls (% as fed)	9.1	2.7
Starch (% as fed)	64.1	1.9
Total sugars (% as fed)	1.6	0.5
Gross energy (kcal/kg as fed)	3860	70
Gross energy (MJ/kg as fed)	16.2	0.3

On the right side of the page, there is a sidebar for 'AJINOMOTO ANIMAL NUTRITION GROUP' and 'AJINOMOTO EUROLYSINE S.A.S.'. It includes a search bar, a language dropdown menu set to 'English', a 'Feed categories' list (Cereal grains, Cereal by-products, Legume grains and oilseeds, Oil by-products, Roots, tubers and by-products, Fruits by-products, Other plant products, Animal by-products, Dairy products and by-products, Oils and fats, Mineral products, Amino acids and other products), and a 'User login' section with fields for 'Username' (admin) and 'Password' (masked with dots), and buttons for 'Create new account', 'Request new password', and 'Log in'.



# Under development: website

## ► Tables: ruminants



Tables de composition et de valeur nutritive des matières premières destinées aux animaux d'élevage

Tables of composition and nutritive values of feed materials

Home Description Authors About

**Maize**

Grain of maize (*Zea mays* L.). Maize is the major feed cereal world wide. It is used as a source of energy in livestock diets.

**Synonyms**

Com (American English)

Main constituents Amino acids Pigs Poultry **Ruminants** Other species

**Ruminants**

Systali: 3 feeding levels/% concentrate

Parameter	INRA 2007	Low	Medium	High
Organic matter digestibility (%)	88.5	87.1	89.9	95.3
Energy digestibility (%)	86.1	84.7	87.5	93.0
DE (kcal/kg as fed)	3320	3260	3370	3590
DE (MJ/kg as fed)	13.9	13.7	14.1	15.0
ME (kcal/kg as fed)	2799	2750	2900	3190
ME (MJ/kg as fed)	11.7	11.5	12.2	13.3
Nitrogen effective degradability (%)	43	53	47	39
Starch effective degradability (%)	60	67	61	53
NE milk (kcal/kg as fed)	1910	1840	1970	2230
NE milk (MJ/kg as fed)	8.0	7.7	8.2	9.3
NE for meat (kcal/kg as fed)	1802	1870	2030	2350
NE for meat (MJ/kg as fed)	7.5	7.8	8.5	9.8
UFL (per kg as fed)	1.05	1.04	1.12	1.26
UFV (per kg as fed)	1.06	1.06	1.16	1.33
PDIA (g/kg as fed)	47	35	39	45
PDIN (g/kg as fed)	64	62	63	65
PDIE (g/kg as fed)	84	81	86	91

**Feed categories**

- Cereal grains
- Cereal by-products
- Legume grains and oilseeds
- Oil by-products
- Roots, tubers and by-products
- Fruits by-products
- Other plant products
- Animal by-products
- Dairy products and by-products
- Oils and fats
- Mineral products
- Amino acids and other products

**User login**

Username \*  
admin

Password \*  
.....

► Create new account  
► Request new password

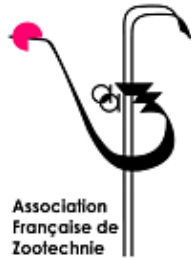
Log in



# Roadmap

- ▶ Functional website by the end of 2015/early 2016
- ▶ Edited by Sauvant, Tran, Perez, and Bastianelli
  - Tables for the main feed materials (about 150)
  - Will include Systali values
- ▶ Progressive rollout in 2016-2017
  - Other feeds
  - Values for other feed units systems
  - Interactive and dynamic features
  - Subscription area
  - E-book and print versions

# Thank you for your attention!



Association  
Française de  
Zootechnie



**AJINOMOTO.**

**AJINOMOTO ANIMAL NUTRITION GROUP**  
**AJINOMOTO EUROLYSINE S.A.S.**

