GRDC Grains Research & Development Corporation	Project number (as allocated by the GRDC)	DAS294
	GRDC Subprogram Number	1.4.1

Final Report

Contact Details

Project Title	:	Inclusion of data for additional livestock species in the Australasian Livestock Feed Ingredient Database (ALFID)
Organisation	:	South Australian Research and Development Institute (A division of Primary Industries and Resources South Australia)
ACN No. or legal name	:	
Australian Business Number	:	53763159658
Organisation's Mailing Address	:	SARDI Pig and Poultry Production Institute GPO Box 397, Adelaide, South Australia, 5001
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Commencement date	:	July 1, 1999
Completion date	:	September 30, 2001 No. of Years: 2

1.   Budget Summary

Financial year (insert relevant years)	1999-00	2000-01					Total $ GRDC
Total GRDC $ agreed *(excluding GST)*	89,750	89,750					179,500
Summarise the equity calculations for the share of total project intellectual property (IP), licensing and / or royalty income. This should be consistent with the Full Proposal.							GRDC's share =50%

2. Summary of Project Achievements

Provide a plain English description of the background and importance of the issue this project was designed to address, the major achievements of the project, and how these achievements have / will benefit the Australian grains industry (limit to two A4 sides)

Project Title:
Inclusion of data for additional livestock species in the Australasian Livestock Feed Ingredient Database (ALFID).

Project aims:
1. To expand the recently developed Australasian Livestock Feed Ingredient Database (ALFID) to include data on the nutritional quality of feed grains for other livestock species (broilers, layers and aquaculture species) and enhance existing data for pigs.

2. To enhance the existing capability of the ALFI database to predict the nutritional quality of feed grains.
3. To increase the distribution of the ALFI database, improve the overall utilisation of feed grains and facilitate the delivery of research outcomes to end-users.

Background:

Feed grains for use in livestock diets represent the greatest single production cost, especially for intensively housed livestock. Based on current estimates, the supply of domestic feed grains will be insufficient to meet these grain demands by the livestock sectors. Unless domestic feed grain supplies can be improved through an increase in availability and/or an improvement in the efficiency of use, livestock producers face the prospect of importing grains to meet their needs.

To improve the nutrient utilisation efficiency of livestock, the animal producers, stockfeed manufacturers and grains producers need a large amount of information on the chemical composition and nutritional quality of feed grains. To meet these requirements, development of an interactive, computer-based database on chemical composition and nutritional quality of feed ingredients is essential .

There are a number of databases available in Australia and overseas on the nutritional quality of feed ingredients. However, these databases are not interactive, are hard to access, lack consistency in the information supplied and the format of supply. There is a large variation in the data within existing databases due to lack of information on source and range of the raw ingredients, methods used for obtaining the data, and the storage and processing methods of the ingredients.

To overcome the disadvantages of the existing databases and to deliver information on the nutritional quality of feed ingredients to the grains and livestock industries, the Pig Research and Development Corporation and the Grains Research and Development Corporation funded the development of an interactive, computer-based database on nutritional quality of grains for livestock, the *Australasian Livestock Feed Ingredient (ALFI) Database*. This database supplies detailed information on growing environment of the ingredients, how the ingredients are stored and processed, physical features of the ingredients and the methodology employed for chemical analysis and nutritional evaluation, chemical composition (proximate, amino acid profile, starch, non-starch polysaccharides, fatty acids, soluble and insoluble sugars, vitamins, minerals, anti-nutritional factors and toxins) and nutritive value (nutrient digestibility and availability) of feed ingredients. The ALFI database offers the facilities for users to compare species or varieties within a location or between locations, to search data for a particular region, to retrieve data collected from a particular laboratory or contributed by a particular researcher, and to communicate with researchers. All these features ensure that users will get information relevant to their livestock feeding situation, which will result in an improvement in feeding efficiency and reduced livestock feed costs.

Project achievements:

As a result of completing this project, the Australasian Livestock Feed Ingredient (ALFI) database now includes a large amount of information on the chemical composition and nutritional quality of feed grains for pigs, poultry (broilers, layers) and aquaculture species, and can be used by researchers, members of the grains industries, feed manufacturers and plant breeders as a reference for diet formulation, variety comparison and quality control in trading.

Data for pigs, poultry and aquaculture species has been entered into ALFID which now contains more than 22807 sample entries. The ALFI database also incorporates all information contained with the GRDC GRAILE database. The initial beta version has also been reprogrammed so that it is now more user friendly, and run-time versions have been prepared for distribution via CD-ROM. A web-site (www.alfidbase.com) has also been established and a domain name registered to facilitate e-mail submissions for ALFI information, and to promote the benefits of the database. Promotional brochures and presentation formats for the software has been suggested.

A preliminary business plan was prepared outlining some potential paths for the commercialisation of the ALFI database, however, subsequent meetings with stakeholders indicates that the commercialisation process falls outside the scope of this project and will be developed further via GRDC in consultation with the other stakeholders.

Project outputs:

1. A run-time version of the ALFI database in Microsoft Access containing more than 22,000 entries on the chemical composition and nutritional quality of feed ingredients for pigs, poultry and aquaculture species.
2. A detailed user guide for the database available as hard copy and as a PDF file in Adobe Acrobat format.
3. Confidential documentation of the ALFI database structure.
4. Graphic designs for promotional material and presentation formats for the database.
5. A registered domain name (www.alfidbase.com).

6. A web-site outlining details of the ALFI database and opportunities for purchase or e-mail subscriptions for information.
7. A physical library of more than 1,700 research papers used to source the information within the ALFI database currently stored at the SARDI-Pig and Poultry Production Institute.

Industry benefits:
As a result of completing the project, the following benefits are expected:

1. Improved efficiency of use of feed grains by the livestock sectors based on an improved knowledge of nutritional value.
2. A longer term research and development program aimed at addressing gaps in our knowledge of the nutritional value of grains.
3. Definitive commodity information for international grain markets.
4. Close links between a range of funding organizations and researchers with a common goal that will form the basis for an integrated feed evaluation network.

Other benefits:
Opportunities now exist for interfaces to be developed that will allow selected information from ALFID to be uploaded in to proprietary databases and computer simulation programs such as AUSPIG.

3. Attachments
The following outcomes arising from the ALFI database have been attached to this report:
1. A Run-time version of the ALFI database on CD-ROM.
2. A detailed user manual on CD-ROM as a PDF file and a copy of Adobe Acrobat Reader.
3. A hard copy of the user manual.
4. A hard copy of the database code (Confidential – For restricted distribution).
5. Ingredient and pig, poultry and aquaculture species record audits of the ALFI database (which is a useful tool when searching unknown information. This audit should be lodged on the web-site and as a component of the user manual).
6. Suggested promotional and presentation formats for the ALFI database.
7. A draft business plan for the ALFI database, however, it is accepted that this will now need substantial review following further discussions with the stakeholders.

4. Conclusions, recommendations & other R&D opportunities

Major conclusions
1. The ALFI database contains a large amount of data relating to the chemical composition and nutritional quality of feed ingredients for pigs, poultry (broilers and layers) and aquaculture species. To date, the ALFI database contains more than 22,807 sample entries from more than 390 resources including journal papers, databases, personal communications, reports and books. 2565 samples have related nutritional quality data for pigs, poultry (broilers and layers) and aquaculture species. Over 1700 papers were copied during the development of the ALFI database dating from the early 1970's to present day. More than 500 chemical methods and 300 experimental methods are cited in the ALFI database, as well as detailed information on more than 900 researchers.

Recommendations
1. The ALFI database be commercialised within Australia and that commercialisation proceed as a separate project beyond the scope of the current project.
2. The ALFI database be distributed as a CD-ROM and promoted via direct mail postcards and a web-site.
3. That ALFI be available to end users via an e-mail subscription service managed by the South Australian Research and Development Institute.
4. That a mechanism be developed to update, upgrade and maintain the ALFI database.

Other R&D opportunities that emerged during the course of the project
The ALFI database highlights areas where insufficient information exists in relation to the nutritional quality of ingredients for livestock. There is also an opportunity to expand the scope of ALFID to include information on the nutritional quality of ingredients for other livestock species such as sheep, beef and dairy cattle and horses.

5.   Milestones

Milestone no.	Description & criteria	Planned Achievement Date
1	Update β-version ALFI database to Microsoft Access 2000. Criterion: Programming complete and database running using Access 2000	March 2000 (December, 1999)

Because of the advanced features and the compatibility with the Internet, Access 2000 was selected for the ALFI database. Before updating to Access 2000, the following modifications were made to it:

- Updated the ALFI database menu to accommodate the changes in the search function of the ALFI database.
- Created a new front page with new images.
- Created a new system data entry form, new sample entry form and new functions for view and edit data for individual samples.
- Created a function to distinguish the data entered by the ALFI database manager and the end users. This function will protect the original data distributed to ensure the data quality, and allow end users keep and analyse their own data.
- Online help was built into the ALFI database. This function gives users clear instructions on what is required for each selection form. If users do not meet the minimum requirements, an error message appears on the screen.

Milestone no.	Description & criteria	Planned Achievement Date
2	Collate and enter data relevant to selected livestock species. Criterion: A preliminary database (not including regression or prediction equations) are available for examination by GRDC.	August 2000 (April 2000)

- Literature was searched from CAB for the period 1972-1999.
- The Current Contents was searched for the period 1993-2001.
- One thousand, seven hundred and ninety seven papers were copied and 2624 samples from some of these papers were filtered and entered into the ALFI database.
- The current version of the ALFI database contains more than 22,807 sample entries. Of these entries (which include all data from the GRDC GRAILE database), 2,565 entries relate specifically to the nutritional quality of grains for pigs (1166), poultry (955) and aquaculture species (444).
- Final ALFI database runtime (CD-ROM) versions prepared for distribution to participating Research and Development Corporations detail the new presentation format.

Milestone no.	Description & criteria	Planned Achievement Date
3	Regression and prediction equations finalised. Criterion: The ALFI database will include regression and prediction equations for selected livestock species.	November 2000 (July 2000)

To date, insufficient information exists within the ALFI database for the development of useful regressions equations and this function has not been activated in the current run-time version. Research is currently underway within the Premium Grains for Livestock Program 2: Project 3 – Rapid and Objective Analytical Tests to define those parameters most likely to reflect the nutritional quality of ingredients for pigs, poultry and ruminants. When this research is complete, it is likely that regression information will be incorporated into the ALFI database.

Milestone no.	Description & criteria	Planned Achievement Date
		February 2001
4	Programming for output to the Internet and feed formulation packages finalised. Criterion: A test version on the Internet and output to selected feed formulation packages relevant to the funding industries complete	(October, 2000)

Internet hosting:

Options were identified for the internet hosting of the ALFI database, and an NT server was deemed most appropriate. However, after much closer scrutiny and discussions with others, it became apparent that even with sophisticated security equipment, once the database was available on the internet, the information within it could not be protected and the opportunity for commercial returns would be significantly diminished. For this reason, following consultation with the stakeholders, it was decided that access to ALFI via the internet would only be possible using an e-mail subscription service with a maximum 24 hour turnaround. This was endorsed by Dr John Black who reviewed the internet options for ALFI as follows:

From the development perspective of view, the ALFID product can be regarded to be 3-tier application. The outer tier is the interface forms, which are presented to the customers; the middle tier is the data exchange between the interface and the program inside; and the inner tier is the actual processing to and from the ALFID database (such as tables etc.)

If moving from the current local version of ALFID to the internet, the outer and middle tiers will be completely re-developed, and only leaves the inner tier slightly unchanged. In addition, there is a timeout and speed issue involved in all the internet applications. For instance, for a 28.8K modem, a 2KB page download each time can reach its perfect speed; once the page is over 2KB, the speed will be reduced down outstandingly, thus give the customer an impression that something wrong with the network or the server. Furthermore, the download may be interrupted due to timeout. In ALFID, the searching result could easily reach the 2KB, especially when the page contains the graphics.

It is definitely ideal to realise the same functionality in Internet version as those in the current local version. However, for reasons including the database security and workload, incorporating whole ALFI database on Internet is not an ideal option.

Full details of the proposed website for ALFI can be found at www.alfidbase.com. A full demonstration version of the database, together with a "frequently asked questions" page and an information submission page is presented at this domain. The information submission form contains the same drop down boxes as the local version of the ALFID. Users will complete this form, and will then e-mail their search request to alfid@saugov.sa.gov.au. The information will be entered into the database by an ALFI representative, a search completed and the information will be returned via a dumped Acrobat Reader PDF file within one working day. Information submissions will be accompanied by contact and payment details for the requestee. This approach will allow total security of the database, and will allow ALFI to monitor use and payments for information. It should be noted that a secure mechanism for paying for e-mail subscriptions needs to be devised. It is suggested that a service similar to that offered by the National Australia Bank for secure net banking be utilised. Full details can be found at www.national.com.au/Business_Solutions.

Interfaces with other software:
While an interface between AUSPIG and the ALFI database is still highly desirable, it is now clear that the level of programming required to achieve this is beyond the scope of this project. It would also require a significant knowledge of the AUSPIG code, which is not readily accessible. Following discussions with Mr Laurie Bradley (AUSPIG Manager, DSL Systems Centre) and Dr John Black (Feed Grains Program Coordinator), it was agreed that the interface between AUSPIG and ALFID could only be developed after the conversion of AUSPIG to a Windows format is complete. It is also likely that this interface would have to be developed by AUSPIG staff rather than the ALFI staff.

In the interim, a data dumping function in the form of ASCII files has been developed and included in the current run-time version of ALFID.

Milestone no.	Description & criteria	Planned Achievement Date
		September, 2001
5	Commercialisation process complete. Publication of manuals, hard copy of ALFI, promotional material and disk copy of ALFI finalised. Criterion: Final Report. ALFI database	(June, 2001)

	commercially available, integration into marketing and quality assurance systems.	

Manuals have been published, promotional material has been prepared and run-time versions of the database are available on CD-ROM. The database is in a saleable form following ratification from the stakeholders. At a meeting between Dr Mike Taverner (GRDC), Dr John Thorne (GRDC), Dr Robert van Barneveld (FRDC, SARDI), Dr Ian Johnsson (APL), Dr Yingjun Ru (SARDI) and Dr Miao Zhihong (SARDI), it was decided that this process would occur outside the current project.

6. Achieved outputs
6.1 Output 1

Description: An enhanced version of the Australasian Livestock Feed Ingredient (ALFI) database including data for pigs, poultry (layers and broilers) and aquaculture species available on the internet or CD-ROM.	Delivery date 30, September,2001	Output code K4, P5
Indicate the intended users of the output T 1, 6, 7, 9, 10		

Indicate how the output has, and will continue to be, promoted and adopted leading to the expected outcome (benefits)

An enhanced version of the Australasian Livestock Feed Ingredient (ALFI) database has been developed. This is an interactive and computer-based database that includes information on chemical composition and nutritional value of feed ingredients for pigs, poultry and aquaculture species.

The ALFI Database itself is a tool for the extension of research results. In particular, it will provide GRDC with a mechanism for the delivery of results from the Premium Grains to Livestock Program, among others.

As the ALFI Database will be sold as a commercial product, every attempt will be made to ensure as many end-users as possible are aware of its existence through an active marketing program.

It must be remembered that the ALFI database has the potential to become a national standard for the description of stockfeeds. For this reason, information contained within the database will be widely disseminated.

A beta version of the ALFI database was assessed by potential end-users in Australia and overseas. Feedback from this assessment process ensured the database meets the needs of end-users and enhanced its chances of widespread adoption.

A potential commercialisation strategy was prepared as part of an initiative fostered by RIRDC. This business plan provides detailed information on potential ways to commercialise the completed database. A full copy of the proposal is attached to this report, however, it is recognised that the approaches within this plan may no longer be relevant.

Indicate whether the output contains any third party owned technology and any implications this might have for the commercialisation of the output

The equity share of the ALFI database (for pigs) is GRDC 44%, the Pig Research and Development Corporation 44% and the South Australian Research and Development Institute 12%.

Additional funds have been invested from the Fisheries Research and Development Corporation ($37,500), Pig Research and Development Corporation ($30,000) and the Rural Industries Research and Development Corporation ($42,000). In addition, further contributions have been provided by SARDI. The above contributions will be used to distribute equity in the database accounting for the initial investment from SARDI, GRDC and PRDC.

If the output was not achieved during the course of the project, indicate the reasons why
The output was achieved.

6.2   Output 2

Output 2	A longer term research and development strategy aimed at addressing gaps in our knowledge of the nutritional quality of grains for livestock	*Delivery Date* September, 2001	Output Code P5

Indicate the intended users of the output
T 1, 6, 7, 9, 10

Indicate how the output has, and will continue to be, promoted and adopted leading to the expected outcome (benefits)
The ALFI database will be utilised as a sink for information arising from the Premium Grains for Livestock Program. When the second phase of this program is complete, ALFID will assist with the formulation of a longer term research strategy. Further to this, the subsequent commercialisation of ALFI will allow end-users to provide feedback about the gaps in our knowledge that are preventing efficient utilisation of feed ingredients.

Indicate whether the output contains any third party owned technology and any implications this might have for the commercialisation of the output
Nil.

Detail the commercialisation strategy for the output during and post the project if relevant, including the involvement of all commercial parties and their inputs (financial or otherwise)
N/A

If the output was not achieved during the course of the project, indicate the reasons why
The output was achieved.

6.3   Management of Intellectual Property (IP)

Provide a summary of any IP strategies undertaken or planned to facilitate the protection and / or commercialisation of the project's realised outputs
Intellectual property currently vests with SARDI, the Grains Research and Development Corporation, the Pig Research and Development Corporation (now Australian Pork Ltd), the Fisheries Research and Development Corporation and the Rural Industries Research and Development Corporation based on proportional investments detailed in the project schedule. While intellectual property distributions should not be considered for contributors of data to the database, some arrangements may have to be made in relation to royalties from licenses for use of this information. This detail must be covered in any subsequent commercialisation plan. Based on their contributions to the development of the ALFI database, the following distribution of intellectual property is likely to exist: SARDI   16% Grains Research and Development Corporation   33% Pig Research and Development Corporation   30% Fish Research and Development Corporation   10% Rural Industry Research and Development Corporation 11%

Provide a list of all scientific or technical papers published, and any patents filed

1. R. J. van Barneveld, Z. H. Miao and Y. J. Ru (2000). Development of the Australasian Livetsock Feed Ingredient (ALFI) Database. Proceedings of South Australian Pig and Poultry Fair.
2. Y. J. Ru, H. J. Bray and R. J. van Barneveld (1999). Development of the Australasian Livestock Feed Ingredient (ALFI) Database. Proceedings of South Australian Pig and Poultry Fair.
3. Van Barneveld, R..J., Ru, Y.J and Zhihong, M. (2001). Australasian Livestock Feed Ingredient Database. Grains Research and Development Corporation: Canberra.
4. Van Barneveld, R..J., Ru, Y.J and Zhihong, M. (2001). Australasian Livestock Feed Ingredient Database Users Manual. Grains Research and Development Corporation: Canberra.

7. Expected Outcome (benefits)
7.1 Description

a) Specify any outcome (benefits) achieved during the project

During the course of the project, a useful network of scientists and end-users was established during the beta-testing of the database. The database itself was also a useful outcome.

b) Specify the expected outcome (benefits) post project

On a quantitative basis, it is realistic to suggest that the database has the capacity to reduce the level of variation in estimates of nutritive value for all grains by more than 5%. Using the digestible energy value of lupins as an example, a 15% variation in digestible energy value can be worth up to $30/tonne for this ingredient when it is included in pig diets. For lower value ingredients and for other livestock species, the impact of variation in nutritive value may be less significant (or vice versa), but when all grains are considered together, we are assessing a potential 5% reduction in uncertainty associated with the use of more than 10 million tonnes of grain.

Benefits from this research will apply to marketing and distribution systems and processing systems. Within marketing and distribution it is hoped that dedicated growers of feed grain will be able to define their commodity as a tangible resource. Feed grain buyers will also have a basis for trade. Within processing systems, stockfeed manufacturers and livestock producers represent the primary beneficiaries.

7.2   R&D Type

Type	R&D activity (expressed as a %)	%
Estimate the R&D type expressed as a % of the total effort		
Pure Basic	Experimental or theoretical work undertaken primarily to acquire new knowledge without a specific application in view. Carried out without looking for long term economic or social benefits	
Strategic Basic	Research directed into specific broad areas in expectation of useful discoveries. Research providing the broad base knowledge necessary for the eventual solution of recognised practical problems	
Applied	Original work undertaken to acquire new knowledge with a specific application in view, to determine new methods or ways of achieving some specific and pre-determined objectives	
Experimental Development	Systematic work using existing knowledge gained from research and / or practical experience for the purpose of creating new or improved materials, products, processes or services	75
Demonstration & Extension	Presenting the technology in way that allows a clear assessment of its technical and economic viability on a commercial scale. Extension is the broader communication of new knowledge or technologies	20
Commercialisation	Commercialisation can be considered to be complementary to demonstration and relates to the investment in developing a new product or technology to the point where it is ready for release to the market	5
Training & Development	Relates to the development and maintenance of the human resources relevant to the GRDC's target industries	
Total		100%

7.3   Flow of benefits

Specify the two 'Flow of Benefit' categories most applicable to this project (refer to the table in the guidelines)
1. **Impact on grain supply**: Reduction in the variability of output.
2. **Community benefits flowing outside the grains industry**: A tool to deliver research outcomes to all livestock sectors resulting in improved feed utilisation efficiency.

Complete 7.3.1 and 7.3.2 below to quantify the flow of benefits both to date (within project) and forecasted (post project):

7.3.1   Realised flow of benefits

a) Estimate the per unit economic impact of the project to date (eg. $/ha)	$5-30/T
Justification Simulations models such as AUSPIG can be used to accurately predict the net benefit arising from improved characterisation of feed ingredients prior to inclusion in diets for pigs. The benefits will be specific to each enterprise and will depend on the primary grains being used. In general, variation of 2 MJ/kg in the digestible energy content of a grain can be worth as much as $30/tonne to a pig producer.	

b) Estimate the scale of the system to which the impact has applied to date (eg. ha, tonnes)	200,000 T
Justification To date, outputs arising from this research have had minimal commercial application. They may have influenced a proportion of the pig and poultry sectors based on application by consultant nutritionists, but this would be limited to only several hundred thousand tonnes of grain	

c) Estimate the level of adoption to date (%)*	5%
Justification Adoption rate will be influenced by the promotional and commercialisation strategy. As ALFID has only just been completed, the extent of use has been limited.	

Estimate the annual benefit to date (= a x b x c*)	$50-300,000

*remember to convert the % figure to a decimal when calculating

7.3.2   Forecasted flow of benefits

a. Estimate the maximum per unit economic impact of the project (eg. $/ha)	$30/T
Justification Simulations models such as AUSPIG can be used to accurately predict the net benefit arising from improved characterisation of feed ingredients prior to inclusion in diets for pigs. The benefits will be specific to each enterprise and will depend on the primary grains being used. In general, variation of 2 MJ/kg in the digestible energy content of a grain can be worth as much as $30/tonne to a pig producer.	

b. Estimate the maximum scale of the system to which the impact will apply (eg. ha, tonnes)	10,000,000 T
Justification	

This research will ultimately apply to the entire Australian pig, poultry, ruminant and aquaculture sectors which currently consume in excess of 10 million tonnes of grain per annum with an anticipated increase in consumption of 3% per annum.

c. Estimate the maximum level of adoption (%) *	70%

Justification
Adoption rate will be influenced entirely by the commercialisation and promotional strategies adopted by the stakeholders.

Estimate the maximum expected annual benefit (= a x b x c*)	$210,000,000
Estimate the year of initial adoption	**2002**
Estimate the year of maximum adoption	**2004**

remember to convert the % figure to a decimal when calculating

8.   Risk assessment

After considering the relevant table in the guidelines, comment on the risk that the flow of benefits to the Australian grains industry will not be realised or reach their maximum because of difficulties associated with adoption or commercialisation of the project outputs

There are very few identifiable risks associated with the commercialisation of the ALFI database. It is a tangible commodity limited only by our ability to maintain and upgrade it, which in itself will be an integral part of the commercialisation strategy.

9.   Certification

Project Supervisor's signature   _____

Name (in capitals)   Dr R J van Barneveld
Date: 25 February, 2002

Research Organisation Signature   _____

Name and Title of authorised signatory (in capitals)   _____
Date: 25 February, 2002

10.   Government Time Box Initiative

If your organisation employs less than 20 people provide an estimate of the time taken to complete this form. Include the time spent by all employees reading the instructions, working on the question and obtaining relevant information.	Hours Minutes

Attachment 1. Audit of ingredients and chemical composition data in the Australasian Livestock Feed Ingredient Database (ALFID).

Category	Ingredient	Chemical composition	No.of sample
Additives			
	Cerelose (glucose monohyrate)	Proximate	1
	Yeast brewers'	Amino acid	7
		Fatty acid	1
		Mineral	3
		Proximate	17
		Vitamins	2
	Yeast torula	Amino acid	1
		Fatty acid	1
		Mineral	1
		Proximate	1
		Vitamins	1
Animal protein			
	Blood & Mucosa product	Amino acid	1
		Mineral	1
		Proximate	1
	Blood meal	Amino acid	23
		Fatty acid	2
		Mineral	12
		Proximate	40
		Vitamins	5
	Blood meal(avian)	Amino acid	1
		Proximate	1
	Blood meal(bovine)	Amino acid	2
		Mineral	2
		Proximate	2
	Blood meal(porcine)	Amino acid	2
		Mineral	1
		Proximate	2
	Bone flour	Mineral	1
		Vitamins	1
	Bone meal	Mineral	2
		Proximate	3
	Bovine plasma meal	Amino acid	1
		Proximate	1

Category	Ingredient	Chemical composition	No.of sample
Animal protein			
	Buttermilk	Amino acid	2
		Mineral	3
		Proximate	6
		Vitamins	1
		Carbohydrates	1
	Buttermilk powder	Amino acid	1
	Carcass meal	Proximate	2
	Casein	Amino acid	8
		Fatty acid	1
		Mineral	2
		Proximate	9
		Vitamins	2
		Carbohydrates.	1
	Cheese	Proximate	1
	Crab meal	Amino acid	1
		Fatty acid	1
		Mineral	1
		Proximate	1
		Vitamins	1
	Delactosed whey	Amino acid	1
		Proximate	1
	Egg meal (no shell)	Amino acid	4
		Proximate	4
	Feather & blood meal	Amino acid	1
		Proximate	1
	Feather & offal meal	Amino acid	5
	Feather meal	Amino acid	32
		Fatty acid	1
		Mineral	9
		Proximate	37
		Vitamins	3
	Feather meal(broiler)	Amino acid	7
		Proximate	7
	Feather meal(chick&turkey,hog hair)	Proximate	3

Category	Ingredient	Chemical composition	No.of sample
Animal protein			
	Feather meal(chick, turkey&duck)	Proximate	1
	Fish meal	Amino acid	35
		Fatty acid	1
		Mineral	15
		Proximate	57
		Vitamins	6
	Fish meal (anchovy)	Amino acid	2
		Fatty acid	1
		Mineral	2
		Proximate	3
		Vitamins	3
	Fish meal (capelin)	Amino acid	5
		Mineral	3
		Proximate	7
	Fish meal (Danish)	Proximate	1
	Fish meal (Tuna)	Proximate	1
	Fish meal (white)	Amino acid	2
		Fatty acid	1
		Mineral	1
		Proximate	3
		Vitamins	1
	Fish meal(British columbis herring)	Proximate	1
	Fish meal(C. auratus)	Amino acid	1
		Proximate	1
	Fish meal(Chilean)	Amino acid	4
		Proximate	4
		Carbohydrates	1
	Fish meal(Groundfish)	Amino acid	1
		Anti-nutritional factor	1
		Mineral	1
		Proximate	1
	Fish meal(herring)	Amino acid	20
		Anti-nutritional factor	9
		Fatty acids	1
		Mineral	17

Category	Ingredient	Chemical composition	No.of sample
Animal protein			
		Proximate	25
		Vitamin	1
	Fish meal(lantern)	Amino acid	1
		Mineral	1
		Proximate	1
	Fish meal(mackerel)	Amino acid	2
		Anti-nutritional factor	2
		Mineral	2
		Proximate	2
	Fish meal(Menhaden)	Amino acid	7
		Anti-nutritional factor	1
		Fatty acid	1
		Mineral	8
		Proximate	10
		Vitamin	1
	Fish meal(norse-LT94)	Amino acid	3
		Anti-nutritional factor	1
		Mineral	2
		Proximate	3
	Fish meal(Norwegian herring)	Proximate	1
	Fish meal(Peruvian)	Amino acid	1
		Proximate	1
	Fish meal(salmon scraps&offal)	Amino acid	1
		Anti-nutritional factor	1
		Mineral	1
		Proximate	1
	Fish meal(silver hake)	Amino acid	1
		Anti-nutritional factor	1
		Mineral	1
		Proximate	1
	Fish meal(sprat&blue whiting)	Amino acid	1
		Proximate	1
	Fish meal(Triabunna Tas.)	Amino acid	1
		Proximate	1
	Fish solubles	Amino acid	2
		Fatty acid	1

Category	Ingredient	Chemical composition	No.of sample
Animal protein			
	Fish solubles	Mineral	2
		Proximate	2
		Vitamins	2
	Fresh milk	Proximate	1
	Hog hair meal	Amino acid	2
		Proximate	2
	Lipromel	Proximate	1
	Liver meal	Amino acid	1
		Mineral	2
		Proximate	4
		Vitamin	1
	Meat & bone meal	Amino acid	49
		Fatty acid	1
		Mineral	39
		Proximate	72
		Vitamins	6
	Meat & bone meal(beef)	Amino acid	9
		Proximate	9
	Meat & bone meal(lamb)	Amino acid	1
		Proximate	1
	Meat meal	Amino acid	28
		Fatty acid	10
		Mineral	21
		Proximate	47
		Vitamins	7
		Carbohydrates	1
	Meat or Meat&boneMeal	Amino acid	9
		Mineral	9
		Proximate	9
	Meat&bone meal(All pork)	Amino acid	10
		Proximate	10
	Meat&bone meal(beef&pork)	Proximate	1
	Meat&bone meal(cattle&sheep)	Amino acid	3
		Proximate	3

Category	Ingredient	Chemical composition	No.of sample
Animal protein			
	Meat&bone meal(cattle,sheep&lamb offal)	Amino acid	2
		Proximate	2
	Meat&bone meal(High bone&low CP)	Amino acid	4
		Proximate	4
	Meat&bone meal(mixed anim.by-prod.)	Proximate	2
	Meat&bone meal(Mixed species)	Amino acid	14
		Proximate	17
	Meat&bone meal(sheep&lamb offals-bones)	Amino acid	2
		Proximate	2
	Milk powder	Amino acid	1
		Mineral	1
		Proximate	2
	Milk skim	Amino acid	4
		Fatty acid	1
		Mineral	2
		Proximate	6
		Vitamins	6
	Pancreas meal	Amino acid	1
		Proximate	1
	Plasma protein	Amino acid	1
		Proximate	1
	Porcine plasma meal	Amino acid	1
		Proximate	1
	Poul.& feather meal	Amino acid	3
		Mineral	2
		Proximate	4
		Vitamins	2
	Poul.by-prod.meal&feather meal	Amino acid	1
		Proximate	1
	Poultry by-prod.meal	Amino acid	9
		Fatty acid	1

Category	Ingredient	Chemical composition	No.of sample
Animal protein			
	Poultry by-prod.meal	Mineral	7
		Proximate	14
		Vitamins	1
	Poultry litter	Proximate	4
	Poultry meal	Amino acid	3
		Mineral	3
		Proximate	6
	Poultry meat meal	Amino acid	1
		Proximate	2
	Poultry offal meal	Amino acid	2
		Fatty acid	1
		Mineral	1
		Proximate	6
		Vitamins	2
	Shrimp meal	Amino acid	1
		Proximate	1
	Silkworm pupae	Proximate	2
	Single cell protein	Amino acid	1
		Proximate	1
	Skim milk powder	Amino acid	5
		Anti-nutritional factor	1
		Mineral	3
		Proximate	11
		Vitamins	1
	Snail meal	Amino acid	1
		Mineral	1
		Proximate	1
	Spirulina meal	Amino acid	1
		Proximate	1
	Water-soluble fraction of feather meal	Amino acid	1
		Proximate	1
	Whey	Amino acid	2
		Fatty acid	1
		Mineral	1
		Proximate	2

Category	Ingredient	Chemical composition	No.of sample
Animal protein			
	Whey	Vitamins	1
	Whey (low lactose)	Amino acid	1
		Fatty acid	1
		Mineral	1
		Proximate	1
		Vitamins	1
	Whey powder	Amino acid	2
		Mineral	1
		Proximate	5
		Vitamins	1
	Yeast (n-Paraffin-grown)	Proximate	1
Co-products			
	African oil bean meal	Amino acid	1
		Mineral	1
		Proximate	1
	Ambadi meal	Mineral	2
		Proximate	2
		Carbohydrates	1
	B. campestris meal	Amino acid	4
		Anti-nutritional factor	4
		Mineral	1
		Proximate	6
	B. napus meal	Amino acid	1
		Anti-nutritional factor	1
		Mineral	1
		Proximate	2
		Residue-toxin	1
	Babacu nut meal	Amino acid	1
		Mineral	1
		Proximate	1
	Bakery waste	Amino acid	1
		Fatty acid	1
		Mineral	1
		Proximate	1
		Vitamins	1
	Barley distillers solids	Amino acid	3
		Mineral	2
		Proximate	3

Category	Ingredient	Chemical composition	No.of sample
Co-products			
	Barley dust	Proximate	1
	Barley protein concentrate	Amino acid	1
	Barley rootlets	Amino acid	1
		Mineral	1
		Proximate	1
		Carbohydrates	1
	Bean meal	Proximate	1
	Bean offal	Mineral	1
		Proximate	1
	Beet molas.stillage	Amino acid	1
		Mineral	1
		Proximate	1
	Beet pulp	Amino acid	1
		Mineral	1
		Proximate	1
		Vitamin	1
	Bengal gram dust	Proximate	1
	Beverage grain&soluble	Amino acid	7
		Proximate	7
	Bone char (sugar)	Proximate	1
	Brewer's grains	Amino acid	4
		Fatty acid	2
		Mineral	3
		Proximate	10
		Vitamin	2
	Brewers' rice	Amino acid	1
		Fatty acid	1
		Mineral	1
		Proximate	1
		Vitamin	1
	Brewer's spent grain	Proximate	1
	Canola meal	Amino acid	43
		Fatty acid	9
		Mineral	7
		Proximate	48

Category	Ingredient	Chemical composition	No.of sample
Co-products			
	Canola meal (high hull&fibre content)	Amino acid	1
		Proximate	1
	Cashew nut meal	Amino acid	1
		Mineral	1
		Proximate	1
	Cassava meal	Amino acid	6
		Mineral	1
		Proximate	6
		Carbohydrate	5
	Cassava peel	Mineral	1
		Proximate	1
	Cassava root meal	Mineral	10
		Proximate	10
	Citrus pulp	Mineral	1
		Proximate	5
	Clay	Mineral	3
		Proximate	3
	Cocoa bean shell	Mineral	1
		Proximate	1
	Cocoa husk	Mineral	1
		Proximate	1
	Cocoa pod husk	Amino acid	1
		Mineral	1
		Proximate	1
	Coconut cake	Amino acid	3
		Proximate	3
		Carbohydrate	3
	Coconut expeller	Proximate	1
	Coconut meal	Amino acid	6
		Fatty acid	2
		Mineral	4
		Proximate	9
		Vitamins	2
		Carbohydrate	1

Category	Ingredient	Chemical composition	No.of sample
Co-products			
	Coconut meal(copra)	Amino acid	1
		Fatty acid	1
		Mineral	1
		Proximate	1
		Vitamins	1
	Cocoyam peel	Mineral	1
		Proximate	1
	Coffee hulls	Proximate	1
	Coffee pulp	Anti-nutritional factor	1
		Proximate	1
		Carbohydrate	1
	Conophor seed meal	Amino acid	1
		Mineral	1
		Proximate	1
	Copra cake	Amino acid	1
		Proximate	1
	Copra meal	Amino acid	1
		Anti-nutritional factor	1
		Proximate	1
		Carbohydrate	1
	Cotton gin byproduct	Proximate	1
	Cottonseed hulls	Amino acid	1
		Anti-nutritional factor	1
		Proximate	2
	Cottonseed kernel meal	Amino acid	1
		Mineral	1
		Proximate	2
	Cottonseed meal	Amino acid	35
		Anti-nutritional factor	17
		Fatty acid	4
		Mineral	9
		Proximate	50
		Vitamins	4
		Carbohydrate	1
	Cottonseed meal (glandless)	Amino acid	1
		Anti-nutritional factor	1
		Mineral	1

Category	Ingredient	Chemical composition	No.of sample
Co-products			
	Cottonseed meal (glandless)	Proximate	1
	Cowpea meal	Amino acid	4
		Mineral	4
		Proximate	4
		Carbohydrate	4
	Crambe seed meal	Amino acid	1
		Mineral	1
		Proximate	1
		Carbohydrate	1
	Distilled grain	Amino acid	1
		Proximate	2
	Distilled grains(with solubles)	Amino acid	1
		Proximate	1
	Fuel grains&solubles	Amino acid	2
		Proximate	2
	Glucosinolate-free canola meal	Proximate	1
	Grass meal	Proximate	1
	Groats	Amino acid	3
		Fatty acid	1
		Mineral	3
		Proximate	6
		Vitamin	1
	Groundnut cake	Amino acid	1
		Mineral	1
		Proximate	2
	Groundnut kernel meal	Amino acid	1
		Proximate	1
	Groundnut meal	Amino acid	5
		Mineral	4
		Proximate	6
	Groundnut oilcake	Proximate	1
	Guinea-Corn-Sta.-Res	Mineral	1
		Proximate	1

Category	Ingredient	Chemical composition	No.of sample
Co-products			
	Hominy meal	Amino acid	2
		Anti-nutritional factor	1
		Mineral	1
		Proximate	3
		Vitamins	1
	Lentil husk	Proximate	1
	Leucaena leaf meal	Anti-nutritional factor	1
		Mineral	1
		Proximate	1
	Linola meal	Amino acid	2
		Proximate	2
	Linseed cake	Amino acid	1
		Proximate	1
	Lupin (general) meal	Amino acid	1
		Proximate	1
	Maize (distillers'g)	Amino acid	1
		Fatty acid	1
		Mineral	1
		Proximate	1
		Vitamin	1
	Maize bran	Amino acid	2
		Proximate	2
		Carbohydrate	2
	Maize cob	Mineral	1
		Proximate	1
	Maize flour	Mineral	1
		Proximate	4
	Maize germ	Amino acid	3
		Mineral	3
		Proximate	3
	Maize germ meal	Amino acid	1
		Proximate	1
	Maize gluten	Amino acid	4
		Fatty acid	2
		Mineral	3
		Proximate	8

Category	Ingredient	Chemical composition	No.of sample
Co-products			
	Maize gluten	Vitamin	2
	Maize gluten feed	Amino acid	4
		Mineral	1
		Proximate	5
		Carbohydrate	3
	Maize gluten meal	Amino acid	11
		Fatty acid	1
		Mineral	2
		Proximate	14
		Vitamin	1
		Carbohydrate	4
	Maize grits	Fatty acid	1
		Mineral	1
		Proximate	1
		Vitamin	1
	Maize hominy feed	Amino acid	5
		Proximate	5
		Carbohydrate	5
	Maize meal	Amino acid	3
		Proximate	3
		Carbohydrate	3
	Maize offal	Mineral	1
		Proximate	2
	Maize protein powder	Amino acid	1
		Proximate	1
	Maize screenings	Proximate	1
	Maize starch	Amino acid	1
		Proximate	4
		Carbohydrate	3
	Maize starch residue	Mineral	1
		Proximate	1
	Maize(dis.grain&sol.)	Amino acid	1
		Fatty acid	1
		Mineral	1
		Proximate	1
		Vitamin	1

Category	Ingredient	Chemical composition	No.of sample
Co-products			
	Maize(dis.soluble)	Amino acid	1
		Fatty acid	1
		Mineral	1
		Proximate	1
		Vitamin	1
	Malt combings	Amino acid	3
		Mineral	2
		Proximate	6
	Malt sprout meal	Amino acid	1
		Mineral	1
		Proximate	1
	Middlings	Proximate	1
	Mill run	Amino acid	5
		Mineral	2
		Proximate	7
		Vitamin	1
	Milo	Proximate	1
	Molasses	Amino acid	1
		Mineral	3
		Proximate	5
		Vitamin	1
	Mustard oilcake	Amino acid	1
		Proximate	4
	Oat bran	Mineral	1
		Proximate	1
	Oat pollard	Proximate	1
	Oil palm slurry	Mineral	2
		Proximate	2
	Palm cake	Amino acid	2
		Proximate	2
		Carbohydrates	2
	Palm kernel cake	Amino acid	1
		Proximate	2
	Palm kernel meal	Amino acid	5
		Mineral	1

Category	Ingredient	Chemical composition	No.of sample
Co-products			
	Palm kernel meal	Proximate	5
	Pea pollard	Amino acid	1
		Proximate	2
	Pea protein concentrate	Amino acid	1
	Peanut meal	Amino acid	8
		Fatty acid	2
		Mineral	3
		Proximate	11
		Vitamin	2
		Carbohydrates	1
	Peanut oil cake meal	Proximate	1
	Peanut oil meal	Mineral	1
		Proximate	1
		Carbohydrates	1
	Peanut skins	Proximate	1
	Pineapple pulp residue	Mineral	1
		Proximate	1
	Plantain peel	Mineral	1
		Proximate	1
	Pork offal	Amino acid	1
		Proximate	1
	Potato starch	Proximate	2
	Potato(CP concentr.)	Amino acid	2
		Mineral	1
		Proximate	2
	Rapeseed cake	Amino acid	1
		Proximate	1
	Rapeseed kernel cake	Amino acid	2
		Proximate	2
	Rapeseed kernel meal	Anti-nutritional factor	2
		Proximate	2
	Rapeseed meal	Amino acid	37
		Mineral	1

Category	Ingredient	Chemical composition	No.of sample
Co-products			
	Rapeseed meal	Proximate	50
		Carbohydrates	7
	Rapeseed protein concentrate	Proximate	1
	Rice bran	Amino acid	2
		Fatty acid	1
		Mineral	3
		Proximate	12
		Vitamin	1
	Rice flour	Proximate	3
	Rice hulls	Amino acid	3
		Mineral	1
		Proximate	5
	Rice husk	Mineral	1
		Proximate	1
	Rice husk cake	Amino acid	1
		Proximate	1
	Rice husk meal	Amino acid	1
		Proximate	1
	Rice offals	Proximate	1
	Rice polishings	Amino acid	2
		Fatty acid	1
		Mineral	3
		Proximate	5
		Vitamin	1
	Rice pollard	Amino acid	5
		Fatty acid	2
		Mineral	2
		Proximate	8
		Vitamin	1
	Rice seed ectoderm	Amino acid	1
		Proximate	1
	Rubber seed	Mineral	2
		Proximate	2
		Carbohydrates	2
	Safflower kernel meal	Fatty acid	1

Category	Ingredient	Chemical composition	No.of sample
Co-products			
	Safflower kernel meal	Mineral	1
		Proximate	1
		Vitamin	1
	Safflower meal	Amino acid	1
		Fatty acid	1
		Mineral	1
		Proximate	1
		Vitamin	1
	Seal meal (Carcass residues-Harp)	Amino acid	4
		Proximate	4
	Seal meats	Mineral	3
		Proximate	3
	Sesame meal	Amino acid	4
		Anti-nutritional factor	1
		Fatty acid	1
		Mineral	2
		Proximate	6
		Vitamin	1
	Sheanut cake	Anti-nutritional factor	1
		Mineral	1
		Proximate	1
	Sorghum germ meal	Amino acid	1
		Anti-nutritional factor	1
		Mineral	1
		Proximate	1
	Soybean (CP-concentr.)	Amino acid	2
		Mineral	1
		Proximate	2
		Carbohydrates	1
	Soybean concentrate	Amino acid	2
		Anti-nutritional factor	2
		Proximate	2
	Soybean CP-isolate	Amino acid	2
		Mineral	1
		Proximate	3
		Vitamin	1
	Soybean flakes	Amino acid	6

Category	Ingredient	Chemical composition	No.of sample
Co-products			
	Soybean flakes	Anti-nutritional factor	6
		Proximate	6
	Soybean flour (defatted)	Amino acid	1
		Proximate	1
	Soybean flour (dehulled)	Amino acid	1
		Anti-nutritional factor	1
		Proximate	1
	Soybean husk	Proximate	1
	Soybean kernel meal	Amino acid	12
		Anti-nutritional factor	2
		Fatty acid	1
		Mineral	1
		Proximate	8
		Vitamin	1
	Soybean meal	Amino acid	96
		Anti-nutritional factor	17
		Fatty acid	1
		Free sugar	4
		Mineral	6
		NSP-insoluble	11
		NSP-sol.	11
		Proximate	120
		Vitamins	1
		Carbohydrates	16
		NSP	10
	Soybean oil cake meal	Proximate	1
	Sugar cane juice	Mineral	1
		Proximate	1
	Sunflower cake	Amino acid	4
		Proximate	4
		Carbohydrates	3
		NSP	1
	Sunflower kernel meal	AMINO ACID	1
		Fatty acid	1
		Mineral	1
		Proximate	1
		Vitamin	1
	Sunflower meal	Amino acid	17

Category	Ingredient	Chemical composition	No.of sample
Co-products			
	Sunflower meal	Fatty acid	1
		Mineral	2
		NSP-insoluble	1
		NSP-sol.	1
		Proximate	20
		Vitamins	1
		Carbohydrates	2
	Sunflower oil cake M	Amino acid	4
		Mineral	4
		Proximate	7
		Carbohydrates	4
	Tomato pulp meal	Proximate	1
	Tomoto juice residue	Mineral	1
		Proximate	1
	Vinasse	Amino acid	1
		Proximate	1
	Wet barley protein	Amino acid	2
		Mineral	1
		Proximate	2
	Wheat (red dog)	Amino acid	1
		Mineral	1
		Proximate	1
		Vitamin	1
	Wheat bran	Amino acid	21
		Fatty acid	3
		Mineral	5
		Proximate	29
		Vitamin	2
		Carbohydrates	8
	Wheat feed screenings	Amino acid	5
		Mineral	5
		Proximate	5
	Wheat germ	Amino acid	1
		Mineral	1
		Proximate	2
	Wheat gluten	Amino acid	6
		Mineral	2
		Proximate	9

Category	Ingredient	Chemical composition	No.of sample
Co-products			
	Wheat gluten flour	Amino acid	1
		Proximate	1
	Wheat gluten meal	Amino acid	1
		Proximate	2
	Wheat middlings	Amino acid	5
		Fatty acid	1
		Mineral	1
		Proximate	7
		Vitamins	1
		Carbohydrates	2
	Wheat offal	Mineral	1
		Proximate	1
	Wheat pollard	Amino acid	7
		Fatty acid	2
		Mineral	1
		Proximate	11
		Vitamin	1
	Wheat shorts	Amino acid	1
		Fatty acid	1
		Mineral	1
		Proximate	1
		Vitamin	1
	Wheat starch	Proximate	1
	Wheatflour by product	Amino acid	2
		Mineral	1
		Proximate	2
		Carbohydrates	1
	Wheatgerm screen's	Amino acid	1
		Proximate	1
	Whey permeate	Amino acid	1
		Mineral	1
		Proximate	1
	Yam peel	Mineral	1
		Proximate	1
Cereal			
	Algaroba	Amino acid	1

Category	Ingredient	Chemical composition	No.of sample
Cereal			
	Algaroba	Mineral	1
		Proximate	1
	Amaranth	Amino acid	6
		Mineral	6
		Proximate	6
	Azolla	Amino acid	1
		Mineral	1
		Proximate	1
	Barley	Amino acid	73
		Anti-nutritional factor	16
		Fatty acid	3
		Free sugar	7
		Mineral	61
		NSP-sol.	3
		Proximate	193
		Vitamins	6
		Carbohydrates	63
		NSP	15
	Barley(hulless)	Amino acid	2
		Proximate	2
	Buckwheat	Amino acid	3
		Fatty acid	1
		Mineral	1
		Proximate	3
		Vitamin	1
	Canary grass seed	Amino acid	1
		Proximate	2
	Cassava	Amino acid	2
		Mineral	2
		Proximate	2
		Vitamin	1
	Common reed	Proximate	1
	Guinea maize	Amino acid	1
		Proximate	1
	Japanese millet	Amino acid	3
		Fatty acid	1
		Mineral	3
		Proximate	5

Category	Ingredient	Chemical composition	No.of sample
Cereal			
	Japanese millet	Vitamin	1
	Maize	Amino acid	63
		Anti-nutritional factor	2
		Fatty acid	9
		Mineral	14
		Proximate	111
		Vitamin	4
		Carbohydrates	11
	Maize(high lysine)	Amino acid	5
		Mineral	1
		Proximate	5
	Maize(High-lysine)	Amino acid	1
		Proximate	1
	Millet	Amino acid	5
		Fatty acid	1
		Mineral	2
		Proximate	6
		Vitamin	2
	Naked oats	Amino acid	6
		Fatty acid	1
		Mineral	4
		Proximate	8
		Vitamin	4
		Carbohydrates	2
	Oat groat	Amino acid	3
		Fatty acid	1
		Mineral	1
		Proximate	4
		Vitamin	1
	Oats	Amino acid	14
		Fatty acid	2
		Mineral	36
		Proximate	64
		Vitamin	5
		Carbohydrates	27
	Pearl millet	Amino acid	2
		Mineral	2
		Proximate	4
	Proso millet	Amino acid	3

Category	Ingredient	Chemical composition	No.of sample
Cereal			
	Proso millet	Anti-nutritional factor	7
		Mineral	7
		Proximate	7
	Red oats	Amino acid	1
		Proximate	1
		Carbohydrates	1
	Rice	Amino acid	13
		Fatty acid	1
		Mineral	5
		Proximate	20
		Vitamin	1
		Carbohydrates	4
	Rye	Amino acid	5
		Anti-nutritional factor	1
		Fatty acid	1
		Mineral	2
		Proximate	8
		Vitamin	2
		Carbohydrates	1
	Saltbush	Proximate	1
	Shattercane	Amino acid	1
		Anti-nutritional factor	1
		Mineral	1
		Proximate	1
	Sorghum	Amino acid	125
		Anti-nutritional factor	116
		Fatty acid	14
		Free sugar	27
		Mineral	35
		Proximate	203
		Residue-toxin	3
		Vitamin	11
		Carbohydrates	35
	Triticale	Amino acid	60
		Anti-nutritional factor	13
		Fatty acid	1
		Free sugar	4
		Mineral	14
		NSP-soluble	4
		Proximate	84
		Vitamin	2

Category	Ingredient	Chemical composition	No.of sample
Cereal			
	Triticale	Carbohydrates	19
		NSP	4
	Wheat	Amino acid	145
		Anti-nutritional factor	29
		Fatty acid	10
		Free sugar	23
		Mineral	59
		nsp-sol.	1
		Proximate	380
		resi-toxin	7
		Vitamin	8
		Carbohydrates	61
		NSP	2
	Wheat (feed)	Proximate	1
	Wheat(Aust. Std.wheat)	Amino acid	1
		Proximate	1
	Wheat(high protein)	Amino acid	1
		Proximate	1
	White maize	Amino acid	2
		Proximate	2
	Wild oats	Proximate	1
	Yellow maize	Amino acid	25
		Anti-nutritional factor	1
		Mineral	7
		Proximate	29
		Vitamin	1
		Carbohydrates	1
Vegetable protein			
	A. acutifolia	Anti-nutritional factor	2
		Proximate	2
	Adzuki bean	Amino acid	6
		Anti-nutritional factor	34
		Mineral	5
		Proximate	42
		Carbohydrates	2
	African yam bean	Proximate	4
	Alfalfa	Amino acid	2

Category	Ingredient	Chemical composition	No.of sample
Vegetable protein			
	Alfalfa	Fatty acid	2
		Mineral	2
		Proximate	2
		Vitamin	2
	Alfalfa meal	Proximate	3
	Alfalfa protein concentrate	Amino acid	1
		Proximate	1
		Vitamin	
	Atlas lupin	Anti-nutritional factor	13
		Fatty acid	13
		Mineral	73
		Proximate	83
	Aust. sweet lupin	Amino acid	171
		Anti-nutritional factor	1569
		Fatty acid	1
		free sugar	3
		Mineral	2170
		NSP-insol.	7
		NSP-sol.	7
		Proximate	4138
		Vitamins	1
		Carbohydrates	12
		Nsp	3
	B. campestris	Amino acid	1
		Anti-nutritional factor	2
		Mineral	3
		Proximate	3
	B. napus	Amino acid	1
		Anti-nutritional factor	2
		Mineral	3
		Proximate	4
	B.campestris(full-fat)	Proximate	1
	Bambaragroundnut	Amino acid	2
		Mineral	6
		Proximate	6
	Bitter vetch	Anti-nutritional factor	1
		Mineral	1
		Proximate	1

Category	Ingredient	Chemical composition	No.of sample
Vegetable protein			
	Black cumin seed	Mineral	5
		Proximate	5
		Vitamin	5
	Black mung bean	Amino acid	12
		Anti-nutritional factor	12
		Mineral	12
		Proximate	20
	Borlotti bean	Anti-nutritional factor	21
		Mineral	7
		Proximate	7
	C. australe	Anti-nutritional factor	1
		Proximate	1
	C. ensiformis	Anti-nutritional factor	1
		Proximate	1
	Canola	Amino acid	22
		Anti-nutritional factor	1
		Fatty acid	2
		Mineral	11
		Proximate	34
		resi-toxin	1
		Vitamin	2
	Canola (full-fat)	Amino acid	1
		Anti-nutritional factor	1
		Proximate	2
	Carob bean	Mineral	1
		Proximate	8
		Carbohydrates	5
	Chaya leaf meal	Amino acid	1
		Anti-nutritional factor	1
		Mineral	1
		Proximate	1
	Chickpea (desi)	Amino acid	37
		Anti-nutritional factor	133
		Mineral	129
		Proximate	172
		Carbohydrates	2
	Chickpea (general)	Anti-nutritional factor	18
		Fatty acid	27

Category	Ingredient	Chemical composition	No.of sample
Vegetable protein			
	Chickpea (general)	Mineral	47
		NSP-insoluble	1
		NSP-sol.	1
		Proximate	78
		Vitamin	1
		NSP	1
	Chickpea-Kabuli	Anti-nutritional factor	24
		Fatty acid	55
		Mineral	151
		Proximate	159
	Common vetch	Amino acid	2
		Anti-nutritional factor	2
		Mineral	2
		Proximate	7
	Cottonseed cake	Amino acid	5
		Mineral	1
		Proximate	6
		Carbohydrates	5
	Cowpea	Anti-nutritional factor	8
		Fatty acid	47
		Mineral	16
		Proximate	73
		Vitamin	1
		Carbohydrates	2
	Cyprus vetch	Proximate	1
	Faba bean	Amino acid	44
		Anti-nutritional factor	58
		Fatty acid	1
		Mineral	144
		NSP-insoluble	1
		NSP-sol.	1
		Proximate	228
		Vitamin	3
		Carbohydrates	2
		NSP	1
	Field beans	Amino acid	9
		Anti-nutritional factor	6
		Mineral	2
		Proximate	14
	Field pea	Amino acid	331

Category	Ingredient	Chemical composition	No.of sample
Vegetable protein			
	Field pea	Anti-nutritional factor	760
		Fatty acid	2
		Mineral	946
		NSP-insoluble	1
		NSP-sol.	1
		Proximate	1627
		Vitamin	5
		Carbohydrates	1
		NSP	13
	G. soya	Anti-nutritional factor	1
		Proximate	1
	G. tomentalla	Anti-nutritional factor	1
		Proximate	1
	Green mung bean	Amino acid	21
		Anti-nutritional factor	31
		Mineral	22
		Proximate	45
		Vitamin	1
	Groundnut	Mineral	1
		Proximate	1
	Guar	Anti-nutritional factor	3
		Proximate	3
	Horse bean	Amino acid	1
		Proximate	1
	Horse gram	Anti-nutritional factor	1
		Mineral	6
		Proximate	11
	Jack bean	Amino acid	5
		Anti-nutritional factor	2
		Mineral	5
		Proximate	7
	Kidney bean	Amino acid	2
		Mineral	6
		Proximate	6
	L. digitatus	Amino acid	1
		Mineral	1
		Proximate	2

Category	Ingredient	Chemical composition	No.of sample
Vegetable protein			
	L. palestinium	Amino acid	1
		Mineral	1
		Proximate	2
	L. pilosus	Amino acid	12
		Anti-nutritional factor	14
		Mineral	56
		Proximate	65
	Lablab	Amino acid	5
		Anti-nutritional factor	13
		Mineral	6
		Proximate	17
		Vitamin	1
	Lathyrus sativus	Amino acid	7
		Anti-nutritional factor	4
		Mineral	7
		Proximate	7
	Lentil	Amino acid	16
		Anti-nutritional factor	50
		Fatty acid	1
		Mineral	70
		Proximate	47
		Vitamin	3
	Leucaena leaf	Amino acid	1
		Proximate	1
	Leucaena Leucocephal	Amino acid	2
		Mineral	1
		Proximate	3
	Lima bean	Amino acid	2
		Anti-nutritional factor	3
		Mineral	7
		Proximate	8
		Vitamin	1
		Carbohydrates	1
	Linseed	Amino acid	12
		Fatty acid	3
		Mineral	6
		Proximate	18
		Vitamin	3
		Carbohydrates	1

Category	Ingredient	Chemical composition	No.of sample
Vegetable protein			
	Linseed meal	Amino acid	1
		Proximate	3
	Lupin (general)	Amino acid	1
		Mineral	8
		Proximate	22
	Moth bean	Anti-nutritional factor	1
		Proximate	1
	Mucuna beans	Amino acid	2
		Anti-nutritional factor	2
		Proximate	2
	Mucuna sp.	Anti-nutritional factor	1
		Proximate	1
	Mungbeans	Amino acid	4
		Anti-nutritional factor	2
		Mineral	2
		Proximate	4
	Narbon bean	Amino acid	11
		Anti-nutritional factor	11
		Mineral	111
		Proximate	129
	Navy bean	Amino acid	28
		Anti-nutritional factor	21
		Fatty acid	1
		Mineral	30
		Proximate	54
		Vitamin	4
		Carbohydrates	2
	P. coccineus	Anti-nutritional factor	1
		Proximate	1
	P. elegans	Anti-nutritional factor	1
		Proximate	1
	P. helvolus	Anti-nutritional factor	1
		Proximate	1
	P. leucanthus	Anti-nutritional factor	1
		Proximate	1
	P. peduncularis	Anti-nutritional factor	1

Category	Ingredient	Chemical composition	No.of sample
Vegetable protein			
	P. peduncularis	Proximate	1
	P. pilosus	Anti-nutritional factor	1
		Proximate	1
	P. racardianus	Anti-nutritional factor	1
		Proximate	1
	P. schottii	Anti-nutritional factor	1
		Proximate	1
	Pea	Amino acid	49
		Anti-nutritional factor	17
		Fatty acid	1
		Mineral	3
		Proximate	62
		Vitamin	1
		Carbohydrates	4
		NSP	16
	Peanut	Amino acid	11
		Anti-nutritional factor	2
		Fatty acid	2
		Mineral	10
		Proximate	21
		Vitamin	2
		Carbohydrates	1
	Pigeon pea	Amino acid	25
		Anti-nutritional factor	40
		Mineral	23
		Proximate	54
		Carbohydrates	1
	Pima cottonseed	Anti-nutritional factor	4
		Mineral	4
		Proximate	4
	Purple vetch	Amino acid	1
		Anti-nutritional factor	1
		Mineral	1
		Proximate	2
	Rapeseed	Amino acid	2
		Anti-nutritional factor	2
		Proximate	7
		Carbohydrates	1

Category	Ingredient	Chemical composition	No.of sample
Vegetable protein			
	Rice bean	Anti-nutritional factor	1
		Proximate	6
	S. grandiflora	Anti-nutritional factor	1
		Proximate	1
	S. sesban	Anti-nutritional factor	2
		Proximate	1
	Safflower	Amino acid	10
		Fatty acid	2
		Mineral	6
		Proximate	18
		Vitamin	2
		Carbohydrates	1
	Sandplain lupin	Amino acid	1
		Mineral	23
		Proximate	29
	Sesame	Amino acid	3
		Mineral	3
		Proximate	6
		Vitamin	3
	Sesbania seed	Proximate	6
	Soybean	Amino acid	61
		Anti-nutritional factor	29
		Fatty acid	2
		Mineral	26
		Proximate	96
		Vitamin	11
		Carbohydrates	3
	Soybean (full-fat)	Amino acid	2
		Anti-nutritional factor	1
		Proximate	7
		Carbohydrates	1
	Sunflower	Amino acid	31
		Anti-nutritional factor	1
		Fatty acid	4
		Free sugar	24
		Mineral	7
		NSP-insoluble	24
		Proximate	65
		Vitamin	1

Category	Ingredient	Chemical composition	No.of sample
Vegetable protein			
	Sunflower	Carbohydrates	25
		NSP	24
	Tamarind seed	Amino acid	1
		Anti-nutritional factor	1
		Mineral	1
		Proximate	1
	Tarwi lupin	Proximate	1
	Tepary bean	Anti-nutritional factor	1
		Proximate	1
	V. lanceolata	Anti-nutritional factor	1
		Proximate	1
	V. sublobata	Anti-nutritional factor	1
		Proximate	1
	V. trilobata	Anti-nutritional factor	1
		Proximate	1
	V. vexillata	Anti-nutritional factor	1
		Proximate	1
	White leaf protein	Amino acid	1
		Proximate	1
	White lupin	Amino acid	74
		Anti-nutritional factor	138
		Fatty acid	2
		Free sugar	3
		Mineral	239
		NSP-insoluble.	3
		NSP-soluble	3
		Proximate	334
		Vitamin	1
		Carbohydrates	4
		NSP	2
	Woolly pod vetch	Amino acid	1
		Anti-nutritional factor	1
		Mineral	1
		Proximate	2
	Yellow lupin	Amino acid	10
		Anti-nutritional factor	12
		Mineral	10

Category	Ingredient	Chemical composition	No.of sample
Vegetable protein			
	Yellow lupin	Proximate	19
		Vitamin	1
		Carbohydrates	2
Mineral supplements			
	Calstock Phos	Mineral	1
	Christmas Is PO4	Mineral	2
	Curacao phosphate	Mineral	1
	Defluorinated PO4	Mineral	1
	Diammonium phosphate	Mineral	1
	Dicalcium phosphate	Mineral	2
	Egg shells	Mineral	2
		Proximate	2
	Gypsum (CaSO4)	Mineral	1
	Limestone	Mineral	3
		Proximate	3
	Mono-ammonium PO4	Mineral	1
	Monocalcium 2H PO4	Mineral	1
	Mono-dicalcium PO4	Mineral	1
	Nauru phosphate	Mineral	1
	Oyster shell	Mineral	1
	Phosphoric acid	Mineral	1
	Shell grit	Mineral	1
		Proximate	1
	Sodium phosphate	Mineral	1
	Sodium tripolyphosph	Mineral	1
	Tricalcium phosphate	Mineral	1
	Trple superphosphate	Mineral	1

Category	Ingredient	Chemical composition	No.of sample
Fats and Oils			
	Maize oil	Fatty acid	1
		Proximate	1
	Peanut oil	Fatty acid	1
		Proximate	1
	Poultry fat	Fatty acid	1
		Proximate	1
	Safflower oil	Fatty acid	1
		Proximate	1
	Soybean oil	Fatty acid	1
		Proximate	1
	Sunflower oil	Fatty acid	1
		Proximate	1
	Tallow (stabilised)	Fatty acid	1
		Proximate	2
Miscellaneous			
	Biscuit meal	Amino acid	1
		Proximate	1
	Biscuit waste	Proximate	1
	Dogfood scrap meal	Amino acid	1
		Proximate	1
	Gelatin	Amino acid	2
		Proximate	2
	Grape waste	Proximate	4
	Paper and algae	Amino acid	1
		Mineral	1
		Proximate	1
Vegetables			
	Cabbage	Amino acid	1
		Proximate	1
	Potato	Amino acid	1
		Proximate	1
	Sweet potato	Amino acid	1
		Mineral	2

Category	Ingredient	Chemical composition	No.of sample
Vegetables			
	Sweet Potato	Proximate	3
Fibre supplements			
	Celufil	Proximate	1

Attachment 2. Audit of nutritional quality data of feed ingredients for pigs contained within the Australasian Livestock Feed Ingredient Database (ALFID).

Category	Ingredient	Chemical composition	Nutritional quality	No. of samples
Additives				
	Yeast brewers'	Amino acids	Digestibility	1
		Energy	Energy	1
	Yeast torula	Energy	Energy	1
Animal protein				
	Blood & Mucosa product	Energy	Energy	1
		Proximate	Digestibility	1
	Blood meal	Amino acids	Availability	2
		Amino acids	Digestibility	8
		Energy	Energy	4
		Proximate	Digestibility	3
	Buttermilk powder	Proximate	Digestibility	1
	Casein	Amino acids	Digestibility	2
		Energy	Energy	1
		Proximate	Digestibility	1
	Egg meal (no shell)	Energy	Energy	1
	Feather meal	Amino acids	Digestibility	3
		Energy	Energy	2
		Proximate	Digestibility	3
	Fish meal	Amino acids	Availability	3
		Amino acids	Digestibility	6
		Energy	Energy	1
		Proximate	Digestibility	8
	Fish meal(anchovy)	Energy	Energy	1
	Fish meal(C. auratus)	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Fish meal(Chilean)	Amino acids	Digestibility	3
		Proximate	Digestibility	3
	Fish meal(herring)	Energy	Energy	2
		Proximate	Digestibility	1
	Fish meal(Menhaden)	Amino acids	Digestibility	3
		Energy	Energy	2
		Proximate	Digestibility	2

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Animal protein				
	Fish meal(Peruvian)	Amino acids	Digestibility	2
		Proximate	Digestibility	2
	Meat & blood meal	Amino acids	Digestibility	1
		Proximate	Digestibility	1
		Amino acids	Availability	8
		Amino acids	Digestibility	3
		Energy	Energy	13
		Proximate	Digestibility	17
	Meat meal	Amino acids	Availability	8
		Amino acids	Digestibility	4
		Energy	Energy	5
		Proximate	Digestibility	7
	Meat or Meat&bone Meal	Amino acids	Digestibility	9
		Proximate	Digestibility	9
	Milk skim	Amino acids	Digestibility	2
		Energy	Energy	3
		Proximate	Digestibility	3
	Plasma protein	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Pork offal	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Single cell protein	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Skim milk powder	Amino acids	Availability	3
		Amino acids	Digestibility	5
		Proximate	Digestibility	5
	Whey	Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	1
Co-products				
	B. campestris meal	Energy	Energy	3
	Babacu nut meal	Energy	Energy	1
		Proximate	Digestibility	1
	Bakery waste	Amino acids	Digestibility	1
		Energy	Energy	1
	Barley distillers solids	Amino acids	Availability	1

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Co-products				
	Barley distillers solids	Amino acids	Digestibility	1
		Minerals	Availability	1
		Proximate	Availability	1
		Proximate	Digestibility	3
	Barley protein concentrate	Proximate	Digestibility	1
	Bean meal	Energy	Energy	1
		Proximate	Digestibility	1
	Beet pulp	Amino acids	Digestibility	1
		Energy	Energy	1
	Bone char (sugar)	Minerals	Digestibility	1
	Brewer's grains	Amino acids	Digestibility	1
		Energy	Energy	1
	Brewers' rice	Energy	Energy	1
	Canola meal	Amino acids	Availability	2
		Amino acids	Digestibility	21
		Energy	Energy	11
		Proximate	Digestibility	23
	Canola meal (high hull&fibre content)	Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	1
	Cashew nut meal	Energy	Energy	1
		Proximate	Digestibility	1
	Cassava meal	Energy	Energy	6
		Proximate	Digestibility	6
	Coconut cake	Energy	Energy	3
		Proximate	Digestibility	3
	Coconut expeller	Proximate	Digestibility	1
	Coconut meal	Energy	Energy	1
		Proximate	Digestibility	2
	Coconut meal (fat high)	Proximate	Digestibility	1
	Coconut meal(copra)	Amino acids	Digestibility	1
		Energy	Energy	1
	Cottonseed cake	Energy	Energy	5

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Co-products				
	Cottonseed cake	Proximate	Digestibility	5
	Cottonseed meal	Amino acids	Availability	8
		Amino acids	Digestibility	16
		Energy	Energy	8
		Proximate	Digestibility	16
	Cottonseed meal (glandless)	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Cowpea meal	Energy	Energy	2
	Crambe seed meal	Amino acids	Digestibility	1
		Minerals	Digestibility	1
		Proximate	Digestibility	1
	Distilled grain	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Fish solubles	Amino acids	Digestibility	1
		Energy	Energy	2
	Grass meal	Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	3
	Groundnut kernel meal	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Groundnut meal	Energy	Energy	2
		Proximate	Digestibility	1
	Linola meal	Energy	Energy	1
	Maize (distillers'g)	Energy	Energy	1
	Maize bran	Energy	Energy	2
		Proximate	Digestibility	2
	Maize germ	Energy	Energy	3
		Proximate	Digestibility	3
	Maize gluten	Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	2
	Maize gluten feed	Energy	Energy	4
		Proximate	Digestibility	4
		Amino acids	Digestibility	2

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Co-products				
	Maize gluten feed	Energy	Energy	5
		Proximate	Digestibility	5
	Maize grits	Energy	Energy	1
	Maize hominy feed	Energy	Energy	5
		Proximate	Digestibility	5
	Maize meal	Energy	Energy	3
		Proximate	Digestibility	3
	Maize protein powder	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Maize starch	Energy	Energy	3
		Proximate	Digestibility	3
	Maize(dis.grain&sol.	Amino acids	Digestibility	1
		Energy	Energy	1
	Maize(dis.soluble)	Energy	Energy	1
	Malt sprout meal	Energy	Energy	1
		Proximate	Digestibility	1
	Middlings	Energy	Energy	1
		Proximate	Digestibility	1
	Mill run	Energy	Energy	2
		Proximate	Digestibility	2
	Milo	Energy	Energy	1
		Proximate	Digestibility	1
	Oat groat	Amino acids	Digestibility	2
		Energy	Energy	3
		Proximate	Digestibility	2
	Palm cake	Energy	Energy	2
		Proximate	Digestibility	2
	Palm kernel meal	Amino acids	Digestibility	3
		Energy	Energy	1
		Proximate	Digestibility	3
	Pea protein concentrate	Proximate	Digestibility	1
	Peanut meal	Amino acids	Digestibility	5
		Energy	Energy	2

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Co-products				
	Peanut meal	Proximate	Digestibility	4
	Potato starch	Proximate	Digestibility	2
	Potato(CP concentr.)	Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	1
	Poultry by-prod.meal	Amino acids	Digestibility	5
		Energy	Energy	1
		Proximate	Digestibility	4
	Rapeseed cake	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Rapeseed cake(high-fat)	Proximate	Digestibility	1
	Rapeseed cake(low-fat)	Proximate	Digestibility	1
	Rapeseed kernel cake	Amino acids	Digestibility	2
		Proximate	Digestibility	2
	Rapeseed meal	Amino acids	Availability	1
		Amino acids	Digestibility	8
		Energy	Energy	7
		Minerals	Digestibility	17
	Rice bran	Amino acids	Digestibility	1
		Energy	Energy	3
		Proximate	Digestibility	2
	Rice husk cake	Amino acids	Digestibility	1
		Proximate	Digestibility	1
		Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Rice polishings	Amino acids	Digestibility	1
		Energy	Energy	1
	Rice seed ectoderm	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Safflower kernel meal	Energy	Energy	1
	Safflower meal	Energy	Energy	1
	Sesame meal	Amino acids	Digestibility	1
		Energy	Energy	1

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Co-products				
	Soybean concentrate	Amino acids	Digestibility	2
		Proximate	Digestibility	2
	Soybean CP-concentr.	Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	1
	Soybean CP-isolate	Amino acids	Digestibility	2
		Energy	Energy	1
		Proximate	Digestibility	1
	Soybean flakes	Amino acids	Digestibility	6
		Proximate	Digestibility	6
	Soybean flour (defatted)	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Soybean kernel meal	Amino acids	Digestibility	4
		Energy	Energy	1
		Proximate	Digestibility	5
	Soybean meal	Amino acids	Availability	6
		Amino acids	Digestibility	38
		Energy	Energy	18
		Proximate	Digestibility	56
	Sugar beet pulp	Proximate	Digestibility	1
	Sugar cane juice	Energy	Energy	1
	Sunflower cake	Energy	Energy	4
		Proximate	Digestibility	5
	Sunflower cake with hull	Proximate	Digestibility	1
	Sunflower kernel meal	Amino acids	Digestibility	1
		Energy	Energy	1
	Sunflower meal	Amino acids	Availability	2
		Amino acids	Digestibility	7
		Energy	Energy	1
		Proximate	Digestibility	7
	Sunflower oil cake M	Energy	Energy	2
	Tapioca	Proximate	Digestibility	1
	Vinasse	Energy	Energy	1
		Proximate	Digestibility	1

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Co-products				
	Wet barley protein	Amino acids	Digestibility	1
		Minerals	Availability	1
		Proximate	Availability	1
		Proximate	Digestibility	2
	Wheat (red dog)	Energy	Energy	1
	Wheat bran	Amino acids	Digestibility	3
		Energy	Energy	13
		Proximate	Digestibility	14
	Wheat gluten	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Wheat middlings	Amino acids	Digestibility	2
		Energy	Energy	4
		Proximate	Digestibility	4
	Wheat pollard	Energy	Energy	3
		Proximate	Digestibility	3
	Wheat shorts	Amino acids	Digestibility	1
		Energy	Energy	1
	Whey (low lactose)	Amino acids	Digestibility	1
		Energy	Energy	1
	Whey permeate	Energy	Energy	1
Cereal				
	Algaroba	Energy	Energy	1
		Proximate	Digestibility	1
	Barley	Amino acids	Availability	6
		Amino acids	Digestibility	25
		Carbohydrates	Digestibility	5
		Energy	Energy	86
		NSP	Digestibility	3
		Proximate	Digestibility	93
	Barley(hulless)	Amino acids	Digestibility	2
		Proximate	Digestibility	6
	Buckwheat	Amino acids	Digestibility	1
		Energy	Energy	2
		Energy	Energy	1
		Proximate	Digestibility	2
	Cassava	Amino acids	Digestibility	1

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Cereal				
	Cassava	Energy	Energy	2
		Proximate	Digestibility	1
	Maize	Amino acids	Availability	1
		Amino acids	Digestibility	18
		Energy	Energy	19
		Proximate	Digestibility	34
	Maize(high lysine)	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Millet	Amino acids	Digestibility	1
		Energy	Energy	1
	Naked oats	Amino acids	Digestibility	2
		Energy	Energy	3
		Proximate	Digestibility	4
	Oats	Amino acids	Digestibility	4
		Energy	Energy	5
		Proximate	Digestibility	6
	Pearl millet	Amino acids	Digestibility	2
		Energy	Energy	2
		Proximate	Digestibility	2
	Rice	Amino acids	Digestibility	3
		Energy	Energy	5
		Proximate	Digestibility	7
	Rye	Amino acids	Digestibility	2
		Energy	Energy	1
		Proximate	Digestibility	2
	Sorghum	Amino acids	Digestibility	2
		Energy	Energy	65
		Proximate	Digestibility	63
		Proximate	Energy	1
	Triticale	Amino acids	Digestibility	2
		Energy	Energy	25
		Proximate	Digestibility	6
	Wheat	Amino acids	Availability	9
		Amino acids	Digestibility	24
		Carbohydrates	Digestibility	1
		Energy	Energy	153
		NSP	Digestibility	1
		Proximate	Digestibility	95

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Vegetable protein				
	Adzuki bean	Amino acids	Availability	1
		Energy	Energy	1
	Alfalfa	Amino acids	Digestibility	1
		Energy	Energy	2
	Alfalfa meal	Proximate	Digestibility	1
	Aust. Sweet lupin	Amino acids	Availability	10
		Amino acids	Digestibility	4
		Energy	Energy	20
		Proximate	Digestibility	6
	B. campestris	Energy	Energy	2
	B. napus	Energy	Energy	1
		Proximate	Digestibility	1
	B.campestris(F.FatM)	Energy	Energy	2
	Black Mung bean	Amino acids	Availability	1
		Energy	Energy	1
	Canola	Amino acids	Availability	5
		Amino acids	Digestibility	1
		Energy	Energy	1
	Canola (full-fat)	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Chickpea (desi)	Energy	Energy	1
	Chickpea (general)	Amino acids	Availability	1
		Energy	Energy	3
		Proximate	Energy	2
		Proximate	Metabilizability	2
	Chickpea-Kabuli	Energy	Energy	1
	Common vetch	Energy	Energy	1
	Cowpea	Amino acids	Availability	1
		Energy	Energy	1
	Faba bean	Amino acids	Availability	3
		Amino acids	Digestibility	10
		Energy	Energy	5
		Proximate	Digestibility	11
	Field beans	Amino acids	Digestibility	8
		Proximate	Digestibility	9

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Vegetable protein				
	Field pea	Amino acids	Availability	3
		Energy	Energy	11
	Green mung bean	Amino acids	Availability	1
		Energy	Energy	1
	Jack bean	Amino acids	Digestibility	4
		Proximate	Digestibility	4
	Lablab	Amino acids	Availability	1
		Energy	Energy	1
	Lentil	Amino acids	Digestibility	1
		Energy	Energy	1
	Linseed	Amino acids	Availability	1
		Amino acids	Digestibility	1
		Energy	Energy	2
	Mungbeans	Amino acids	Digestibility	4
		Proximate	Digestibility	4
	Navy bean	Amino acids	Availability	6
		Energy	Energy	6
		Proximate	Digestibility	1
	Pea	Amino acids	Digestibility	29
		Carbohydrates	Digestibility	3
		Energy	Energy	11
		Proximate	Digestibility	35
	Peanut	Amino acids	Availability	2
		Energy	Energy	1
	Pigeon pea	Amino acids	Availability	1
		Energy	Energy	2
		Proximate	Energy	1
		Proximate	Metabilizability	1
	Rapeseed	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Sandplain lupin	Energy	Energy	3
	Soybean	Amino acids	Availability	8
		Amino acids	Digestibility	20
		Energy	Energy	4
		Proximate	Digestibility	21

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Vegetable protein				
	Soybean (full-fat)	Amino acids	Digestibility	8
		Energy	Energy	1
		Energy	Energy	2
		Proximate	Digestibility	8
	Sunflower	Amino acids	Availability	4
	White lupin	Amino acids	Availability	3
		Amino acids	Digestibility	3
		Energy	Energy	12
		Proximate	Digestibility	5
	Yellow lupin	Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	1
Mineral supplements				
	Christmas Is PO4	Minerals	Digestibility	1
	Dicalcium phosphate	Minerals	Digestibility	1
Fats and Oils				
	Animal fat	Proximate	Digestibility	1
	Tallow (stabilised)	Energy	Energy	1
Vegetables				
	Sweet potato	Energy	Energy	1
		Proximate	Digestibility	1

Attachment 3. Audit of nutritional quality data of feed ingredients for poultry contained within the Australasian Livestock Feed Ingredient Database (ALFID).

Category	Ingredient	Chemical composition	Nutritional quality	Number of samples
Additives				
	Brewer's yeast	Energy	Energy	2
	Cerelose(Glucose monohyrate)	Energy	Energy	1
	Dextrose	Energy	Energy	1
	Yeast (n-Paraffin-grown)	Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	1
Animal Protein				
	Blood meal	Amino acids	Availability	3
		Amino acids	Digestibility	2
		Energy	Energy	2
		Proximate	Digestibility	1
	Carcass meal	Energy	Energy	2
	Casein	Amino acids	Digestibility	3
		Proximate	Digestibility	1
	Feather & offal meal	Amino acids	Availability	5
	Feather meal	Amino acids	Availability	7
		Amino acids	Digestibility	20
		Energy	Energy	11
		Proximate	Digestibility	1
	Feather meal(broiler feather)	Amino acids	Digestibility	7
		Energy	Energy	6
	Fish meal	Amino acids	Availability	4
		Amino acids	Digestibility	4
		Energy	Energy	12
		Proximate	Digestibility	4
	Fish meal (capelin)	Amino acids	Digestibility	3
		Proximate	Digestibility	3
	Fish meal (Tuna)	Amino acids	Availability	1
	Fish meal(Alaska herring)	Amino acids	Availability	1
	Fish meal(anchovy)	Amino acids	Availability	1
	Fish meal(British Columbia scrap)	Amino acids	Availability	1

Category	Ingredient	Chemical composition	Nutritional quality	Number of sample
Animal protein				
	Fish meal(herring)	Energy	Energy	1
	Fish meal(lantern)	Amino acids	Digestibility	1
	Fish meal(lantern)	Proximate	Digestibility	1
	Fish meal(Menhaden)	Energy	Energy	1
	Fish meal(Peruvian anchovy)	Amino acids	Availability	1
	Fish meal(Seattle rock cod)	Amino acids	Availability	1
	Hair meal	Amino acids	Availability	2
	Hog hair meal	Amino acids	Digestibility	2
		Energy	Energy	2
	Meat & blood meal	Amino acids	Digestibility	1
		Proximate	Digestibility	1
		Amino acids	Availability	9
		Amino acids	Digestibility	9
		Energy	Energy	2
		Proximate	Digestibility	6
	Meat & bone meal(beef)	Amino acids	Digestibility	8
		Energy	Energy	8
	Meat meal	Amino acids	Availability	5
		Amino acids	Digestibility	4
		Energy	Energy	6
		Fatty acids	Digestibility	2
		Proximate	Digestibility	6
	Meat&bone meal(All pork)	Amino acids	Digestibility	10
		Energy	Energy	10
	Meat&bone meal(High bone&low CP)	Amino acids	Digestibility	4
		Energy	Energy	4
	Meat&bone meal(Mixed species)	Amino acids	Digestibility	10
		Energy	Energy	10
	Poul.by-prod.meal&feather meal	Amino acids	Availability	1
	Seal meal (Carcass residues-Harp)	Energy	Energy	4
	Seal meats	Energy	Energy	3
	Shrimp meal	Amino acids	Availability	1

Category	Ingredient	Chemical composition	Nutritional quality	Number of sample
Animal protein				
	Snail meal	Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	1
	Water-soluble frac.of feather meal	Amino acids	Digestibility	1
		Energy	Energy	1
Co-products				
	Ambadi meal	Energy	Energy	1
		Proximate	Digestibility	1
	B. campestris meal	Energy	Energy	1
	B. napus meal	Energy	Energy	1
	Bitter vetch meal	Amino acids	Digestibility	1
	Brewer's grains	Energy	Energy	2
	Brewer's spent grain	Energy	Energy	1
	Canola meal	Amino acids	Availability	4
		Amino acids	Digestibility	10
		Energy	Energy	6
		Proximate	Digestibility	6
	Cassava root meal	Energy	Energy	10
	Cocoa pod husk	Energy	Energy	1
	Coffee pulp	Energy	Energy	1
	Cottonseed meal	Amino acids	Availability	2
		Amino acids	Digestibility	8
		Energy	Energy	2
		Proximate	Digestibility	7
	Cowpea meal	Amino acids	Availability	2
		Energy	Energy	2
	Distilled grain	Energy	Energy	1
	Distilled grains(with solubles)	Amino acids	Availability	1
		Amino acids	Digestibility	2
		Energy	Energy	1
		Proximate	Digestibility	1
	Field pea meal	Amino acids	Digestibility	1

Category	Ingredient	Chemical composition	Nutritional quality	Number of sample
Co-products				
	Groundnut cake	Amino acids	Availability	1
		Energy	Energy	1
	Groundnut kernel meal	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Groundnut oilcake	Energy	Energy	1
	Maize germ meal	Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	1
	Maize gluten	Amino acids	Availability	1
		Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	1
	Maize gluten meal	Energy	Energy	1
	Mill run	Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	1
	Oat groat	Energy	Energy	1
	Oat meal	Energy	Energy	1
	Oil palm slurry	Energy	Energy	1
	Palm kernel cake	Energy	Energy	1
		Amino acids	Availability	2
	Peanut meal	Energy	Energy	1
		Proximate	Digestibility	1
	Peanut oil cake meal	Energy	Energy	2
	Peanut oil meal	Energy	Energy	1
	Peanut skins	Energy	Energy	1
	Poultry by-prod.meal	Amino acids	Availability	3
		Energy	Energy	3
	Rapeseed meal	Amino acids	Availability	9
		Amino acids	Digestibility	6
		Energy	Energy	11
	Rapeseed meal	Proximate	Digestibility	6
	Rice bran	Energy	Energy	6

Category	Ingredient	Chemical composition	Nutritional quality	Number of sample
Co-products				
	Rice polishings	Amino acids	Digestibility	2
		Energy	Energy	1
		Proximate	Digestibility	2
	Rice pollard	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Rubber seed	Energy	Energy	2
	Sesame meal	Energy	Energy	1
	Sheanut cake	Energy	Energy	1
	Soybean kernel meal	Amino acids	Availability	3
		Amino acids	Digestibility	5
		Energy	Energy	2
		Proximate	Digestibility	2
	Soybean meal	Amino acids	Availability	10
		Amino acids	Digestibility	20
		Energy	Energy	29
		Proximate	Digestibility	19
	Soybean oil cake meal	Amino acids	Availability	1
		Energy	Energy	2
	Sunflower meal	Amino acids	Availability	1
		Amino acids	Digestibility	8
		Energy	Energy	2
		Proximate	Digestibility	7
	Sunflower oil cake M	Amino acids	Availability	2
		Energy	Energy	8
	Vetch meal	Amino acids	Digestibility	1
	Wheat bran	Energy	Energy	4
		Proximate	Digestibility	1
	Wheat middlings	Amino acids	Availability	1
		Amino acids	Digestibility	2
		Energy	Energy	1
		Proximate	Digestibility	1
	Wheat pollard	Energy	Energy	1
Cereal				
	Amaranth	Energy	Energy	1
	Azolla	Amino acids	Digestibility	1

Category	Ingredient	Chemical composition	Nutritional quality	Number of sample
Cereal				
	Azolla	Energy	Energy	1
		Proximate	Digestibility	1
	Barley	Amino acids	Availability	2
		Amino acids	Digestibility	4
		Energy	Energy	57
		Proximate	Digestibility	6
	Common reed	Energy	Energy	1
	Maize	Amino acids	Availability	8
		Amino acids	Digestibility	25
		Energy	Digestibility	1
		Energy	Energy	42
		Proximate	Digestibility	31
	Maize(high lysine)	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Naked oats	Energy	Energy	3
	Oats	Amino acids	Availability	5
		Energy	Energy	40
		Proximate	Digestibility	10
	Pearl millet	Energy	Energy	2
	Proso millet	Energy	Energy	7
	Rye	Amino acids	Digestibility	1
		Energy	Energy	3
		Proximate	Digestibility	1
	Saltbush	Energy	Energy	1
	Sorghum	Amino acids	Availability	25
		Amino acids	Digestibility	37
		Energy	Energy	39
		Proximate	Digestibility	15
	Triticale	Amino acids	Availability	1
		Amino acids	Digestibility	5
		Energy	Energy	23
		Proximate	Digestibility	4
	Wheat	Amino acids	Availability	10
		Amino acids	Digestibility	29
		Energy	Energy	154
		Proximate	Digestibility	52

Category	Ingredient	Chemical composition	Nutritional quality	Number of sample
Cereal				
	Wheat (feed)	Energy	Energy	1
	Yellow maize	Amino acids	Digestibility	1
		Energy	Energy	4
Vegetable protein				
	African yam bean	Energy	Energy	4
	Alfalfa	Amino acids	Availability	1
		Energy	Energy	1
	Alfalfa meal	Energy	Energy	3
	Alfalfa protein concentrate	Amino acids	Availability	1
		Energy	Energy	1
	Aust. Sweet lupin	Amino acids	Digestibility	4
		Energy	Energy	1
		Proximate	Digestibility	4
	B. campestris	Energy	Energy	2
	B. napus	Energy	Energy	2
	Bitter vetch	Amino acids	Digestibility	2
	Canola	Amino acids	Availability	2
		Amino acids	Digestibility	2
		Energy	Energy	2
	Canola (full-fat)	Energy	Energy	1
	Chaya leaf meal	Energy	Energy	1
	Chickpea (general)	Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	1
	Cowpea	Energy	Energy	4
	Faba bean	Amino acids	Digestibility	2
		Energy	Energy	7
		Proximate	Digestibility	5
	Field beans	Energy	Energy	4
	Field pea	Amino acids	Availability	12
		Amino acids	Digestibility	2
		Energy	Energy	13
		Proximate	Digestibility	2

Category	Ingredient	Chemical composition	Nutritional quality	Number of sample
Vegetable protein				
	Jack bean	Proximate	Digestibility	10
	Lupin (general)	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Mungbeans	Energy	Energy	1
	Pea	Energy	Energy	6
		Proximate	Digestibility	6
	Pigeon pea	Energy	Energy	4
	Rapeseed	Amino acids	Availability	3
		Amino acids	Digestibility	1
		Energy	Energy	4
		Proximate	Digestibility	1
	Soybean	Amino acids	Availability	2
		Amino acids	Digestibility	5
		Energy	Energy	5
		Proximate	Digestibility	3
	Soybean (full-fat)	Energy	Energy	2
	Sunflower	Amino acids	Digestibility	1
		Energy	Energy	2
		Proximate	Digestibility	2
	Vetch	Amino acids	Digestibility	2
	White lupin	Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	1
Miscellaneous				
	Biscuit meal	Amino acids	Digestibility	1
	Dogfood scrap meal	Amino acids	Digestibility	1
	Gelatin	Amino acids	Digestibility	1
		Proximate	Digestibility	1

Attachment 4. Audit of the nutritional quality of feed ingredients for aquaculture species contained within the Australasian Livestock Feed Ingredient Database (ALFID).

Category	Ingredient	Chemical composition	Nutritional quality	No. of samples
Additives				
	Brewer's yeast	Energy	Energy	5
		Proximate	Digestibility	6
	Yeast	Proximate	Digestibility	1
	Yeast torula	Proximate	Digestibility	1
Animal protein				
	Albumin	Proximate	Digestibility	1
	Animal carcass residue	Proximate	Digestibility	2
	Blood meal	Amino acids	Digestibility	2
		Energy	Energy	1
		Minerals	Availability	1
		Proximate	Digestibility	21
	Blood meal(poultry)	Proximate	Digestibility	1
	Casein	Amino acids	Digestibility	1
		Amino acids	Availability	1
		Proximate	Digestibility	4
	Crab meal	Proximate	Digestibility	2
	Crab meal(whole)	Proximate	Digestibility	1
	Feather meal	Amino acids	Digestibility	1
		Energy	Energy	1
		Minerals	Availability	3
		Proximate	Digestibility	8
	Feather meal(chick&turkey,hog hair)	Proximate	Digestibility	3
	Feather meal(chick, turkey&duck)	Proximate	Digestibility	1
	Fish meal	Amino acids	Digestibility	4
		Proximate	Digestibility	10
	Fish meal (capelin)	Proximate	Digestibility	1
	Fish meal (Chili)	Proximate	Digestibility	1
	Fish meal (Danish)	Proximate	Digestibility	1

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Animal protein				
	Fish meal (Tuna)	Proximate	Digestibility	1
	Fish meal(anchovy)	Amino acids	Availability	1
		Energy	Energy	1
		Minerals	Availability	2
		Proximate	Digestibility	4
	Fish meal(British columbis herring)	Energy	Energy	1
		Proximate	Digestibility	1
	Fish meal(Chilean)	Amino acids	Availability	1
		Proximate	Digestibility	1
	Fish meal(Groundfish)	Energy	Energy	1
		Proximate	Digestibility	1
	Fish meal(herring)	Amino acids	Availability	9
		Amino acids	Digestibility	1
		Energy	Energy	10
		Minerals	Availability	2
		Proximate	Digestibility	17
	Fish meal(Jack mackerel)	Proximate	Digestibility	3
	Fish meal(Mackerel)	Energy	Energy	2
		Proximate	Digestibility	2
	Fish meal(Menhaden)	Amino acids	Availability	6
		Energy	Energy	1
		Minerals	Availability	5
		Proximate	Digestibility	12
	Fish meal(norse-LT94)	Amino acids	Availability	2
		Energy	Energy	1
		Proximate	Digestibility	2
	Fish meal(Norwegian herring)	Proximate	Digestibility	2
	Fish meal(Peruvian)	Minerals	Availability	1
		Proximate	Digestibility	1
	Fish meal(pilchard)	Proximate	Digestibility	3
	Fish meal(salmon scraps&offal)	Energy	Energy	1
		Proximate	Digestibility	1
	Fish meal(salmon)	Proximate	Digestibility	1
	Fish meal(silver hake)	Energy	Energy	1
		Proximate	Digestibility	1

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Animal protein				
	Fish meal(Triabunna Tas.)	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Krill meal	Proximate	Digestibility	2
	Lipromel	Proximate	Digestibility	1
	Meat & bone meal	Amino acids	Availability	1
		Minerals	Availability	2
		Proximate	Digestibility	11
	Meat & bone meal(beef)	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Meat & bone meal(lamb)	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Meat meal	Amino acids	Digestibility	1
		Amino acids	Availability	1
		Proximate	Digestibility	6
	Meat meal (shark)	Proximate	Digestibility	2
	Meat&bone meal(beef&pork)	Proximate	Digestibility	1
	Meat&bone meal(mixed anim.by-prod.)	Proximate	Digestibility	2
	Meat&bone meal(Mixed species)	Proximate	Digestibility	3
	Milk skim	Proximate	Digestibility	1
	Pancreas(glandular) meal	Proximate	Digestibility	2
	Poul.by-prod.meal&feather meal	Proximate	Digestibility	1
	Poultry meal	Amino acids	Digestibility	2
		Proximate	Digestibility	2
	Poultry meat meal	Proximate	Digestibility	1
	Poultry offal meal	Proximate	Digestibility	3
	Poultry viscera	Proximate	Digestibility	1
	Shrimp bran	Proximate	Digestibility	1
	Shrimp meal	Amino acids	Digestibility	1

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Animal protein				
	Shrimp Meal	Proximate	Digestibility	1
	Silkworm pupae	Proximate	Digestibility	2
	Spirulina meal	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Squid liver powder	Proximate	Digestibility	1
	Squid meal	Amino acids	Digestibility	1
		Proximate	Digestibility	3
	Whey powder	Energy	Energy	1
		Proximate	Digestibility	1
	Whey(cattle)	Proximate	Digestibility	2
	Whey(cattle-low lactose)	Proximate	Digestibility	1
Co-products				
	Barley dust	Proximate	Digestibility	1
	Bengal gram dust	Proximate	Digestibility	1
	Canola meal	Amino acids	Availability	1
		Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	5
	Canola meal(glucosinolate-free)	Energy	Energy	1
		Proximate	Digestibility	1
	Cottonseed kernel meal	Amino acids	Digestibility	1
		Minerals	Availability	1
		Proximate	Digestibility	5
	Cottonseed meal	Amino acids	Availability	1
		Proximate	Digestibility	7
	Fish solubles	Proximate	Digestibility	1
	Flaxseed meal	Proximate	Digestibility	1
	Gelatinised wheat starch	Proximate	Digestibility	2
	Lentil husk	Proximate	Digestibility	1
	Linseed meal	Amino acids	Digestibility	2
		Proximate	Digestibility	3

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Co-products				
	Maize flour	Proximate	Digestibility	3
	Maize gluten feed	Proximate	Digestibility	1
	Maize gluten meal	Amino acids	Availability	2
		Amino acids	Digestibility	1
		Minerals	Availability	2
		Proximate	Digestibility	11
	Maize(dis.soluble)	Proximate	Digestibility	1
	Mill run	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Milo(sorghum grain)	Proximate	Digestibility	1
	Mustard oilcake	Amino acids	Digestibility	1
		Proximate	Digestibility	2
	Pea protein concentrate	Proximate	Digestibility	5
	Peanut meal	Amino acids	Availability	1
		Amino acids	Digestibility	1
		Proximate	Digestibility	4
	Potato starch	Proximate	Digestibility	2
	Poultry by-prod.meal	Energy	Energy	1
		Minerals	Availability	3
		Proximate	Digestibility	9
	Pre-gelatinized starch	Proximate	Digestibility	1
	Rapeseed kernel meal	Minerals	Digestibility	4
		Proximate	Digestibility	4
	Rapeseed meal	Proximate	Digestibility	1
	Rapeseed protein concentrate	Energy	Energy	1
		Proximate	Digestibility	1
	Rice bran	Amino acids	Availability	1
		Proximate	Digestibility	6
	Rice flour	Proximate	Digestibility	3
	Rice mill feed	Amino acids	Availability	1
		Proximate	Digestibility	1

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Co-products				
	Rice polishings	Proximate	Digestibility	1
	Sesame meal	Amino acids	Digestibility	1
		Proximate	Digestibility	2
	Soybean CP-concentr.	Amino acids	Availability	1
		Proximate	Digestibility	1
	Soybean CP-isolate	Energy	Energy	2
		Proximate	Digestibility	2
	Soybean flour (dehulled)	Proximate	Digestibility	1
	Soybean husk	Proximate	Digestibility	1
	Soybean kernel meal	Minerals	Availability	2
		Proximate	Digestibility	6
	Soybean meal	Amino acids	Availability	4
		Amino acids	Digestibility	3
		Energy	Energy	2
		Minerals	Availability	1
		Proximate	Digestibility	28
		Proximate	Digestibility	2
	Tomato pulp meal	Proximate	Digestibility	1
	Wheat bran	Proximate	Digestibility	1
	Wheat flour	Minerals	Availability	2
		Proximate	Digestibility	8
	Wheat germ	Proximate	Digestibility	1
	Wheat gluten	Amino acids	Digestibility	1
		Proximate	Digestibility	6
	Wheat gluten meal	Minerals	Availability	2
		Proximate	Digestibility	3
	Wheat middlings	Amino acids	Availability	1
		Energy	Energy	1
		Minerals	Availability	2
		Proximate	Digestibility	10
	Wheat shorts	Proximate	Digestibility	2
	Wheat starch	Energy	Energy	1
	Wheat starch	Proximate	Digestibility	1

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Cereal				
	Maize	Amino acids	Availability	1
		Proximate	Digestibility	9
	Rice	Proximate	Digestibility	1
		Proximate	Digestibility	1
	Sorghum	Amino acids	Digestibility	1
		Energy	Energy	1
		Proximate	Digestibility	1
		Proximate	Digestibility	1
		Proximate	Digestibility	1
		Proximate	Digestibility	1
	Wheat	Energy	Energy	2
		Minerals	Digestibility	1
		Proximate	Digestibility	7
	Wheat(Aust. Std.wheat)	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Wheat(high protein)	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Yellow maize	Proximate	Digestibility	2
Vegetable protein				
	Alfalfa meal	Proximate	Digestibility	2
	Aust. Sweet lupin	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Canola	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Chickpea (desi)	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Cowpea	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Faba bean	Amino acids	Digestibility	1
		Proximate	Digestibility	1
	Field beans	Carbohydrates	Digestibility	2
		Proximate	Digestibility	2
	Field pea	Amino acids	Digestibility	1
		Carbohydrates	Digestibility	2
		Proximate	Digestibility	3

Category	Ingredient	Chemical composition	Nutritional quality	No. of sample
Vegetable protein				
	Lupin (general)	Proximate	Digestibility	1
	Pea	Minerals	Digestibility	1
		Proximate	Digestibility	7
	Soybean	Amino acids	Digestibility	2
		Carbohydrates	Digestibility	2
		Proximate	Digestibility	15
	Soybean (full-fat)	Amino acids	Availability	1
		Proximate	Digestibility	15
	Sunflower	Proximate	Digestibility	1
	White lupin	Amino acids	Digestibility	1
		Minerals	Digestibility	1
		Proximate	Digestibility	3
Miscellaneous				
	Gelatin	Amino acids	Digestibility	1
		Proximate	Digestibility	1

Attachment 5

The Australasian Livestock Feed Ingredient Database

Business Plan Example

Submitted by:

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Abstract

The Australasian Livestock Feed Ingredient (ALFI) database improves both the quality and quantity of information available on the nutritional value of feed ingredients. It is the first product developed to meet a strong industry demand for comparative information on feed ingredient quality and will represent the industry standard for feed ingredient information. ALFI can be delivered to industry using the Internet, on computer disk or via print media and a keen market already exists for the product.

Table of contents

Executive summary

The business plan was created for the Australasian Livestock Feed Ingredient (ALFI) database. The document covers both business and marketing issues vital to commercial success of the database. The following key aspects of the business plan are presented below :

1.   Description of the business opportunity

- The database is the first of its kind in the world for any livestock species.
- There is an opportunity to establish new feed ingredient standards for livestock.
- The product creates the chance to become a solid market leader due to its innovative nature and accessibility.
- The proposed database is planned to be part of an existing R&D activity.
- Constant updates and improvement of the product will secure its role as the only source of reliable information on feed ingredients.

2.   Demonstration of the capability of the team

- Broad experience in delivering research outcomes to the industry.
- Technical expertise in the fields of animal nutrition, project management and computer programming.
- Continuous contact with and knowledge of Australian rural industries.
- Access to modern research facilities and up to date research data.
- Changing stages of the product development and changing roles of the project participants : product testers become product marketers and clients; designers and creators become expert advisers.

3.   The marketing strategy

- Analysis of the external market environment and understanding of the Australian feed grain industry reveals the real need for the product.
- Market segments for the product are created based on the benefits sought by the three identified groups of customers: "Formulators", "Explorers" and "Traders".
- Detailed identification of economic and intangible benefits delivered by the database to the customers.
- Product audit and market testing is supported by the assessment of relative advantage and the SWOT analysis of the ALFI database.
- The marketing objectives are formed and followed by the original plan of the strategies in the areas of product, price, place and promotion of the database.

4.   Financial matters

- The estimated financial predictions over the next three years reveal the product as a potential source of income.
- Further study is required to evaluate financial performance in more detail and take into account all aspects of the business.
- The use of scenario analysis and calculation of NPV (or IRR) will be helpful.

Introduction

In the year 2000, Australian livestock will consume 19650 kt of feed including 8680 kt of cereals, 810 kt of pulses, 680 kt of grain meals, 640 kt of other protein meals, 140 kT of cottonseed and 8700 kT of roughage and additives. Feed accounts for the largest proportion of industry operating costs, especially for intensively housed livestock. Any improvement in the efficiency of use of feed ingredients will have great benefit for the Australian livestock industry.

To improve the nutrient utilisation efficiency of livestock, the animal producers, stockfeed manufacturers and grains producers need a large amount of information on the chemical composition and nutritional quality of feed grains. To meet these requirements, development of an interactive, computer-based database on chemical composition and nutritive value of feed ingredients is essential.

There are a number of databases available in Australia and overseas on the nutritional quality of feed ingredients. However, these databases are not interactive, are hard to access, lack consistency in the information supplied and the format of supply. There is a large variation in the data within existing databases due to lack of information on source and range of the raw ingredients, methods used for obtaining the data, and the storage and processing methods of the ingredients. To overcome the disadvantages of the existing databases and to deliver information on the nutritional quality of feed ingredients to the grains and livestock industries, a number of Australian research and development corporations including the Rural Industries Research and Development Corporation, the Pig Research and Development Corporation and the Grains Research and Development Corporation, funded the development of an interactive, computer-based database on nutritional quality of grains for livestock, the *Australasian Livestock Feed Ingredient (ALFI) Database*. This database supplies detailed information on growing environment of the ingredients, how the ingredients are stored and processed, physical features of the ingredients and the methodology employed for chemical analysis and nutritional evaluation, chemical composition (proximate, amino acid profile, starch, non-starch polysaccharides, fatty acids, soluble and insoluble sugars, vitamins, minerals, anti-nutritional factors and toxins) and nutritive value (nutrient digestibility and availability) of feed ingredients.

The ALFI database offers the facilities for users to compare species or varieties within a location or between locations, to search data for a particular region, to retrieve data collected from a particular laboratory or contributed by a particular researcher, and to communicate with researchers. All these features ensure that users will get information relevant to their livestock feeding situation, which will result in an improvement in feeding efficiency and reduced livestock feed costs. The ALFI database has the facility to output datasets for use with "in-house" databases as text or in an excel file format. Database access via the Internet will ensure that the database is truly interactive and the latest information is always accessible.

The ALFI Database is the first of its kind in the world for any livestock species. It is hoped that wide adoption of this database, and efficient, low-cost adaptation to existing "in house" systems will make the ALFI Database a national standard for stockfeed manufacture. This database will be targeted towards Australian plant breeders, grain growers, commodity marketers, nutritionists, stockfeed manufacturers, livestock producers and government institutions. Similar targets are also perceived overseas, particularly in Asia. On this basis, there are many thousand potential clients and contributors to the ALFI database.

Mission statement

Our main role is to provide service to a variety of primary industries including the areas of livestock, crops, horticulture and aquaculture sectors. These service activities comprise of undertaking applied research and development and delivering innovative and cost-effective technologies to the industry.

One of the major areas of our activities is to identify and evaluate the quality of various feed grains commonly used by livestock and plant industries.

Feed constitutes a significant portion of the overall production costs in the livestock industries. The accurate assessment of grain quality is critical to grain breeders and growers. To improve the nutrient utilisation efficiency, the following fundamental needs of the industry will be achieved:

- Comprehensive information on the chemical composition and nutritional value of feed grains for all livestock species,
- A set of common feed grain standards,
- Specifications on the grain quality requirements,
- Specifications on the most appropriate quality parameters,
- Providing a quality assurance program for feed grains.

Precise information on the value of feed ingredients is economically essential to the end-users. Applied research and developing new technologies and tools in this area is designed to solve the industry's problem of optimising the efficiency of use of limited feed grain supplies. However, the information delivered in the database may only serve as a background for decision making (eg animal diet formulation). ALFI is seen as a solution to the problem of *uncertainty* about the nutritional value of feed grains. The delivery of accurate information is only an intermediate solution to a wider problem of low production efficiency .

PPPI possesses an array of essential skills and capabilities to succeed in this project, which include:
- Proven record in managing and conducting applied research for primary industries including the evaluation of nutritional value of feedstuffs,
- Experience in delivering research outcomes to the industry,
- Highly educated/trained and motivated staff,
- Access to excellent technical expertise and a modern research infrastructure,
- Up to date information on the industry trends and requirements achieved through industry training activities, research seminars, advisory activities etc.

The *distinctive* ownership compared with competitors, seems to be an access to an incomparable amount of research data derived from Government funded research projects. This ownership, in conjunction with the direct involvement from other public sector organisations, creates one of our major distinctive competences and competitive advantage.

Marketing audit (external)

Global trends

According to ABARE, feedgrain demand in Australia is about 10 million tonnes p.a. and is forecast to increase at a rate of 3 % per annum.

The future of Australia's feed grain industry is closely linked to domestic and international livestock industries and is ultimately dependent on demand for livestock products by human consumers. The growth prospect of the industry primarily lies in overseas markets with the major influencing factors being:
- Fast growth of incomes and population in developing countries resulting in increased consumption of animal products
- Liberalisation of international trade due to agreements reached at the GATT and APEC

For the above reasons the future increase in global demand for feedstuffs is expected.

The Australian stock feed industry

The feed grain industry in Australia is diverse and serves a variety of livestock species. The industry structure is presented in Appendix1.

Approximately half of the feed grain supply is utilised by the integrated large-scale producers and formal manufacturing industry. The stockfeed manufacturing industry is concentrated. The big industry players include Ridley Agriproducts, Wesfeeds and Milne Feeds to mention a few. There is also a large number of small operators serving regional markets. The industry entry/exit barriers are relatively low. The switching costs for feed-using industries are insignificant with little brand loyalty. As a result, the strong competition in the industry is along the dimensions of low price and quality of service.

The current major characteristics and key driving forces in relation to the Australian feed grain industry are summarised in Appendix 2.

Market for the product

The broad livestock feed industry consists of various members, whose business roles are quite diverse. The value creation chain and simplified interrelationships between different sectors of the industry are schematically presented in Appendix 3.

The production of livestock feeds involves an interlocking network of disciplines, all of which require information on the quality of raw materials used to produce animal feed. The ALFI database is a product delivering this precise and comprehensive information to the users. The market for this product can be defined as a "feed ingredients technical information". The final *consumer* of the database information is a livestock producer with other members of the chain being only intermediate *customers* for the product.

Market segments

The proposed market segments are created based on the specific benefits sought by group members in <u>any</u> feed ingredient database. The selected segments form the following broad groups of customers:

Group A ("Formulators")	Group B ("Explorers")	Group C ("Traders")
• Feed manufacturing industry • Livestock producers (who home mix) • Industry consultants	• Scientists (R&D, education) • Plant breeders • Research consultants	• Grain growers • Grain and ingredients merchants

It should be noted that:

- It is practical to subdivide some group members into microsegments eg. Livestock producers > poultry producers > layers and/or broilers or scientists/consultants > specialisation in ruminants and/or monogastric animals),
- Consultants in groups A and B often may not be serving one group only,
- It is anticipated that the level of generated profits from the segments will be : Group A : 75%, Group B : 20% and Group C : 5%.

Analysis of benefits

The results of the analysis of benefits sought by identified segments are presented below.

Group	Product features	Advantages	Benefits sought
A	• Quality/quantity of data • Compatible with diet formulation programs and in-house databases	• Improved knowledge of nutritive value • Comparative quality tool	Increased efficiency in feed and animal production = Economic benefits (*)
B	• Comprehensiveness of the database • Ability to input own data • High quality of data • Built-in reference database	• Better evaluation of nutritive value • Identifies gaps in knowledge • Covers multiple disciplines	Research and educational benefits, data storage place, + formulation of new research projects = Intangible benefits
C	• User friendliness • Internet compatible • Built-in comparison system	• Definite commodity information	Base standard for grain quality based payment = economic benefits

(*) Group A : Final economic benefit is delivered by applying feed formulation programs. The feed ingredient database serves as a background information for the diet formulation and does not <u>directly</u> produce economic benefits.

Marketing audit (internal)

The product

The ALFI database is a unique computer-based database providing all the information that is necessary to adequately define the true nutritional quality of a feed ingredient. The fundamental benefit from using the database is an improved efficiency of use of feed grains in livestock industries.

The detailed description of the product broad content as well as its relative advantages are presented below.

Description :

The ALFI database is the first computer-based interactive nutritional database developed for the Australasian livestock feed industry. The database links chemical composition of feed ingredients to the nutritive value of ingredients for individual animal species. The database includes: information on chemical composition and physical properties of the samples, their nutritive value, growing conditions, reference database and feed ingredient data file. The database intentionally does not include a diet formulation function.

Product purpose :

As a standardised feed ingredient database, the ALFI database will substantially reduce the variation associated with nutritional parameters that can not be measured routinely.

Product type :

Business-to-business specialty product/service with unique characteristics

Product content :

Core product : <u>information</u>, physically delivered by:
(options) computer software – CD-ROM; floppy disks; hard copy; telephone; Internet

+   professionally designed packaging
high quality guide/manual
after sales service (on line helpdesk, troubleshooting)nutritional/ technical advice and updates
continuous modernisation of the database
product warranty
immediate availability

+   strong (promoted) brand name of the product
reputation of the developers

=   product of high quality and good performance

Testing and assessment

- The database was designed by incorporating the desired features defined in an initial planning workshop. The participants represented all three target segments with the majority from Groups A and B.
- The first version of the database with a sample dataset was demonstrated to an international audience at a professional conference (APSA). Responses and feedback resulted in some modifications to the product's design and content.

- Copies of the beta-version of ALFID together with a detailed feedback form have been sent out to potential users. All comments and constructive suggestions resulted in actions/responses from the development team.

The relative advantages

There is a number of feed ingredient databases available in Australia and overseas. However, it should be emphasised that there are currently no product competitors in the market place which enable us straightforward comparison. All possible comparisons are made in relation to existing standards. A shortened list of commonly used databases is presented in Appendix 4.

These databases are often published in book form and contain nutritional information based on small subsets of information collected over the last fifty years. None of the existing databases provide all the information that is necessary to adequately define the true nutritional quality of a feed ingredient. All (known to us) competitors very often present conflicting and varying information about the value of the same feed ingredient.

The major technical features which are of significant magnitude to the most important groups (A, B) of users are comparatively summarised in Appendix 4.
NB: the term "existing databases" refers to the possibly most advanced alternative product.

SWOT analysis of ALFI

	Group	A	B	C
Strengths				
• technologically advanced quality product		3	3	
• initial design to customer specifications, market tests and assessment		3	3	
• expertise, experience and skills in the field		3	3	
Weaknesses				
• financially not solid (limited funding), continuous reliance on external support		3	3	3
• lack of market research activities (eg precise assessment of the market size)		3	3	3
• not all animal species covered by the database (reason : funding)		3	3	3
• no product customisation (everything for everyone)		3	3	3
Opportunities				
• target specific group of users + educate potential users		3	3	3
• alliances with diet formulation software manufacturers		3	3	
• alliances with feed additives manufacturers		3	3	
• become an expert and adviser and not only a developer/publisher		3	3	
• open overseas markets for the product		3	3	
Threats				
• domestic market may prove too small to break even		3	3	3

- possible copyright legal problems (sourcing the database information)   3   3
- decline of the market (less members)   3   3

Marketing objectives

- To complete the development of the ALFI database and to <u>customise</u> it to the requirements of different beneficiaries in the existing Australian market.

- To establish the database as a national feed ingredient <u>standard</u> and to replace, and where technically possible absorb, other currently utilised databases.

- To ensure that the database is available and offered to <u>100%</u> of sectors of the Australian feed and animal industries

- To actively penetrate and develop an international market for the ALFI database (NZ, Asia)

The quality and comprehensiveness of the easily accessible data offered to the users by the ALFI database constitute its distinctive characteristic as compared with competitors. The number one attribute, however, appears to be relative *credibility* of this product. Promoting that attribute may form the so-called unique selling proposition for the database and its brand name. As a consequence, the name ALFI database will attract all three market segments simultaneously.

The proposed competitive strategy for the ALFI database and its publishers would be a broad differentiation strategy. This business approach would aim to differentiate the database from its substitutes and appeal to an extensive cross-section of buyers in the three market segments.

The major features of the above strategy for the ALFI database are broadly presented in Appendix 5.

Business model

The ALFI database follows the pattern of New Product Development Process commencing with idea generation and reaching the point of test marketing and finally commercialisation. As the result, the business model of the ALFI is being also changed as the product gradually enters the final stage of its development. The outline of the model and the corresponding working teams are briefly presented below :

I.   Development stage (current)

Team members	Roles
1. SARDI PPPI R&D team	- Securing R&D finance of the project + suprvision - Generating design and content ideas - Scientific research - Programming + physical creation of ALFI
2. Various testers of the β version of the database	- Testing the prototype product - Constructive suggestions and comments

II.   *Commercialisation stage (final)*

Team members	Roles
1. Commercial partner eg.**DSL**-commercial arm of CSIRO (success story with AUSPIG software)	All aspects of marketing the ALFI database (to be furher defined)
2. SARDI PPPI R&D team	Focusing on core competence • Technical/scientific product support • Continuous development, up-grades and additions • Expert advise and after sales support, troubleshooting • Product improvement

Strategies

The key marketing strategies in relation to *product, price, place and promotion* are described below.

Product related strategies

- Include the data for other animal species – this is the most important task with the intention of fully attracting various customers and successfully competing
- Create the database structure, which consists of the following major components:
  1. The frame (or the "skeleton") of the database – i.e. stripping away any extras/details and creating only a basic database environment / platform

  2. The modules, which are animal species specific. They will be offered separately and sold with the frame as requested by the customer.

The basic offered software package would be for example: " **frame + poultry module**"

The proposed structure will deliver the following benefits:

- Customisation of the database
- The database can be launched and sold, and the modules are offered as they gradually become available.
- This step-by-step process will help establish the product's name on the market and ultimately become the industry standard.
- Commanding higher profits from sales as compared to the complete (universal) database

- Design and develop two versions of the ALFI database:

  1. "Professional": full version of the database containing all information.
        This version will be designed mainly for Group B customers.

  2. "Standard": basic, simplified version containing only major features. This version can be upgraded to the professional version.

- Create supplements (additions) which are delivered periodically – eg when licence fee payment is due

- Full integration with the most commonly used feed formulation computer software packages. This is an important consideration given the following:

    - prospective adding value to the database and broadening of its customer base
    - a diet formulation software and this database (a supporting tool) could be offered and promoted together under some arrangements

Price related strategies

Given the innovative features of the database and its differentiation, the currently estimated market value needs to be reviewed and precisely defined. At present, this product has technically no equivalent in the marketplace and should not be undervalued. It is proposed that the database is offered at a premium price considering its uniqueness, specialised nature and a relatively small Australian market that could limit the sales volume.

The database is positioned as a high-quality, exclusive item resulting from a lengthy R&D process. Premium price for this product will be one of the signals of its high value to the customers. Demand for the database is likely to be relatively price inelastic and there is still little known about exact costs of manufacturing and marketing of the product. In these circumstances, it is suggested to apply a skimming pricing policy of high initial price that is moving down at a slow rate.

Some practical issues regarding a price charged for the database are as follows:
- There are two parts of the price:
- Initial price paid for the product
- Price paid periodically for the licence to use the database
- Downloading parts/full of the database off the Internet will be payable on per page/section basis
- The price level will be related to the version of the database ie. the "Standard" version will command lower price than the "Professional" version
- Each module (animal species) of the database should be priced and sold separately

Place related strategies

- Mail delivery system or optional personal installation with a short training
- Continuous availability of the database (all available versions and modules) - the level of stock held is subject to forecasting experience
- Prompt order processing system
- The use of intermediaries should be considered with international distribution of the ALFID
- The Internet: its growing marketing potential should be recognised and considered as a data delivery tool. However, detailed investigation is necessary to ensure that sales of CD-ROM based software are not jeopardised. Some relevant factors in this matter include market coverage, copyright issues and payment system.
- A hard copy version of the whole database should not be currently considered a distribution option. The general reason lies in the unique character of the ALFID - a modern, interactive computer based information. From practical point of view, a book version could significantly reduce sales of the ALFID due to threat of photocopying.

Promotion related strategies

It is suggested that the major objective of the promotion of the database is to <u>demonstrate</u> its unique characteristics and quality in the context of the requirements of the targeted groups of users.
The following points relate to promotional activities:
- obtain more detailed information on numbers and characteristics of customers in each target group
- advertisements in professional press, publications and the industry related events
- personal presentations of the product
- a known expert's opinion on the database should be displayed on the packaging and promotional materials
- produce a short demo version of the database on CD-ROM and/or diskettes .This should include a sharp graphical demonstration of major benefits ("monetary"; "scientific"), delivered to the customers by the user-friendly ALFI database.

Budget

The following is an outline of the budget with suggested income and estimated expenditure as a result of this business plan. The assumed selling price is $2,000 for a basic software package and $500 as a licence fee. For simplicity of this preliminary budget exercise other sources of income/expenditure (such as distribution on the Internet) were not included.

Year	1	2	3
Number of copies purchased	50	80	100
Number of users (licences)	50	130	230

Estimated costs ($)

	1	2	3
• Additional programming			
Modules separation			
Internet			
Linkage to other databases	45000	-	-
Demo CDs			
• Personel salary (1 person)	50000	50000	50000
• Software (CD) manufacturing	500	800	1000
• Promotional materials (5%)			..
Advertisements			
Conferences	5000	9250	12000
Industry displays			
• Data acquisition	2000	2000	2000
• User training	5000	8000	10000
• After sale service			
Helpdesk	2500	6500	11500
Troubleshooting			
• IP/Royalties (5%)	5000	9250	12000
Total costs	115000	85800	98500

Revenue potential ($)

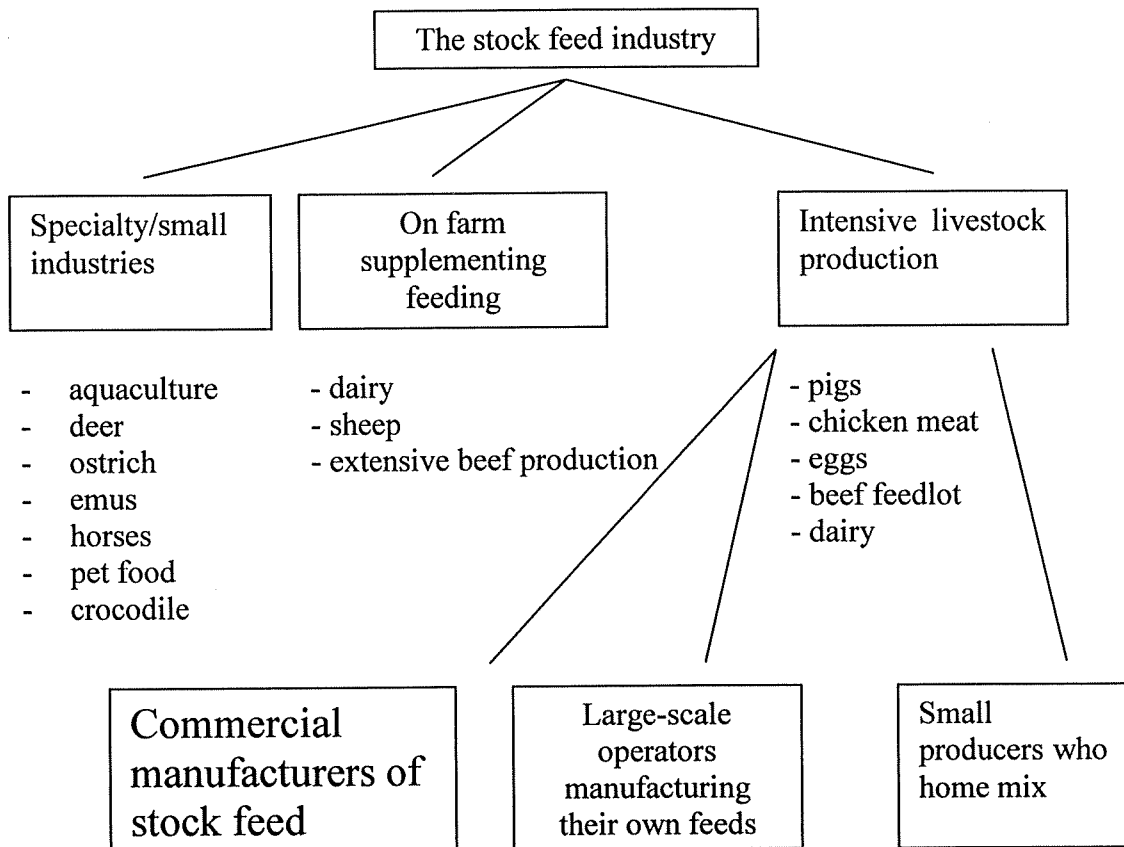|	1	2	3
Copies purchased	100000	160000	200000
Licence renewals	-	25000	40000
Total revenue	100000	185000	240000

Appendix 1

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                    ┌─────────────────────────┐
                    │  The stock feed industry │
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Specialty/small industries	On farm supplementing feeding	Intensive livestock production

-   aquaculture
-   deer
-   ostrich
-   emus
-   horses
-   pet food
-   crocodile

- dairy
- sheep
- extensive beef production

- pigs
- chicken meat
- eggs
- beef feedlot
- dairy

Commercial manufacturers of stock feed	Large-scale operators manufacturing their own feeds	Small producers who home mix

Figure 1. The structure of the feedstock industry

Appendix 2

Table 1. Key characteristics of the Australian feed grain industry

| Key factors	Major characteristics
1. Changing industry structure	- increasing concentration - more efficient feeding practices - increase in slaughter number - incorporation of new grains into feed rations
2. Increasing feed efficiency due to :	- genetic improvements of plants and animals - increasing knowledge about raw material composition for more precise diet formulation - benefits from using enzymes: improved animal performance, more economic and flexible use of grains, use of minor ingredients and by-products; overall: more grains consumed
3. Environment influences	- reducing the problem of effluent = more grain consumed over other feedstuffs
4. Nutritive qualities	- poor information on grain quality and nutritional composition of feed grains (reliance on "averages") - wide quality variation between/within varieties, and between/ within regions - increasing focus on higher quality crops versus higher yielding crops - plant breeding for higher nutrient content and reducing anti-nutritional factors (eg pulses) - more focus on pricing system based on quality parameters
5. Changing of customer demand	- greater consistency of raw material required - increased demand for specialty products (eg low fat products) - greater emphasis on quality parameters of feeds such as protein and vitamin content - more specialised, customised and performance specific animal feeds are now required
6. Differing growth rates of end users	- eg growth in beef and diary industries = increased importance of barley and sorghum as feed ingredient
7. Development in feed analysis and diet formulation	- least cost linear programs for diet formulations - new laboratory techniques and technologies
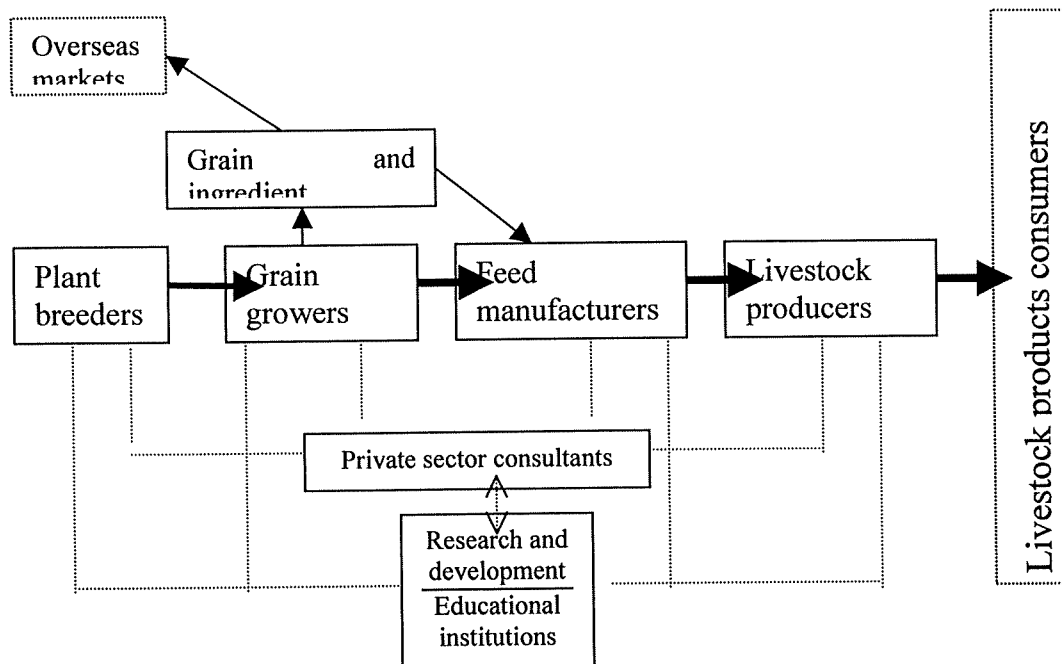
Figure 2. Livestock feed value chain

Appendix 4

Some of the most commonly used feed ingredient databases are:

- SCA Feeding Standards for Australian Livestock (1987)
- AUSPIG Feed Ingredient Database (1994)
- Scientific publications
- Nutrition Company/Proprietary databases

Table 2. Technical comparison of databases

Feature (content)	Existing databases	The ALFI database
Country of origin, range of values, growing conditions etc	No	Yes
Most recent data based on latest scientific advances	No	Yes
Type of methodology used to obtain nutritional value	No	Yes
Rich nutritional data on most commonly used grains	No	Yes
Interactive tool, computer-based, easy to update, and review	No	Yes
Common way of expressing the results	No	Yes
Easily accessible	No	Yes
Information on potential anti-nutritional factors	No	Yes
Information on higher quality grains in the feed market	No	Yes
Consistency in definition of co-products	No	Yes
Available for all major intensively farmed animal species	Yes	No

Appendix 5

Table 3. The major features of the marketing strategy for the ALFI database

Strategies

1. Targeting a broad cross-section of the market – various types of users.

2. Competitive advantage reached by distinctive features – eg. interactiveness.

3. Several variations of the database and wide selection of the options available.

4. Commanding a premium price due to successful differentiation.

5. Communicating the points of difference in the offered product.

6. Stressing constant improvement and regular updates of the database.

7. Monitoring/supporting the database performance – creating reputation and brand image.

Proposed promotional and

presentation material

for the:

Australasian Livestock

Feed Ingredient Database

(ALFID)

ALFI Database - Postcard (front)

ALFI DATABASE

Australian Pork LIMITED · FISHERIES RESEARCH & DEVELOPMENT CORPORATION · GRDC · RIRDC RURAL INDUSTRIES RESEARCH & DEVELOPMENT CORPORATION · SARDI RESEARCH AND DEVELOPMENT

Announcing a new tool for growers, suppliers, and researchers in the pig, poultry and aquaculture industries, the *Australasian Livestock Feed Ingredient Database*.

www.alfidbase.com

ALFI Database - Postcard (back)

ALFI DATABASE

The Australasian Livestock Feed Ingredient Database (ALFI) provides practical and detailed information on the nutritional quality of feed ingredients for use in pig, poultry and aquaculture diets.

The ALFI database is computer-based and contains more than 20,000 entries relating to the chemical, physical and nutritional composition of a wide range of feed ingredients. It is available as either a CD-ROM complete with instruction manual or via an e-mail subscription service.

A full demonstration of the ALFI database, together with purchase details or e-mail subscription service information can be found at our web-site: **www.alfidbase.com**

ADDITIONAL INFORMATION IS AVAILABLE FROM:

BARNEVELD NUTRITION PTY LTD
19-27 Coonan Road South Maclean Qld 4280
Phone 07 5547 8611 **Fax** 07 5547 8624 **Email** rob@barneveld.com.au

SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE
Pig and Poultry Production Institute, Roseworthy, SA, 5371
Phone 08 8303 7787 **Fax** 08 8303 7977 **Email** alfi@saugov.sa.gov.au

www.alfidbase.com

ALFI Database - CD Folder (front & back covers)

Australasian
LIVESTOCK
Feed Ingredient
Database

www.alfidbase.com

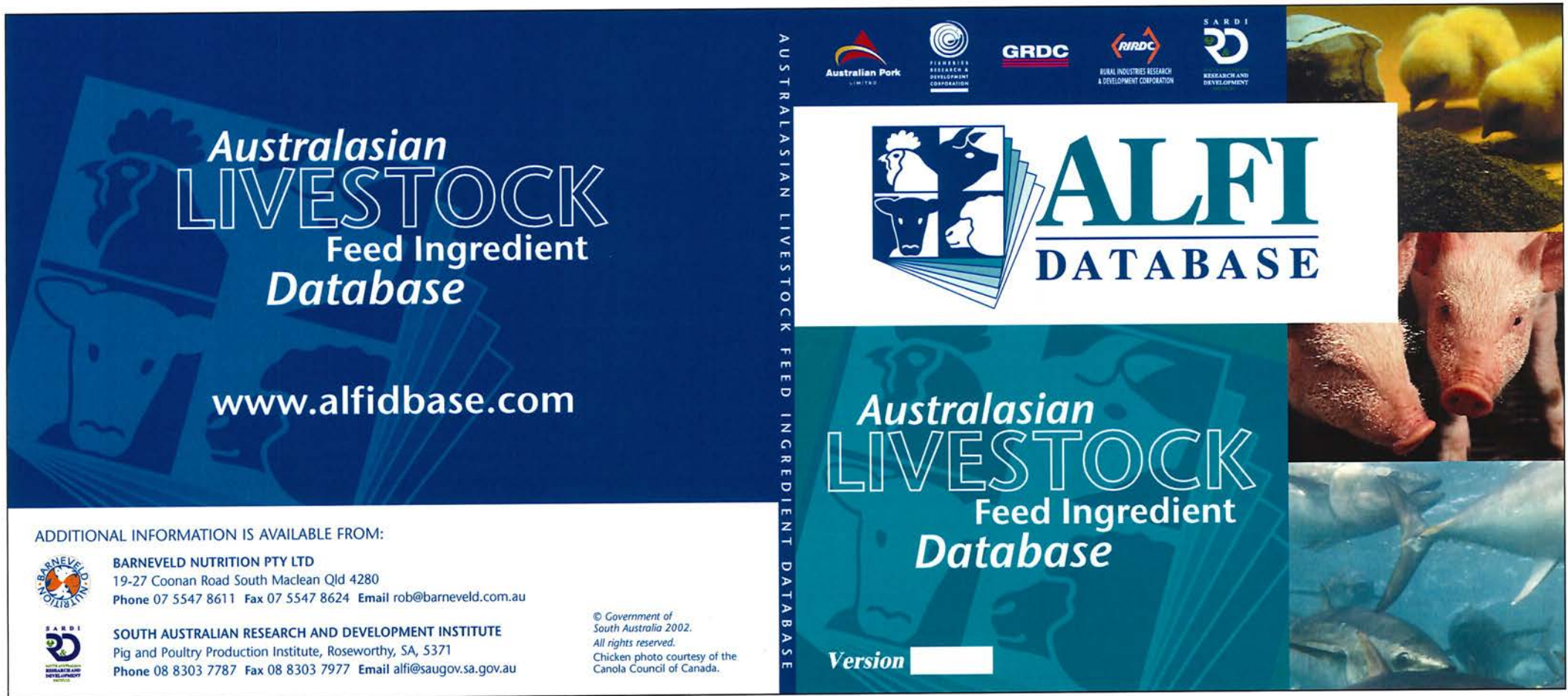ADDITIONAL INFORMATION IS AVAILABLE FROM:

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GRDC

Australian Pork LIMITED

RIRDC
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SARDI
RESEARCH AND
DEVELOPMENT

ALFI
DATABASE

Australasian
LIVESTOCK
Feed Ingredient
Database

Version

ALFI Database - CD Folder (inside & pocket)

AUSTRALASIAN LIVESTOCK FEED INGREDIENT DATABASE

Produced under the auspices of Australian Pork Ltd, the Grains Research and Development Corporation, the Rural Industries Research and Development Corporation (Chicken Meat and Egg Industry Research and Development Committees) and the Fisheries Research and Development Corporation by the South Australian Research and Development Institute and Barneveld Nutrition Pty Ltd
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SYSTEM REQUIREMENTS

To run the ALFI database, you need the following minimum configuration:

- An IBM-compatible computer with a minimum of 486 DX or higher (Pentium is recommended).
- A hard disk with 150 MB of free disk space for the whole ALFI database (120 MB for the pig, poultry and aquaculture components when supplied as separate modules).
- A VGA or compatible display (VGA or higher is recommended).
- 16 MB RAM, preferably 32 MB or higher.
- Microsoft Windows 95/98, Windows NT 3.5 or later.

INSTALLING THE ALFI DATABASE

Windows 95/98 or Windows NT from CD:

- Start Windows 95/98 or Windows NT.
- Insert CD in CD-ROM drive.
- From the Start menu choose Run.
- Windows displays the Run dialog box.
- Type x:setup.exe in the Command Line box (where x is the letter for your CD-ROM drive).
- Follow the setup instructions on the screen.

ALFI DATABASE

Australasian LIVESTOCK
Feed Ingredient
Database