



How to choose a pelleted product: Manufacturer portfolios, feeding instructions, product promotion and nutritional knowledge

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Clinic
of Zoo Animals, Exotic Pets and Wildlife



Choosing a specific diet I

- Following your own specifications (basically, having a nutritionist on your payroll):
 - knowledge of requirements
 - concept of feeding regime

*=> look for a diet that meets your specifications
or*

=> have a diet produced according to your specifications

Commercial manufacturers are suppliers of a choice or service, but not consultants.

Catalogues are only a selection of your choice of options (which you might want to expand by ordering the production of a specific diet).



Choosing a specific diet II

- You do not really know

=> check (amongst other sources) manufacturer catalogues for potential solutions

=> ask manufacturer or retailer for suggestions

Commercial manufacturers are suppliers and also consultants.

The dilemma typically is that consultation is considered a free service and manufacturers can only earn money if selling their products.





The overriding question

- How do you judge whether a manufacturer is not only a trustworthy supplier but also a trustworthy consultant?

=> look of web page/catalogue

=> correctness completeness of information

=> the nutritional approach / philosophy communicated by the portfolio, the advertisement, the recommendations

Or, as commercial manufacturers, how do you convince potential clients that you are a trustworthy consultant?



Correct information



Correct information

- Are there evident mistakes in the given information?



Correct information

HIGH FIBER PRIMATE DIET

9021

This diet is designed to be fed as the sole source of nutrition for ALL primates with the exception of tamarins and marmosets. This diet incorporates all of the latest innovations and technical developments.

- * No wheat gluten product
- * All vegetable—no animal fat or protein
- * Patented source of vitamin C with a shelf life of near-infinity
- * Extended shelf life—if properly stored, up to six months
- * Higher fiber content—typically testing 18 to 20 percent ADF (acid detergent fiber)
- * All natural source of vitamin E (d-alpha-tocopherol)
- * Low iron content
- * Probiotics (*Lactobacillus acidophilus*, *L. casei*, *Bifido*, and *Enterococcus faecium*)
- * Metal Amino Acid Complex added for chelate mineral benefits
- * Form and texture which promotes good gum health and reduction in dental plaque

FEEDING DIRECTIONS

Feed as sole source of nutrition but if produce or browse is fed, the HIGH FIBER PRIMATE DIET should comprise no less than 50% of dry matter intake. Eliminate or severely limit the feeding of high sugar and high carbohydrate produce such as bananas, grapes, and oranges. Use leafy fibrous items such as kale, celery and lettuce.

Adult consummation rate is approximately 1 pound for each 30 pounds of body weight. This will vary from animal to animal and should be used as a rough guide only.

INGREDIENTS

GROUND CORN, DEHYDRATED ALFALFA, CORN GLUTEN, SOYBEAN MEAL, SOYBEAN OIL, GROUND SOYBEAN HULLS, LIMESTONE, ZINC OXIDE, SALT, MANGANOUS OXIDE, COPPER SULFATE, DICALCIUM PHOSPHATE, CHORINE CL, DRIED LACTOBACILLUS ACIDOPHILUS FERMENTATION PRODUCT, L-LYSINE, BIOTIN, SOURCE OF VIT. C, METAL AMINO ACID COMPLEX, YEAST CULTURE, VIT. E SUPPLEMENT, NIACIN SUPPLEMENT, CALCIUM PHOSPHATE, MANGANESE OXIDE, CALCIUM IODINATE, COPPER SULFATE, ZINC OXIDE, SODIUM SELENITE.

CALCULATED NUTRIENTS

CRUDE PRO.....23.80% MIN
CRUDE FAT.....4.60%
CRUDE FIBER.....9.00%

ASH.....6.20%
ME.....2598.70CAL/kg
CALCIUM.....0.90%
PHOSPHORUS.....0.62%
POTASSIUM.....0.84%
SODIUM.....0.21%
COPPER.....11.80PPM
IODINE.....0.60PPM
IRON.....300.00PPM
MAGNESIUM.....2305.00PPM
MANGANESE.....45.00PPM
POTASSIUM.....0.80PPM
SELENIUM.....0.02PPM
ZINC.....111.11PPM
VITAMIN D3.....1.5IU/g
VITAMIN A.....25.60IU/g
VITAMIN E132.0IU/kg
BIOTIN.....0.09mg/kg
CHOLINE.....1145.00mg/kg
NIACIN.....46.00mg/kg
PANTOTHENIC.....22.00mg/kg
RIBOFLAVIN.....9.00mg/kg
THIAMINE.....4.00mg/kg
VITAMIN B12.....0.02mg/kg
VITAMIN C.....100.00mg/kg



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Correct information

Browser Rhino Plus Diet

Description

Mazuri® ZuLife® Browser Rhino Plus Diet is a nutritionally balanced starch-, phosphorus- and iron- controlled blended diet designed for captively managed herbivores with increased energy demands.

Features and Benefits

- **Nutritionally balanced.**
- **High in fermentation fibers** - Provides energy and supports healthy rumen.
- **Starch controlled (<4.0%).**
- **Reduced phosphorus and iron formulation.**
- **Highly palatable** - Enhanced by beet pulp and molasses addition.
- **Contains flaxseed** - Source of Omega-3 fatty acids.
- **Naturally preserved with mixed tocopherols.**



Product Form

Wet pelleted feed: ¼" diameter x ½" to ¾" length, with molasses.

- 40 lb. net weight paper sack

Catalog

0041949

Guaranteed Analysis

Crude protein not less than 13.0%
Crude fat not less than 7.5%
Crude fiber not more than 30.0%
Ash not more than 9.0%

Calcium not less than 0.55%
Calcium not more than 1.05%
Phosphorus not less than 0.40%
Salt not less than 0.15%
Salt not more than 0.65%
Sodium not more than 0.85%



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Wet pelleted feed: 1/4" diameter x 1/2" to 3/4" length, with molasses.

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Information policy

Ingredients

Soya Bean Meal, Soya Oil, Molasses, Oat Byproduct, Grass Meal, Cellulose Powder, Vitamin and Mineral Premix.

Soya Bean Hulls, Lucerne, Oat Hulls and Bran, Dehulled Extracted Toasted Soya, Molasses, Soya Bean Oil, Minerals and Vitamins.

Ingredients

Ground aspen, dried beet pulp, dehydrated alfalfa meal, dehulled soybean meal, soybean oil, cane molasses, sucrose, salt, magnesium oxide, dicalcium phosphate, calcium carbonate, monosodium phosphate, potassium phosphate dibasic, L-lysine, L-ascorbyl-2-polyphosphate (stabilized vitamin C), inositol, dl-methionine, choline chloride, d-alpha tocopheryl acetate (form of vitamin E), pyridoxine hydrochloride, copper sulfate, menadione sodium bisulfite complex (source of vitamin K), calcium iodate, thiamine mononitrate, zinc oxide, cholecalciferol (form of vitamin D₃), folic acid, biotin, calcium pantothenate, vitamin A acetate, vitamin B₁₂ supplement, riboflavin supplement, nicotinic acid, cobalt carbonate, sodium selenite.



Information policy

Storage Conditions

For best results, store contents of open paper sack in container with sealing lid. Store in a cool (75°F or colder), dry (approximately 50% RH) location. Freezing will not harm the diet and may extend freshness. Use within 1 year of bag manufacturing.



Diet design



Diet design

- How up to date and how logical is the formulation of an individual diet?



Diet design

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Vol 47, No 2
April 1997

Hepatic Hemosiderosis in Common Marmosets, *Callithrix jacchus*: Effect of Diet on Incidence and Severity

Georgina F. Miller,¹ Dennis E. Barnard,¹ Ruth A. Woodward,¹ B. Michael Flynn,¹ and Jeff W. M. Bulte²

Abstract | We examined the effect of dietary iron concentration on the incidence of hepatic hemosiderosis in common marmosets (*Callithrix jacchus*) and assessed the impact of hemosiderosis on animal health. Thirteen young adult common marmosets were fed nutritionally balanced natural-ingredient diets formulated to contain either 100 or 500 ppm of iron. Six were fed the low-iron and seven received the high-iron diet. Baseline blood values and liver iron content were determined for each animal. Animals were weighed monthly, blood work (hematologic analysis, serum iron concentration, total iron-binding capacity, percent of transferrin saturation) was performed semi-annually, and liver biopsies for iron analysis were obtained after marmosets had consumed the test diets for 13 months or at necropsy. Midway in the study, the high-iron diet was reformulated to contain 350 ppm of iron because of the death of a male which had consumed that diet for 7 months. Four of seven marmosets fed the high-iron diet died during the first year of the study, compared with one death in the low-iron cohort. The mean increase in liver iron content of the marmosets fed the high-iron diet was 6,371 µg/g, dry weight analysis. In contrast the low-iron cohort had a mean decrease of 621.5 µg/g. These results indicate that liver iron content can be affected by dietary iron intake. The increased mortality in the marmosets fed the high-iron diet also suggests that hepatic hemosiderosis can be detrimental to marmoset health.



Diet design

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Diet design

Diets containing high concentrations of iron fed to marmosets in captivity are the cause of hepatic hemosiderosis. Commercial marmoset diets vary greatly in their iron content. New World Primate Diet 5040 (PMI Feeds, Inc.,) contains 381 ppm of iron; NIH-48 marmoset diet (Zeigler Bros., Inc., Gardners, Pa.) contains 380 ppm of iron; and Zu/preem canned marmoset diet (Hill's Pet Nutrition, Inc.) contains 20 ppm of iron. In this study the relative contribution of the 500 and 350 ppm diets to the iron accumulation is unclear. Results from a single marmoset indicate that a diet containing as little as 350 ppm of iron can cause substantial iron accumulation. Marmoset F2 was obtained at 7 months into the study and received the 500-ppm iron diet for only 2 weeks. It died after 4.5 months of consuming the 500-ppm iron diet; in that time its liver iron content had increased from a baseline value of 1,215 $\mu\text{g/g}$ to 10,337 $\mu\text{g/g}$, greater than an eightfold increase.

Diet design

Marmoset

2002

Suitable Species

Marmosets and other small New World Primates.

Nutritional Benefits

- Fortified with stable form of Vitamins C.
- Small pellets for easy handling by small animals.
- Provide all essential nutrients which may not be found in fresh raw foods.

Ingredients

Wheat, Maize, Wheatfeed, Soya Bean Meal, Dried Yeast, Poultry Meat Meal, Whey Powder, Soya Oil, Vitamins and Minerals Mix.

Feeding Recommendations

Normally fed with supplementation of fresh foods for enrichment but can be fed as a complete diet.

Food should be introduced gradually to avoid digestive upsets.

Should form about 20-25% of the total daily food intake and this will provide about 50% of the micro-nutrient requirement with a valuable protein boost.

Marmoset

Crude Oil	%	7.50
Crude Protein	%	25.40
Crude Fibre	%	3.70
Ash	%	10.50
N.F.E.	%	42.90
Starches	%	27.80
Sugars	%	7.80
Gross Energy	MJ/Kg	15.80
Dig. Energy	MJ/Kg	13.30
Met. Energy	MJ/Kg	12.00
Linoleic Acid	%	2.12
Linolenic Acid	%	0.27
Calcium	%	2.16
Phosphorus	%	1.46
Phytate Phosphorus	%	0.18
Sodium	%	0.33
Chlorine	%	0.45
Potassium	%	0.81
Magnesium	%	0.29
Iron	mg/Kg	358.00
Copper	mg/Kg	18.00
Manganese	mg/Kg	85.00
Zinc	mg/Kg	71.00
Cobalt	µg/Kg	2018.00
Iodine	µg/Kg	3379.00
Selenium	µg/Kg	232.00
Fluorine	mg/Kg	54.00
Vitamin A	IU/Kg	30142.00
Vitamin D ₃	IU/Kg	11640.00
Vitamin E	mg/Kg	105.60
Vitamin B ₁	mg/Kg	27.70
Vitamin B ₂	mg/Kg	18.20
Vitamin B ₆	mg/Kg	14.10
Vitamin B ₁₂	µg/Kg	39.40
Vitamin C	mg/Kg	2966.00
Vitamin K ₃	mg/Kg	5.30
Folic Acid	mg/Kg	10.20
Nicotinic Acid	mg/Kg	92.70
Pantothenic Acid	mg/Kg	37.30
Choline	mg/Kg	1951.00
Inositol	mg/Kg	1649.00
Biotin	µg/Kg	398.00



Diet design

Ingredients

Wheat, Barley, Wheatfeed, Soya Bean Meal, Exp. Linseed Cake, Soya Oil, Molasses, Oat Byproduct, Grass Meal, Vitamin and Mineral Premix.

Ingredients

Wheat, Wheatfeed, Soya Bean Meal, Soya Hulls, Soya Oil, Glucose, Molasses, Grass Meal, Cellulose Powder, Vitamin and Mineral Premix.



Diet design

Grazer

Suitable Species

All Grazing Ruminants.

Nutritional Benefits

- No non-nutrient feed additives, such as antibiotics and growth promoters.
- Contains high levels of starch and low levels of sugars suitable for these specialised feeders.

Ingredients

Wheat, Barley, Wheatfeed, Soya Bean Meal, Exp. Linseed Cake, Soya Oil, Molasses, Oat Byproduct, Grass Meal, Vitamin and Mineral Premix.

Feeding Recommendations

Designed as concentrate feeds to supplement normal grazing and bulk feeds.

Browser Maintenance

Suitable Species

All Browsing Ruminants.

Nutritional Benefits

- Contains high levels of sugar and low levels of starch suitable for these specialised feeders.
- No non-nutrient feed additives, such as antibiotics and growth promoters.
- Contains high levels of Essential Fatty Acids.
- Adequate levels of Vitamin E and Selenium.

Ingredients

Wheat, Wheatfeed, Soya Bean Meal, Soya Hulls, Soya Oil, Glucose, Molasses, Grass Meal, Cellulose Powder, Vitamin and Mineral Premix.

Feeding Recommendations

Normal daily allowance would be about 1Kg per 100Kg bodyweight per day, plus adequate good quality browse.

Additional Information

Can be used with Browser Breeder Diet to provide a complete nutritionally balanced diet throughout the animals life.

Browser rations are specialised and cannot be obtained from normal feed manufacturers.



Diet design

Ingredients

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Ingredients

Soya Bean Meal, Soya Oil, Molasses, Oat Byproduct, Grass Meal, Cellulose Powder, Vitamin and Mineral Premix.



Diet design

Moose

Suitable Species

Moose and other similar species which are unable to efficiently utilise Cellulose and Starch.

Nutritional Benefits

- Starch reduced to approximate natural foods and to parallel the seasonal changes in nutrient density of these natural foods.
- Adequate amounts of minerals and vitamins.
- Contains 2.5% Sodium Bicarbonate which helps prevent acidosis and supplies bicarbonate ions which are essential for cellulytic bacteria.

Oil, Glucose, Molasses, emix.

Ingredients

Wheat, Barley, Wheatfeed, Soya Bean Molasses, Oat Byproduct, Grass Meal,

Ingredients

Soya Bean Meal, Soya Oil, Molasses, Oat Byproduct, Grass Meal, Cellulose Powder, Vitamin and Mineral Premix.

Feeding Recommendations

Provide complete nutritional requirement throughout the year.
Diets should be fed together with good quality browse.



Diet design

BROWSER PELLETS 6mm

COMPLEMENTAIRY FEED FOR BROWSERS

Browser Pellets are designed to be fed up to a 40% addition to (a combination of) forages like grass hay, silage and alfalfa hay.

It has a very high fibre content which consists of highly fermentable cellulose and low fermentable lignine. The fibre content in the Browser Pellets originates partly from miscanthus giganteus, a natural plant material highly suitable for browsers.

- Contains a high amount of cellulose and lignin
- Helps in preventing excessive acid production in the stomach by a low amount of sugars and starch and inclusion of mearl (chalk weed)
- Balanced level of vitamins, minerals and trace elements
- With organic bound zinc, manganese and copper to support locomotion, skin and hair, immunity and reproduction

Composition:

miscanthus giganteus, alfalfa, sunflower seed extracted, apple pulp, dried, wheat middlings, soybean hulls, lignocellulose (spruce), cane molasses, linseed expeller, oats, linseed, sodium chloride, maerl, soybean oil, calcium carbonate, monocalcium phosphate, magnesium oxide.



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Miscanthus x giganteus



Scientific classification

Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Monocots
(unranked):	Commelinids
Order:	Poales
Family:	Poaceae
Subfamily:	Panicoideae
Genus:	<i>Miscanthus</i>
Species:	<i>M. x giganteus</i>

Binomial name

Miscanthus x giganteus

J.M.Greef , Deuter ex Hodk., Renvoize

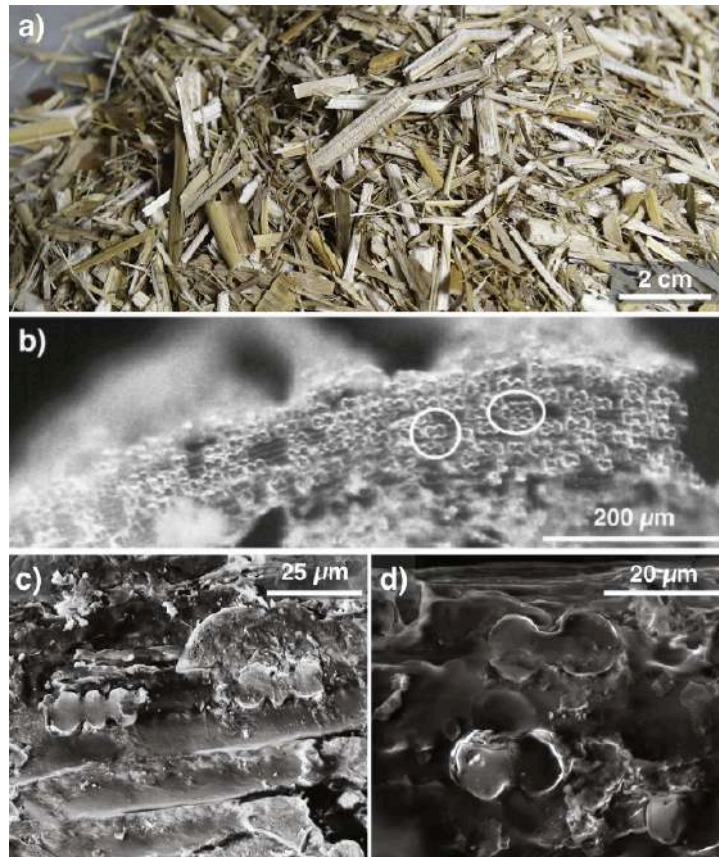


Diet design

Opaline phytoliths in *Miscanthus sinensis* and its cyclone ash from a biomass-combustion facility

Ruggero Vigliaturo^{a,*}, Damaris Kehrli^b, Patxi Garra^c, Alain Dieterlen^c, Gwenaëlle Trouvé^b, Volker Dietze^d, Jonathan P. Wilson^e, Reto Gieré^{a,f}

Industrial Crops & Products 139 (2019) 111539



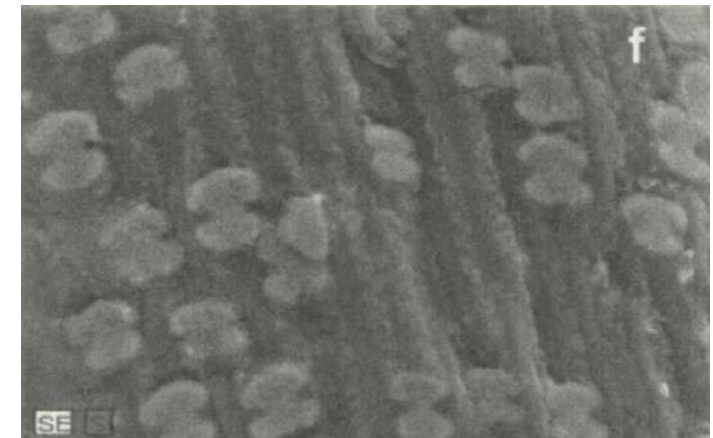
Plant Soil (2014) 374:871–882
DOI 10.1007/s11104-013-1885-8

REGULAR ARTICLE

Biochar from *Miscanthus*: a potential silicon fertilizer

David Houben • Philippe Sonnet •
Jean-Thomas Cornelis

Biochar from *Miscanthus* (BM) acted as a potential source of bio-available Si, likely because, being a C4 grass-derived biochar, it contains substantially higher amounts of Si in the form of phytoliths than any other plant-derived biochar





Recommendation rationale

- Do recommendations follow an evident logic?



Recommendation rationale

As a guide for Giant Anteaters feed:

For Maintenance 15g of powder/kg BW/d
(BW= Body Weight)



As a guide for Aardvarks feed:

For Maintenance feed 13g of powder/kg BW/d





Recommendation rationale

As a guide for Giant Anteaters feed:

For Maintenance 15g of powder/kg BW/d
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An analysis of the factors that influence the level and scaling of mammalian BMR

Brian Keith McNab *

Comparative Biochemistry and Physiology, Part A 151 (2008) 5–28

Species	Mass (g)	BMR (kJ/h)
<i>Myrmecophaga tridactyla</i>	30600	52.23

Species	Mass (g)	BMR (kJ/h)
<i>Orycteropus afer</i>	48000	123.37



Recommendation rationale

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=> $96 \text{ kJ} / \text{kg}^{0.75} / \text{d}$
(or $41 \text{ kJ} / \text{kg} / \text{d}$)

=> $162 \text{ kJ} / \text{kg}^{0.75} / \text{d}$
(or $62 \text{ kJ} / \text{kg} / \text{d}$)



Correct, comprehensive information

Soft-Bill Diet

Description

Soft-Bill Diet is designed for soft-bill birds of all ages, including parent birds caring for their young.

Features and Benefits

- Nutritionally complete for adult fruit-eating birds - No supplementation necessary.
- Extruded Nugget - Highly palatable and has a nine month shelf life.
- Each batch is analyzed for iron content - Allows for proper feeding of iron sensitive species.
- Contains only natural vitamin E - Vitamin E comes from only natural sources.
- Contains mixed tocopherols - All natural antioxidant.
- Contains enhanced carotenoid levels - Serve as natural antioxidants and pigments.

Product Form

- Extruded Pellet: 3/16" diameter x 1/8" length. 15 lb. net weight paper sack.

Guaranteed Analysis

Crude protein not less than	20.0%
Crude fat not less than	8.0%
Crude fiber not more than	5.0%
Ash not more than	7.0%

Ingredients

Wheat flour, wheat germ, soy protein concentrate, corn gluten meal, soybean oil, dicalcium phosphate, brewers grains, brewers dried yeast, sucrose, calcium carbonate, tagetes extract, L-lysine, salt, calcium propionate, powdered cellulose, DL-methionine, choline chloride, menadione dimethylpyrimidinol bisulfite (vitamin K), pyridoxine hydrochloride, biotin, d-alpha tocopheryl acetate (natural source vitamin E), L-threonine, tocopherols (a preservative), cholecalciferol (vitamin D₃), folic acid, manganese sulfate, canthaxanthin, zinc sulfate, vitamin A acetate, riboflavin, cyanocobalamin (vitamin B₁₂), nicotinic acid, thiamin mononitrate, calcium pantothenate, copper sulfate, calcium iodate, sodium selenite.

Feeding Directions

This diet is appropriate for many bird species and is useful when desiring to control dietary iron. Each batch of Soft-Bill Diet is analyzed for iron and the analyzed iron concentration is made available to all customers via the website at www.mazuri.com. To switch birds from fruit mixes (or any diet they are currently being fed) to Soft-Bill Diet, do a gradual change over. Start with 10% Soft-Bill Diet and 90% of their customary diet. Each day increase the amount of Soft-Bill Diet by 10% and decrease the amount of the customary diet correspondingly. This diet should be fed at a rate of at least 70% of their daily intake, with the remainder being fruits, vegetables and enrichment items. During the switchover period, as well as for the first week after the switchover, it is critical that birds be observed carefully. Monitor the birds weight and behavior. If the bird loses weight, or if the bird is not consuming the product, offer a 50:50 mix of product and the customary diet. After the bird has stabilized and started to consume the product, continue the conversion process.

For critically iron sensitive species (i.e. Toucans and Mynahs), avoid the addition of high iron food items (e.g. meat, dog food) and stick with items which are consistently low in iron (e.g. Papaya, apple, and other high moisture fruits). For other omnivorous species of birds, food items with higher iron concentration may be appropriate, with the minimum 70% of intake as

Soft-Bill Diet serving to reduce the overall dietary iron concentration. Consult your avian veterinarian to determine how iron sensitive your species, or individual bird, may be.

This diet is designed for birds after their first molt. Female birds which are heavy layers (more than 20 eggs per season) should have calcium supplementation in the form of pure, pharmaceutical grade, calcium carbonate at a rate of 2% of their daily intake. Calcium carbonate should be added during the laying season only. The powdered calcium carbonate may be mixed in with the birds fruit mixture.

Always provide a source of fresh, clean water.

Caution

This product is designed to have a low concentration of dietary iron. No readily available iron source is added as an ingredient to this diet. This product is not intended to be a sole diet for growing birds or birds which are not iron sensitive. Prolonged use of this product could result in an iron deficiency.

02/15/06

Soft-Bill Diet

Approximate Nutrient Composition NUTRIENTS

Protein, %	20.5
Arginine, %	1.11
Cystine, %	0.49
Glycine, %	0.70
Histidine, %	0.47
Isoleucine, %	0.95
Leucine, %	1.87
Lysine, %	1.10
Methionine, %	0.63
Phenylalanine, %	1.10
Tyrosine, %	0.70
Threonine, %	0.83
Tryptophan, %	0.24
Valine, %	1.00

Fat, % 8.7

Fiber (Crude), %	1.7
Neutral Detergent Fiber, %	4.7
Acid Detergent Fiber, %	1.7

Metabolizable Energy, kcal/gm 3.74

MINERALS

Ash, %	5.3
Calcium, %	1.45
Phosphorus, %	0.82
Phosphorus (non-phytate), %	0.60
Potassium, %	0.50
Magnesium, %	0.10
Sodium, %	0.17
Chlorine, %	0.43
Sulfur, %	0.30
Iron, ppm	50-125*
Zinc, ppm	70
Manganese, ppm	85
Copper, ppm	17
Iodine, ppm	0.85
Cobalt, ppm	0.23
Chromium, ppm	0.05
Selenium, ppm	0.20

VITAMINS

Vitamin K (as menadione), ppm	3.0
Thiamin Hydrochloride, ppm	10
Riboflavin, ppm	15
Niacin, ppm	125
Pantothenic Acid, ppm	20
Choline Chloride, ppm	1,900
Folic Acid, ppm	4.8
Pyridoxine, ppm	12
Biotin, ppm	0.90
Vitamin B ₁₂ , mcg/kg	66
Vitamin A, IU/gm	70
Vitamin D ₃ (added), IU/gm	2.0
Vitamin E, IU/kg	300

* Each batch of Soft-Bill Diet, is analyzed for iron and the analyzed iron concentration is available to all customers via the website at www.mazuri.com.

02/15/06



Principles of portfolio design

- Bottom-up: a historical collection of diets that are then sorted into groups
 - customers can always buy what they are used to
 - scientific background or fashion of diets will most likely not be consistent
 - state-of-the-art products next to out-dated recipes*
 - contradictory product lines*
 - lack of biological/nutritional logic across the portfolio*



Historical portfolio: pet rodents





Principles of portfolio design

- **Bottom-up:** a historical collection of diets that are then sorted into groups
 - customers can always buy what they are used to
 - scientific background or fashion of diets will most likely not be consistent
 - state-of-the-art products next to out-dated recipes*
 - contradictory product lines*
 - lack of biological/nutritional logic*
- **Top-down:** an overruling dietary concept determines the choice of diets offered
 - customers have to adjust to new concepts
 - scientific background or fashion of diets will more likely be consistent
 - state-of-the-art products*
 - consistent product lines*
 - based on biological/nutritional logic*



Taxonomic portfolio

Grazer-Pellet

Browser-Pellet

Camelid-Pellet

Rhino-Pellet

Elephant-Pellet

Zebra-Pellet

Kangaroo-Pellet

Moose-Pellet



what about intermediate feeders?



Taxonomic portfolio

Grazer-Pellet

Browser-Pellet

Camelid-Pellet

Rhino-Pellet

Elephant-Pellet

Zebra-Pellet

Kangaroo-Pellet

Moose-Pellet



what is so special about camels?



Taxonomic portfolio

Grazer-Pellet

Browser-Pellet

Camelid-Pellet

Rhino-Pellet

Elephant-Pellet

Zebra-Pellet

Kangaroo-Pellet

Moose-Pellet

what about grazing and browsing rhinos?



Taxonomic portfolio

Grazer-Pellet

Browser-Pellet

Camelid-Pellet

Rhino-Pellet

Elephant-Pellet

Zebra-Pellet

Kangaroo-Pellet

Moose-Pellet

what about grazing and browsing kangaroos?



Taxonomic portfolio

Grazer-Pellet

Browser-Pellet

Camelid-Pellet

Rhino-Pellet

Elephant-Pellet

Zebra-Pellet

Kangaroo-Pellet

Moose-Pellet

why a specific diet for non-moose browsers?









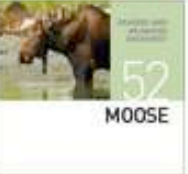








Hoofstock – large historical portfolio I

		
Grain-Free Hay Enhancer Supplement – Chaparral & Wildon (WV) # 08712 – 50 lb \$25.49	Wild Herbivore Plus Diet # 3255V – 50 lb \$33.44	Wild Herbivore 16 Fiber Diet (Cube) # 0V03 – 50 lb \$22.46
		
Wild Herbivore Diet 16 Fiber # 3271 – 50 lb \$32.46	Wild Herbivore Ruminant Supplement # 3210C – 20 lb \$12.44	Brewer's Wildon Cube # 327P – 40 lb \$26.46
		
ACP 16 Herbivore Diet (Pellet) # 3838 – 50 lb \$26.46	ACP 16 Herbivore Diet (Cube) # 3840 – 50 lb \$33.44	ACP 20 Herbivore # 3840 – 50 lb \$27.46
		
Sheep Loco # 3839 – 50 lb \$26.46	Hoofstock Diet # 375A – 1 kg \$33.44	Ruminant Pellets # 3838 – 50 lb \$26.46
		
Celery Pellets # 3832 – 50 lb \$22.46	Brewer's Extract # 3823 – 50 lb \$33.44	Brewer's Maintenance # 3804 – 50 lb \$26.46
		
Moose Extract # 3837 – 40 lb \$22.46	Moose Maintenance # 3838 – 40 lb \$23.44	Zoo-Pak Wild Herbivore Diet # 3255K – 40 lb Available for purchase through a local dealer. Click here to find



Hoofstock – large historical portfolio II

 <p>44 BROWSER BREEDER</p>	 <p>45 BROWSER MAINTENANCE</p>	 <p>46 CAMEL</p>	 <p>47 EL-E-VITE</p>	 <p>48 EXOTIC GRAZER</p>
<p>Suitable species</p> <p>All Browsing Ruminants during breeding season.</p>	<p>Suitable species</p> <p>All Browsing Ruminants.</p>	<p>Suitable species</p> <p>Camels – Bactrian and Arabian. Other species with similar digestive physiology, feeding and nutrient requirements (i.e. medium to large ruminant grazers) can be fed this diet i.e. Waterbuck, Topi, Llama, Cape Buffalo, Banteng.</p>	<p>Suitable species</p> <p>Elephants, Rhinos and other Herbivores.</p>	<p>Suitable species</p> <p>All Grazing Ruminants.</p>
 <p>49 GRAZER</p>	 <p>50 HERBIVORE CONCENTRATE</p>	 <p>51 MACROPOD</p>	 <p>52 MOOSE</p>	 <p>53 PIG</p>
<p>Suitable species</p> <p>All Grazing Ruminants.</p>	<p>Suitable species</p> <p>Most species of Ruminant.</p>	<p>Suitable species</p> <p>All species of Macropod.</p>	<p>Suitable species</p> <p>Moose and other similar species which are unable to efficiently utilise Cellulose and Starch.</p>	<p>Suitable species</p> <p>Suitable for feeding most species of pigs during breeding and maintenance.</p>
 <p>54 REINDEER</p>	 <p>55 SHEEP (LOCUSH)</p>	 <p>56 VITAMIN E CUBES</p>	 <p>57 WHITE RHINO CONCENTRATE</p>	 <p>58 ZEBRA</p>
<p>Suitable species</p> <p>Reindeer and similar species.</p>	<p>Suitable species</p> <p>Most species of Sheep and other Artiodactyla.</p>	<p>Suitable species</p> <p>Most species of Ruminant.</p>	<p>Suitable species</p> <p>Most species of Pachyderm, except Black Rhinoceros.</p>	<p>Suitable species</p> <p>All species of Zebra.</p>



Hoofstock – simple (top-down) portfolio

Herbivore nutrition

Herbivores eat plants. This animal group has specialized digestive physiology to utilize plant materials by different strategies to supply energy for life, growth and reproduction. To be able to digest plant material, herbivores live in symbiosis with microorganisms in their gastrointestinal tract (bacteria, yeasts, other protozoa). These microorganisms ferment plant fibers, especially cellulose, that are otherwise indigestible for vertebrates. Fermentation takes place either in a foregut (e.g., cows) or hindgut system (e.g., horses), so that a distinction is made between foregut fermenters and hindgut fermenters.

Furthermore, herbivores are classified according to their choice of preferred feed in three different groups: grazers, browsers and intermediate feeders. Thus the feed in the zoo must be adjusted to the different requirements of those groups:

GRAZERS

Preferred feed

Grazers feed mainly on grasses. These animals graze large areas in one place and ingest vast amounts of grasses in a relatively unselective way.

Anatomy

Grazers have a wide mouth with a small mouth opening and stiff lips. Ruminating grazers usually have a large, divided foregut system.

Feeding

With regard to feeding solutions in zoos the main focus should be on high fiber and moderate protein and energy contents.

INTERMEDIATE FEEDERS

Some species are so-called intermediate feeders as they combine the characteristics of both groups: for example, sheep, goats or certain types of deer and antelope.

BROWSERS

Preferred feed

Browsers are highly selective in their search for food while primarily eating young shoots, herbs or buds. They gather their feed in different areas.

Anatomy


Compared with grazers, browsers have sensitive lips with a larger mouth and longer tongue to pick their preferred food. Ruminating browsers usually have a smaller foregut system.

Feeding

In zoos the main focus should be on a high content of fermentable fibers and a sufficient protein supply.



Hoofstock – simple (top-down) portfolio



Our 5 herbivore feeds:

Elephant

Product number
968.60
3715.PD.S25

- Supplementary feed high in fiber
- Specially designed for prophylaxis against obesity
- With linseed products for natural omega-3 fatty acids
- Supplemented with vitamin E, biotin and zinc, as well as other vitamins and trace elements
- The elephant's high requirement of vitamin E and D is particularly respected



SUPPLEMENTED
With an appropriate daily ration no further supplementary feeds are needed thanks to adequate vitamin, mineral and trace element supplementation of our products

Browser

Product number
959.60
3699.PD.S25

- Balanced fiber composition, highly suitable for browsers with high contents of fermentable fiber from apple pomace, soybean hulls and beet pulp for a healthy gastrointestinal tract
- Protein content adapted to the requirements of browsers with regard to the lower protein content of European alfalfa
- High levels of vitamin E and organic selenium
- Copper supplemented also suitable for higher requirements of cervids
- Biotin supplemented for horn and fur
- No mineral iron is substituted
- With linseed products for a naturally high content of omega-3 fatty acids
- Bicarbonate for the prevention of ruminal acidosis



Grazer

Product number
957.60
3697.PD.S25

- Balanced fiber composition for optimal digestive health specifically suitable for grazers
- Rich in celluloses
- Well suitable for equids owing to low content of expanding fibers and supplementation with B vitamins
- Protein content adapted to the lower requirement of grazers
- High levels of vitamin E and organic selenium
- Biotin supplemented for horn and fur
- No mineral iron is substituted
- With linseed products for a naturally high content of omega-3 fatty acids
- Bicarbonate for the prevention of ruminal acidosis



Grazer Cu-controlled

Product number
958.60
3698.PD.S25

- Copper content of only 5 ppm specifically for copper sensitive herbivores
- Except for the reduced copper content, the feed offers the same special features and advantages as the grazer feed

ALL FEEDS
contain little grain, thus allowing for low starch contents – a strong support for ruminal and intestinal health



Rhino and tapir


Product number
969.60
3695.PD.S25

- A special formulation low in iron with naturally low iron raw materials and manufactured without additional iron supplementation for black rhinos and tapirs
- Adapted to the requirements of browsers by using high content of alfalfa
- High content of pectins through beet pulp and grape marc to supply fermentable fibers
- Supplemented with vitamin E and selenium



Hoofstock – simple (top-down) portfolio

Our 5 herbivore feeds:



Elephant Product number: 355-60 (2015-10-15)

- Supplementing feed high in fibre
- High fibre content improves digestion and health
- High fibre content improves digestion and health
- High fibre content improves digestion and health
- High fibre content improves digestion and health



SupPLEMENTED

Brower Product number: 355-60 (2015-10-15)

- Supplementing feed high in fibre
- High fibre content improves digestion and health
- High fibre content improves digestion and health
- High fibre content improves digestion and health
- High fibre content improves digestion and health



Grazer Product number: 355-60 (2015-10-15)

- Supplementing feed high in fibre
- High fibre content improves digestion and health
- High fibre content improves digestion and health
- High fibre content improves digestion and health
- High fibre content improves digestion and health



Rhino and tapir Product number: 355-60 (2015-10-15)

- Supplementing feed high in fibre
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Grazer Cu-controlled Product number: 355-60 (2015-10-15)

- Supplementing feed high in fibre
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ALL FEEDS

Product number: 355-60 (2015-10-15)

Application:

Which product is best suited for your animal?

Among other factors, the choice of a supplementary diet depends largely on the additional fed roughage and its composition as well as the quantities of the single components of the daily ration. The following lists are not to be considered as complete. Talk to our experts for further information.

GRAZERS			INTERMEDIATE FEEDERS	BROWSERS	
Elephant	Grazer	Grazer Cu-controlled	Brower		Rhino and tapir
Product no. 355-60 3715-PD-525	Product no. 357-60 3837-PD-525	Product no. 358-60 3838-PD-525	Product no. 359-60 3899-PD-525		Product no. 369-60 3695-PD-525
Asian Elephant	Buffalo	Wild Sheep	Muskox	Giraffe	Black Rhinoceros
African Elephant	Banteng	Llama	Eland Antelope	Okapi	Sumatran Rhinoceros
	Wild Cattle	Alpaca	Impala	Bushbuck	Indian Rhinoceros
	Wildbeest	Vicuña	Thomson's Gazelle	Nyala	Javan Rhinoceros
	Waterbuck	Guarana	Springbok	Sitatunga	Tapirs
	Oryx		Pronghorn	Gerenuk	
	Onibi		Saiga Antelope	Duiker	
	Topi		Dama Gazelle	Suni	
	Blackbuck		Ibex	Dikdik	
	Bactrian Camel		Goats	Klipspringer	
	Dromedary		Chamois	Kudu	
	Père David's Deer		Wapiti	Muntjac	
	Zebra		Sika Deer	Roe Deer	
	Hippopotamus		Red Deer	Moose	
	White Rhinoceros		Mule Deer	Tree-kangaroos	
	Eastern Grey Kangaroo		Rock-wallabies	Small Wallabies	
	Red Kangaroo			Reindeer*	
				Bongo*	
				Pigmy Hippopotamus*	
				Water Deer*	





Principles of portfolio design ... and choice

- A complicated portfolio with no directly apparent logic
 - ... is difficult to communicate within the zoo or within an interest group such as a keeper forum
 - ... supports the impression that nutrition is
 - difficult to understand & very complicated*
 - mythical*
 - ... and indirectly leads to feeding mistakes because people do not think along



Principles of portfolio design ... and choice

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 - ... supports the impression that nutrition is
 - difficult to understand & very complicated*
 - mythical*
 - ... and indirectly leads to feeding mistakes because people do not think along
- A simple portfolio with a clear biological logic
 - ... can be communicated easily within the zoo or within an interest group
 - ... is a didactic experience for users
 - ... and indirectly helps to avoid feeding mistakes because people understand what they do and think along



A strategic question



high degree of skill due to permanent exposure to nutritional issues



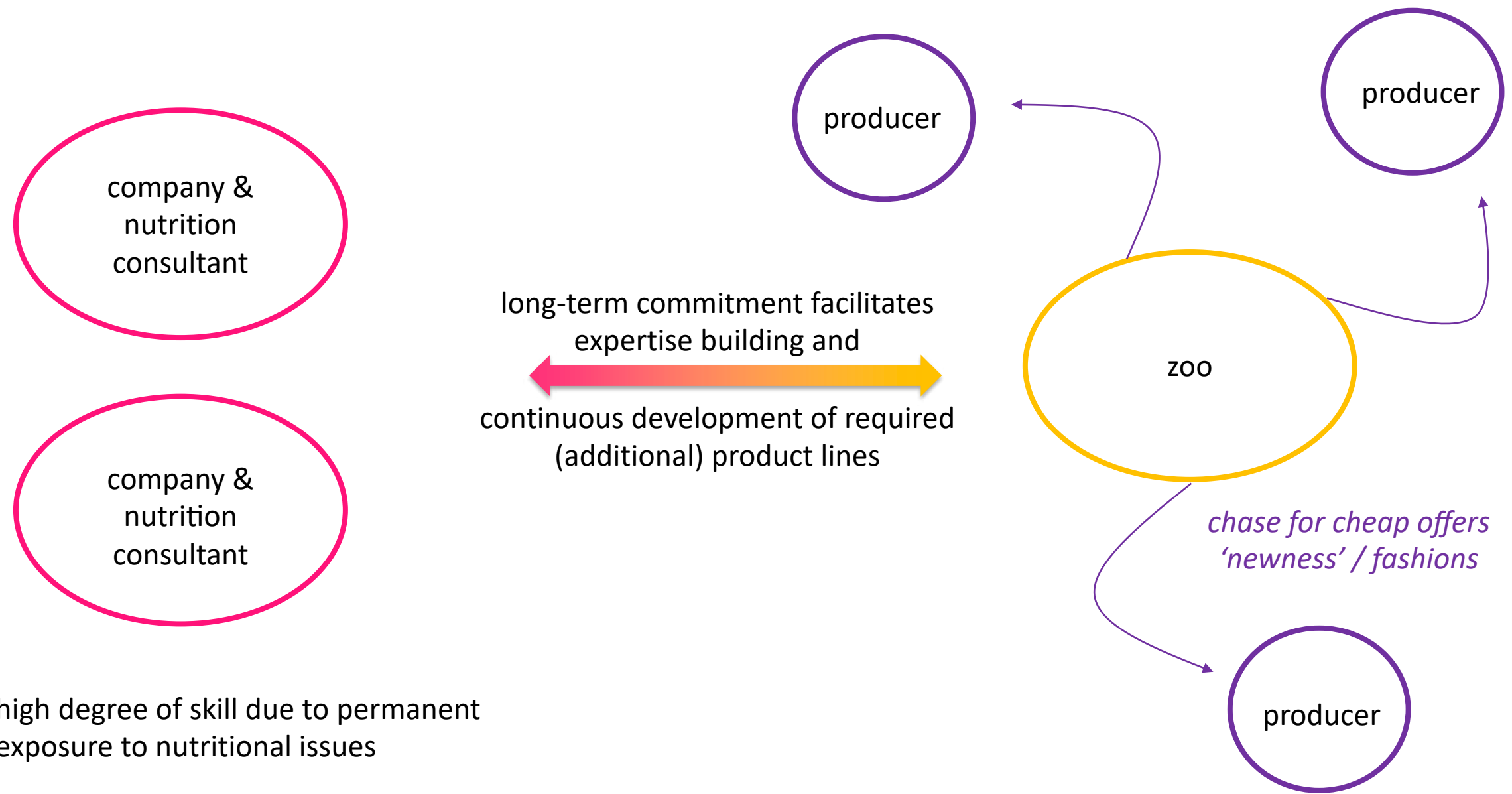
A strategic question



exploiting a special situation ?

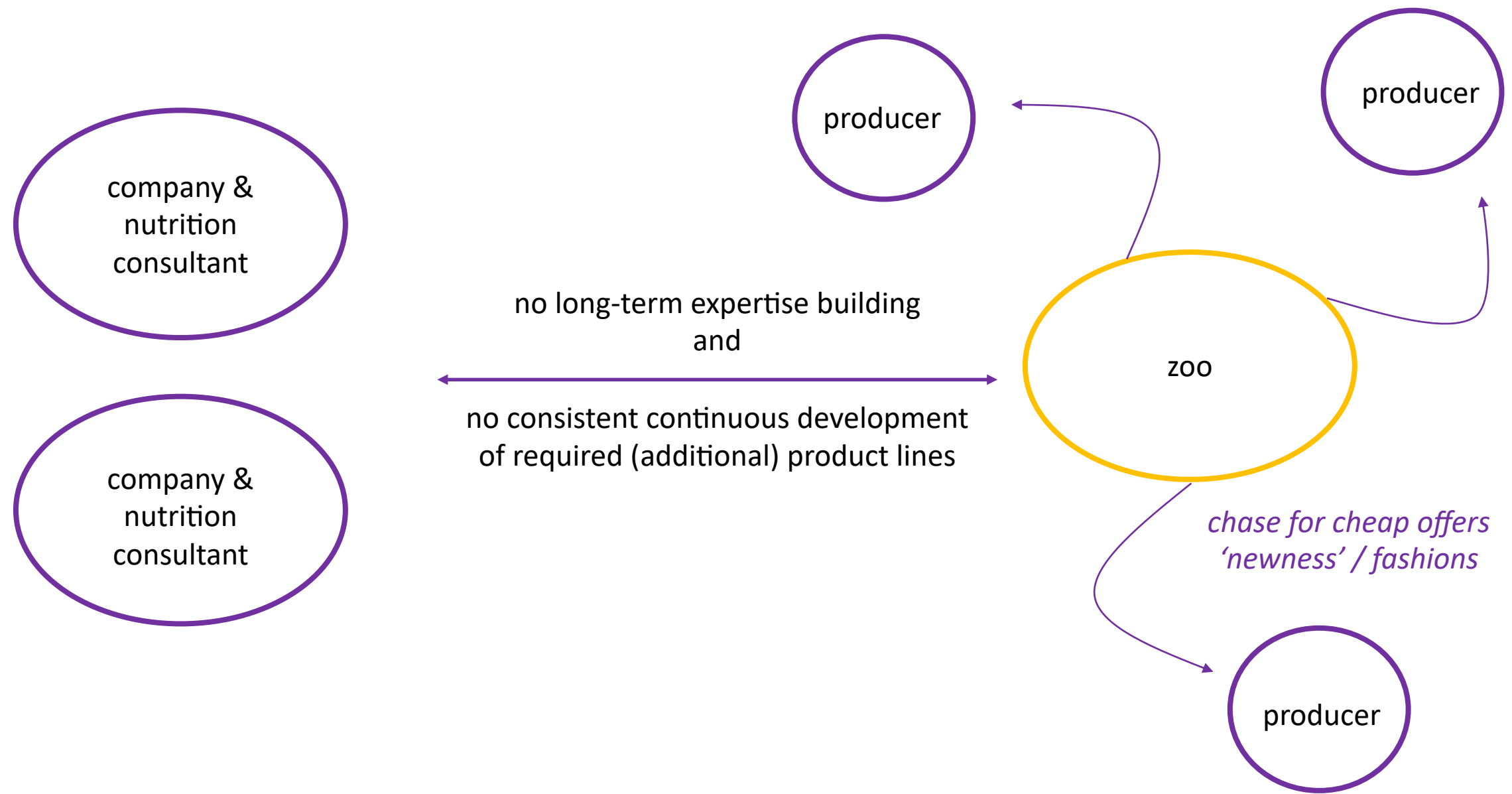


A strategic question





A strategic question





*thank you for your
attention*