Development Trend Analysis of Global Beef Cattle Industry

全球肉牛产业发展趋势分析

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Beijing, May 2019

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HEALTH · NUTRITION · MATERIALS

Summary 主要内容

- Global Beef market/trends全球肉牛市场/趋势
- Sustentability 可持续性
- Farm level trends 牧场发展水平趋势
- Technical & Scientific benefits of new technologies 新技术的优势

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Market Trends 市场趋势

- Climate / Environment concerns 关注气候/环境
- Meat Intake globally x locally 全球及部分地区肉类消费量
- Supply chain 供应链
- Logistics 物流
- Beef Export / Import 牛肉出口/进口
  - Customer/market trends 消费者/市场趋势
    - Live animals 活体动物
    - Carcass / Cuts 胴体/四分体
    - Processed meat 肉类加工
    - Meat Quality 牛肉质量
  - 2019 Brazil: +57% export (China, Egypt, Chile, Iran, Arab Emirates, Russia, Turkey, Philippines)2019
    巴西：57%以上出口(中国、埃及、智利、伊朗、阿联酋、俄罗斯、土耳其、菲律宾)
- Adequate Communication 充分的沟通
- Integrated Value Chain 集成价值链
  - Block Chain 区块链

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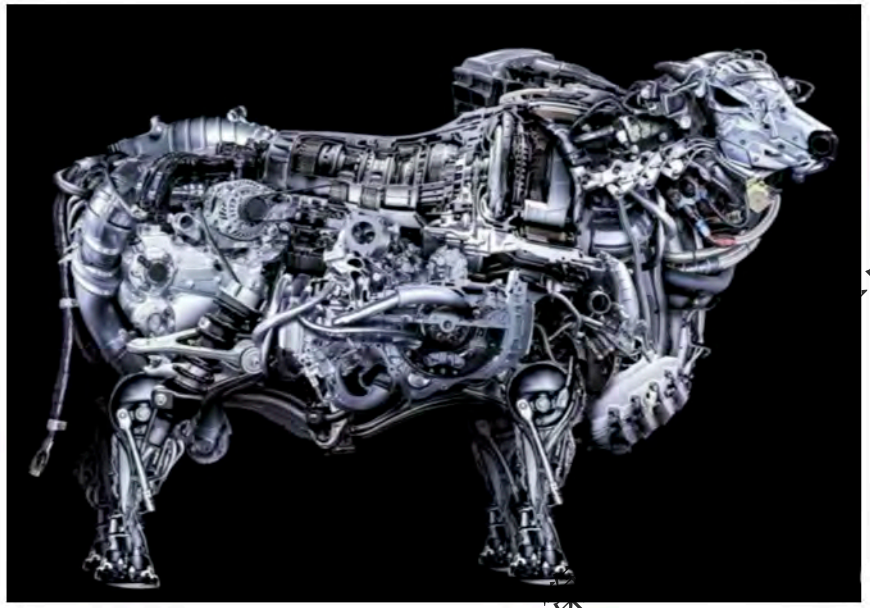

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第四届全国肉牛生产应用技术与产业经济研讨会
Receitas da Edna

Trends 趋势

Published January 31, 2017

European farmers' experiences with precision livestock farming systems

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Trends 趋势

GANADERÍA

Buscan producir más carne cuidando el medio ambiente

15/04/2019 - 7:57 PM

Lanzaron proyecto con apoyo de FAO y Fondo Mundial.

GANADO VACUNO PASTANDO AL BORDE DE LA RUTA.

FAO/Government Uruguay: Farmers + R&D Centers + University 联合国粮农组织/乌拉圭政府：农户+研发中心+大学

- Higher Productivity 更高的生产性能
- Less CH4 emissions 减少甲烷排放
- Less environmental impact 减少环境影响
- Soil-Plant-Animal-Environment management optimization 土地–作物–动物–环境管理优化
- Water quality/contamination 水质/污染
- Intelligent Livestock 智慧的动物

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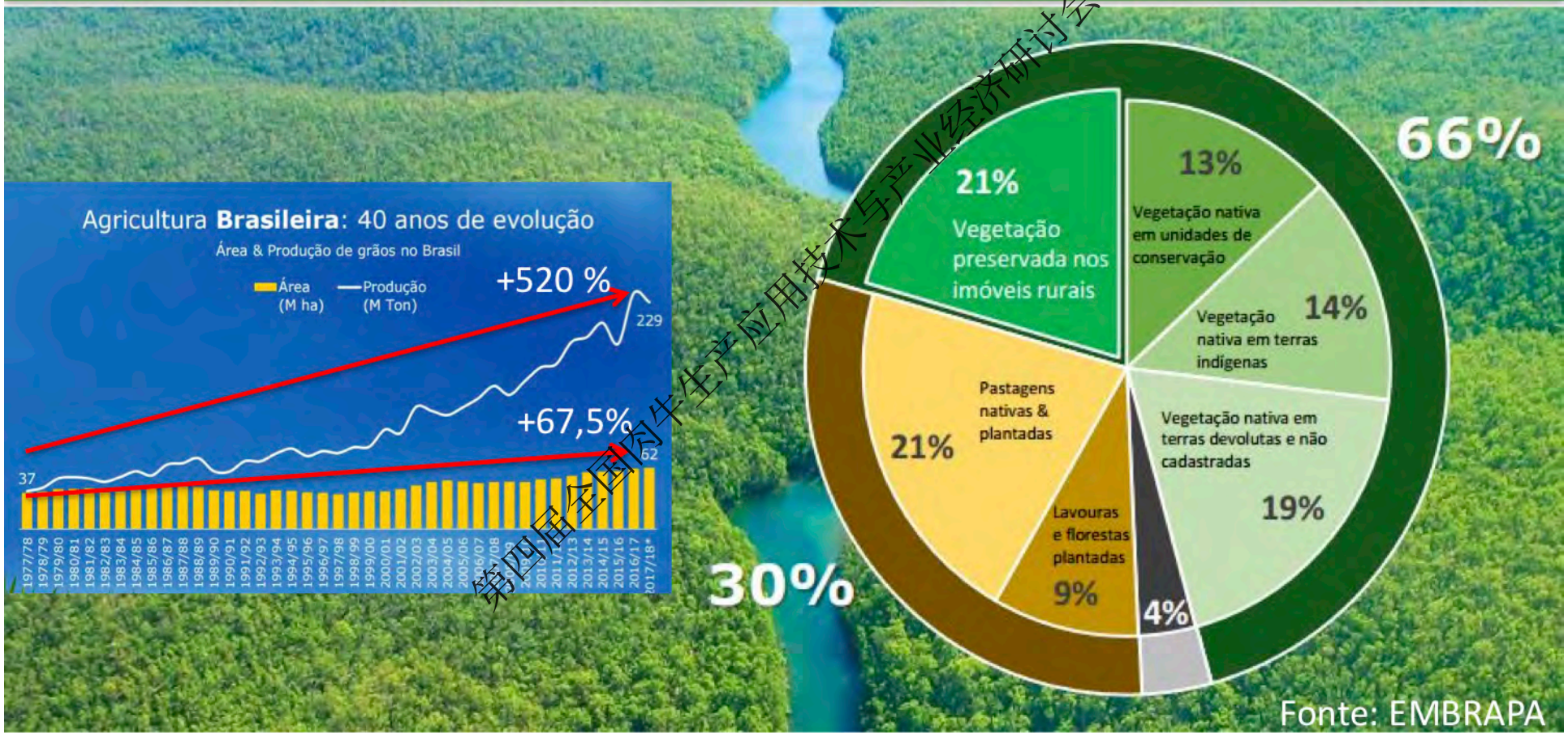
Environmental conservation Brazil
巴西的环境保护



Top 5 bovine meat producers 排名前五的牛肉生产国

- **Brazil, Unites States of America** 巴西, 美国
- **Argentina**, the **European Union** & **Australia** 阿根廷, 欧盟, 澳大利亚

Top 4 bovine meat Exporters 排名前四的牛肉出口国

World bovine meat exports 2018 + 6.1% ~10.9 million tonnes. **Argentina**, **Brazil, Australia** & **Unites States of America** were largely behind the expansion, partially offset by declines in **India** & the **European Union**.

2018年全球牛肉出口增加6.1%-约1090万吨

阿根廷, 巴西, 澳大利亚和美国的出口大幅增加, 印度和欧盟下降在一定程度上抵消了一部分

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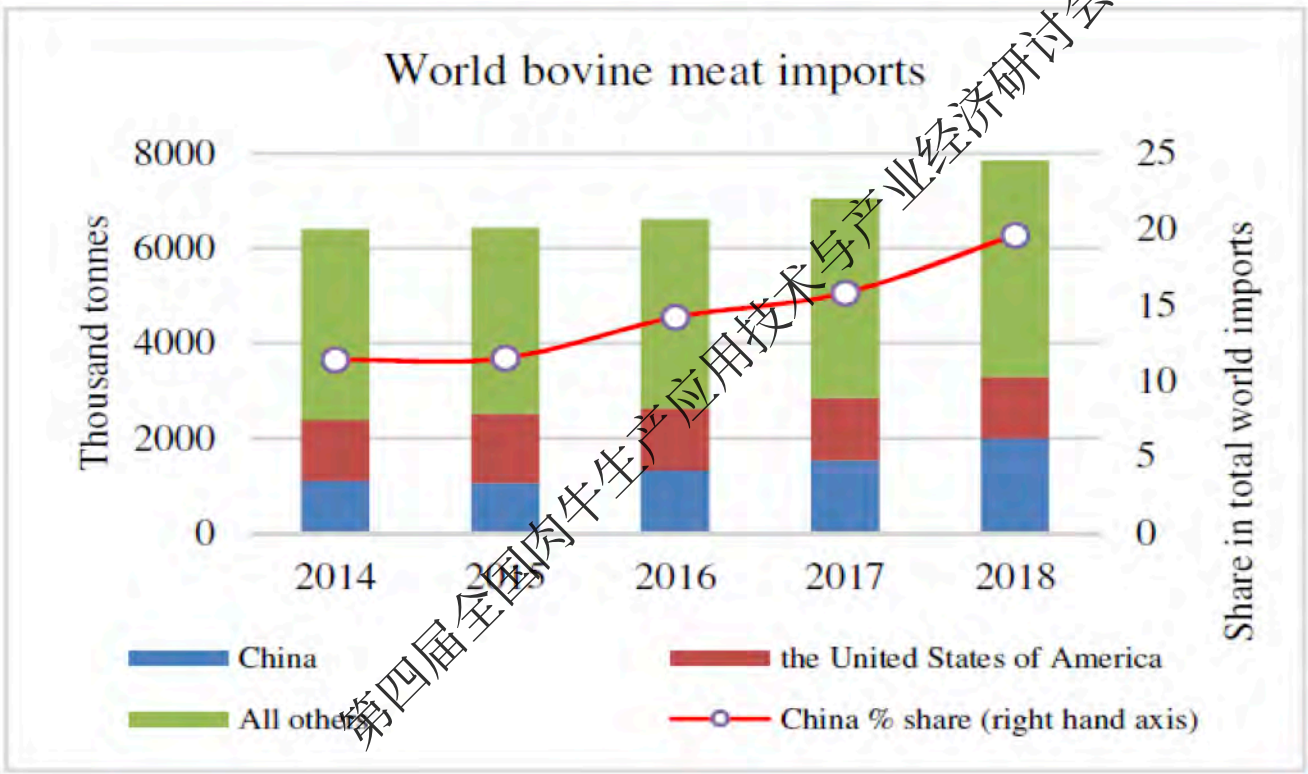
Top bovine meat Imports 主要牛肉进口国



Souce: FAO 2019

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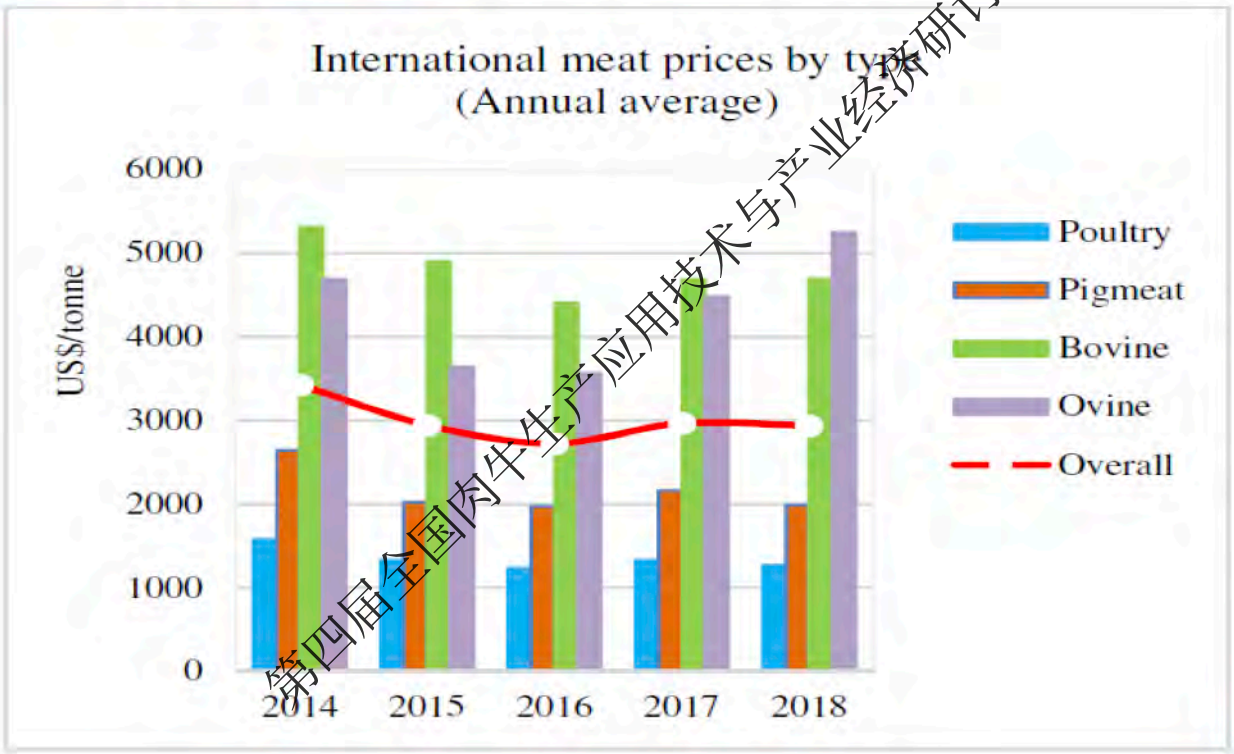
Different meat - Different Prices
肉类品种不同，价格各异



Souce: FAO 2019

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Top bovine meat Producers
主要的牛肉生产国

Principais produtores mundiais de carne bovina[1]

	2019	2018	2017
EUA	12.725	12.286	11.943
Brasil	**10.200**	**9.900**	**9.550**
EU	7.800	7.915	7.863
China	7.400	7.325	7.260
Índia [2]	4.330	4.300	4.250
Argentina	3.000	2.950	2.840
Austrália	2.180	2.300	2.149
México	2.000	1.960	1.925
Paquistão	1.820	1.800	1.780
Turquia	1.400	1.400	1.399
Rússia	1.355	1.340	1.336
Outros	9.413	9.402	9.329
Total	**63.623**	**62.878**	**61.624**

[1] Em mil toneladas equivalente-carcaça. Os dados de 2019 são previsões e os de 2018 estimados. [2] nclui carne de búfalo. **Fonte**: USDA/FAS Outubro/2018, adaptação **DBO**.

Top bovine meat Exporters
主要牛肉出口国

Principais exportadores mundiais de carne bovina[1]

País	2019	2018	2017
Brasil	**2.200**	**2.100**	**1.856**
Índia[2]	1.625	1.665	1.849
Austrália	1.510	1.630	1.485
EUA	1.472	1.435	1.297
Nova Zelândia	589	603	593
Argentina	575	500	293
Canadá	515	500	465
Uruguai	415	440	436
Paraguai	360	380	378
U.Europeia	350	350	369
México	330	305	280
Outros	666	650	635
Total	**10.576**	**10.558**	**9.967**

[1] Em milhões de toneladas equivalente-carcaça. Os dados de 2019 são previsões e os de 2018, preliminares. [2] As exportações da Índia referem-se à carne de búfalo. **Fonte**: USDA, outubro/2018. Adaptação **DBO**.

Top bovine meat Consumers
主要牛肉消费国

Principais consumidores mundiais de carne bovina[1]

	2019	2018	2017
EUA	12.657	12.206	12.052
China	8.705	8.530	8.227
Brasil	**8.045**	**7.850**	**7.750**
União Europeia	7.820	7.935	7.832
Índia [2]	2.705	2.635	2.401
Argentina	2.425	2.450	2.547
México	1.890	1.865	1.841
Rússia	1.810	1.823	1.840
Paquistão	1.761	1.741	1.722
Turquia	1.469	1.489	1.424
Japão	1.320	1.316	1.277
Outros	11.127	10.884	10.761
Total	**61.734**	**60.724**	**59.674**

(1) Em milhões de toneladas equivalente-carcaça. Os dados de 2019 são previsões e os de 2018, preliminares. (2) Índia inclui carne de búfalo. **Fonte**: USDA, outubro/2018. Adaptação **DBO**.

Bovine Meat Figures 牛肉生产及进出口数据

Bovine production (thousand tonnes, CWE)			
	2017	2018	Change 2018 over 2017 (%)
World	**69 614**	**71 083**	**2.1**
United States	11 943	12 254	2.6
Brazil	9 550	9 932	4.0
EU 28	7 867	8 032	2.1
China	6 361	6 457	1.5
Argentina	2 842	3 049	7.3
India	2 524	2 536	0.5
Australia	2 149	2 306	7.3
Mexico	1 927	1 979	2.7

Bovine exports (thousand tonnes, CWE)			
	2017	2018	Change 2018 over 2017 (%)
World	**10 242**	**10 870**	**6.1**
Brazil	1 858	2 068	11.3
United States	1 487	1 629	9.5
Australia	1 357	1 517	11.8
India	1 708	1 445	-15.4
New Zealand	540	575	6.6
Argentina	311	524	68.6
Canada	442	475	7.5
EU 28	492	464	-5.7

Bovine imports (thousand tonnes, CWE)			
	2017	2018	Change 2018 over 2017 (%)
World	**9 740**	**10 142**	**4.1**
China	1 541	1 993	29.3
United States	1 314	1 315	0.1
Japan	824	869	5.4
Viet Nam	1 037	809	-22.0
Rep. of Korea	488	533	9.3
Russian Fed.	523	491	-6.2
EU 28	305	333	9.1
Chile	264	298	12.8

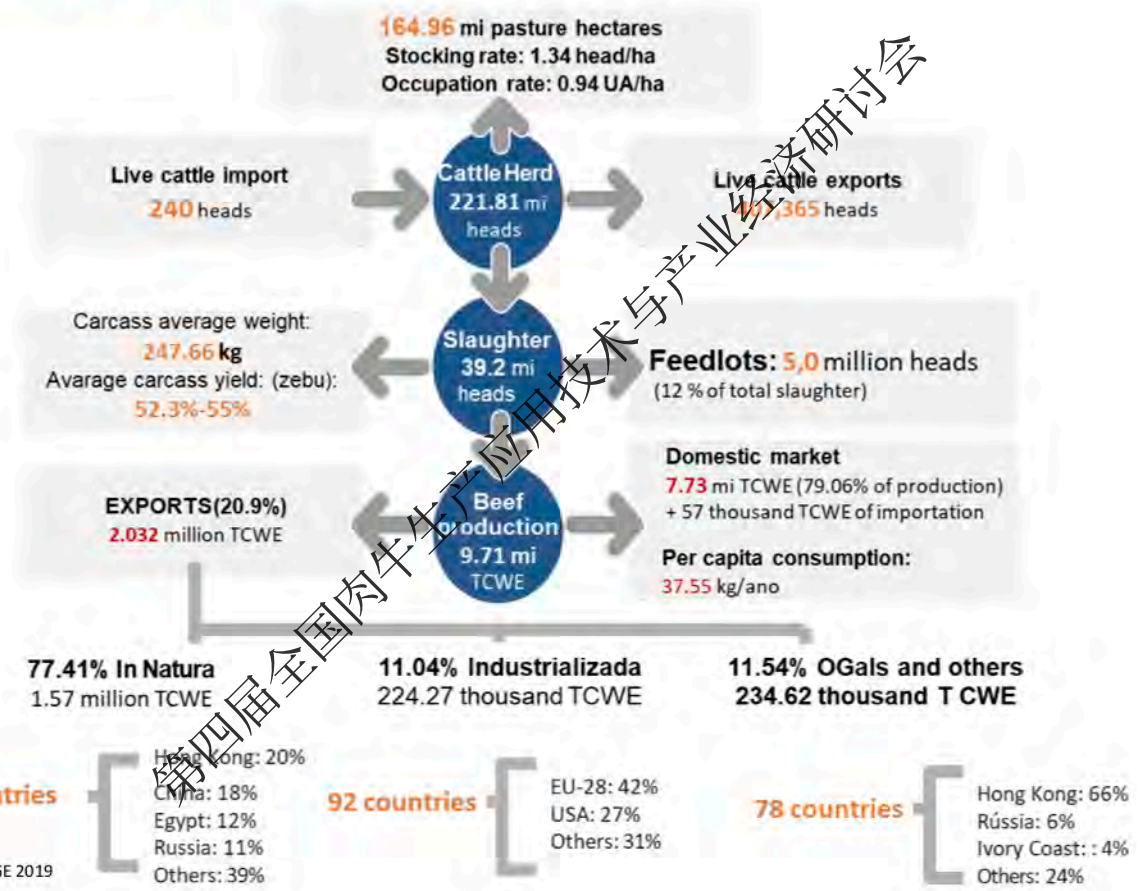
Souce: FAO 2019

Feedlot Global Players ~64 mi heads
全球肉牛存栏-6400万头

- NA 北美
  - USA 美国 - 22 (USDA 2019)
  - Canada 加拿大-1
- Europe 欧洲 - 22, 5
  - Italy 意大利-2,6
  - Iberia (Spain+Portugal)
    西班牙和葡萄牙 - 2, 4
  - France 法国 - 4,6
  - Turkey 土耳其 -1,2
  - UK 英国 - 4,3
  - Russia 俄罗斯- 1,4
- South Africa 南非-1,4 mi heads
- Latin America 拉丁美洲
  - Brazil 巴西 - 5,2 (ABIEC: Athenagro, data Secex/ MDIC, IBGE 2019)
  - Argentina 阿根廷 - 6,5-7 (Cámara Argentina de Feedlot 2019)
  - Uruguay 乌拉圭 - 0,3 (Rabobank/Inia)
  - Paraguay 巴拉圭- 0,4
  - Mexico 墨西哥 - 0,9
- Australia 澳大利亚 - 3

http://www.feedlots.com.au/
http://www.feedlots.com.au/industry/quarterly-survey

Livestock Farming in Brazil 巴西的肉牛业



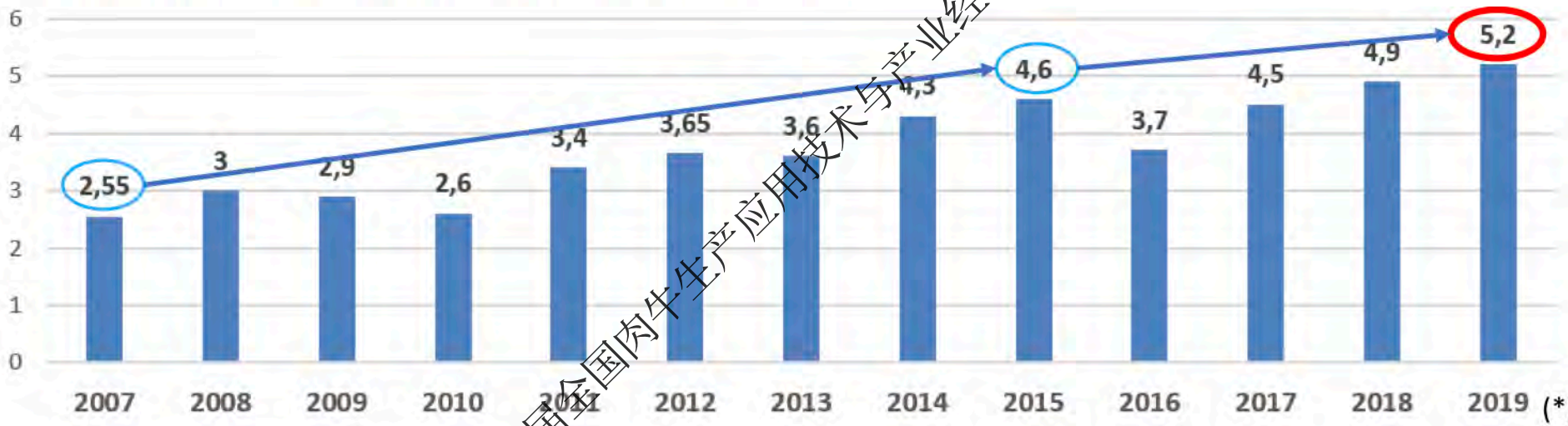
Source: ABIEC: Athenagro, data Secex/MDIC, IBGE 2019

Number of animals in feedlot 2007-2019

2007–2019年育肥牛存栏

Millions of animals, 2007 - 2019 (*)

Source: ANUALPEC, 2017 & SIM - DSM, 2019.



CAGR (2007 – 2018) = 6,12 %

Brazilian Beef Cattle Figures 巴西肉牛数据

ABIEC

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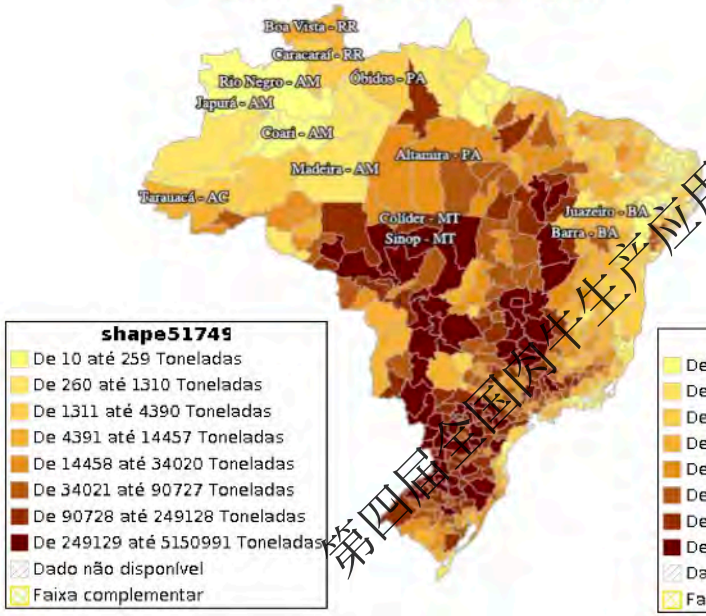
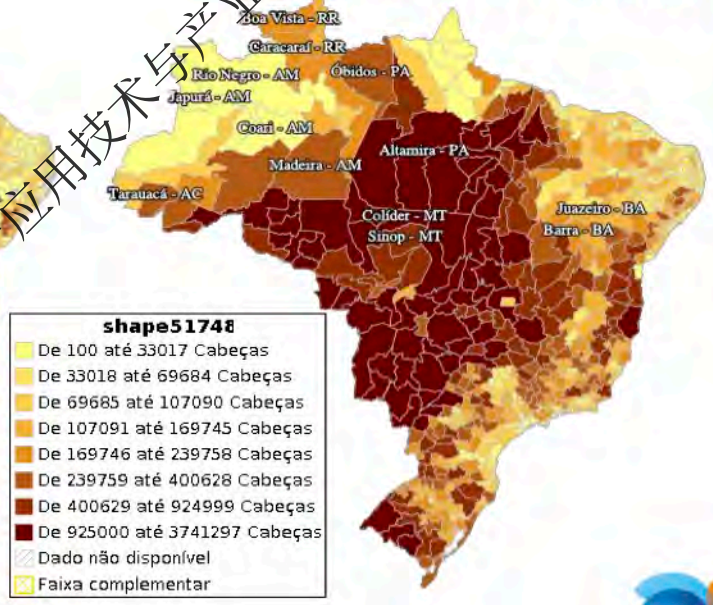
Positive perspectives for beef cattle intensification in Brazil巴西肉牛的优势是集约化（一条龙）

Crop Production 作物产量
2018 = + de 200 MI TONS



Bovine Heard 牛群数量
2018 = + de 200 MI bovinos



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Average Carcass Weight 2018 and trends
2018年平均胴体重和趋势

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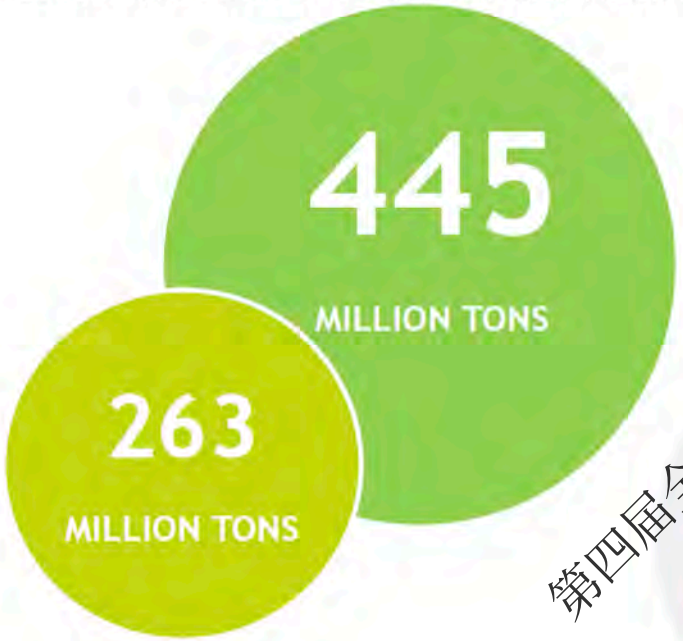
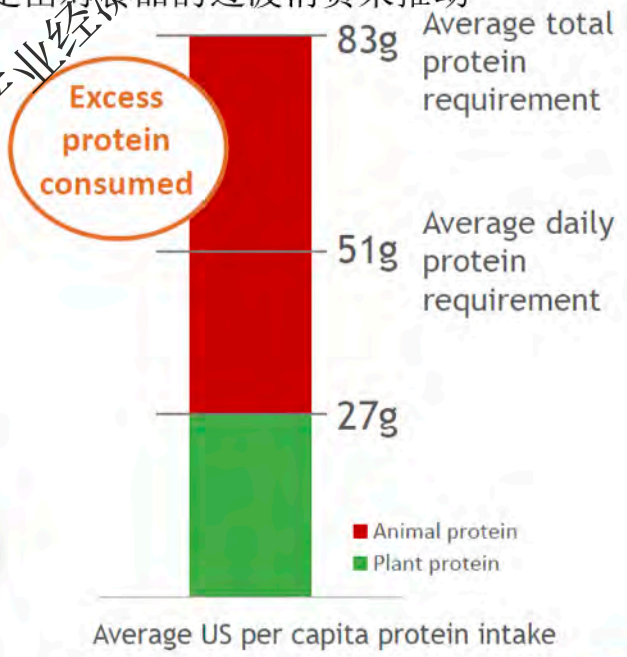
GREATER DEMAND FOR ANIMAL PROTEIN

EXPECTED TO RISE 70-80% BY 2050. SUPPORTS HUMAN HEALTH & WELFARE GAINS, BUT MUCH WILL BE DRIVEN BY OVER-CONSUMPTION OF FOOD

人们对动物蛋白有更高的需求

2050年预计增加70-80%.维持人类对健康和福利的增长需求,更多是由对食品的过渡消费来推动





Source: World Resources Institute 2017; Mottet at al, Global Food Security 14 (2017) 1.8; WEF white paper, Meat: the Future. Time for a protein portfolio to meet tomorrow's demand. *Meat includes beef, pork and chicken

Meat* production expected to grow from 263 million tons today to 445 million tons by 2050 (ca. 70% increase). Population expected to grow from 7 billion to 9.6 billion by 2050 (ca. 40% increase)

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LARGE FOOTPRINT & MANY AREAS TO IMPROVE

涉足的领域很大，需要改进的地方很多

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VALUE CHAIN DRIVING CHANGE TO MORE SUSTAINABLE FEED RAW MATERIAL USE

价值链推动向更可持续的饲料原料的使用转变

70-80
million tons additional soy consumption expected in the next decade

Equivalent to the current production of Brazil, Uruguay & Paraguay combined

预计未来十年大豆的需求量将增加7000-8000万吨
等于目前巴西，乌拉圭和巴拉圭的总产量

The Consumer Goods FORUM
The Global Network Serving Shopper & Consumer Needs

Sustainable Soy Sourcing Guidelines

TESCO

Announces plan for zero deforestation soy targeting chicken first in 2018-19

乐购宣布在2018年-2019年计划首先以鸡肉为目标实现大豆零砍伐

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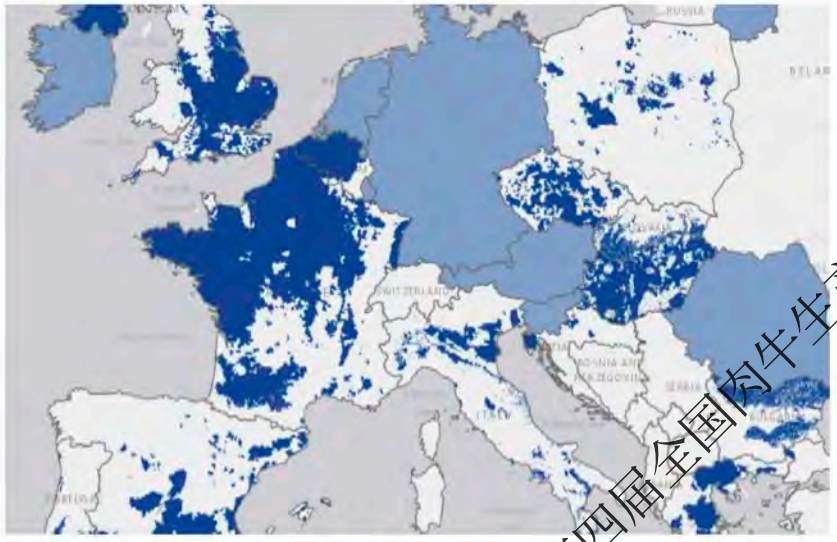
Source: WWF 2016: Tesco 2018.

THE NITROGEN CHALLENGE

EXAMPLE: EUROPE 氮素面临的挑战
举例：欧洲



EU Nitrate Vulnerable Zones (NVZs) dark blue

Nitrogen is vital for crop growth, but high concentrations are harmful to people & nature.
氮对植物生长是至关重要的，但是过高的氮会对人类和自然产生危害

Excess nitrogen from agricultural sources is one of the main causes of water pollution in Europe.
来自农业领域过多的氮是欧洲水污染的主要原因

Driven by intensification of animal and crop production.
动物和植物集约化生产是主要的驱动力

Nitrogen is monitored (NVCs) and limits on manure application are set (170kg N/ha/yr).
对氮进行监测，并限制肥料施用（170kgN/公顷/年)

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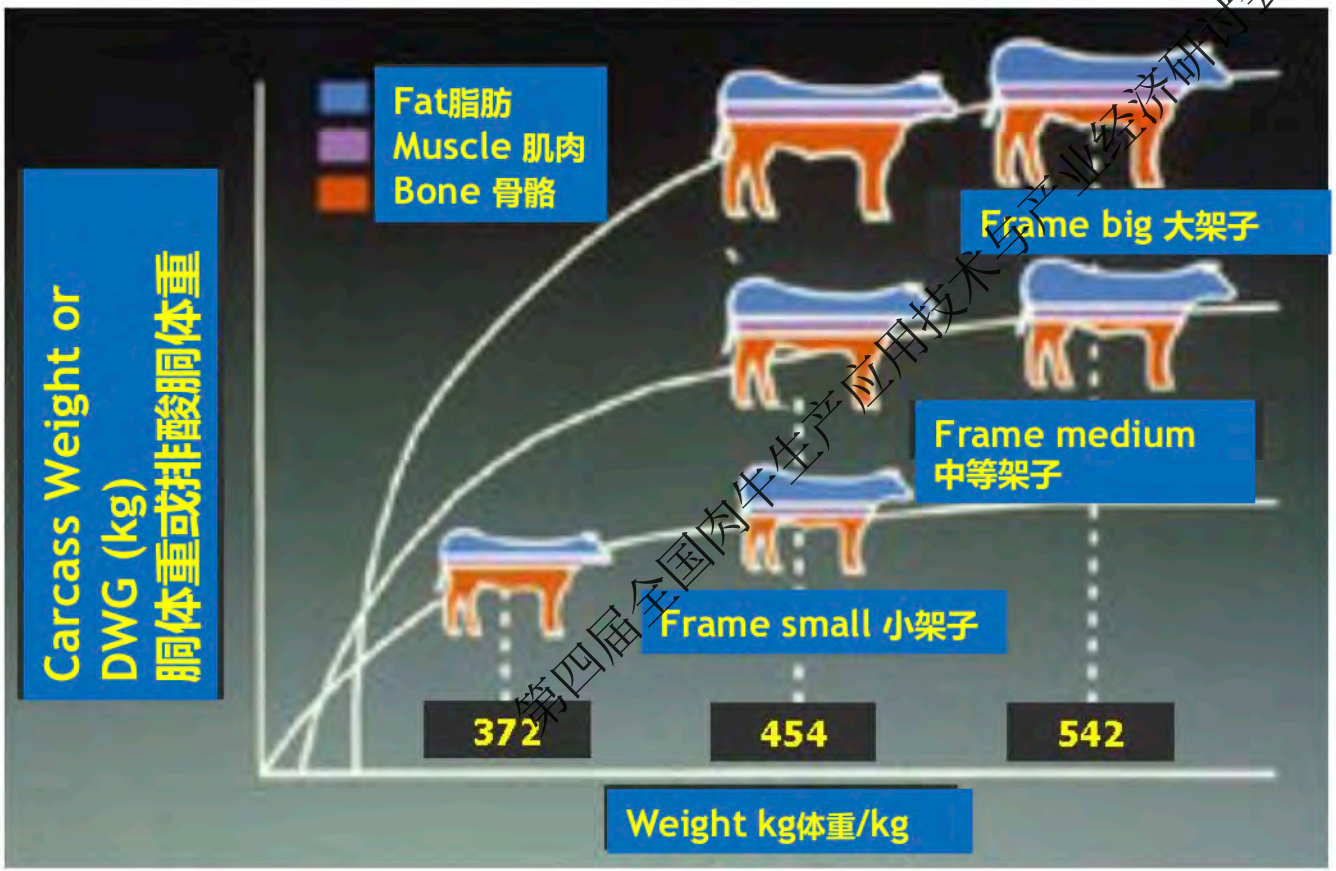
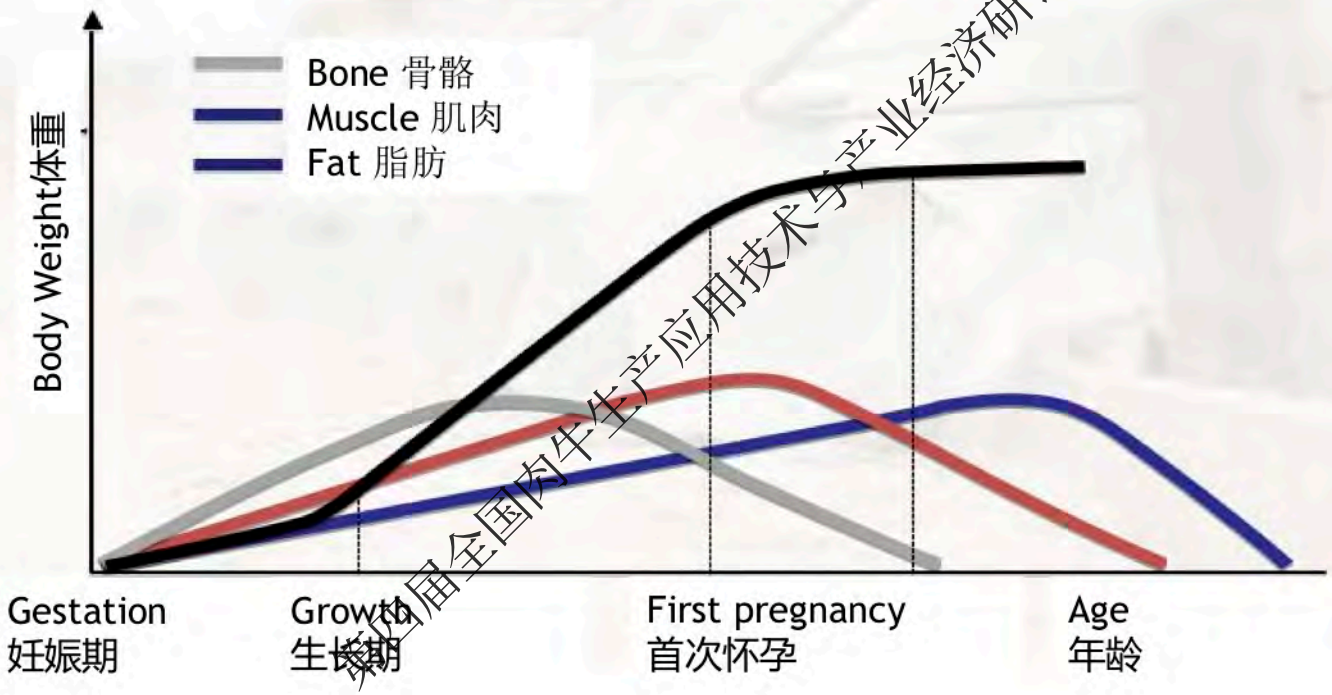
Farm Level Trends 牧场水平趋势

- Farm Labor quality 牧场劳动力质量
  - People Training & Capacitation
  - 人员培训& 能力培养
- Production Costs optimization 成本优化
  - Investment x less expenses
    投资x减少费用
  - Commodities 日用商品
  - Local Raw Materials 本地化原材料
  - Adequate Nutritional Supplementation
    充足的营养供应
- New Feed Additives 新的饲料添加剂
  - Antibiotic free 无抗
  - Hormones 激素
  - Enzymes 酶
  - Eubiotics 摄生素
- Animal Welfare 动物福利
  - Management 管理
  - Heat stress 热应激
  - Animal Health 动物健康
- Innovative Technologies 创新技术
  - Digital farms 数字化牧场
  - Farm Management 牧场管理
  - PLF (Precision Livestock Farming)
    牧场精准化管理
- Technical Support 技术支持

FRAME - Dressing x Weight 架子–外形X体重



Growth Curve 生长曲线



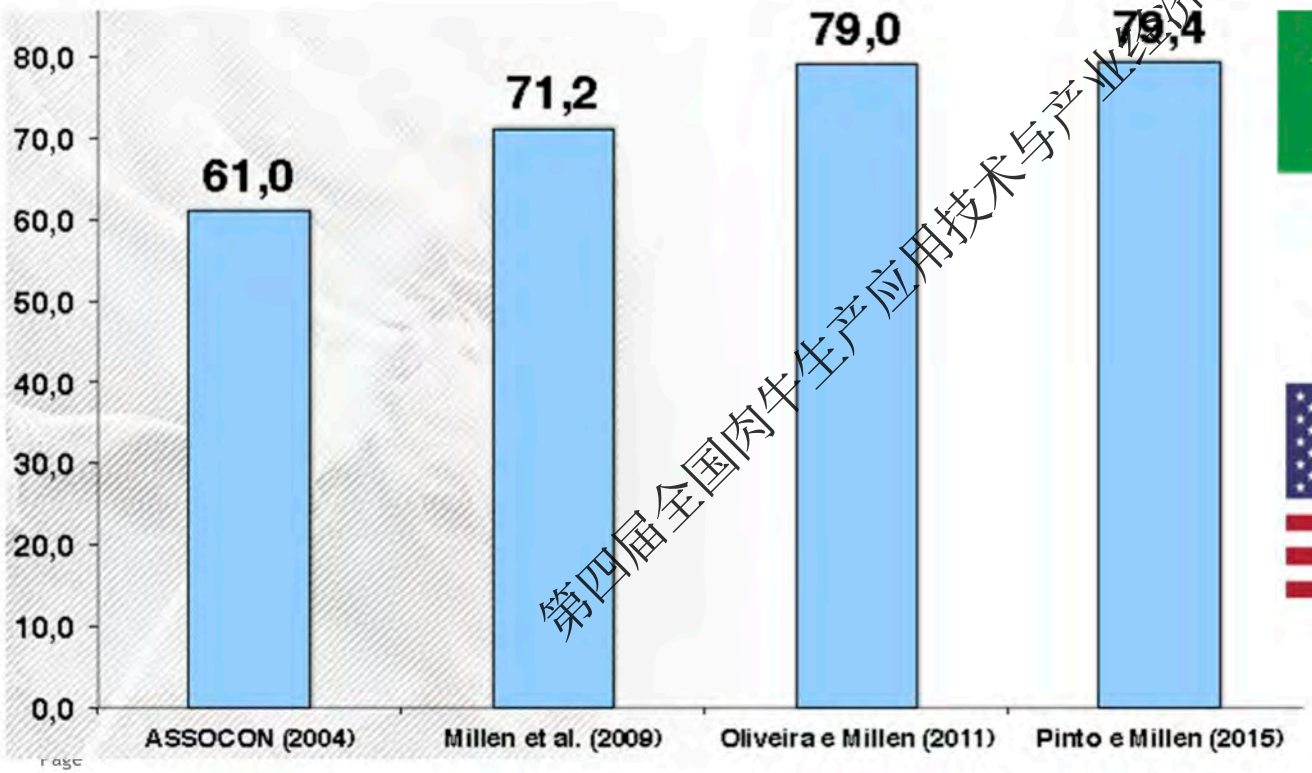
Adaptado de Baldwin (1995)

Best moment for slaughter 最佳出栏时间

(Days in Feed x Profitability-饲喂天数和收益)

Evolution of Concentrate Levels in Feedlot

育肥厂精料使用水平进展



91%

Vasconcelos e Galyean (2007)

SIMULAÇÃO ECONÔMICA CONFINAMENTO 2019

Cliente: DSM/TORTUGA

Município: Brasil

Ingredientes	R$ / Ton	R$/Kg	DIETA MACHOS 2019 ALTO VOLUMOSO 60 : 40 (V:C) 14% PB 70%NDT	INTERMEDIÁRIA 40 : 60 (V:C) 14,5% PB 74% NDT	ALTO CONCENTRADO 20 : 80 (V:C) 15% PB 78% NDT
Corn Silage 33% DM	R$ 120,00	R$0,120	21,410	14,950	7,150
Corn	R$ 500,00	R$0,500	3,310	4,800	6,980
Soybean Meal	R$ 1.100,00	R$1,100	0,900	0,615	0,477
Cottonseed	R$ 630,00	R$0,630		1,020	1,536
Urea	R$ 1.800,00	R$1,800	0,125	0,130	0,130
DSM Vit/Min/EO	R$ 4.450,00	R$4,450	0,300	0,300	
DSM Vit/Min/EO/Amylase	R$ 5.500,00	R$5,500			0,290
Consumo total (Kg)			26,05	21,82	16,56
Consumo MS (Kg)			11,25	11,05	10,75
Consumo % PV			2,45%	2,40%	2,35%
GPD (Kg/dia)			1,35	1,55	1,74
Dias de Confinamento			119	103	92
Rendimento de Carcaça			53,50%	54,50%	55,50%
Peso Vivo Inicial (Kg)			380,00	380,00	380,00
Peso Vivo Final (Kg)			540,00	540,00	540,00
Custo nutricional da dieta			R$8,77	R$7,08	R$7,67
Custo operacional			R$1,00	R$1,00	R$1,00
Custo nutricional + operacional			7,77	8,08	8,67
@ colocadas			6,59	6,95	7,31
Custo da @ produzida			R$ 139,75	R$ 119,98	R$ 108,96
VALOR DA ARROBA DO BOI GORDO (R$/@)			R$ 150,00	R$ 150,00	R$ 150,00
CUSTO TOTAL PERÍODO (R$)			R$ 921,39	R$ 834,28	R$ 796,84
LUCRO LÍQUIDO (R$/ANIMAL)			R$ 67,61	R$ 208,72	R$ 300,16
PREÇO BOI MAGRO (R$)			R$ 1.900,00	R$ 1.900,00	R$ 1.900,00
RENTABILIDADE PERÍODO (%)			2,40%	7,63%	11,13%

High Concentrate Diets 高精

- Higher Performance DWG 高增重性能
- Lower costs/kg meat 较低的公斤肉成本
- Less days in feed 低的饲养天数
- Higher profitability 较高的效益
- Equipment optimization 设备最优化

DWG (live weight x Carcass):日增重（活重x胴体）

A. Forage x A. Concentrate（饲草X精料）.

1,35kg x 1,74kg **(28,80%)**

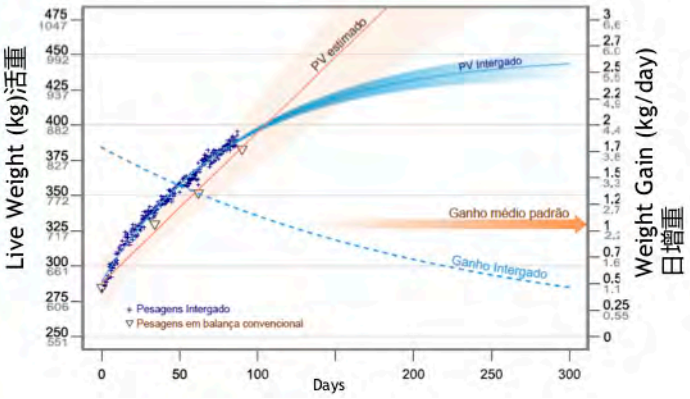
0,83kg x 1,19kg **(43,57%)**

203,14kg x 135,29kg **(33,4%)**

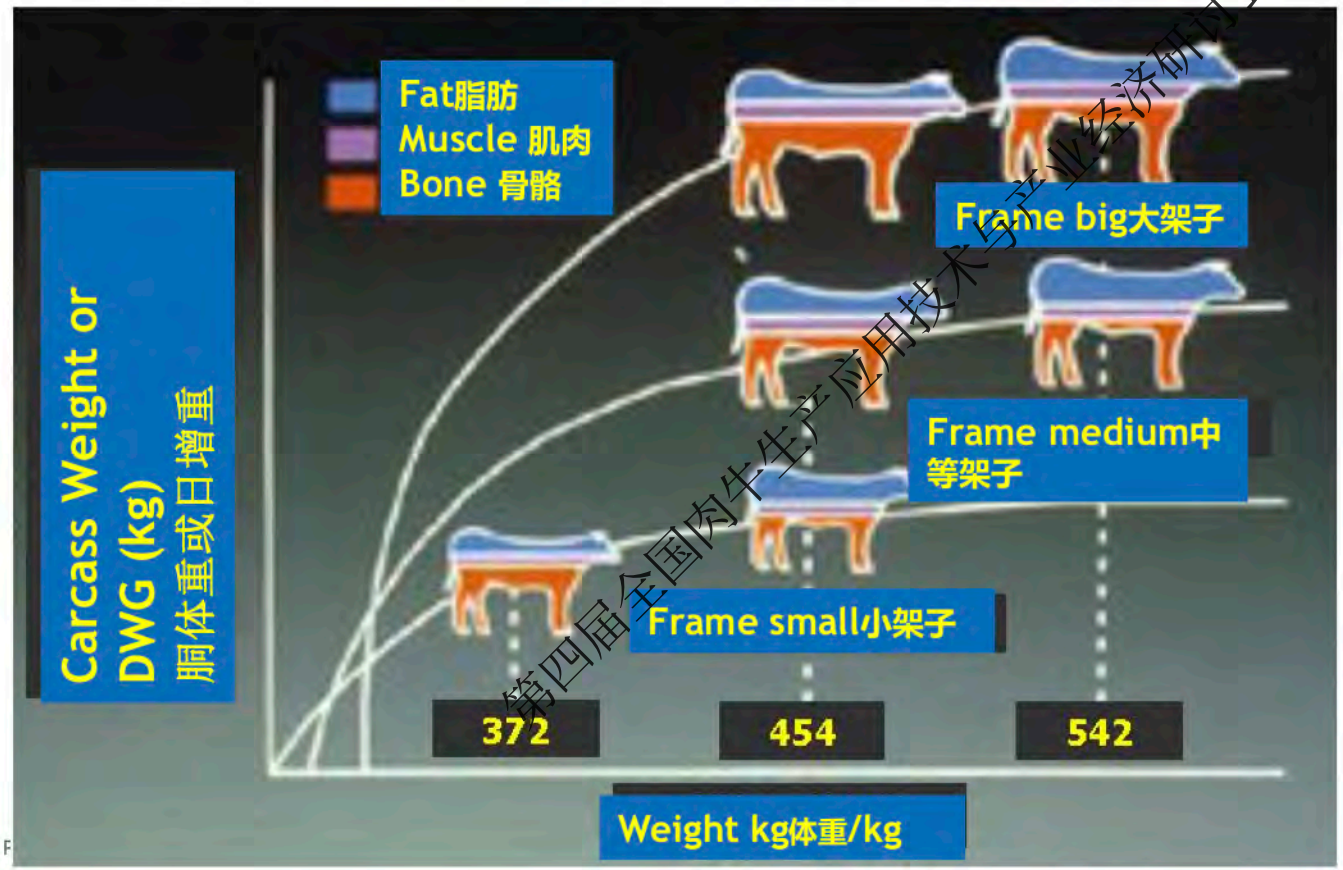
Profitability 效益

Technical Trends for Feedlot in Brazil
巴西育肥技术发展趋势

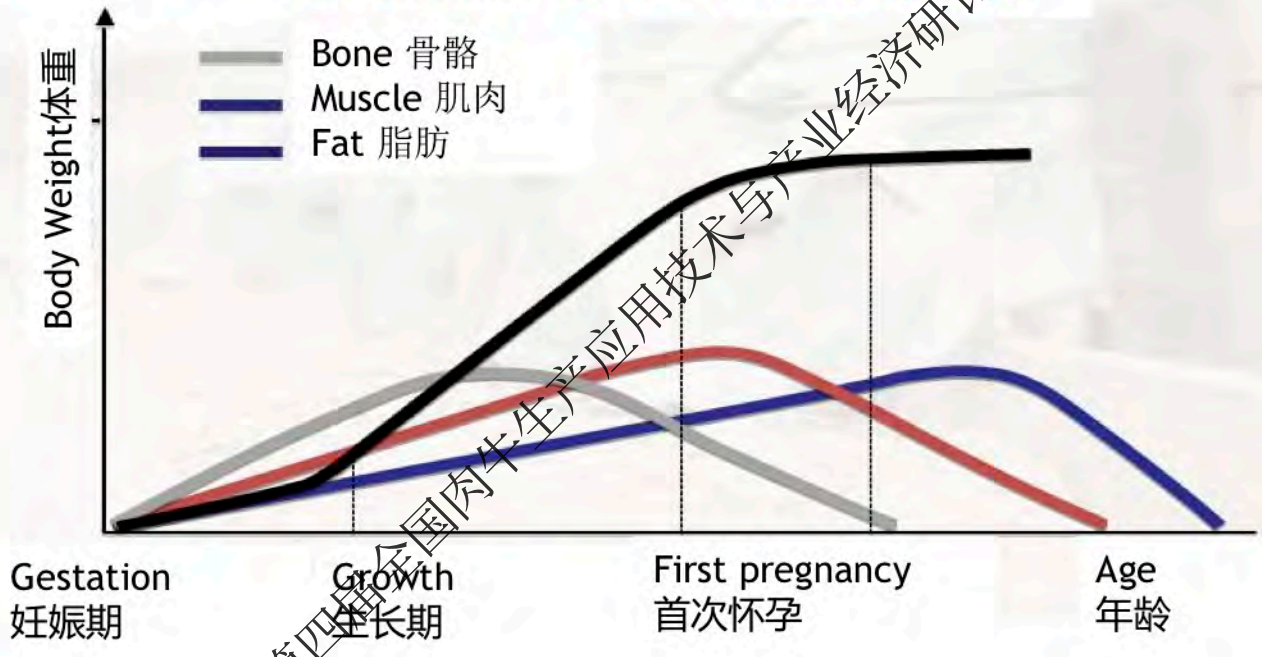
- ✓ Management Improvement and new Technologies/Equipments
  改善管理和新技术/新设备
- ✓ More Challenging Diets and new feed Additives
  更具挑战性的日粮和新饲料添加剂
- ✓ More days in feed
  饲养更长时间
- ✓ Heavier animals to slaughter
  出栏体重更大



Estrutura Corporal (FRAME SIZE) – animais podem ter o mesmo acabamento, mas com pesos diferentes!



Growth Curve 生长曲线

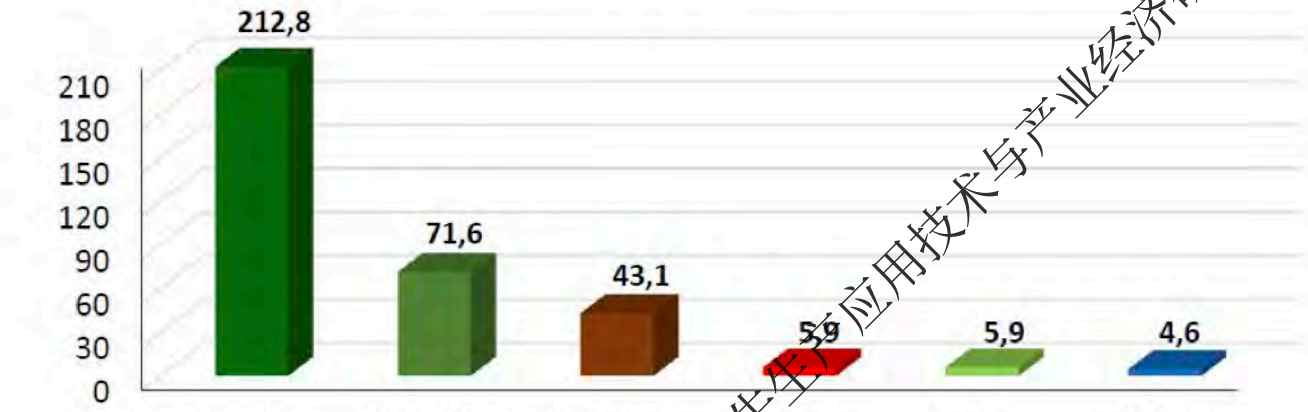


Adaptado de Baldwin (1995)

Organs Development 器官发育

Organs Development (gain weight) at 61 days in feed (g/day)

饲喂61天的器官发育程度（g/天）

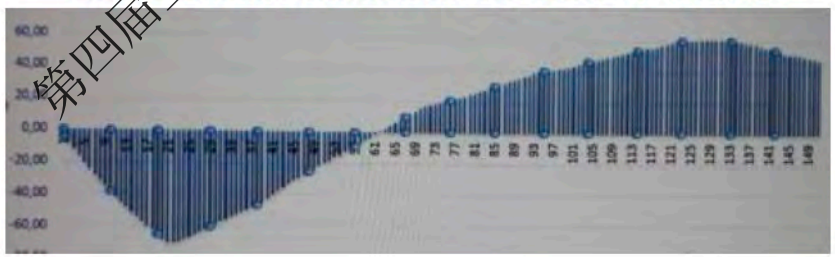


TOTAL 344 g

合计344g

PONTO ÓTIMO DE ABATE (Dias de cocho vs. Dias de Lucro)

Lucro Bruto Acumulado vs. Dias de Cocho



Beef cattle production肉牛生产

- New technologies to optimize beef cattle production: essential oils and exogenous enzymes

  提高肉牛生产水平的新技术：精油和外源酶。

Intensive production systems 集约化生产体系

- Higher energy diets 高能日粮
  - Higher use of grains 使用更多的谷物
  - Risk of ruminal acidosis 瘤胃酸中毒风险
  - Additives – modulate ruminal fermentation 添加剂-调节瘤胃发酵
    - **Antibiotic 抗生素** NO

Animal Feed Science and Technology 200 (2015) 8–16

Contents lists available at ScienceDirect

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Thyme and cinnamon essential oils: Potential alternatives for monensin as a rumen modifier in beef production systems

B. Khorrami [a,*]

[a] Department of Animal Science, Faculty of Agriculture, Ferdowsi University of Mashhad, Mashhad, Iran

Feed – source of energy 饲料-能量饲料


Animal Feed Science and Technology 197 (2014) 64–75

Contents lists available at ScienceDirect

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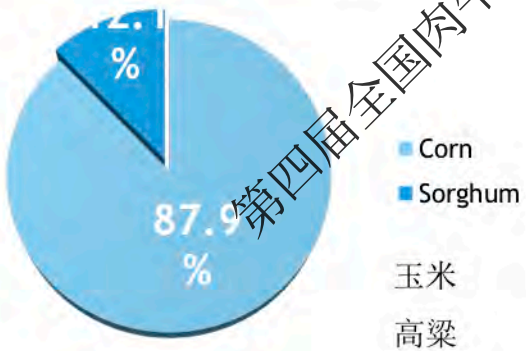
Survey of the nutritional recommendations and management practices adopted by feedlot cattle nutritionists in Brazil

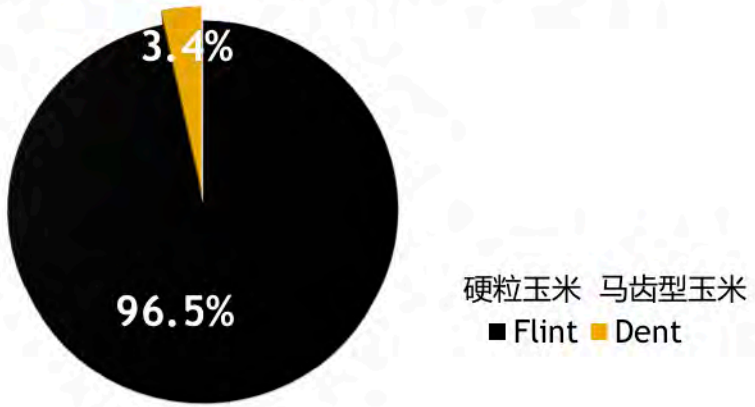
C.A. Oliveira, D.D. Millen*

Animal Science College, São Paulo State University (UNESP), Dracena campus, Dracena, São Paulo 17900-000, Brazil

Primary grain used in Brazil在巴西主要使用谷物



Type of corn used 玉米类型

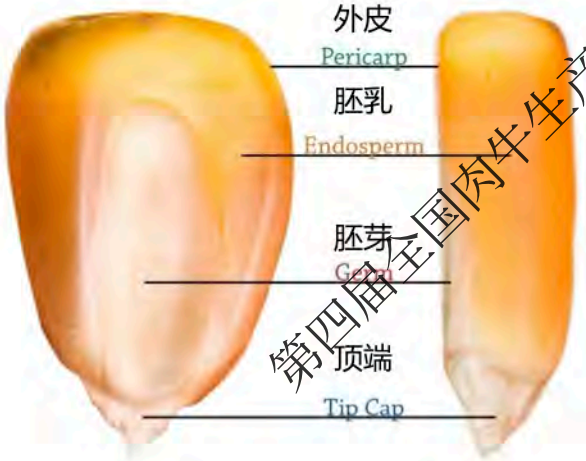


Corn quality 玉米质量

J. Dairy Sci. 85:3008–3012

Relationship Between Corn Vitreousness and Ruminal In Situ Starch Degradability

C. E. S. Correa,* R. D. Shaver,†[1] M. N. Pereira,* J. G. Lauer,†[2], and K. Kohn†[2]
*Universidade Federal de Lavras, Departamento de Zootecnia, Lavras, Brazil, 37200-000
†University of Wisconsin, Madison 53706



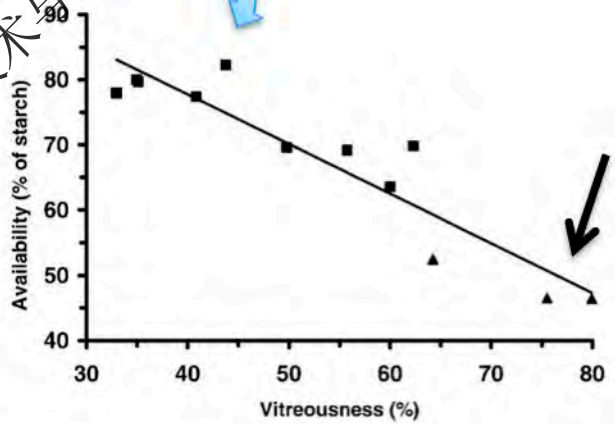


Figure 3. Relationship between corn kernel vitreousness and ruminal in situ starch availability measured in three U.S. dent (■) and three Brazilian flint (▲) hybrids harvested at the mature stage of maturity and two U.S. dent (■) hybrids harvested at half milk line, black layer, and mature stages of maturity. Availability = A + B [k_d/(k_d+k_p)] with K_p at 0.08/h. Availability = 108.2 – 0.7605*Vitreousness. r^2 = 0.87. $P < 0.001$.

Enzyme action酶的作用

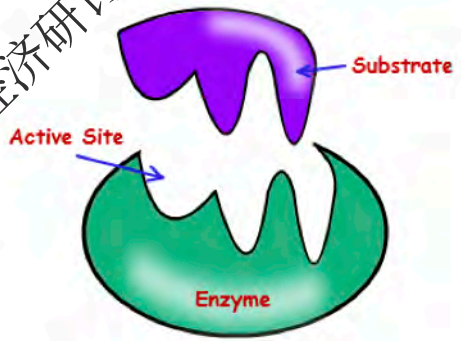
1st Substrate dependent - availability

底物依赖型—有效性

2nd Potential to increase digestibility

提高消化性的潜力

- Degradation rate 降解率
- Chances on site of digestion 在消化部位的机会



Previous information 已有的案例

Table 1 (Abstr. 612). Combination of essential oils and exogenous enzymes on feedlot performance of finishing Nellore bulls 精油和外源酶配合在育肥牛上的使用效果

Item	MON	CRINA	CRINA+ MON	CRINA+ RUM	CRINA+ RUM+P	P-Value	SEM
Initial BW, kg	330.8	330.8	330.9	330.6	330.7	0.9422	10.9
Final BW, kg	476.4^{b}	486.5^{ab}	474.1^{b}	494.1^{a}	463.1^{c}	0.0001	12.6
DMI, kg/d	8.64^{bc}	9.24^{ab}	8.50^{c}	9.45^{a}	8.44^{c}	0.0001	0.27
ADG, kg/d	1.615^{b}	1.722^{ab}	1.584^{b}	1.812^{a}	1.465^{c}	0.0001	0.06
FE, G:F	0.187^{ab}	0.187^{ab}	0.188^{ab}	0.193^{a}	0.175^{b}	0.0001	0.005
HCW, kg	264.8^{b}	272.5^{ab}	262.3^{b}	277.0^{a}	257.4^{c}	0.0002	8.01
Dressing, %	55.5	56.0	55.5	56.1	55.8	0.2652	0.25

Meschiatti et al., 2015

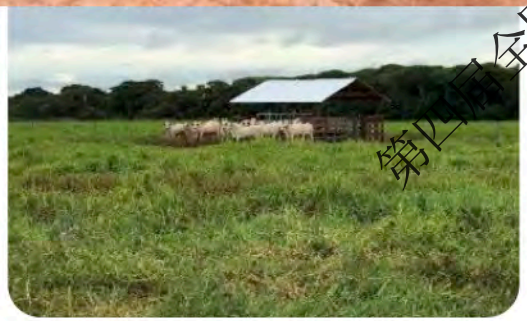
Effects of essential oils and exogenous enzyme in feedlot finishing cattle diets high in *flint* corn ground at different particle sizes

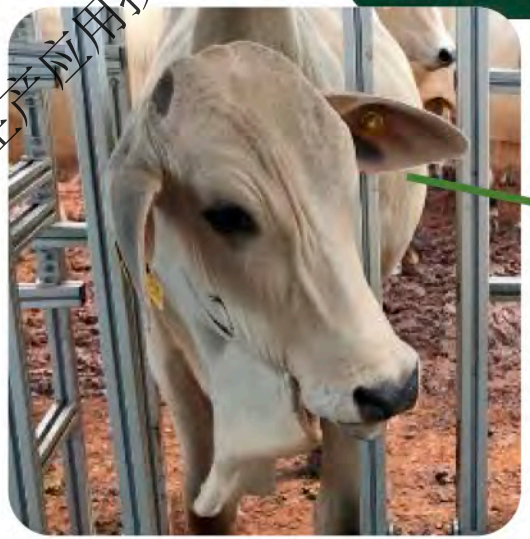
observed on feed efficiency (G:F) and dressing percentage. There was an interaction effect (P = 0.02) between ground corn particle size and feed additives for hot carcass weight (HCW). Animals fed CGC diets and CRINA-RUM presented 11.5 kg greater HCW (P<0.05) compared to animals fed CGC and MON - 295.2 and 283.7 kg, respectively. On the other hand, no effects (P>0.05) of additives were observed for HWC on GC diets. The CRINA-RUM combination for finishing cattle fed *flint* CGC diets increases HCW and can be an effective substitute for sodium monensin.

Meschiatti et al., 2016

Electronic feeders and weight platforms
Grazing system and facilities – supplementation
电子自动饲喂系统和体重秤量系统和设备-补充

Precise evaluation – last generation on equipment!

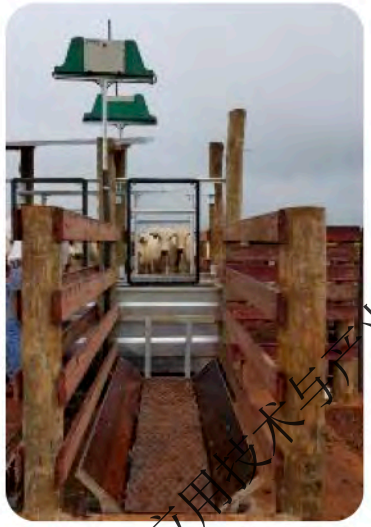


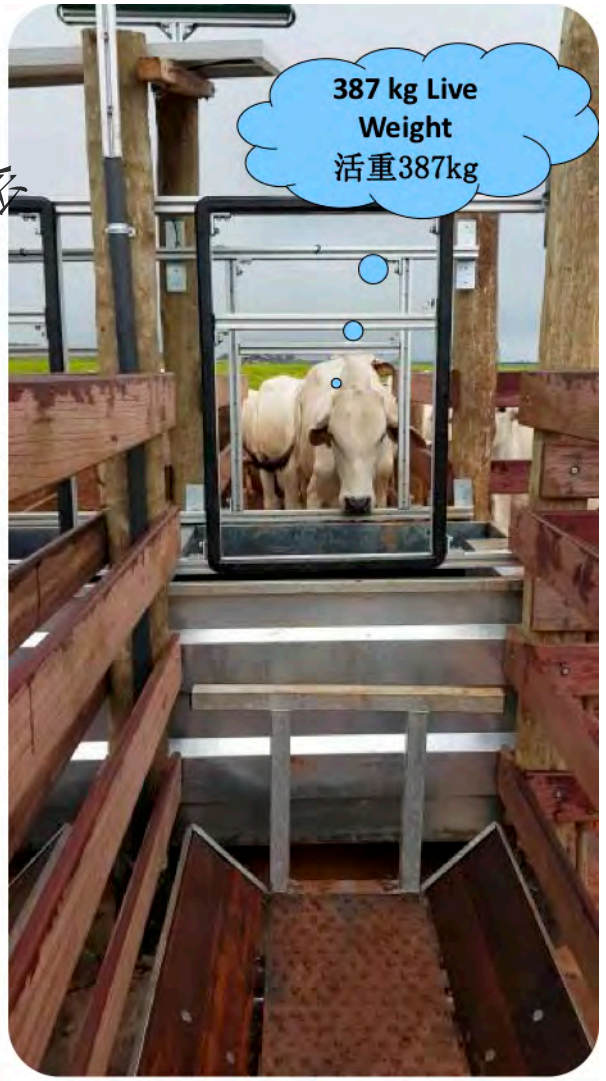


Electronic feeders 电子饲喂系统

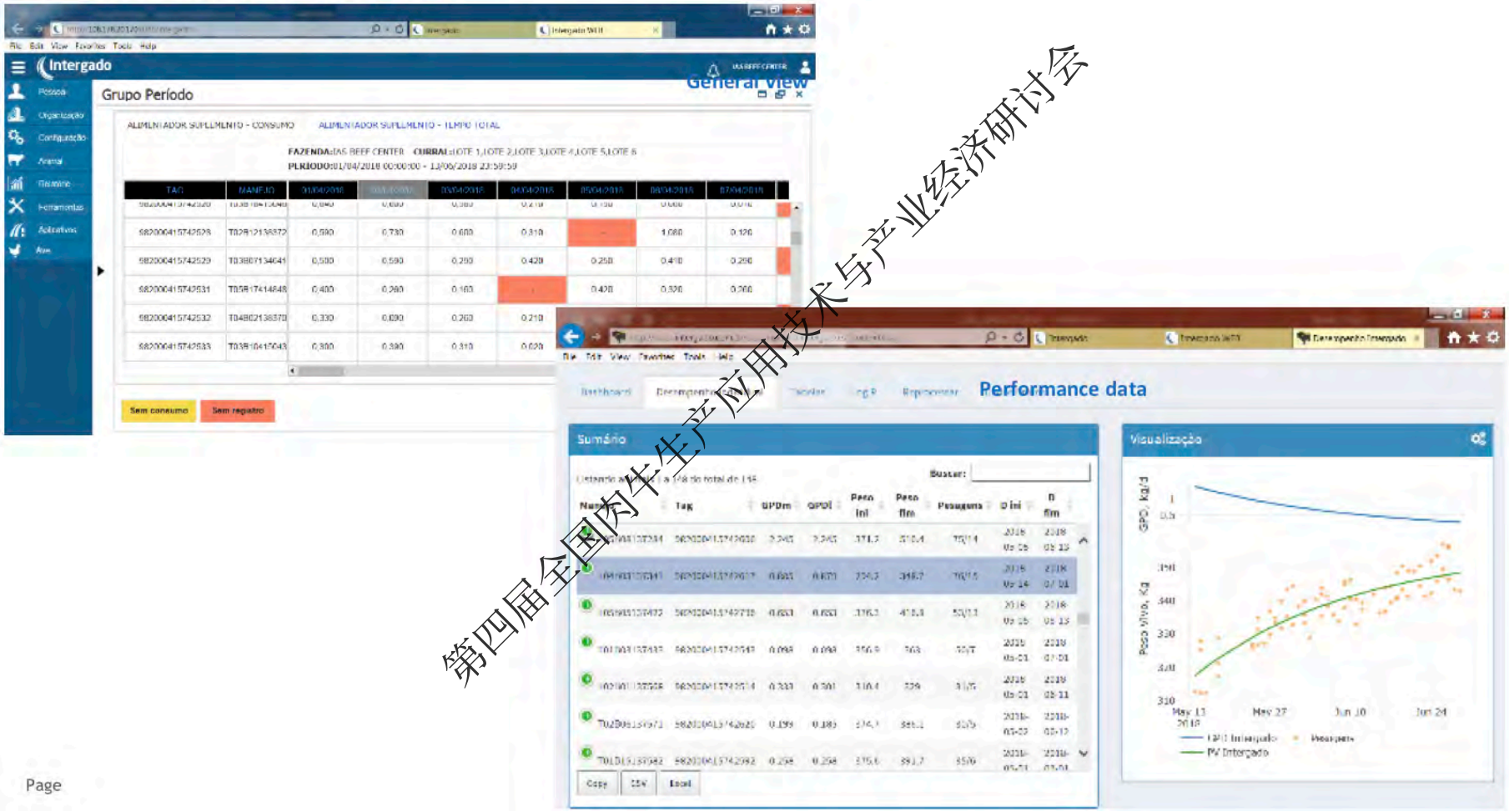
Weighting platforms

称重台





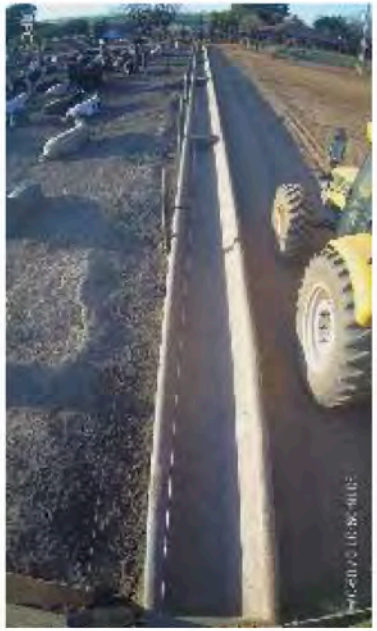
Dashboard 控制界面



Consistency: feed delivery 饲料投放一致性

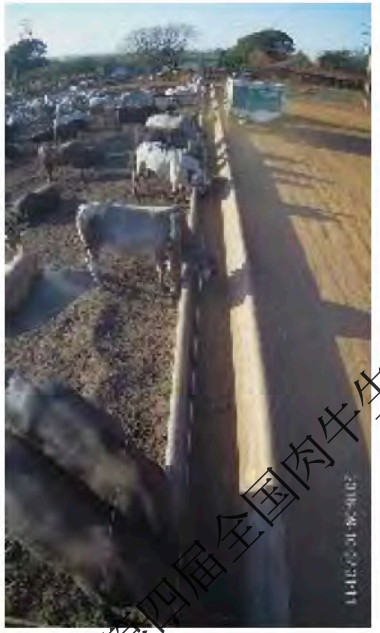
Range: 7:00 - 7:30 am

1/9/2018 - 07:09:07



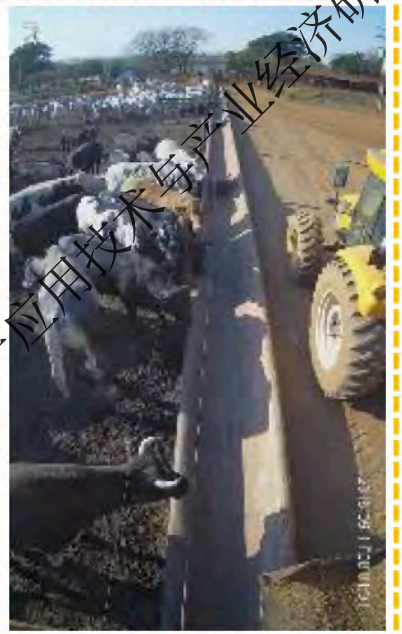
On time
准时

10/9/2018 - 07:31:11



On time

11/9/2018 - 08:01:01

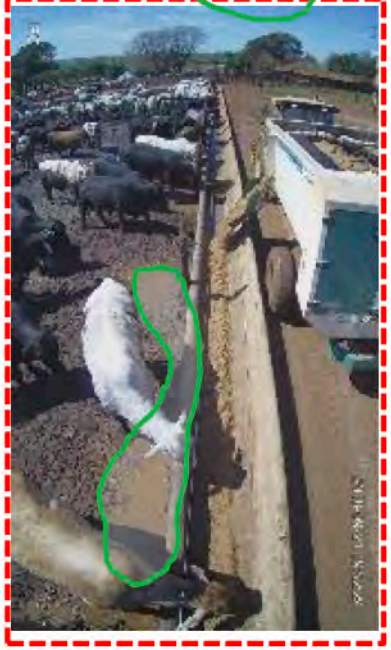


Out
超时

21/9/2018 - 09:52:29

2 h and 20 min late

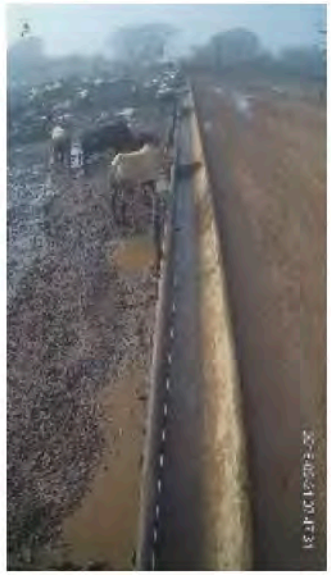
30 min late



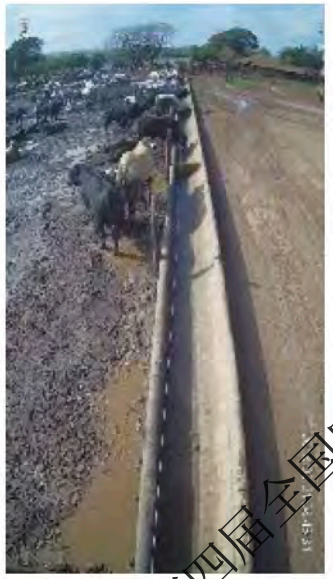
Out

Feed Bunk: cattle behavior 食槽：牛的行为

21/9/2018 - 07:47:31 21/9/2018 - 08:48:31 21/9/2018 - 09:22:29 21/9/2018 - 09:40:30 21/9/2018 - 09:52:29

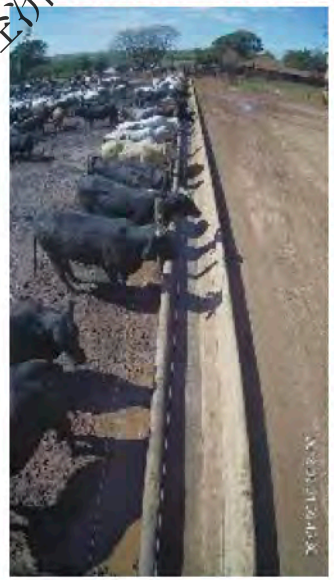


Low Cattle Bunk低饲槽



Empty Bunk空饲槽

Empty Bunk
Low Cattle Bunk



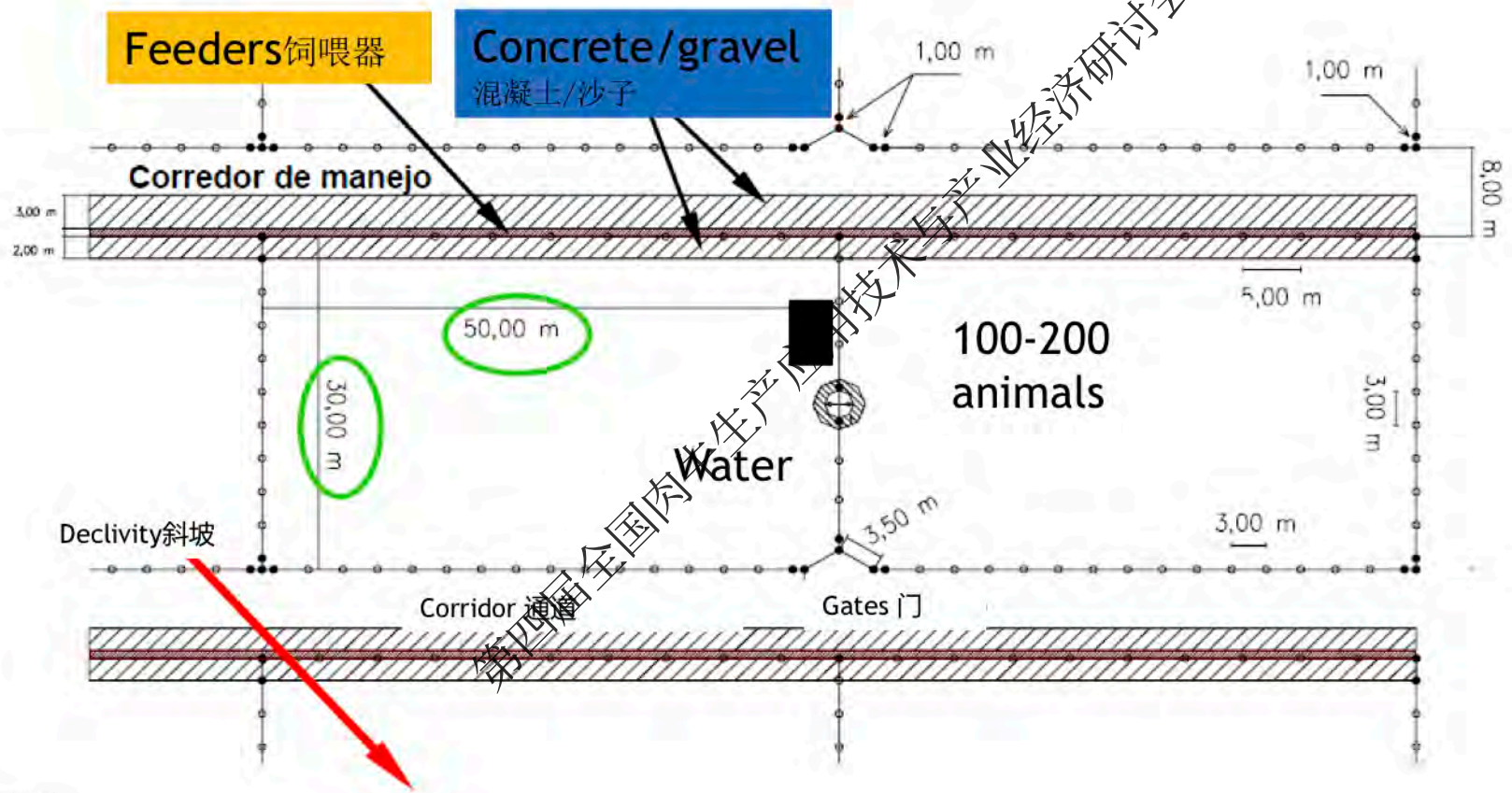
Empty Bunk
Half Cattle Bunk

Full Bunk
Half Cattle Bunk

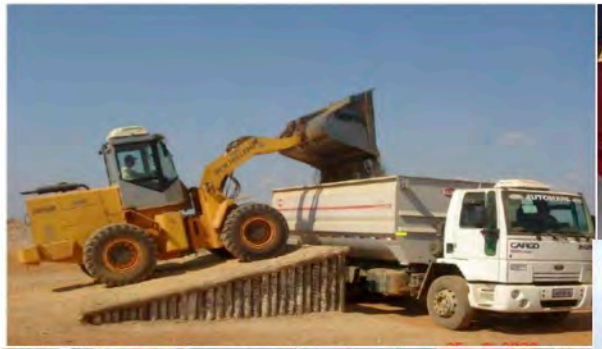
Human resource: bunk reader
人的作用：食槽评分

- *3 min to clean and give bunk score 3分钟清理并给予食槽评分*
- *2 people working 2人工作*
- *Bunk score done by 6:50 am上午6：50之前完成食槽评分*

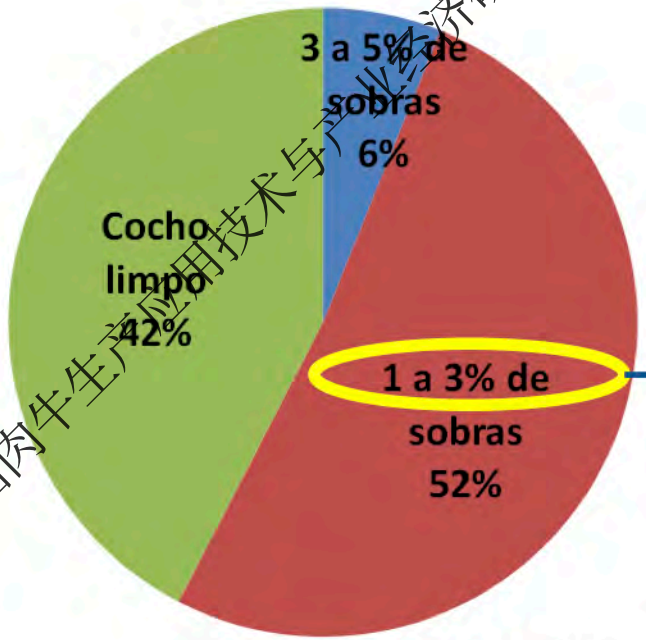
Figura 3. Projeto de currais de confinamento.



TMR Equipments TMR设备



Feeders reading 饲槽观察



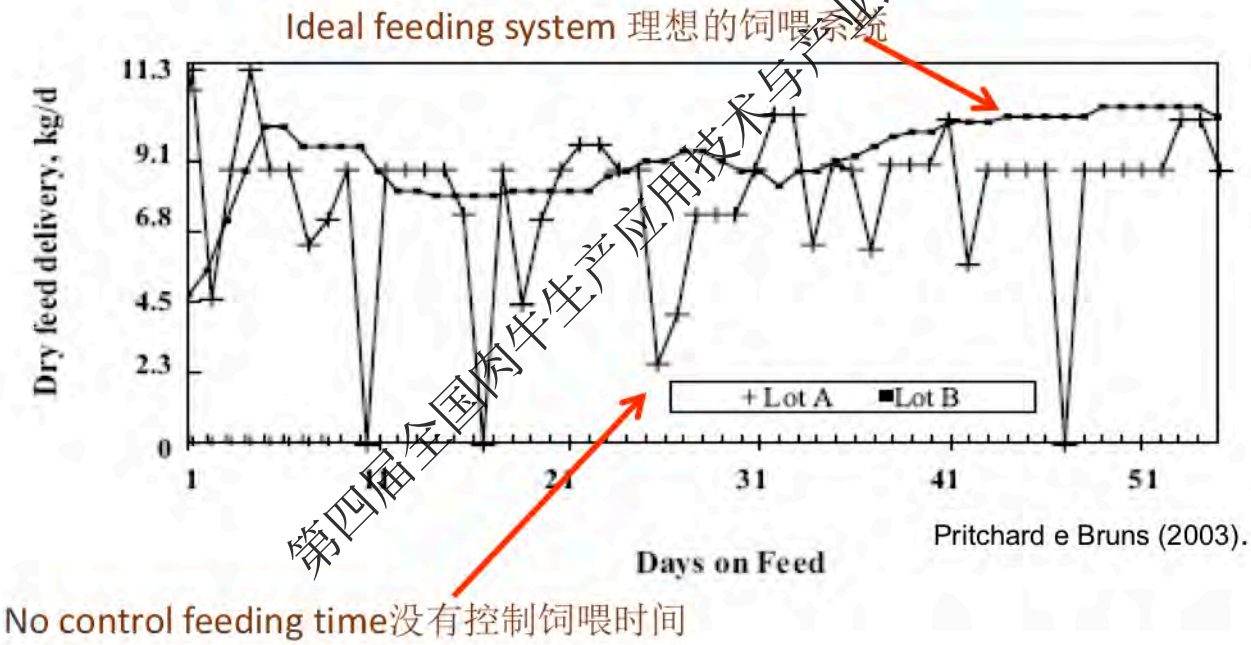
Pinto e Millen (2016)

Animals behavior after 1st feeding 首次采食后的动物行为

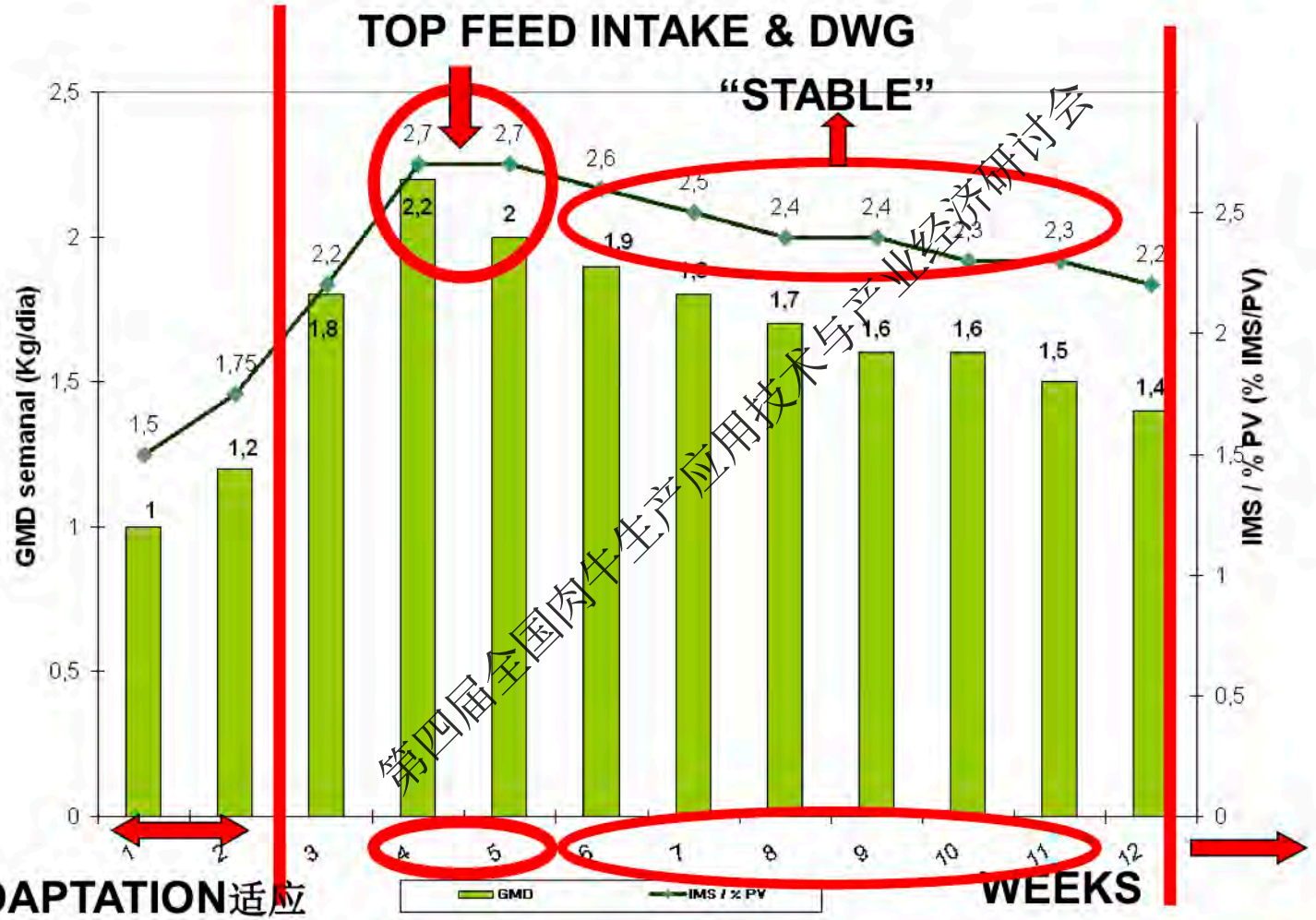
- The “ideal” for 1st feeding is 25% of animals are full and waiting next feeding, and 50% resting/ruminating and 25% standing up (Horton, 1990).
- 首次采食后的理想状态时25%的动物等待下次采食，50%休息或者反刍，25%动物站立。

Feeding efficiency: Predict X real Tolerance (0 a 3%)
采食量：预测和实际差距（0-3%）

Too much feed today ... Too low feed tomorrow
今天饲喂太多，明天饲喂太少



Pritchard e Bruns (2003).



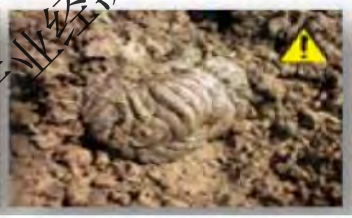
FEACAL SCORE 粪便评分

SCORE 1 1分
LIQUID/DIARREA腹泻

SCORE 2 2分
TOO SOFT 太稀

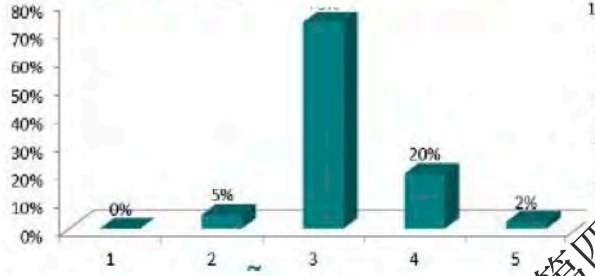
SCORE3 3分
FIRM 有形

SCORE4 4分
TOO FIRM 太硬

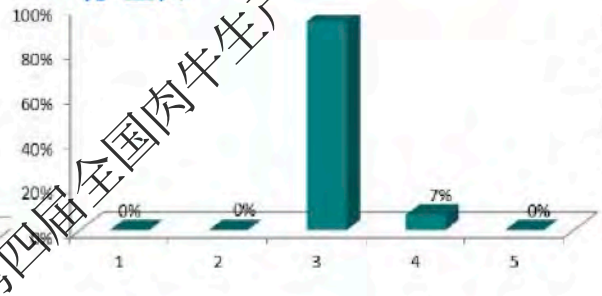


SCORE 5 5分
DRY 干

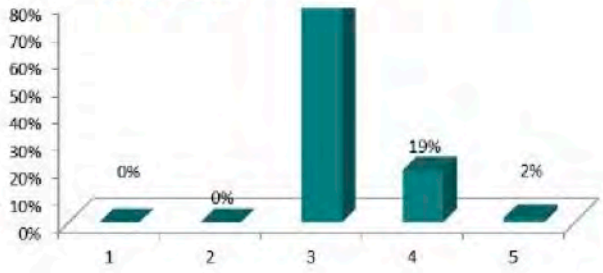
FEACES SCORE - ADAPTATION粪便评分-适应



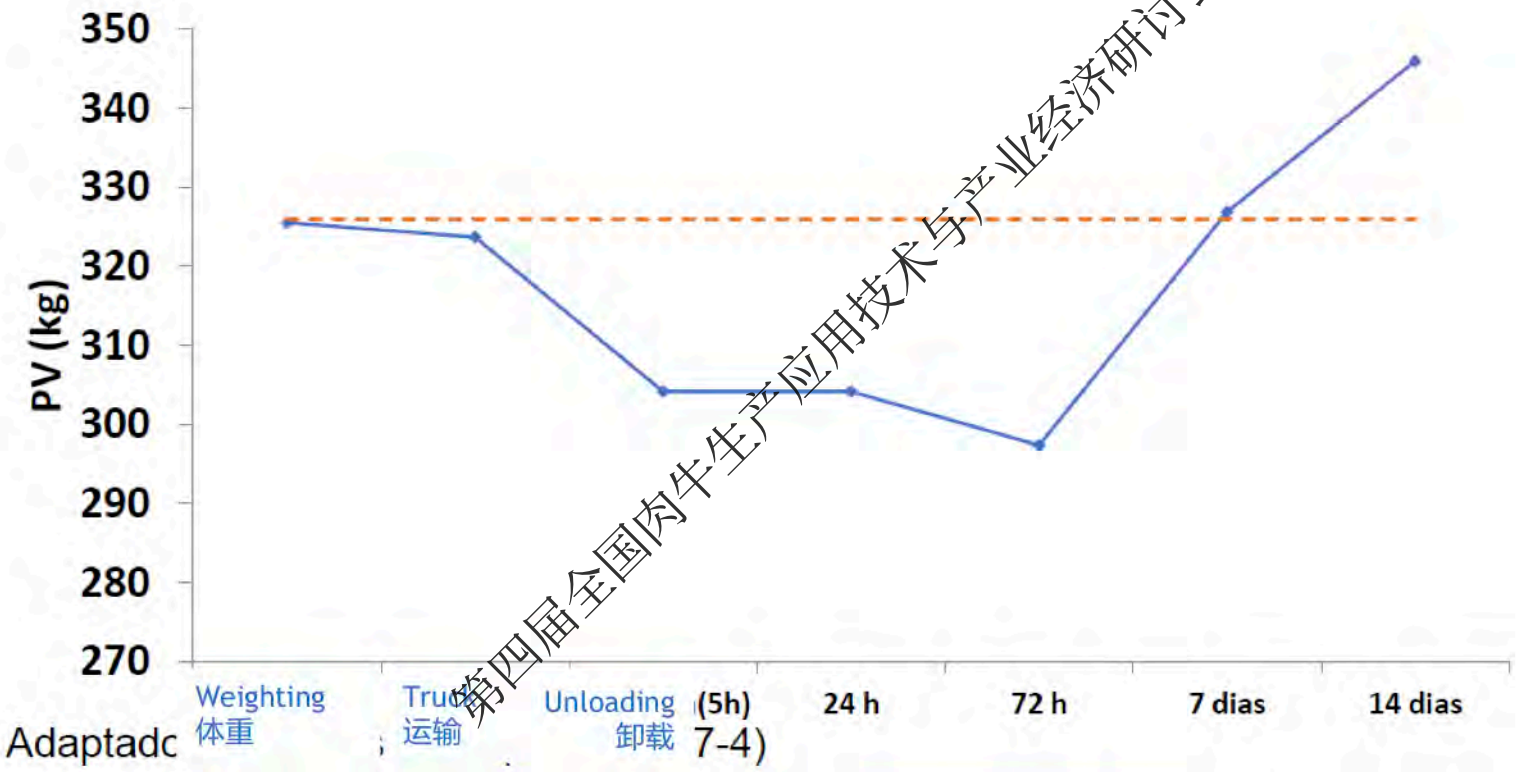
FEACES SCORE - GROWING粪便评分-生长



FEACES SCORE - FINISHING粪便评分-结束



Loss of weight due to corral/transportation 因为圈养和运输损失体重



Adaptadc 7-4)