Precision Feeding Through Digital Innovation and Models

数智化营养赋能精准饲喂

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泰高北美区战略市场与技术总监

The 14th Leman China
Oct. 2025

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个人简介 Who I am

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Education 教育背景

2002-2009 **本科** 农业工程，**硕士** 动物科学
B.Sc. Agricultural Engineering, **M.Sc.** Animal Science

2010-2015 **博士** 动物营养
Ph.D. Animal Nutrition

- 研究方向：肠道微生物与免疫学 Focus: Gut Microbiology and Immunity
- 麦吉尔大学，加拿大蒙特利尔 （Zhao Xin教授实验室） McGill University, Montreal, Canada (Prof. Xin Zhao' s lab)

Professional Experience 工作经历

All within the North American Swine Industry 全部任职于北美生猪产业

2015-2021 猪营养师（嘉吉） Swine Nutritionist (Cargill)

2021-Today 战略市场与技术总监 （泰高）
Director, Strategic Marketing and Technology (Nutreco)

Live in Ontario, Canada 现居加拿大安大略

加拿大与中国生猪市场
Canadian and Chinese Swine Markets

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	CANADA (2025)	CHINA (2025)
Total Hog Inventory 生猪总存栏量	~14 million head (down 0.9% YoY)	~408 million head (down 0.4% YoY)
Breeding Herd 能繁母猪存栏量	~1.2 million sows	~40 million sows (declining trend)
Annual Pork Output 猪肉年产量	~2.1 million metric tons (stable to slight growth)	~57 million metric tons (slight decline expected)
Export Share 出口占比	~65% of production exported (mainly to U.S., Japan, Mexico, South Korea)	Minimal exports
Consumption Trend 消费趋势	~15 kg per capita, stable	~40 kg per capita, slightly declining
Industry Structure 产业结构	Mix of family farms and integrators; moderate consolidation 家庭农场与一条龙企业混合经营；整合度适中	Rapid consolidation; top 20 firms produce 28% of pigs 整合迅速；前20大企业生产了28%的生猪

共同的挑战
Common Challenges Between

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Feed Cost 饲料成本

- High pressure on efficiency
- 效率压力巨大
- Consolidation towards integrated systems
- 向一体化系统整合

Legislation 法规

- Antimicrobial reduction
- 减少抗生素使用
- Zinc oxide reduction
- 限制氧化锌用量
- Carbon footprint
- 碳足迹管控

Diseases 疾病

- Predominance of viruses (PRRS), bacteria (Strep. Suis, E. Coli, Salmonella)
- 病毒性疾病为主（猪繁殖与呼吸综合征）、细菌性疾病（猪链球菌、大肠杆菌、沙门氏菌）

Technology Adoption 技术应用

- Digitalization and automatization
- 数字化与自动化
- Integration of new technologies
- 新技术融合

Trade 贸易

- Logistics and Trade regulations
- 物流与贸易法规
- Raw material volatility
- 原材料价格波动

Labour shortage 人工短缺

- Limited access to skilled labour
- 技术劳动力稀缺
- High rotation of personnel
- 人员流动率高

数字化革命
The Digital Revolution

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Few High-Impact Applications and Technologies
部分高度受影响的应用和技术

饲料原料与现场评估
Ingredient and Feed On-Site Evaluation
- Nutrient Analysis
- Quality Control
- Particle Size Distribution

传感技术
Sensing Technologies
- Computer Vision, Air Quality, and Health Monitoring

基准比对
Benchmarking

建模、数据整合与分析
Modeling, Data Integration, and Analytics
- Precise Nutrient Requirement
- Management Optimization Strategies
- Performance & Financial Return Calculation
- Shipping & Carcass Quality Assessment
- Sustainability Metrics

自动化精准饲喂系统
Automated Precision Feeding Systems
- Individually Tailored Nutrition
- Right Time, Right Amount Feeding

是时候调整方向了
It’ s time to shift gears

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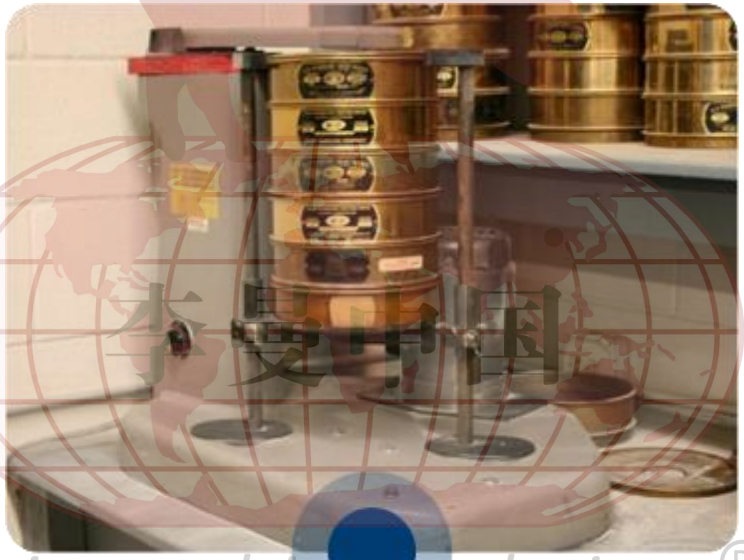
Great in their time. Outdated today!
旧时王谢堂前燕，飞入寻常百姓家。

Hongqi CA770
红旗 CA770

1960s and 1970s.



Sieve Test for Particle Size
粒度筛分试验

1960s - today!

Kjeldahl Protein Analysis
凯氏定氮法

1900s - today!

原料现场评估
On-Site Ingredient Evaluation

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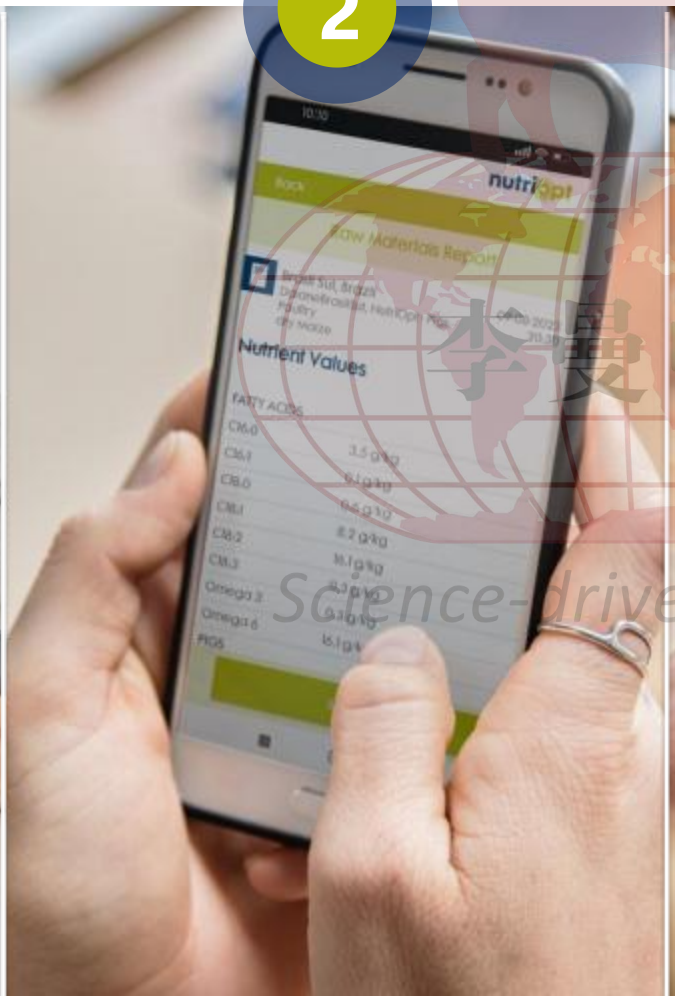
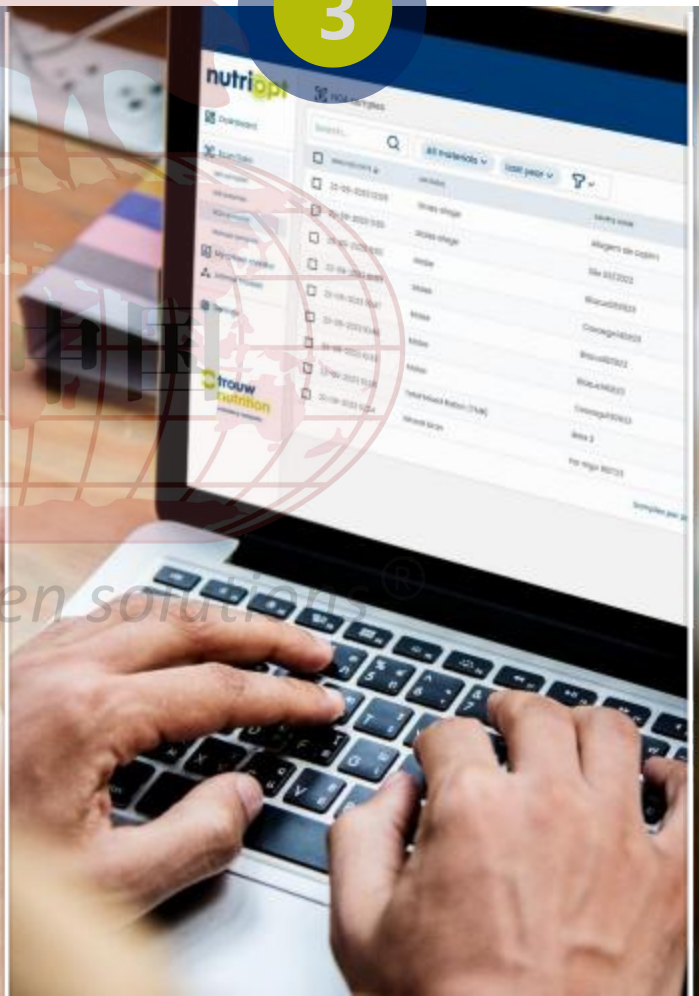
Scan 扫描	Access 登录	Analyse 分析	Act 行动
1	2	3	4

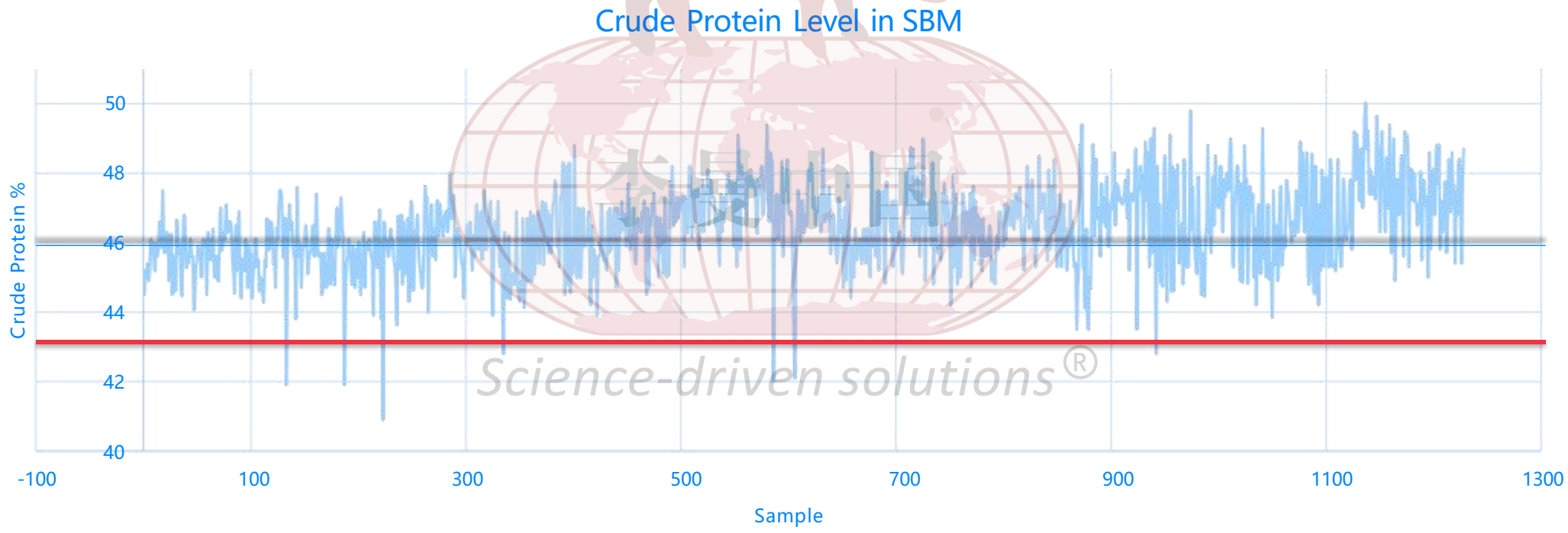




为什么原料分析很重要
Why Ingredient Analysis Matter

豆粕案例 Soybean Meal (SBM) example:

More than 1000 samples of SBM were tested in Canada. The variation in Crude Protein (CP)% ranged from 42% to 50%
在加拿大对1000多份豆粕样本进行的检测显示，其粗蛋白含量在42%至50%之间波动



豆粕案例
Soybean Meal example

- When you formulate a fattener diet assuming soybean meal has 43% protein, but the actual level is 46%, you’ re leaving money on the table
- 如果配制育肥猪日粮时假设豆粕粗蛋白含量为43%，而实际到货的豆粕含量高达46%，那么你相当于把利润白白浪费掉了

43% Protein

Diet	Cost /mt	Amount
Grower	$430	80 kg/pig
Finisher	$400	200 kg/pig
Cost/pig		**$160.4**

46% Protein

Diet	Cost /mt	Amount
Grower	$418	80 kg/pig
Finisher	$394	200 kg/pig
Cost/pig		**$159.2**

Saving= $1.2 /pig

* savings vary based on formula, soybean meal, amino acids, and other ingredient prices

Digital Twins
数字孪生

For Nursery and Grow Finish Pigs
针对保育和生长育肥猪

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数字孪生 Digital Twins

A digital twin is a virtual copy of a real system that helps simulate how it works and predict the impact of decisions before they're made!
数字孪生是指通过创建一个真实系统或物理实体的虚拟副本，利用实时数据驱动，来模拟其运行状态，并能够在实际决策实施前预测其影响的技术概念

1. Data_Collection
2. Model Processing
3. Performance & Economic Analyses
4. On-Farm Application

数字孪生 Digital Twins

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INPUTS
输入

Animal
(sex, genetic, phase, etc)

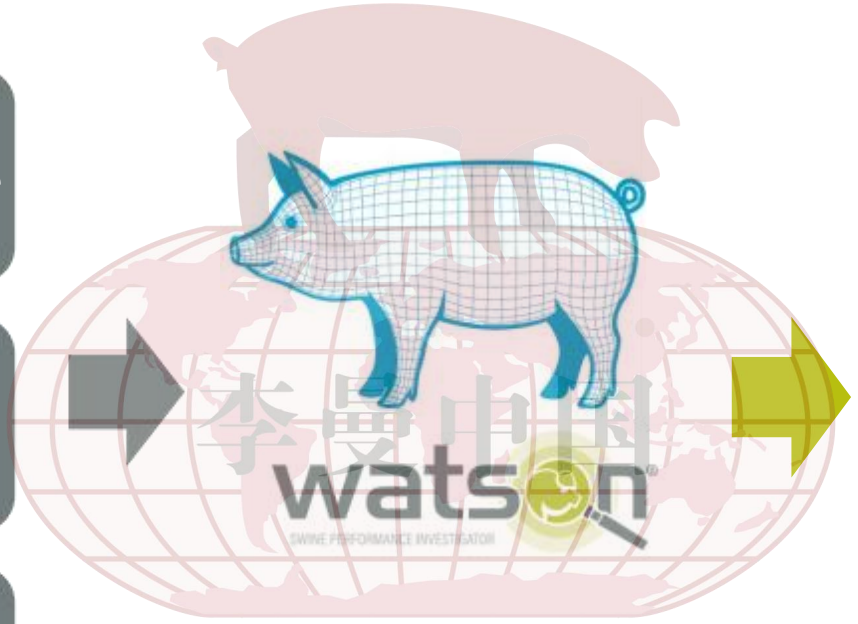
Economics
(feed cost, pork price etc)

Management
(health, Stocking density etc.)

Environment
(temperature, humidity, etc.)

Sustainability
(transport, manure system, etc.)

Nutrition
(ingredient and nutrient profile)



Science-driven solutions®

Formulation Software
配方软件

OUTPUTS
输出

Performance

Carcass

Financial Return

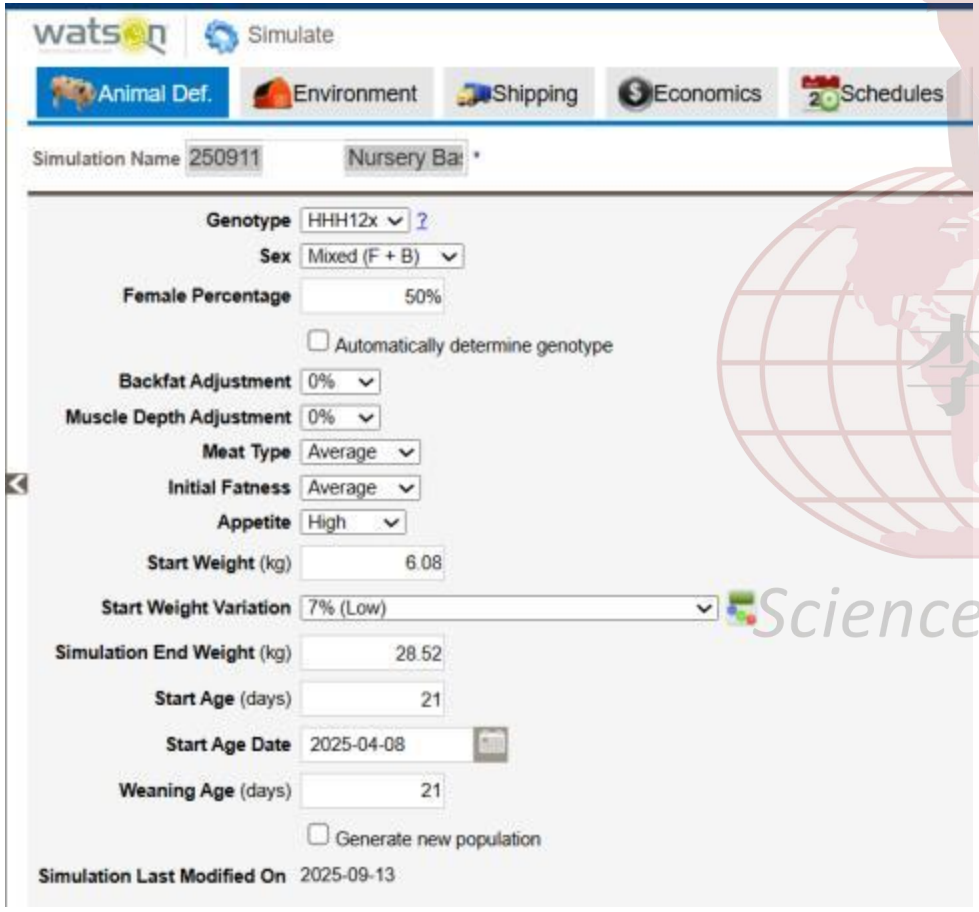
Optimization

Environmental/ Carbon Impact

Shipping Strategy

案例研究 – 保育阶段 Case study – Nursery

A large pork producer in Ontario asked about the impact of a diet change, as well as the comparison between a 3-phase and a 4-phase feeding program
安大略省一家大型猪肉生产商询问了变更饲料的影响，以及3阶段与4阶段饲喂程序的比较



Input: 输入

Genotype determination (intake/day, ADG, current FCR)
基因型测定（采食量/天，平均日增重，当前饲料转化率）

Animal Definition
动物定义

- Weaning age 断奶日龄
- Weaning weight 断奶体重
- End weight 出栏体重
- Days in nursery 保育舍饲养天数

Environment and Management
环境与管理参数

- Feed waste 饲料浪费
- Pen size 栏位尺寸
- Stocking density 饲养密度
- Feeder type (trough/individual) 料槽类型（通槽/个体）
- Barn temperature and Humidity舍内温湿度
- Flooring (plastic, slatted) 地面类型（塑料，漏缝地板）
- Mortality 死亡率

案例研究 Case study

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Output 输出

Parameter	Baseline	New Diet	
		3-Phase	4-Phase
Start weight (kg)	6.6	6.6	6.6
End weight (kg)	25.9	26.0	25.9
ADG (g)	458	461	460
Total feed (kg/pig all phases)	27.4	27.4	27.5
Feed conversion	1.42	1.42	1.43
Cost/kg ($/pig)	0	-0.025	-0.032
Total days	42	42	42

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Sow Model
母猪模型

For lactating and Gestating sows
针对泌乳母猪与妊娠母猪

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母猪模型　Sow Model

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Sows: The Farm’s Greatest Asset
母猪：猪场最重要的资产

生产力的基础
Foundation of Productivity

营养与体况管理直接影响母猪的产仔性能及其使用年限

Nutrition and body condition directly influence litter performance and sow longevity.

高昂的替代成本
High Replacement Cost

每一头母猪都代表着巨大的投资

Every sow represents a significant investment.

每头母猪都是独特的
Each Sow is unique

个体需求至关重要——精准饲喂能确保满足其特定营养需求

Individual Needs Matter — precision feeding ensures her specific requirements are met.

母猪模型　Sow Model

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Thanks to advanced modeling, sow data can also be plugged into the model to create precision feeding programs tailored to the farm’ s objectives
借助先进的建模技术，母猪数据亦可输入模型，从而制定出根据猪场具体目标定制的精准饲喂方案。

母猪定义
Sow Definition
- Genotype
- Parity
- Total Born
- Piglet Birth Weight
- Piglets Weaned
- Weaning weight

模拟
Simulations
- Nutrient requirements
- Farrowing Body weight
- Target mating weight
- Back fat change
- Feed amount

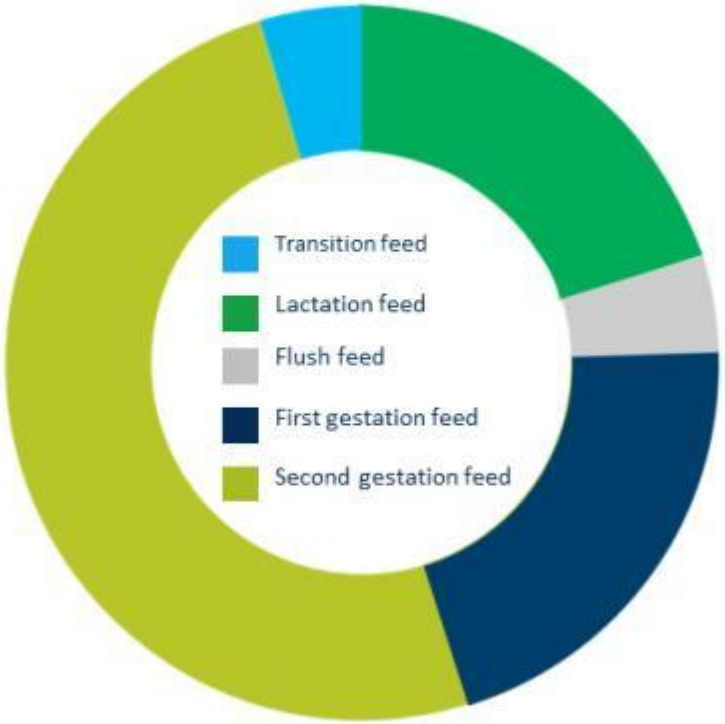
环境
Environment
- Housing System
- Room Temperature
- Activity
- Feed Waste

饲喂程序
Feed Schedules
- Diet composition
- Feed curve (intake level)
- Number of Phases

收益 Benefits

Optimum feed program and body condition management in sows results in
优化母猪的饲喂程序和体况管理，能够带来一系列关键的积极效果：

- Body condition Management- > Longevity 精准的体况管理- > 延长母猪使用年限
- Smooth farrowing 顺利分娩
- High feed intake in lactation phase 高的哺乳期采食量
- More milk production - > Less piglet mortality 充足的奶水与营养 - > 降低仔猪死亡率
- Less Sow weight loss during lactation phase 减少哺乳期体重损失
- Higher reproductive performance in next cycle 下一周期更高的繁殖性能
- Reduce gilt replacement costs 降低后备母猪更新成本



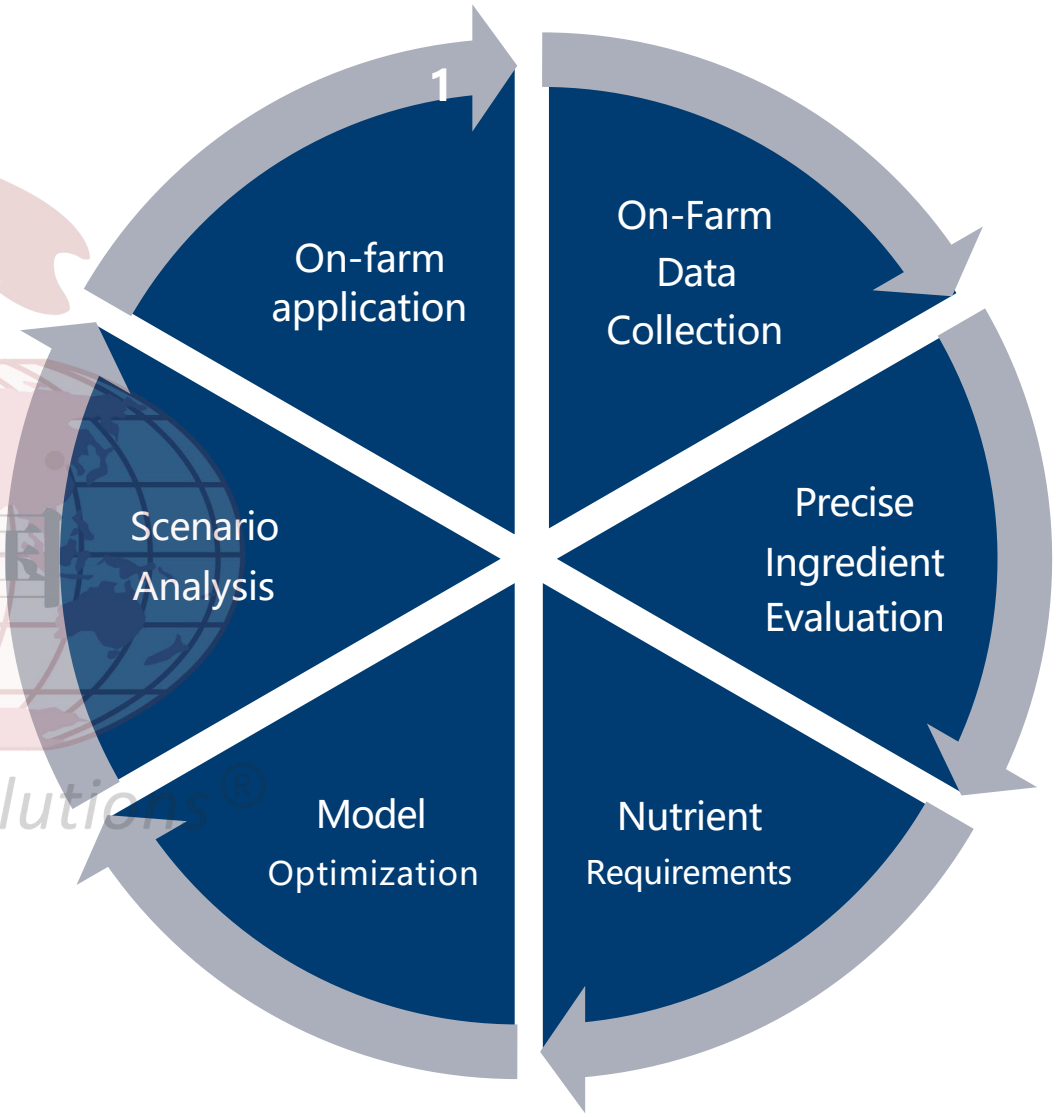
总结 Summary

Precision feeding is a continuous cycle that turns on-farm data into optimized nutrition programs.

精准饲喂是一个持续的闭环流程， 它将猪场数据转化为经过优化的营养方案。

By combining ingredient evaluation, modeling analysis, and advanced on farm equipment, precision feeding delivers practical, real-time feeding strategies that that drive pig performance and farm profitability

通过将原料评估、模型分析和先进的现场检测设备相结合，精准饲喂能够制定出实用且实时的饲喂策略，从而提升猪只生产性能并提升猪场盈利水平。



谢谢您!
Thank you!

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