Understanding and Targeting the Grid

Charles Grant

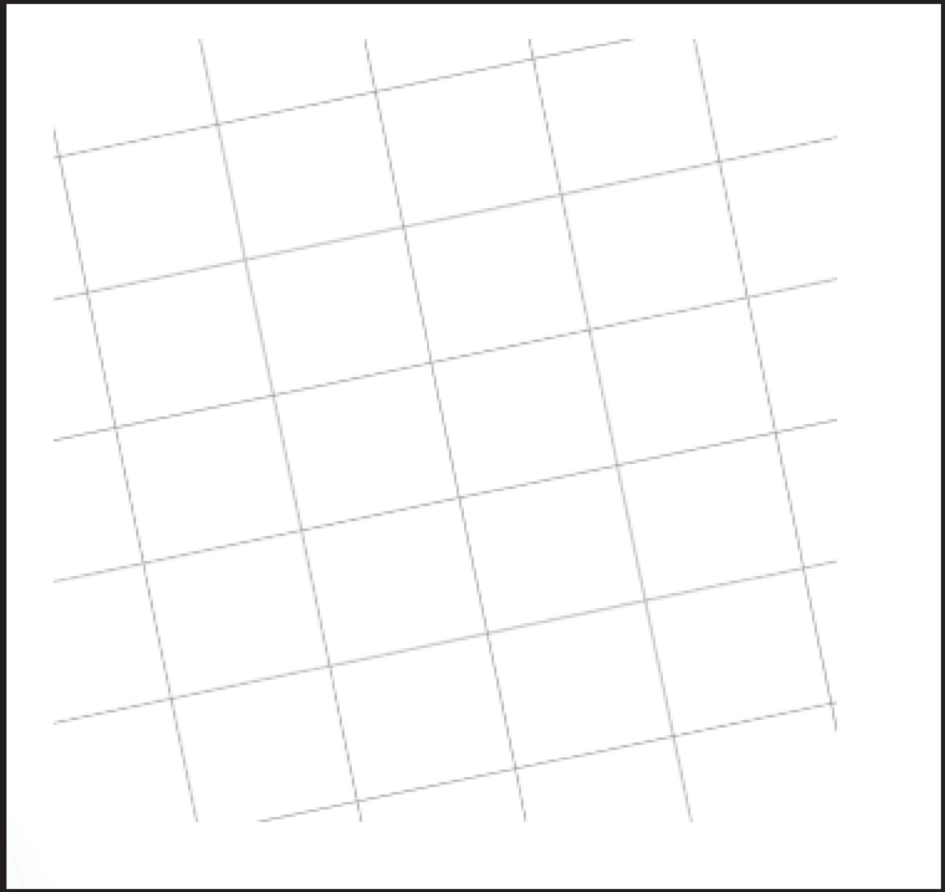
"I can only make money on 60% of the pigs that I buy."

Bill Maclean, Schneiders Plant Manager, 1996

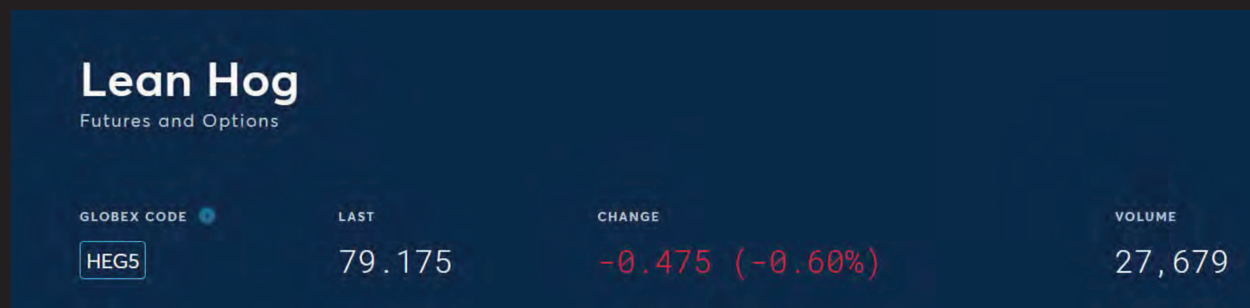
“We’re not getting the number of pigs in the sweet spot of the grid that we would like to see.”

Gustavo, Feeder Barn Manager, 2024

The grid system, introduced in the early 1990s, was designed to bring more consistency to the weights and characteristics of pig carcasses.



In February 1997 Live Hog Futures were replaced with Lean Hog Futures



With the carcass focus, pigs hitting the high indexes increased from ~ 60%-70%

Problem

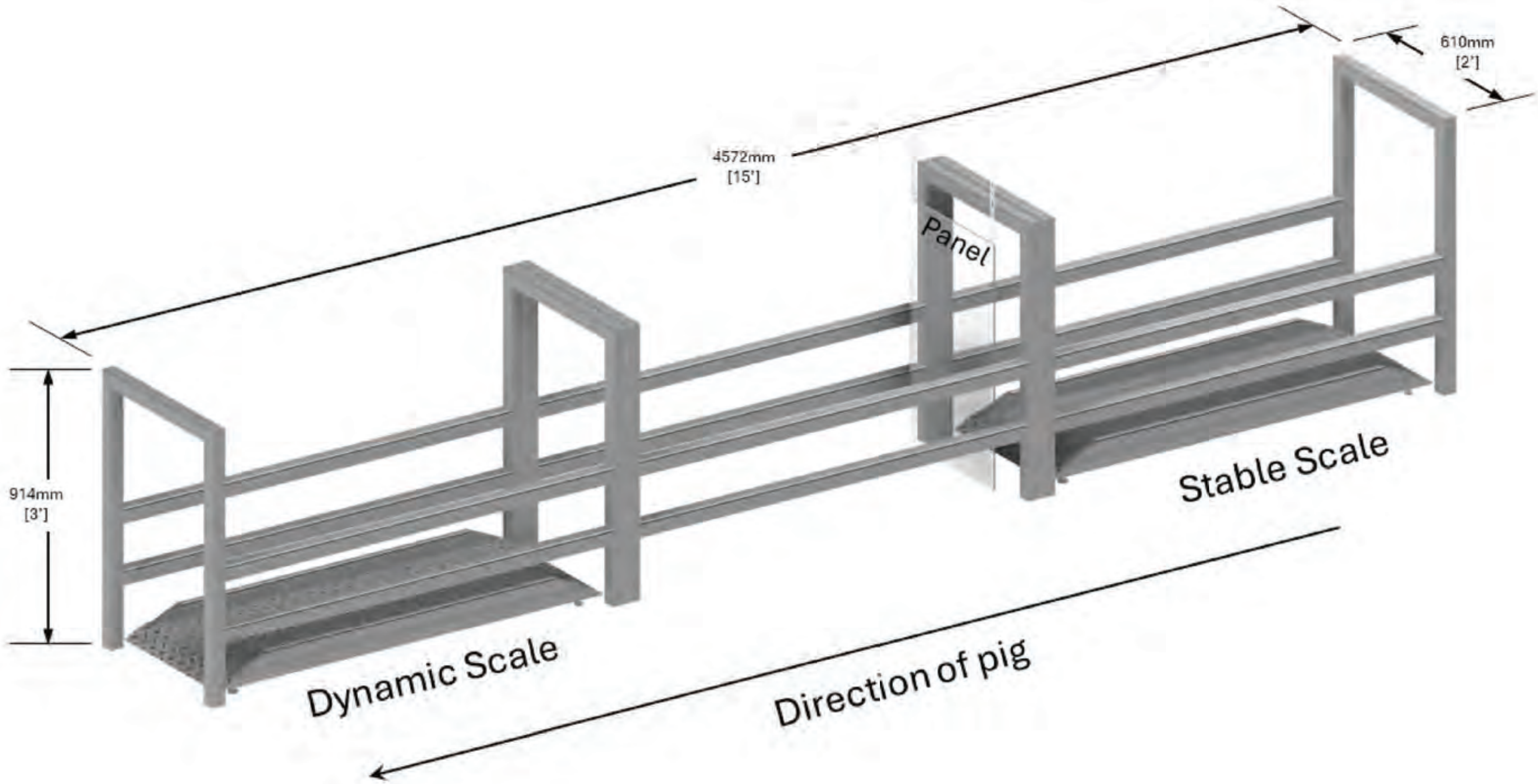
Approx 30% of the pigs are not hitting the sweet spot on the grid

~10% heavy

~20% light

Solution

1. Count
2. Weigh
3. Optimize



4572mm
[15']
610mm
[2']
Panel
914mm
[3']
Stable Scale
Dynamic Scale
Direction of pig


nuc
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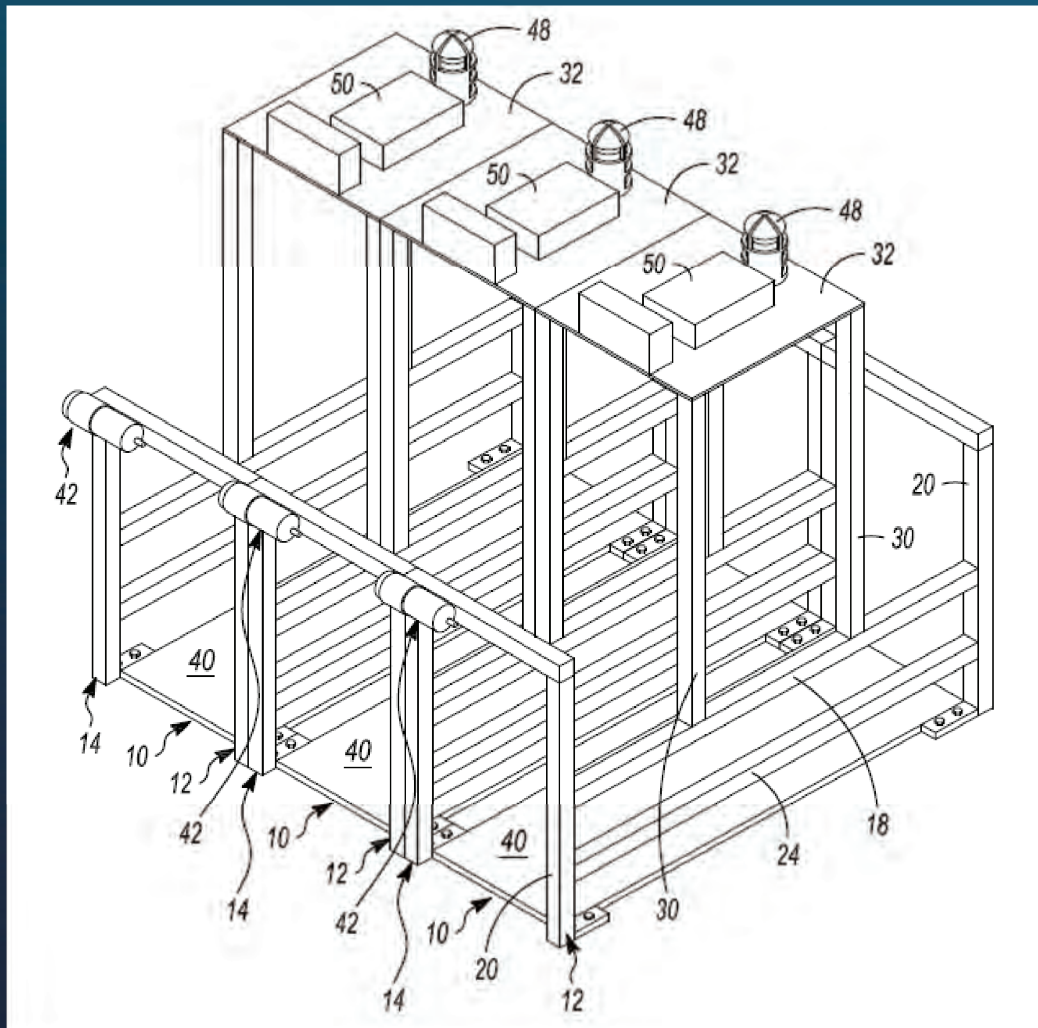

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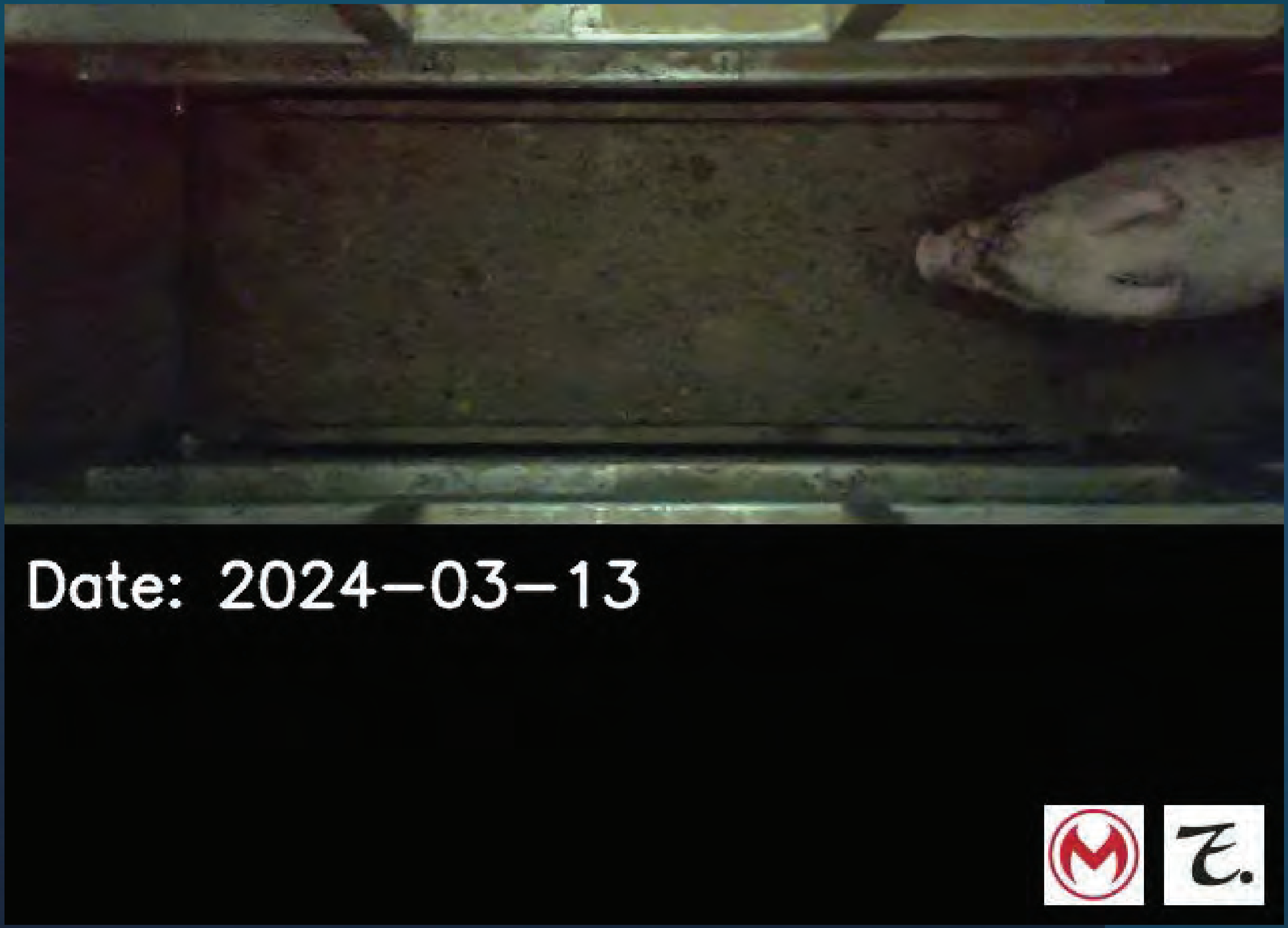
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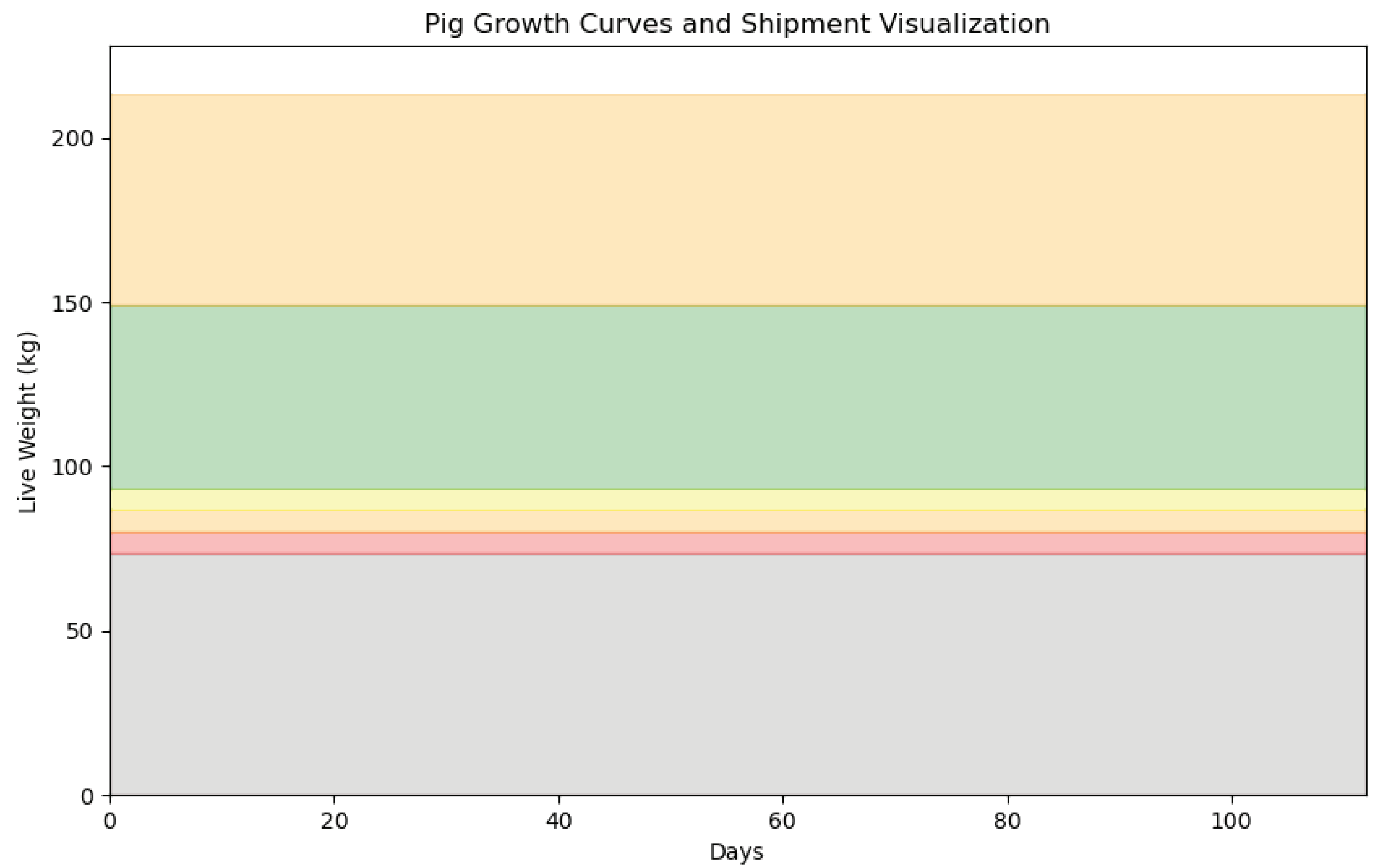

Pig Growth Curves and Shipment Visualization
Live Weight (kg)
0
50
100
150
200
Days
0
20
40
60
80
100

Business Process

1. Innovate
2. Patent
3. Validate
4. Publish
5. Commercialize

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(54) Title: LIVESTOCK ASSESSMENT SYSTEM

Ꞇ. Porcus Optimus™

by Moccus Maximus Inc.

Feeder Pigs in Motion: A Gateless Walk-over Scale and Shipping Optimizer that Targets Grading Grids

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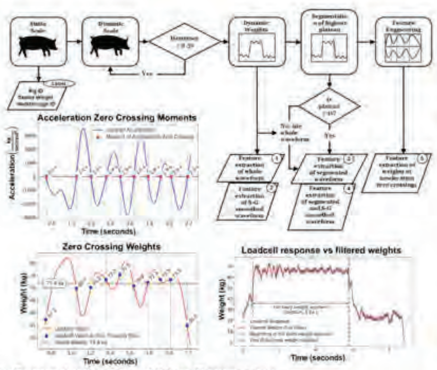
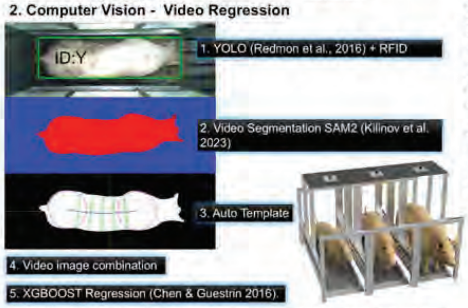
Introduction

Accurate and stress-free weight monitoring is vital for optimizing production and animal welfare in swine farming. Traditional weighing methods involve handling and confinement, which can cause stress and inaccuracies (Stygar et al., 2021). This study presents a novel walk-over scale integrated with machine learning and RFID tracking, enabling precise weight estimation of finishing pigs in motion. The system captures data dynamically, minimizing stress while maintaining accuracy (Gómez et al., 2020). This approach enhances logistics, improves animal welfare, and aligns with modern precision livestock farming practices (Grandin, 2019).

Scaling Prototypes

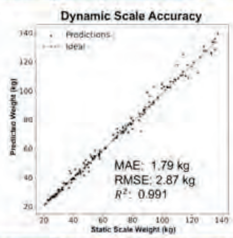


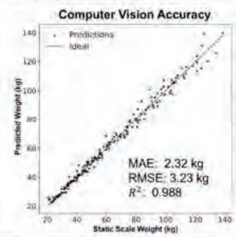
2. Computer Vision - Video Regression



Our dynamic weighing prototypes shows strong accuracy across the finishing range (20-150 kg), achieving a Mean Absolute Error of 1.8 kg and Root Mean Square Error of 2.9 kg based on 944 walk-through measurements. The parallel computer vision system delivers comparable performance (MAE: 2.3 kg, RMSE: 3.2 kg), with both systems maintaining high accuracy (R^2 > 0.98). These metrics align with Stygar's research-validated optimal tolerance range (±2-3 kg) for market timing decisions, supporting effective slaughter weight optimization in finishing operations.

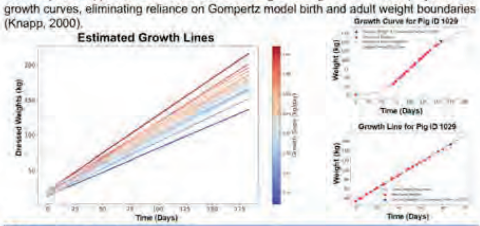
Scaling Analysis: Load Cell and Computer Vision





Dressed Weight Projection Estimate (No Gompertz)

Our simplified approach estimates dressed weight through direct linear projection of growth curves, eliminating reliance on Gompertz model birth and adult weight boundaries (Knapp, 2000).



Shipment Optimization

Our swine operation optimization framework integrates transport logistics, pricing structures, and weight management strategies to maximize profitability through the following components:

- Commercial finishing operation: 2,800 pigs, 16-week depopulation window (Pork Checkoff, 2022)
- Transport: 185 pigs/truck, $2,000 CAD fixed cost, 2-5 trucks Monday to Friday only.
- Pricing: Pioneer Meat's 113 grid matrix, Manitoba Weekly 2023 market data
- Weight assessment: Day 1 and 56 measurements, zero mortality assumption
- Optimization targets: Minimize overweight penalties, space inefficiency, unused truck capacity (Google OR-Tools, 2023)
- Measurement uncertainty: 0-20 kg error injection for individual and scale calibration analysis
- Validation: Near-optimal schedules achieved without individual pig tracking
- Framework flexibility: Customizable grid parameters and operational constraints for producer-specific requirements

Barn Simulation Visualisation

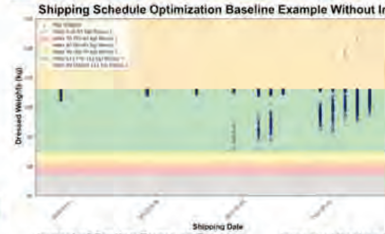
Truck ID	Date	Pig Count	Live Weight Range	Average Index	Shipment Revenue $CAD
1	2023-03-17	167	(135.5 — 147.4)	113	$22 988
2	2023-03-27	174	(137.6 — 149.3)	113	$38 776
3	2023-03-31	185	(142.7 — 149.3)	113	$41 080
4	2023-04-03	185	(145.4 — 149.3)	113	$39 967
5	2023-04-06	182	(144.6 — 149.3)	113	$34 758
6	2023-04-07	185	(145.6 — 149.3)	113	$39 061
7	2023-04-10	170	(146.6 — 149.3)	113	$37 286
8	2023-04-12	147	(100.8 — 201.7)	109.6	$29 400
9	2023-04-13	185	(114.3 — 149.3)	113	$36 071
10	2023-04-13	185	(110.7 — 149.3)	113	$35 780
11	2023-04-13	185	(104.1 — 149.3)	113	$35 583
12	2023-04-14	185	(127.2 — 149.3)	113	$37 884
13	2023-04-14	185	(124.5 — 149.3)	113	$37 941
14	2023-04-14	186	(126.6 — 149.2)	113	[illegible]
15	2023-04-14	185	(123.6 — 149.2)	113	$37 781
16	2023-04-14	185	(121.1 — 149.5)	113	$37 781

Modeling the Impact of Scaling Error

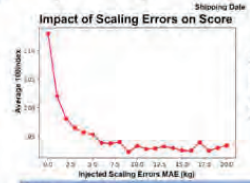
We conducted an economic analysis to understand how weighing accuracy affects profitability in finishing pig operations. Starting with a baseline of perfect weighing (0% error), our simulations showed that producers can achieve $207.31 revenue per pig under optimal conditions. To reflect real-world conditions, we simulated how weighing errors affect this revenue. Our model incorporated typical sources of uncertainty in commercial operations, including variations in initial weight assessment and shipping day scale calibration at the barn level (Hristov et al., 2019). This approach allowed us to evaluate how measurement accuracy influences market timing decisions throughout the finishing cycle (Pork Checkoff, 2022). The results showed a relationship between weighing accuracy and profitability. As measurement errors increased, revenue decreased predictably: 5% error reduced revenue by $2.34 per pig, 10% error by $4.39 per pig, and 15% error by $9.27 per pig. This demonstrates that accurate weight measurements are crucial for maximizing profitability in modern swine production. Given that manual weighing is labor-intensive and stressful for both animals and workers, with visual evaluation being the least accurate method at only 82-84% accuracy for market weight estimation (Holt et al., 2022), our dynamic weighing system offers a practical solution that maintains high accuracy while enabling frequent, stress-free weight monitoring. This allows producers to optimize market timing decisions without compromising animal welfare or operational efficiency.

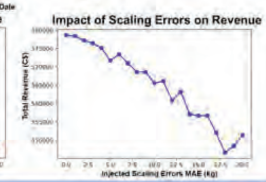
Revenue Loss Due to Suboptimal Scheduling

Shipping Schedule Optimization Baseline Example Without Injected Scaling Errors



Scoring Grid		
Dressed Weight	100index	Bonus CAD($)
0-55 kg	0	1
55-60 kg	70	1
60-65 kg	90	1
65-70 kg	90	1
70-112 kg	113	2
>112 Kg	90	1





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Porcus Optimus™

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Thank you!

Questions?