Challenges of the Canadian Pig Market and Hybrid Rye Inclusion in Local Pig Rations

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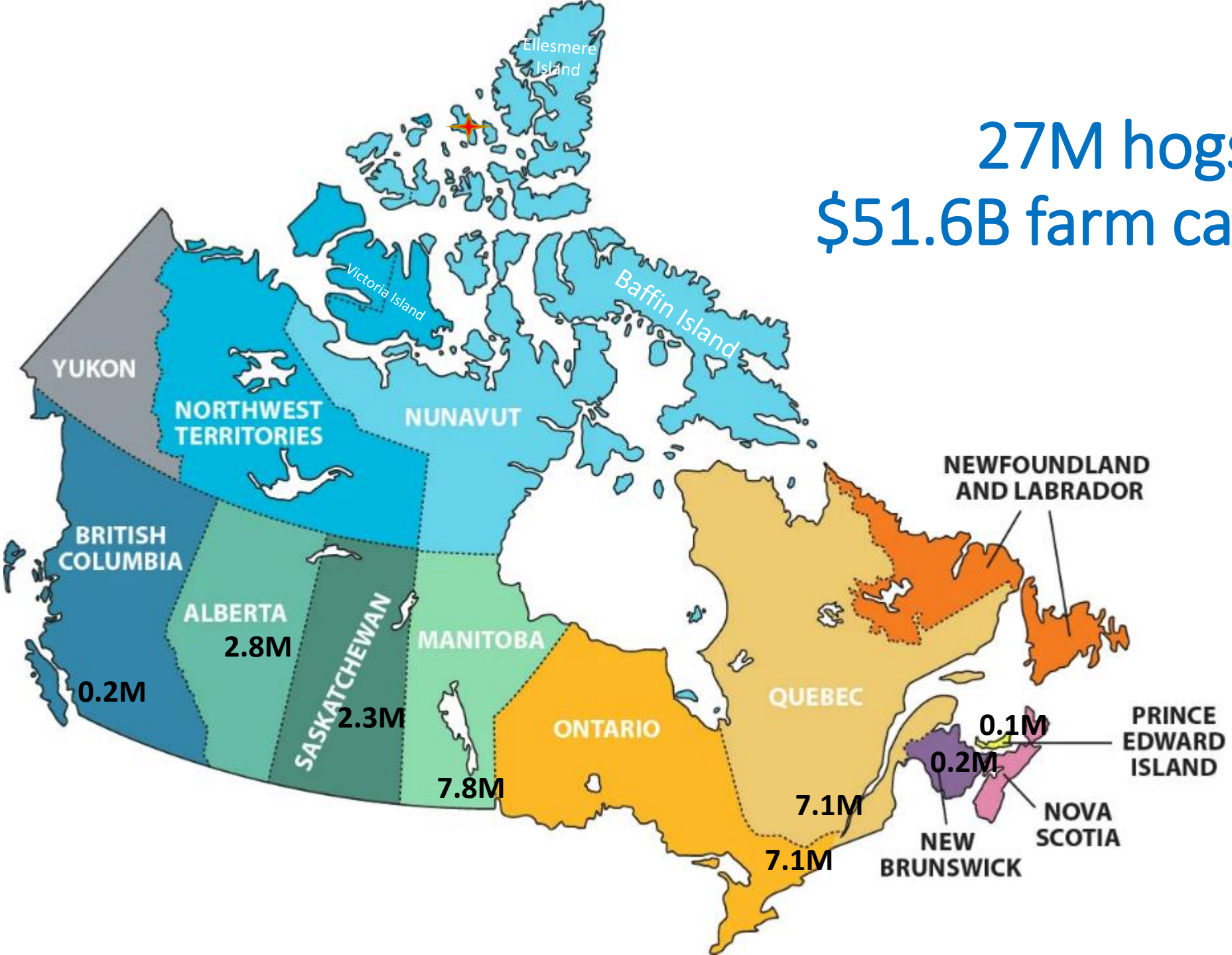
27M hogs marketed
$51.6B farm cash receipts



https://www.cpc-ccp.com/foreign-trade

In 2019, Canada exported >1.2 Mt of pork & products valued at $4.2 billion to 94 countries

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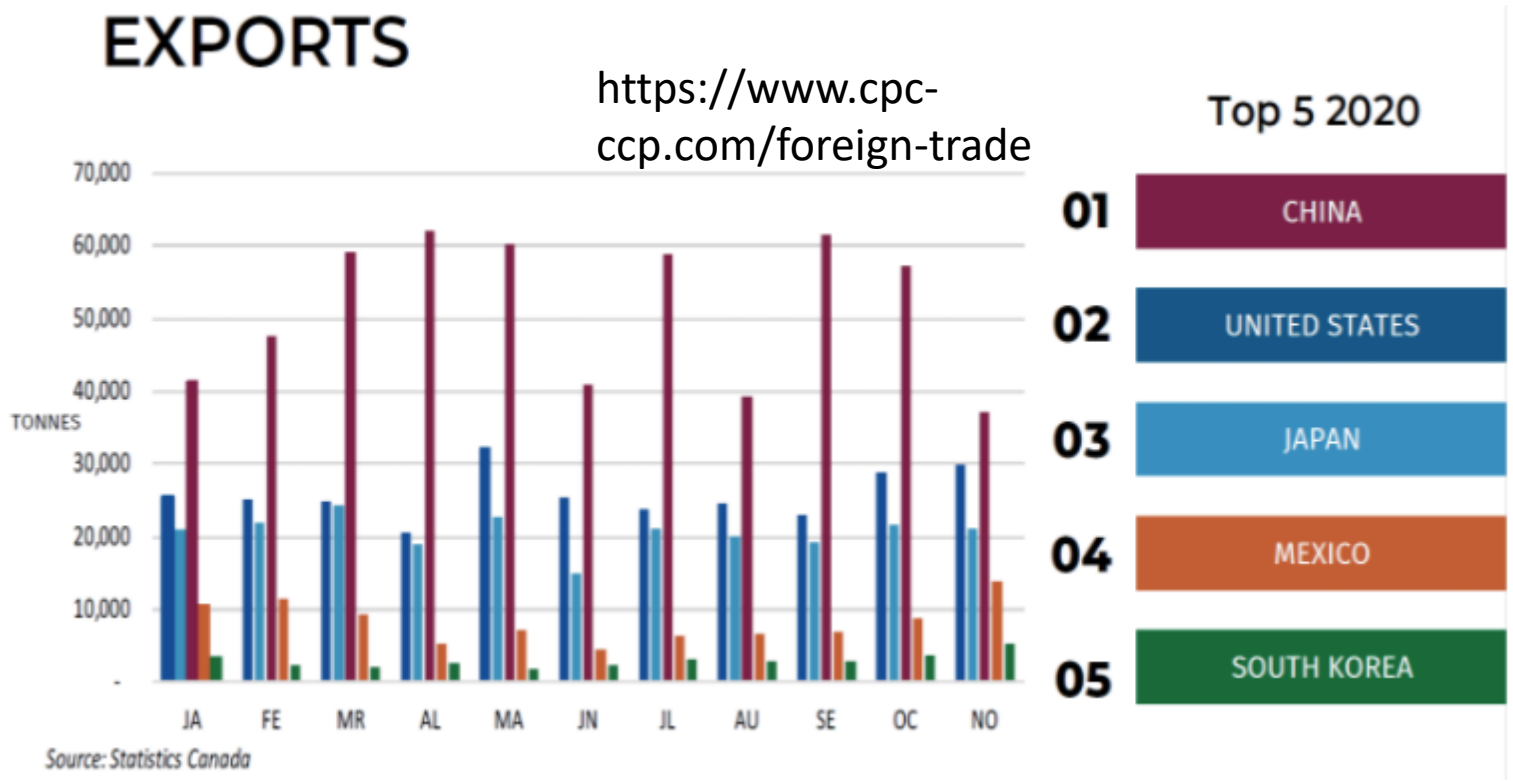
Challenges of the Canadian Pig Market

Global

- Trade: **China**, US new gov.
- Threat of ASF



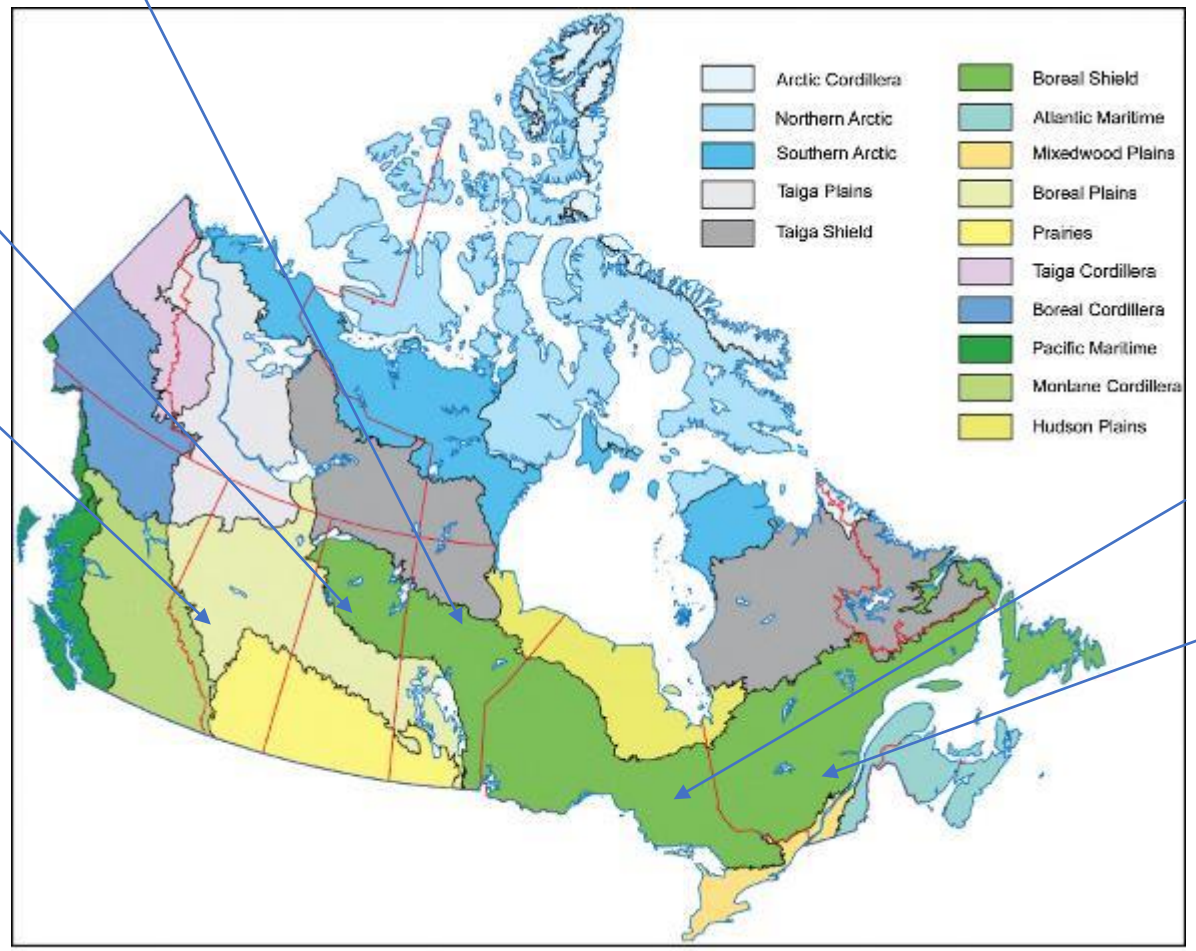
National

- Packers and COVID 19
- Crowding
- Low profit, seasonal fluctuations
- Banks reluctant to lend
- Constipated barns
- Pork pricing & signals
- Vertical integration
- Hutterite colonies

Western vs. Central Canada Pig Diets

Alberta, Saskatchewan, Manitoba

- Wheat, barley-based
- Canola, Soy expellers
- Canola oil
- Field pea, faba bean
- Distillers dried grain
- Wheat co-products
- Triticale, rye



Ontario, Quebec

- Corn-based
- Soybean meal
- Soy oil

Formulation Challenges and Opportunities

Challenges

- Small cereal grains higher CP, fibre, lower in energy value
- Canola, pulses increase CP more
- Greater inclusion of fats, costly
- Least-cost diets higher in protein
- Ammonia in barns; water usage
- Nitrogen, phosphorus in manure

Opportunities

- Lower energy diets => take advantage of feed intake
- Long winters, shorter summers
- Farm-mixed, mash, particle size
- Producers feed what they grow vs. integrators, feed mills source grain at least cost

Why Rye?

- ~325,000 ha sown to rye in Canada, ~80% in Prairies
- Rye is a cereal crop similar to wheat
- Rye in Canada is used mostly for whiskey and spirits
- Hardiness allows for efficient use of spring runoff
- Extends the ‘work season’ vs. spring planted cereals

Why Hybrid Rye?

- Hybrids produce vast amounts of pollen. Stigma is oversaturated by pollen. Mold spores have a lesser chance to infect plant
- Fall planted rye flowers earlier than spring sown cereals. Ergot and Fusarium infection risk is lower. Plants are generally less stressed in spring than summer
- European hybrids yield >30% more over conventional rye, 20-40% over wheat
- **Greater grain yield compared with wheat** was an attractive incentive for us to evaluate feeding hybrid fall rye to hogs

Formulating Hybrid Rye

- Mainly substitute wheat
- Price, consistency of supply
- More soluble fibre
- Response to carbohydrases
- Max inclusion ~65% because of pulses, canola inclusion
- Soluble fibre x resistant starch
- VFA vs. cereal starch => FE
- Dressing percentage –no effect
- Perception of ergot
- Optical seed cleaners

Fibre in Rye Grain

- Rye has greater fibre content than wheat grain
- Fibre in rye grain is mostly complex sugars
- These soluble sugars could be made more digestible/fermentable by feeding NSP enzymes
- Prairie hog producers typically stock two cereal grains (barley, wheat), but not 3, so we decided to…

✓**Evaluate feeding increasing hybrid rye inclusions replacing wheat grain**

✓**Test whether or not NSP enzymes would make hybrid rye grain more digestible**

%	Rye	Wheat
Total NSP	13.1	9.8
Arabinose	2.8	2.1
Xylose	4.6	3.5
Glucose	4.8	3.5
Uronic acid	0.3	0.3

Commercial Scale Hog Trial

- **Drumloche Research Barn at Lougheed, AB**

- 2 growout rooms
- 52 pens in each room
- 6 feed bins per room

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Materials and Methods

- **Feedstuffs:**
  - **Wheat grain:**
    - Mainly soft wheat 10-11% protein
    - Grown within 100-160 km radius of Irma, AB
  - **Rye grain:**
    - Hybrid variety Bono developed by KWS LOCHOW GMBH (Bergen, Germany)
    - Grown at Kalco Farms near Gibbons, AB
  - **Enzyme:**
    - Endofeed W DC (GNC Bioferm, Bradwell, SK)
    - Containing 1400 units/g β-glucanase
    - 4500 units/g xylanase
    - Inclusion level 200 mg/kg

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	Grower 2			Grower 3			Finisher 1			Finisher 2		
	Rye inclusion			Rye inclusion			Rye inclusion			Rye inclusion		
	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Wheat	313.1	155.7	20.0	412.1	205.1	20.0	440.7	219.3	20.0	456.5	226.8	20.0
Rye	156.6	312.0	446.0	206.0	410.3	591.4	220.3	439.0	635.8	228.2	455.0	659.2
wDDGS	287.2			217.2			234.5			240.1		
Field pea	204.8			139.1			81.0			52.2		
Canola oil	13.2	15.4	17.3	4.0	6.9	10.0	4.0	7.1	9.9	4.0	7.2	10.2
L-Lys	4.70	4.67	4.65	4.0	3.96	3.94	3.50	3.46	3.43	3.20	3.16	3.12
Others	20.4	20.2	20.0	17.6	17.4	18.4	16.0	15.6	15.4	15.8	15.5	15.2
NE Mcal/kg	2.30			2.30			2.30			2.30		
SID Lys/NE	3.89			3.31			2.91			2.69		

Others: Limestone, mono-dical, salt, DL-Met, L-Thr, phytase, feeder micro

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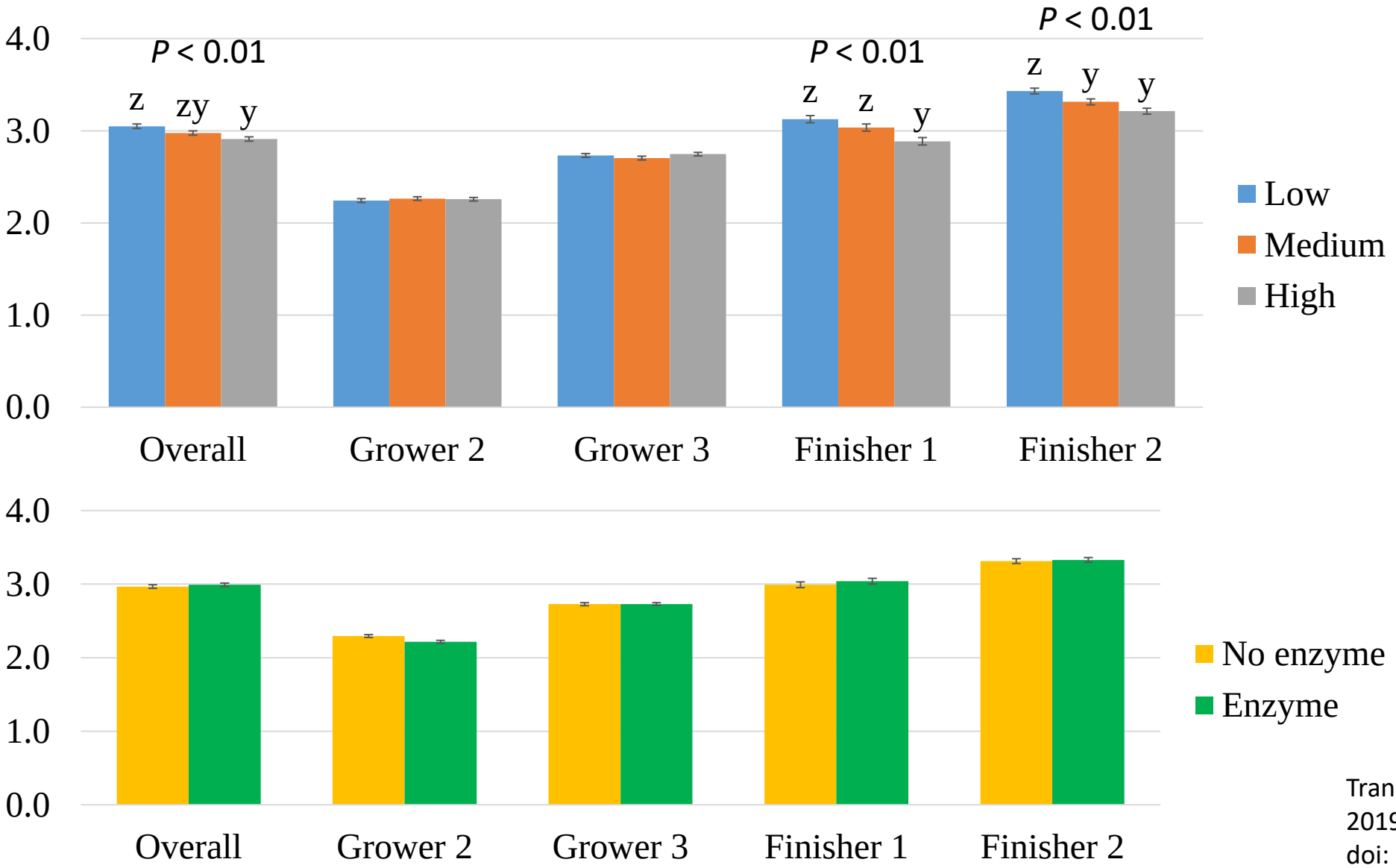
Feed intake, kg/d



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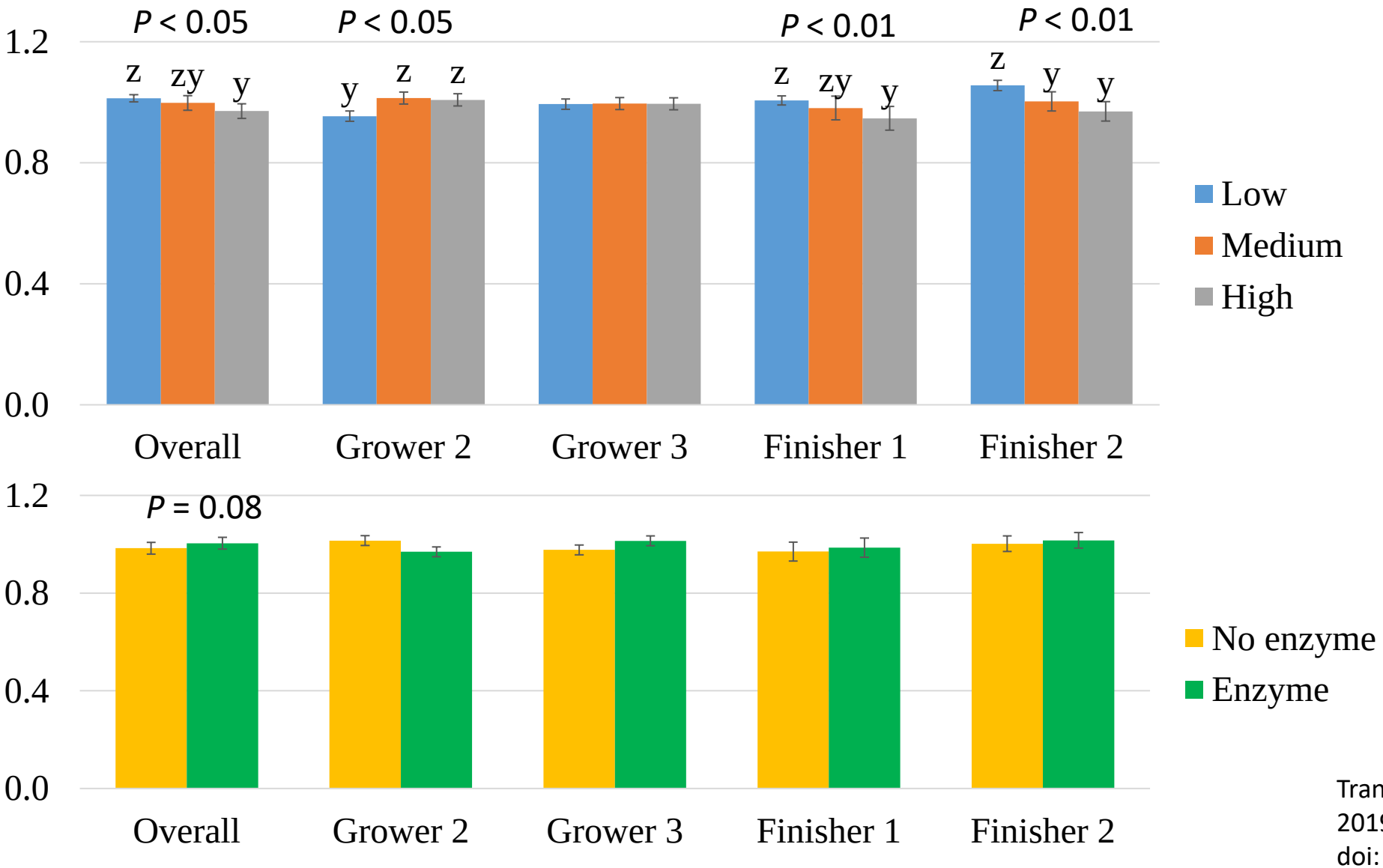
Weight gain, kg/d



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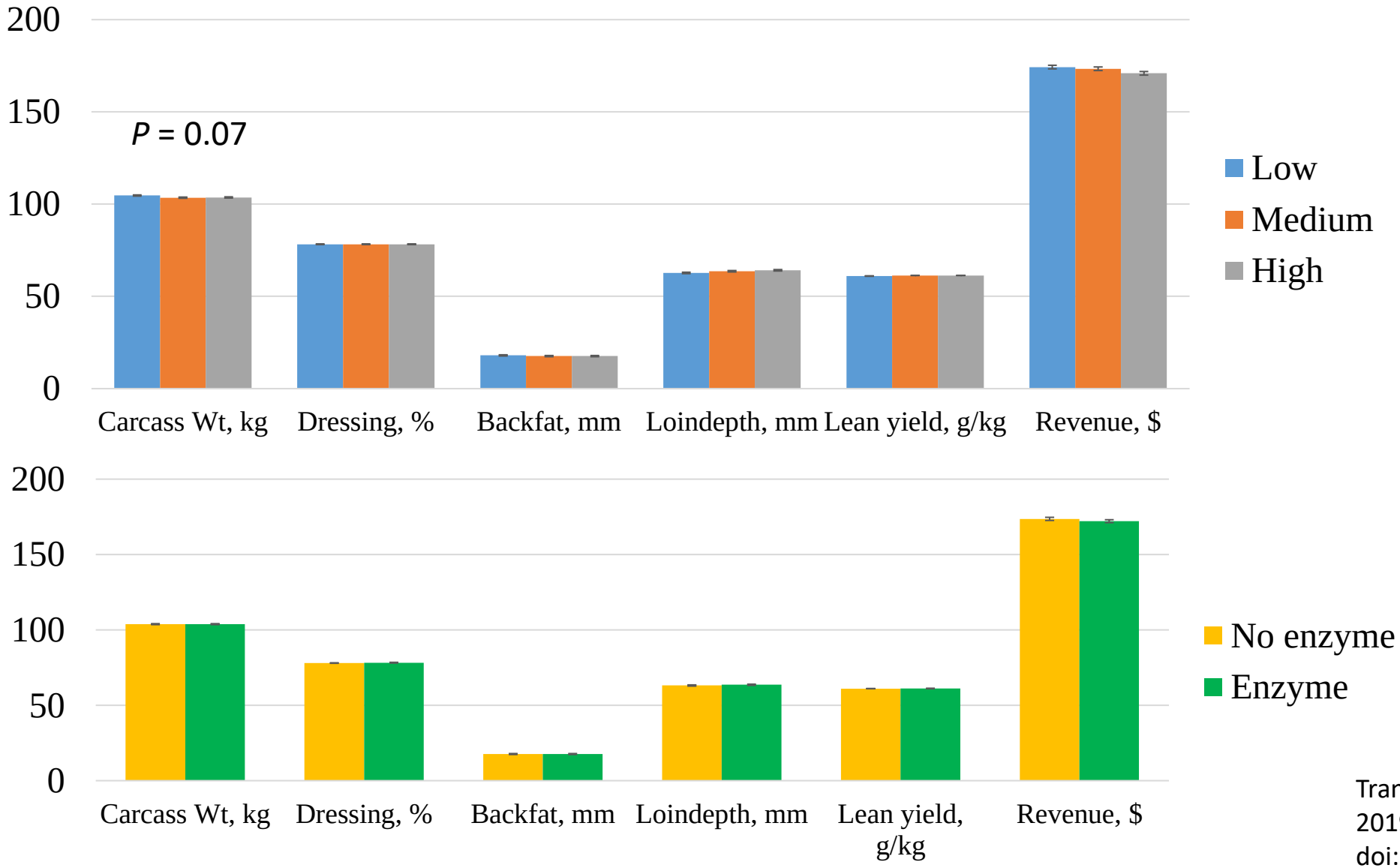
Carcass traits



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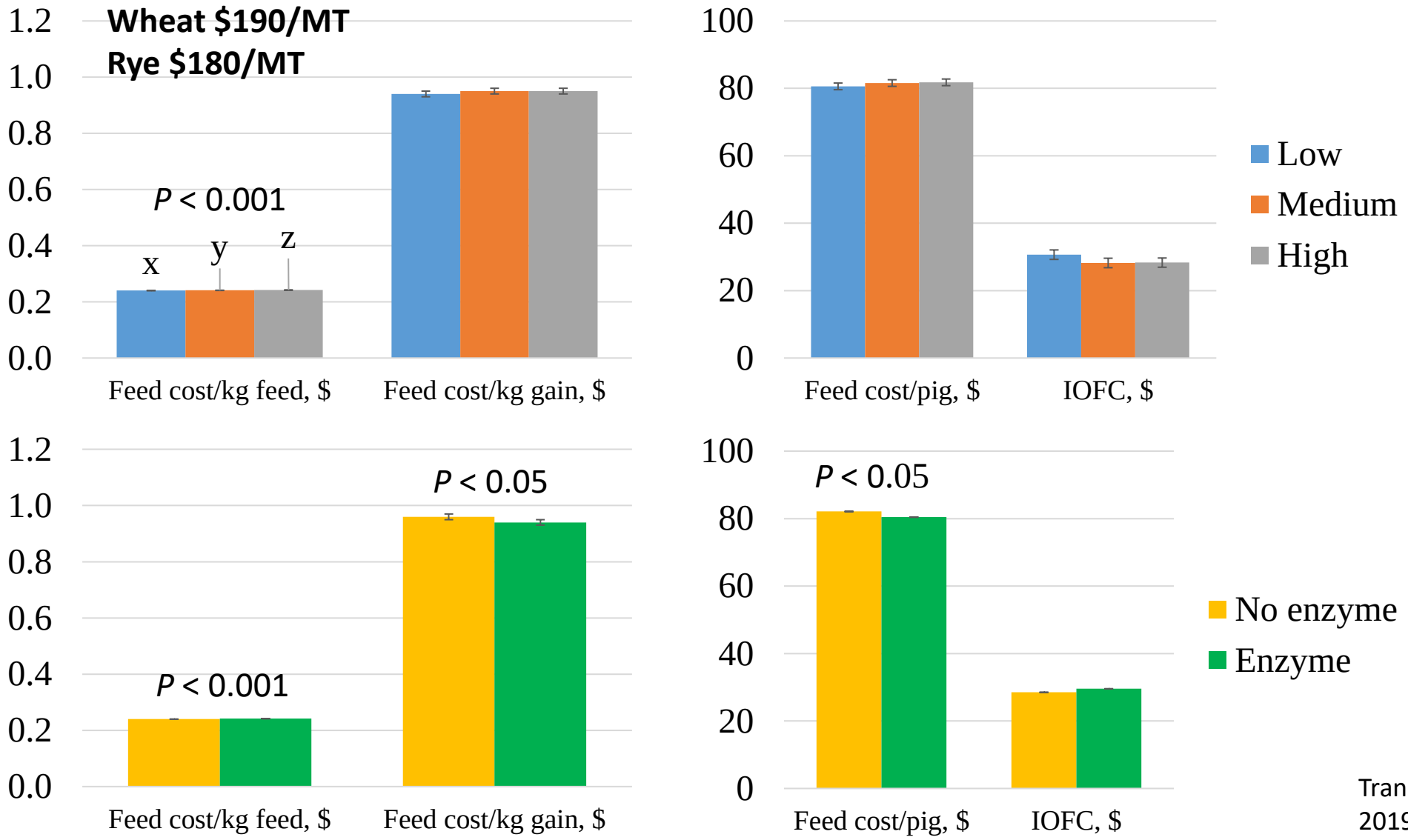
Cost vs. Benefit



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Hogs fed per unit of land

- Assuming **hybrid rye yields 100 vs. wheat 60 bu/acre,**
- Growout rations include 60% cereal grain,
- Pigs started at 43.7kg, FE was 0.323, carcass weight averaged 103.55kg, dressing was 78.06%, lean yield was 61.16%.

103.6	kg carcass /	0.781	dressing =	132.7	kg live at slaughter			
89.0	kg weight gain /	0.323	gain:feed =	275.4	kg feed per hog x	60%	cereal =	165 kg cereal per hog
69.4	kg carcass gain x	0.612	lean =	42.5	kg lean gain			
100	bu/acre rye =	6723	kg/ha	1728	kg lean pork/ha for rye			41 hogs fed/ha of rye
60	bu/acre wht =	4034	kg/ha	1037	kg lean pork/ha for wht			24 hogs fed/ha of wht
		2689	kg differ.	691	more kg lean pork per ha of rye than wht			16 hogs fed/acre of rye
				617	more lb lean pork per acre of rye than wht			10 hogs fed/acre of wht

Hogs fed per unit of land

- Assuming **hybrid rye yields 90 vs. wheat 70 bu/acre,**
- Growout rations include 60% cereal grain,
- Pigs started at 43.7kg, FE was 0.323, carcass weight averaged 103.55kg, dressing was 78.06%, lean yield was 61.16%.

103.6	kg carcass /	0.781	dressing =	132.7	kg live at slaughter			
89.0	kg weight gain /	0.323	gain:feed =	275.4	kg feed per hog x	60%	cereal =	165 kg cereal per hog
69.4	kg carcass gain x	0.612	lean =	42.5	kg lean gain			
90	bu/acre rye =	6050	kg/ha	1555	kg lean pork/ha for rye			37 hogs fed/ha of rye
70	bu/acre wht =	4706	kg/ha	1209	kg lean pork/ha for wht			28 hogs fed/ha of wht
		1345	kg differ.	346	more kg lean pork per ha of rye than wht			15 hogs fed/acre of rye
				308	more lb lean pork per acre of rye than wht			12 hogs fed/acre of wht

Conclusion

- Hybrid rye can completely replace wheat grain in growout hog diets without affecting feed efficiency, feed cost/hog or feed cost/kg BW gain.
- Inclusion of feed NSP enzymes would be recommended for diets containing high rye inclusion levels (45 – 65% of the diet).
- Hybrid rye yields more pork per unit of land than wheat. Life-cycle analysis (LCA) must not separate integrated crop-livestock systems.