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NUTRITIONAL TOOLS FOR REPRODUCTION

PART 1: Heat expression & early conception

WEBINAR

Presented by
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Ruminant nutritionist

In this webinar we cover:

- How are we doing?
- Hormonal processes and their nutritional links
- What are we trying to achieve pre-mating?
- From calving to mating - the timeline
- Tools in the toolchest
- Key points and future thoughts

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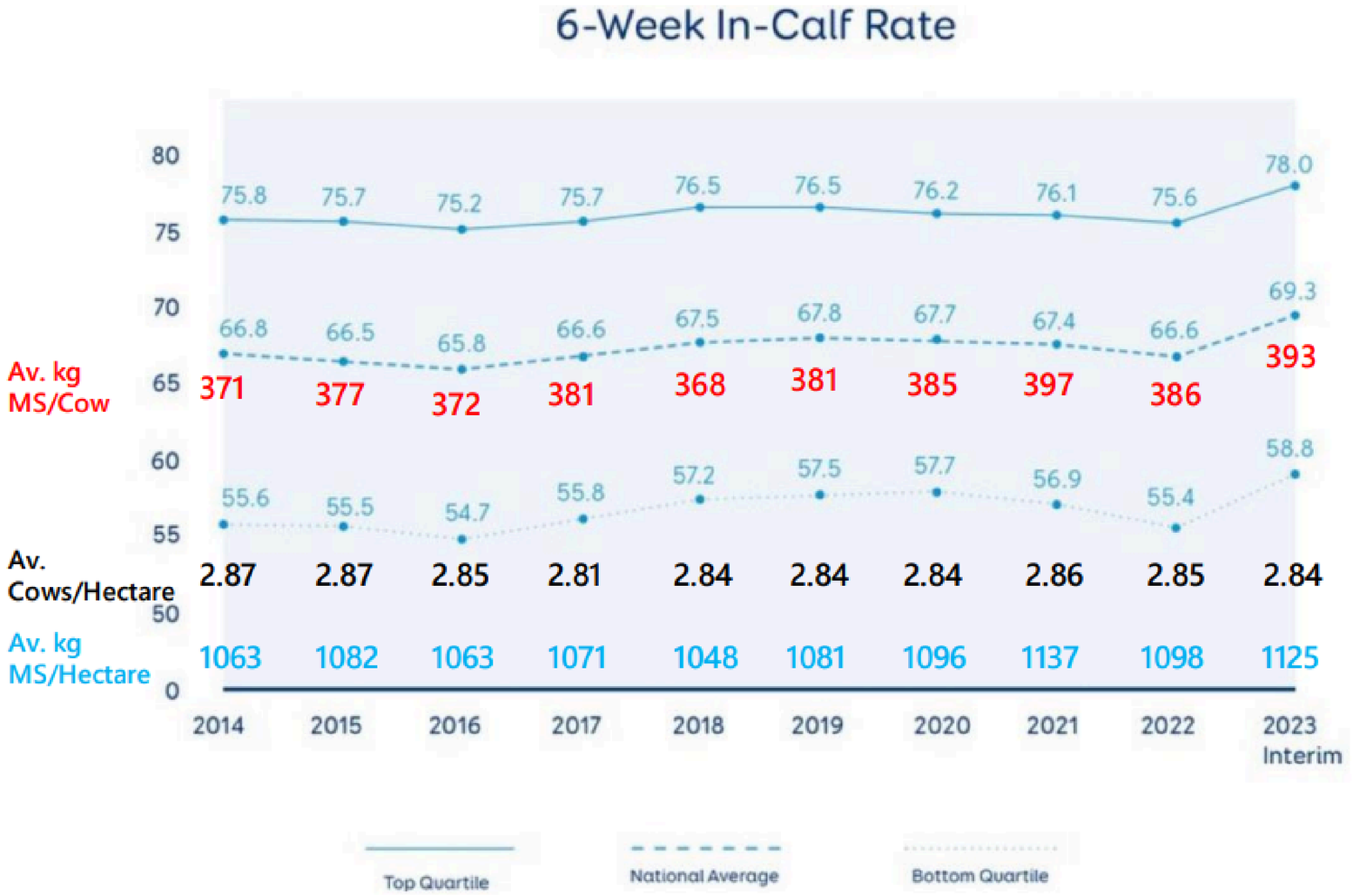
How are we doing?

LIC Repro 22/23 & Dairy NZ stats



IDEAL:

>85% pre-mating heats

3-week SR 90%

3-week ICR >60%

6-week INC >78%

<6% 12-week empty rate

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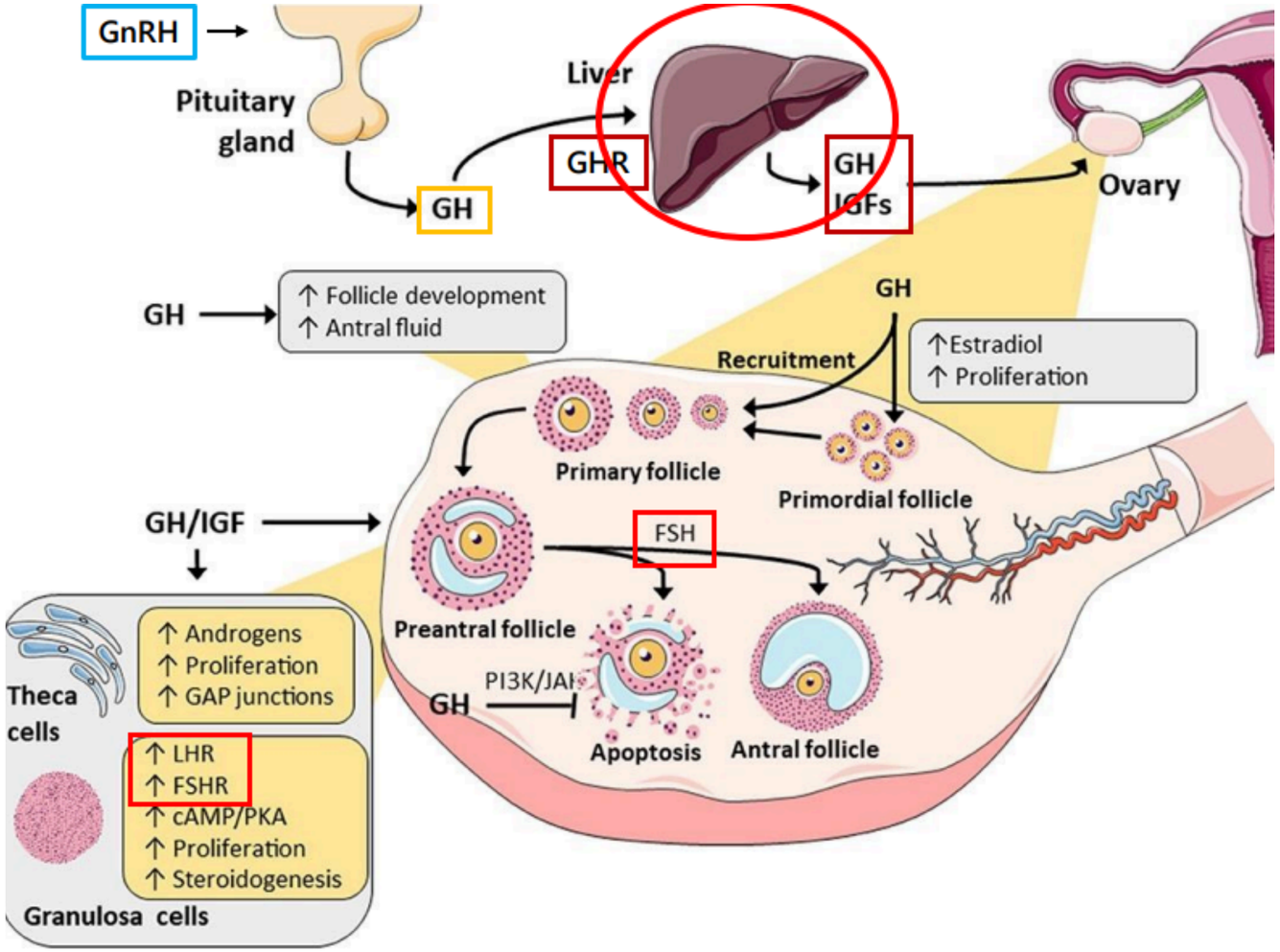
Reproductive endocrine process overview



Gonadotropin (GnRH)

Growth Hormone (GH)

Insulin-like Growth Factor (IGF-1)

Growth Hormone (GH)

Growth Hormone Receptor (GHR)

Follicle Stimulating Hormone (FSH)

Follicle Stimulating Hormone Receptor (FSHR)

Luteinizing Hormone (LH)

Luteinizing Hormone Receptor (LHR)

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ZOOM OUT

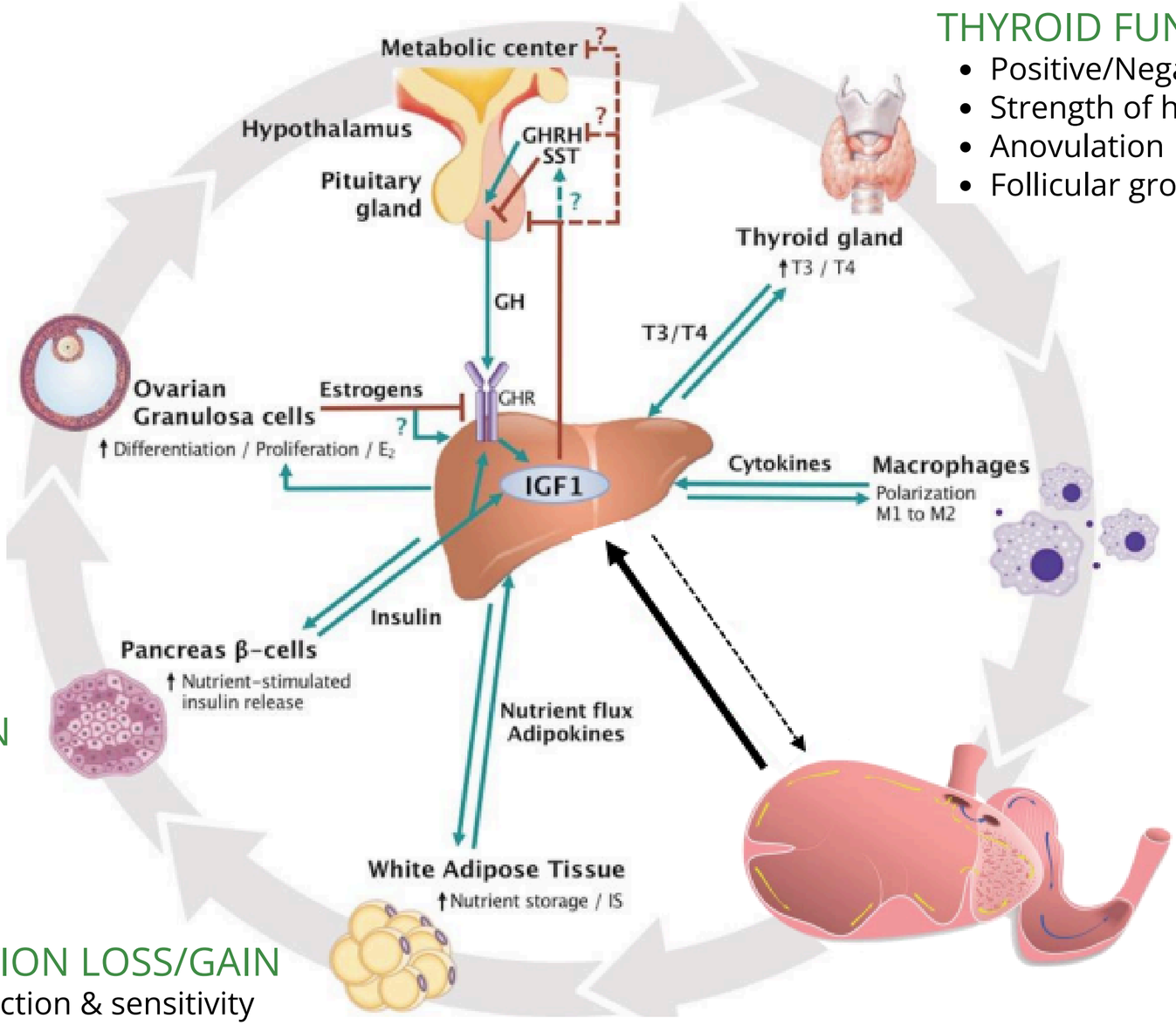
THE ROLE OF THE LIVER

THYROID FUNCTION

- Positive/Negative energy balance
- Strength of heat
- Anovulation
- Follicular growth/quality

REPRODUCTION

- Follicular development
- Pregnancy maintenance
- Follicle quality
- Anovulation



IMMUNE SYSTEM

- SCC metritis
- Glucose & calcium sucker!

INSULIN & GLUCAGON

- Drives hormone production/release

RUMEN PERFORMANCE

- Supplying VFAs, protein, AAs, minerals/vitamins
- Variable propionate, butyrate, acetate
- Influencing appetite
- High calcium requriement for rumination

COW CONDITION LOSS/GAIN

- Insulin production & sensitivity
- Diet composition & other factors

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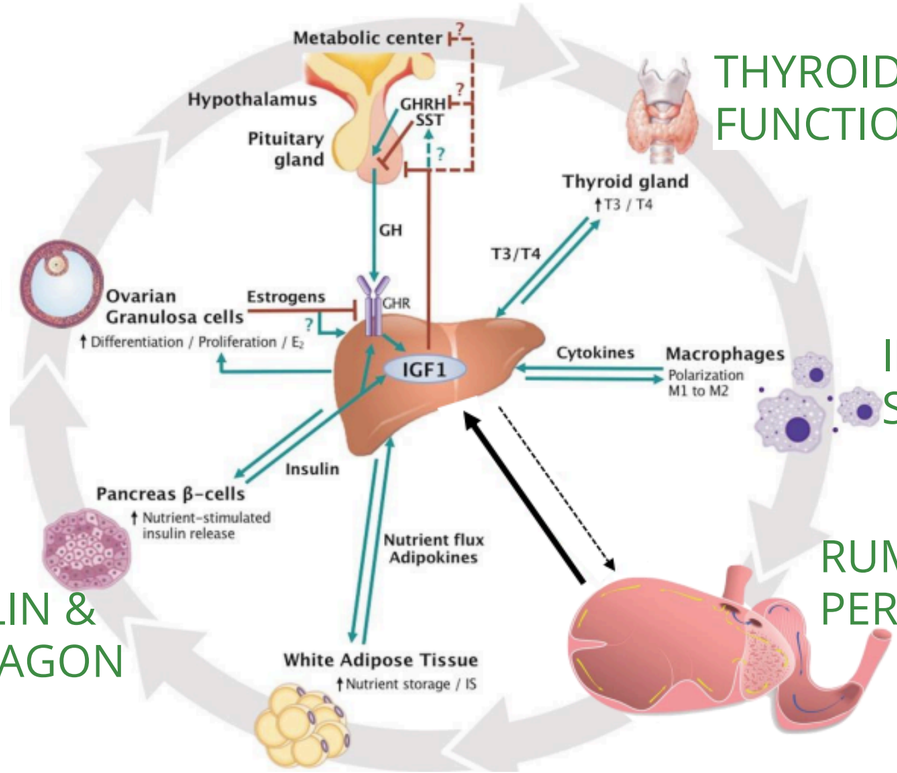
ZOOM OUT FURTHER

THE ROLE OF THE LIVER

- Growth hormone and insulin-like growth factor production
- Critical to follicle growth and quality
- Influences heat expression, anestrus, anovulation
- Influences the release of luteinising hormone, controlling the maintenance of pregnancy

REPRODUCTION



THYROID FUNCTION

- T3 & T4 hormone production is critical for overall reproductive endocrine function
- Effective iodine, selenium, and cobalt supplementation
- Rumen stability affecting iodine and cobalt/B12 metabolism
- Effects energy metabolism and milk production

IMMUNE SYSTEM

- Strong immune response for fast recovery
- Lower stress to protect immune system
- Avoid shifting cows between herds
- Efficient Cu, Zn, and Se supplementation
- Efficient calcium supplementation

INSULIN & GLUCAGON

Insulin & glucagon release are critical to:

- Energy balance, appetite, production
- Glucogenesis regulation
- Stimulating IGF-1 release from the liver
- Amount of insulin produced & cow sensitivity to insulin are important
- Efficient Cu, Zn, & Se supplementation to ensure ROS don't hamper
- Chromium increases insulin sensitivity
- Biotin helps improve insulin production

RUMEN PERFORMANCE

- Balanced diet
- Starch/propionate to drive glucogenesis
- Max energy release
- Max protein utilisation
- Efficient amino acid, B vitamin, biotin, vitamin D & E supply
- NDF and Calsea to stabilise pH and supply calcium
- Efficient Ca, P, Mg, and TE supplementation

COW CONDITION

- Condition loss triggers a shift in the hormonal balance and signals to the cow, "Do not get pregnant"
- Manage dry, transition, & colostrum periods carefully
- Measure constantly post-calving to ensure no condition loss
- Ensure energy density and diet balance are optimum to avoid a hormonal/metabolic shift happening

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What are we trying to achieve pre-mating?

- Maximise cow appetite
- Rumen performance through diet balance
- Achieve and maintain cow condition
- Minimise stress
- Optimise mineral and vitamin nutrition

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OPTIMAL COW APPETITE =

4.25% - 4.75% OF LWT (22kg DM for 480kg cow)

- Hard to exceed 4% on pasture alone
- Optimal appetite indicates well-balanced and functional rumen
- Optimal appetite also indicates good liver function

PERFORMANCE MANAGEMENT

- Rumen fill scoring
- Rumination and eating cow data
- Feed measurement

TOOLS

- Increase energy density of the diet, drive glucogenesis
- Improve rumen stability with better diet balance, Calsea, yeasts, NDF etc.
- Drive glucogenesis with specific rumen bypass fats, ionophores, starch etc.

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RUMEN PERFORMANCE THROUGH DIET BALANCE

- Hard to achieve feeding pasture only in early lactation
- Correct balance of NDF, sugar (WSC), starch, carbohydrates, NPN, and CP
- Correct mineral balance for rumination and microbial function

PERFORMANCE MANAGEMENT

- Rumen and eating cow data
- Protein:fat ratio, fat %, protein %, and MUN monitoring
- Diet herbage analysis

TOOLS

- Adjust feed types and volumes to shift measured values
- Add minerals and vitamins if/when gaps are identified
- Management changes to shift diet balance

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ACHIEVE AND MAINTAIN COW CONDITION

- Cows recovery and achieving PEB as early as possible
- Watching for feed changes that trigger cow condition shifts

PERFORMANCE MANAGEMENT

- Tracking cow condition with regular scoring **with** BOHB blood monitoring
- Protein:fat ration, fat %, protein %, and MUN monitoring **with** rumination/appetite data
- Weighing may have potential - more research in NZ is needed

TOOLS

- Betaine, ionophores, specific bypass fats, cobalt, chromium, calcium…
- Low protein % / high fat % <0.78 protein:fat ratio = **look for:** low energy density, high risk for condition loss/ketosis … **low** appetite
- Good protein % / good fat % 0.78 - 0.82 protein:fat ratio = stable, well-fed rumen, good energy density, optimum liver function, PEB, good appetite
- High protein % / low fat % >0.82 protein:fat ratio = look for: rumen instability, high risk for SARA and condition loss/ketosis… **declining** appetite

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MINIMISE STRESS

- Stress affects hormone expression via energy wastage
- stress increases ROS damage to reproductive organ

PERFORMANCE MANAGEMENT

- Fat % levels in the milk, along iwth rumination and appetitie data
- Watch rumination and eating data within age groups
- Cow behaviour

TOOLS

- Age group management - particularly heifers
- 200-cow social groups - social groups work around troughs
- Manage cow groups based on age/feed competitiveness, **not** condition
- **Do not** adjust cow groups/herds coming into or through mating

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OPTIMAL MINERAL & VITAMIN NUTRITION

- **Macro minerals:** Ca, P, Mg, Na, K
- **Micro minerals:** Cu, Zn, Co, I, Se, Mn, B, Cr
- **Vitamins:** Biotin (Vit H), vitamin E, vitamin D, and B-group vitamins

PERFORMANCE MANAGEMENT

- Blood, herbage, cow/health performance

TOOLS

- Test, test, test!
- Diet calculator that helps to balance mineral and vitamin nutrition

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From dry to mating - the timeline

MILK COMPONENTS

Example: 470kg Kiwi-cross herd

Don’t look at any one milk component in isolation - together they tell a story.

- **Production** per cow, kg DM/kg MS, are important measurements
- **Fat %** gives us an indication of rumen stability and performance
- **Protein %** gives us an indication of energy being release from the diet
- **Protein:fat ratio** is a calculation giving us an indication of comparative balance only
- **MUN** is a measurement of the amount of ammonia that is escaping the rumen and not being utilised by rumen microbes

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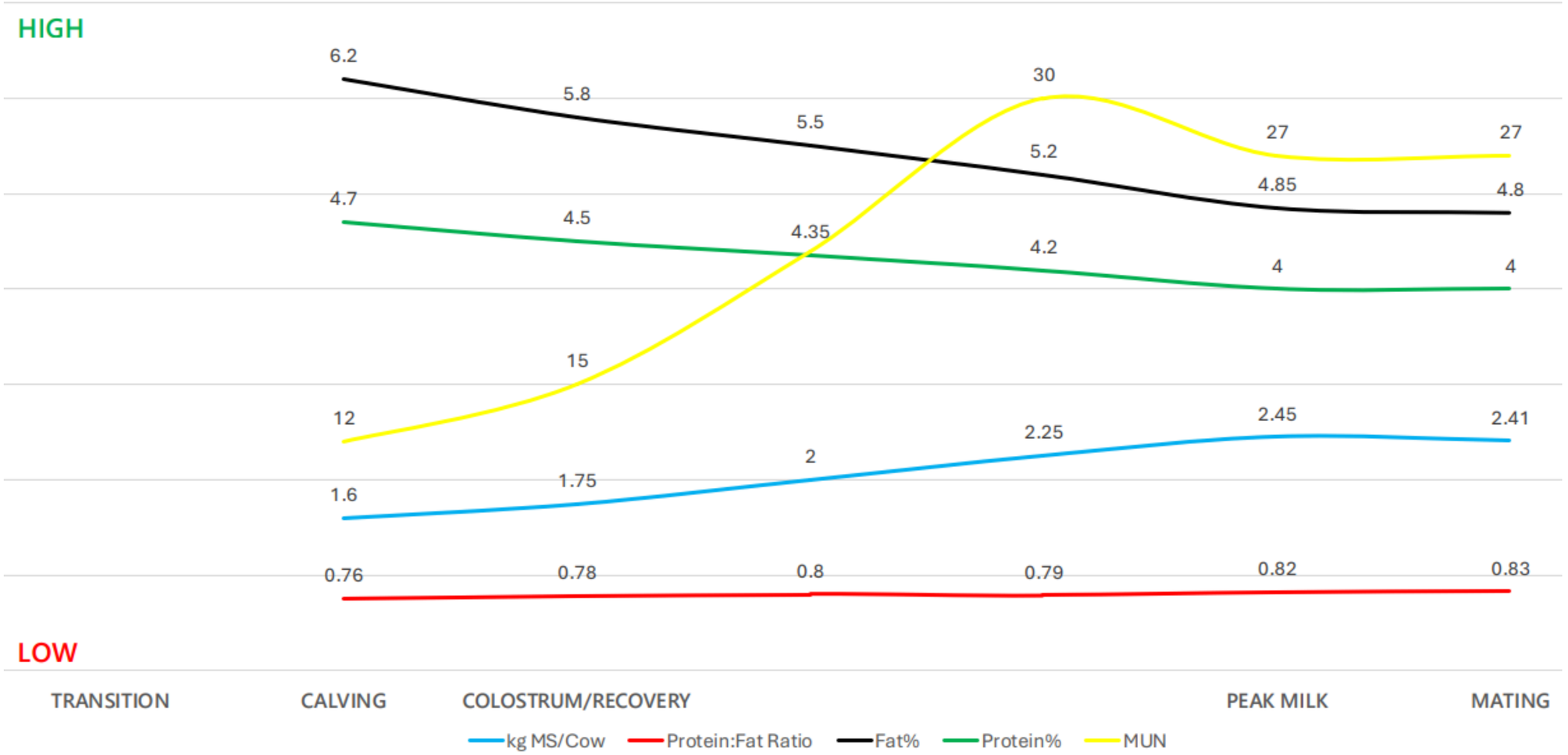
MILK COMPONENTS

Example: 470kg Kiwi-cross herd



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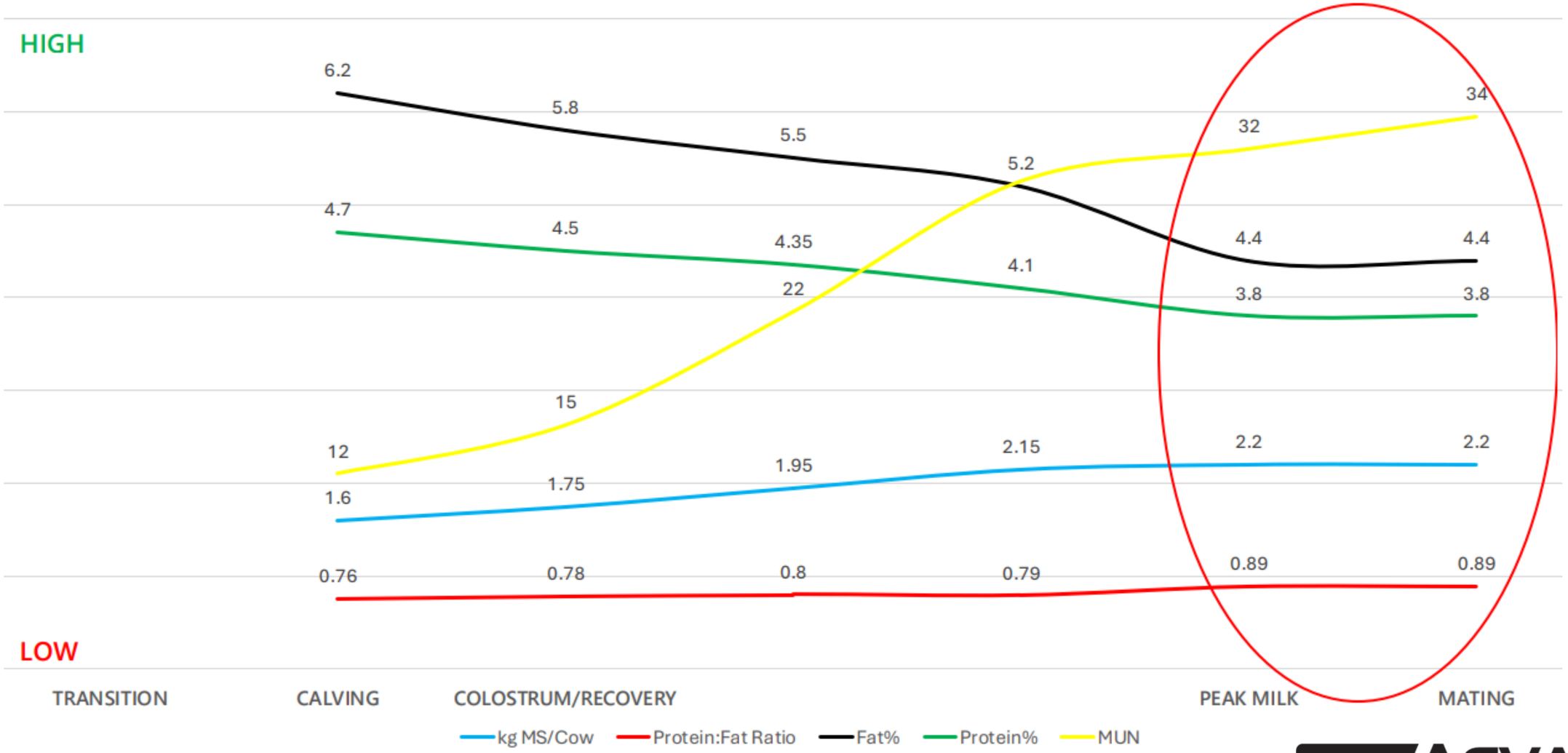
LOW NDF/RUMEN INSTABILITY/HIGH NPN



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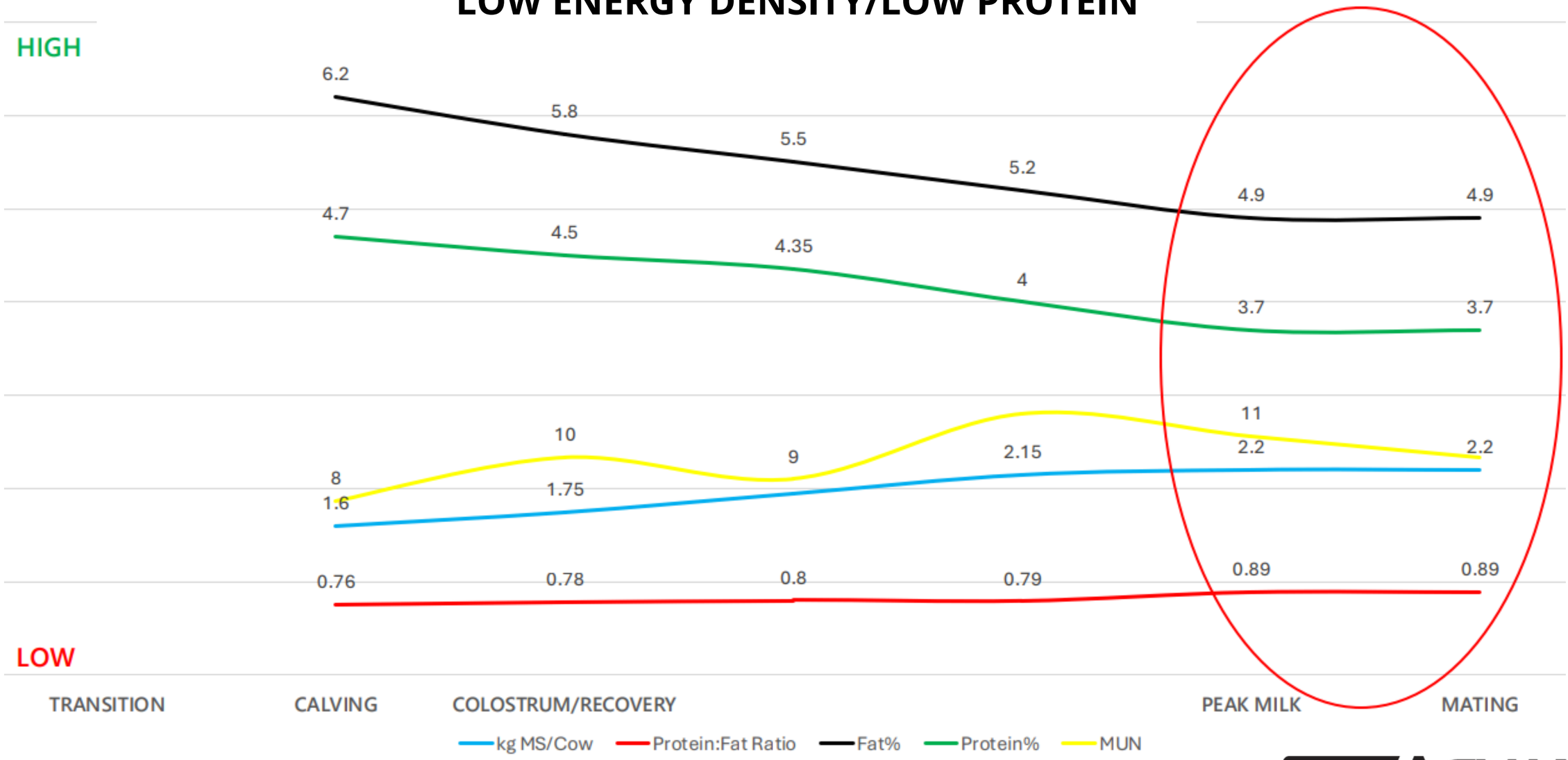
FROM DRY TO MATING - THE TIMELINE

LOW ENERGY DENSITY/LOW PROTEIN



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RUMINATION/EATING MINUTES

- Wearable data compliments milk data - it is ideal to interpret this data together!
- Rumination minutes gives us an idea of rumen stability and performance
- Eating minutes gives an indication on how much time a cow is spending trying to eat (measured at a group level only)
- The level of rumination and eating trends and how they compare to each other are the key components

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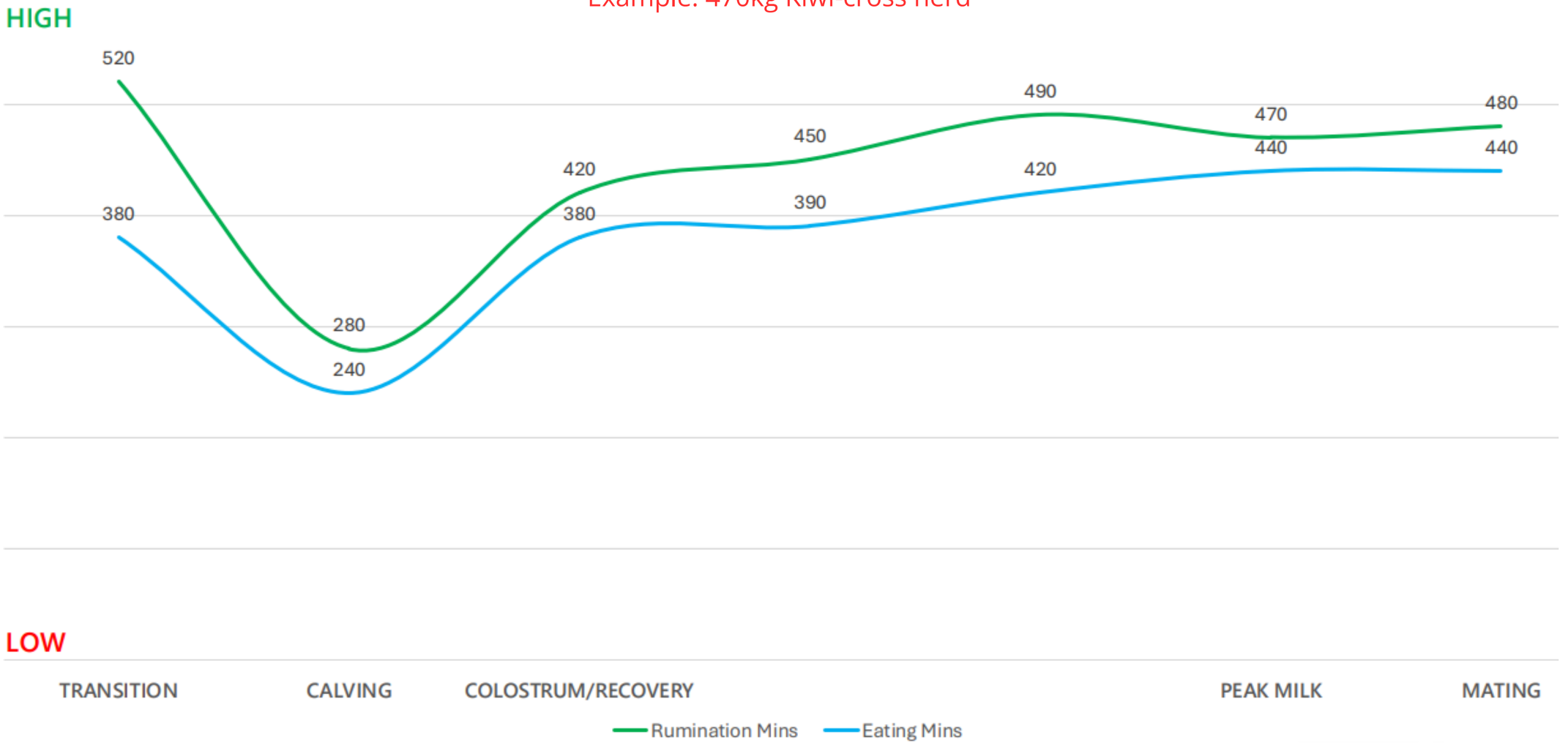
RUMINATION AND EATING

Example: 470kg Kiwi-cross herd



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FROM DRY TO MATING - THE TIMELINE

RUMINATION AND EATING

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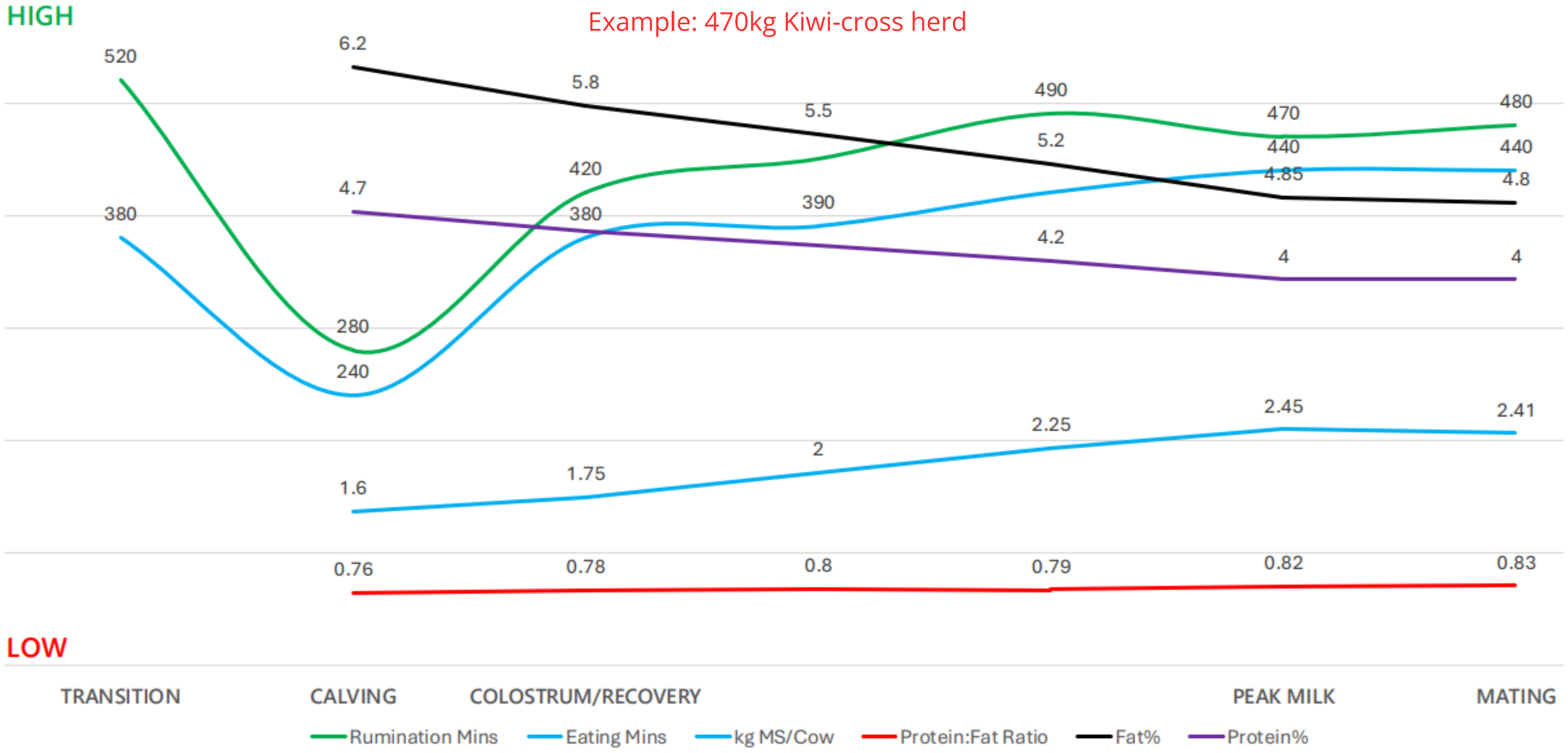

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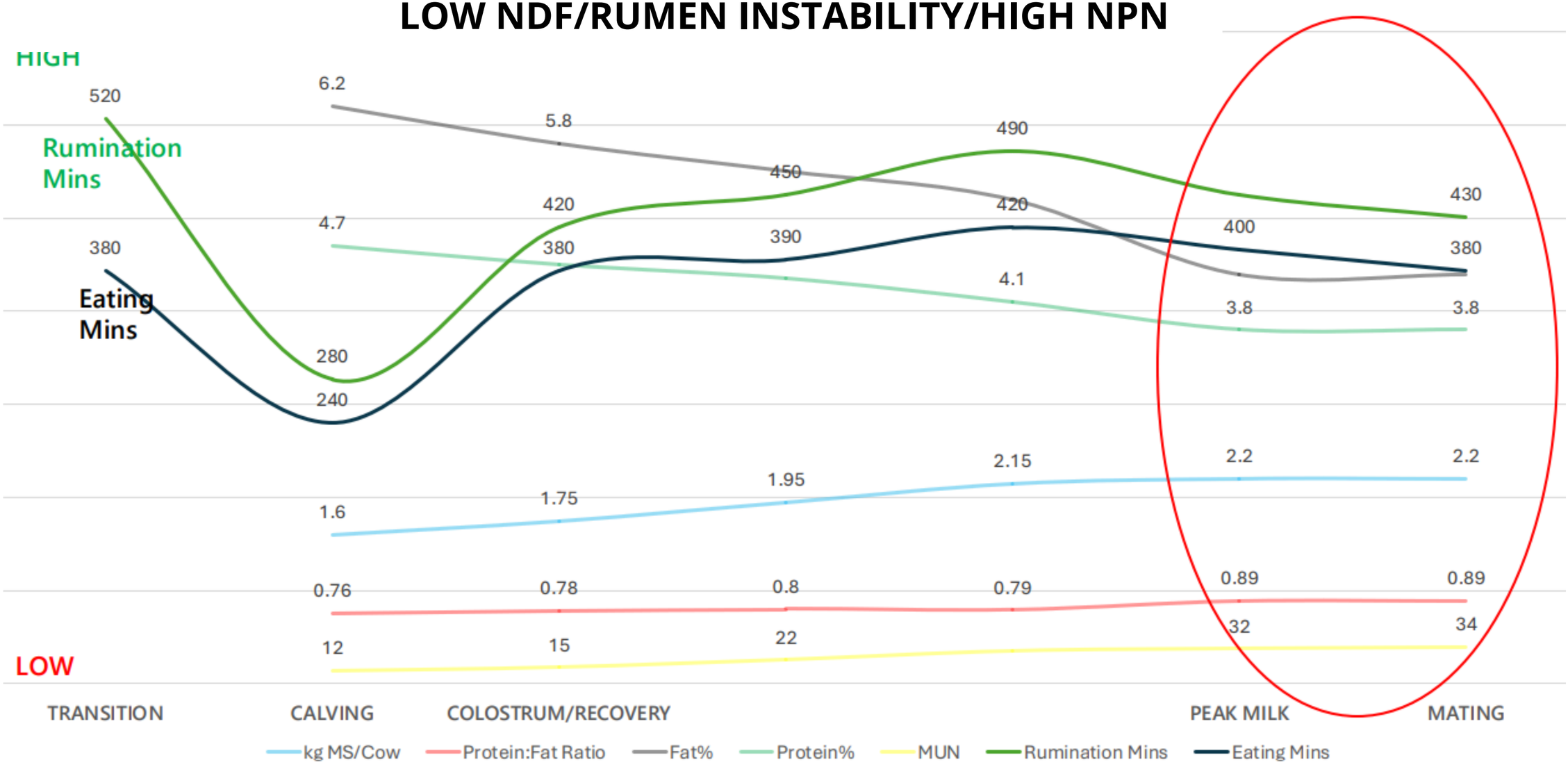
LOW NDF/RUMEN INSTABILITY/HIGH NPN



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FROM DRY TO MATING - THE TIMELINE

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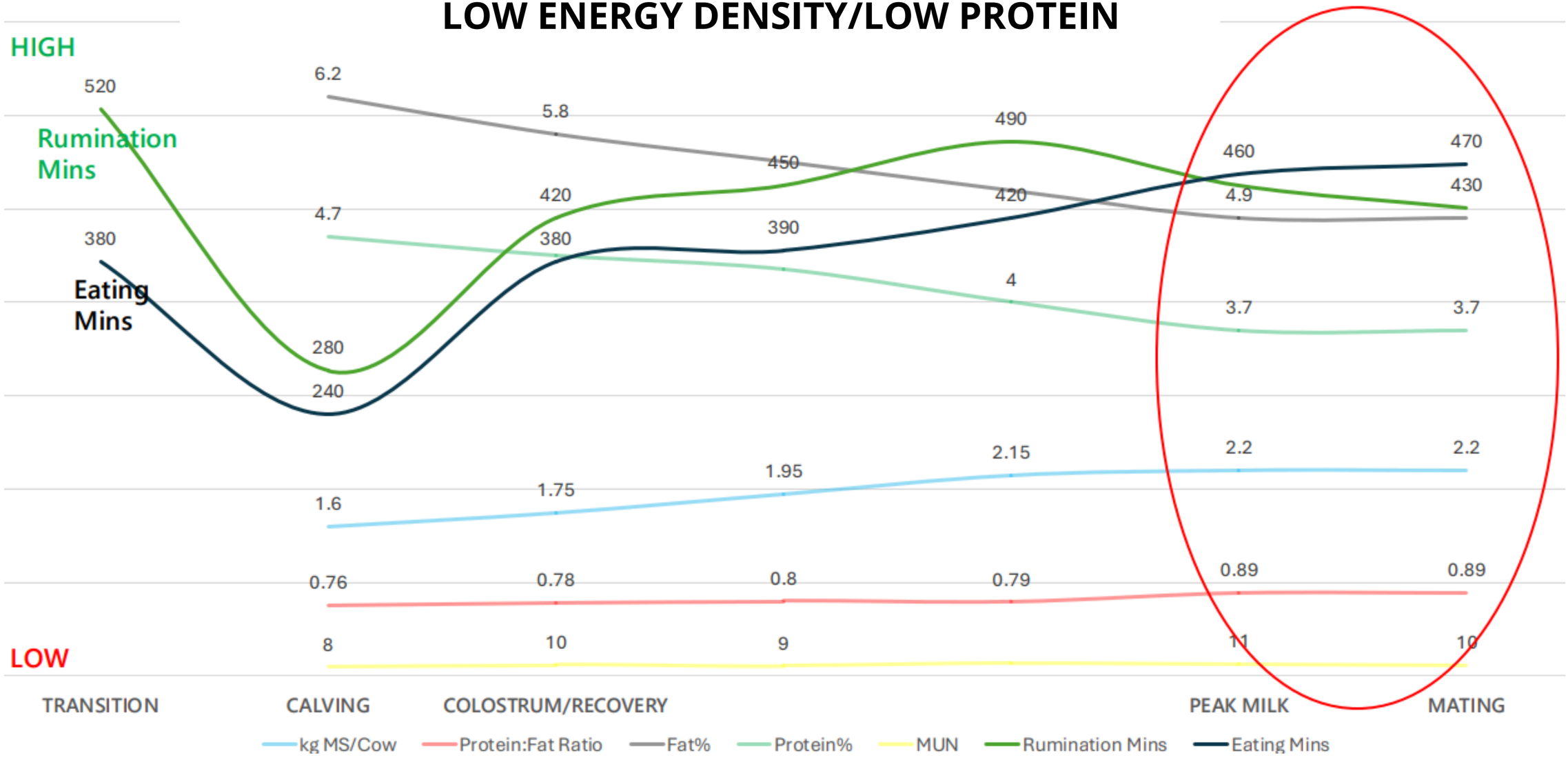

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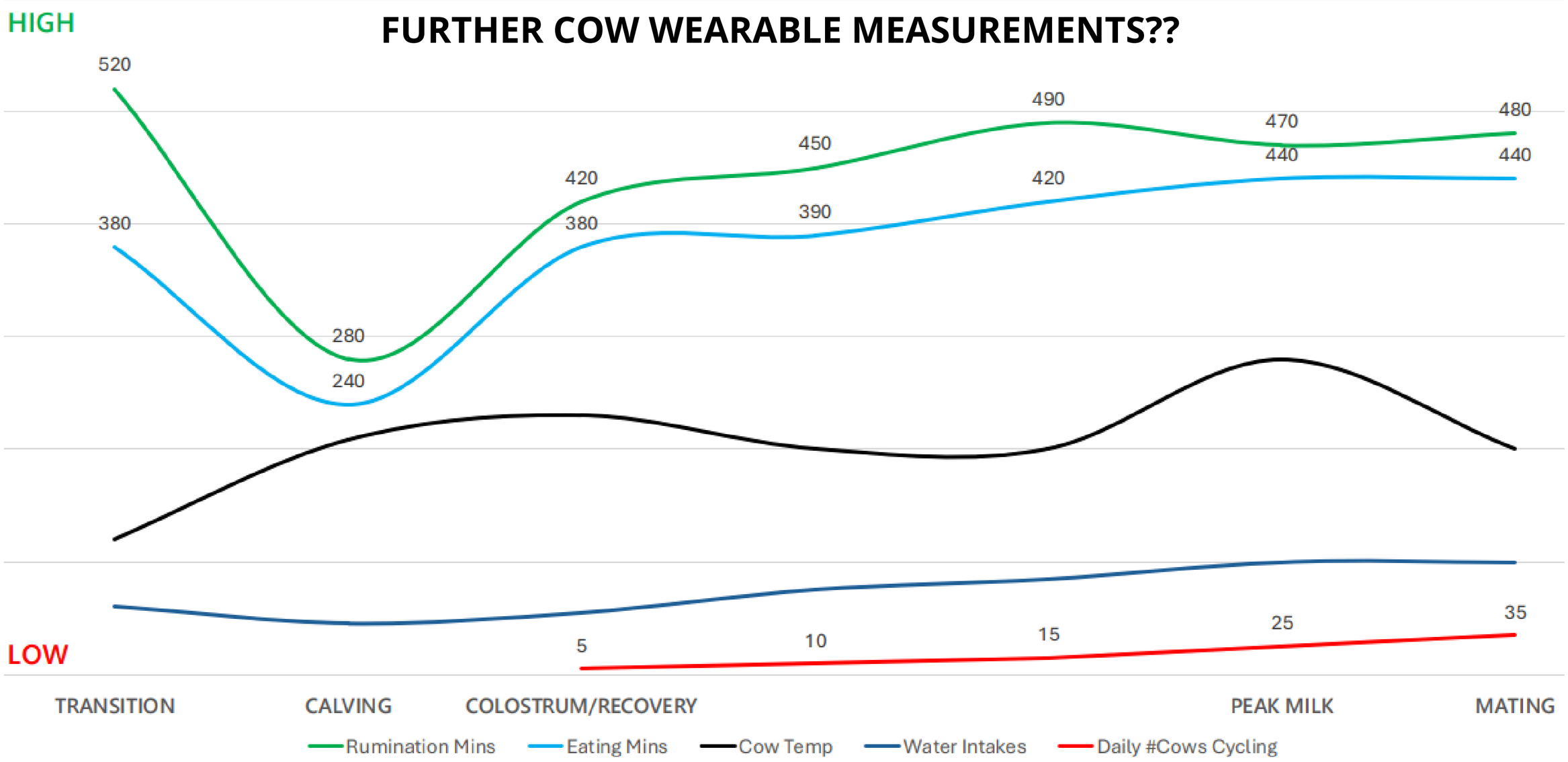
FROM DRY TO MATING - THE TIMELINE



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Key points & future thoughts

ONE: Should we be measuring both NEFA & BOHB levels pre-mating?

TWO: Can we investigate liver function using blood measurements after calving and treat for irregularities to improve liver performance?

THREE: Where is the point at which it is economically viable to address issues? How do we manage this based on different payouts for the season-to-come?

FOUR: Is there more insight we can gain from cow wearable data to help bring nutrition and reproduction closer together?

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