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Digital Innovation at the Service of Breeders: The Synergy Portal and Mobile App for Real-Time Genetic Decision Support

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The Past

Data: Fragmented and siloed records.

Action: Retrospective problem-solving in the barn.

Inbreeding: Probabilistic pedigree calculations, often applied too late.

The Paradigm Shift

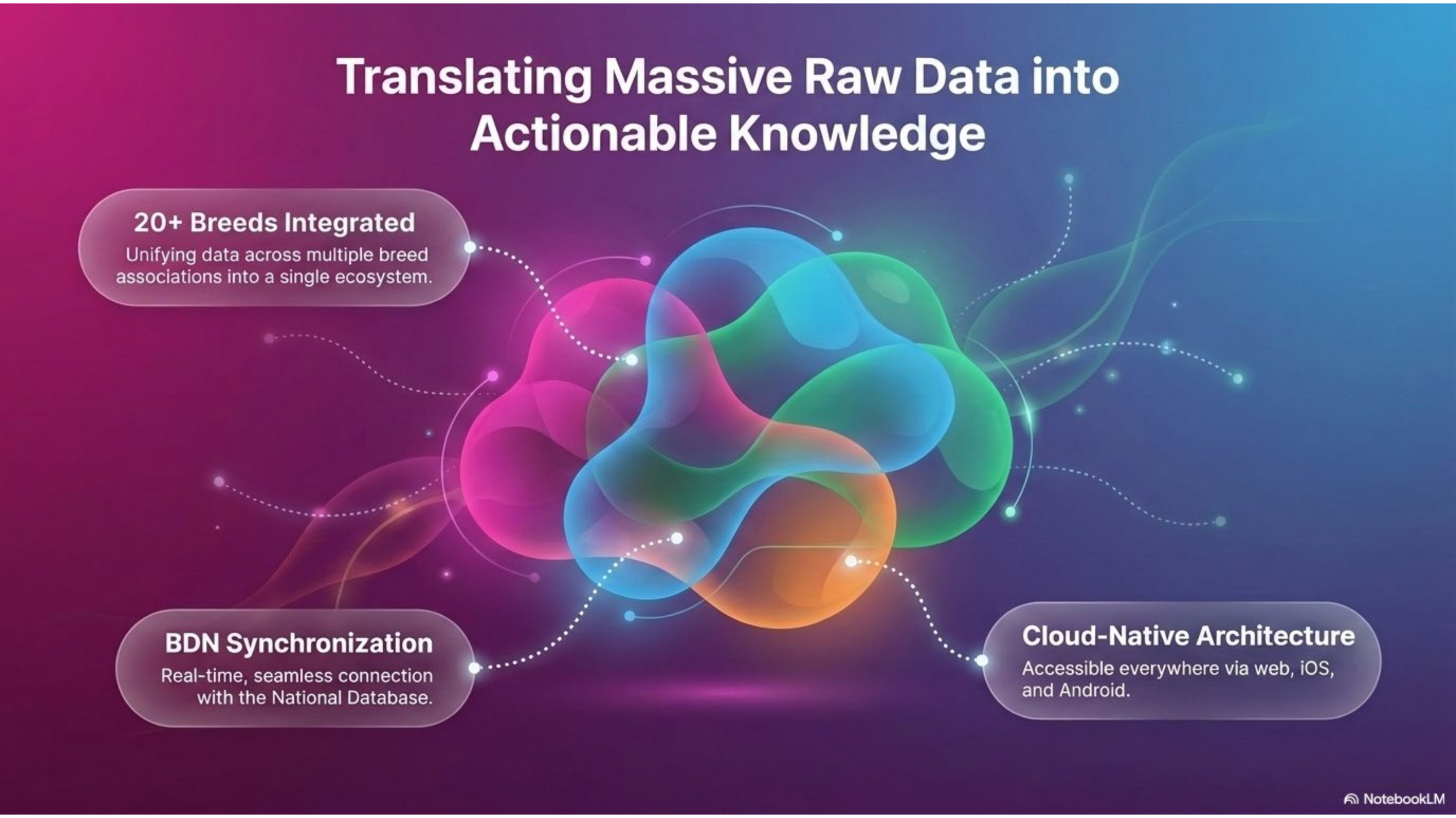
The Future

Data: Centralized, real-time strategic tools.

Action: Data-driven, predictive decision support.

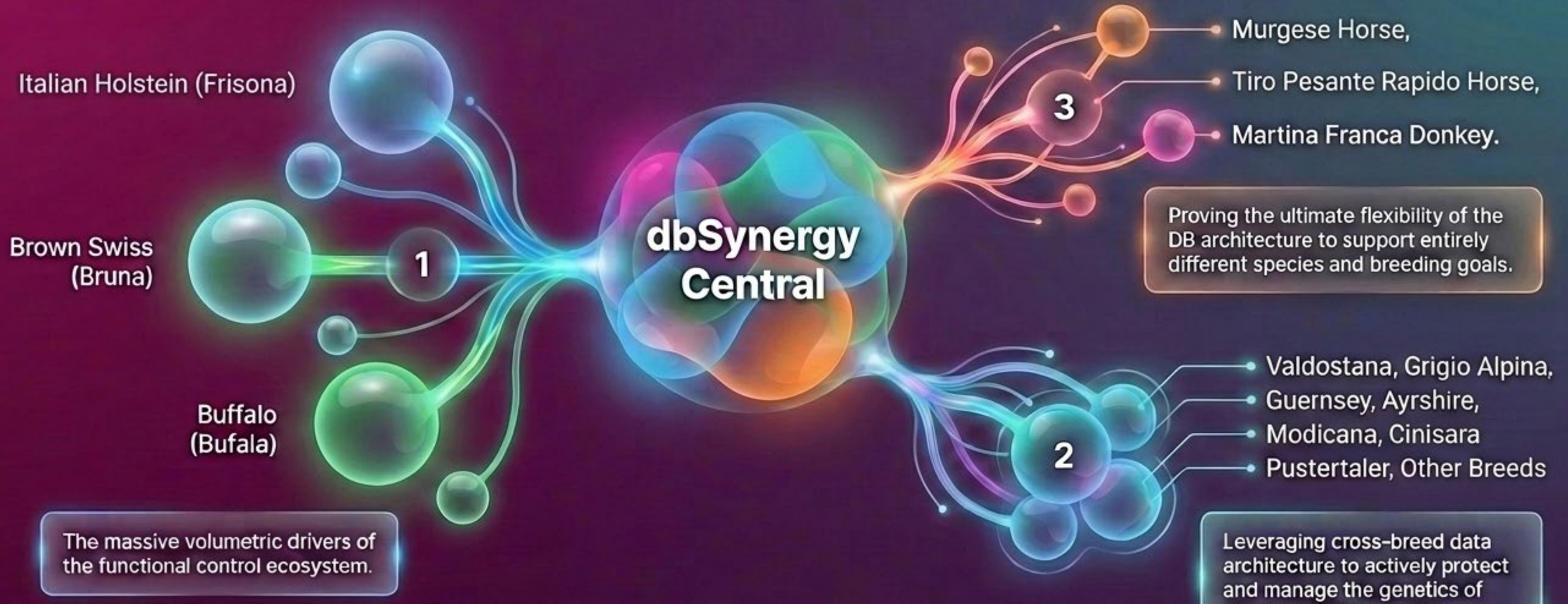
Inbreeding: Precise genomic and pedigree integration.

Translating Massive Raw Data into Actionable Knowledge



Unprecedented Breadth: Integrating 10 Associations & 20+ Breeds

Breaking down data silos to power a truly multi-species genetic decision support system.



The massive volumetric drivers of the functional control ecosystem.

Proving the ultimate flexibility of the DB architecture to support entirely different species and breeding goals.

Leveraging cross-breed data architecture to actively protect and manage the genetics of rustic and local populations.

The Anatomy of dbSynergy: 4 Pillars of Precision

~10.4 Million Records

Registry (Anagrafiche)

The foundational pedigree and demographic baseline across all integrated herds, establishing the structural map of the population.

~2.2 Million Records

Morphology (Morfologiche)

High-fidelity, expert-validated biometric and conformational assessments recorded natively on-farm.

~37.8 Million Records

Functional Controls (Controlli Funzionali)

The massive engine of lifetime performance, continuous health tracking, and environmental response data.

~59,000 High-Density Profiles

Genomics (Analisi Genomiche)

The rapidly expanding layer of realized DNA inheritance unlocking exact relationship values for Gen.IO predictions.

The Momentum of Integration: Scaling Beyond 50 Million Data Points

50,544,415

Total Integrated Records Projected for 2026.

The Phenotypic Engine

37.2M → 37.8M
(Functional Controls)

Adding over 600,000 new lifetime performance records in a single year, providing an ever-deepening pool of real-world results to train evaluations.

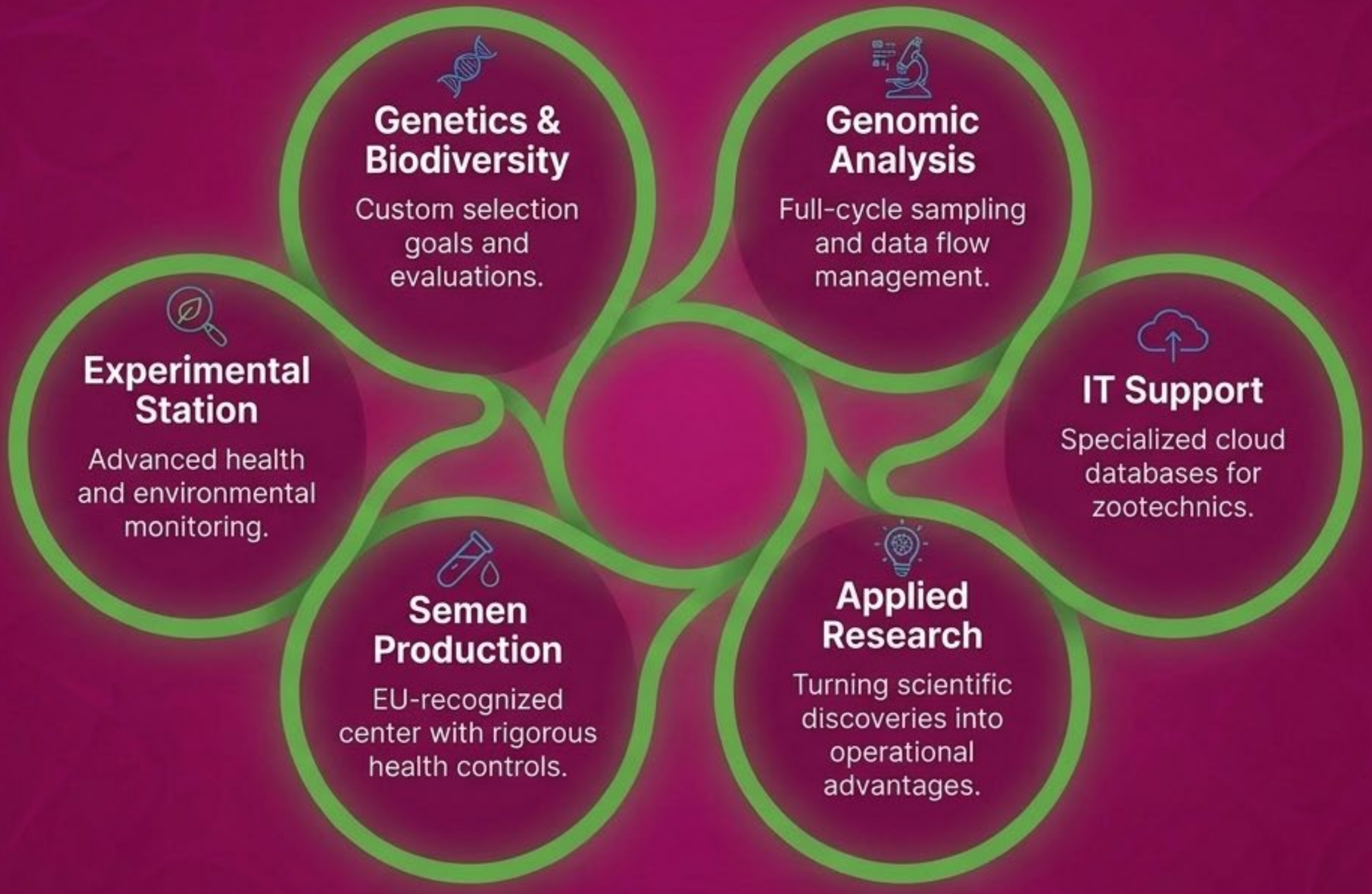
The Genomic Future

54.8k → 59k
(Genomic Analyses)

A near 8% annual expansion in realized genetic blueprints—the fastest-growing and most critical layer for precise GEBV and real-time mating.

A continuously compounding matrix—where every new phenotype and genotype strengthens the predictive power of the entire herd.

A Comprehensive Service Ecosystem



Digital Innovation: From Reacting to Predicting

Synergy Portal

- 10M Animal Records
- 37M Functional Controls
- 2.2M Morphological Evaluations
- 54,000+ Genomic Analyses

Cloud-based architecture featuring real-time synchronization with National Databases and 17 breed associations.

Smart Mating & Kinship

Integrating pedigree and high-density genomic data to calculate precise consanguinity.

Gen.io & Parentele Tools:
Enabling highly intelligent, predictive mating decisions directly from the barn.

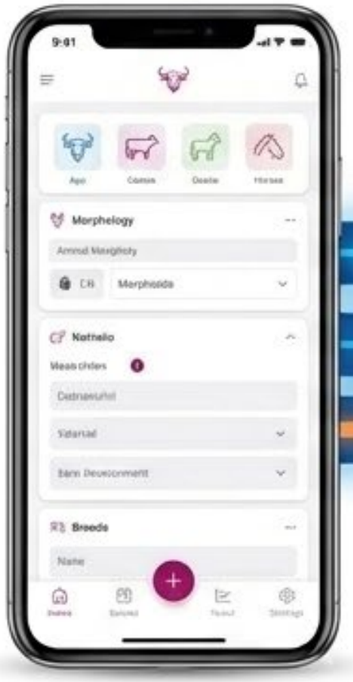
Field Applications

Mobile-first tool for comprehensive in-barn evaluations.

- Real-time morphological data
- Biometric measurement capturing
- In-field behavioral testing
- Direct-to-cloud synchronization

Advances in Phenotyping: High-Fidelity Field Data

MORFO
By SYNERGY
APP VALUTAZIONI MORFGLOGICHE



Dedicated App (Morfo)

Standardizing multi-breed expert morphological evaluations natively on mobile (Cows, Buffalo, Horses).

Comprehensive Schematics

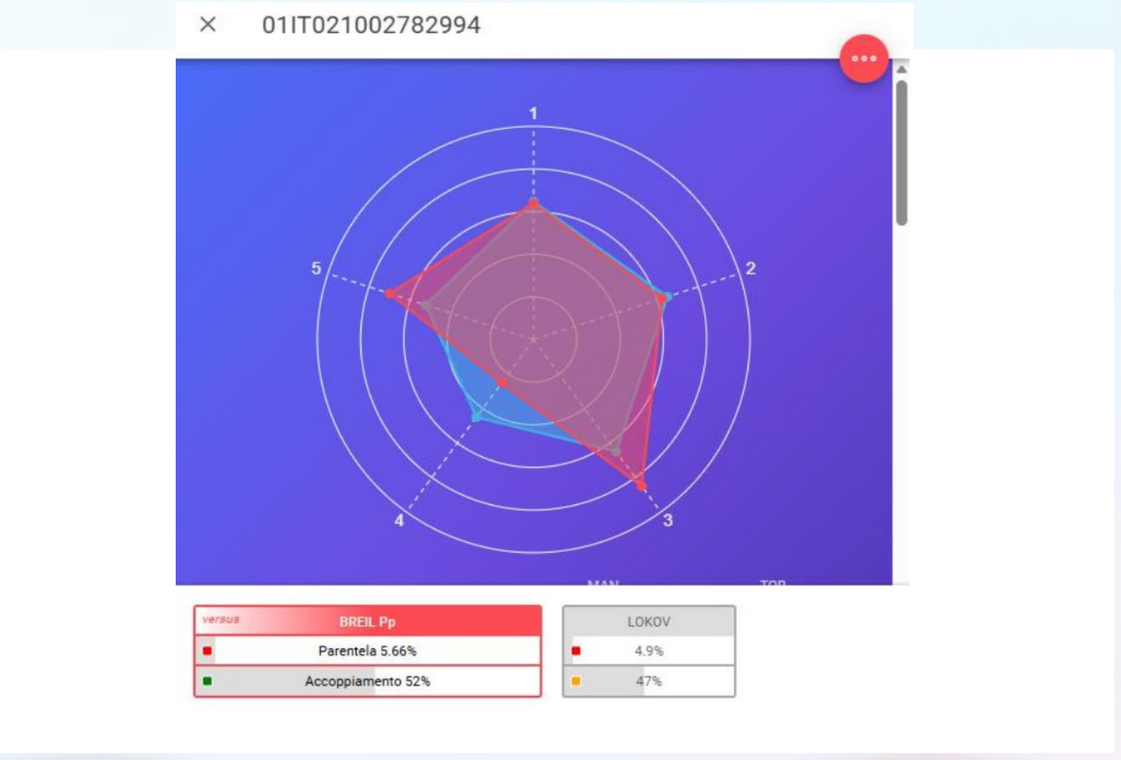
Seamless digital recording of morphological assessments at genetic centers and behavioral testing.

On-Farm Expansion

Integration of new on-farm data collection modules directly from the breeder's environment to the central database.

GEN.IO - Accoppiamenti Genomici Intelligenti

GEN.IO
by SYNERGY
ACCOPPIAMENTI GENOMICI INTELLIGENTI



The Engine

Translating complex GEBVs and Parentele similarity data into an intuitive, breeder-facing software ecosystem.

Deep Customization

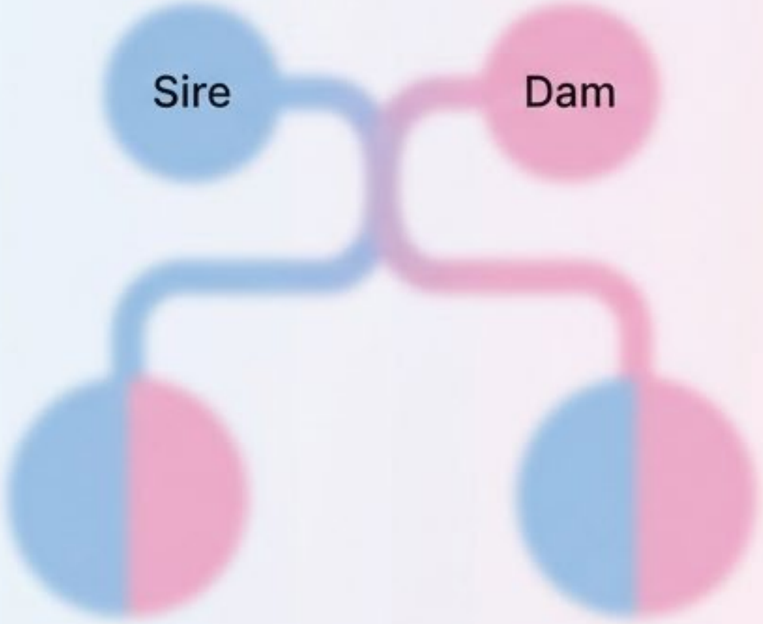
Empowers breeders to select proprietary bull groups and evaluate the optimal mating scenario for every single animal in the herd.

Accessibility

Cloud-native access ensuring the full weight of the national database is available instantly in the barn.

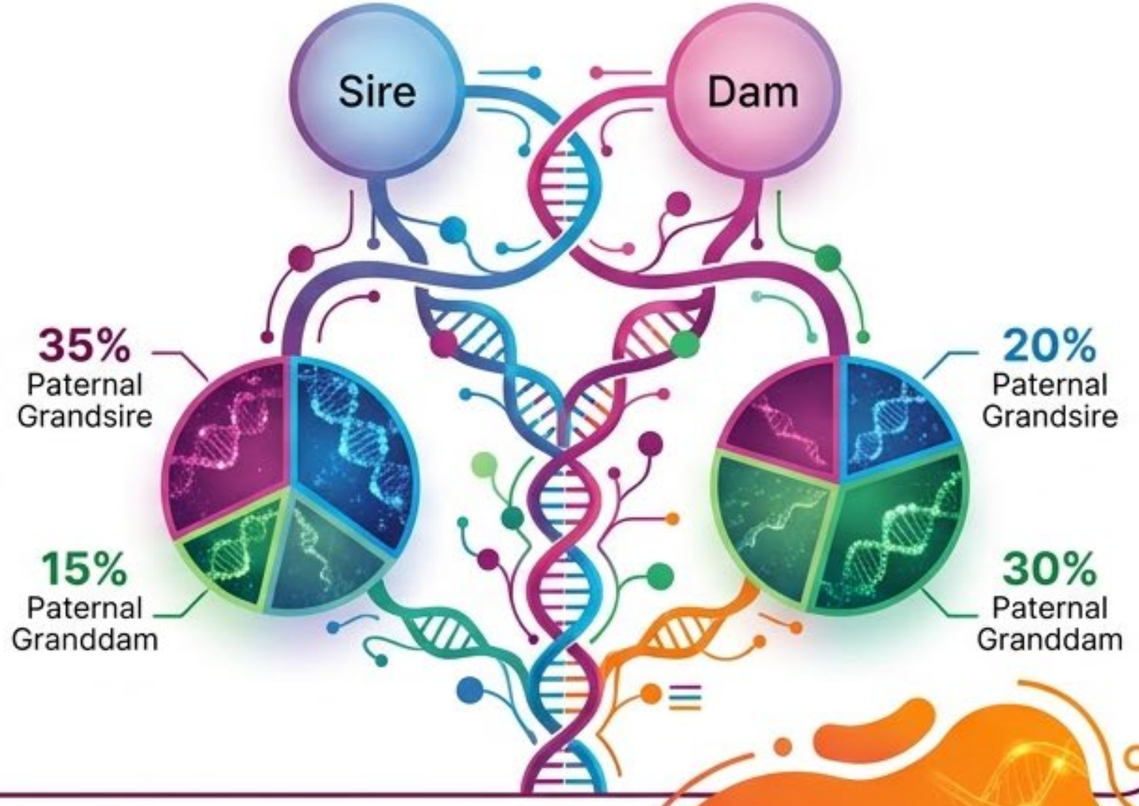
The Illusion of the Average Sibling: Decoding Mendelian Sampling

The Pedigree Assumption



Expected: 50% shared genetics.
Reality: An oversimplified average.

The Genomic Reality



The Random Shuffle: Cattle possess 30 pairs of chromosomes. During reproduction, one from each pair is randomly selected, creating over **1.07 billion** possible combinations per parent.

The Pedigree Blindspot: Traditional models assume full siblings share exactly **50%** of their DNA.

The Genomic Truth: Actual DNA sharing between full siblings ranges widely from **35% to 65%.**

Pedigree gives you the statistical average. Genomics gives you the exact blueprint.

Upgrading Resolution: From Expected Probabilities to Realized Inheritance

The Pedigree Matrix (A)

Data Input & Accuracy

Relies on genealogical records (historically carries up to a 10% human recording error rate).

Relationship Basis

Calculates the expected probability of alleles being Identical by Descent (IBD).

F_{ped}

Inbreeding Calculation

Uses F_{ped}, an assumed coefficient that cannot distinguish between recent and ancient inbreeding.

Actionability Timeline

High reliability only achieved after 3-5 years of progeny testing.

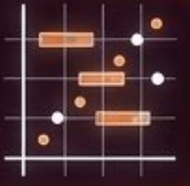
The Genomic Matrix (G)

Data Input & Accuracy

Relies on direct SNP Genotypes (DNA is self-verifying, effectively eliminating parentage errors).

Relationship Basis

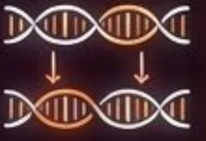
Measures the realized proportion of actual shared DNA segments.



F_{ROH} F_{GRM}

Inbreeding Calculation

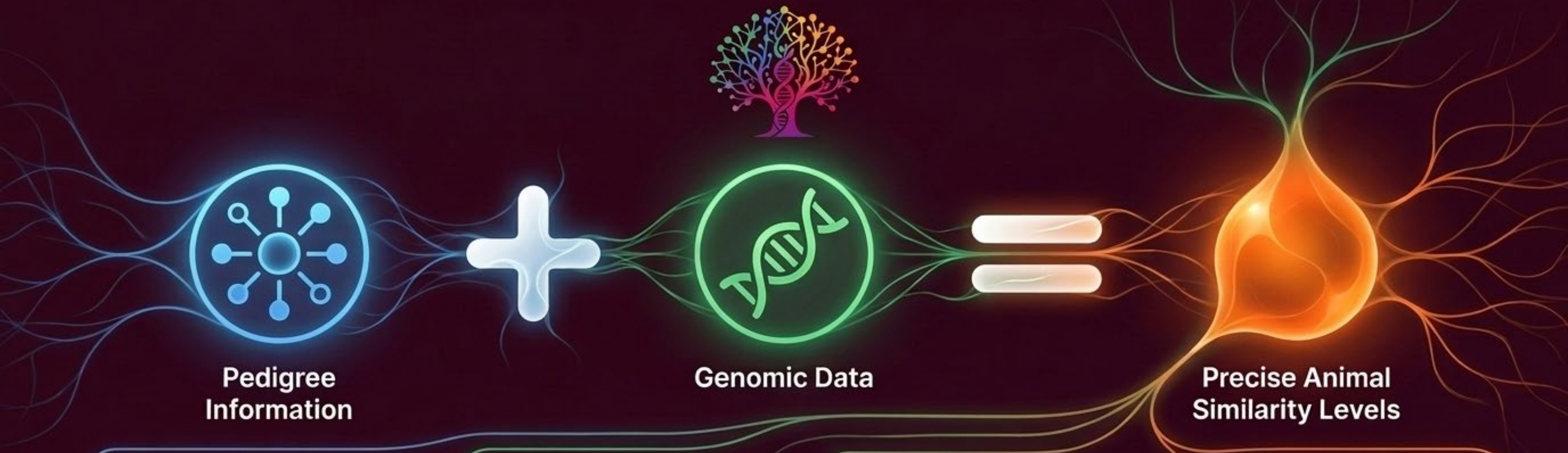
Uses F_{ROH} and F_{GRM}, measuring actual homozygous DNA segments to accurately predict and avoid inbreeding depression.



Actionability Timeline

High reliability (70-77% accuracy) achieved at days old from a single DNA tissue sample.

Gen.IO by Synergy: The Ultimate Synthesis for Precise Genetic Management



- **Unprecedented Precision:** By merging the numerator relationship matrix (A) with the genomic matrix (G), Parentele moves beyond probabilistic estimates to calculate the exact consanguinity between any two animals.
- **Biodiversity Protection:** Identifies safe mating pairs even within smaller, highly related, or endangered populations by measuring actual genomic homozygosity (F_ROH).
- **Pocket-Sized Power:** Accessible via web and smartphone. Seamlessly integrates data across 17 different breed associations and the National Database (BDN).
- **Predictive, Not Reactive:** Allows breeders to run instant mating simulations, apply advanced relationship-value thresholds, and prevent hereditary defects before a single breeding decision is made.

Pocket-Sized Genetic Management: The App in Action

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Select & Test

Choose specific bulls directly from your smartphone.

Real-Time Match

Run instant mating simulations against the entire herd.

Apply Thresholds

Filter cows using advanced relationship-value limits.

Protect & Plan

Optimize semen doses and mathematically prevent hereditary defects before they happen.

Tangible Outcomes of Integration

Real-Time Speed

No more waiting for retrospective lab reports; decision support happens instantly on-farm.

Risk Mitigation

Near-zero probabilistic error in managing hereditary defects and inbreeding depression via genomic parentele.

Economic Sustainability

Maximized genetic gain directly correlates to improved feed efficiency, optimized fertility, and extended production longevity.

On-the-Ground Operations & Research

World-class physical infrastructure backing digital insights.

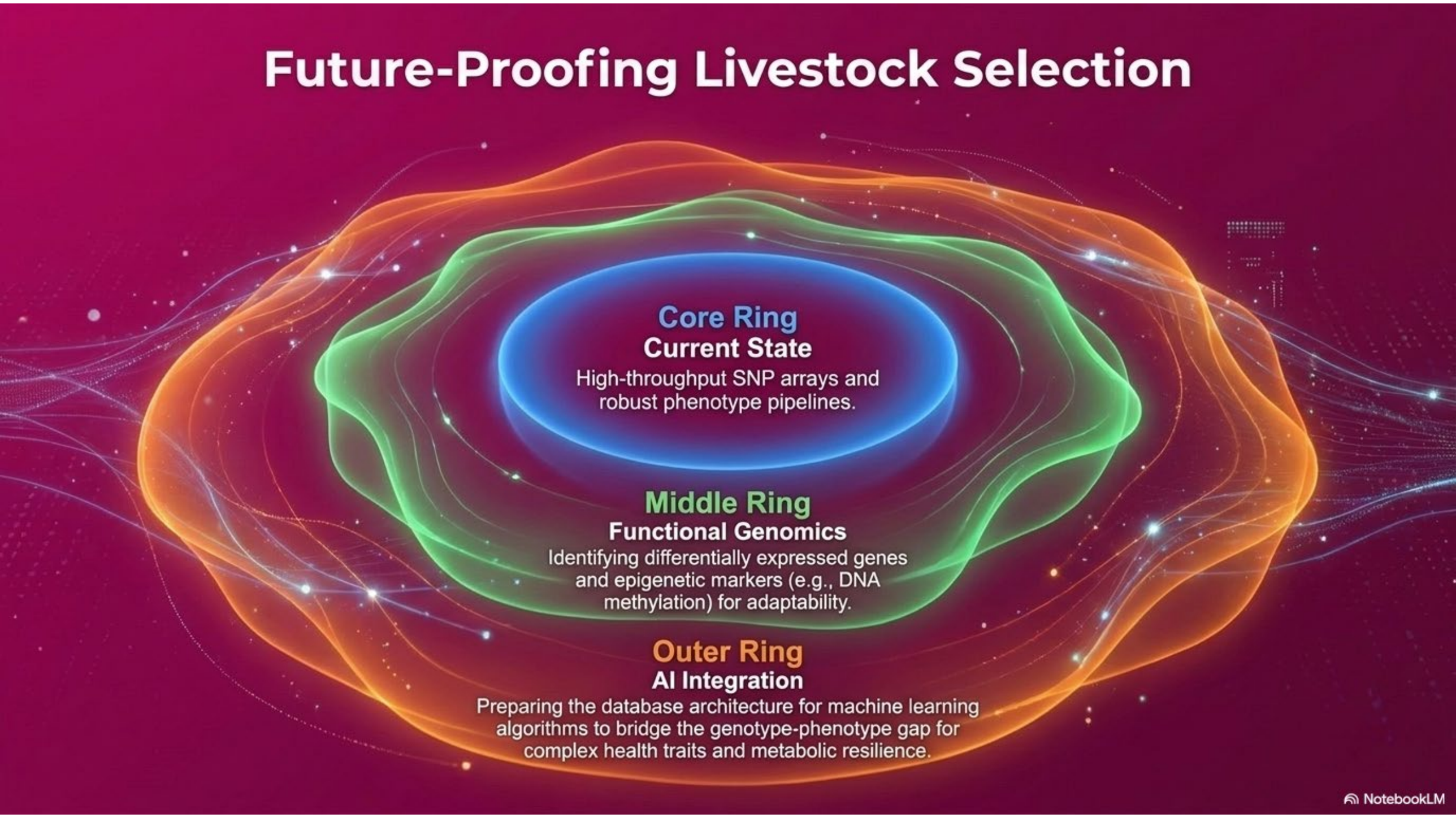
EU-Recognized Semen Center

- Production capabilities for both elite young and adult sires.
- Rigorous health and quality controls monitored by the Lazzaro Spallanzani Institute.
- Advanced logistics network for fresh semen distribution.
- Dedicated, high-capacity cryopreservation warehouse for frozen distribution.

The Experimental Station

- Houses males of all ages and heifers up to 3 months pre-calving.
- In-Vivo Testing: Strict quarantine protocols, advanced behavioral testing, and precise biometric measuring.
- Specialized Ops: Elite embryo production services and sire jump training.
- Environmental Tracking: Real-time ‘sniffers’ constantly measuring individual methane and CO2 emissions.

Future-Proofing Livestock Selection



FROM REACTING TO PREDICTING.

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Every mating decision now actively contributes to the long-term genetic health, sustainability, and competitive power of the herd.

ANA AYGU

R.I.S. BUFALA

A.N.A.Bo.Ra.Va.
Associazione Nazionale Allevatori Bovini di Razza Valdostana

ANAJER

FRIS.ITAL.I.

ANARB

This is Synergy. Actionable knowledge, organically connected.