

Single step BLUP in field data

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Single Step

- Extend use of DNA info in breeding
 - More accurate reflection of genetic relations in population
 - Optimal use of genotyped animals
- More accurate breeding values

- Added value proven scientifically

Literature: mainly simulation



Field data: ...



Minimum requirements

- Starting point: BLUP using pedigree relations
 - Multitrait (25), multiline (9 million pigs)
 - Genetic groups
 - Restart with old solutions
- Develop into: BLUP using combination of pedigree and DNA relations
 - All of the above
 - Merge without downsizing
 - Flexible for further development

Analyze this

- Breeding value estimation MiXBLUP software
 - Traditional pedigree
 - Single step
- Relationship matrix single step calc_grm software
- Training data : validation data ~ 90% : 10%
- Example trait birth weight

Validation

	Training	Validation
Phenotyped	590,000	53,000
Genotyped	22,000	3,000

- Primiparous records
- General linear model on validation data
 - Phenotype corrected for fixed effects as in BVE
 - Additional fixed effect breeding value

Prince charming or just a frog?

- $$\Delta G = \frac{\sigma_H * r_{IH} * i}{L}$$
- $$r_{IH} = \frac{r(\text{corr_phenotype}, \text{EBV})}{\sqrt{\text{heritability}}}$$
- Regression: aim is 1 unit EBV is 1 unit phenotype

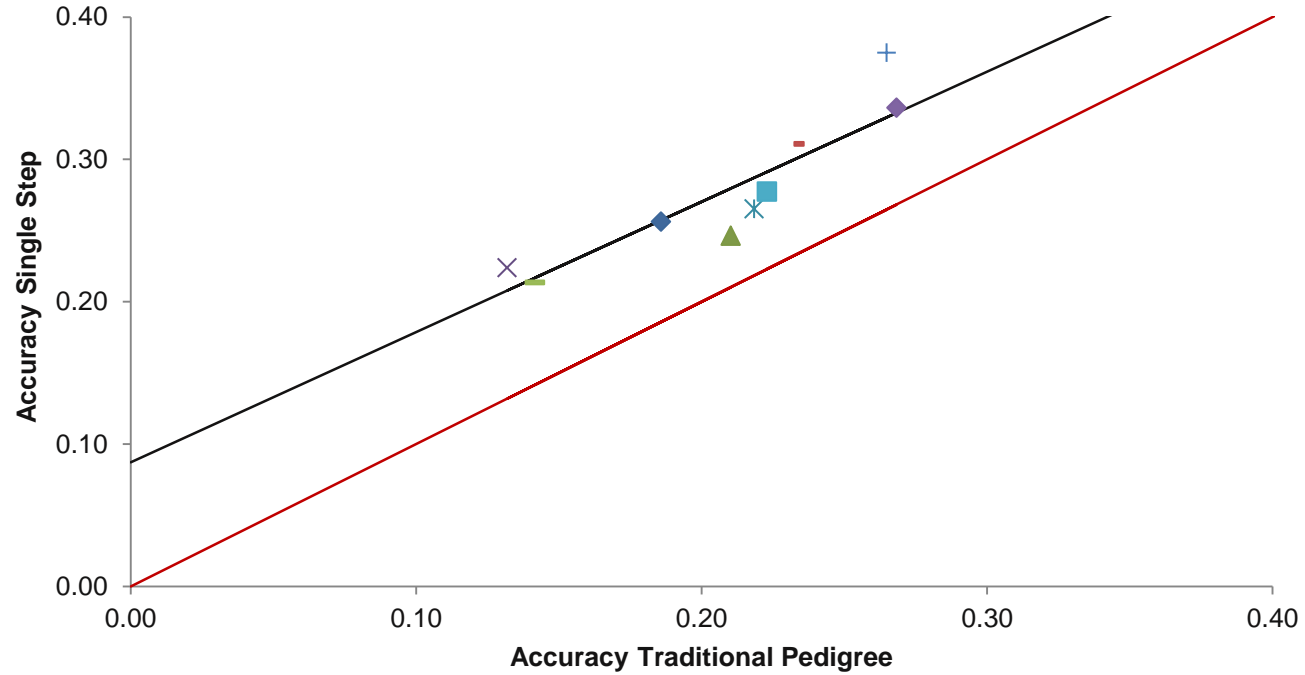




Added value single step

- Regression coefficients
 - Traditional 0.88 vs single step 0.99
- Correlation corrected phenotype – estimated breeding value
 - Traditional 0.17 vs single step 0.24
- Accuracy
 - Increased by 42% with single step

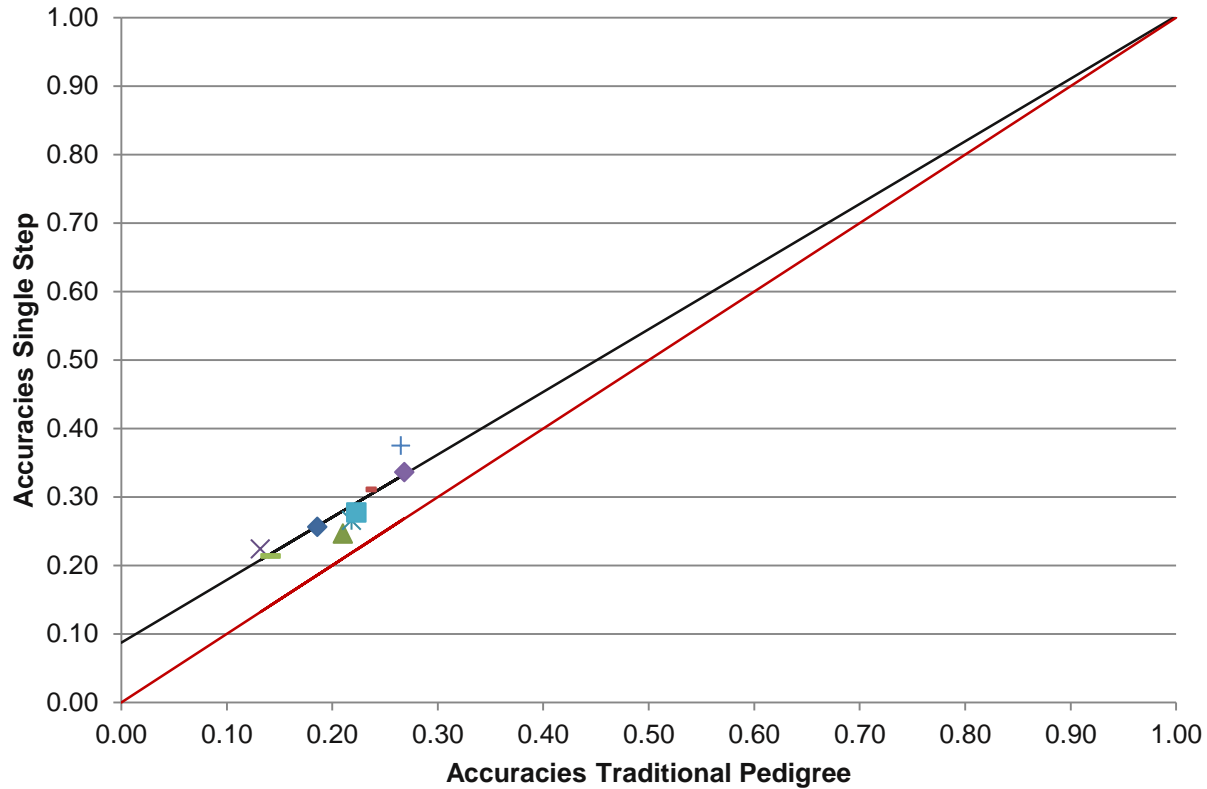
Accuracies



Accuracies

Trait	Traditional %	Single step %	% improvement
1	19	26	38
2	21	25	17
3	13	22	70
4	22	27	21
Birth weight	26	37	42
6	23	31	34
7	14	21	51
8	27	34	25
9	22	28	24

Accuracies



Concluding remarks



- Also in field data demonstrable added value of single step
 - Size does matter; substantial number of animals required
- Increased run time single step
 - Requires monitoring and resilient computer environment
- Requires innovative solutions as number of genotyped animals grow

Thank you



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