How dual-purpose is dual-purpose? The balancing act between fattening and laying performance: An index to describe dual-purpose poultry

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The 75th EAAP Annual Meeting

Session 2. Breeding scheme optimization: balancing breeding goal(s), genetic progress and diversity

Firenze, September 1, 2024

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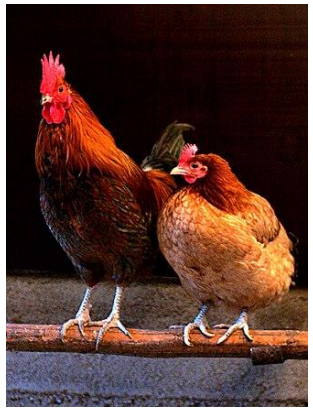
Outline for today's presentation

1. Status of Chick Culling in Europe
2. What is Dual-Purpose Poultry?
3. PPILOW Project – on-station trials
    a) Materials & Methods
    b) Results of German on-station trial
    c) Conclusion on performance profiles
4. Quantification of dual-purpose performance
5. Dual-Purpose Index
6. Summary

Status of chick culling in Europe

Layer strain

Selection based on egg production, egg quality traits



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Progeny

Fertilized eggs

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Chicks

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~~***Culling of day-old male chicks***~~

FR: Article R214-17

- From 1/1/2023 : all hatcheries must be equipped with operational material to avoid the culling of male chicks
  -> Special case when it is not possible to comply with the decree

DE: Article TierSchtG Art. 1 § 4c

- From 1/1/2022 : it is a punishable offence to kill a vertebrate animal "without reasonable cause" (incl. unprofitability) or to cause it suffering and pain

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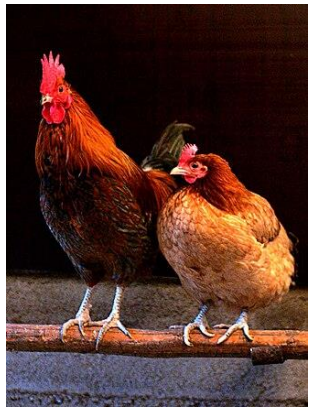
Status of chick culling in Europe

Layer strain

Selection based on egg production, egg quality traits



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Progeny

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Alternative strategies

FR: Article R214-17

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1. **fattening of males of layer lines**
2. **In-ovo sexing**
3. **dual-purpose poultry**

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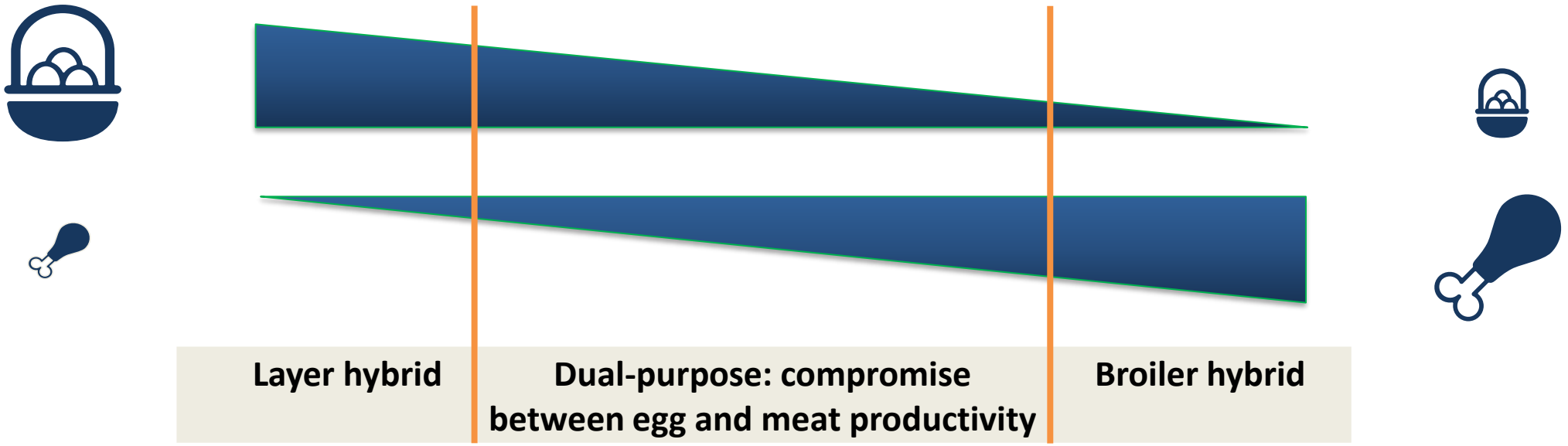
What is dual-purpose poultry?



→ ‘Dual-purpose’ is eggs and meat **combined at different levels** but performance **lower than in specialized genotypes**

→ In dual-purpose poultry **both** female and male chicks are reared

→ To define economic and biologic efficiency both need to be taken into account as a **unit**

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What is dual-purpose poultry?

- To date, only **few scientific** publications on dual-purpose poultry under **experimental and organic conditions** (Torres et al., 2019; Muth et al., 2019; Baldinger and Bussemas, 2021; Tiemann et al., 2020)

  → Available data are less valid than for high-performance hybrids
- **Higher welfare** in dual-purpose poultry (Tiemann et al., 2020; Giersberg et al., 2019; Daş et al., 2021)
- **High robustness** and **adaptability** in free-range and extensive systems (Castellini et al., 2016; Ajayi et al., 2020)
- Higher FCR but more **frugal** in nutrient requirements (Urban et al., 2017; Röhe et al., 2019; Kreuzer et al., 2019)

  → **resource-saving** diets?/**optimization** of feeding strategy
- Term 'dual-purpose poultry' **not defined** (Gebhardt et al., 2023)
- Evaluation of females and males as **unit** not described (Werner et al., 2023; Ibrahim et al., 2019)

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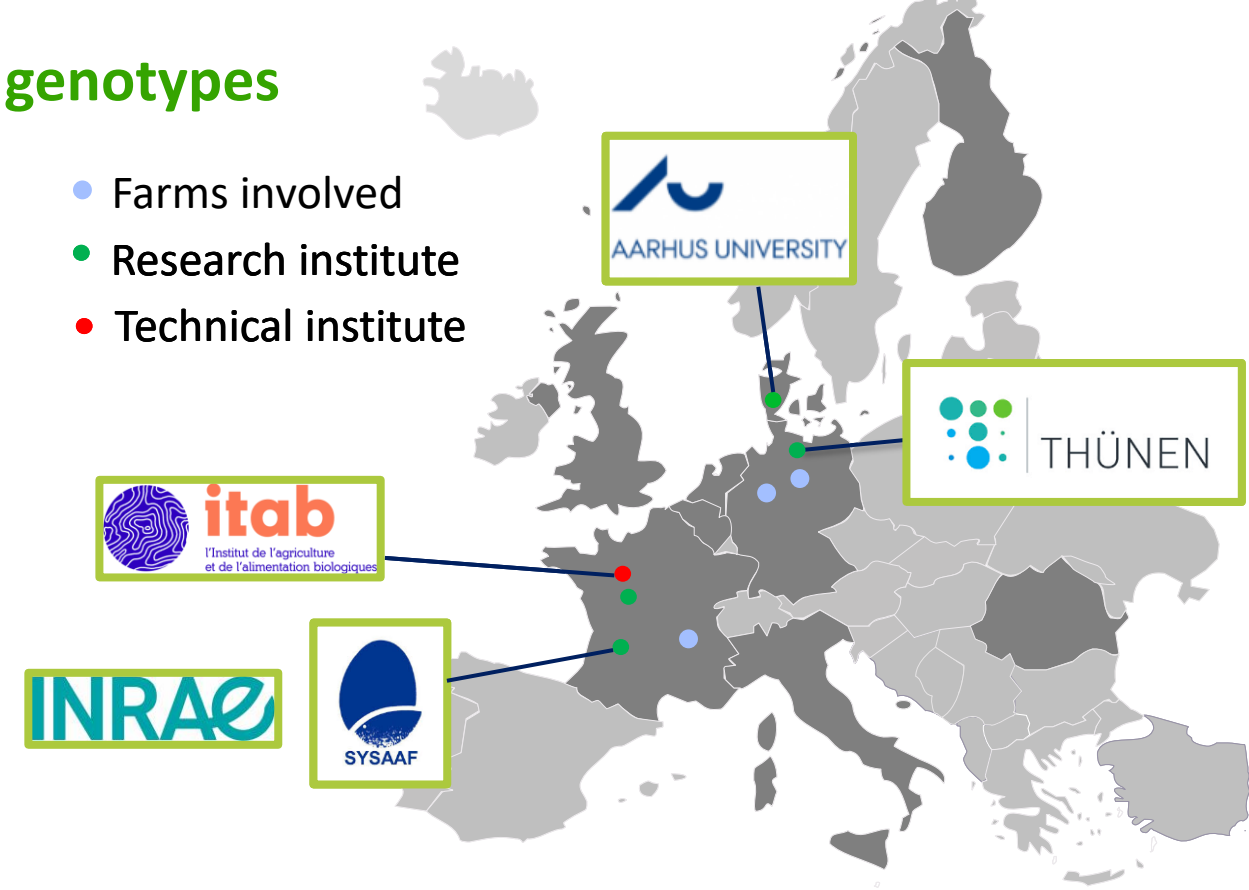
PPILOW Partners: trials of dual-purpose genotypes

- Cooperation with breeding companies to select **three novel genotypes** suitable as dual-purpose poultry
- On-station trials in three different countries to evaluate **performance, welfare, behaviour and product quality under organic conditions**
- **Economic analysis**
- Close partnership with national practitioner groups to discuss results and select most-promising genotype for **on-farm trials**



→ Data presented here refer to the German on-station trials

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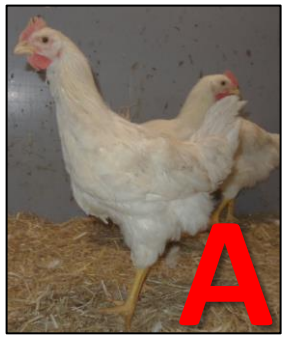
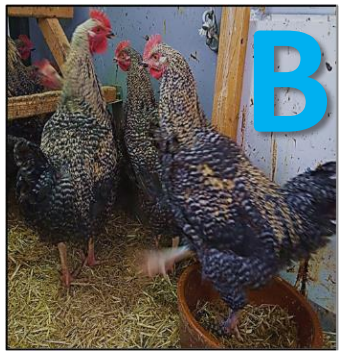
PPILOW German on-station trials / Materials & Methods





Males:

- 8 mobile barns with 2 pens on pasture
  = 16 groups (4 groups per genotype)
- Group size: 40 males
- 2 slaughter dates per genotype (target weight 2.1 kg)
  - Week 10: A and D
  - Week 12: A, B, C, D
  - Week 16: B and C
- **Control = JA757** D

Females:

- 8 mobile barns with 2 pens on pasture
  = 16 groups (4 groups per genotype)
- Group size: 20 females
- One laying period up to 72 weeks of age
- **Control = Lohmann Brown plus** D

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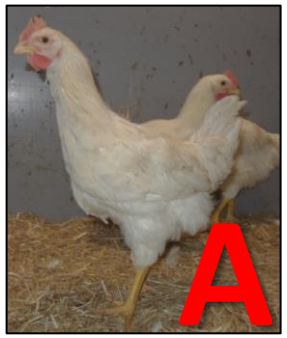
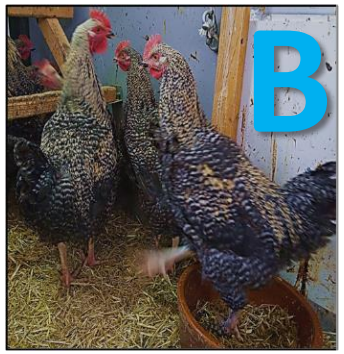
PPILOW German on-station trials / Materials & Methods





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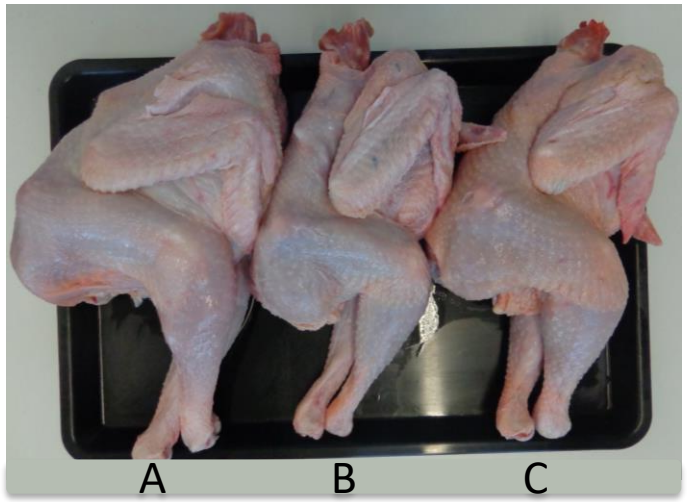
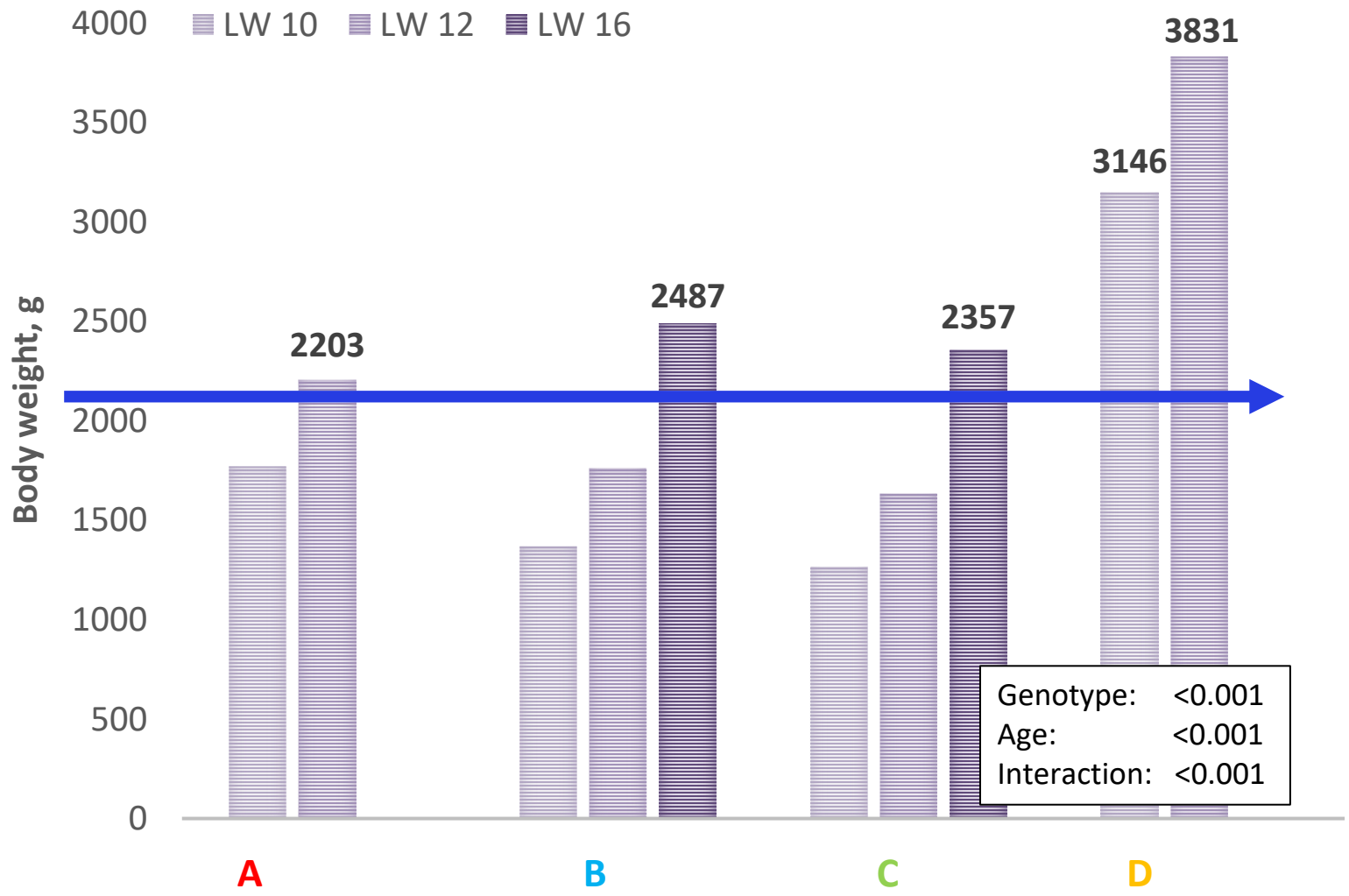
PPILOW German on-station trials / Results – MEAT



Genotype	Daily weight gain, g d^{-1}
A	26.1^{b}
B	22.1^{c}
C	21.3^{c}
D	42.9^{a}

- Range in DWG: C < B < A < D
- Slower growth requires longer fattening period to reach target weight



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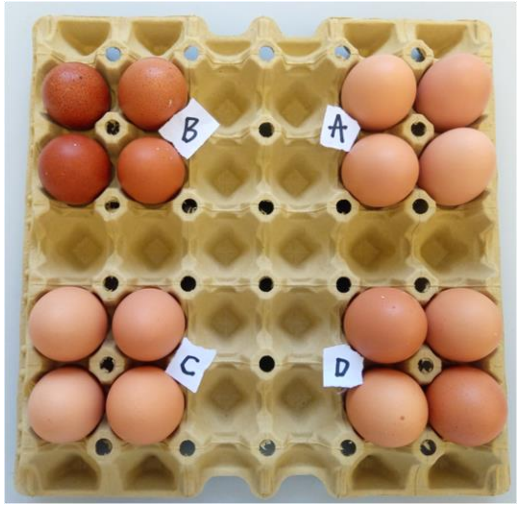
PPILOW German on-station trials / Results – EGGS



Genotype	Laying performance, %
A	61.8[b]
B	71.2[b]
C	72.3[ab]
D	82.9[a]

Range in laying performance: A < B < C < D

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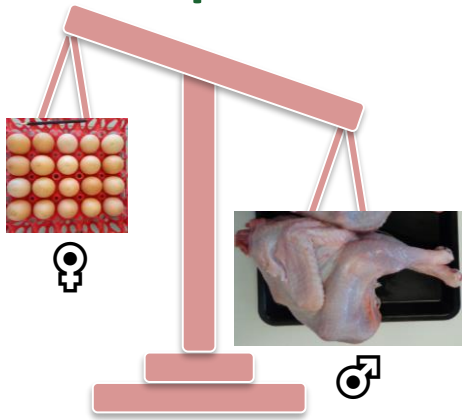
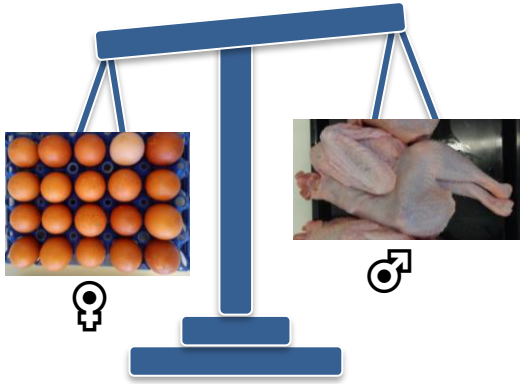
PPILOW German on-station trials / Conclusions on performance profiles

Genotype A:

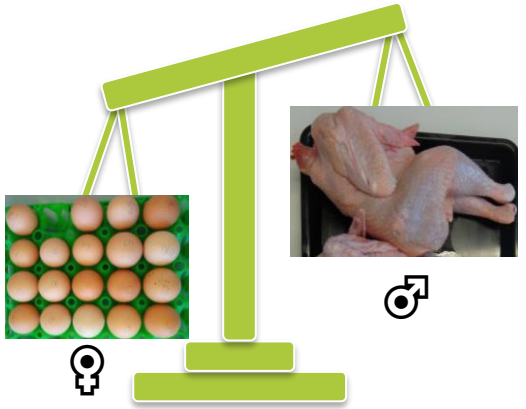
performance profile of this crossbreed is orientated towards its sire line, emphasised on **meat** and shows higher gains on the male side and lower laying on the female side





Genotype B:

performance profile of this dual-purpose purebreed is **balanced**, yet slightly orientated towards egg than meat production



Genotype C:

performance profile of this crossbreed is orientated towards its dam line, emphasised on **laying** and shows only slight gains on the male side

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Quantification of dual-purpose performance?

- Joint **economic** evaluation?

  ie. 280 eggs x 0.35 €/egg = **98 €** VS 2.5 kg x 1.80 €/kg = **4.50 €**

  → imbalance due to level of returns

- Joint **performance** evaluation?

  ie. laying performance 82 **%** vs daily weight gain 45 **g d^{-1}**

  → imbalance due to different type of data

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Quantification of dual-purpose performance

→ Dual-purpose Index (DPI)*

1. Laying performance of the female of a dual-purpose genotype is expressed as a proportion of a commercial layer (82 %)
2. Daily weight gain of the male of a dual-purpose genotype is expressed as a proportion of a commercial broiler (45 g d^{-1})
3. Proportional laying performance is then divided by proportional fattening performance

Genotype	Laying performance, %		Daily weight gain, g d^{-1}	DPI
A	61.8 / 82.0	:	26.1 / 45.0	1.30
B	71.2 / 82.0	:	22.1 / 45.0	1.77
C	72.3 / 82.0	:	21.3 / 45.0	1.86
D_{female}	82.9 / 82.0	:	16.0 / 45.0	2.84
D_{male}	54.8* / 82.0	:	42.9 / 45.0	0.70

* According to Breeder Mangement Guide, 40 weeks

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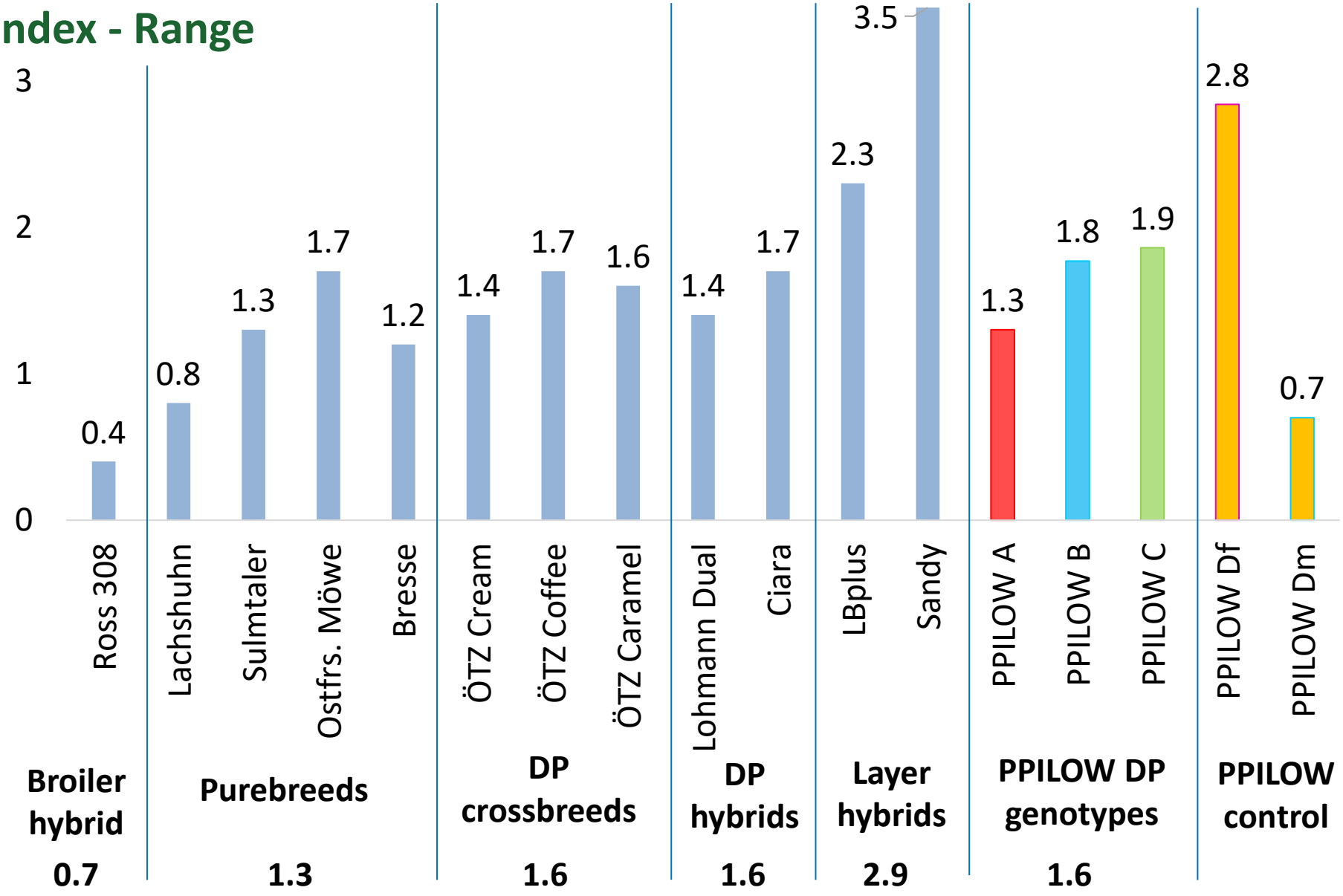
Dual-purpose Index - Range

→ makes it possible to evaluate male and female as a unit and to better differentiate their suitability.



Source DPI Values: * Hörning, B. (2023) Alternativen in der Hühnerzucht? Aktuelle Entwicklungen bei Bruderhähnen, Zweinutzungshühnern und (Label-) Hähnchen, Platform Zweinutzungshuhn. Neuland e.V. Haus Düsse, August 24, 2023.

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Summary

- → Performance of dual-purpose poultry genotypes varies depending on genetic selection employed !

- → Potential:
  - → DPI as coefficient in economic analysis, breeding selection, management decisions etc.

- → Limitations:
  - → Methods outlined are only a first step in assessing the dual-purpose nature of poultry genotypes
  - → No limits have yet been set: ‘dual-purpose’ needs to be defined more precisely
  - → Clear distinction between single-purpose and dual-purpose use

- → DPI is a contribution to ongoing discussion on definition of dual-purpose poultry

- → Further research is needed to optimize the management of dual-purpose poultry

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PPILOW PARTNERS

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Thank you for your attention!
For more information, check out www.ppilow.eu

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