How to develop a framework (MCDA) for the evaluation of One Welfare concept

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The ONE WELFARE APPROACH

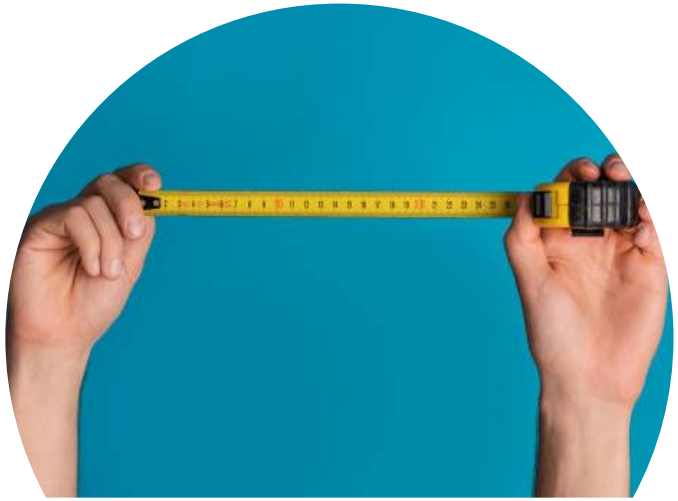
The concept of One Welfare recognizes the **interconnections** between animal welfare, human wellbeing, and the environment

PPILOW

Why is it important to consider One Welfare in organic and low-input outdoor farming systems?

- Proving the quality of the rearing systems (and of the products)

- To understand the diversity of practices throughout Europe

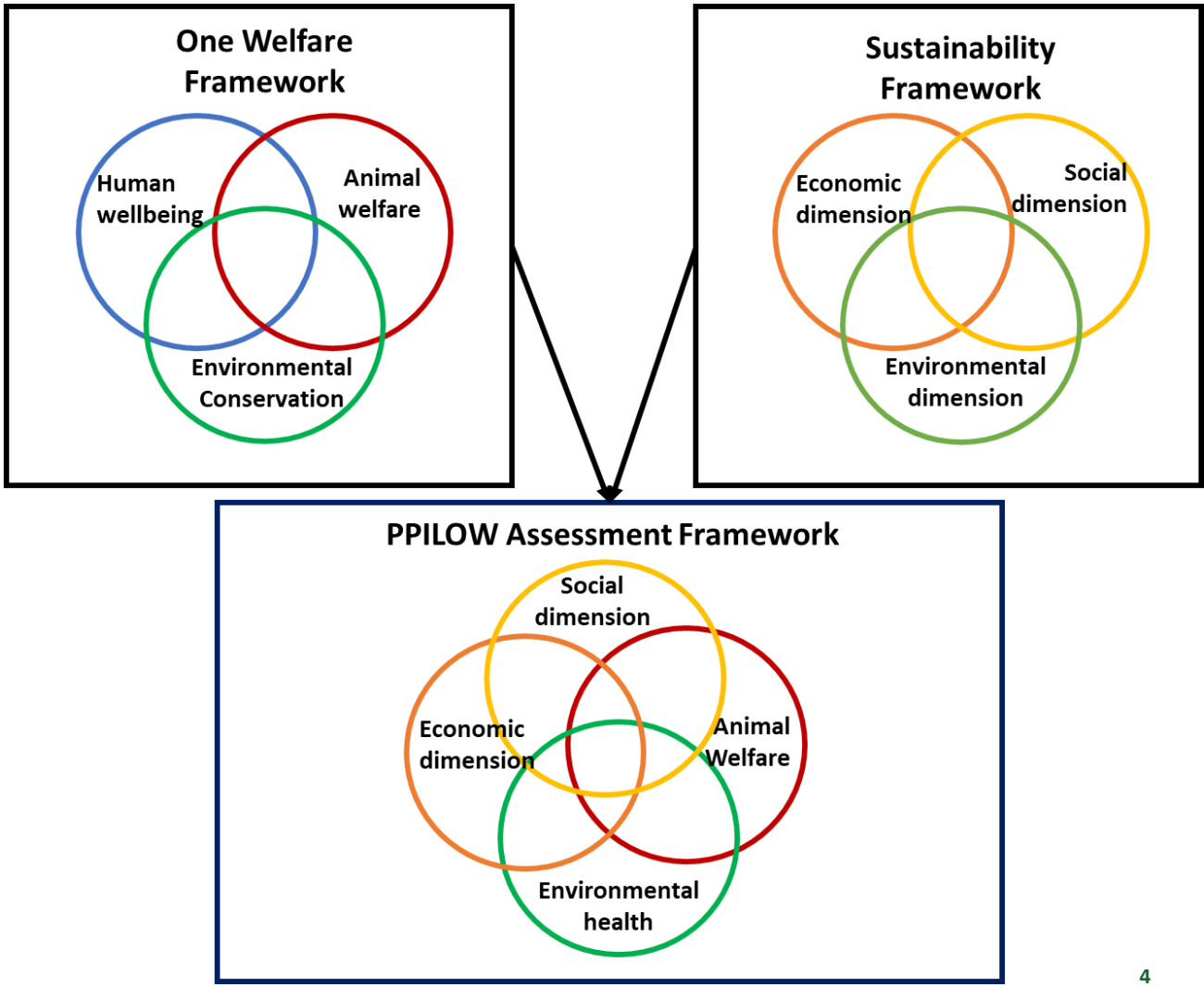


- Still a need to improve animal welfare and limit mortality, in relation to outdoor access challenging the animals, ethical issues, the wish of practitioners, and societal expectations

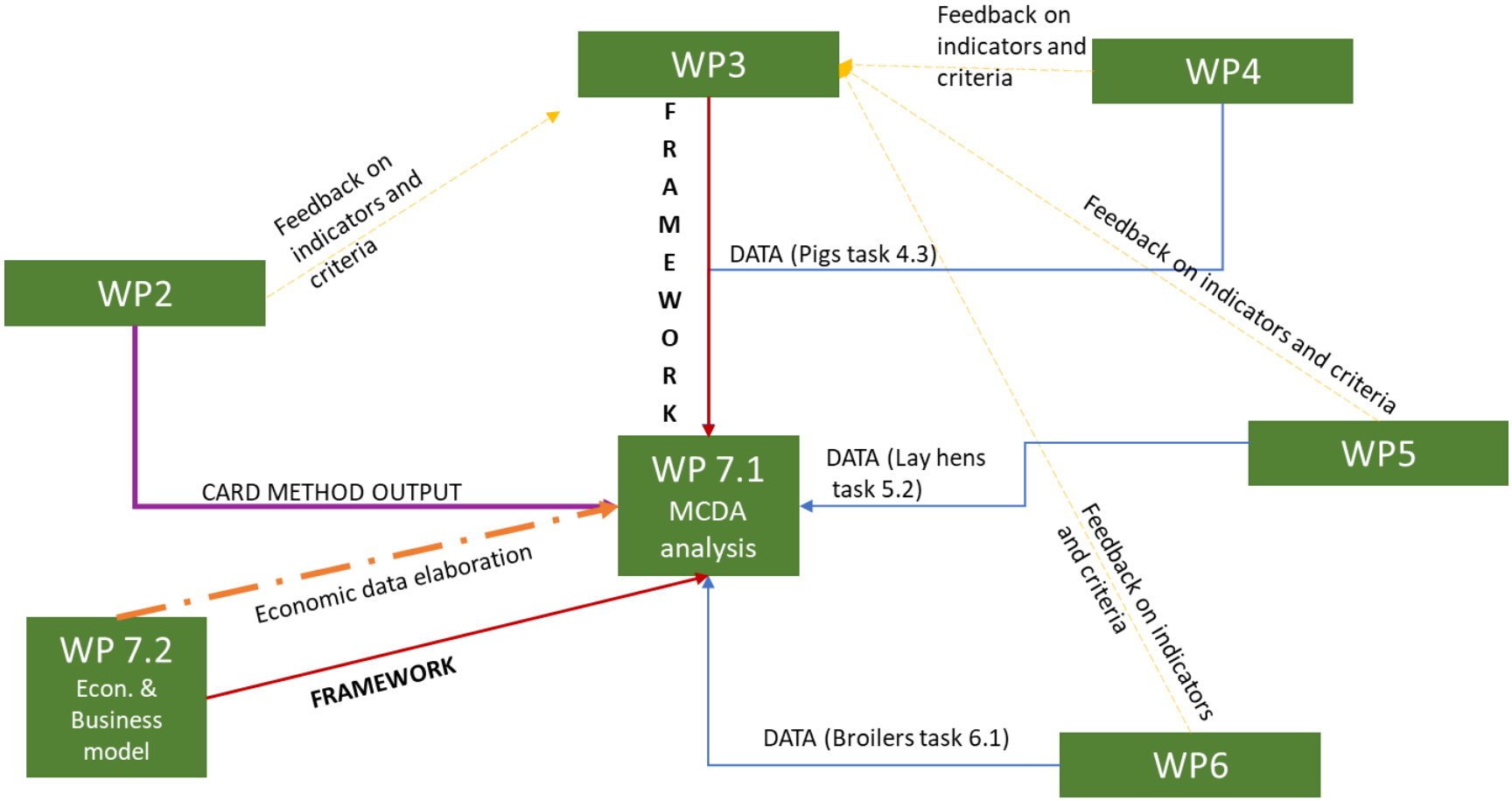
Evaluate the welfare-improving practices by taking into account environmental, economic and social impacts including *human well-being (farmers and breeder, consumers, citizens)*

OWA assessment: the framework construction (1)

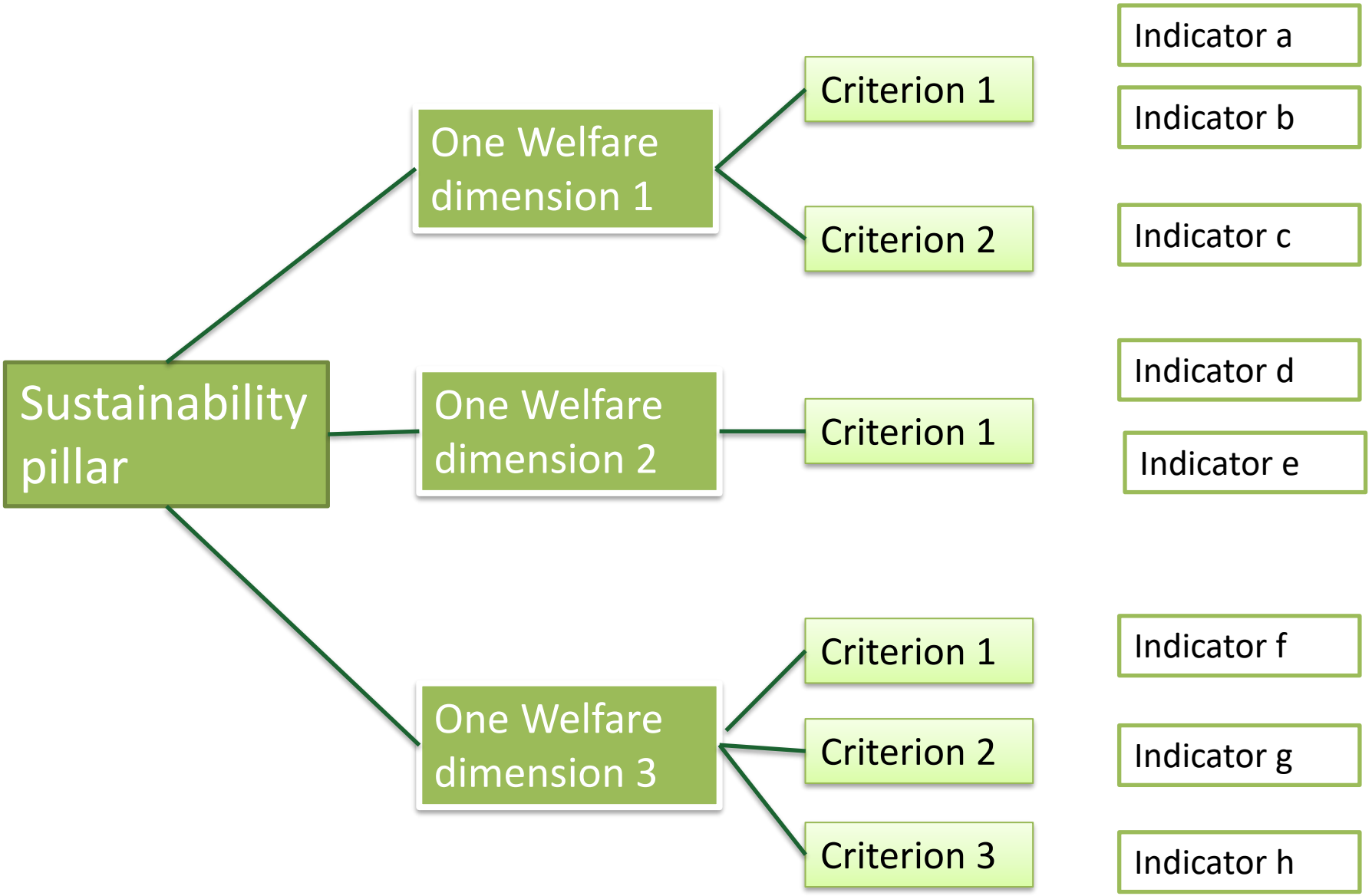
The development of an evaluation framework based on the One Welfare approach will enable sustainability goals to be embraced by emphasizing the impacts of innovative animal husbandry practices on animal and human welfare.



OWA assessment: the framework construction (2)



PPILOW General Framework



OWA assessment: the framework construction (3)

Species type Poultry: Broilers and Ley hens

Species type Pigs: Fattening Pig and Sows

SUSTAINABILITY PILLARS	ONE WELFARE DIMENSIONS
Animal Welfare (4)	Good Feeding (2 criteria, 2-3 indicators)
	Good Environment (Housing) (3 criteria, 3-12 indicators)
	Good Health (3 criteria, 7-24 indicators)
	Appropriate Behaviour (4 criteria, 3-10 indicators)
Environment (3)	Enhance biodiversity (3 criteria, 8 indicators)
	Reduce pollution (soil, air, water) (3 criteria, 4 indicators)
	Minimize external resources used (2 criteria, 3 indicators)
Economy (4)	Performance – quantity (3-5 criteria, 3-5 indicators)
	Performance – quality (1-6 criteria, 2-6 indicators)
	Returns (2-4 criteria, 2-4 indicators)
	Costs (2 criteria, 2 indicators)
Society (4)	Working conditions (5 criteria, 8 indicators)
	Job perception and motivation (3 criteria, 3 indicators)
	Connection with local community (3 criteria, 5 indicators)
	Social Acceptability (4 criteria, 4 indicators)

Specific criteria and indicators for each species type

Some criteria and indicators for all species type and farms

Specific criteria and indicators for each species type

Some criteria and indicators for all species type and farms

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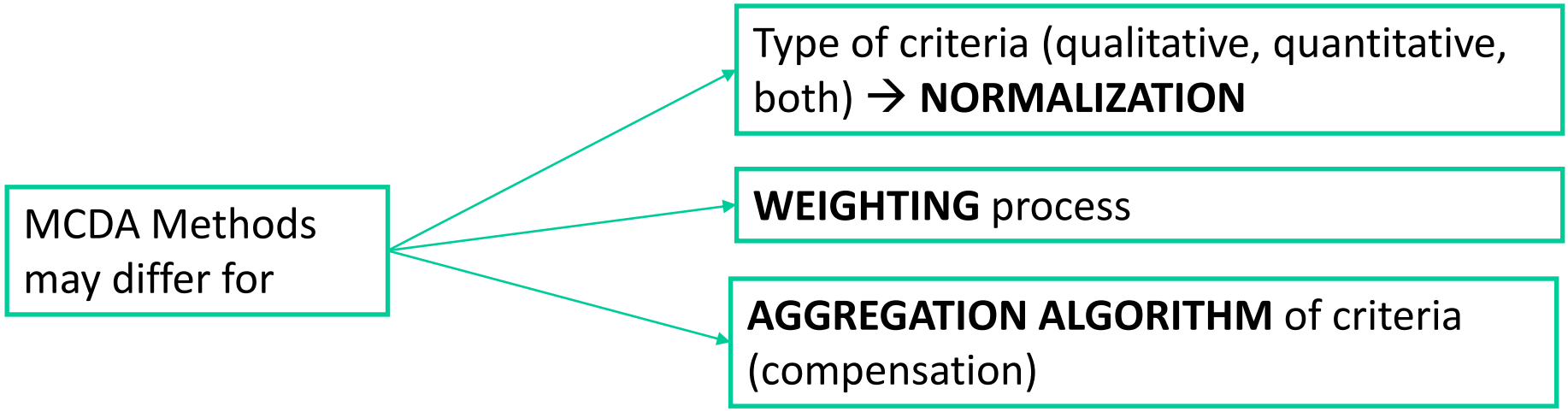
- Multicriteria analysis (MCDA) refers to a family of mathematic methods, aiming to decision support.
- It establishes preferences among multiple options with respect to an explicit set of objectives identified by the decision maker, for which it has established measurable criteria suitable for assessing the degree to which the objectives are achieved.
- In the presence of divergent criteria simultaneously, MCDA allows the assessment of complex issues and seems a successful approach to measuring the One Welfare (OW) concept.

	Alternative A1	**Alternative A2**	**…**	**Alternative An**
Criterion 1	V_{11}	V_{21}	…	V_{n1}
Criterion 2	V_{12}	V_{22}	…	V_{n2}
…	…	…	…	…
Criterio k	V_{1k}	V_{2k}	…	V_{nk}



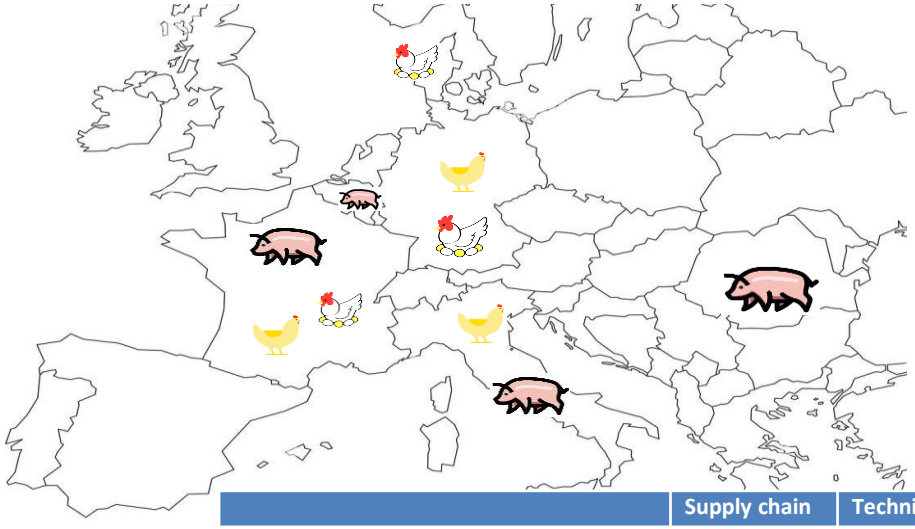
PROMETHEE →Both quantitative & qualitative data;
→ weights as preferences;
→ Pairwise comparison (Outranking method)→ No compensation allowed

OWA assessment: a case study (1)

For the broilers, the lever analyzed is the Italian case study proposed in Task 6.1 (Provision of an adaptability index to outdoor rearing and evaluation of expected improvement from free-range enrichment). The data used refers to a real farm, located in Italy and meeting the requirements of the recruitment rules; the enrichment used is olive trees. The MCDA has been performed according to three different groups of strains (alternatives), namely, a Cross Breed (CB), a Red J (RJ), and a Naked Neck (NN): the first two were reared using the enrichment, while the last one is a standard free-range rearing system, which is considered the business-as-usual (control).

OWA assessment: a case study (2)

Weighting→ Figueira and Roy, 2002 + geometric mean for aggregation



	Broilers	Ley hens	Pigs
Producers & breeders	5	9	4
Supply chain*	4	2	5
Civil society**	3	1	3
Technical experts***	4	5	8
Academic/R&D experts	3	1	4

* Feed producer; packing; retailers; hatchery
** Consumers, activists
*** Consultant, Vet, Engineers

	Supply chain	Technical experts	Producers & breeders	Civil society	Academic	General
Performance quality	9.53	7.55	7.85	10.0	3.77	7.34
Good feeding	9.53	6.79	6.65	8.06	7.54	7.65
Good health	9.53	7.54	6.10	8.07	7.54	7.68
Performance quantity	8.33	5.35	8.60	3.16	1.89	4.70
Returns	8.33	8.33	7.77	4.47	7.54	7.11
Good housing	8.34	6.41	6.72	6.13	7.55	6.99
Costs	7.14	5.26	5.99	3.87	5.66	5.48
Job perception & motivation	4.76	7.98	6.36	4.47	7.55	6.05
Working conditions	4.76	7.35	9.08	5.00	7.55	6.54
Natural behavious	4.76	5.52	3.66	10.0	7.55	5.92
Reduce pollution	3.57	5.57	6.24	10.00	7.55	6.3
Social acceptability	3.57	5.07	5.53	2.23	5.66	4.17
Enhance biodiversity	3.57	5.94	4.64	8.07	7.55	5.70
Connection with local community	1.19	4.31	3.94	3.54	7.55	3.52
Minimize external resources	1.19	4.84	4.45	7.08	7.55	4.24
Depopulation	8.04		4.05	4.73	7.545	5.84

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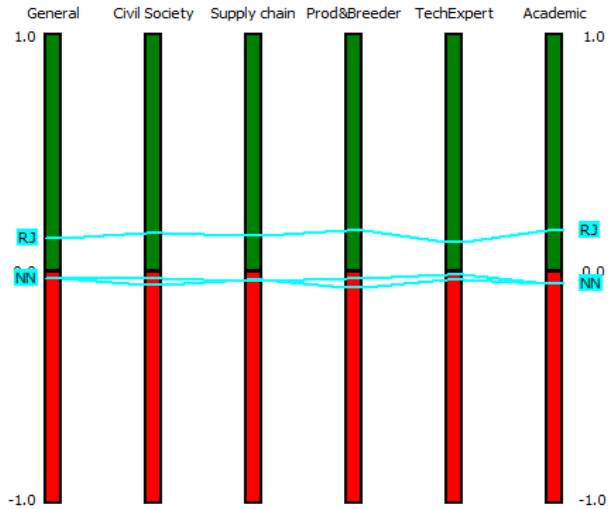
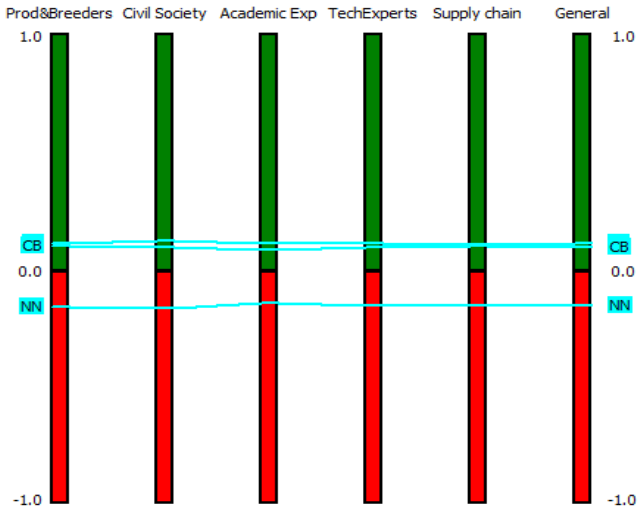
OWA assessment: a case study (3)

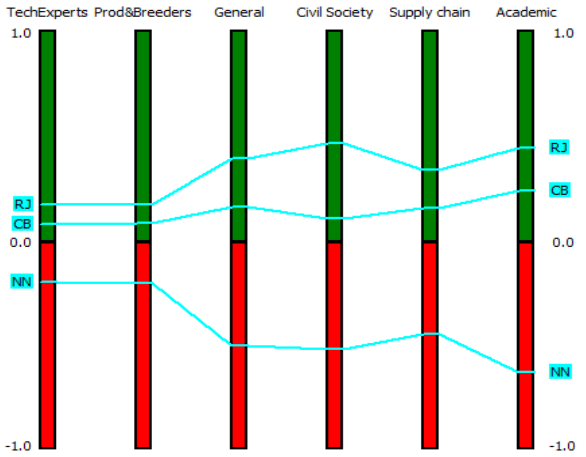
ENVIRONMENTAL PILLAR



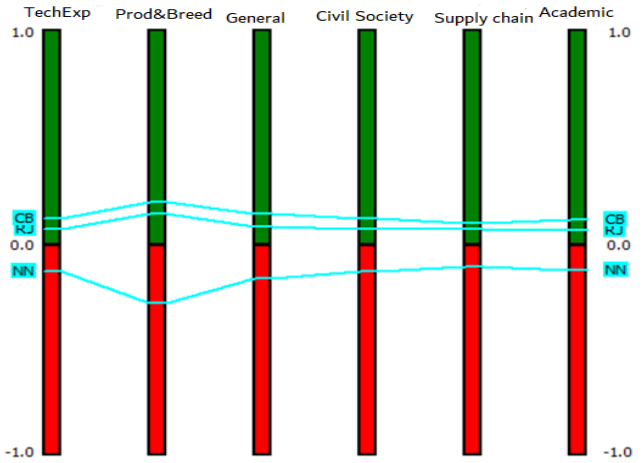
SOCIAL PILLAR



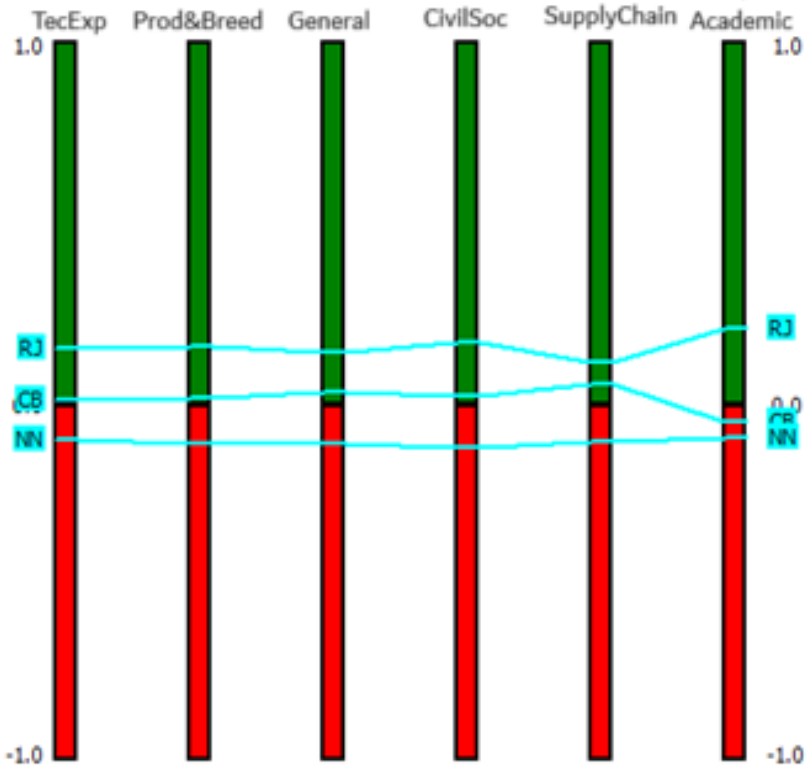
ECONOMIC PILLAR



SOCIAL PILLAR



OWA assessment: a case study (4)



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Final remarks

Applying the evaluation framework to the Broiler case study using MCDA highlights some interesting aspects, such as the effect of enrichment on reducing land consumption, in the case of adequate production performance.

The effect of enrichment seems to be significant in all pillars and thus in the overall assessment of OWA

The possibility of an experimental factor (range enrichment, poultry strain) becoming a real alternative in welfare improvement strategies lies in the alignment among most stakeholders participating in the production and consumption chain.

Economic evaluation of innovations and rearing strategies

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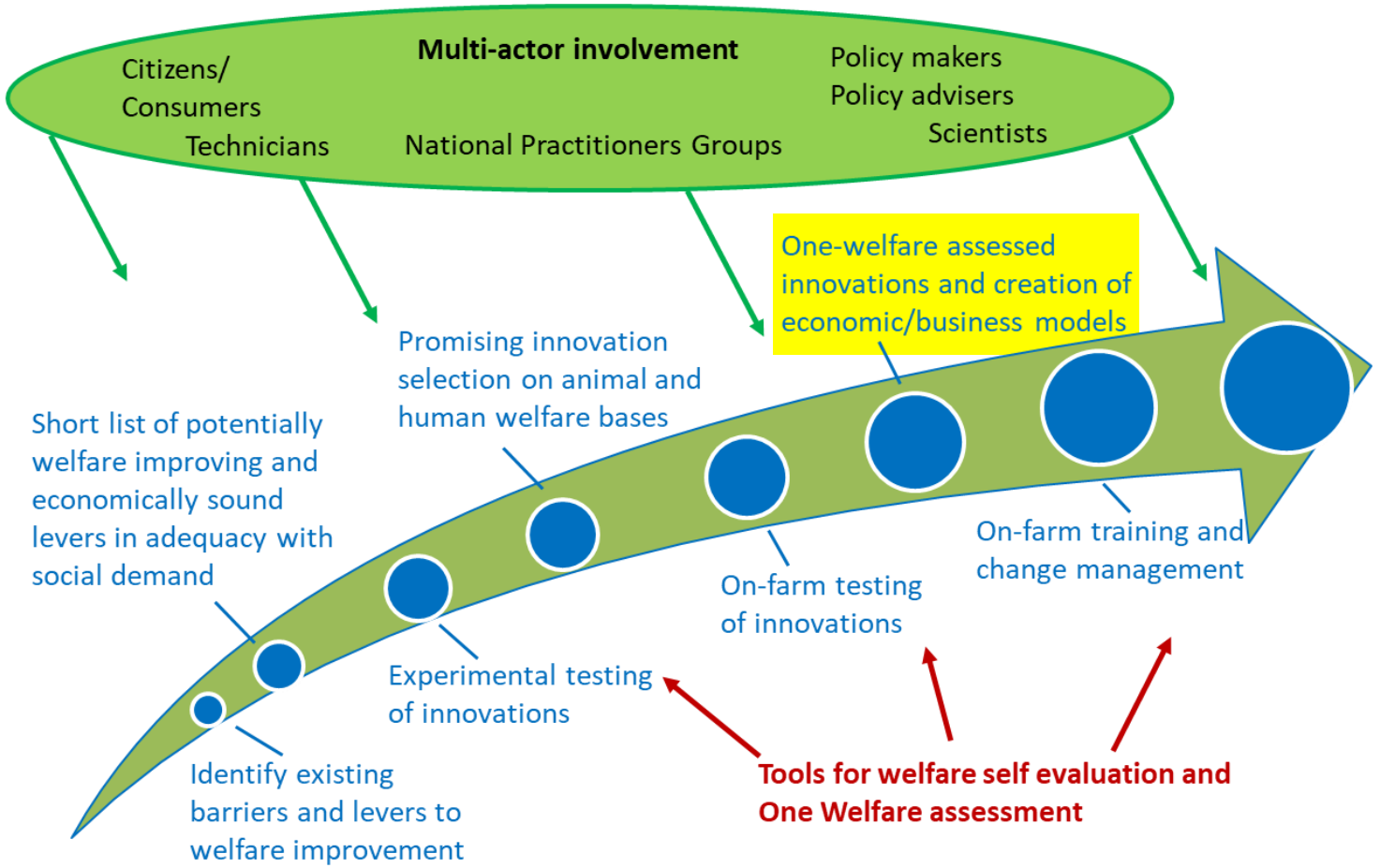
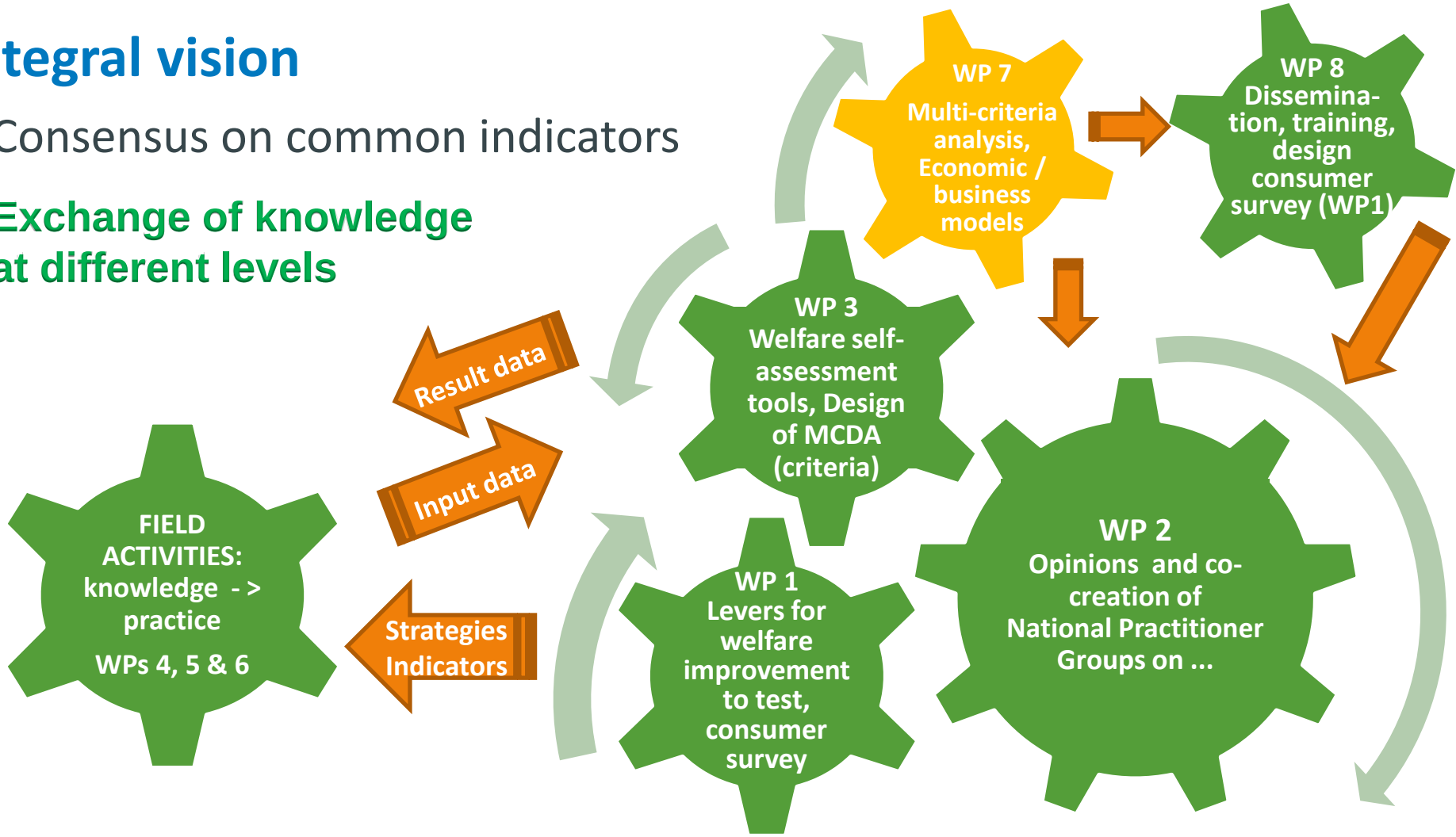
PPILOW WP7 – Pathway to innovation throughout PPILOW



PPILOW WP7 – Interactions with other WPs

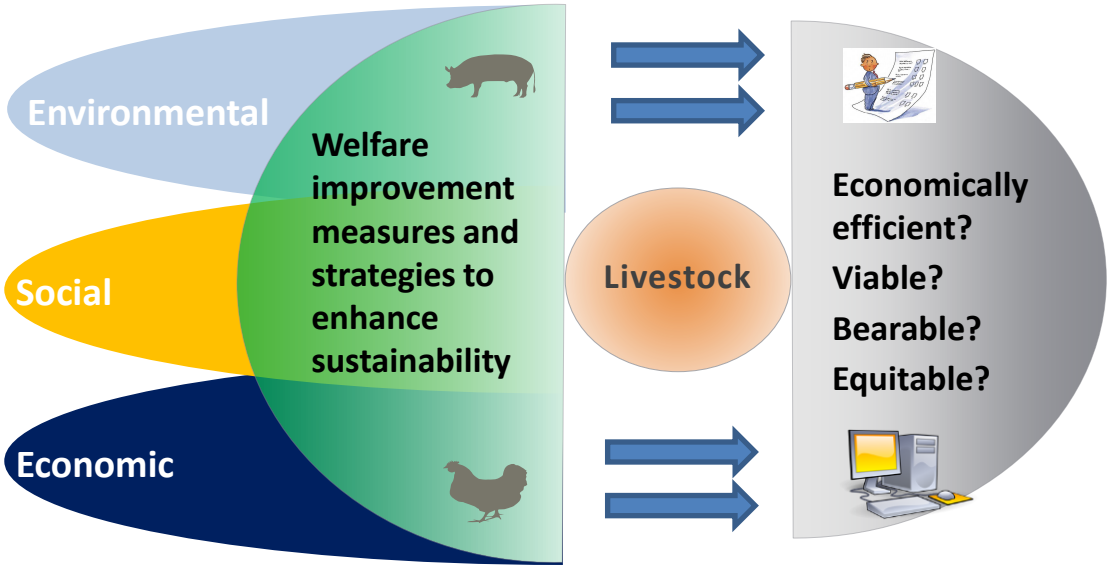
Integral vision

- Consensus on common indicators
- **Exchange of knowledge at different levels**



PPILOW WP7 – Objectives and challenges

WP 7 - Multicriteria and economic evaluation of the proposed technical innovations and rearing strategies complying with a higher welfare level



Only economically viable innovation will prevail…

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Objectives:

- Selection of the most promising solutions: Evaluation of sustainability in compliance with the one welfare concept for each type of production (broilers, eggs, pigs)
- Building advanced economic and business models for the most promising solutions from the MCDA: Identification of the economic viability and feasibility of the selected solutions and its influence on the whole production chain of each type of production

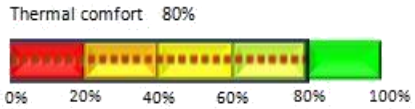
PPILOW How to assess business potential?

1. Start with a vision: What do you want to do and why?
2. Test, validate & improve business model's assumptions
   - What is the target market and customers? Why they are your customers?
   - Does a market opportunity exist?
   - How do you reach your customers? Which delivery/sales channels you will use?
   - How the product is priced? ➔ Different pricing models exist.
3. Specify your value proposition: a short message that focuses on your product and why it is worth buying ➔ What customer's problem does it solve? How your product is better than the competitors?
4. Select the most suitable delivery channels
5. Determine revenues and costs. The revenues should exceed the costs of a product or service that is delivered to the customer.
6. Note: A common mistake is to develop something that „nobody" wants

PPILOW WP7 Approach / Methodology

6 Multi-criteria analysis

Qualitative data: global effect on sustainability of different strategies, its influences on the whole production chain



3 Economic models for poultry, eggs & pigs using agri benchmark method

3 Business models for poultry, eggs & pigs

Quantitative data: additional costs, benefits and savings, physical performances, target prices, profitability

PPILOW WP7 – Expected results / Outcomes

Effects of welfare improving strategies at farm and production chain levels
→ economic, social and environmental criteria

Extra costs for innovative production practices
→ at a specific stage of the production chain (e.g. on ovo sexing)

Using changing production and result parameters
→ total production costs, target price and profit margin

Innovative practices' impact on the operation of the whole production chain
→ changes in structural and organizational relations between actors and stakeholders

WP7 → **Economic efficiency and feasibility**
Consequences on the whole production chain → **WP1 – WP6**

PPILOW Latest updated structure of economic model
Data Analysis and Practice change analysis

Practice change analysis

- Analysis of innovative technologies
- Integration of new farm businesses
- Significant changes in management practices

Trial settings

- Farm data sets
- TIPI-CAL: production and accounting model

Hard to assess the real farm impacts

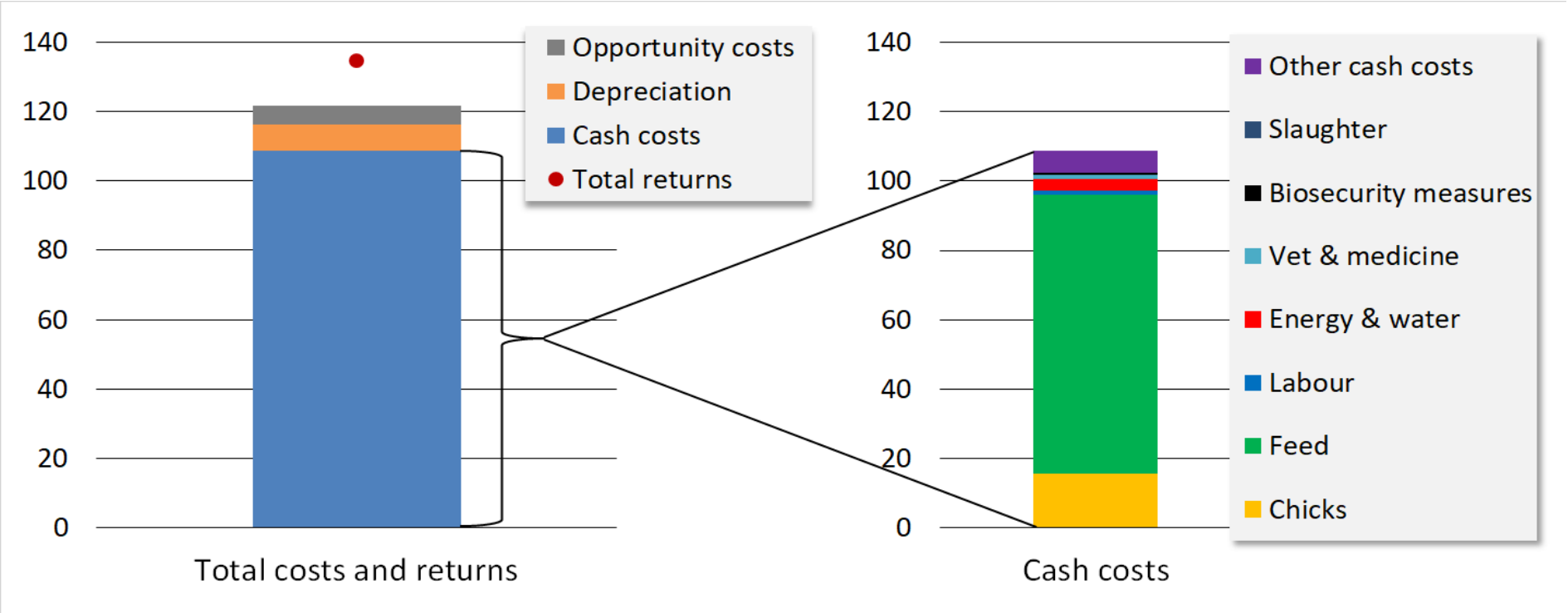
Real-world effects (cost structure & returns)
Complex and multifactorial challenges

Data Analysis – Revenues, fixed and variable costs

Physical parameters:

- Nr. cycles/year, Daily weight gain, Mortality rate, FCR

Production costs and returns (EUR/100 kg LW of produced chicken meat)



PPILOW WP7 – Example of first results

On-station trial of the males of selected dual purpose genotypes in Germany

Dual purpose breeds – Comparison of physical performances

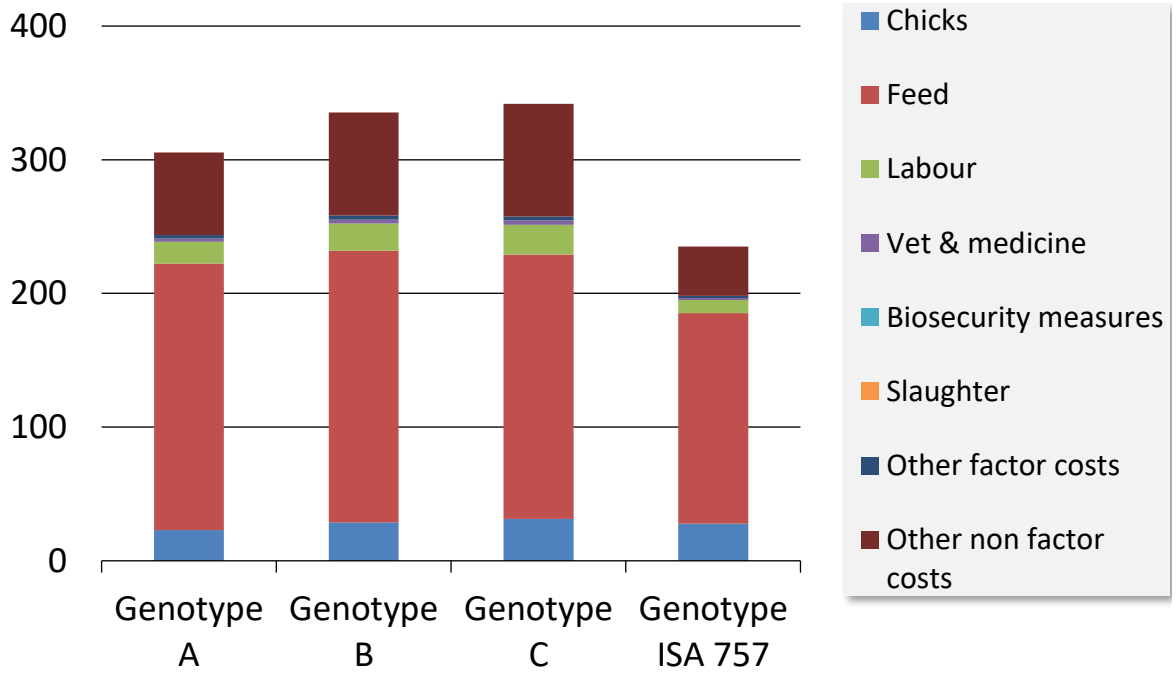
	Genotype A	Genotype B	Genotype C	Genotype ISA 757
Feed Conversion Ratio (FCR)	3,4	3,5	3,4	2,7
Daily weight gain (g/day)	26,1	20,8	19,3	44,6
Average feeding period (days)	83	83	83	85
Total feed consumed per bird (g)	7.444	6.069	5.478	10.217
Final live weight (g)	2.203	1.763	1.634	3.831
Mortality at farm level (%)	1,1	1,1	2,1	3,3




PPILOW WP7 – Example of first results: comparison of production costs

On-station trial of the males of selected dual purpose genotypes in Germany

Costs of production of male dual purpose breeds in Germany (€/100 kg LW)

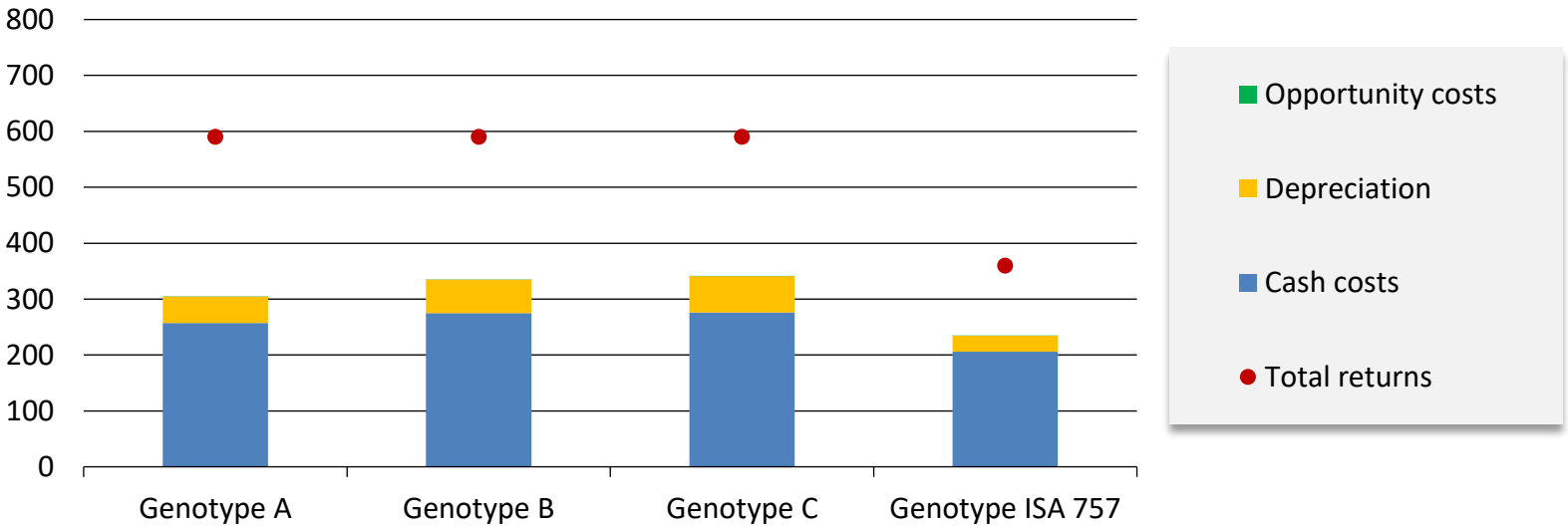


Impact on production costs on farm level:

- Genotype (GT) A: lowest production costs among dual purpose genetics.
- Full cost differences: GT A to control group ISA 757: 70 €/100 kg LG
- GT C to control group ISA 757: 107 €/100 kg.

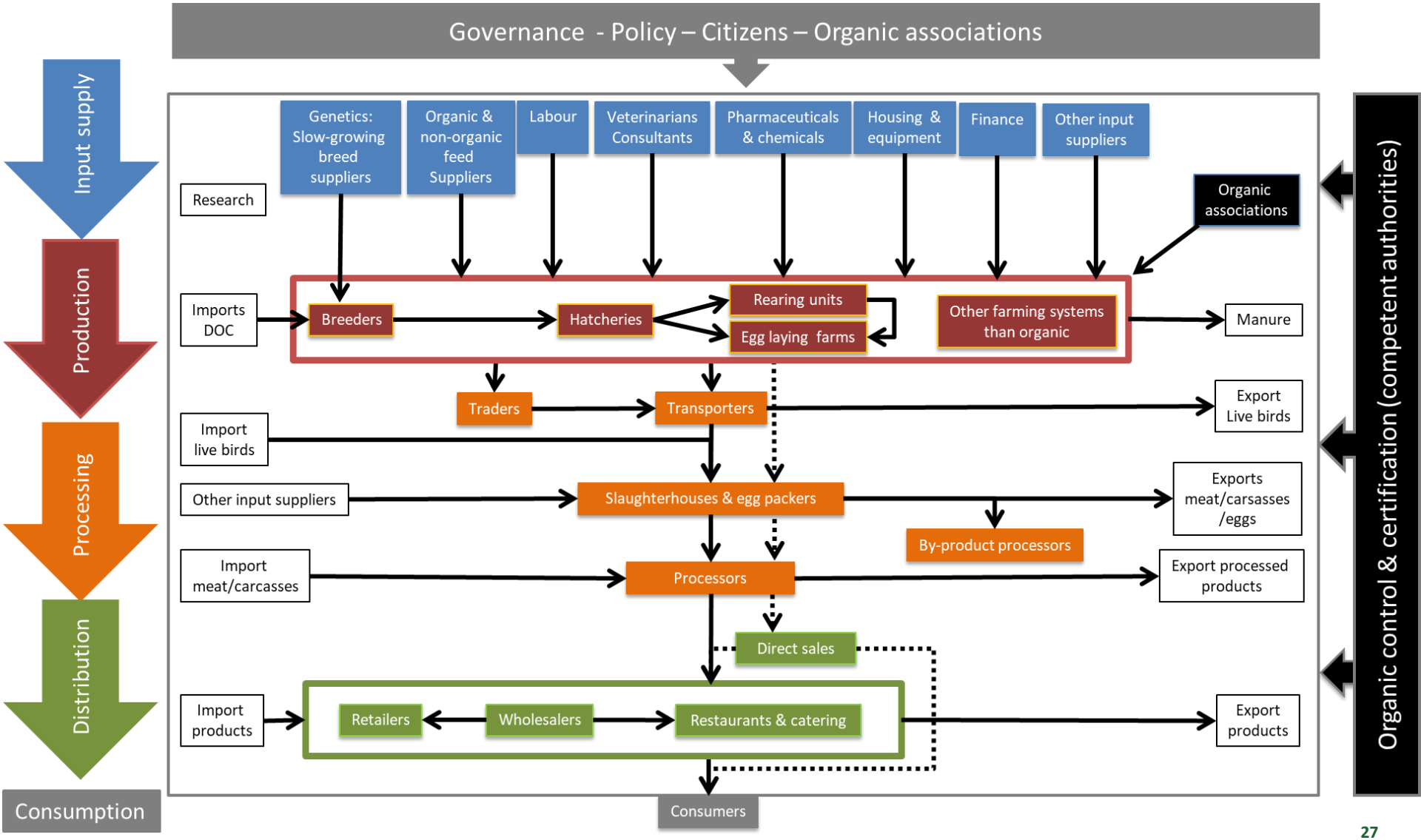
PPILOW WP7 – Example of first results: comparison of profitability

Total costs, returns and profitability (Euro/100 kg live weight)



- Short term profitability = total returns – cash costs.
- Medium term profitability = total returns – cash costs – depreciation costs.
- Long term profitability = total returns – cash costs – depreciation costs – opportunity costs.

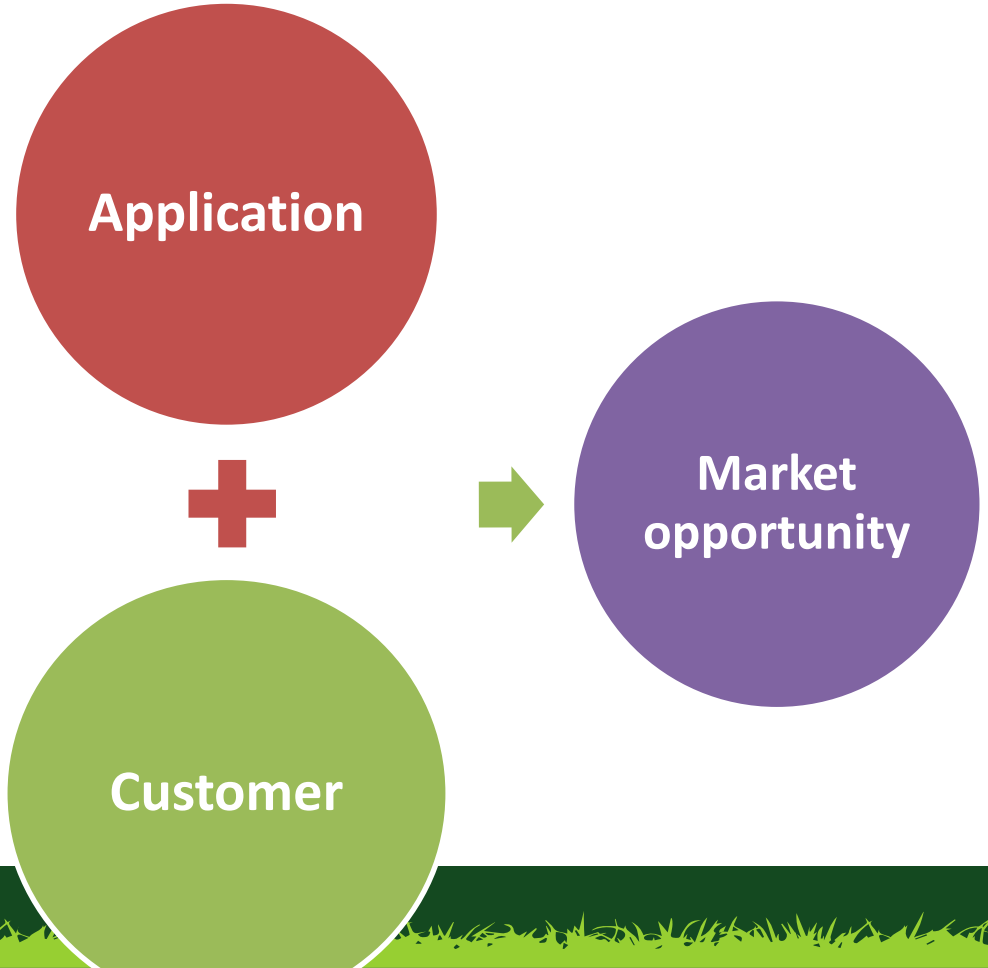
PPILOW Pay attention to key actors needed (poultry VC)



PPILOW When does a market opportunity exist?

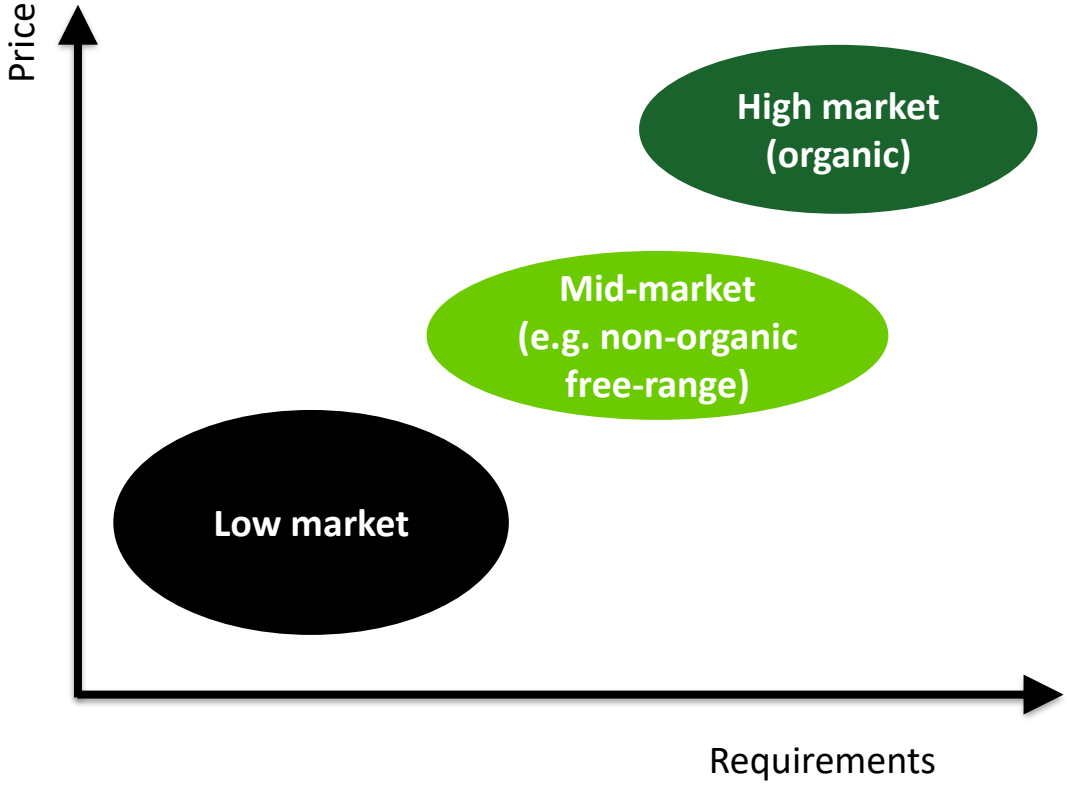
- A viable business must be profitable business
- Economic evaluation of costs and revenues is an essential part of evaluating a business model, but a business model is a broader concept

➔ How value is generated and how does the structure of value chain contribute?



PPILOW – The business model canvas

1. Value Proposition
2. Customer Segments
3. Channels
4. Customer Relationships
5. Key Partnerships
6. Key Activities
7. Key Resources
8. Cost Structure
9. Revenue Streams



Customer segments that you are targetting

What problem(s) they have? Who are early adopters?

Value proposition:

Clear and compelling message: Why your produt/service is worth buying.

Solution: What are the top features?

Comparison: How things are done today?

Channels to reach the customers

How you will make money?

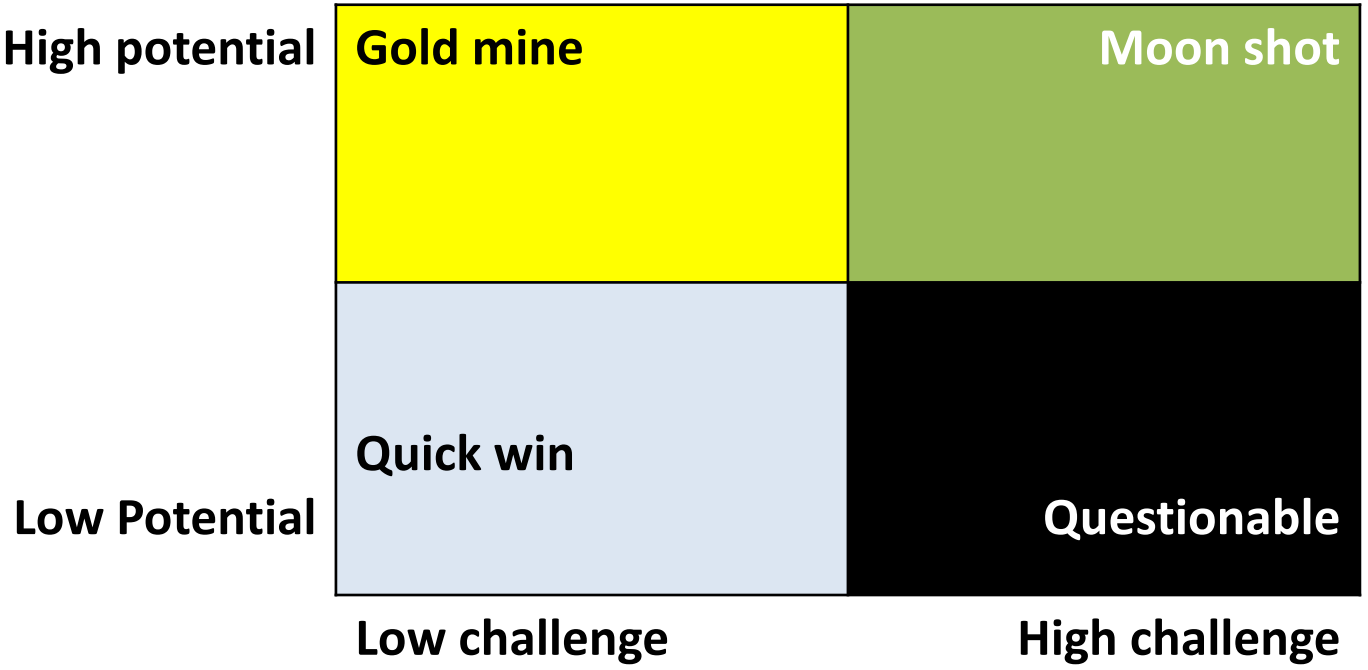
Costs & resources needed?

How & how much revenue is collected?

Metrics to measure your performance

Competitive advantage: How you can retain it? Is it easy to copy?

PPILOW Attractiveness of a market opportunity



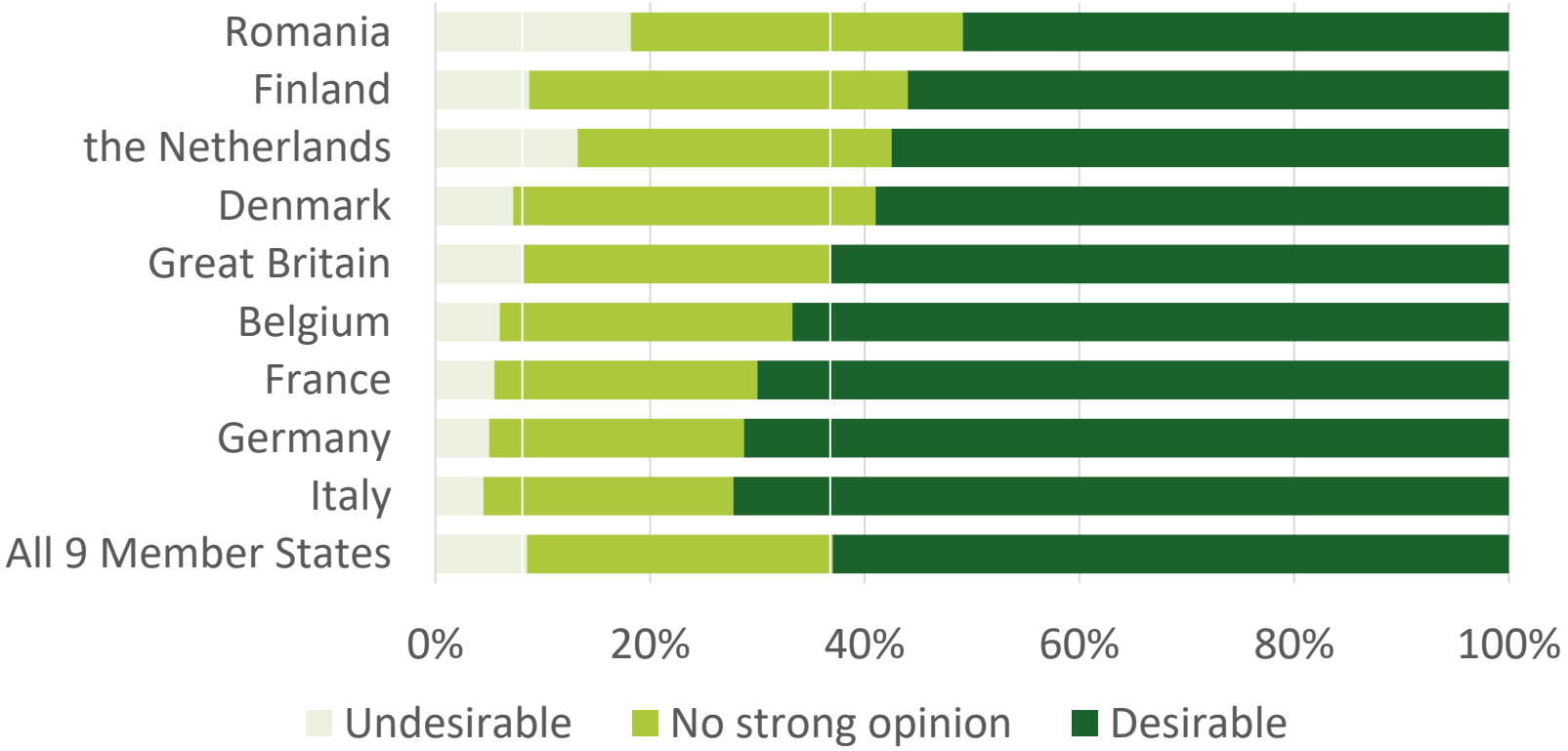
The profit margin may depent on both the potential and the challenge:

- High potential may mean high volume and low markin, or high margin
- High challenge likely increases the costs (and hence the price), but also makes it more challenging to copy the business idea.

Source: Market opportunity navigator

The public's desirability of using methods to avoid the killing of day old male chicks

In total, 63% of citizens considered methods that avoid the killing of male day-old chicks desirable.



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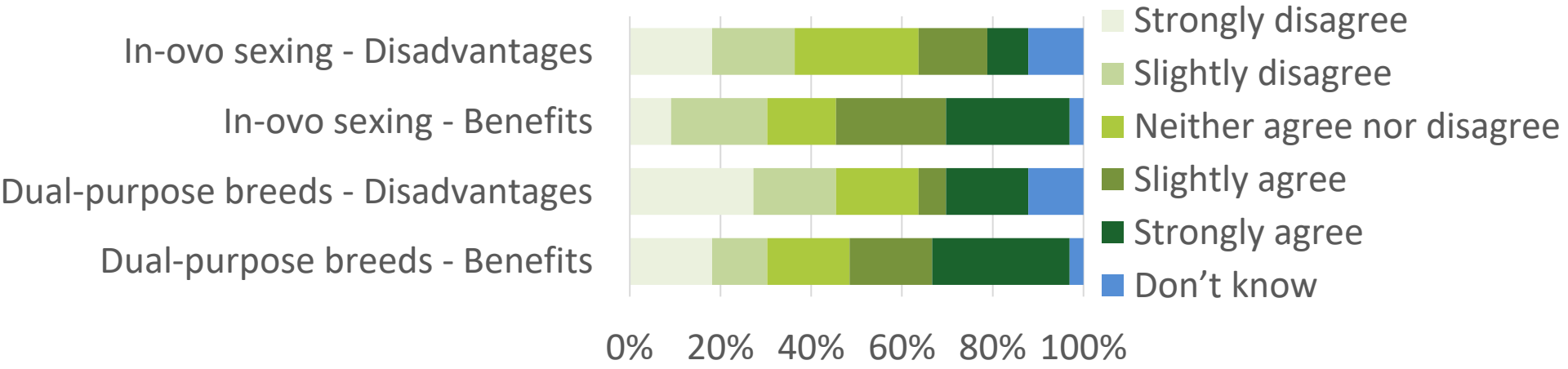
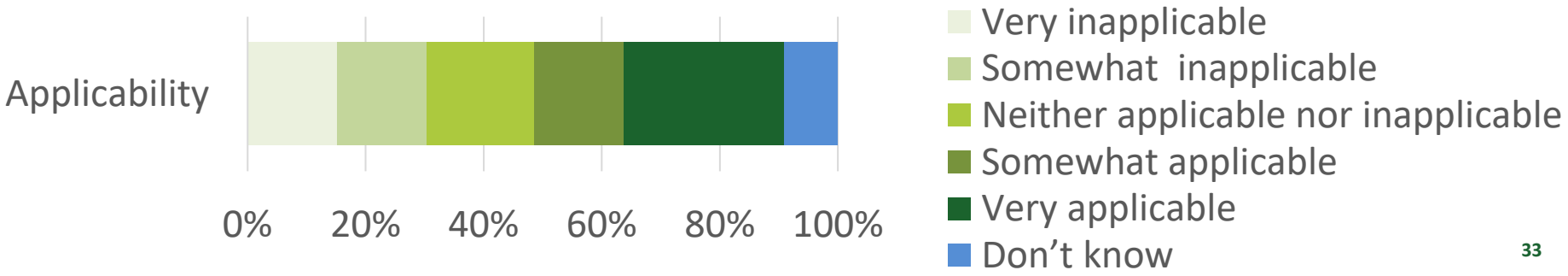
PPILOW – Perceived existence of disadvantage that prevent, and benefits that promote the adoption of practices



In total, 42% of producers found that methods that avoid the killing of male day-old chicks were applicable.



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PPILOW Examples of revenue generation models

Structure	Benefit	Disadvantage
Traditional retail	Easy, established channels	Competition, low profit & differentiation?
Direct sales	No middlemen, value addition & branding	Limited market, reaching the customers
Via restaurants	High value adding potential	Limited quantity, B2B marketing
Online	Potential for innovation & regular customers	Marketing effort, logistics, price sentitive?
Model	**Benefit**	**Disadvantage**
Advertising	Simple, transactional	Customers expect return on investment
Affiliate	Easy for customers to enter	Low control of branding
Bundling	Sell more products	Relies on discounting
Fee-for-service	Simple billing	Requires pipeline of new leads
Franchise	Low initial cost	Difficult to maintain quality, control
Freemium	Potential for rapid growth	How & when profit is generated?
Pay-as-you-go	Easy for customers to enter	Customer retention?
Retailer	More profit margin	High competition
Subscription	Continuous revenues	High customer churn

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PPILOW – A business analysis of dual-purpose breeds…

- An opportunity for **organic farming** that emphasizes "naturalness“, and for **short supply chains**
- Dual-purpose male chicks can replace slow-growing breeds in organic farming
  - ➔Ethically conscious consumers who appreciate slow-growing broiler
  - ➔Reduced need for parent flocks.
- Potential for novel practices and products such as slaughtering different sizes of genotypes, smaller birds, new products for pets/zoo animals?
- Branding + consumer awareness-raising to gain sales & premium price.
- Demanding nutritional requirements and robustness towards climatic challenges.
- Need R&D, enhanced feed efficiency and laying and growing performance.
- Proper training and knowledge on management is needed.

➔ Partnering across the value chain is essential.

PPILOW

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PPILOW ...and early sex determination using in-ovo method

- Ethically more sustainable egg production for **ethically** conscious consumers
- Investments in and maintenance of in-ovo sexing device, potential abandoning of male chicks' crushing equipment, the training of staff incur costs
- New efforts and R&D put in the processing of male eggs.
- Well-thought consumer awareness-raising campaign about ethically sustainable egg production.
- Dialogue between retailers and producers about ethical standards.

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PPILOW A business model canvas for rearing entire male pigs

KEY PARTNERS

- Farmers
- Retailers & restaurants
- Organic certification bodies
- Advisors & Research: how to manage boars & to reduce the risk of boar taint
- Processors (product choice)
- Feed suppliers (more protein)
- Genetics suppliers
- Marketing specialists
- Partnering across the value chain is essential.

KEY ACTIVITIES

- Improve rearing.
- Genetic selection against boar taint.
- Tools to sort, detect & handle tainted pigs.
- Research to reduce boar taint in meat.
- Educating farmers about boars' traits.
- Designing new feeds.

KEY RESOURCES

- Knowhow for training and advice provision.
- R&D investment
- Staff to sort carcasses.
- Boar taint detection device or human nose.
- Product portfolio, which can use smelly carcasses (e.g. spicy meat preparates)

VALUE PROPOSITION

High animal welfare, ethically sound premium pigmeat:

- No castration pain
- No boar taint
- Plenty of space for pigs
- Access to pasture and fresh air
- Reduced environmental impact per kg meat (N, GHG, veterinary inputs)
- Leaner meat, suited to whole meat products

CUSTOMER RELATIONSHIP

- Open & transparent.
- Active dissemination & communication.
- Emphasis on naturalness.
- Collaboration with local foos store, restaurants and animal welfare organisations.

CHANNELS

- Branding & awareness-raising among the consumers to gain adequate sales & price premiums.
- Open days to consumers interested in visiting the farm.
- Website & social media.

CUSTOMER SEGMENTS

- Ethically conscious consumers who appreciate high-quality meat and pay attention to environmental issues.
- Consumers of special meats & local products.
- An opportunity to farms that focus on *naturalness* and for short supply chains.

COST STRUCTURE

- No castration cost.
- Reduced feed use & cost per kg meat, up to -10%, but more expensive feed (protein content).
- Costs of mitigating and detecting boar taint & sorting pigs.
- Cost of new genetics.
- Extra enrichments to mitigate undesired behaviours.

REVENUE STREAMS

- Increased carcass value because of leanness
- Possible Lower reduces slaughter revenue
- Premium obtainable because of special/local breedss

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PPILOW WP7 – Conclusions

- Different methodological approaches were applied based on a standardized data infrastructure (WP 3/3.3).
- The most favorable solutions in terms of sustainability will be identified for each type of production (broilers, eggs, pigs) in close cooperation with the stakeholders (linked to WP2) and in accordance with the One Welfare Concept.
- The most favorable welfare solutions will be evaluated in more detail on the economic dimension in close exchange and collaboration with the NPGs and the experimental WPs 4-6:
- For the most promising solutions identified by Multi-Criteria Decision Analysis (MCDA), more advanced business and economic models were developed to determine the economic viability and feasibility of the proposed strategies and their impact on the whole production chain of each production type (broilers, eggs, pigs).
- Dual-purpose breeds might fit well in organic systems. Both have a holistic and natural approach to broiler production and involve the use of slow-growing birds.

PPILOW **PARTNERS**

Thank you for your attention

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