Development of a multidimensional risk-benefit assessment platform in food process designs: a methodological crossroad

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Background

There is a need to expand existing risk-benefit studies of food products to incorporate environmental, economic, consumer and sustainability issues [1-3]. This need is met through the development of a comprehensive risk-benefit assessment platform which evaluates the entire food production value chain. The issues surrounding food safety as it relates to food quality, health and sustainability is considered in this assessment platform so that the technological solutions and food policy relating to the complex issues in food production remains relevant. This platform aids in the development of more sustainable and healthy products while not compromising safety and economic feasibility.

Objective

Create a multidimensional analysis framework (Fig. 1) by expanding risk-benefit assessment methodologies integrating environmental, nutritional, safety, economic and consumer issues within the food value chain.

Approach

Framework characteristics using MultiCriteria Decision analysis

- Decomposition and understanding of the goal's critical aspects
- Integration of multidisciplinary qualitative and quantitative data
- Integration of WUR expertise on plants, foods, economics, health and sustainability
- Decision-making based on rational values (Fig. 3)

Figure 1. MultiCriteria Decision Analysis (MCDA) approach used for decision processes for multidisciplinary fields and methodologies involved in other Risk-Benefit assessments.

Building and using the decision making model

A step-wise approach (Fig. 2) is performed at different levels of the process: from the concept to the detailed process design, following a product-driven process synthesis approach as previously described[4].

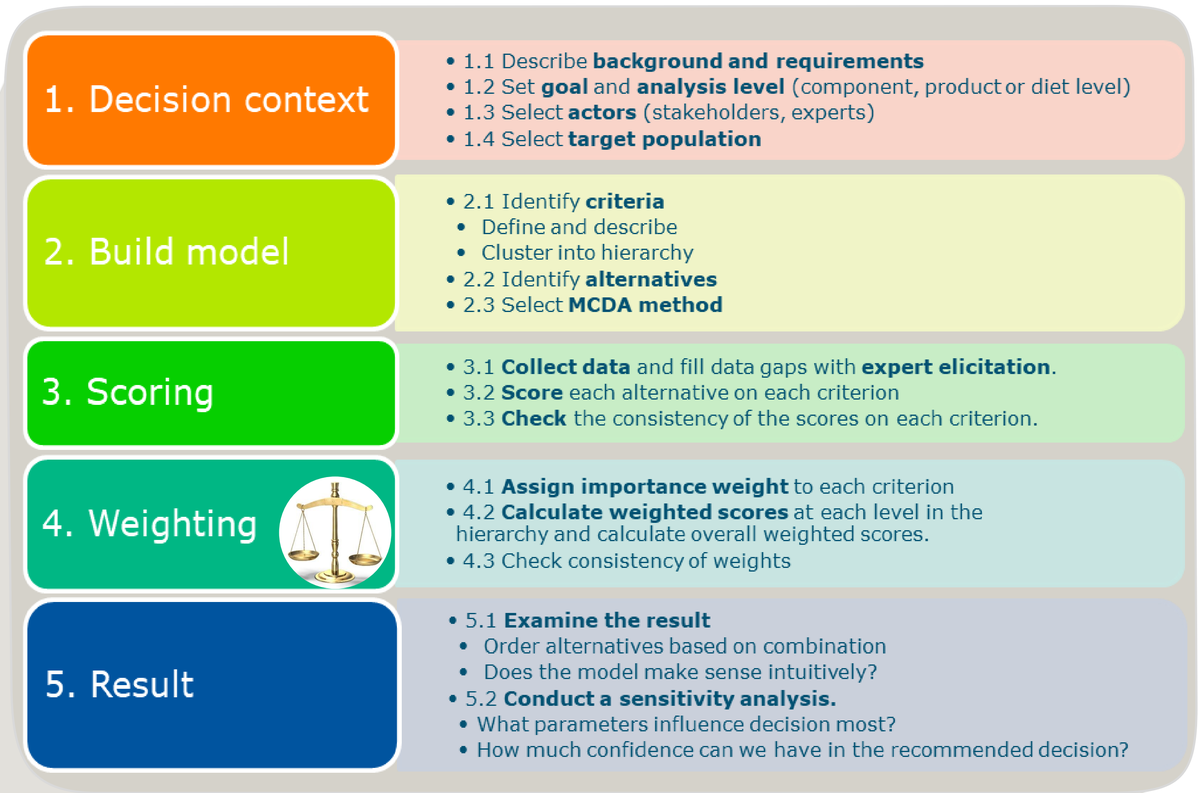
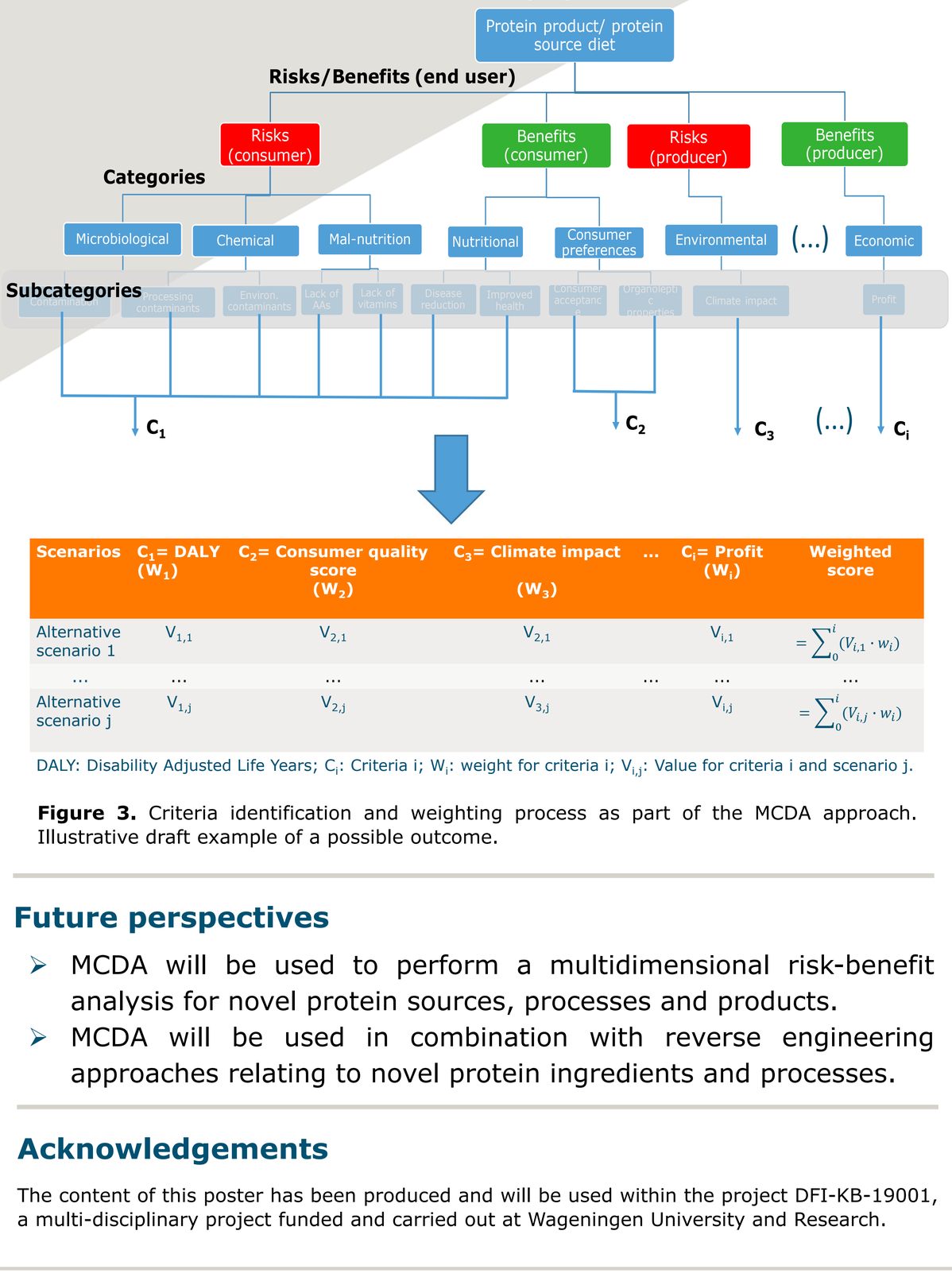


Figure 2. MCDA risk-benefit model step-wise approach.



Scenarios	C_1= DALY (W_1)	C_2= Consumer quality score (W_2)	C_3= Climate impact (W_3)	...	C_i= Profit (W_i)	Weighted score
Alternative scenario 1	$V_{1,1}$	$V_{2,1}$	$V_{2,1}$		$V_{i,1}$	$=\sum_0^i (V_{i,1} \cdot w_i)$
...	...	...	...	...	...	...
Alternative scenario j	$V_{1,j}$	$V_{2,j}$	$V_{3,j}$		$V_{i,j}$	$=\sum_0^i (V_{i,j} \cdot w_i)$

DALY: Disability Adjusted Life Years; C_i: Criteria i; W_i: weight for criteria i; $V_{i,j}$: Value for criteria i and scenario j.

Figure 3. Criteria identification and weighting process as part of the MCDA approach. Illustrative draft example of a possible outcome.

Future perspectives

- MCDA will be used to perform a multidimensional risk-benefit analysis for novel protein sources, processes and products.
- MCDA will be used in combination with reverse engineering approaches relating to novel protein ingredients and processes.

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