



RELACS

IMPROVING INPUTS FOR ORGANIC FARMING

EUROPEAN RESEARCH PROJECT

2018-2022

www.relacs-project.eu

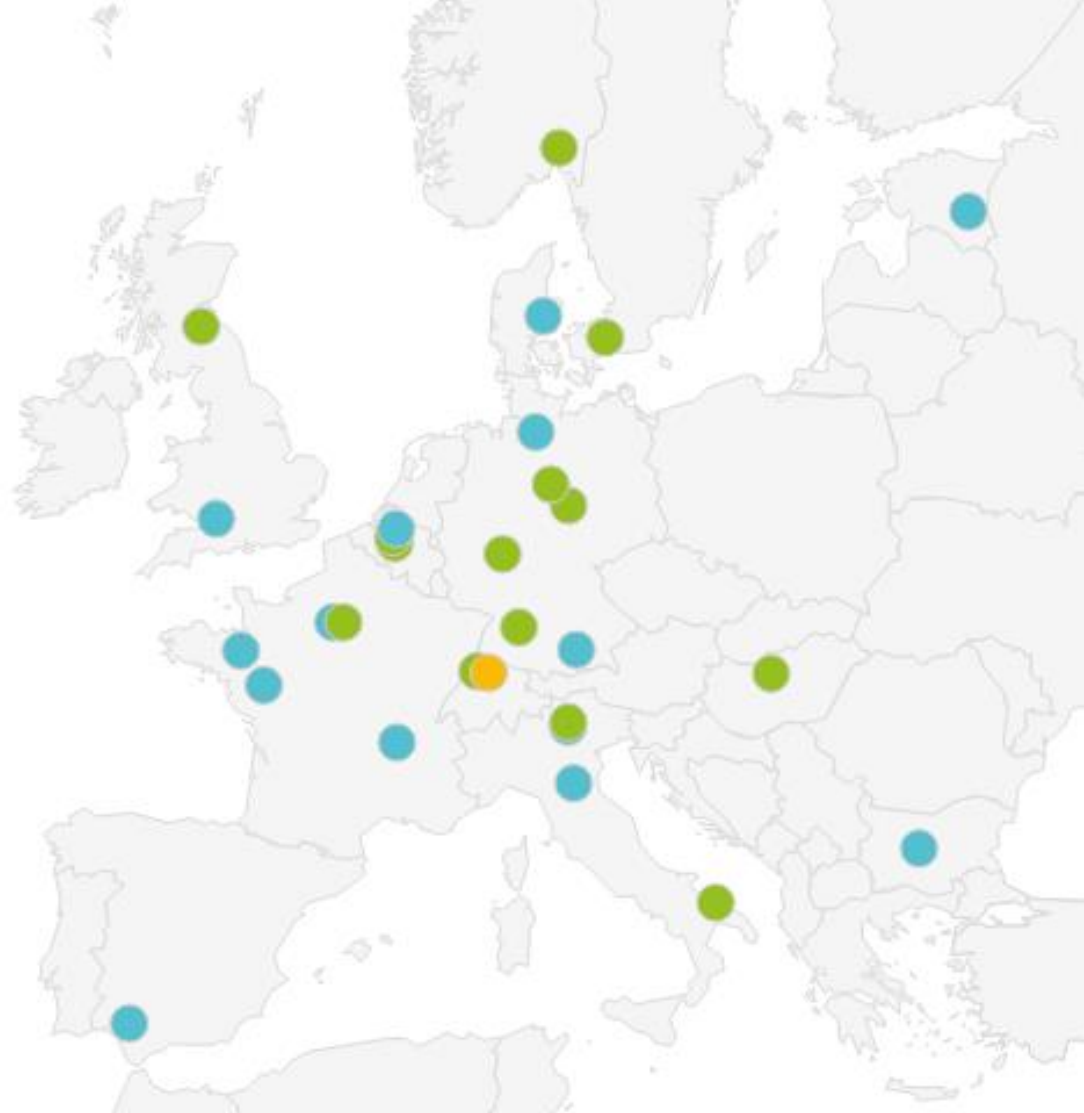
Lucius Tamm (coordinator)

RELACS in a nutshell

- **Replacement of Contentious Inputs in Organic Farming Systems**
- Evaluates solutions to further reduce the use of external inputs and develop cost-efficient and environmentally safe tools and technologies to:
 - Reduce the use of copper and mineral oil in plant protection
 - Identify sustainable sources for plant nutrition
 - Provide solutions to support livestock health & welfare (Antibiotics & anthelmintic drugs, non-synthetic vitamins)
- Built on results of previous research projects & took far-advanced solutions forward
- 29 partners from thirteen countries: research, farming, advisory services & industry

Partners

- 13 European countries
- 15 partners
- 11 research organisations
- 1 dissemination partner
- 3 SMEs
- 14 linked parties
- 11 farmer organisations
- 3 research organisations



Copper survey results

- 25 out of 30 European countries allow the use of copper-based PPPs.
- Copper is active against an extraordinary range of crop diseases (>100) including bacteria, oomycetes, ascomycetes and basidiomycetes.
- In central Europe number of crops with use of copper decreases from South (more than 40 crops) to North (5-10 crops). In IT, ES, and FR copper is allowed in more than 40 crops, while in the southern central European countries such as DE or CH, uses on approximately 20 crops are permitted whereas in the northern central Europe 5-10 uses are registered.
- None of the commercially available alternatives has a similar range of uses as copper. Aluminium sulfate, *Aureobasidium pullulans*, *Bacillus amyloliquefaciens* and *Bacillus subtilis* have reported uses against selected plant pathogenic bacteria. Some oomycetes are controlled by aluminium sulfate and possibly also by *Bacillus subtilis*, while sulphur, aluminium sulfate, potassium bicarbonate, lime sulphur have acceptable to good efficacy against selected ascomycetes and basidiomycetes.
- **Total estimated copper use (>3000t) per annum in 12 European countries (2018)**

Tamm et al (2022). Agronomy 2022, 12, 673. <https://doi.org/10.3390/agronomy12030673>

Alternative PPPs for copper reduction explored in RELACS

3 plant extracts:

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- *Larix decidua* extract

- SUMB

Trifolio-M
Hochreine Biosubstanzen

- *Glycyrrhiza glabra* extract

bi pa
Biological Products for Agriculture

- Tagatose

Tagatose formulation was kindly provided by
Kagawa University and Mitsui Chemicals Agro

NEUDORFF

In addition 1 fatty acid product from outside RELACS

- NEU1143 F tested in apple



Conclusions related to copper reduction

Developing fully functional and affordable copper alternatives and to supply them in sufficient quantity is an extremely demanding challenge!

- All 4 'RELACS alternatives' show good efficacy *and will cost more than copper*
- Several alternatives are necessary to cover the broad spectrum of copper use
- All possible preventive measures (e.g. robust varieties, functional biodiversity, crop management practices) need to be adopted
- Adoption of alternative products in farming practice needs supportive action
- Adapt registration requirements to properties of biocontrol/botanicals!

Mineral oil alternatives: orange oil (TRL 9), Clitoria extract (TRL7) & vibrational disruption (TRL5)

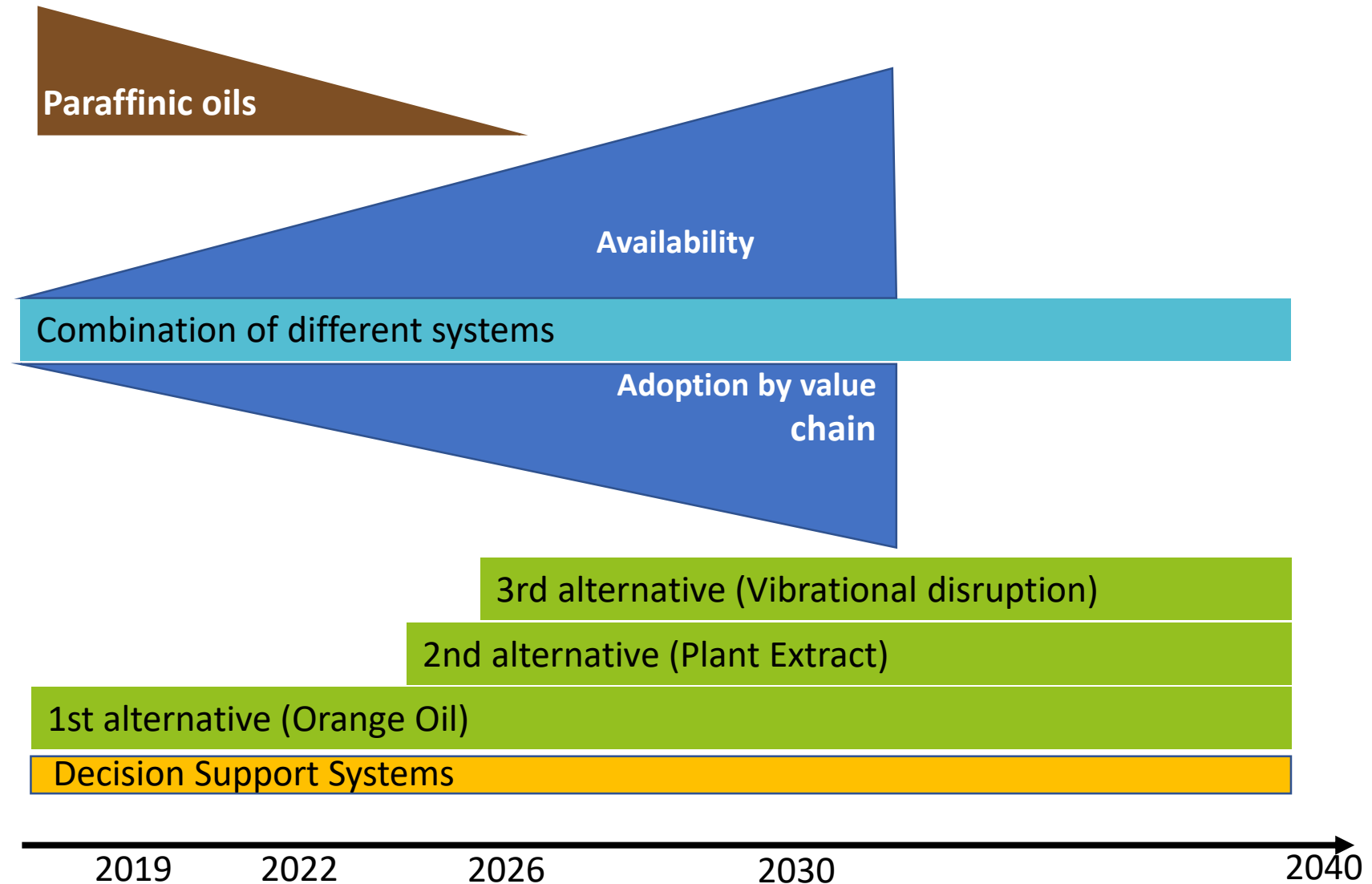
VIBRATIONAL MATING DISRUPTION



VIBRO-TRAPS

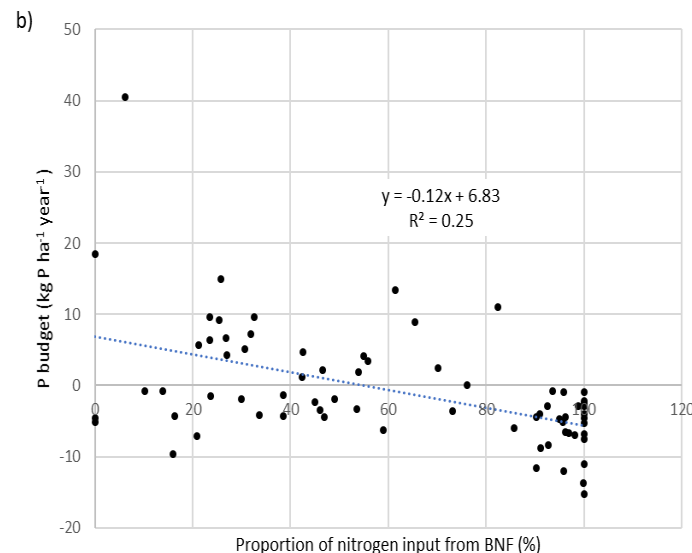


Timeline for mineral oil reduction (southern zone)



Current use of and need for external nutrient sources

- Survey of 71 organic farms in 7 European countries
- 24% of farms deficient for N
- Many farms with **negative balances for P and K**
- **Farm type most important factor** → Stockless farms have highest deficits
- **High reliance on Biological N Fixation correlated with low output, and with negative P and K budgets**

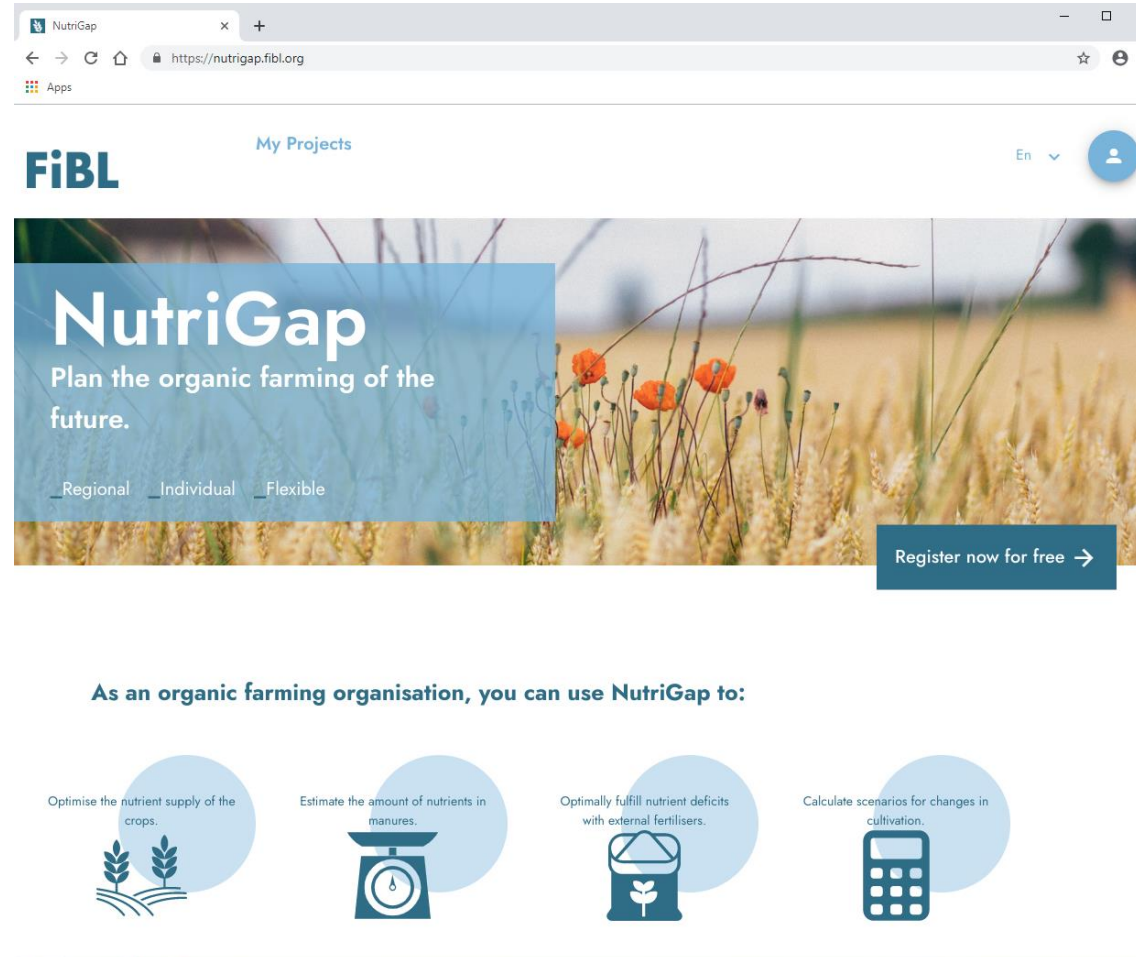


⇒ N needed to increase productivity
⇒ P and K needed to prevent soil mining

Recommendations and agreed positions related to soil fertility management and inputs

- External N supply in addition to Biological Nitrogen Fixation is needed for productivity, esp. on stockless farms
- Balance long-term supply of all nutrients!
- Recycling of societal waste streams and organic regulations needs further development
- Waste streams have increased in quality => clear criteria for acceptance in OF needed
- Providing appropriate nutrient supply at regional level is key to productivity and soil fertility

The regional nutrient planning tool NutriGap is a first step to adress logistics of provision of soil fertility inputs



Anthelmintics

- Anthelmintics are widely used in all grazing livestock species
- Further development of available alternative: tanniferous plant heather (*Calluna vulgaris*)
 - Available in large quantities in some European regions
 - Can be integrated in grazing regime for small ruminants
- New alternative: biocontrol fungus *Duddingtonia flagrans*
 - Nematophagous and highly effective
 - Registration as feed additive pending
 - First field studies in Europe carried out within RELACS
 - No negative interaction with other strategies (e.g. tanniferous forage)
- Impact: Toolbox to control parasitic nematodes further expanded

Antibiotics reduction

- Contentious input #1 according to surveys of RELACS and consumer studies of Organic +
- Further development of available alternative: RELACS Animal Health and Welfare Planning Protocol, including a farmer field school approach
 - Successfully applied by groups of farmers in France, UK, Spain
 - Maintained beyond the duration of RELACS
- New alternative: essential oils
 - Several EOs have antibacterial effects
 - Application validated in clinical mastitis cases
 - Similar to antibiotic treatment
 - No negative effects on sensory milk quality and other milk properties
 - Legal status needs to be clarified

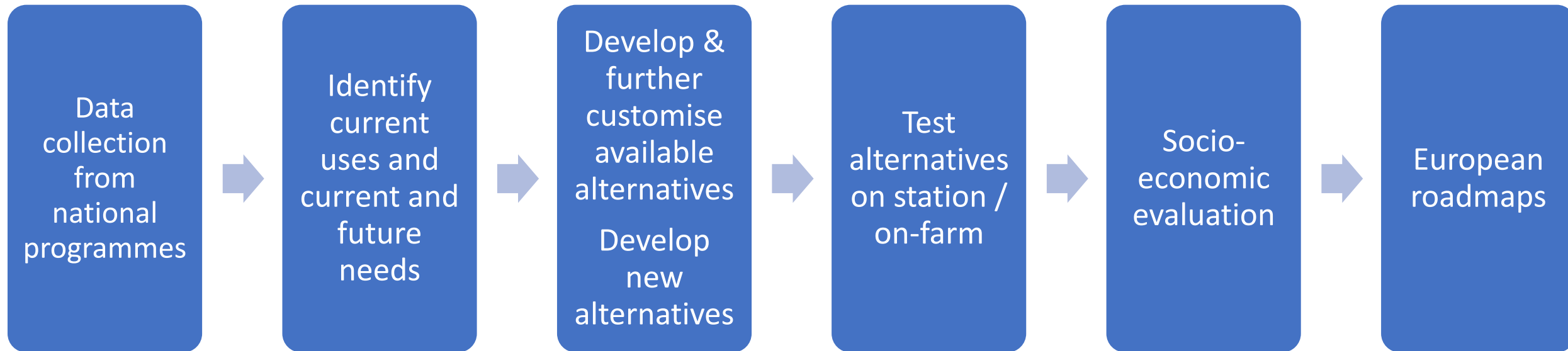
Conclusion: Excellent potential of preventive management and medicinal plants to complement or replace antibiotics is not yet fully utilised

Synthetic/GMO produced vitamin E and B2

- Organic compound feeds are routinely supplemented with vitamins of synthetic origin (e.g. Vit. E) or produced by GMO (e.g. Vit. B2/Riboflavin)
- RELACS approach: development of alternatives and revision of requirements based on published studies and own experiments
 - Substantial reduction of for Vit E and Vit B2 possible without animal health or productivity issues, depending on feed composition, animal species and productive stage
- New alternative: non-GM yeast strains overproducing Vit B2
 - New strain isolated and fermentation protocol optimised
 - Field testing of a newly available non-GM B2 product

Conclusions: Adapting requirements and decreasing concentrations of added vitamins is possible and compensates for higher costs of non-GM produced Vit B2

The RELACS approach for each input





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