Managing diversity for food system resilience

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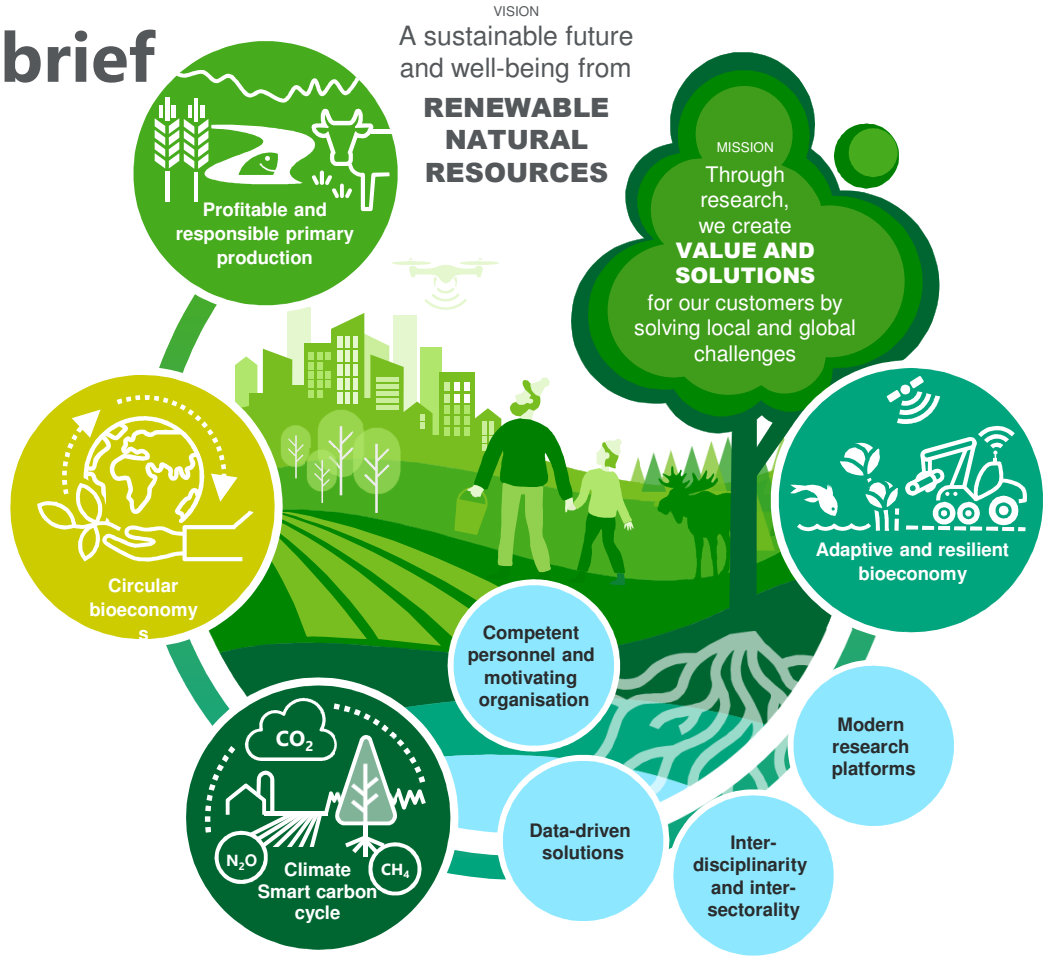
Luke in brief



129 M€
Turnover

75 M€
Budget funding

54 M€
External funding*

22
Locations in Finland

HQ in Helsinki

Present in 12 campuses with universities, research institutes and polytechnics

1274
Employees

14 Management
44 Research professors
603 Researchers
613 Other specialists

** Includes profits from co-funded, collaboration and customer-funded projects and other income. Information from the year 2020.*

Graphics: Jouni Hyvärinen

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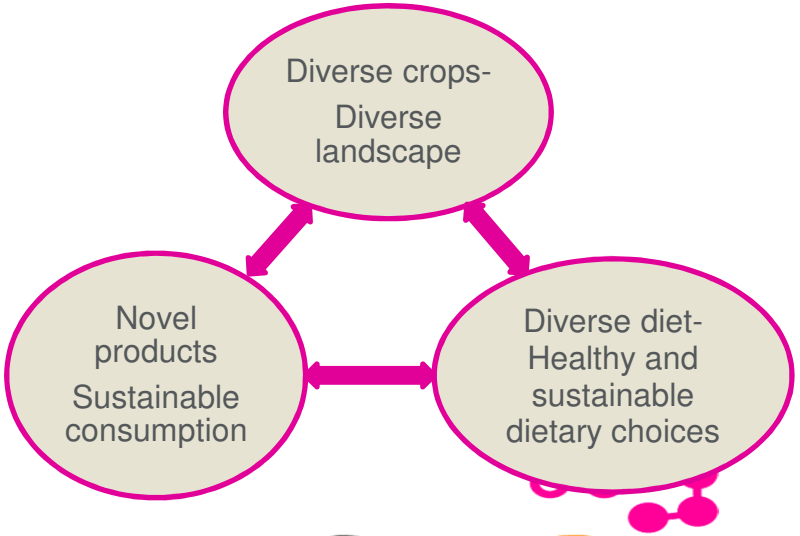
Outline

- Introduction, problems to be solved
- Main general challenges related to diversity
- Diversifying primary production
- Diversity of food consumption
- Diversity of diets



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Diversifying food system in the pursuit of sustainable food system and healthy diets

The modernization of food system has led to dramatic changes in food system, including increased greenhouse gas emissions, air and water pollution as well as an increase in non-communicable diseases

- According to United Nations (UN, 2019), since the 1900s circa 75% of crop diversity has been lost from farmers' fields globally
- Micronutrient deficiency and malnutrition (> 800 million people), obesity (> 1 billion people), social inequality limiting access to healthy food, as well as food waste.

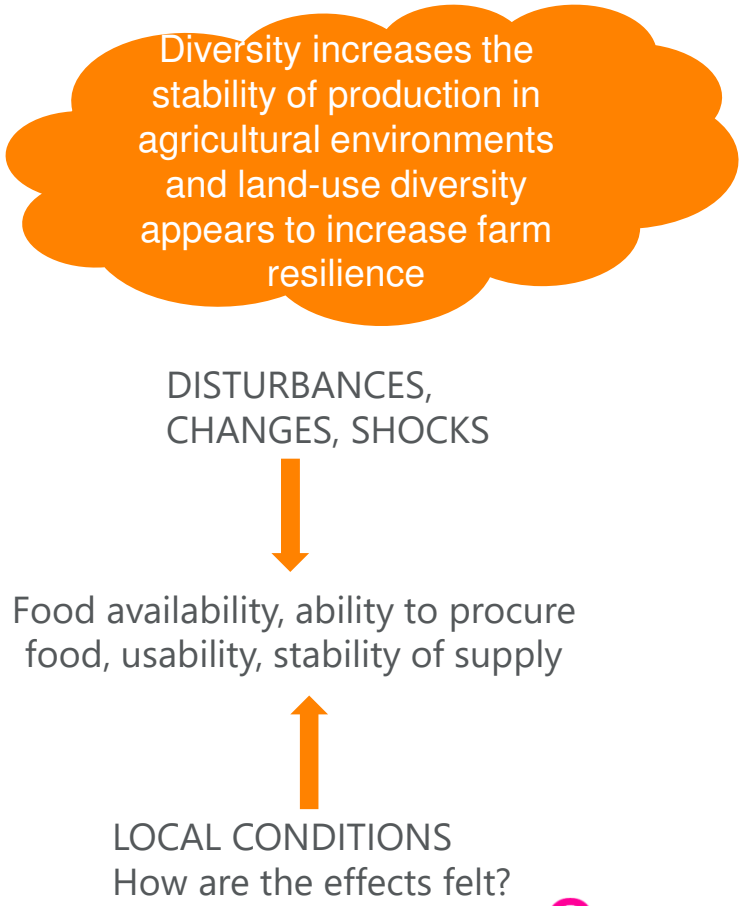
Global transformation of food production and consumption patterns is urgently needed to achieve sustainable Food and Nutrition Security.

Transformation takes place through a number of different pathways

Food system has faced several shocks

Biodiversity promotes resilience

- Diversity is most important factor promoting resilience
- Better ability to recover from disruptions
- Biodiverse system helps to control pesticides and diseases
- Improves soil health
- Promote pollination and maintain the production of ecosystem services in the event of disturbances
- Versatility reduces vulnerability when a single crop fails
- Less dependence on external inputs and greater reliance on biological processes supports soil health and pest and disease control



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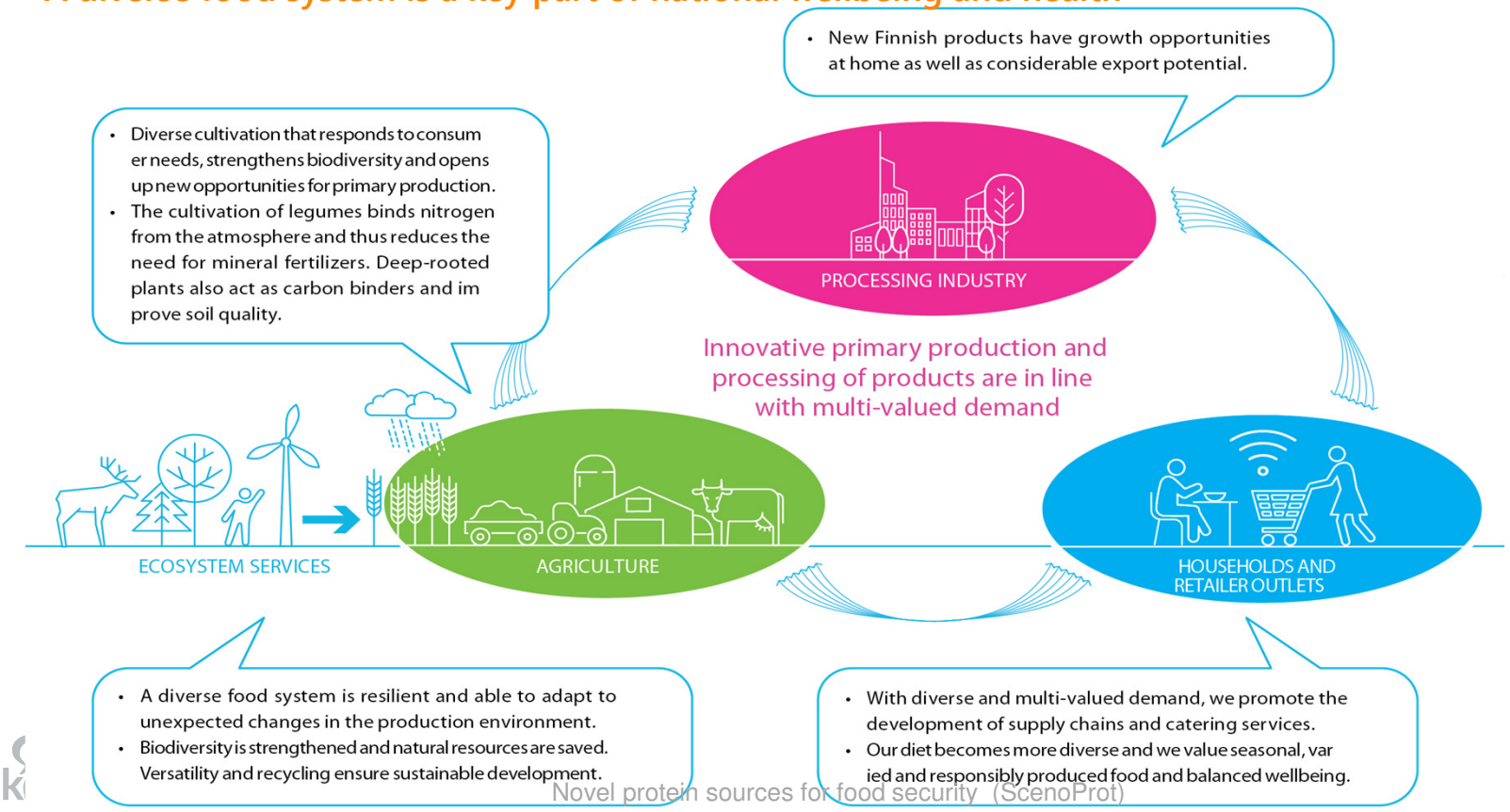
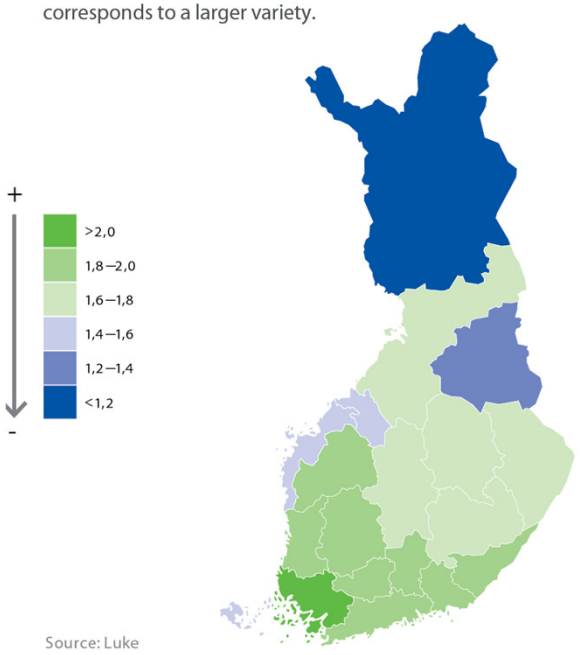
Diversity is covering all the food chain from primary production until consumption

A diverse food system is a key part of national wellbeing and health



Improving resilience and biodiversity in Finnish food system – improving protein self sufficiency - Farming

Variety of field crops by region 2012–2016 according to the Shannon Index, where the larger number corresponds to a larger variety.



Source: Luke

Total 130 different crops

- 3 cereals (total 13) 52.5%
- 1-2 grass (total 10) 37.9%
- Others (>100) 9.7%

The self-sufficiency of Finland's plant-based protein is lowest in rapeseed, rapeseed and soybean.
Production and net import (import and export) of plant-based raw materials (excluding cereals and grass).

Source : Luke

Diversity with land based protein crops

Potential protein crops in Finland

The crop yield potential of plants under different growing conditions to obtain information on the success of alternative crops as the climate changes

- Blue lupin, soya and quinoa will benefit if the temperature increases

Yield variations of protein crops on practical farms (farm tours 2016-18) and compared the results with experimental conditions.

- Farmers' average yield of faba bean was about 2800 kg / ha, while the yield could be 4800 kg / ha. The development of technologies and know-how should be promoted to narrow the gab

Faba bean as precursors to other protein crops (alone and in combination with undergrowth) and cereals to understand what kind of crop rotations can be applied

- Precursor of rapeseed and quinoa improved oat yields (about 250 kg/ha)

Faba bean

Blue lupin

Buckwheat

Quinoa

Oilhemp

Flaxseed

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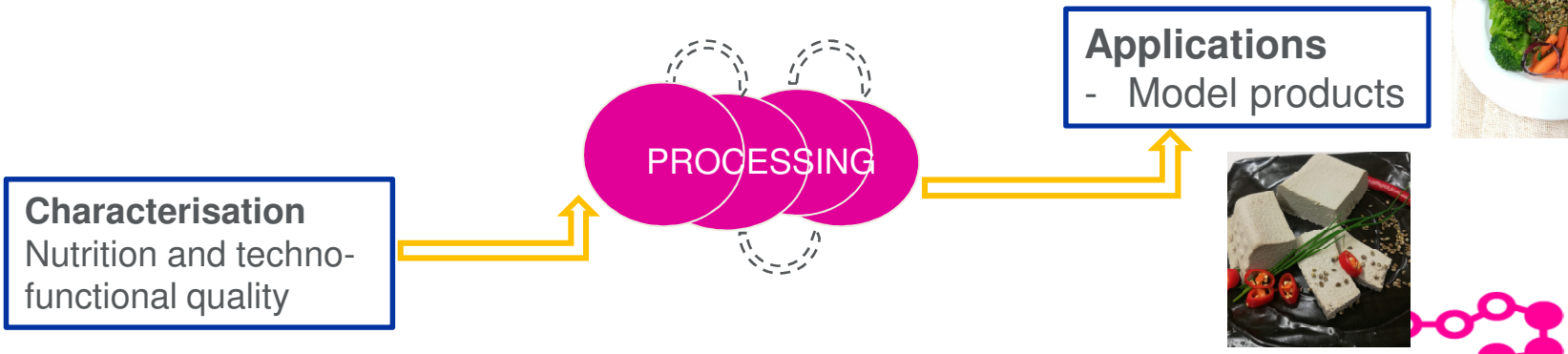
Diversity food consumption

Value creation – co creation with stakeholders

Product development is forefront to introduce new protein sources on consumer plates

- There is a need to provide more nutritive and healthy plant based products that are attractive, available and affordable
- Barriers: low knowledge and skills, raw material quality and amounts



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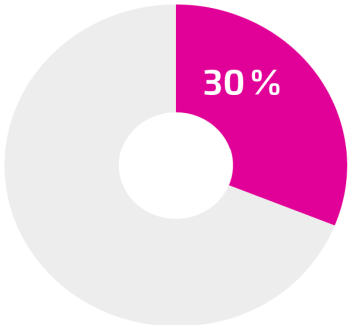
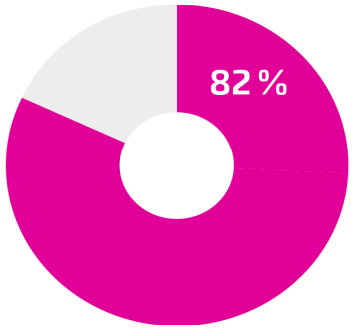
Consumers are interested in health and environment

- More than half of the interviewed will try rather willingly new products if they exist easily available from an own grocery store.
  - Plant products do not appeal to young men
- The most important basis for choosing plant-based protein products is taste- healthiness is also important.
- Price, inexperience and unfamiliarity were the barrier. The perception is that the products are expensive.

Around 1/3 of consumers had started to replace meat or fish with plant alternatives



82% of the interviewees were a lot or by large interested to test new food products



Total interviewees was 305 in concept survey

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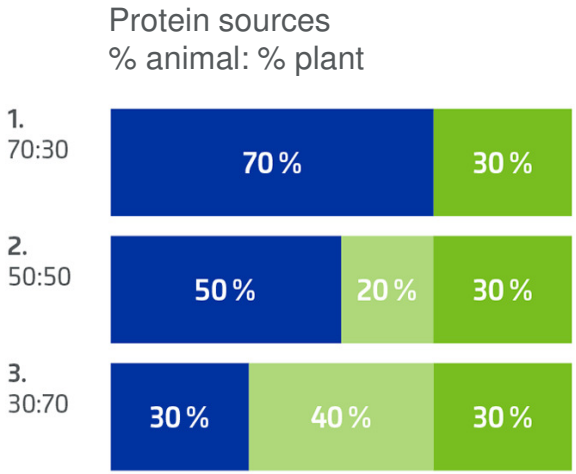
Diversity of the diets

- 150 volunteer of working age healthy were examined, 136 along up 12 weeks
- Risk factors of the diabetes and colon cancer and attitudes to the diets (after 12 weeks and 1 year)



Animal proteins
- Milk products
- Fish
- Meat
- Egg

Plant proteins
- Cereals (bread, pasta, bakery)
- Potato
- rice

Plant proteins
- Fava bean
- Oat
- Hemp
- Buckwheat
- Soy
- Quinoa
- Seeds

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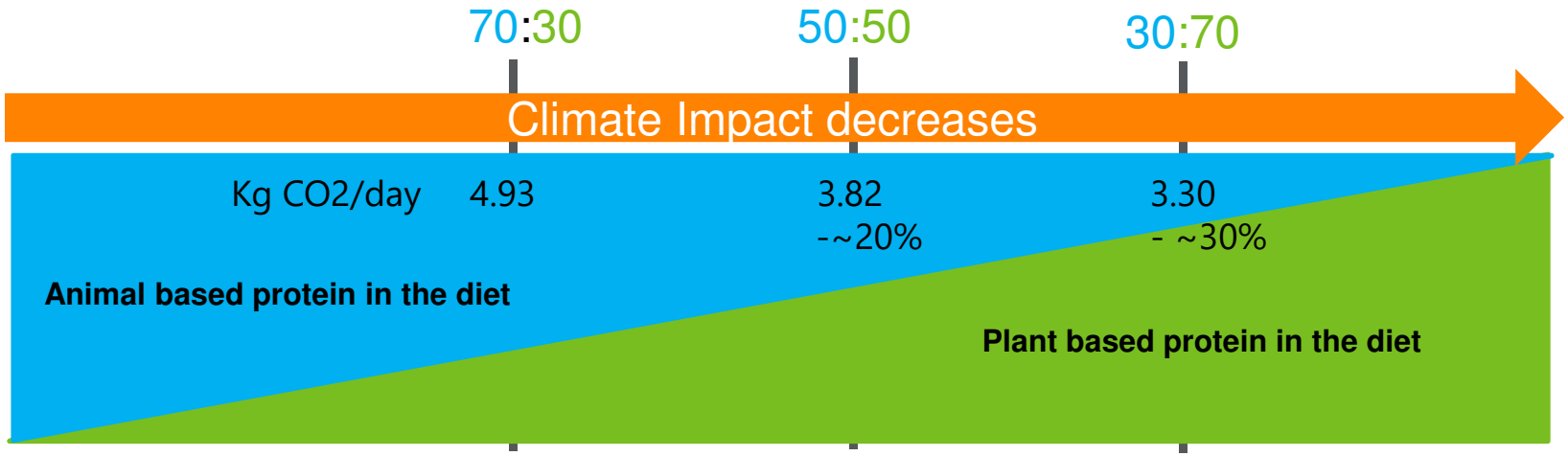
The effects of dietary change from different perspectives



Benefit: Good quality protein, B12 and D vitamin, hemi-iron, Ca
Risks: Quality of fat (saturated), low fiber intake, energy intake -> Increased disease risk (Diabetes, cardiovascular diseases, colon cancer)

Benefit: Good fat quality (unsaturated), high in fiber, folates, phenolic compounds and antioxidants – decreased disease risk
Risks: Protein quality, difficult to obtain recommended levels, essential amino acids, vitamin B12 and D intake, Iodine and Ca intake, potential stomach problems

Conclusion

Better interaction between stakeholders all along the food chain

- For primary production
  - Plant breeding strategies
  - Reform agricultural subsidy polices and encourage the utilization of crop rotation and experimenting with new crops
  - Increase farmers' knowledge and develop farming techniques
- To develop justice in the entire food system, to ensure that the economic needs and interests are balanced.
- For novel protein sources, better evaluate positive and negative effects on human health, production systems and environment, adapt current processes to novel sources while reinforcing sustainability and facilitate social transition
  - Moderate dietary changes will benefit environment and human health – better communication to avoid confrontation
- Support development of products/productions/food systems supporting diversity of food production (crop, specie, biodiversity) and healthy dietary diversity, with proper and adapted legislation and removing unintended obstacles

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Thank you

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