



Feed the Future Innovation Lab  
for Collaborative Research on  
Grain Legumes



# Towards 2050: Projecting Legume Consumption and Production under Alternative Socio-Economic and Resource Conditions

*S02-2: Enhancing Value-Chain Performance through Improved Understanding of Consumer Behavior and Decision-Making*



**K-STATE**  
Research and Extension



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# **Towards 2050: Projecting Legume Consumption and Production under Alternative Socio-Economic and Resource Conditions**

**Vincent Amanor-Boadu & Ralph Armah**  
Department of Agricultural Economics  
Kansas State University

# Key Points

- Incomes will rise
  - income elasticity of pulses consumption is inelastic (e.g. in EU, Africa, India)
- Animal protein cost will rise
  - resource constraints (arable land and fresh water)
  - more cost per unit of animal source protein compared with that from pulses
- Time (knowledge, health and nutrition awareness) will have different effects in different regions
- Implication: Pulses will meet specific needs for certain people at specific times
  - multiple market opportunities in different global regions
    - niche markets in Europe and commodity markets in India and Africa



# Outline

Project population distribution changes to 2050

Effect of income on consumption of pulses by region

Opportunity for seizing consumption opportunities under emerging resource constraints

Some private and public policy options for consideration





# Population and Markets

- Study seeks to identify market opportunities to enhance producers' incomes and their global competitiveness
- Important because openness in trade is expanding across the world, creating opportunities to leverage unique producer characteristics to secure and sustain markets
- Focused on global trends by region – selection based on population, incomes, pulses consumption concentration and potential market opportunities

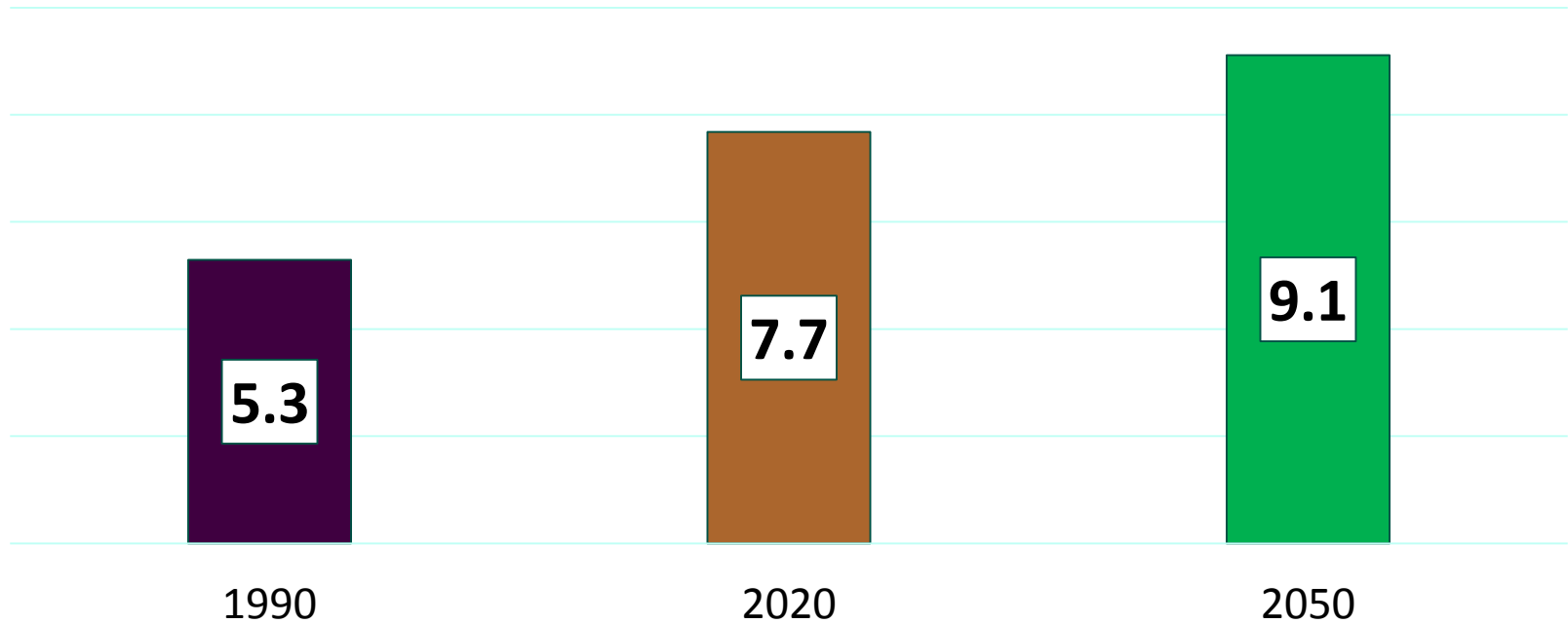


# Importance of Pulses in Global Nutrition

- Pulses are very nutritious and probably provide the cheapest cost per unit of useful nutrition
  - Rich in complex carbohydrates and high in both soluble and insoluble fiber
  - High in protein and essential amino acids compared to most protein sources
  - Large quantities of vitamins (folate, thiamin, niacin, riboflavin, B<sub>6</sub>) and minerals (Fe, K, Mn, Zn) per calorie
  - Can contribute to a healthy microbiome
- Research shows pulses can contribute to reducing risk of certain chronic diseases (cancers and cardiometabolic diseases)

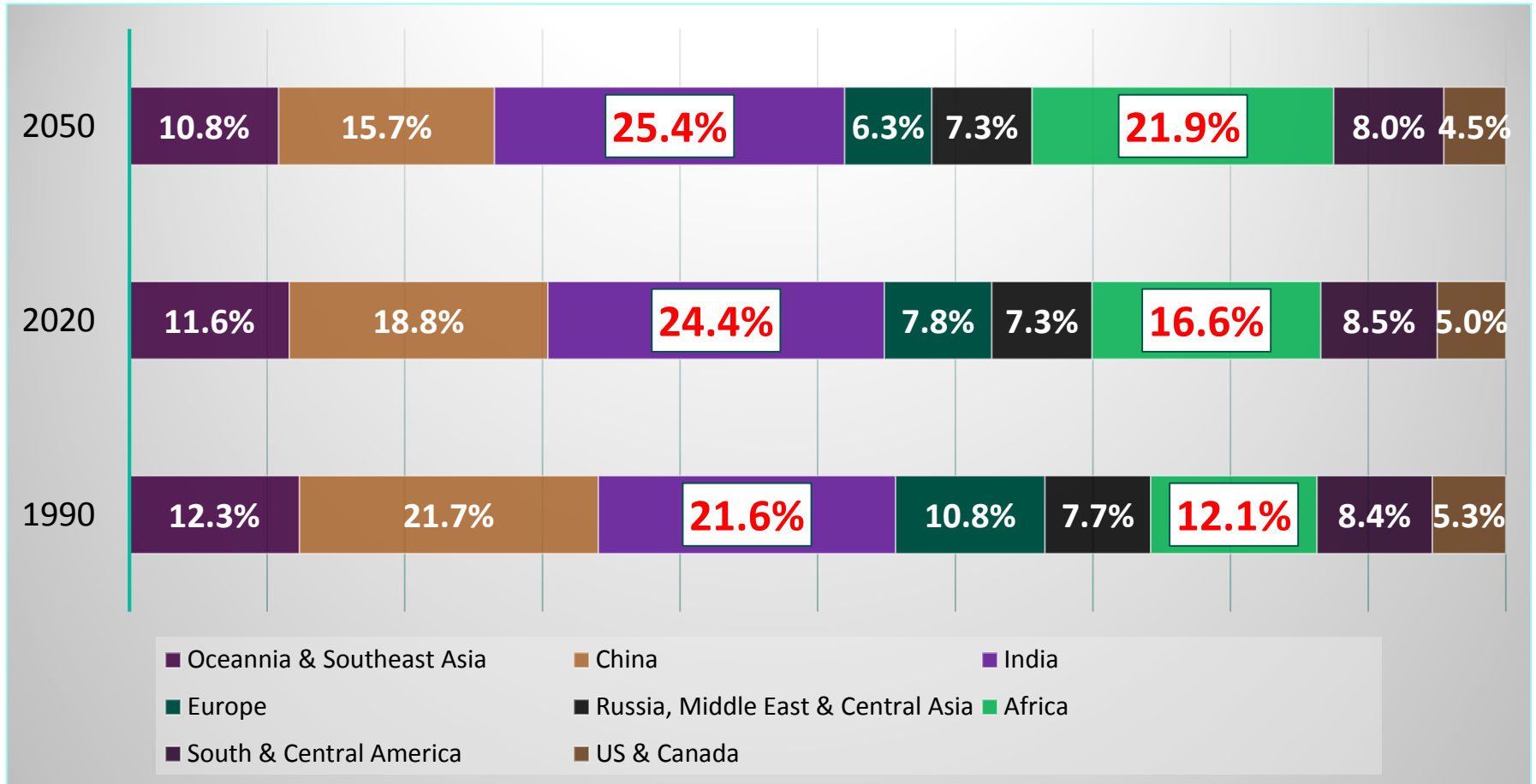


# Global Population 1990-2050 in Billion



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# Regional Share Trends of Global Population



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# GDP per Capita (1990-2016)

Region	Average	Std. Dev.	Min	Max	CV
EU	26,297	8,012	14,962	39,630	30.5%
India	2,970	1,664	1,134	6,572	56.0%
China	5,802	4,543	987	15,535	78.3%
Africa	2,440	762	1,620	3,711	31.3%
North America	39,415	10,420	23,570	56,110	26.4%
South America	10,363	3,209	5,824	15,442	31.0%



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# Pulses-to-Animal Protein Ratio in Diets by Region (1990-2013)

Region	Average	Std. Dev.	Min	Max	CV
EU	2.96%	0.32%	2.58%	3.57%	10.88%
India	67.85%	7.31%	58.20%	90.05%	10.78%
China	3.15%	1.21%	1.92%	6.69%	38.46%
Africa	43.74%	1.27%	40.53%	45.75%	2.89%
North America	3.82%	0.30%	3.31%	4.64%	7.95%
South America	16.44%	1.89%	13.53%	19.61%	11.49%



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# Projecting Future Consumption of Pulses by Region

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## Assumptions

Pulses are consumed for satiety and taste, and over time it shall be consumed for nutrition, health and ethical reasons

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Primary drivers of consumption are income, competing protein products and time

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Time is used to capture knowledge, health and nutrition awareness, ethical behavior, all other factors not explicitly included in the model

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# Regional Consumption Trends

## Predicting the Importance of Pulses in the EU

## The EU Story

Variables	Coefficient	Std. Err.	t	P>
Income (L2)				
Animal Protein				
Year				
Intercept	-40.478	20.826	-1.940	0.060

1% increase in income two years earlier leads to about 0.9% decline in current pulses' consumption, but consumption

**The income elasticity of pulses consumption in Europe is negative and inelastic but time has a positive effect on demand and expected to create a niche opportunity**

expanding the market for pulses and products from pulses in Europe, creating a high value market in Europe by 2050



# Regional Consumption Trends

## Predicting the Importance of Pulses in the Africa

## The Africa Story

Variables	Coefficient	Std. Error	t-Statistic	Prob. >  t
Income (L2)				
Animal Protein				
Year	0.022	0.003	7.556	0.000
Intercept	-38.033	4.930	-7.710	0.000

**The income elasticity of pulses consumption in Africa is negative and inelastic but time has a positive effect on demand and expected to create a commodity opportunity**

1% increase in income two years earlier leads to less than 0.1% decline in current pulses' consumption. This is caused by the income elasticity of pulses.

comes in time on pulses

market in Africa through to 2050 despite increasing evidence of their benefits and economic advantages



# Regional Consumption Trends

## Predicting the Importance of Pulses in India

## The India Story

Variables	Coefficient	Std. Err.	t	P>t
Income (L2)				
Animal Protein				
Year	-0.008	0.002	-3.350	0.004
Intercept	122.349	36.572	3.350	0.004

1% increase in income two years earlier leads to about 0.8% increase in current pulses'

consumption, but consumption decreases by 0.8% annually *t. par.*

**The income elasticity of pulses consumption in India is positive and inelastic but time has a negative effect on demand and expected to create a commodity opportunity**

leads to India but

We assume continuing growth in the Indian pulses market through to 2050





# Projected Regional Consumption Trends

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The income elasticity of consumption of pulses is positive and inelastic in all regions, except EU and Africa

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Animal protein consumption competes with pulses in all regions except India, but it was significant only in India and China



# Projected Regional Consumption Trends

Time is not statistically significant in North and South America, suggesting major gains have probably already been made from awareness, health and other unique market differentiating variables

Opportunities may exist for improving consumption in Europe, Africa and India but China is going to be a challenge going forward



# Conclusions

Three principal factors modelled to influence demand for pulses:

- Increasing global incomes and their effect on food choices and substitutions or restructuring of food hierarchies – think both Engel's theory and Bennett's theory
- Competition from animal proteins
- Health sensibilities and the increasing role of food in health conversations (see Netflix documentary *What the Health*) and resource constraints (arable land and fresh water)

Their effects are non-uniform across the regions



# Private and Public Policy Implications

- Based on income elasticity, competing protein sources, and time (health sensibilities)
  - there will be multiple market opportunities (niche and commodity markets)
- Need for innovative strategies towards policymaking and implementation to facilitate the pulses industry's ability to respond to the foregoing changes





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# Thank You



We acknowledge the data supplied by IMF, FAOSTAT and World Bank that facilitated this research.