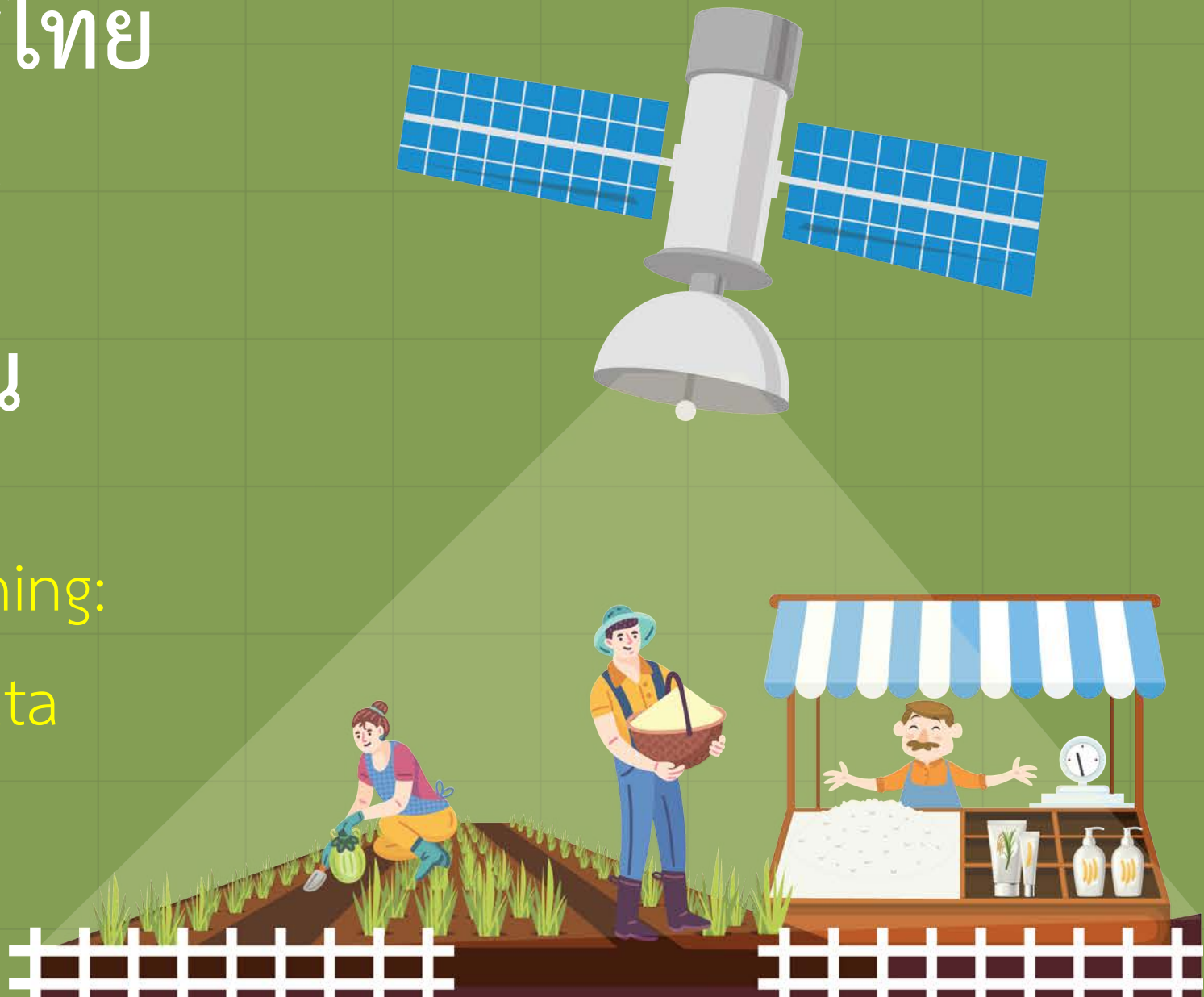
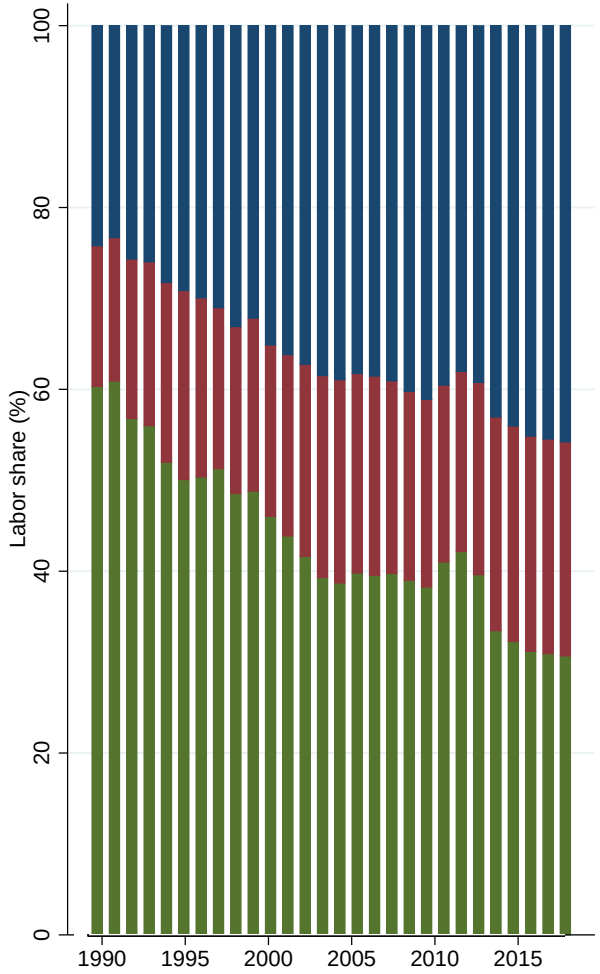
ภูมิทัศน์ภาคเกษตรไทย จะพลิกโฉมอย่างไร สู่การพัฒนาที่ยั่งยืน

Farms, Farmers and Farming:
a Perspective through Data
and Behavioral Insights

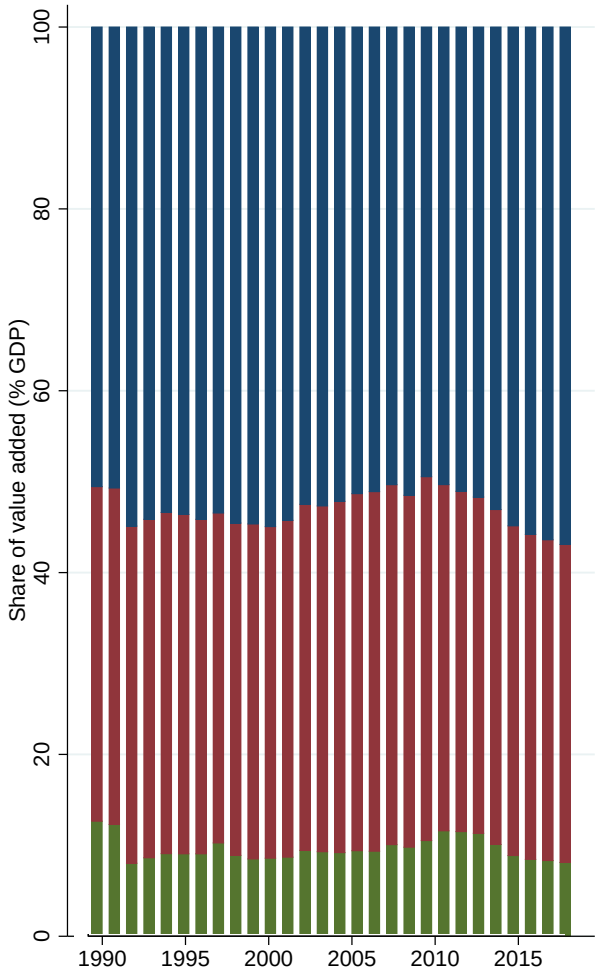


Agriculture in Thai economy: Significance but low value added/worker and slower growth relative to other sectors

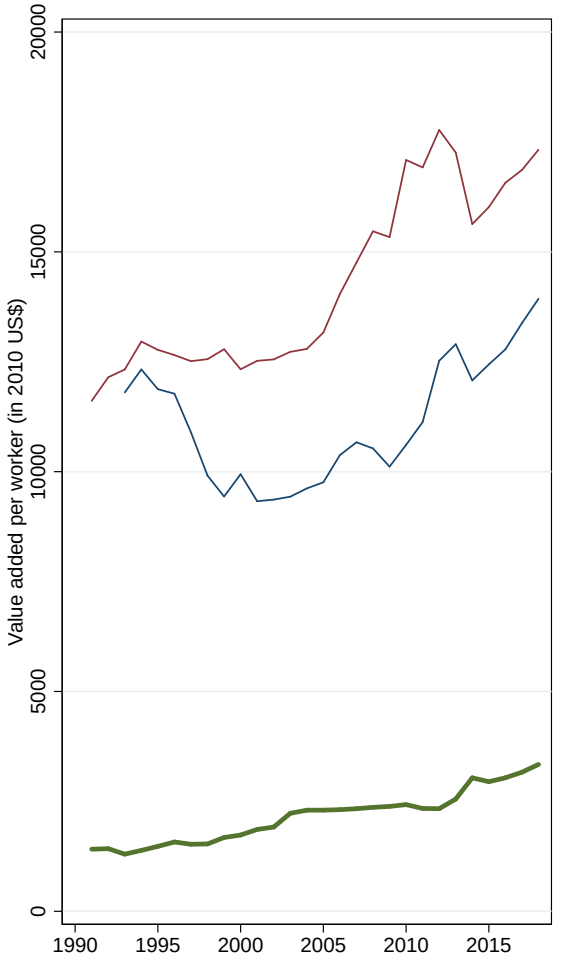
30% of labor in agriculture

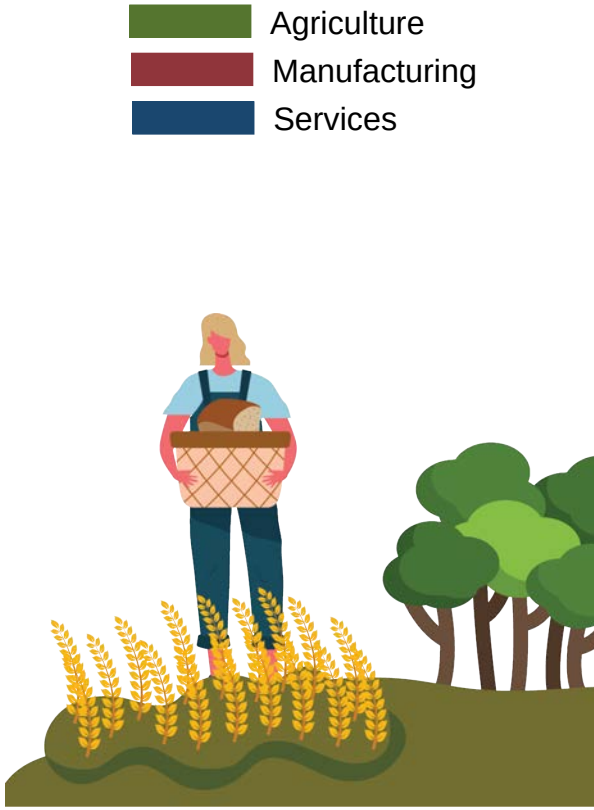


Only contribute 10% to GDP



Lowest value added per worker and slowest growth



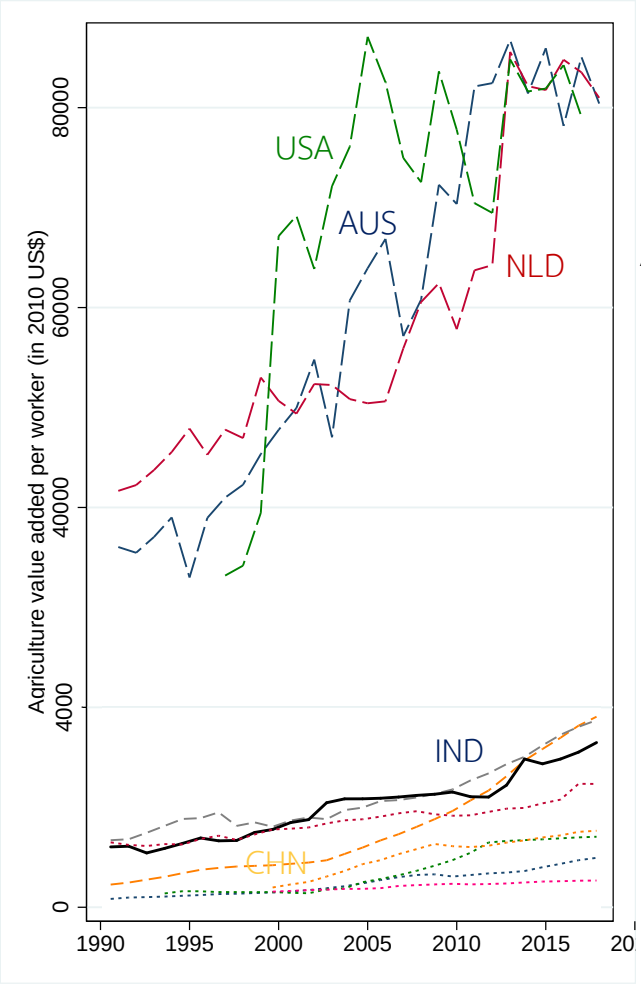


Data source: World Development Indicator, World Bank

Thai agriculture in the world market: Behind many 'competitors'

Are we also loosing our competitiveness in the world market?

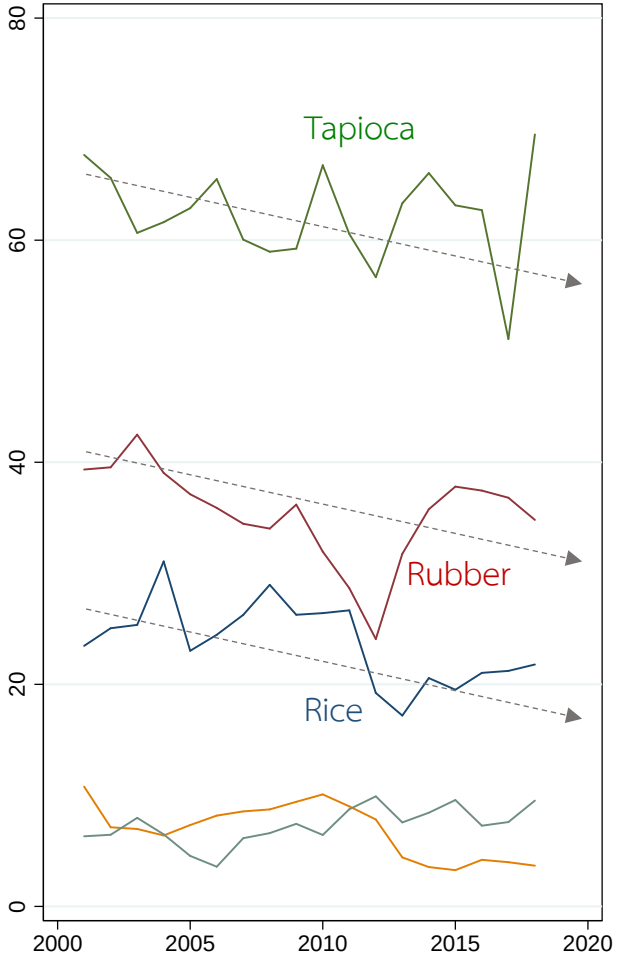
Low and slower growth relative to many competitors



Agriculture value added per worker

AUS
USA
IND
VNM
KHM
MMR
NLD
CHN
THA
PHL
LAO

Declining world market share of our competitive products



Export share in the world market

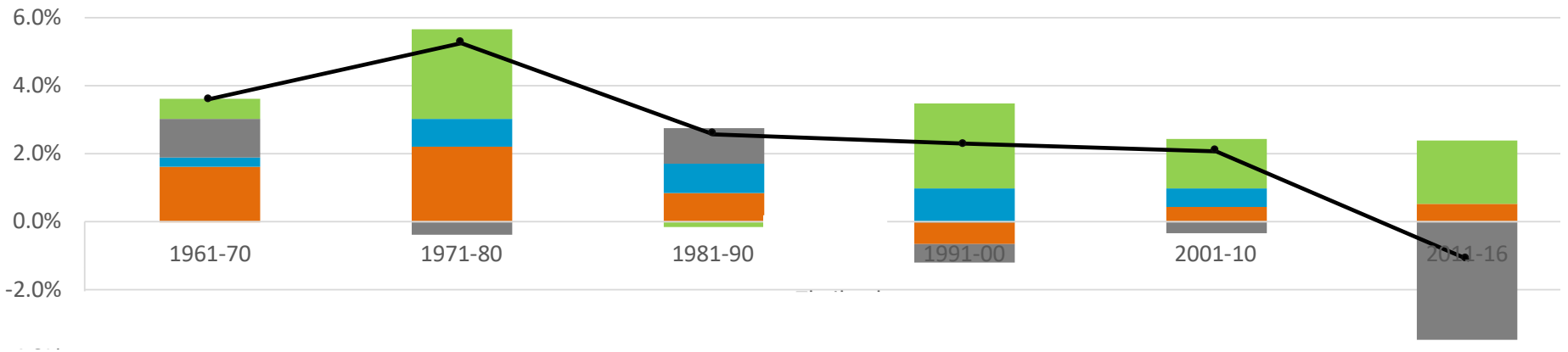
Rice
Tapioca
Sugar
Rubber
Crustaceans

Data source: World Development Indicator, World Bank

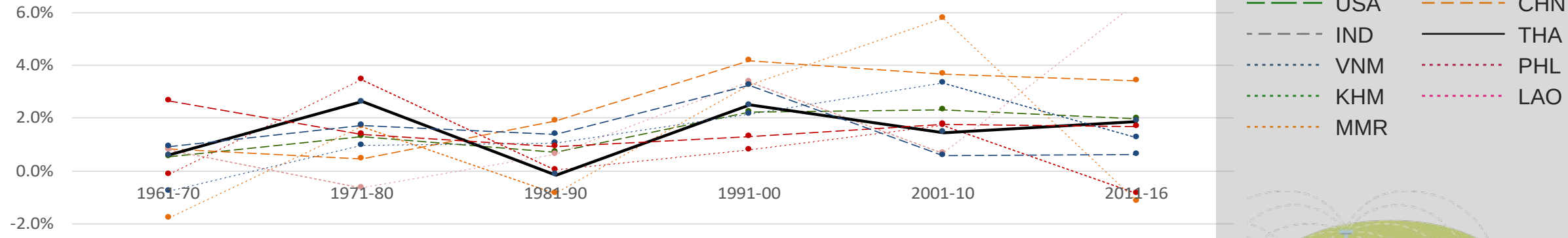
What drive Thailand's agricultural growth over the past 60 years?

TFP, our key engine of agricultural growth is also slowing

Source of agriculture value added growth



Total factor productivity (TFP) growth



Data source: International Agricultural Productivity Data Product, USDA Economic Research Service

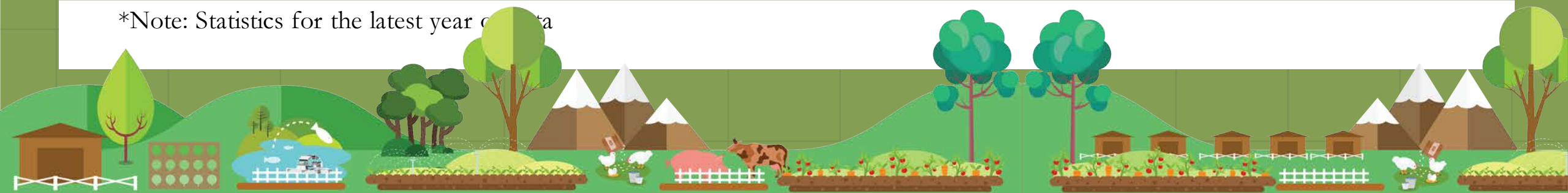
What happen to Thai agriculture?

This paper provides landscape knowledge through data and behavioral insights

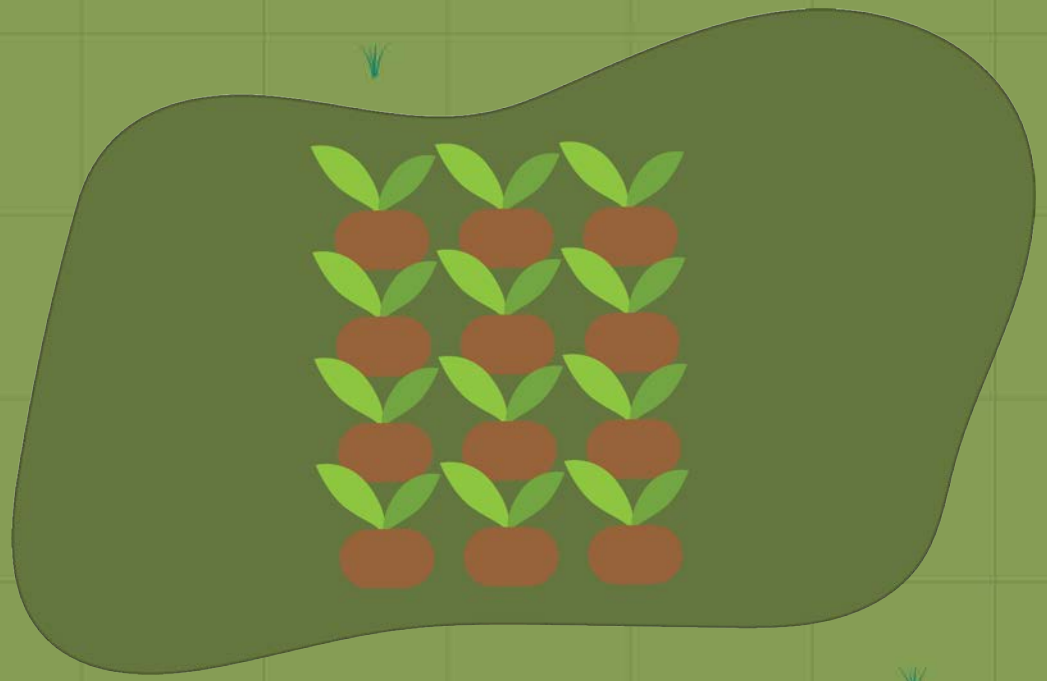
Our main data sources

Data	Year	Households	Individuals	Plots
Farmer registration (DOAE)	2015-2018	5,760,702	15,645,003	12,803,520
Agriculture census (NSO)	2003, 2013	5,911,567	19,678,956	10,689,803
Agricultural household survey (OAE)	2006-2018	6,997	27,003	26,107
Agricultural productivity and prices (OAE)	2012-2018	-	-	-
Loan portfolio of sampled farmers (BAAC)	2012-2018	-	1,000,000	-
Policy participation (DOAE)	2018	3,249,795	-	-

*Note: Statistics for the latest year of data

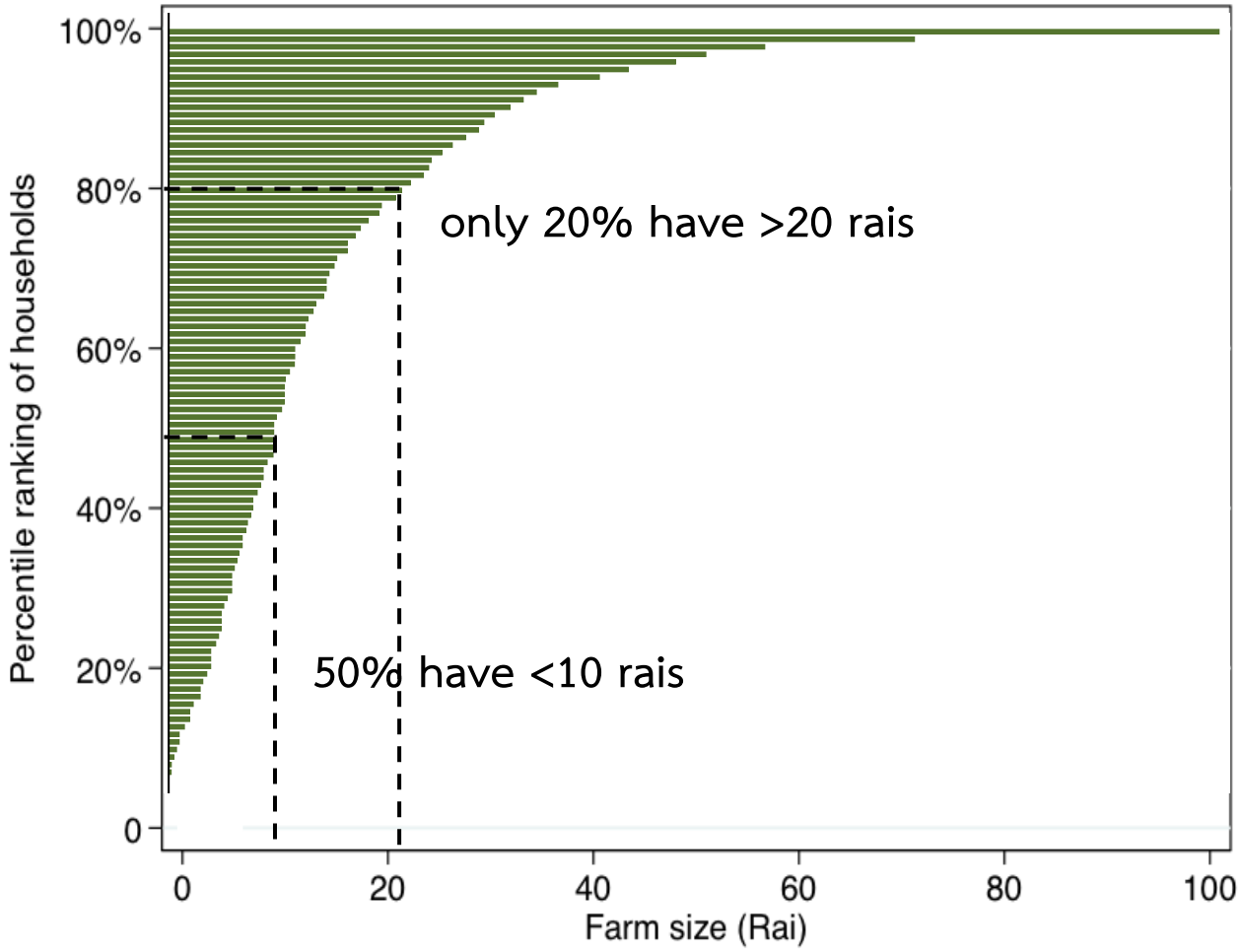


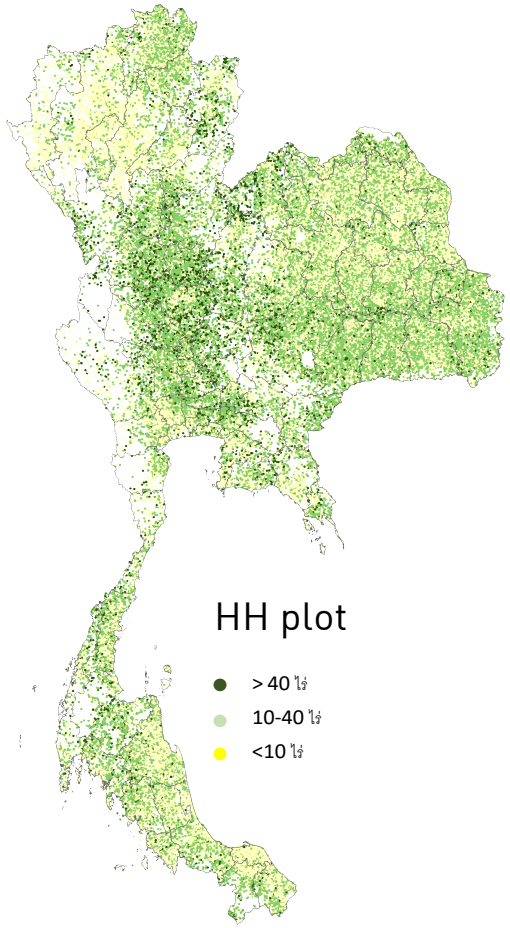
Farms

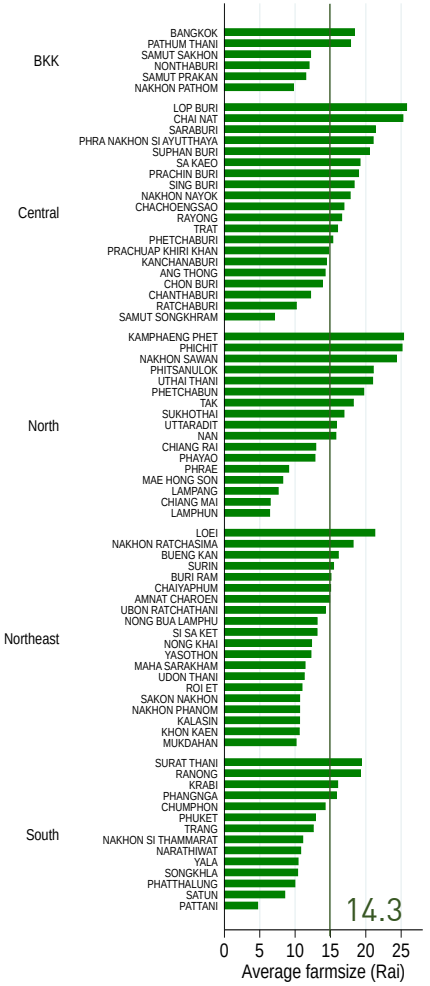


1. Majority of our farmers are smallholders

- Average farm size of 14.3 rai/household



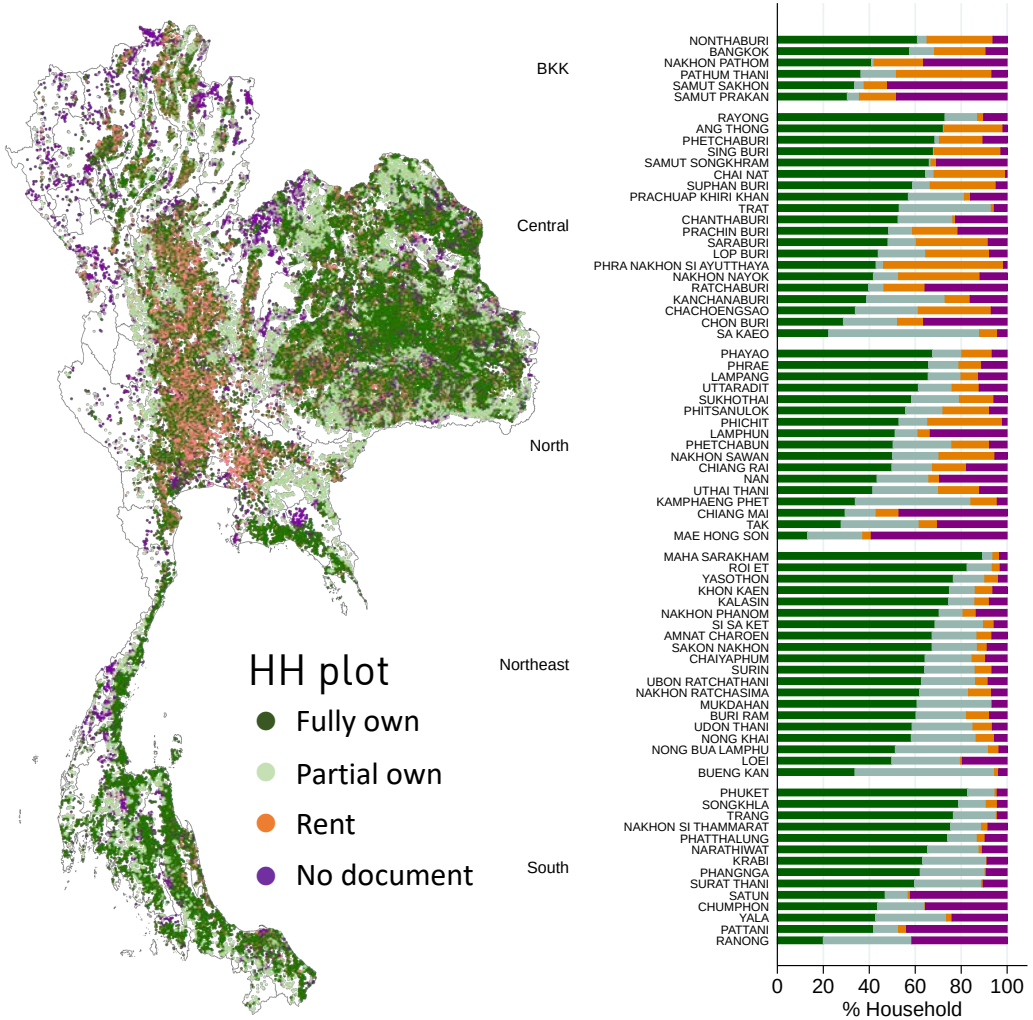




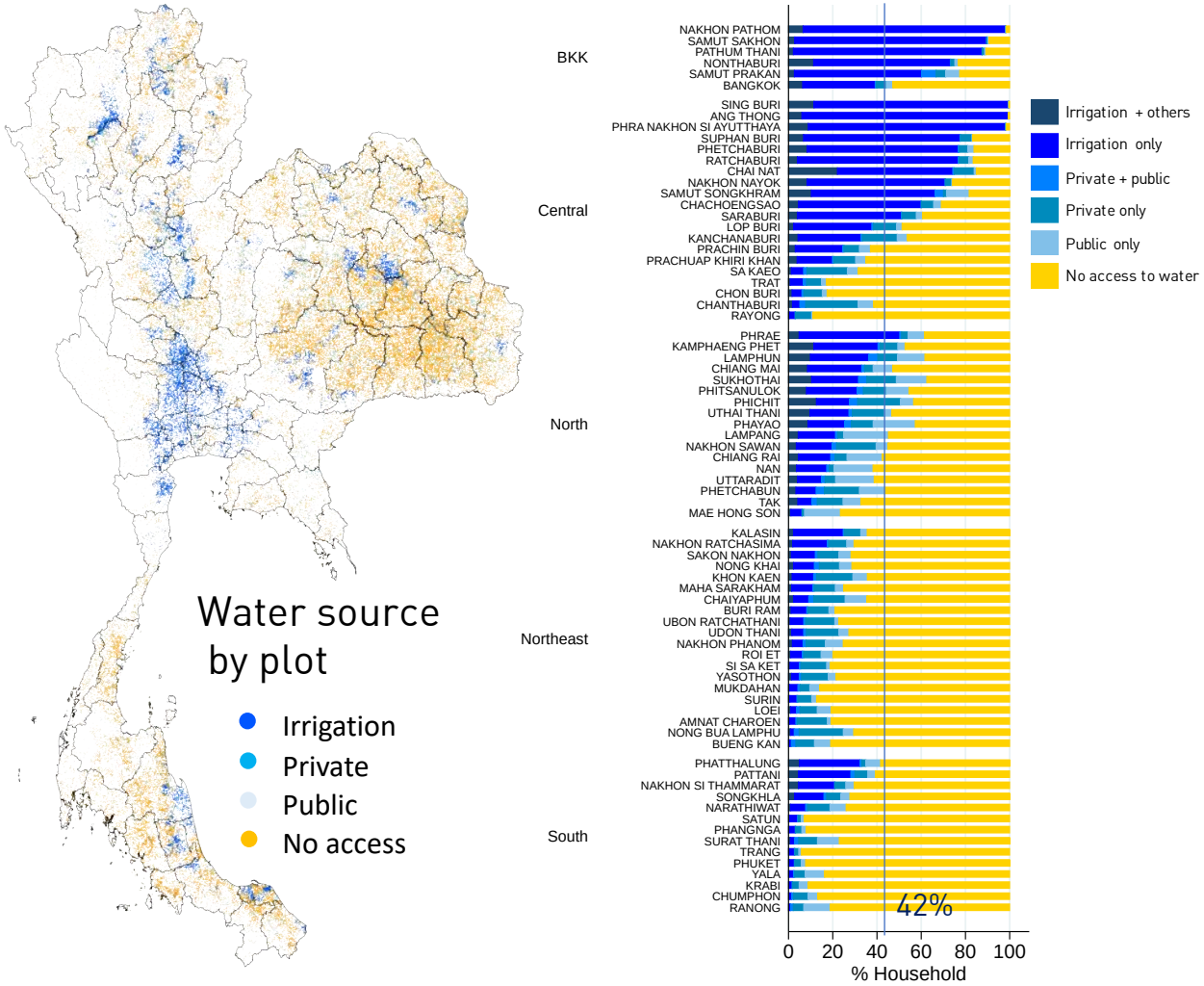
Data source: Farmer registration 2018

2. Still large inequality in land ownership and access to water resource

- 40% of households do not have land ownership

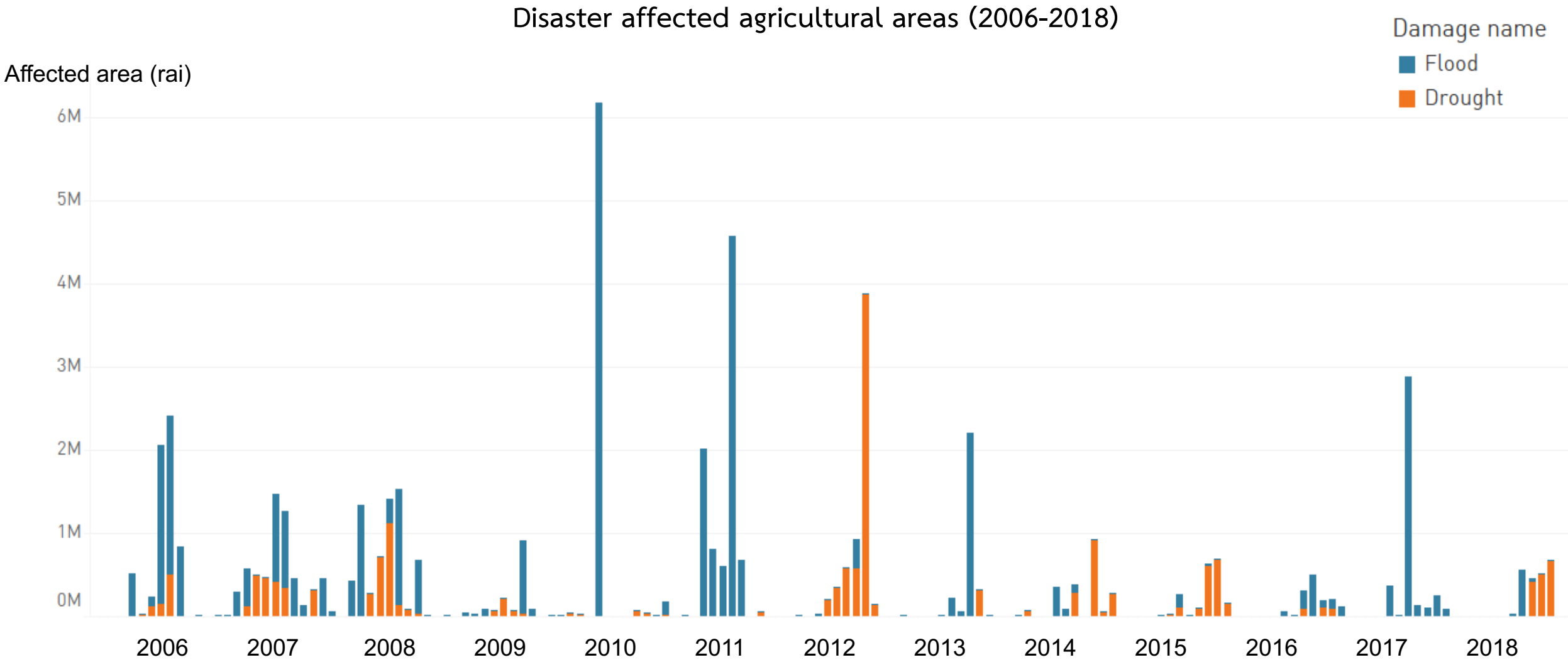


- 58% still cannot access to water resource



Data source: Farmer registration 2018

3. Large exposures to climate risk
... and climate change



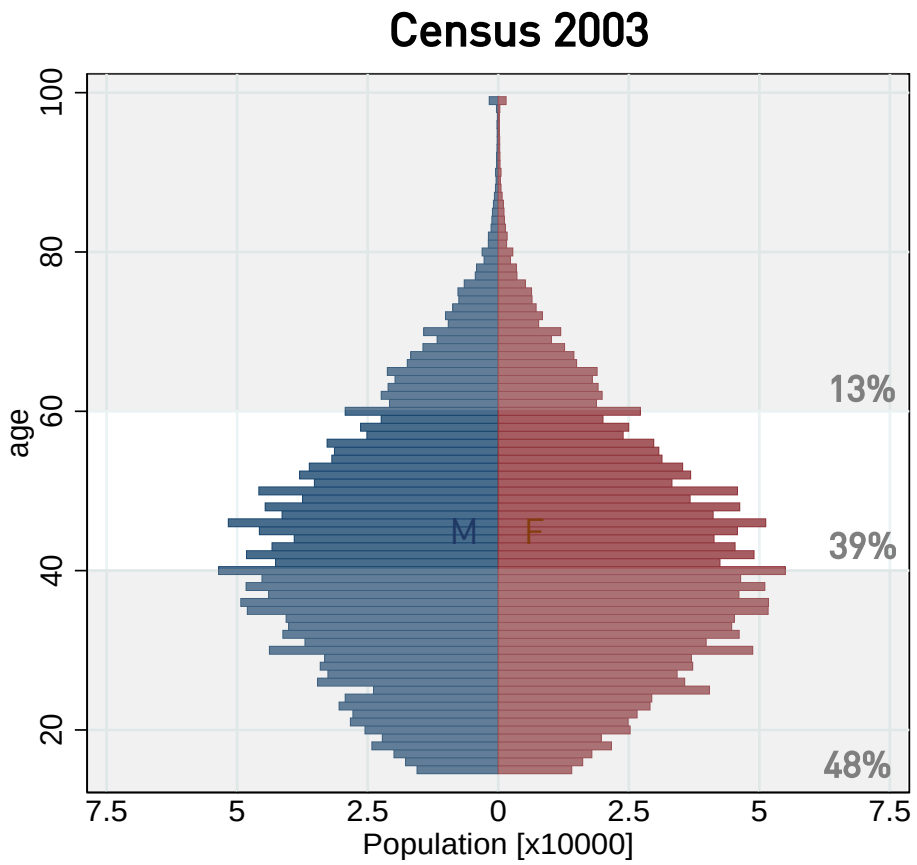
Data source: DOAE 2006-2018

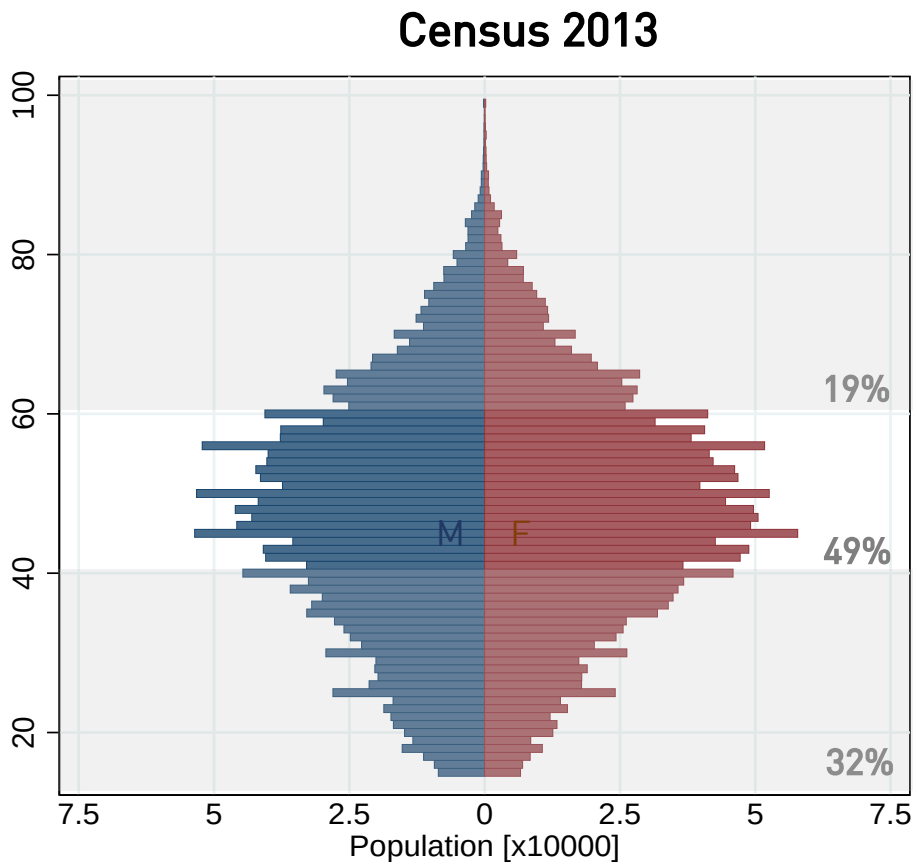
Farmers

4. Rapidly aging farmers

Large prevalence and intensity of aging problem within households

- Declining young labors (<40) and increasing ratio of old labors (>60)
- 46% of households have old labor & mean head age is now 58 years old

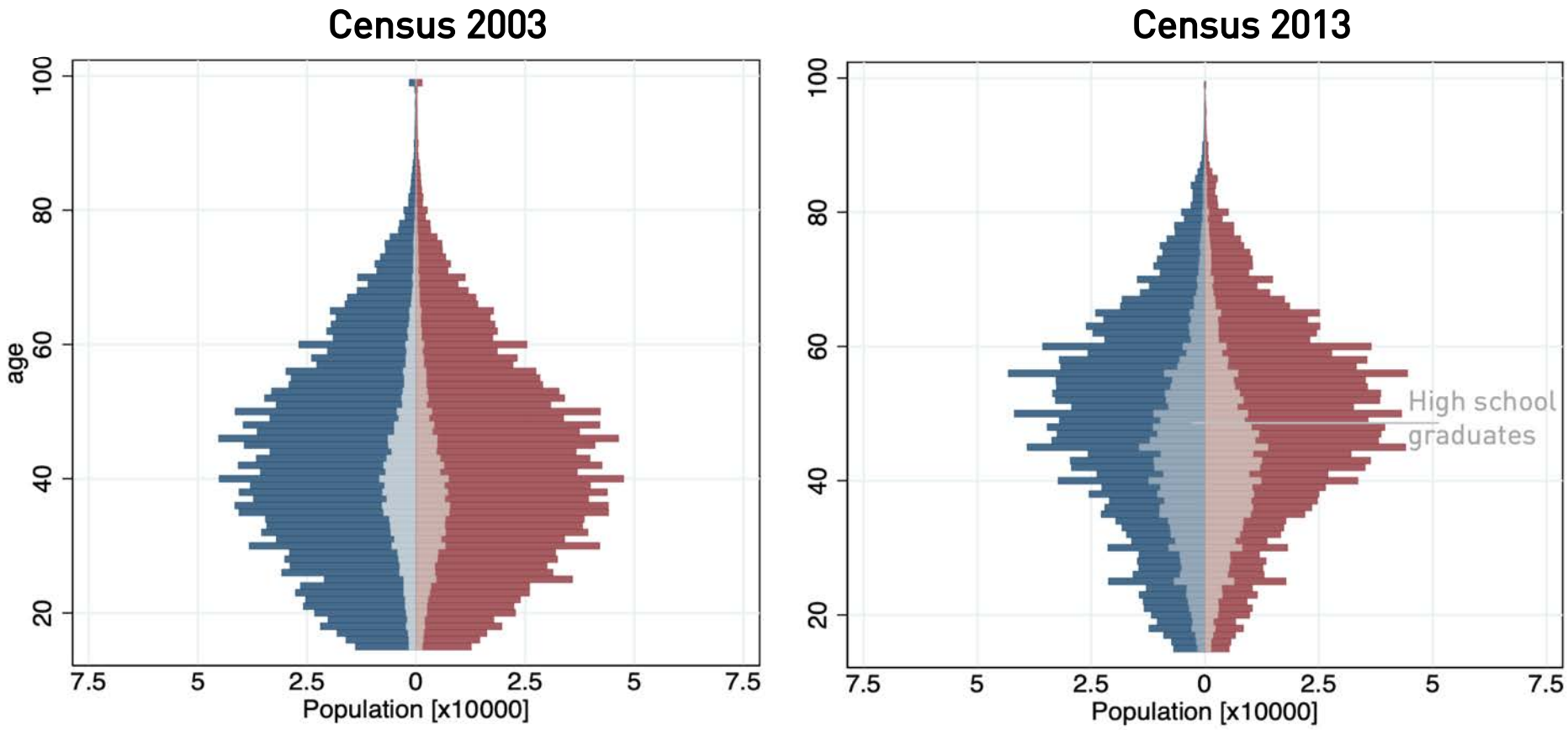




Data source: Census 2003-13

5. Increasing education especially among young labors

- Larger number of labors with high school graduate



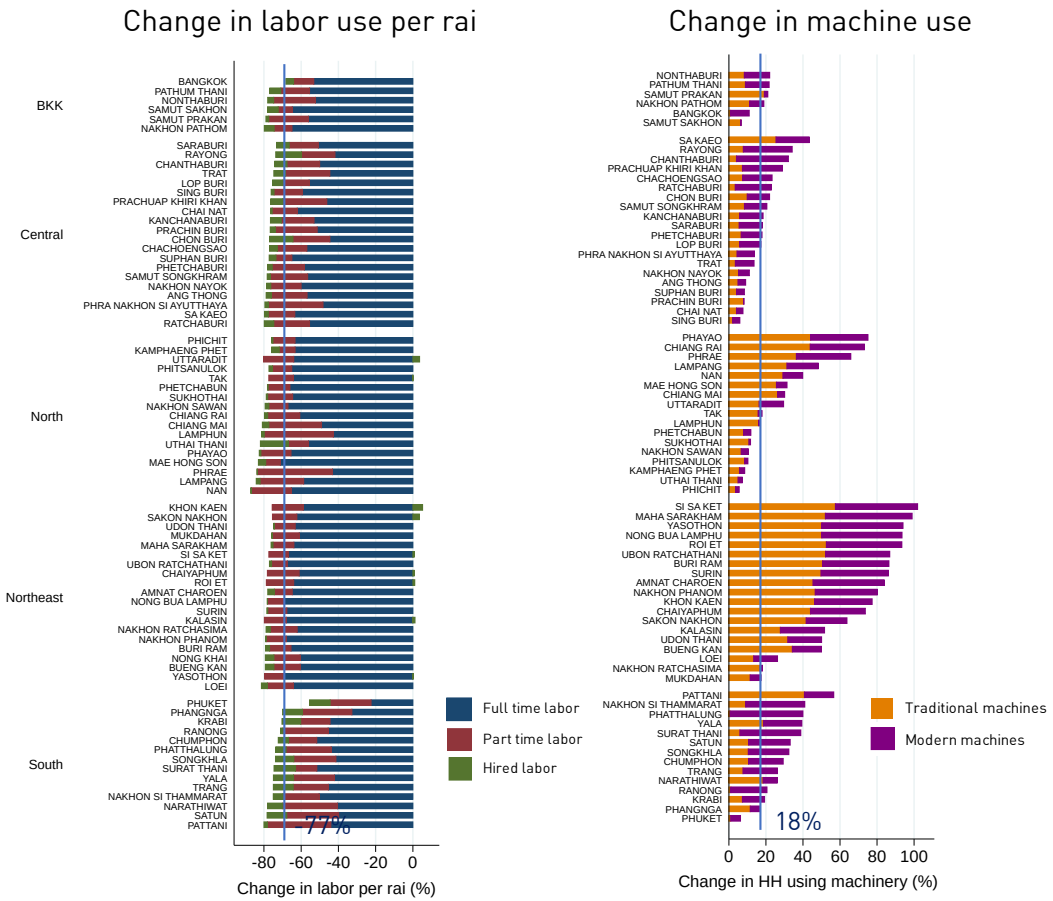
Data source: Census 2003-13

Farming

6. Still large variations in the use of technology

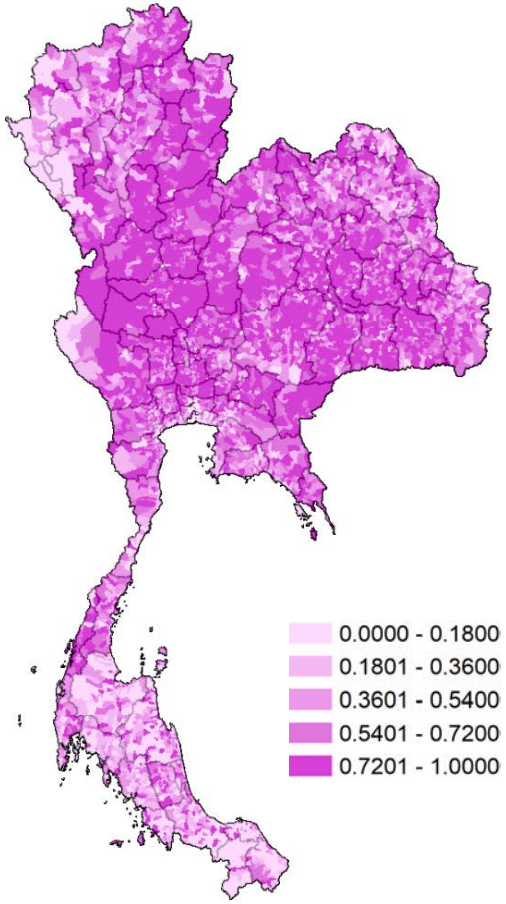
- Structural transformation: Increasing use of mechanization and decline of labor

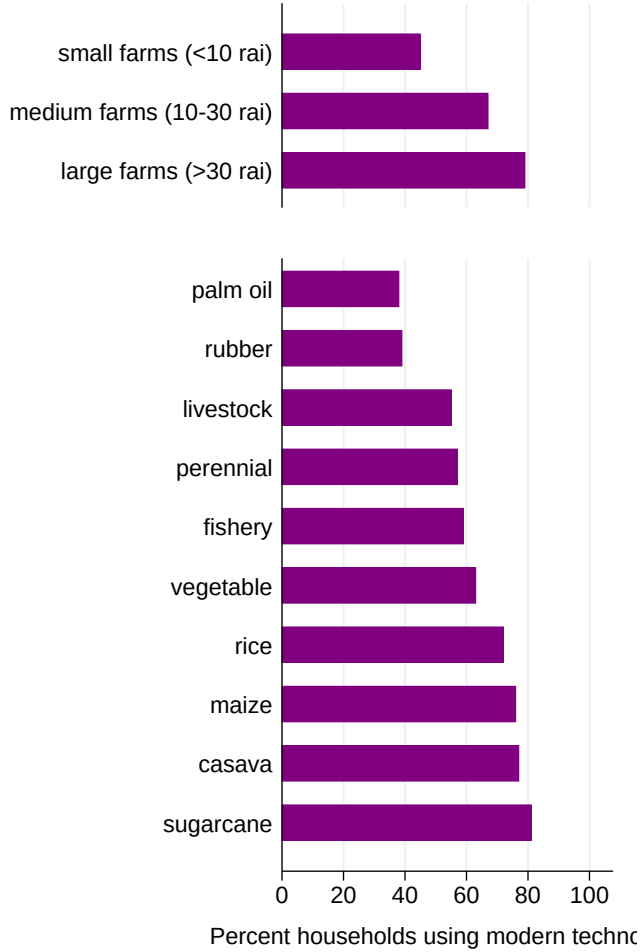
Census 2003-2013



- But technology used vary across farms and activities

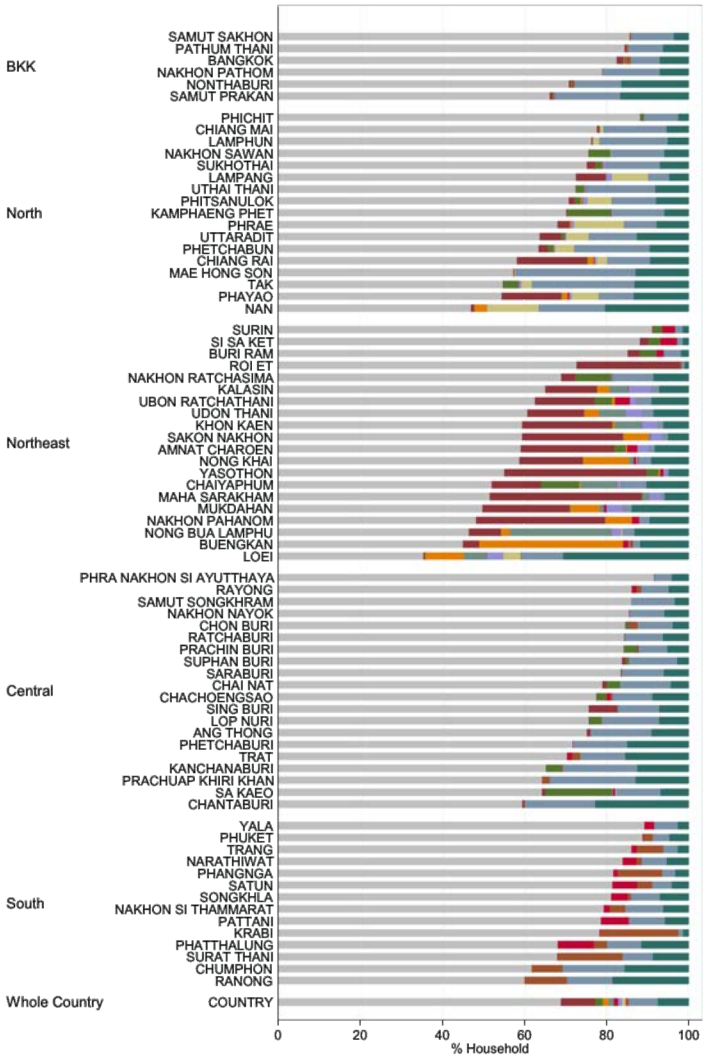
Percent of household using modern technology





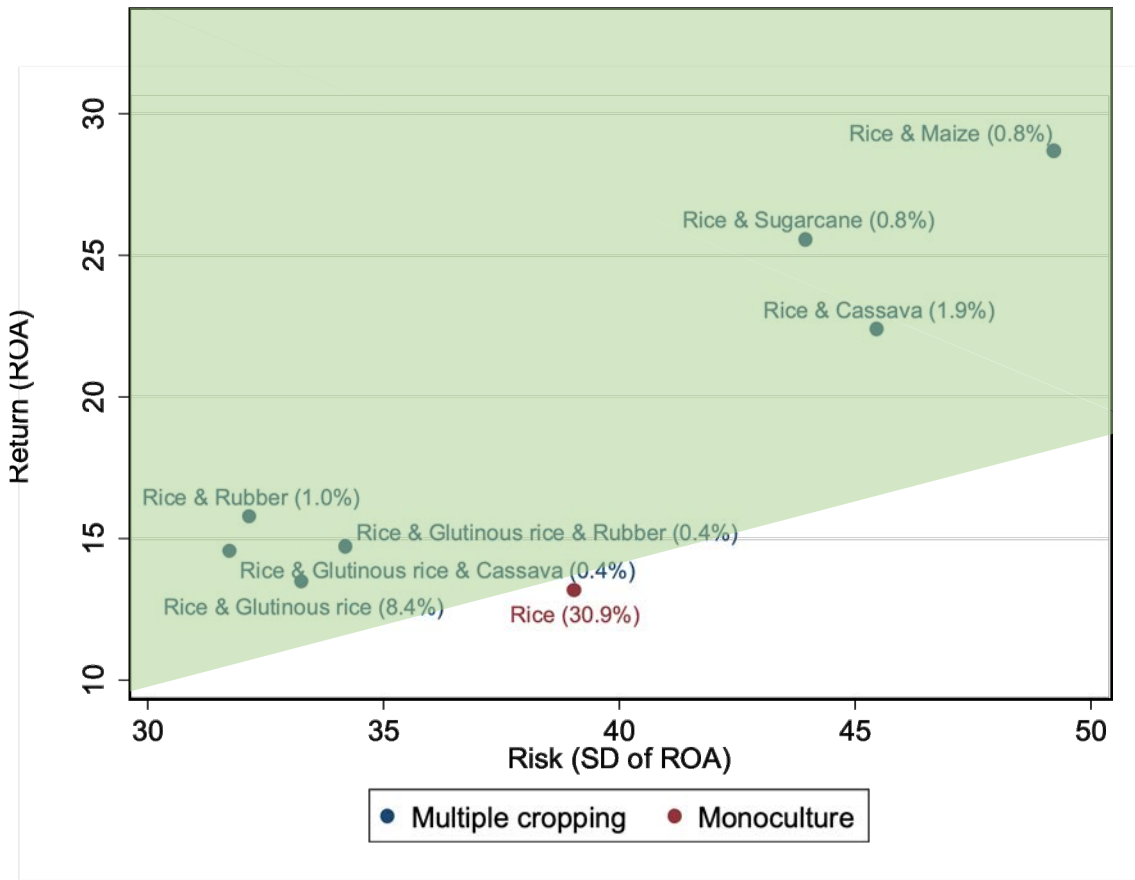
7. Resistance to adapt: Majority still stick with ‘high risk low return’ monocropping

- 2 in 3 of households still grow one crop a year, especially for key crops … which yield low risk adjusted return



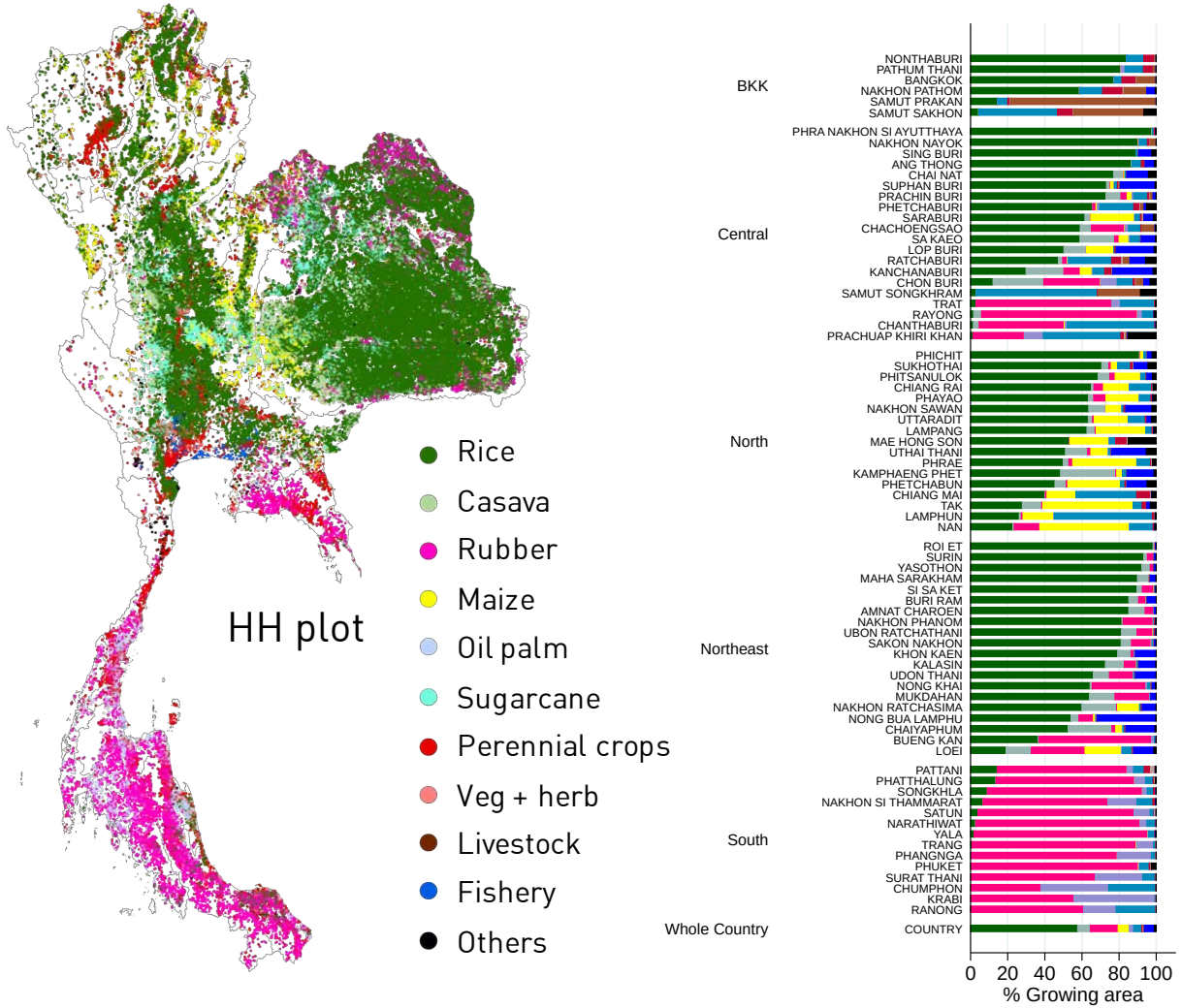
Top ten farm diversification

Top diversification portfolios with rice



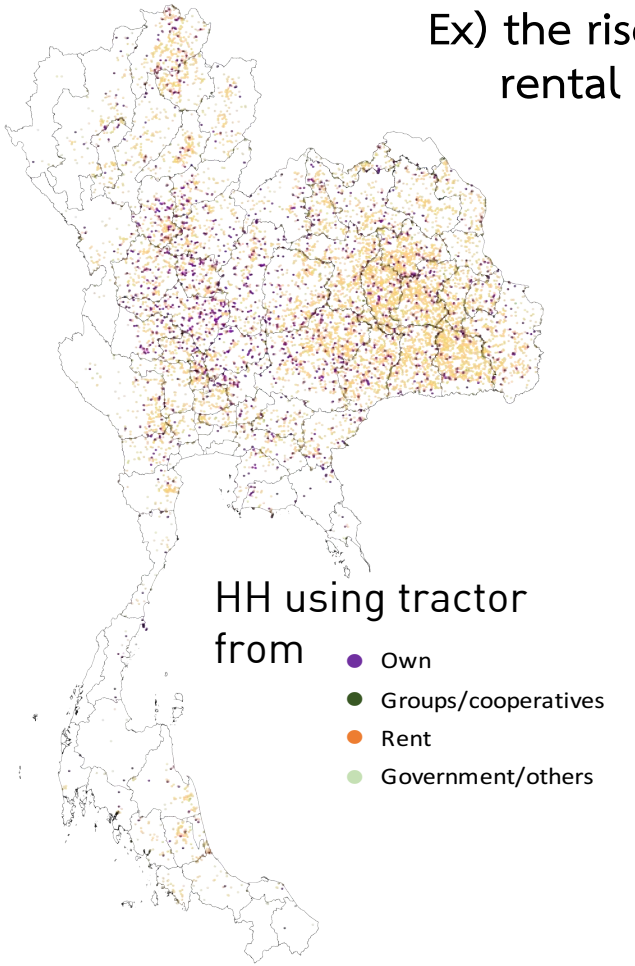
8. Gains from Economies of scale due to geographically concentrated farming

- Agricultural production is largely geographically concentrated



- Gain from economies of scale:

Ex) the rise of active rental markets

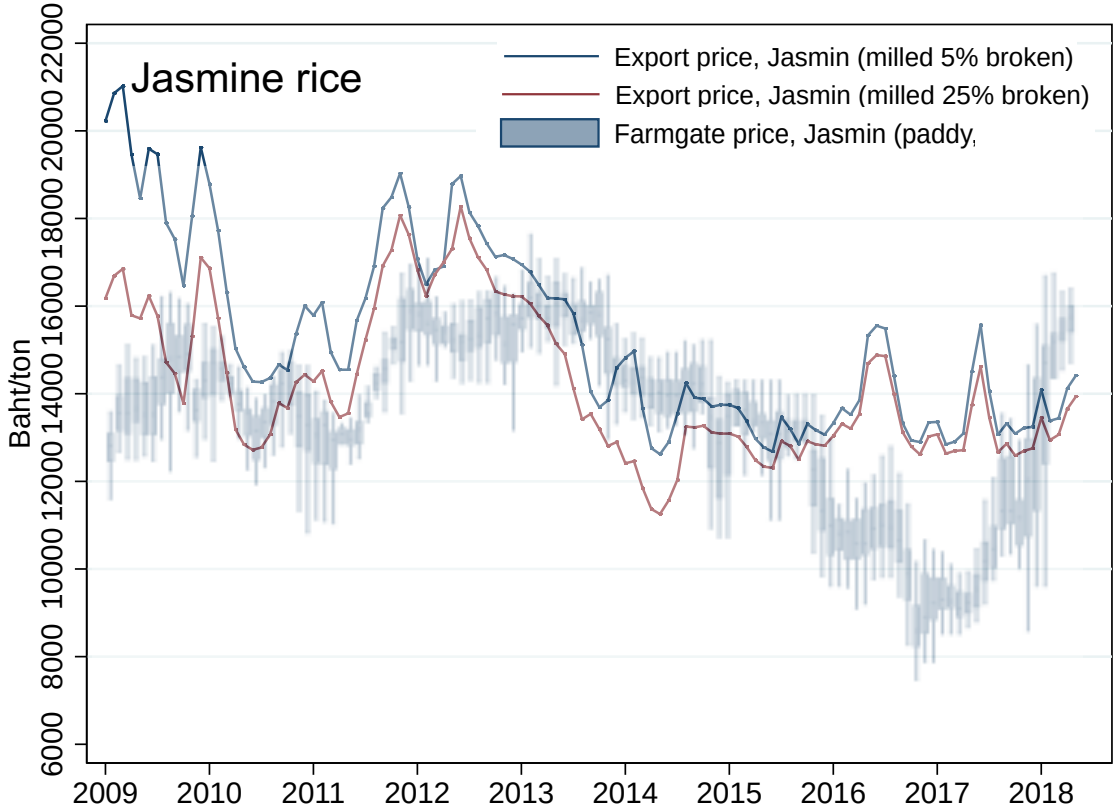


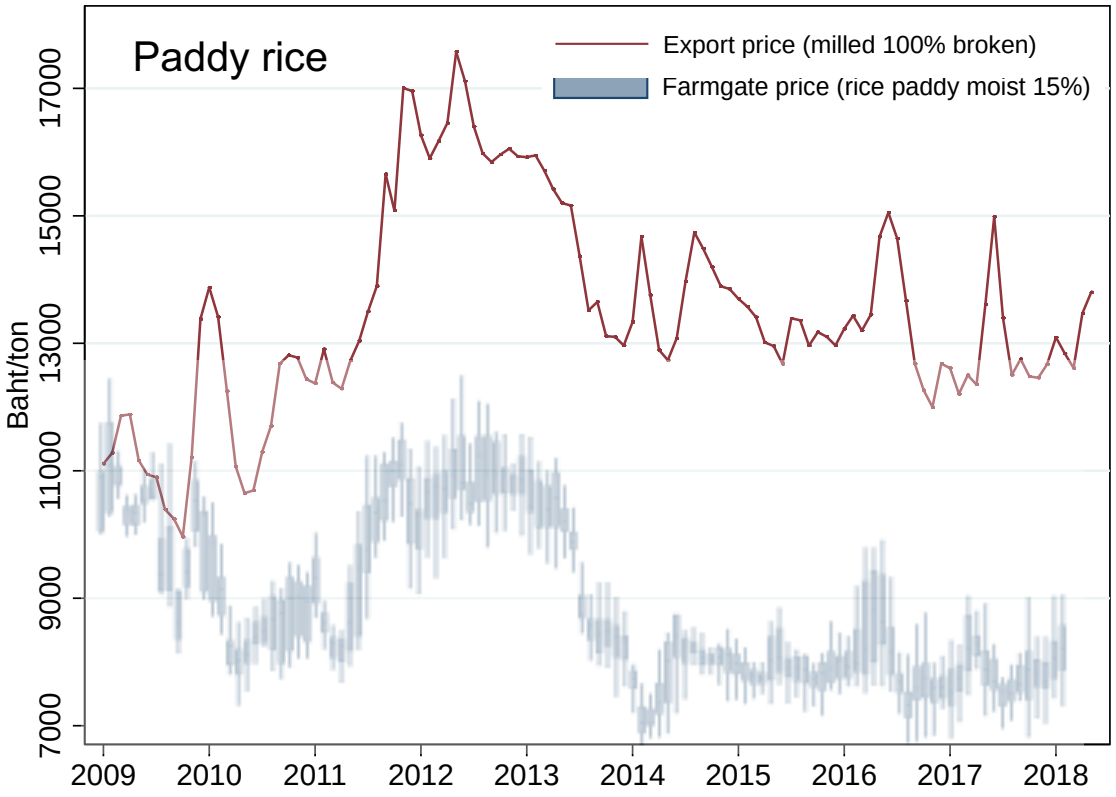
Data source: Farmer registration 2018

Markets

Far from perfect integration to world market (export to farmgate price transmission)

Do we meet the rising market demand for quality?: Far less than perfect price transmission especially for 'quality' product

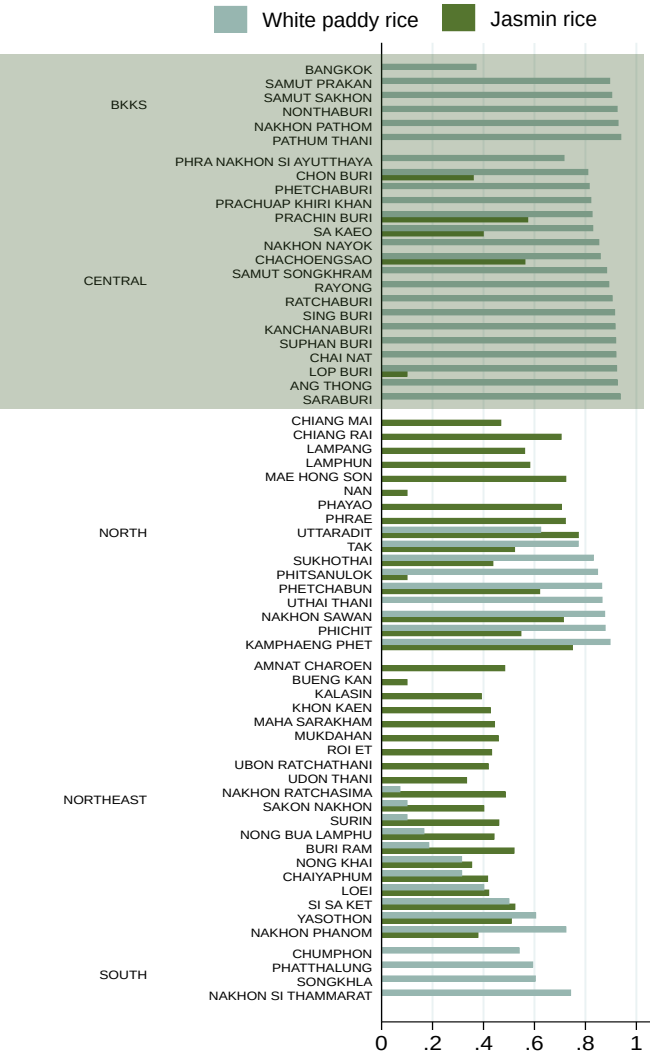




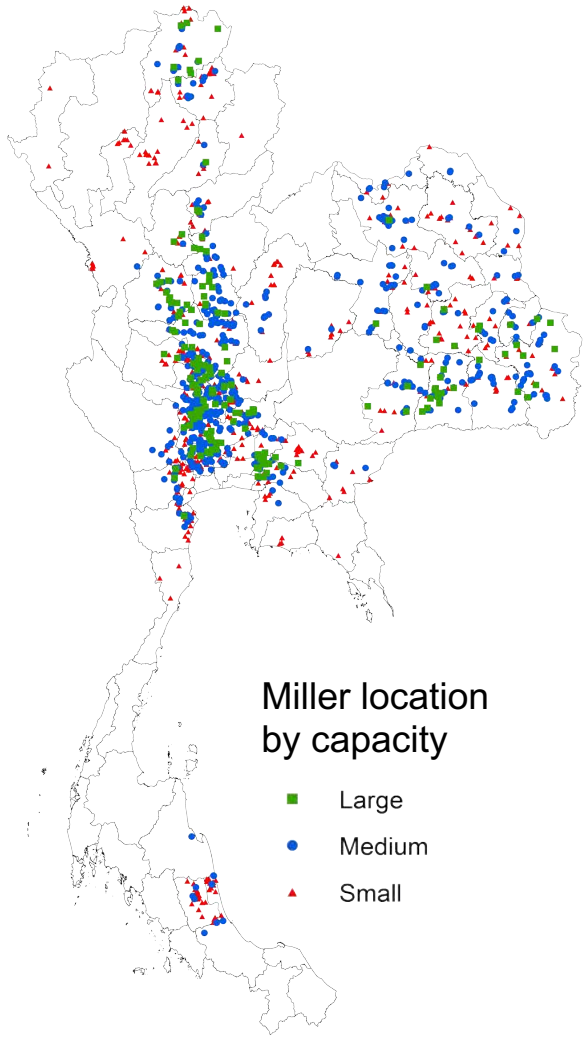
Data source: OAE 2009-2018

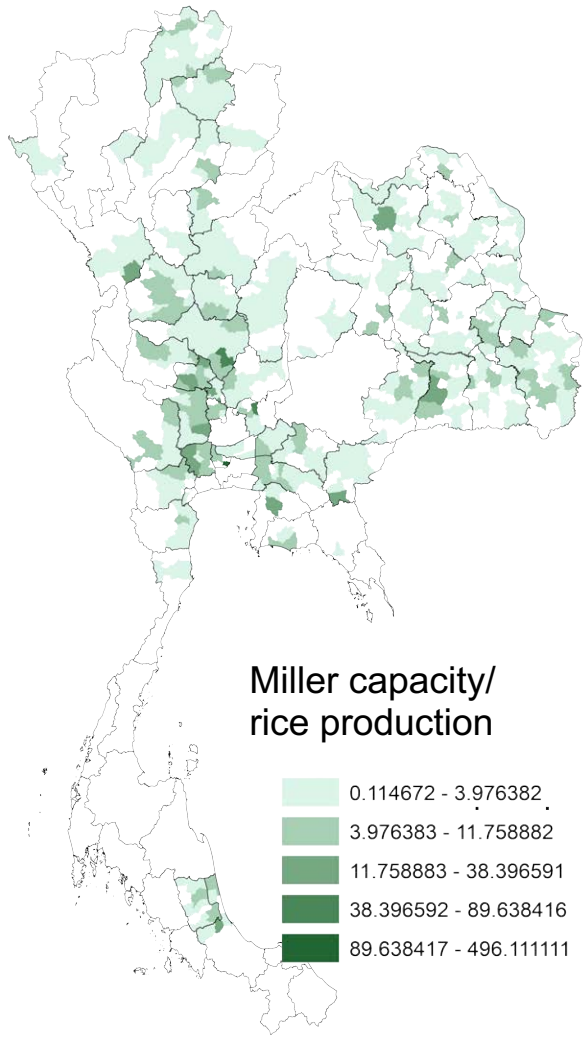
9. Not fully integrate to market: quality, market structure and inefficiencies

Correlations of export and farmgate prices

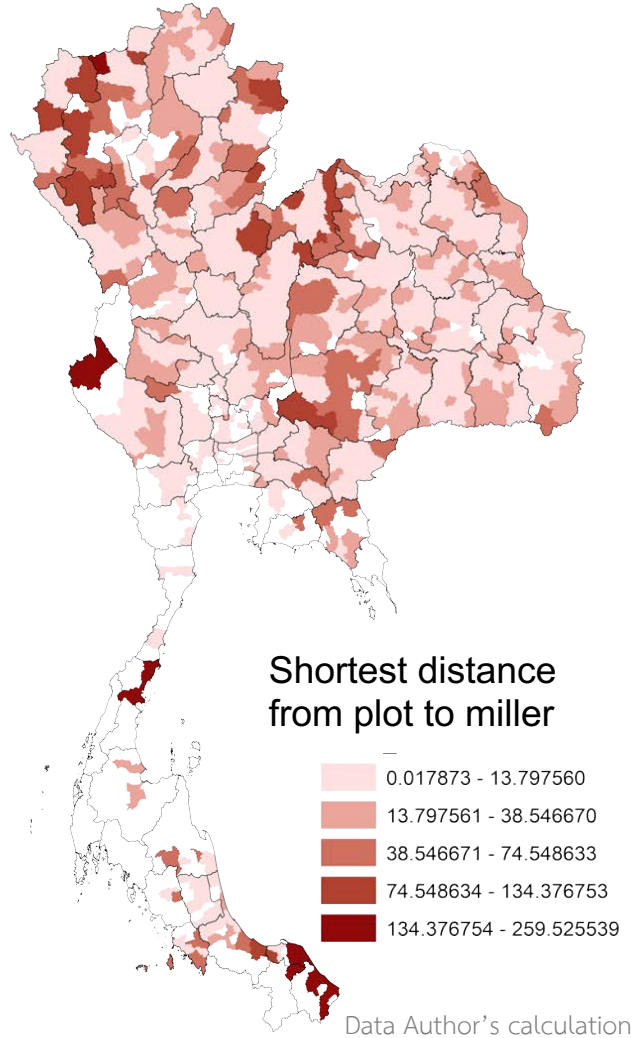


Varying market competition



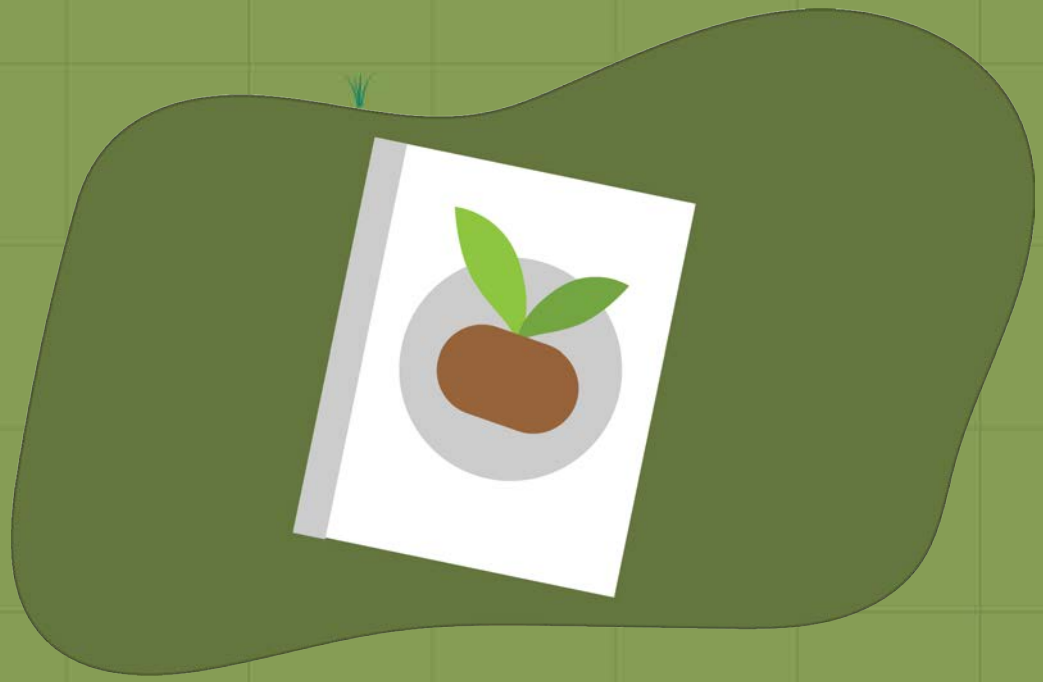


Varying transaction costs

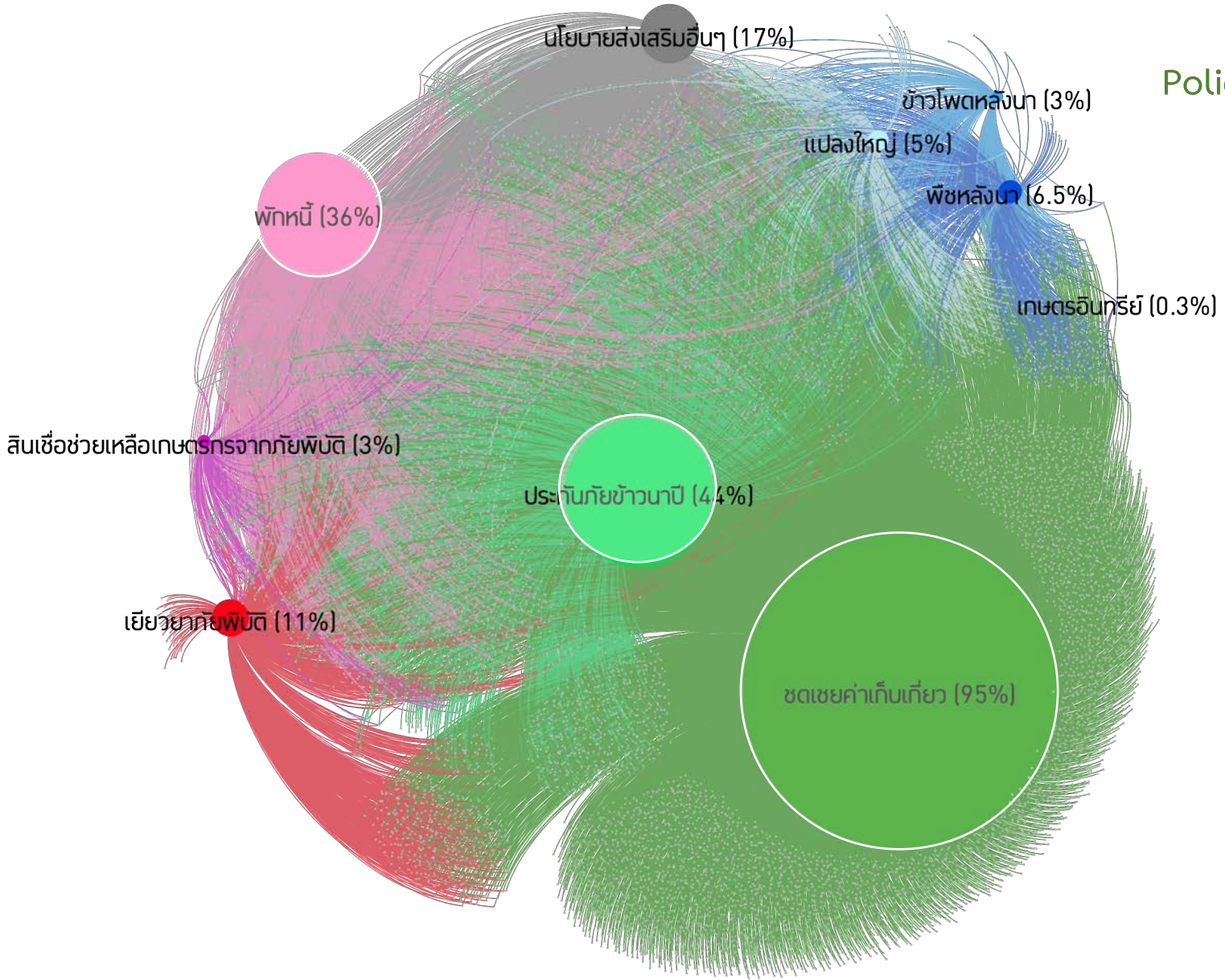


Data Author's calculation

Policies



10. Too much focus on short-term policy assistance could hurt than help?



Policy participation of registered rice farmers (2018)

- Small coverage of growth-driven policies
- Large focus on 'unconditional' assistances

  Average support ~17,000/yr/household

- Attavanich et al. 2019, Chantarat et al. 2019 show these assistances could

  1) Reduce incentive for farmers to adapt

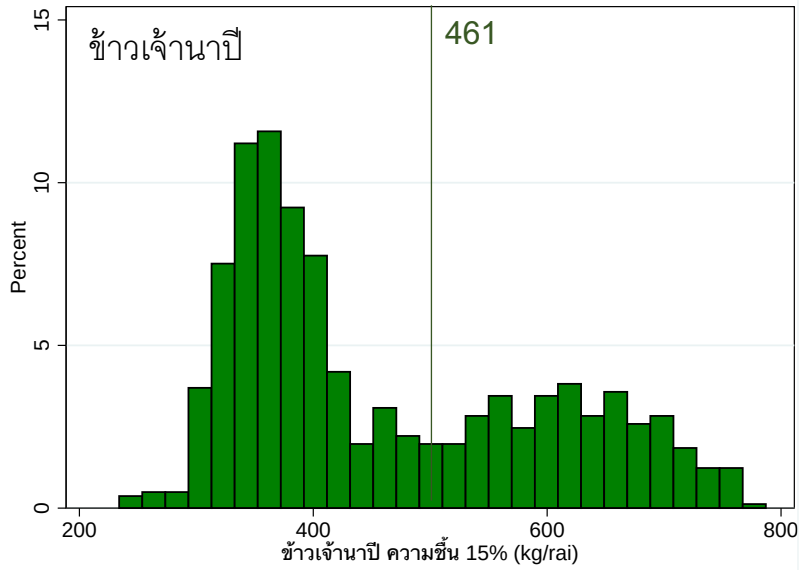
  2) Increase excessive risk taking

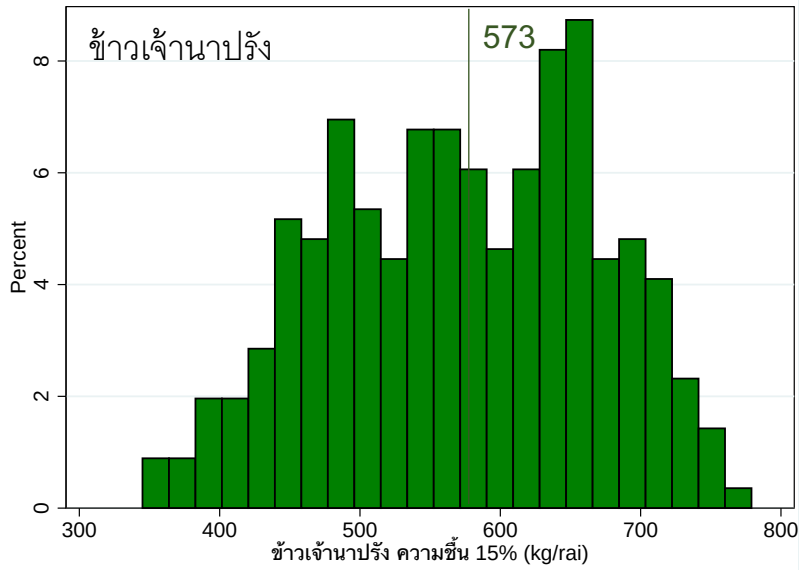
Data source: DOAE 2018

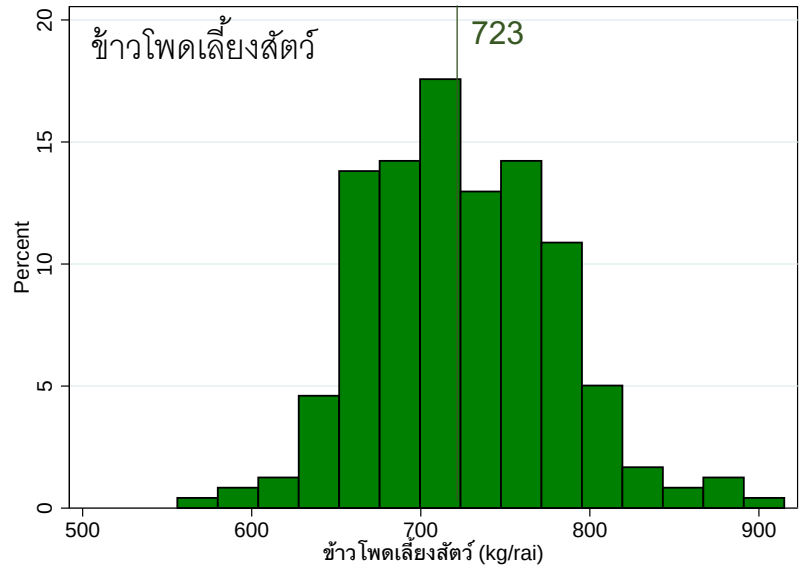
Farming outcomes

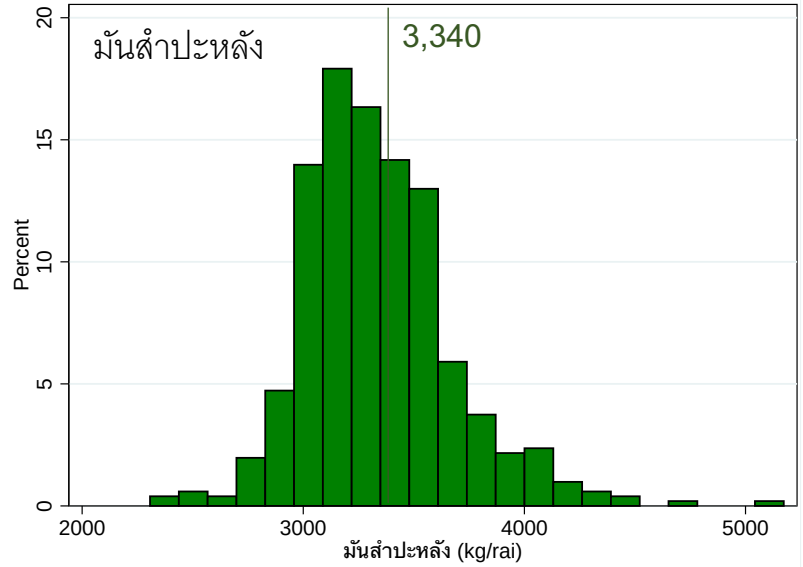
Large variations in productivity

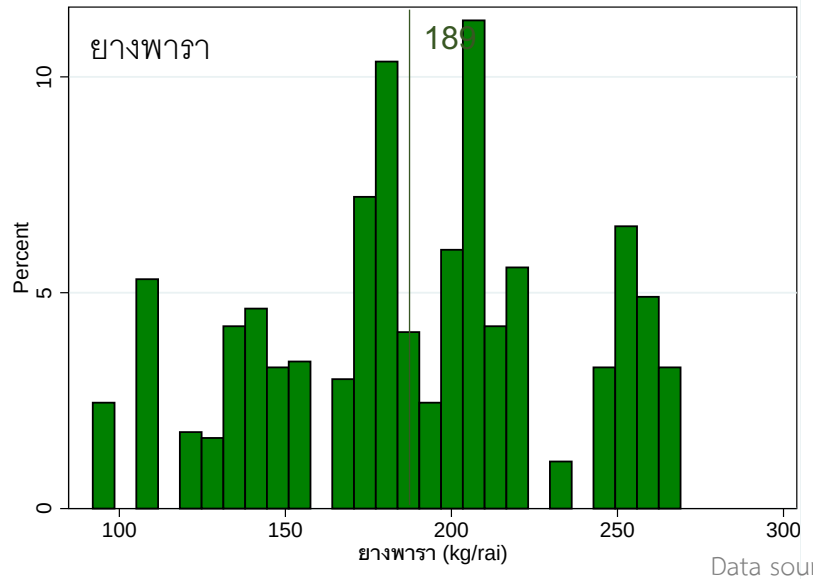
Yield per rai (2018)

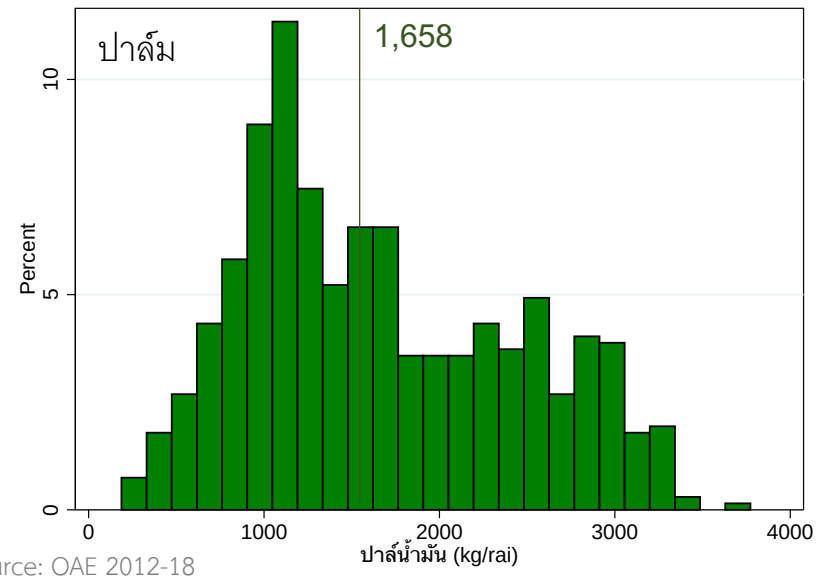








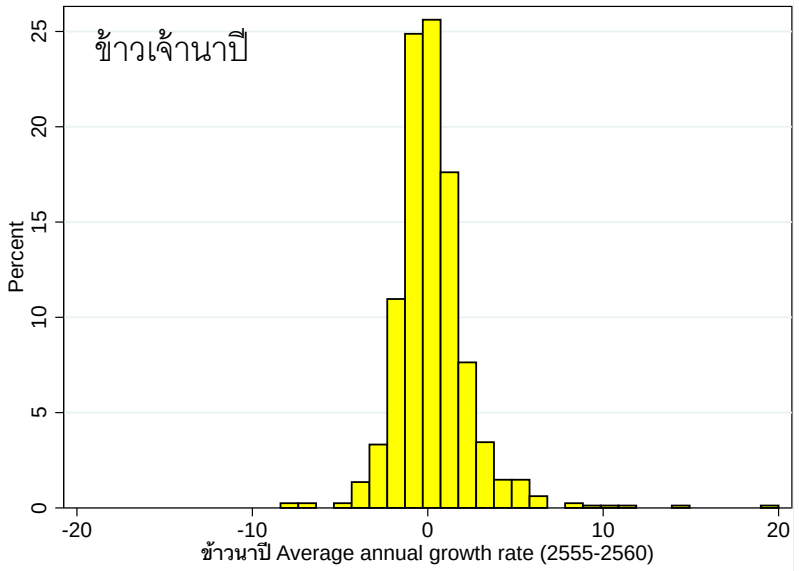


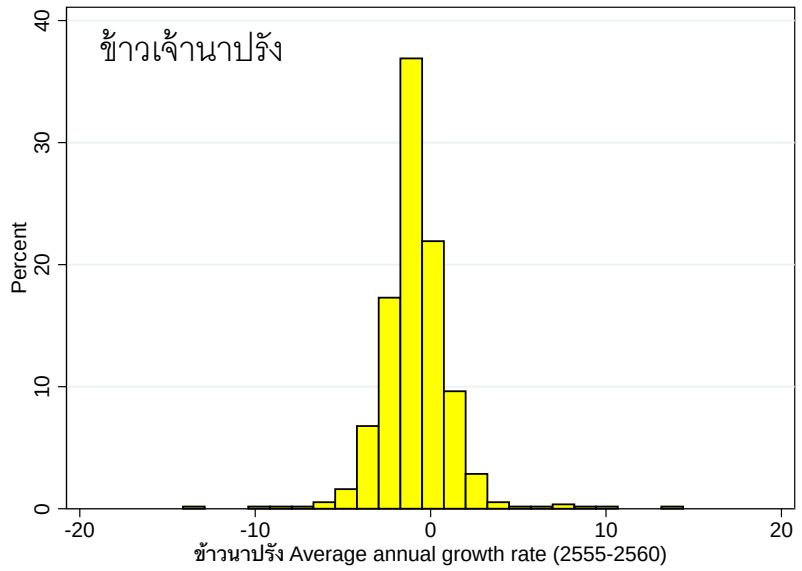


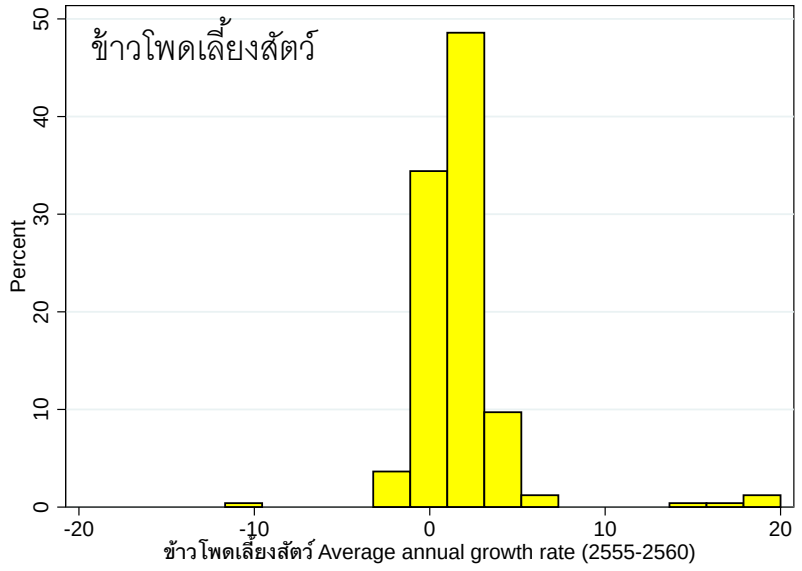
Data source: OAE 2012-18

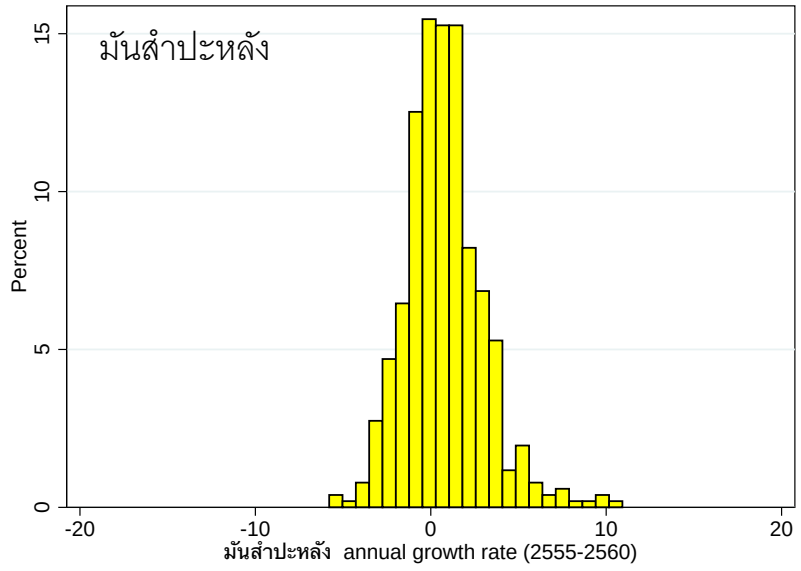
11. Large variations in productivity and productivity growth

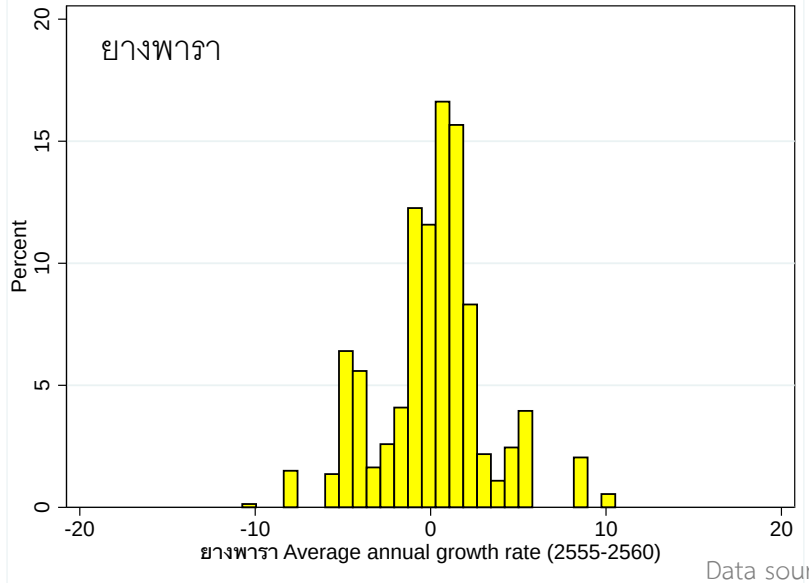
Average Annual growth (2012-18)

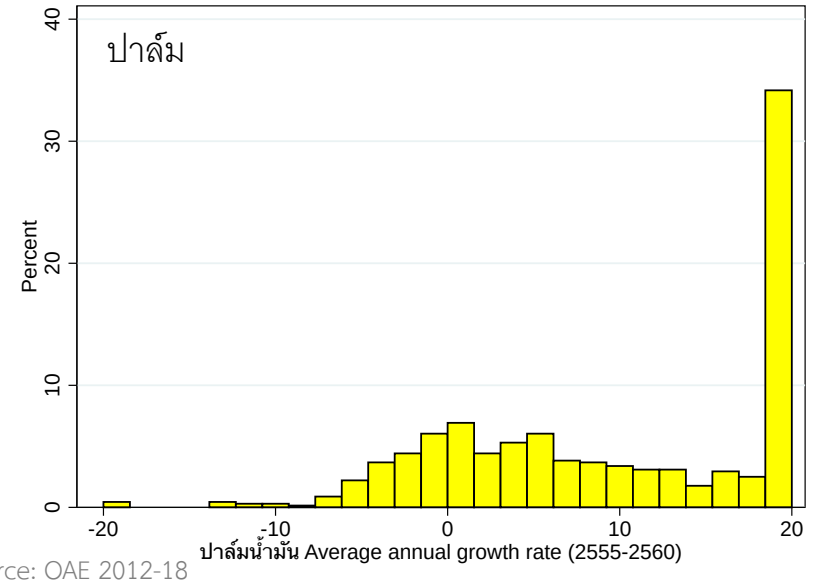










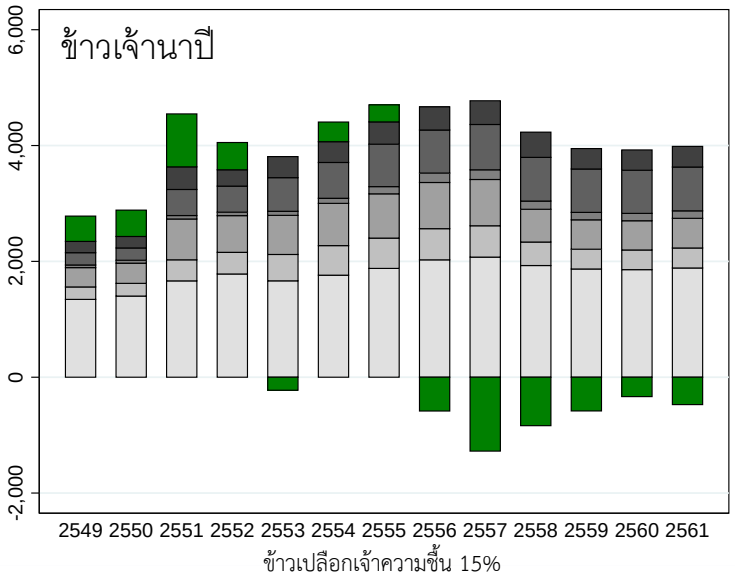


Data source: OAE 2012-18

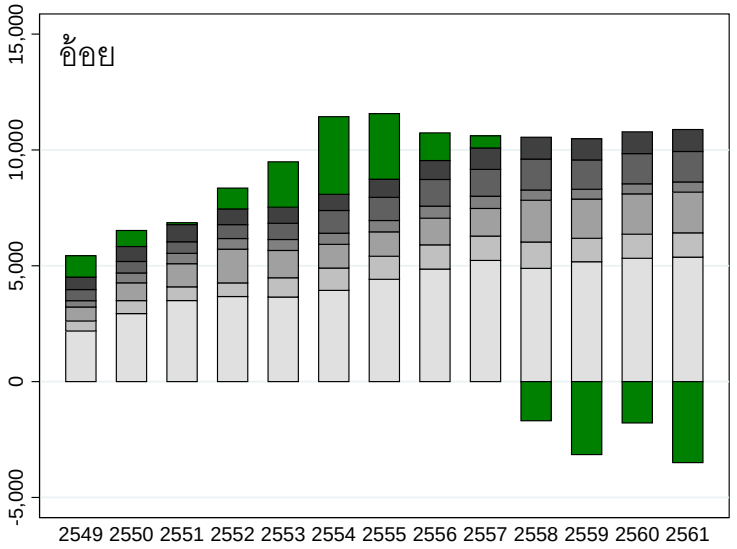
12. Rising costs and decline in margin

Profit-cost per rai (2006-18)

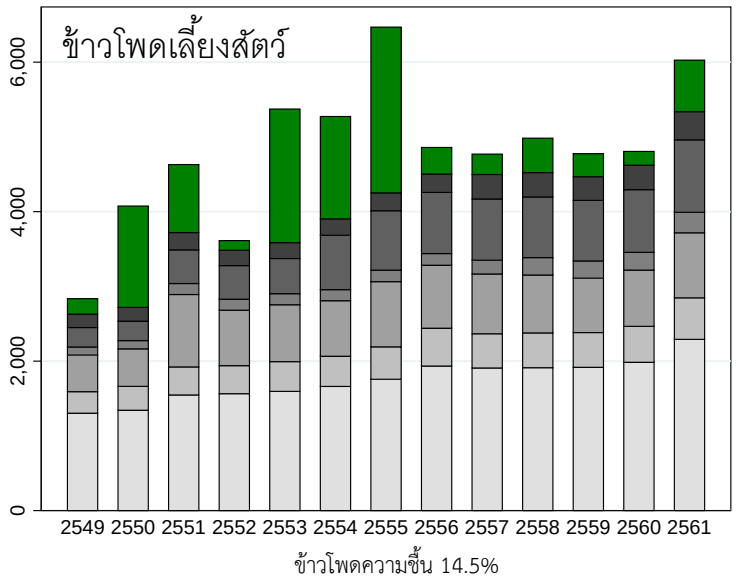
laborcost
fertilizer
landrent
netprofit
seed
pesticide
other



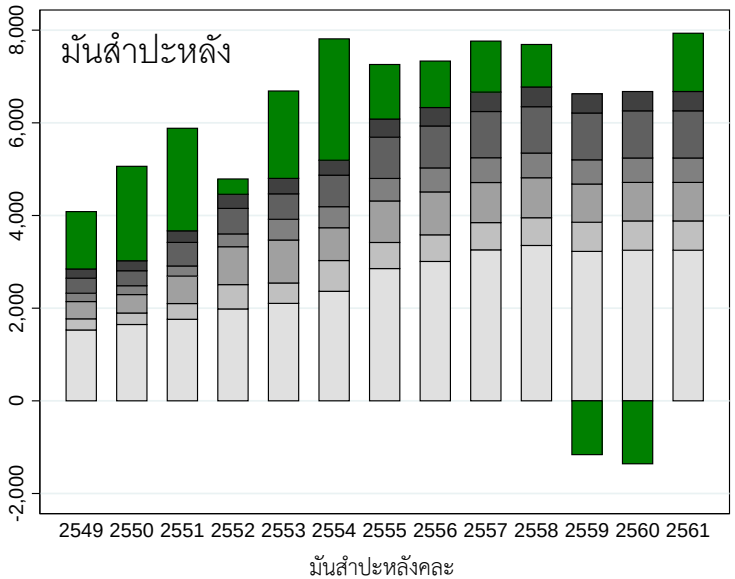
ข้าวเปลือกเจ้าความชื้น 15%



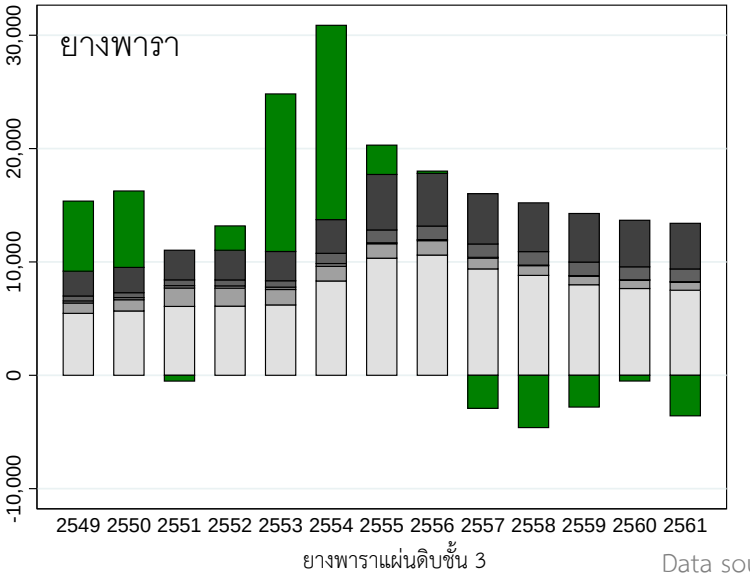
อ้อยโรงงาน



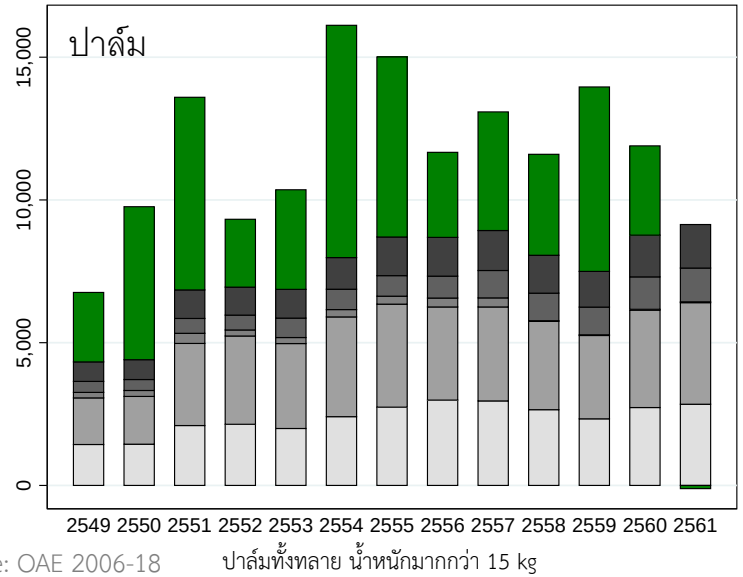
ข้าวโพดความชื้น 14.5%



มันสำปะหลังคละ



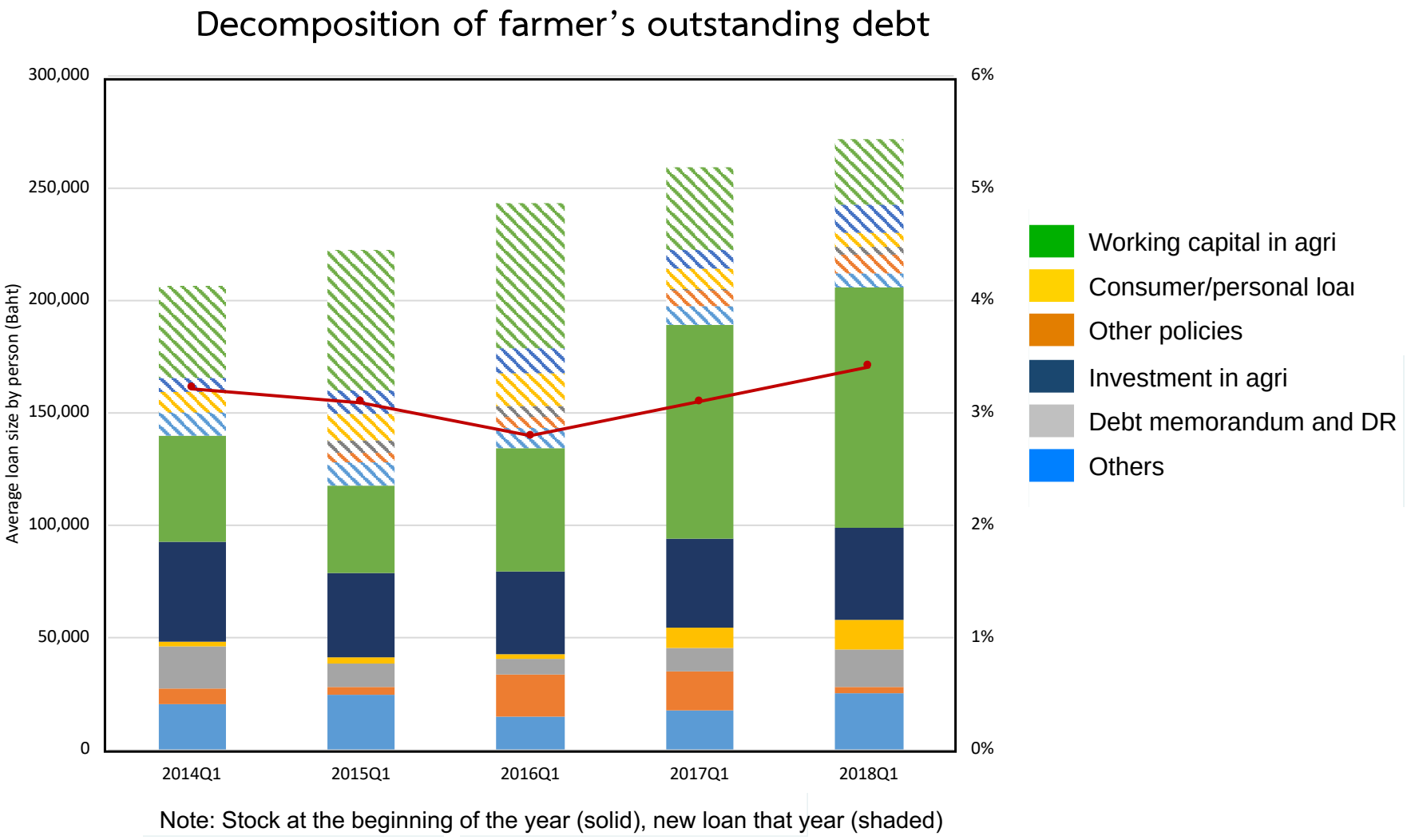
ยางพาราแผ่นดิบชั้น 3

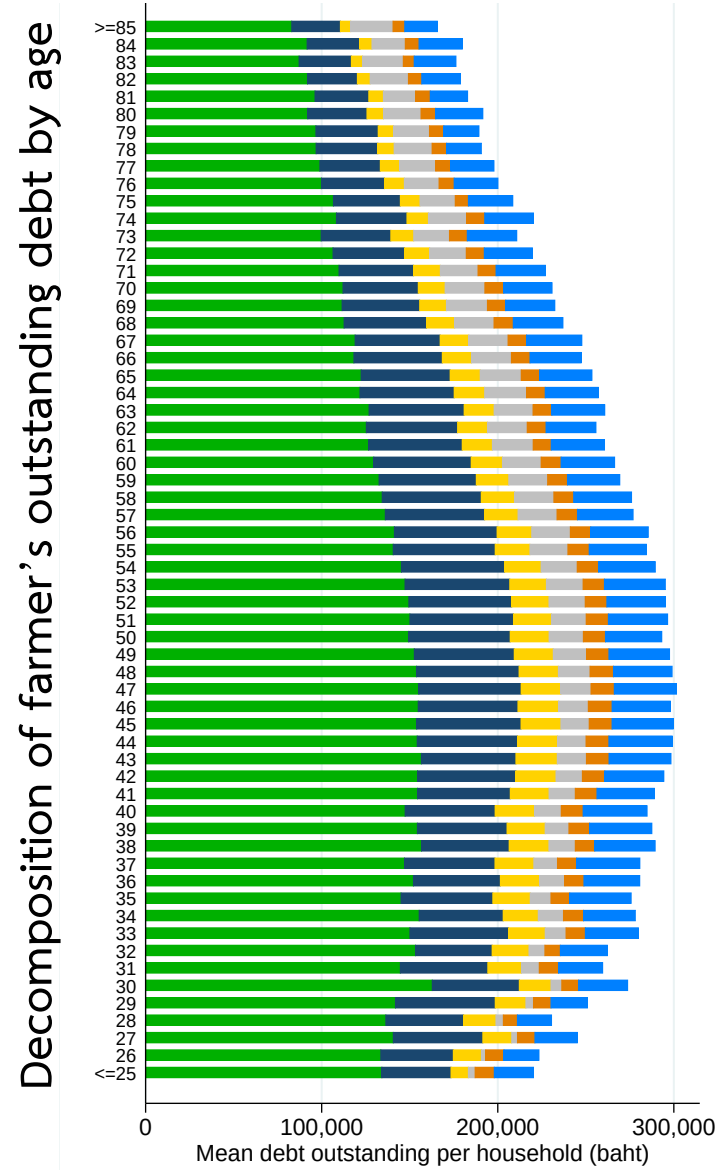


ปาล์มทั้งทลาย น้ำหนักมากกว่า 15 kg

Data source: OAE 2006-18

13. Rising household debt with farming!





Data source: BAAC 2014-18

What happen to Thai agriculture?

Data

Farms

- Small scale
- Land ownership
- Access to water
- Climate risk

Farmers

- Aging

Farming

- Low technology adoption
- Low adaptability

Markets

- Meeting quality demand
- Market power
- Inefficiencies

Policies

- Low coverage for growth-policies
- Induce wrong incentives

Increasing education

Economies of scale

Rising competition

Farming outcomes

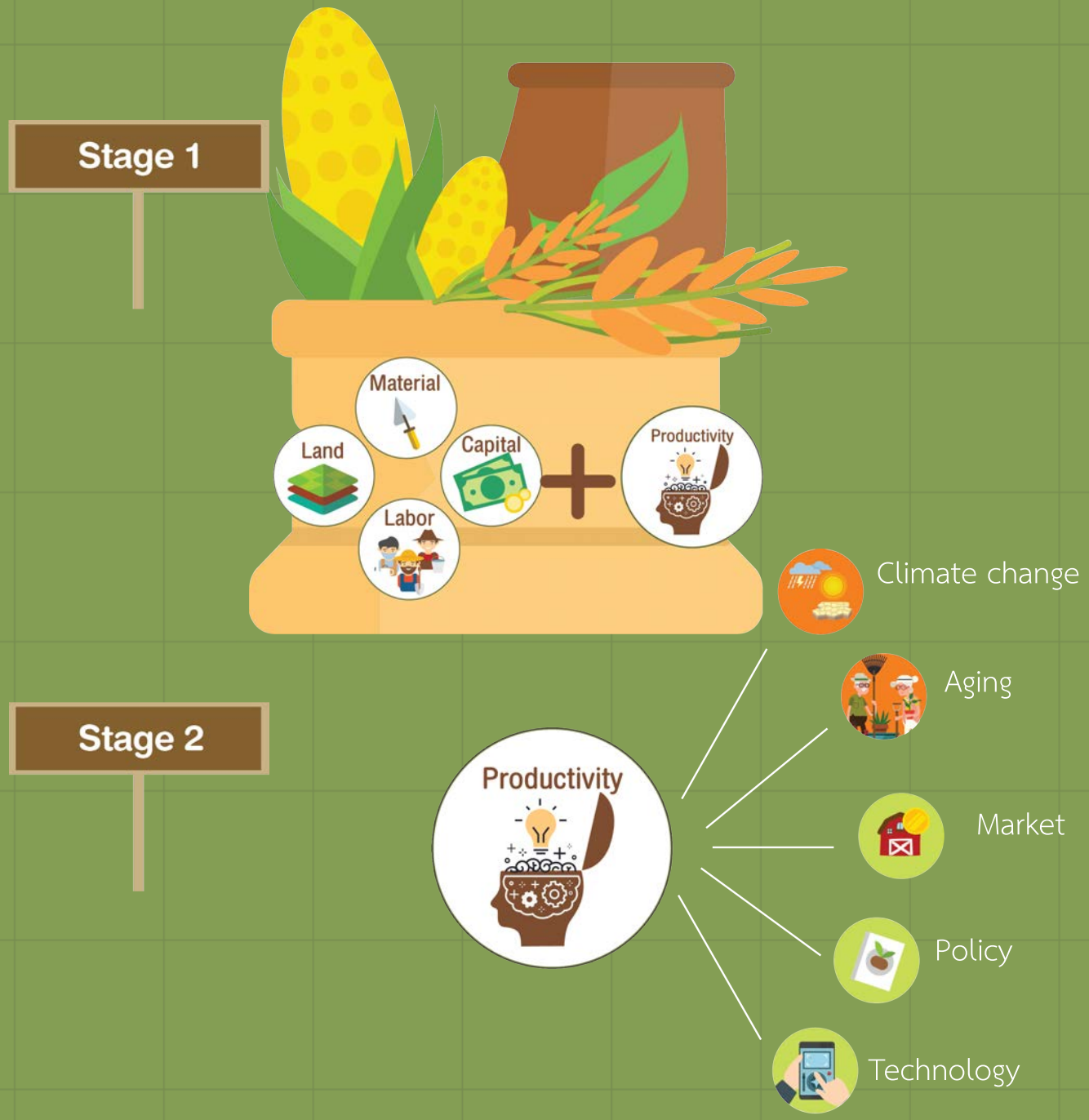
- Low productivity
- High variability
- Low margin/increasing costs
- High debt

Policy priorities

Stochastic frontier analysis

What drive agricultural productivity?

A stochastic frontier estimation model



Stage 1

A production function model to estimate technical efficiency (TE)

$$Y_{it} = \beta_0 K_{it}^{\beta_1} L_{it}^{\beta_2} Lnd_{it}^{\beta_3} M_{it}^{\beta_4} \varepsilon_{it}$$

$$\varepsilon_{it} = v_{it} - u_{it}$$

Stage 2

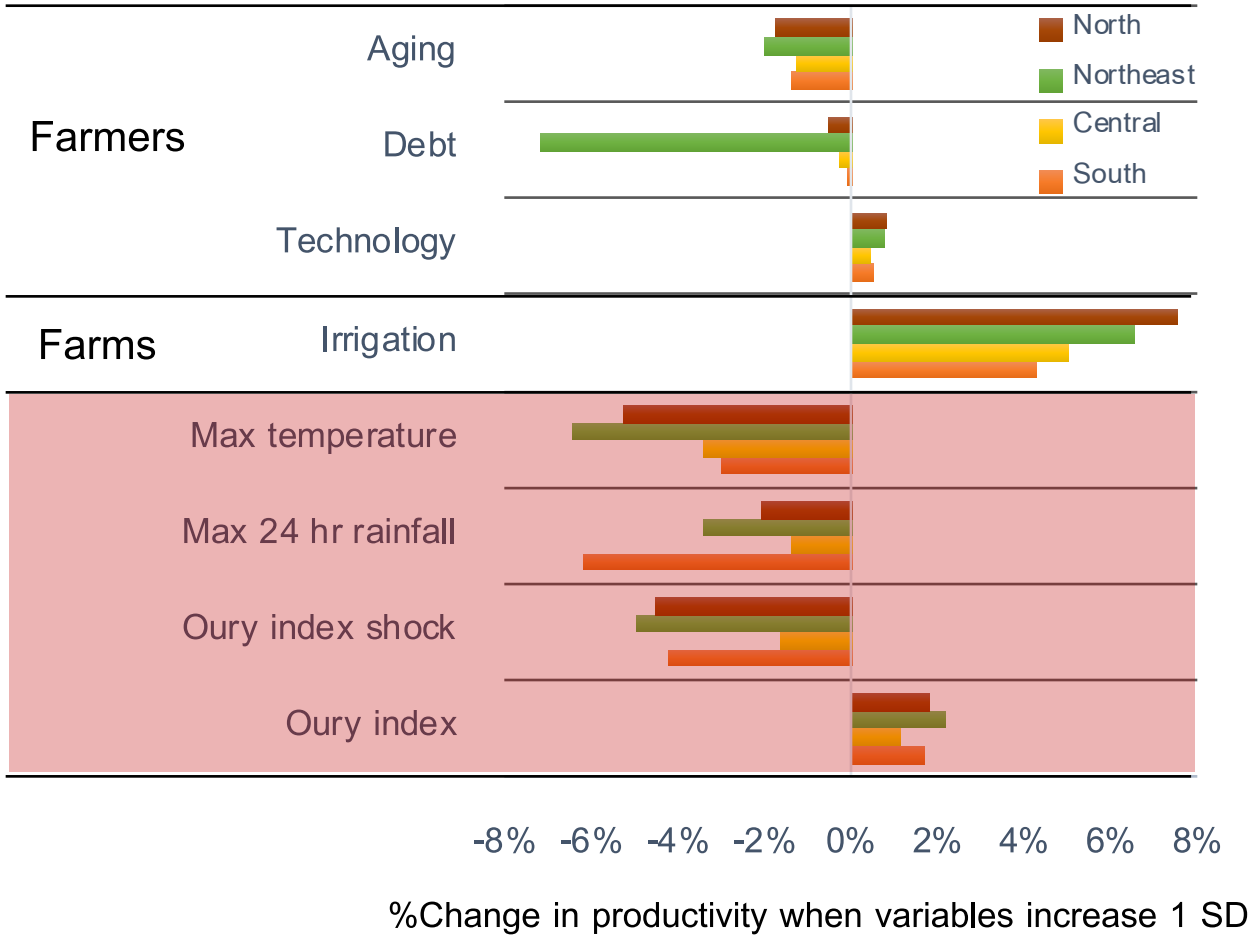
An inefficiency regression model to estimate determinants of TE

$$u_{it} = \delta_0 + \sum_{n=1}^{N} \delta_n Z_{nit} + w_{it}$$

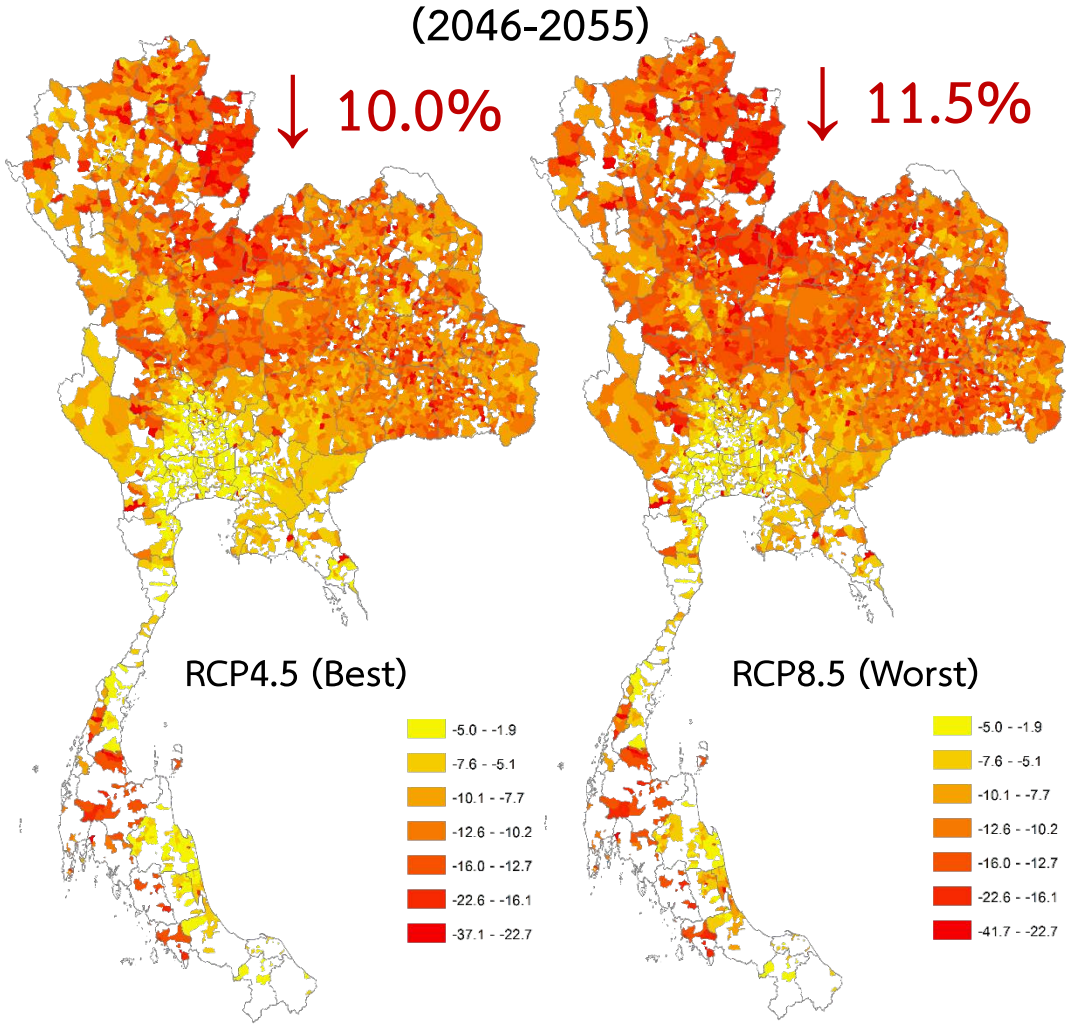
$$TE_{it} = \exp(-\hat{u}_{it})$$

Estimated results: What are key drivers of our agricultural productivity?

Effects on productivity from selected significant variables



Projected climate change effects on productivity



Estimated results: What are key drivers of our agricultural productivity?

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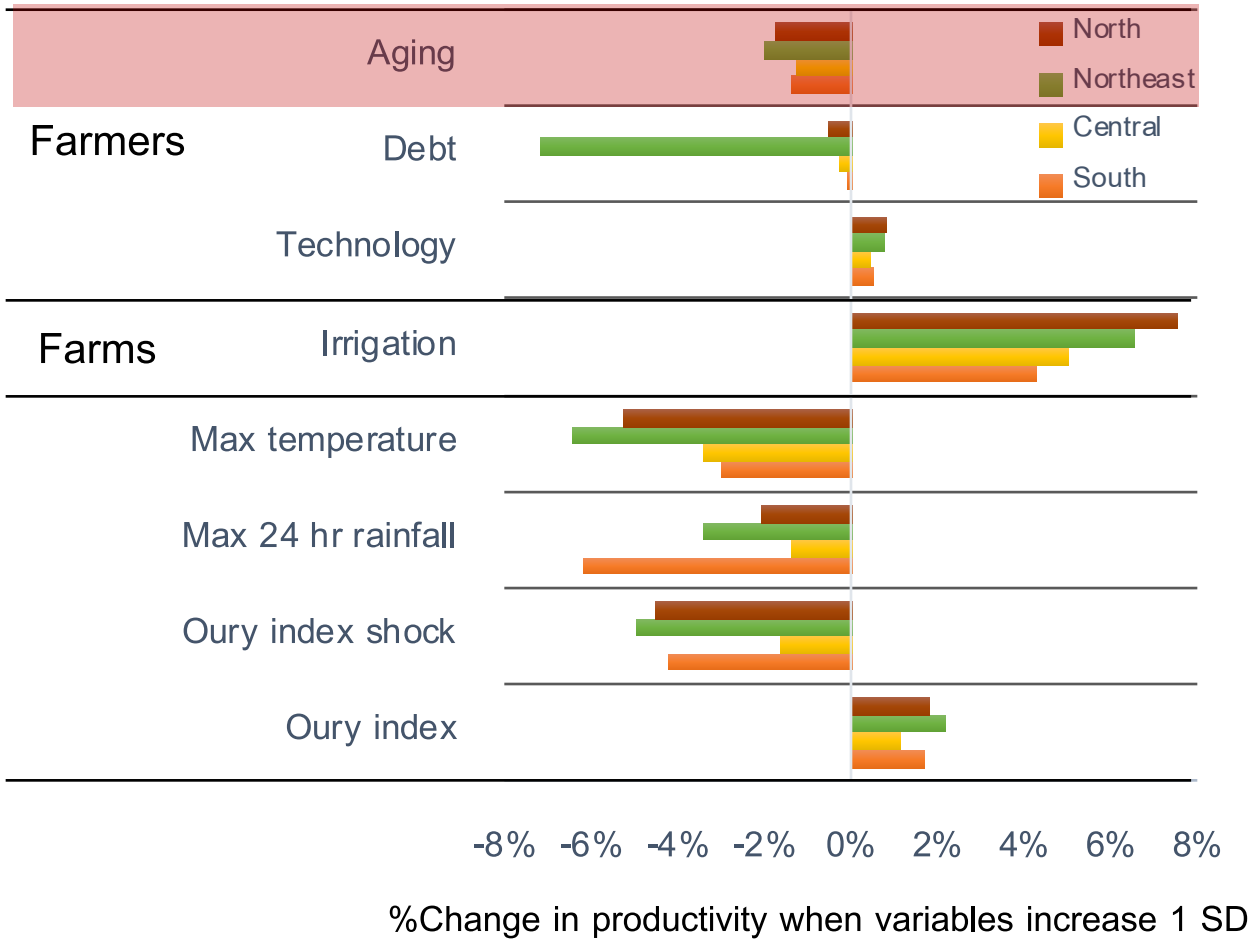
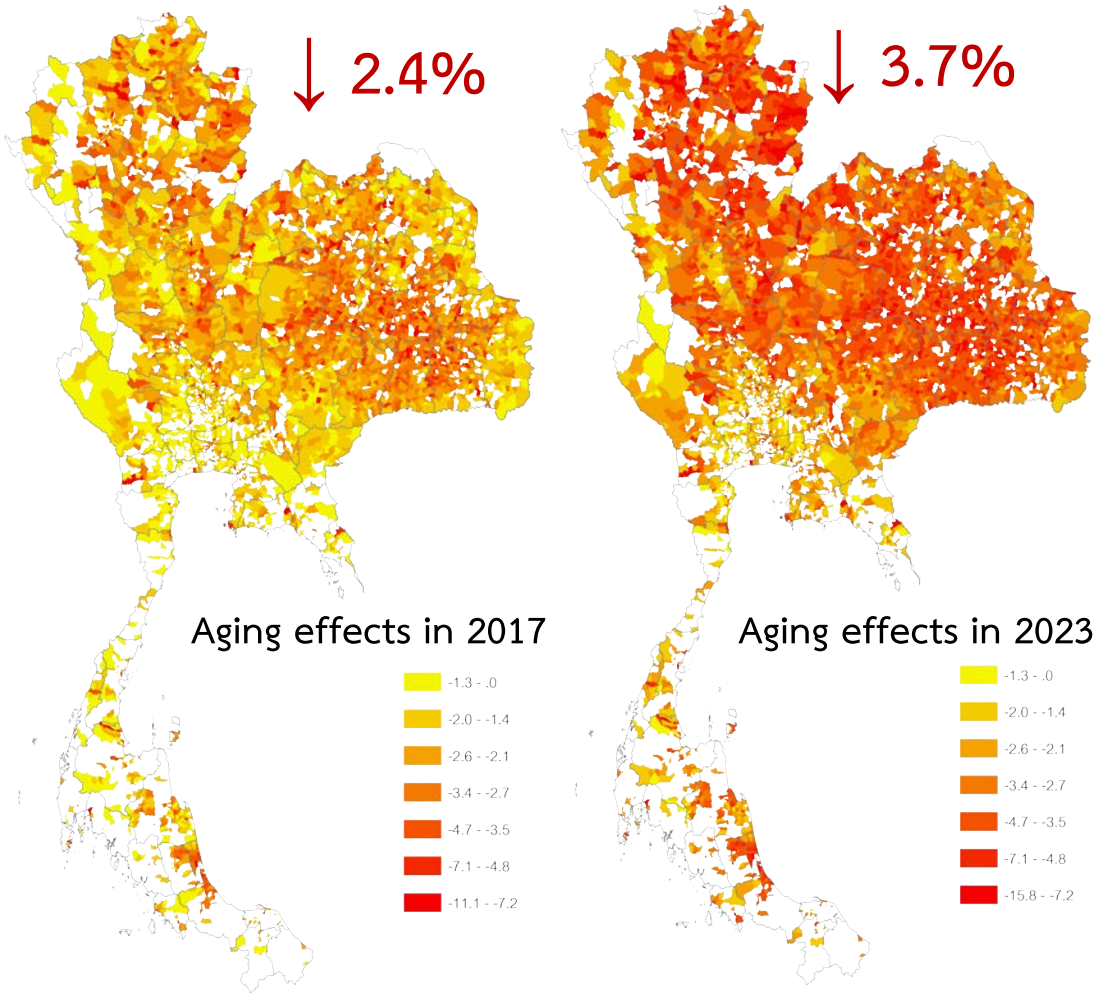


Projected aging effects on productivity



Estimated results: What are key drivers of our agricultural productivity?

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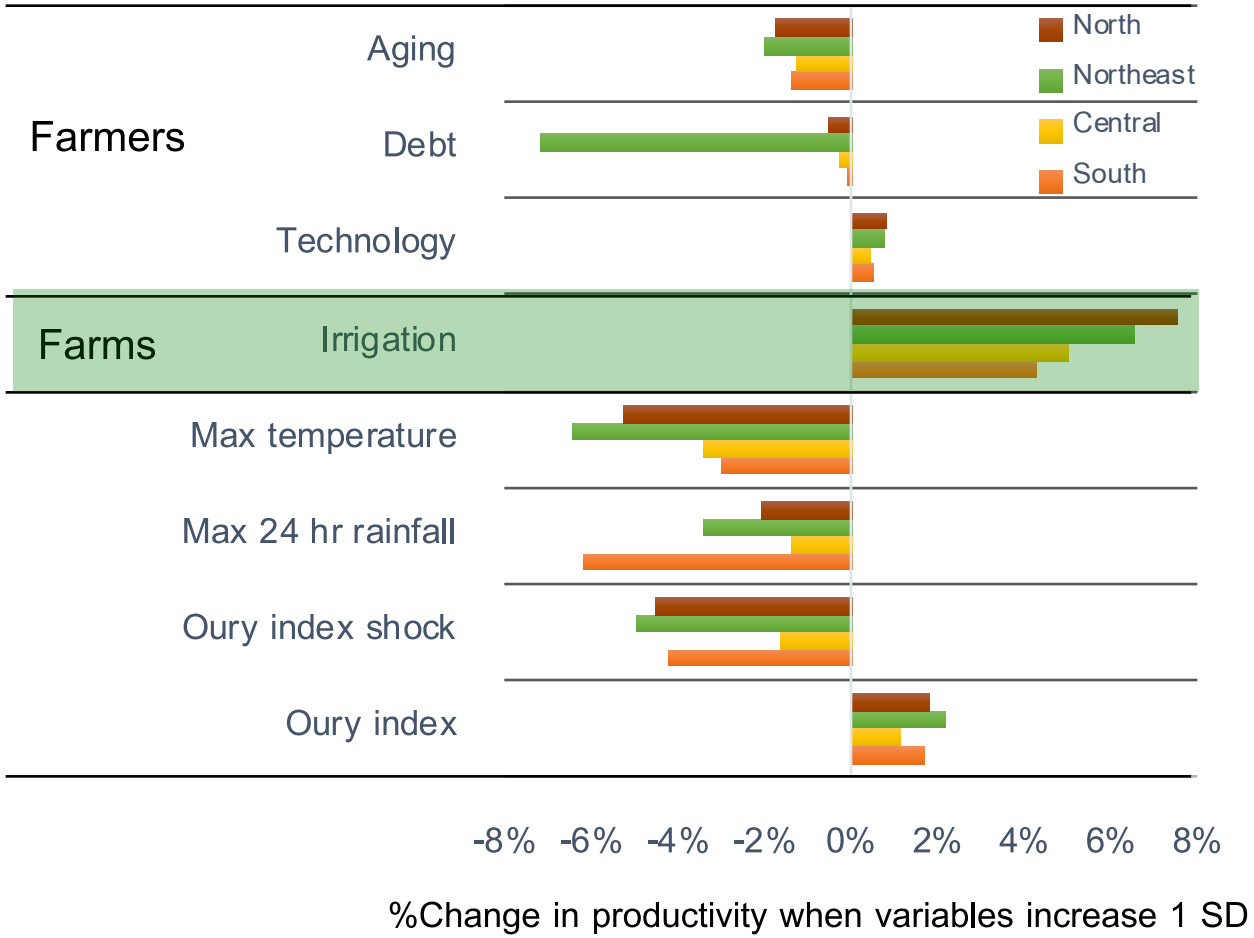
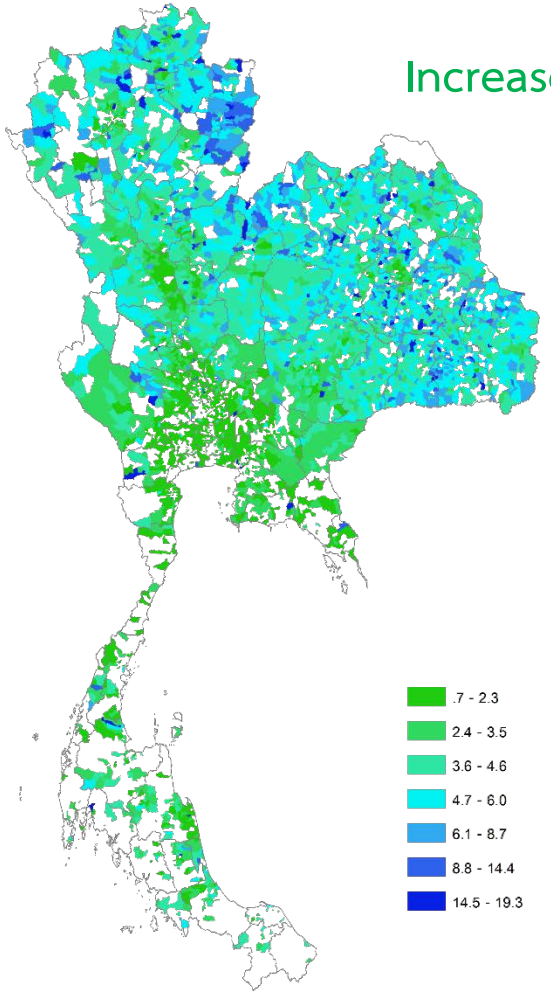


Projected irrigation effects on productivity

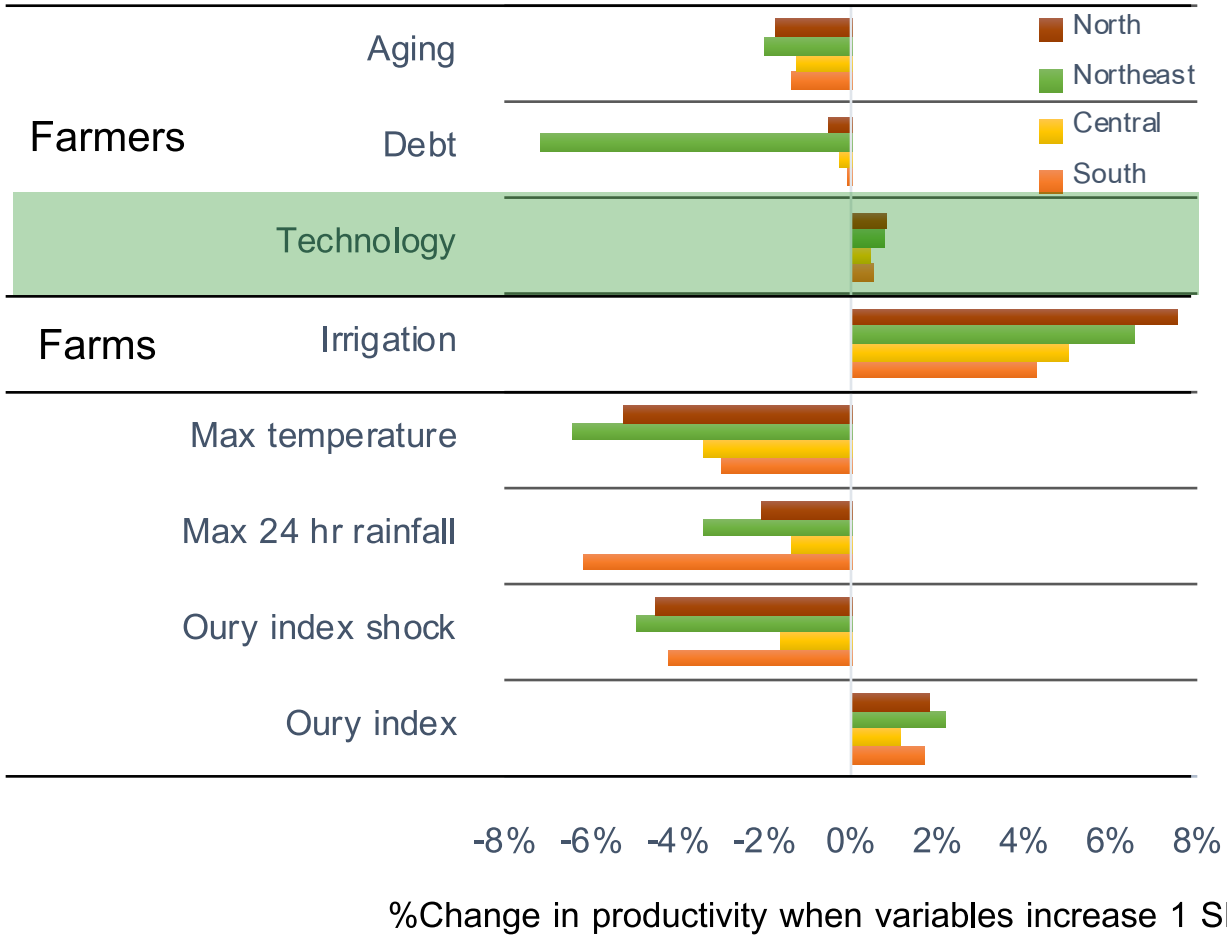


Increase irrigation area by 10%

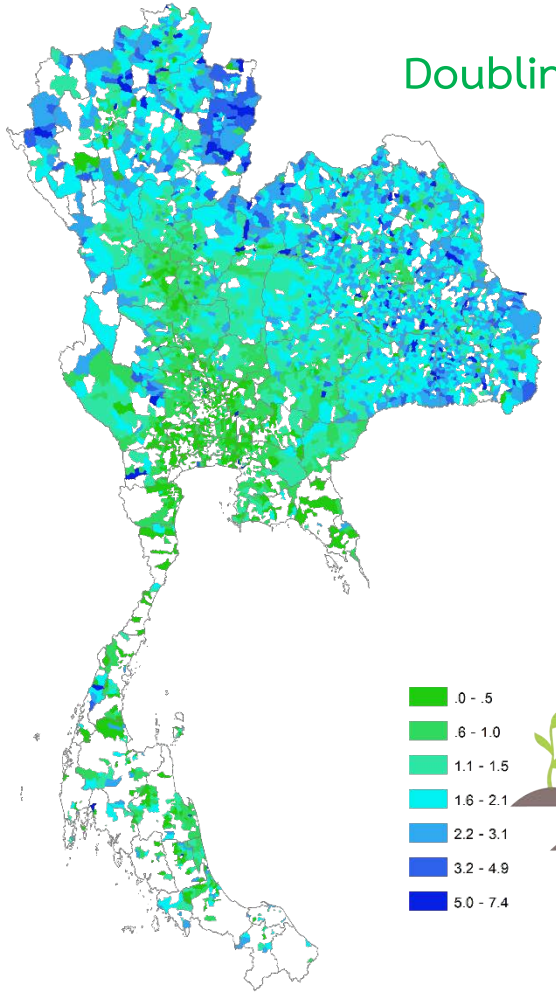
↑ 0.7% - 19.3%

Estimated results: What are key drivers of our agricultural productivity?

Effects on productivity from selected significant variables

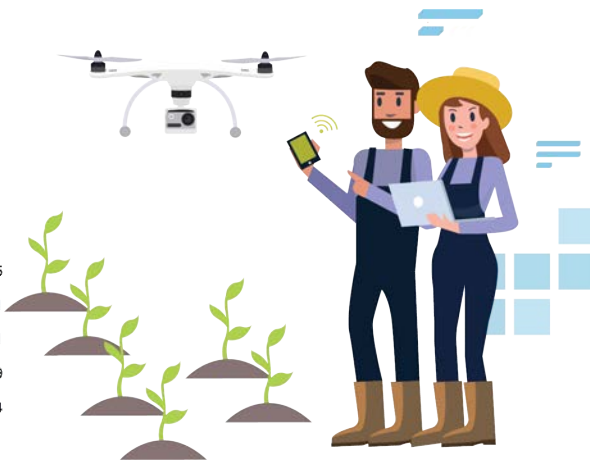


Projected technology effects on productivity



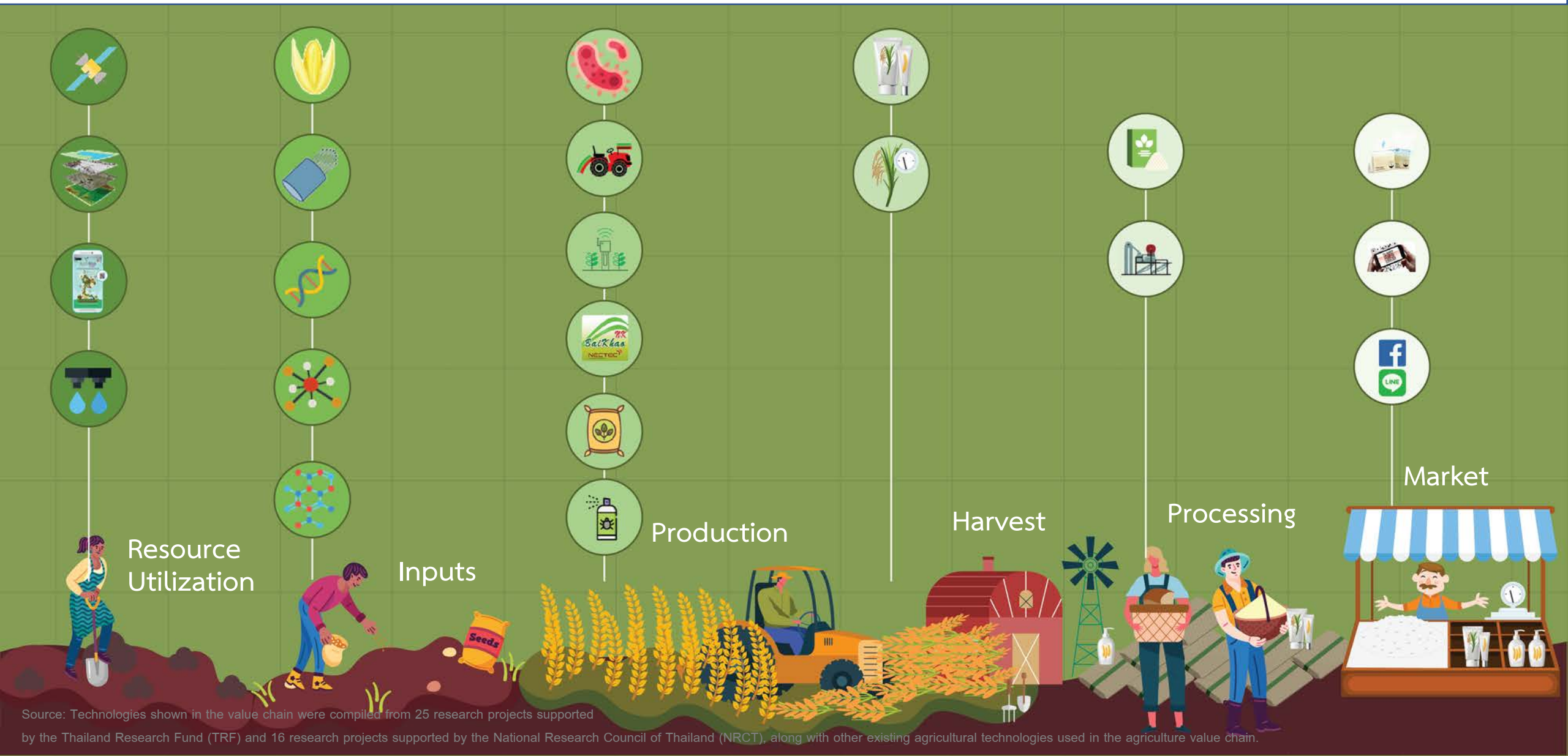
Doubling the use of technology

↑ 0.5% - 7.4%



The second green revolution: Technology available throughout value chain in Thailand

But how do we get smallholder farmers to use technology?



Source: Technologies shown in the value chain were compiled from 25 research projects supported by the Thailand Research Fund (TRF) and 16 research projects supported by the National Research Council of Thailand (NRCT), along with other existing agricultural technologies used in the agriculture value chain.

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Policy priorities

Technology

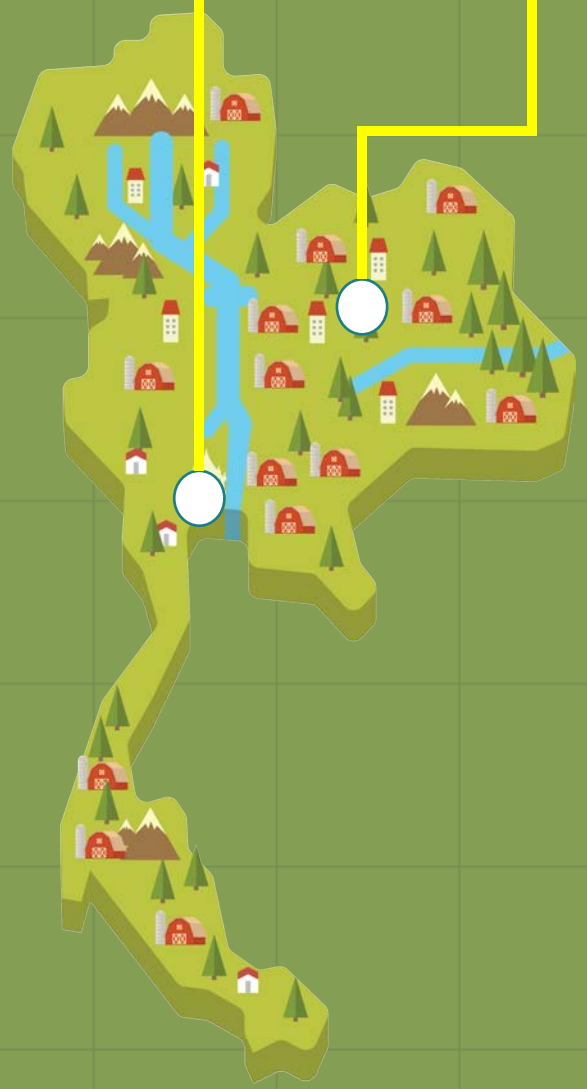
Behavioral insights
via field experiments

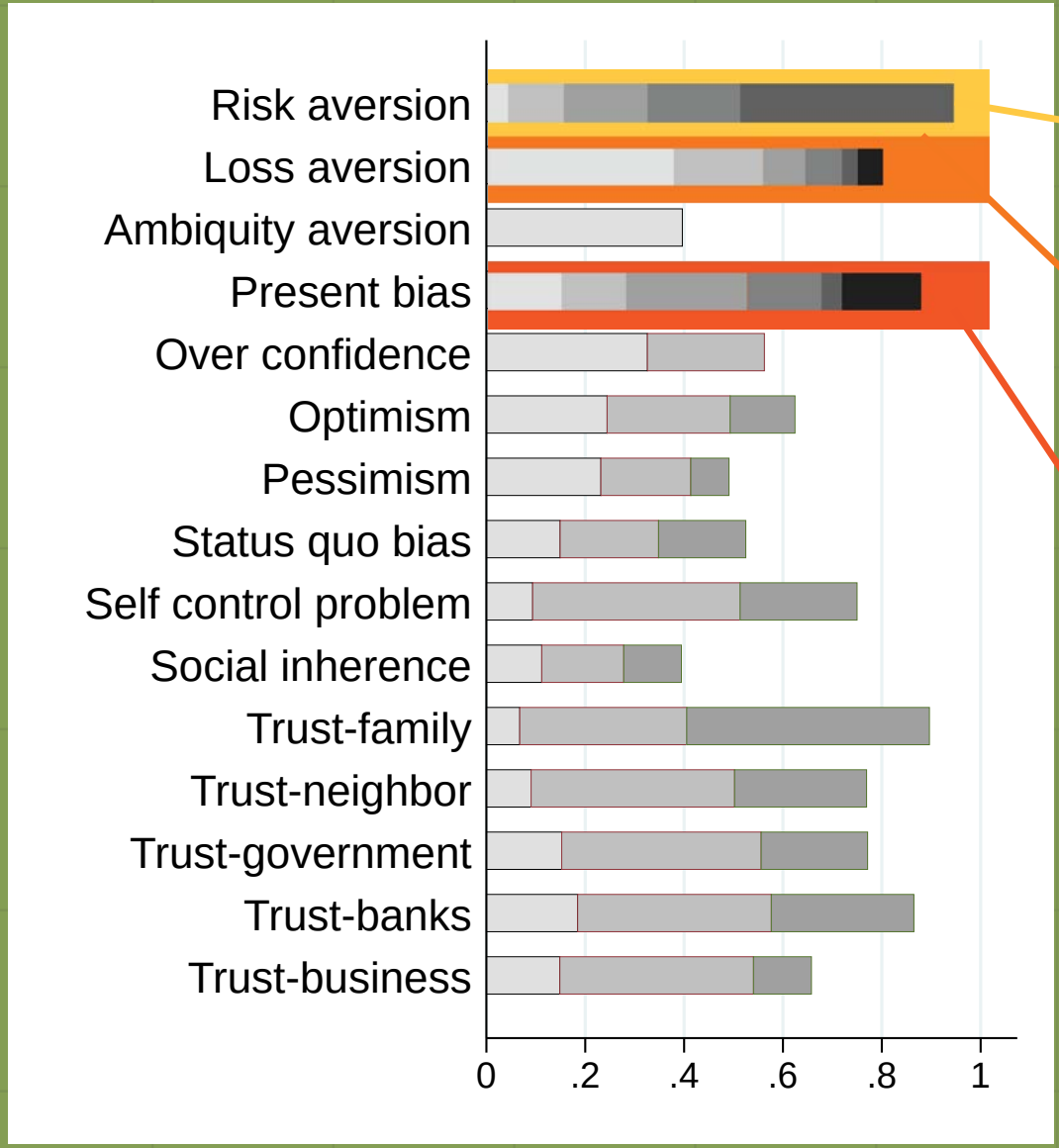
How to bring
policy priorities
into practice?

Bringing policy priorities into practice: How to get smallholders to use technology?

The role of behavioral bias

Conduct lab-in-the-field experiment in 2 areas: Pathumthani and Kalasin





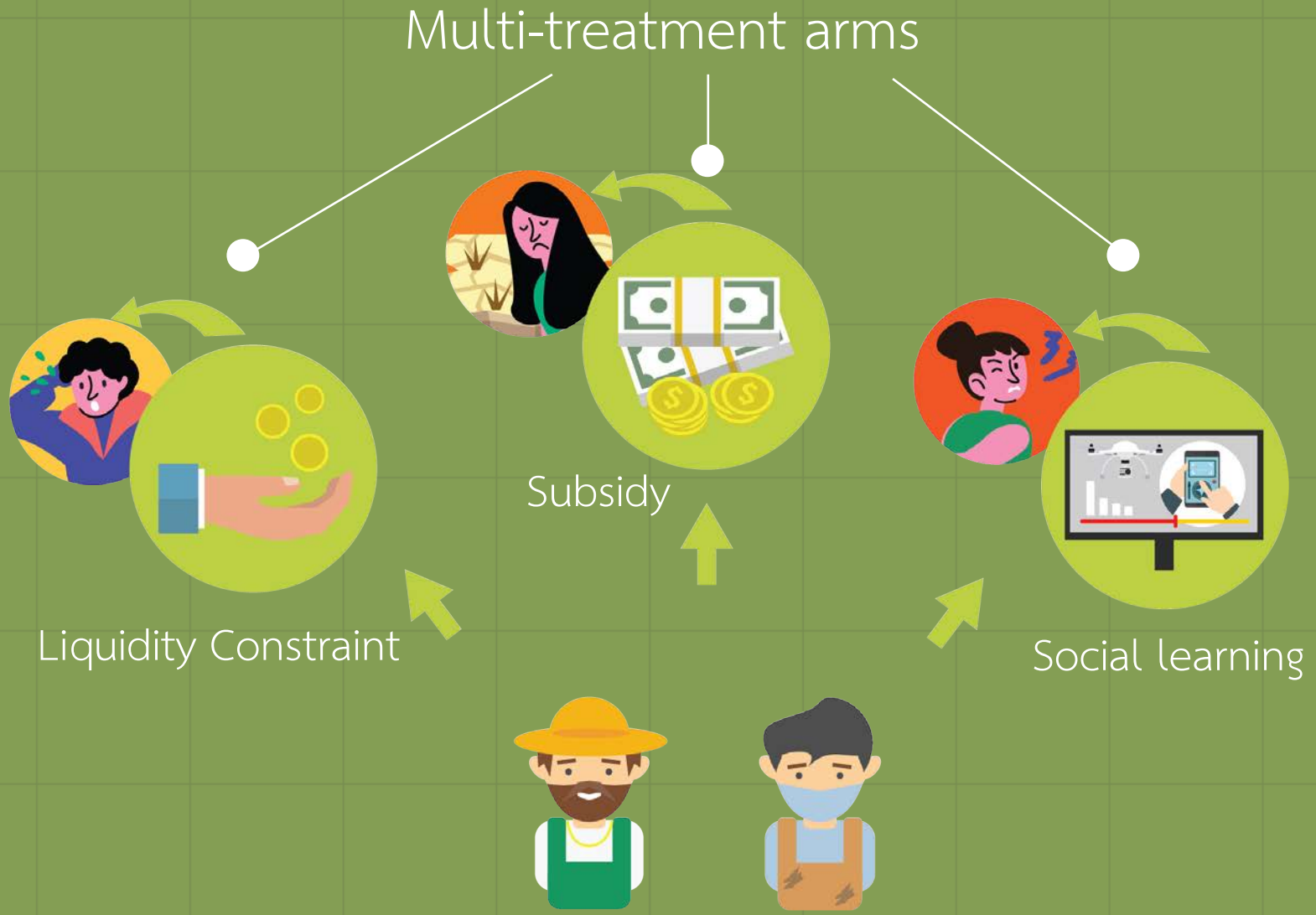
Risk aversion

Loss aversion

Present Bias

Behavioral insights in enhancing farmer's use of technology

Lab in the field experiment

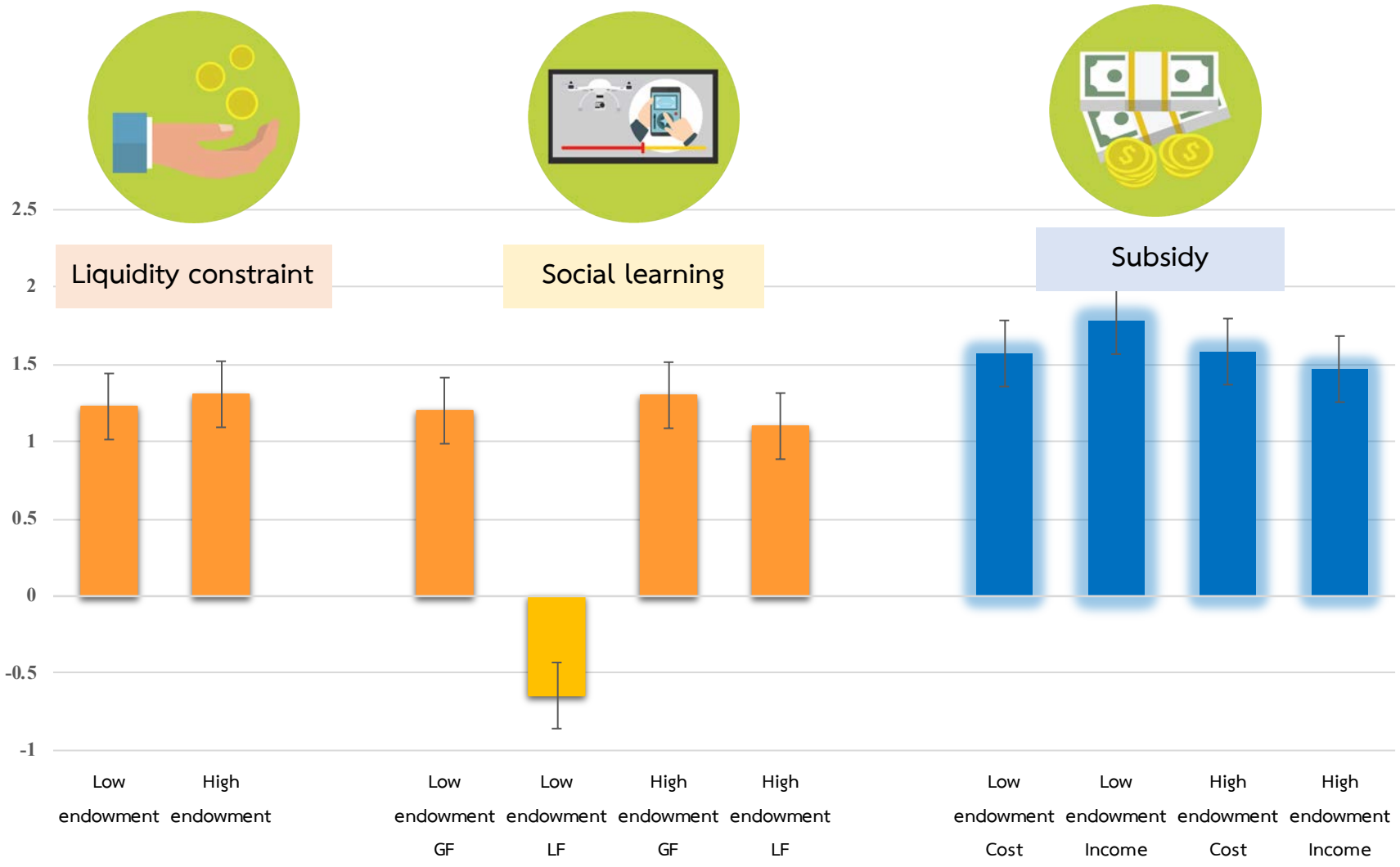


3 research questions

- Do liquidity constraints prevent technology adoption?
- Could technology adoption be enhanced through social learning by involving farmers closer to the target population as technology promoter?
- Could the risk transfer mechanism through provision of subsidies help alleviate the problem of loss aversion, which hinders the adoption of new agricultural technology?

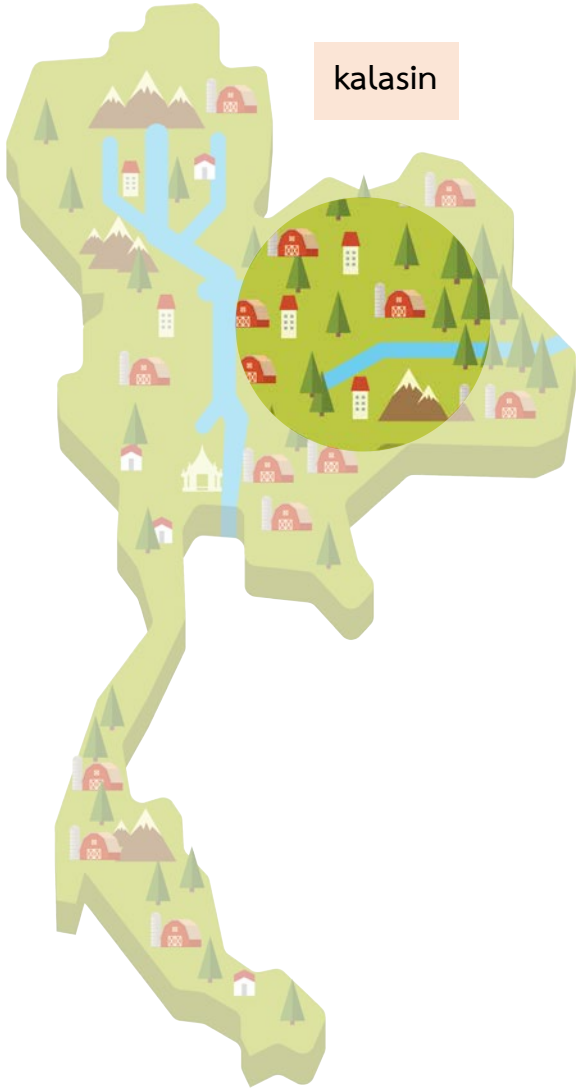
Behavioral insights in enhancing farmer's use of technology

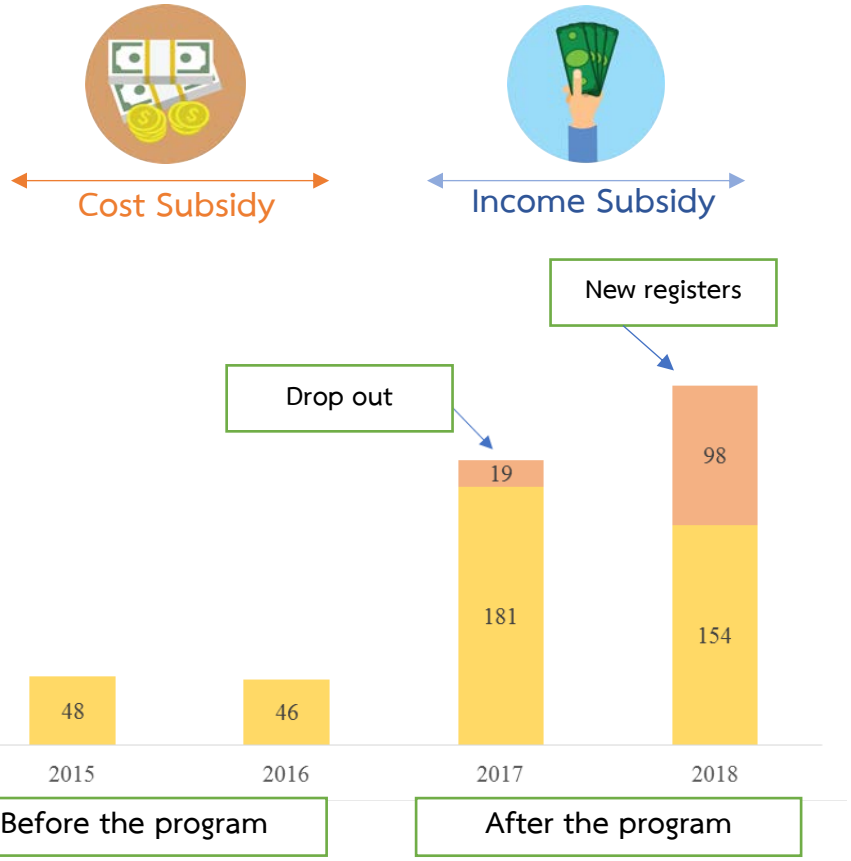
Lab in the field experiment



Behavioral insights in enhancing farmer's use of technology

Comparing our results with field experiment





After implementing the risk transfer mechanism, the number of farmers joining the program significantly increased

Takeaways: 3 key enables toward competitive agriculture