

Policy Forum: Discourses on Sustainability

Adaptation to Climate Change through New Theory Agriculture

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TODAY'S AGENDA



Impacts of Climate Change on
Agriculture



New Theory Agriculture (NTA)
as adaptation measure



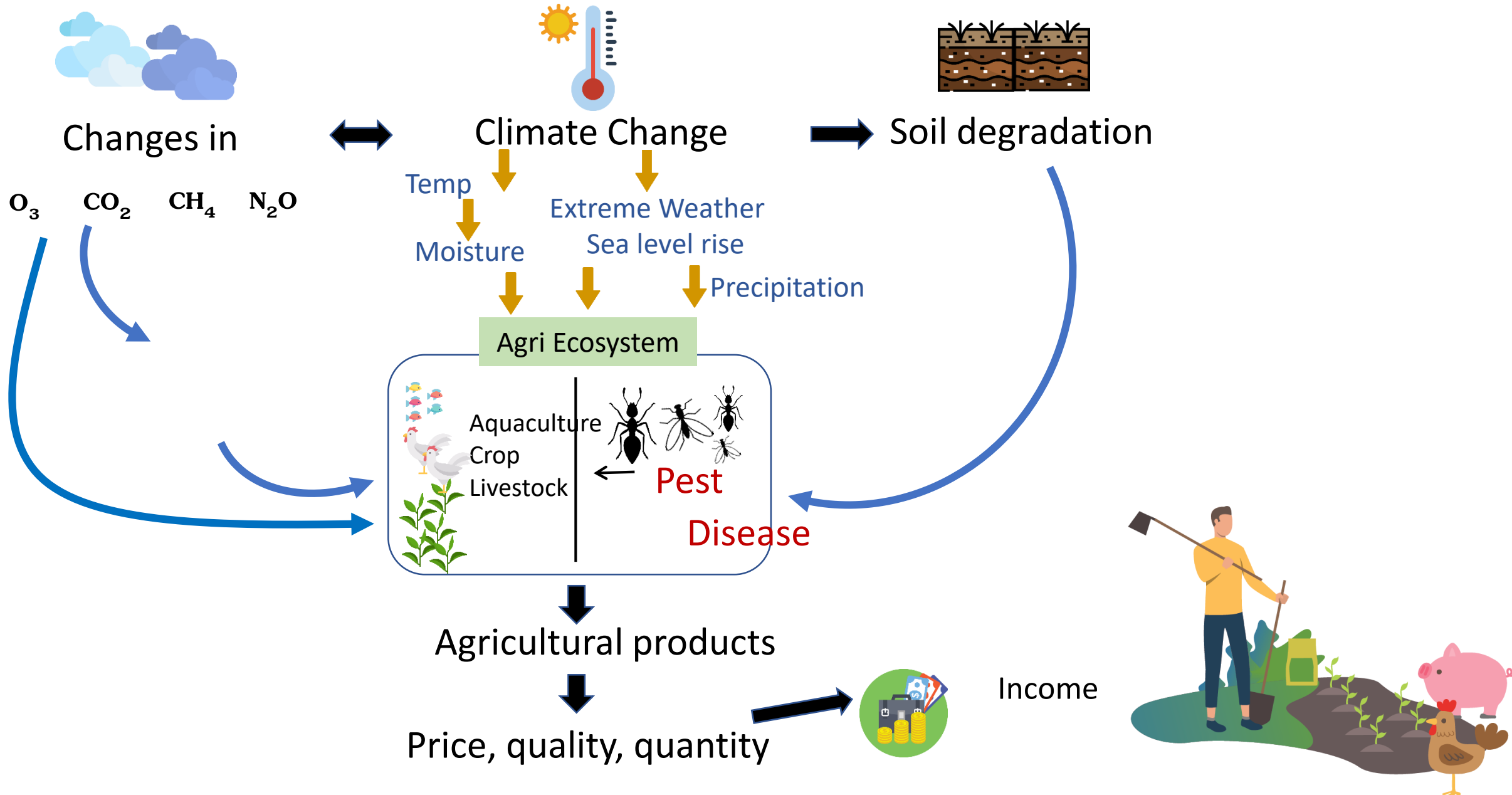
Methodology and Samples



Key Findings



Impacts of Climate Change on Agriculture

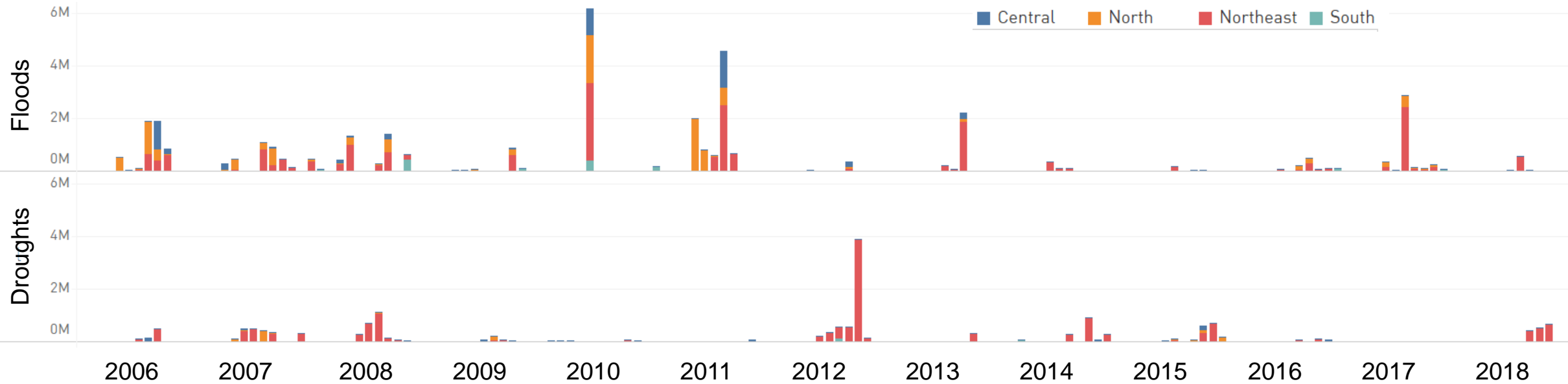


Thai Agriculture is still highly exposed to risk of climate change



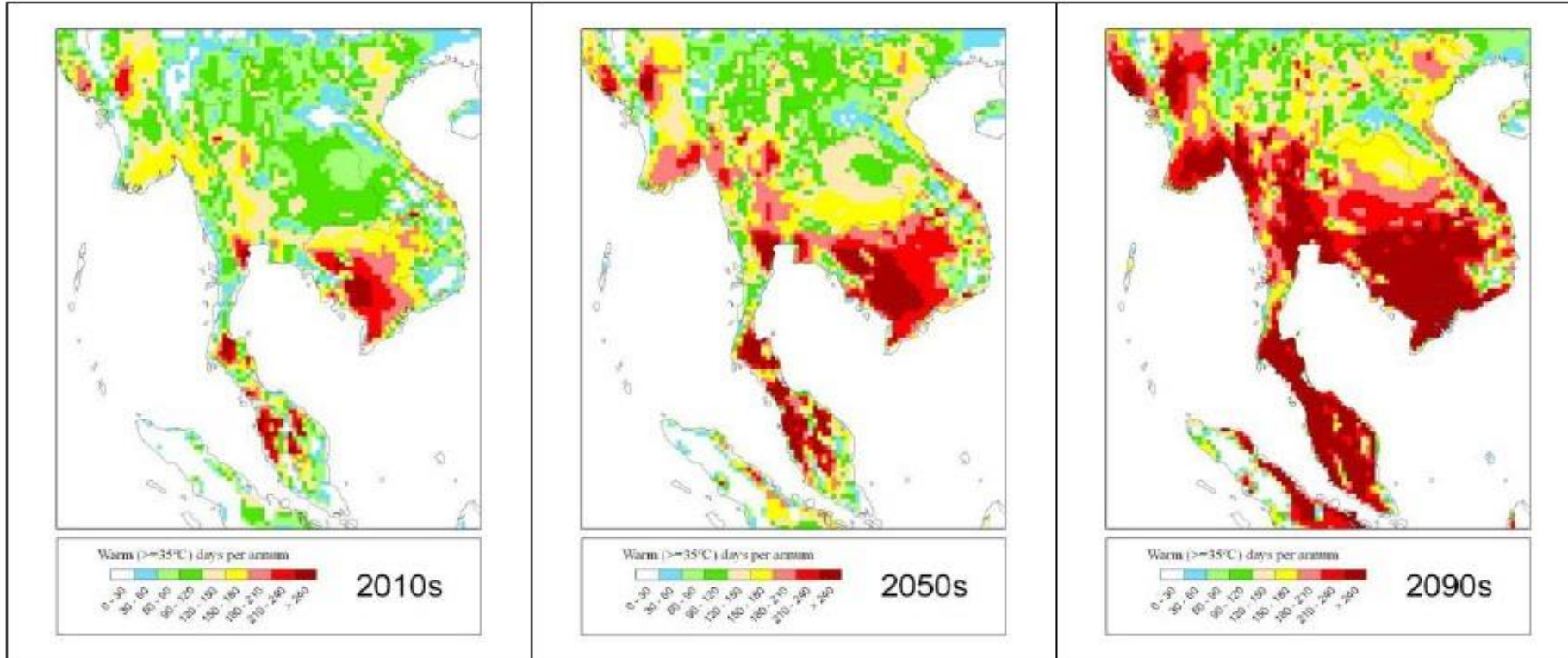
Disaster affected agricultural areas (2006-2018)

Affected area (rai)



Trend of Future Climate

Maximum temperature $\geq 35^\circ\text{C}$

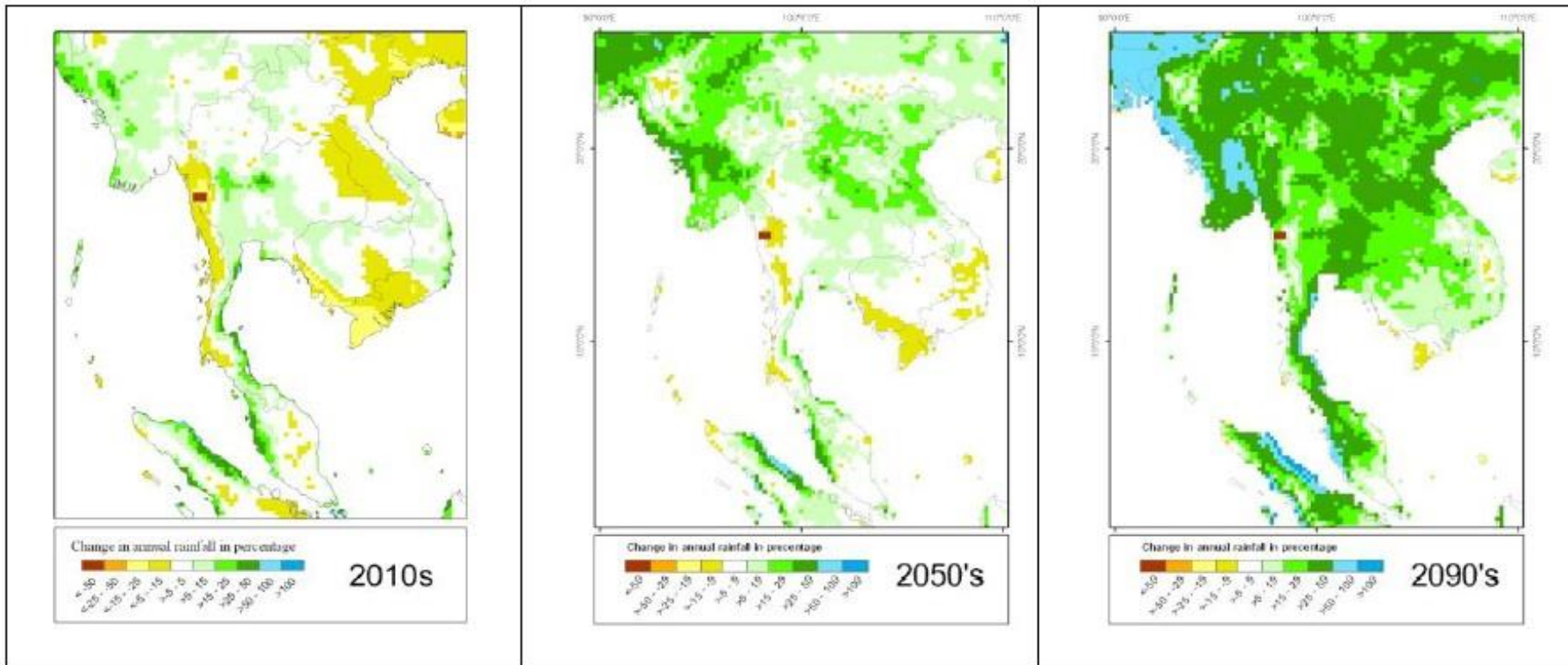


Regional Climate model - PRECIS 20 km resolution downscaling from ECHAM4-GCM under A2 Scenario

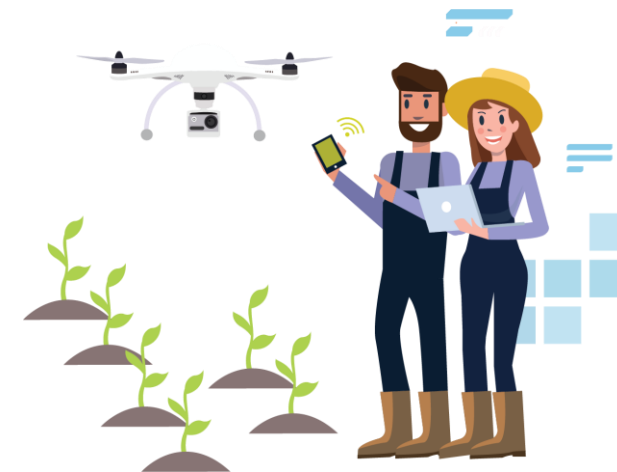


Trend of Future Climate

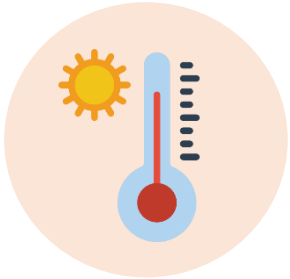
Changes in Annual Rainfall in Percentage



PRECIS climate model with 20 x 20 km resolution downscaling from ECHAM4-GCM



Trend of Future Climate



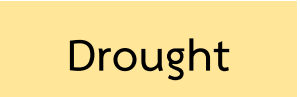
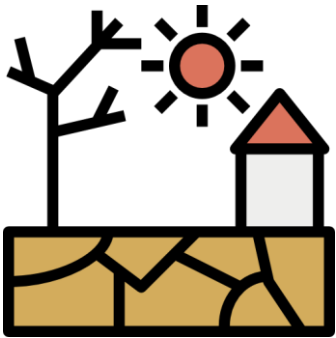
Increase in temperature



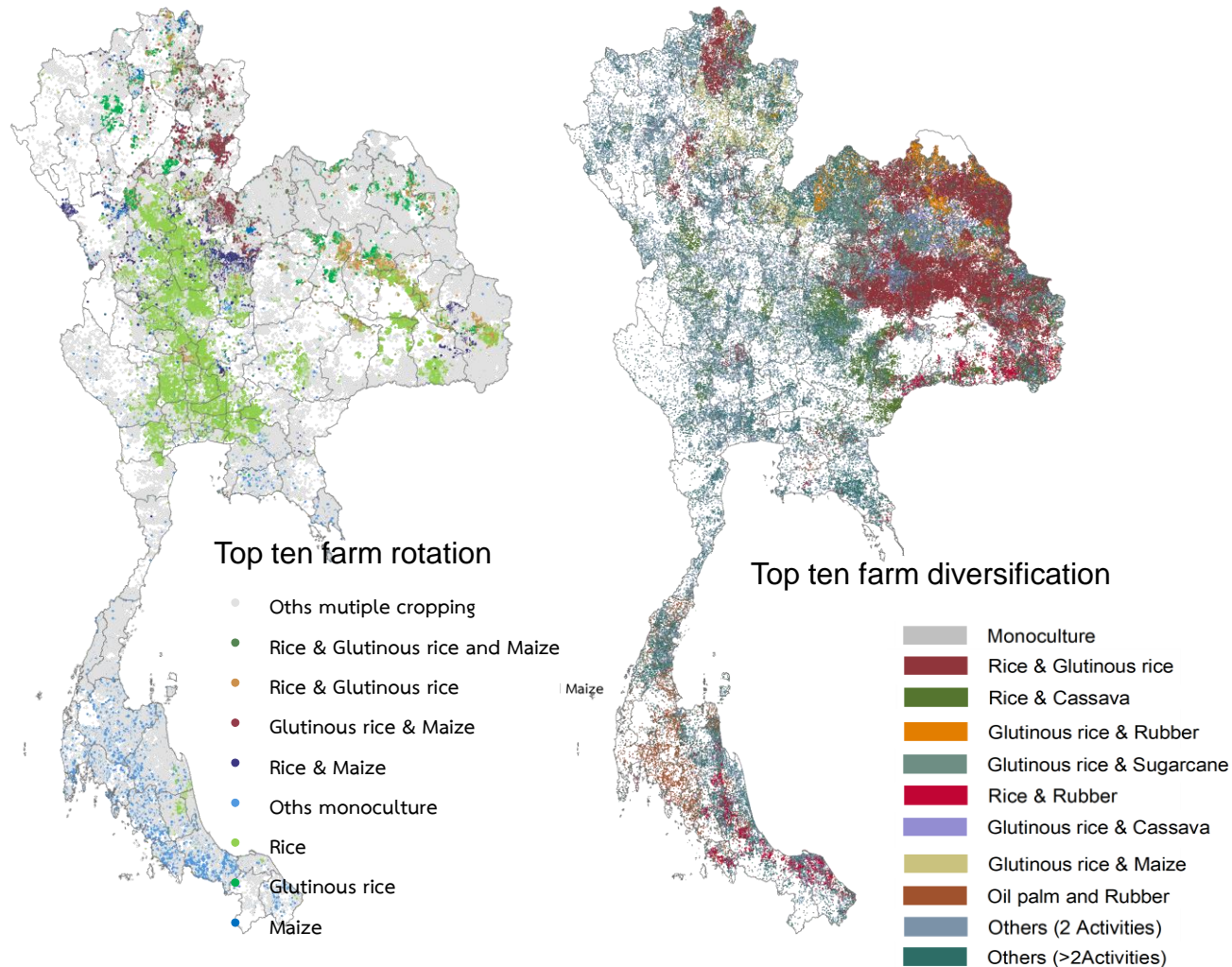
Increase in rainfall variability



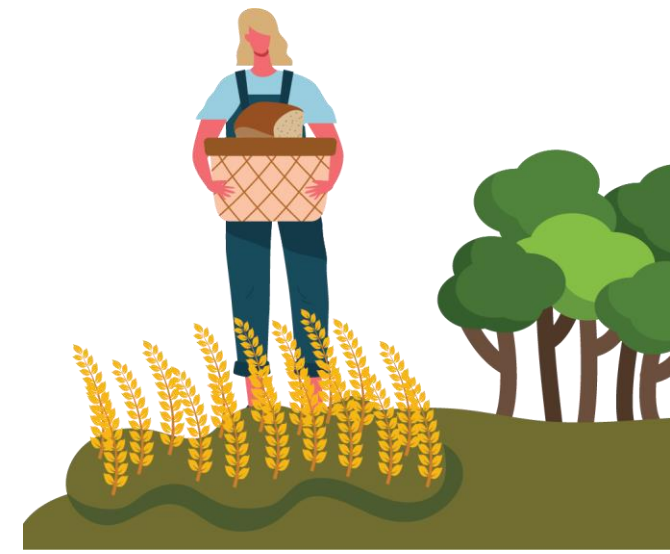
Storm Frequency and Severity



But, 2/3 of farm households grow one crop (monoculture)



Thus, farm households in Thailand have high exposure to climate change!



Examples of adaptation options in agriculture



Water Management

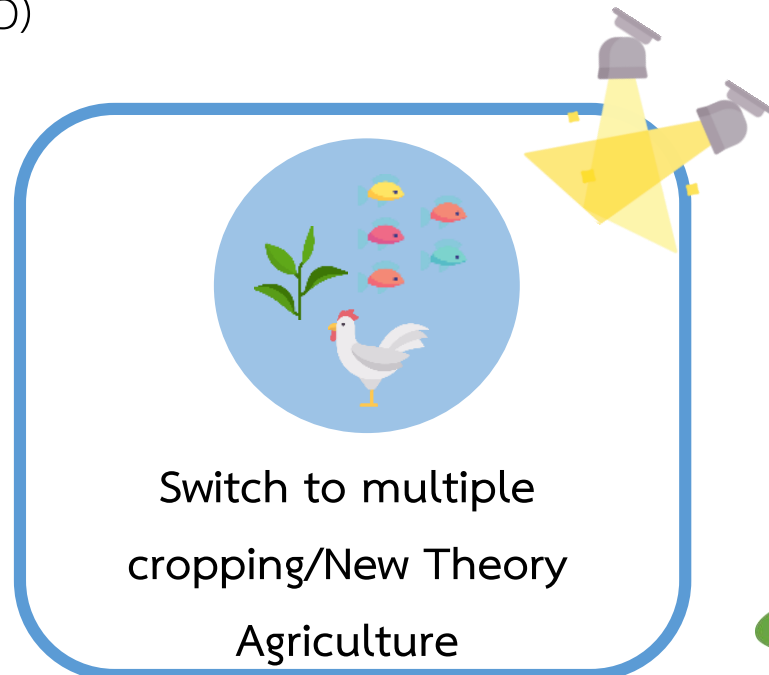
(e.g. on-farm water storage, AWD)



Change crop/livestock varieties



Shift crop calendar



Switch to multiple
cropping/New Theory
Agriculture

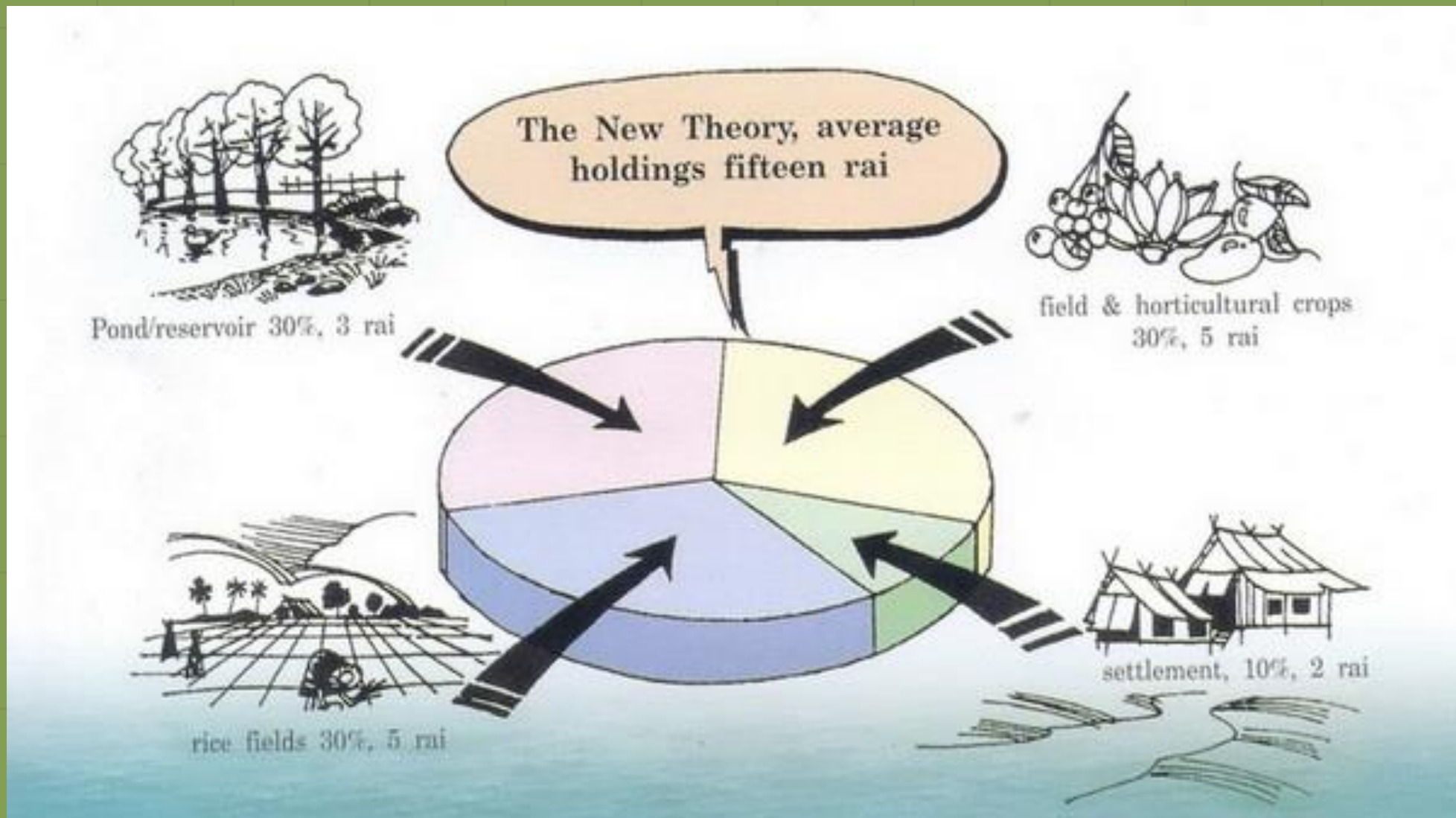


New Theory Agriculture (NTA)



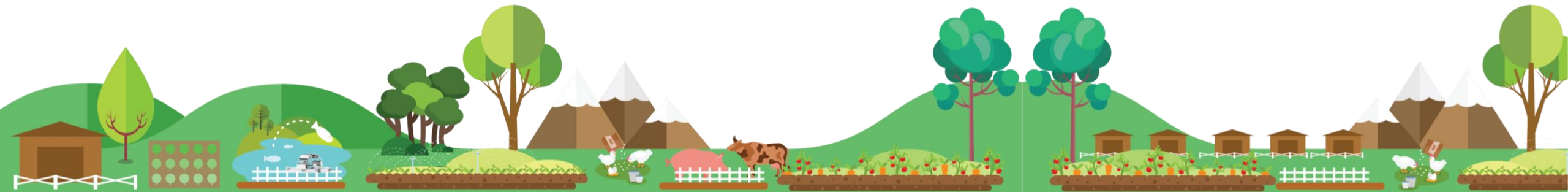
- The NTA is the most distinct and concrete example of the application of the Sufficiency Economy Philosophy to the agricultural sector. His Majesty late King Bhumibol Adulyadej initiated this theory to help Thai farmers who suffer from the impacts of commodity price fluctuations, natural disasters, other unproductive natural conditions, such as dry spells and drought.
- NTA framework aims to reduce risk and vulnerability of agriculture to climate change and increase financial stability and self-reliance.
- The NTA aims at improving the farmers' quality of life, increasing income and reducing expenditure through the efficient use of inputs and resources.

Division of Farmland under New Theory Agriculture (NTA)



Key Research Questions

- Does the net revenue for farmers who enrolled in the NTA project increase?
- Do farmers who enrolled in the NTA project enjoy increased self-reliance through consumption of own agricultural outputs?
- Does food expenditure of farmers who participated in the NTA project decrease?

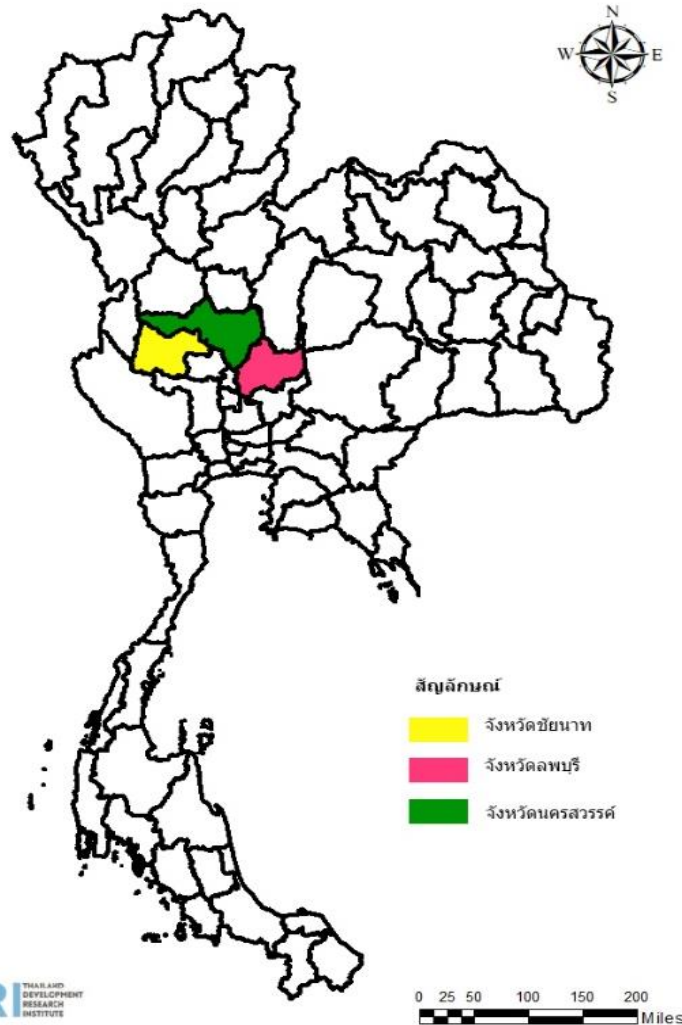


Samples in this Study

- This study focused on participants from the 2018 NTA project cohort.
- Because the NTA project was administered at the farmer level, individual farmers were selected from the villages resulting from the multi-stage sampling procedure; however, the number of randomly selected farmers varied between each village in proportion to degree of NTA enrollment in each village (villages with higher NTA enrollment were allocated a higher number of randomly selected farmers).
- A total of 634 farmers were selected, 423 in the control group, and 211 in the treatment group.
- Farmers in the treatment group (enrolled in the NTA project) received assistance that included agricultural input support, in which farmers received fish, livestock, vegetable varieties, and bio-extract/bio-fertilizer.



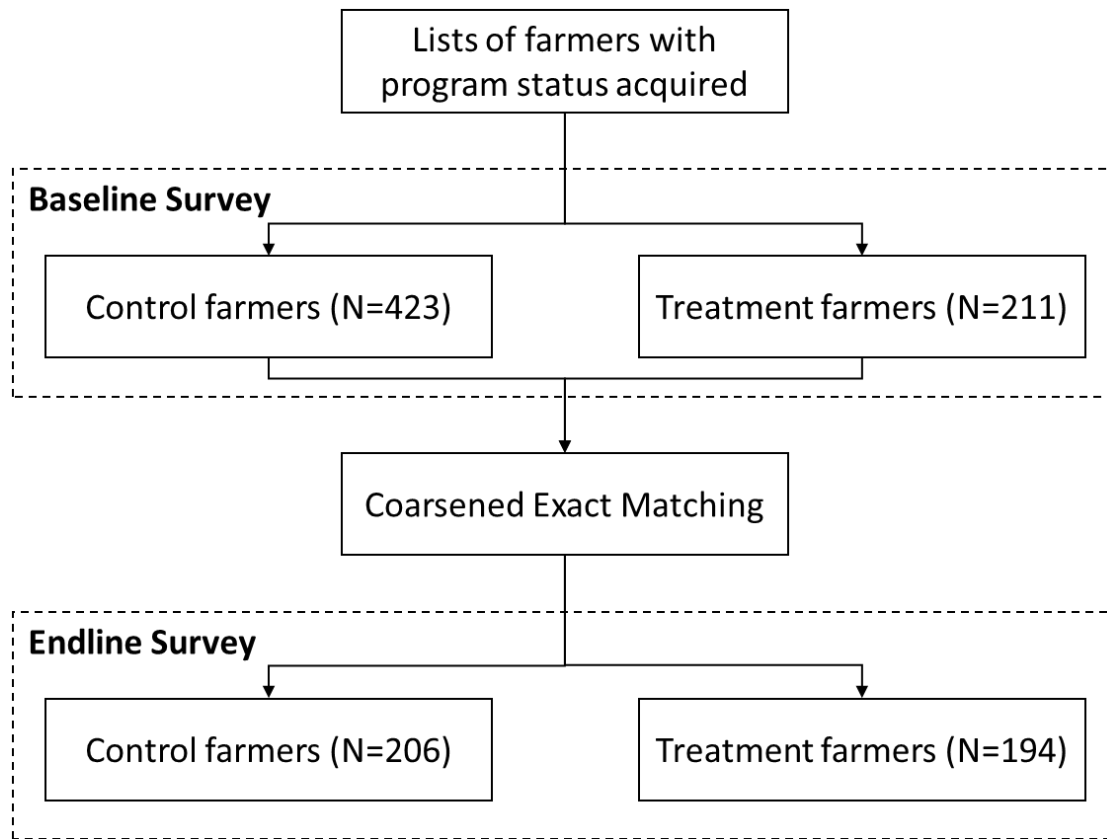
Samples in the Study - Continued



- A multi-stage sampling design was used to ensure a representative sample of the population, in which smaller sampling units were used in each stage. This study used four stages for sampling in the following order: province, district, sub-district, village.
- Using the NTA database, four provinces (in the Central region) with the higher number of NTA project enrollment were selected. The selected provinces include Nakhon Sawan, Lopburi, Ayutthaya, and Chainat.
- Cumulatively, this multistage sampling resulted in a total of 81 total selected villages (3 provinces, 9 districts, and 27 sub districts).



Data Collection



- A baseline survey was administered to both control and treatment farmers before treatment began, between June 4 and June 15, 2018.
- A total of 634 farmers were surveyed for the baseline survey (423 control farmers from 72 villages, 211 treatment farmers from 72 villages).
- An endline survey was administered to 400 farmers (206 control farmers from 72 villages, 194 treatment farmers from 72 villages) between December 6 and December 15, 2018. The smaller number of farmers surveyed was a result of pruning the sample using Coarsened Exact Matching (CEM) i.e., only matched farmers were resurveyed.

Estimation Model

We used the following difference-in-difference specification to quantify the impact of NTA:

$$Y_{it} = \alpha + \beta_T NTA_i + \beta_P Post_i + \delta(NTA_i \times Post_i) + \epsilon_{it}$$

where Y_{it} is one of our core outcomes for farmer i at time t ,

NTA_i is an indicator variable for farmers enrolled in the NTA program

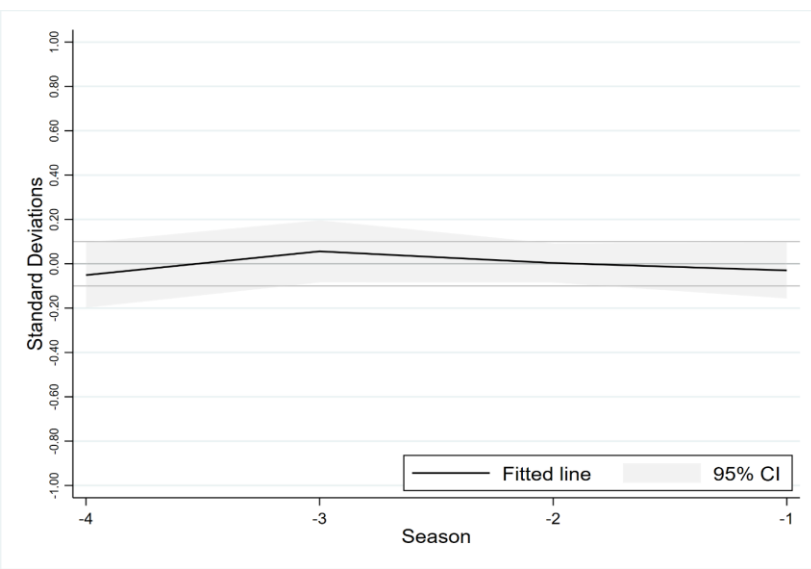
$Post_i$ which is set to zero for 2017 and set to one for 2018

The coefficient of interest is δ which quantifies the difference between the treatment and control groups. All estimations use the matched sample.

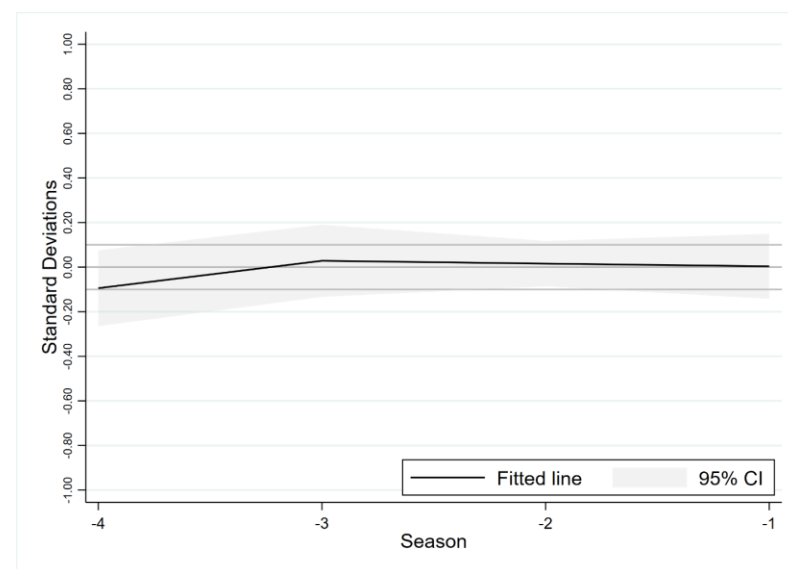


Pre-trends

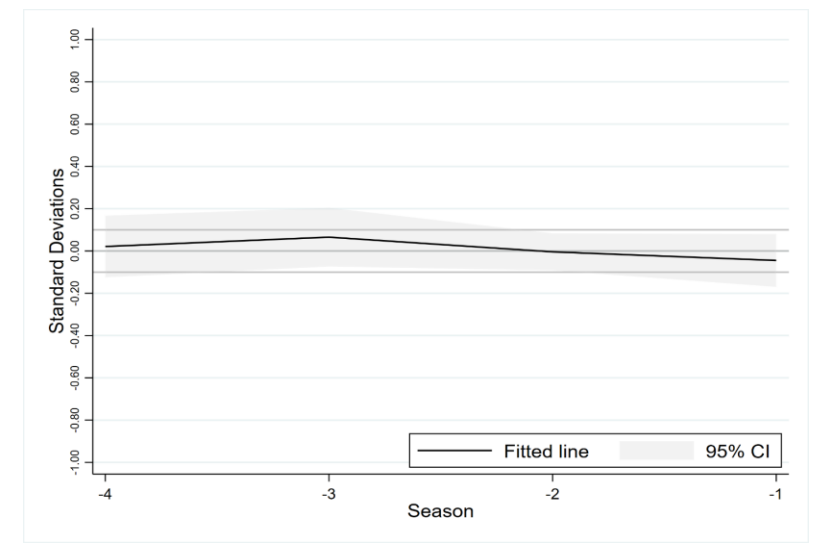
To establish the similarity of our control and treatment groups, we show outcomes pre-trends and a table of balance on observable outcomes. The figure below shows trends for total revenue, total cost and net revenue for the four seasons preceding the intervention. We find that the treatment group does not differ from the control: all differences are within 0.1 SD of the control group.



Total Revenue



Total Cost



Net Revenue

Impacts on Farm Income



- Net revenue for NTA farmers in the 2018 wet-season increased by THB 33,808. This gain in net revenue is driven by a decrease in total costs incurred, THB 9,863, and an increase in total revenue of THB 23,086, though these results have lower precision than the main result on net revenue gain. Thus, the production process was modified such that differences occurred in both input (reflected by the reduced costs) and output (reflected by the increased revenues).
- NTA farmers are less likely to report zero income, by 12 percentage points, and less likely to report zero or negative net revenue, by eight percentage points.

Understanding Production



- Farmers in the NTA program tended to grow more crops – the typical NTA farmer grew about 0.17 more crops than the typical non-NTA farmer.
- The bulk of farmer income gain is driven by increased crop revenue (THB 21,487), followed by livestock revenue (THB 1,583) and a negligible change in fishery revenue (THB 16).
- At the same time, we note that crop and livestock production saw a decline in cost, while fishery production saw a small increase in cost.

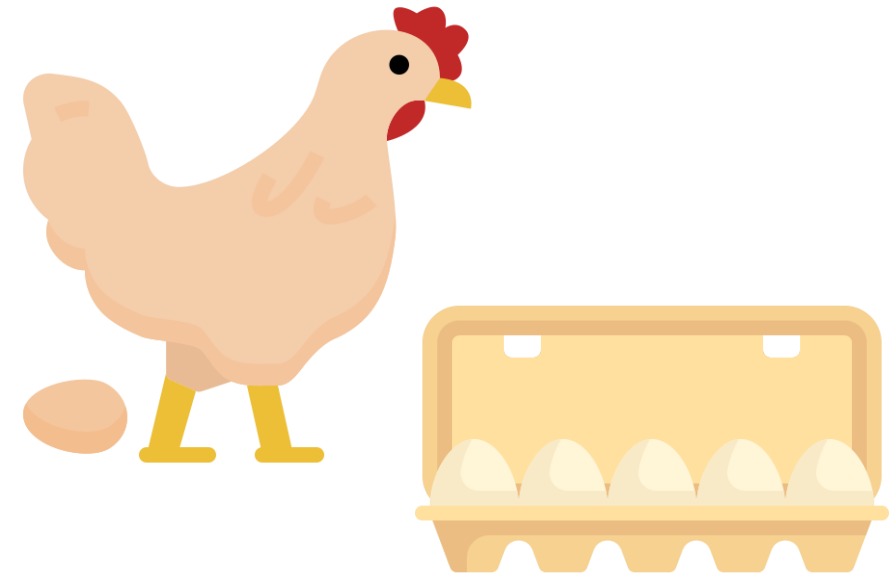
Food Expenditure and Consumption

- When asked if they saved money on food they typically consume by consuming more from on-farm production as compared to last season, farmers in the treatment group saved a small amount, THB 27. So, farmers maintained their overall level of food expenditure but saved on certain categories of food they typically consume.
- Farmers do not report any change to consuming vegetables from own production but fewer farmers (14 percentage points) in the NTA program say they consumed own-farm fruit.



Farmers' Protein Consumption

- We look at a variety of protein consumption from own production. We find that consumption of eggs (low cost protein) increased in the NTA group: 16 percentage points more farmers reported increased consumption of eggs in the NTA group.



Discussion

- Our results suggest that farmers in the NTA program did modify their production in line with the recommendations of NTA, which include diversifying crop mix, and integrating farming practices such as using animal manure to fertilize and recycling on-farm water. Most farmers are crop producers to begin with, so the fact that the bulk of the change in their net revenue is driven by crop income and costs is unsurprising. However, they do diversify their crop mix which may play a role in their changed revenue and cost figures.
- Furthermore, NTA prescribes reusing materials from on-farm e.g., recycling manure as fertilizer. This reuse likely enabled cost savings.

