

# Improving Skills of Rice Farmers in Thailand

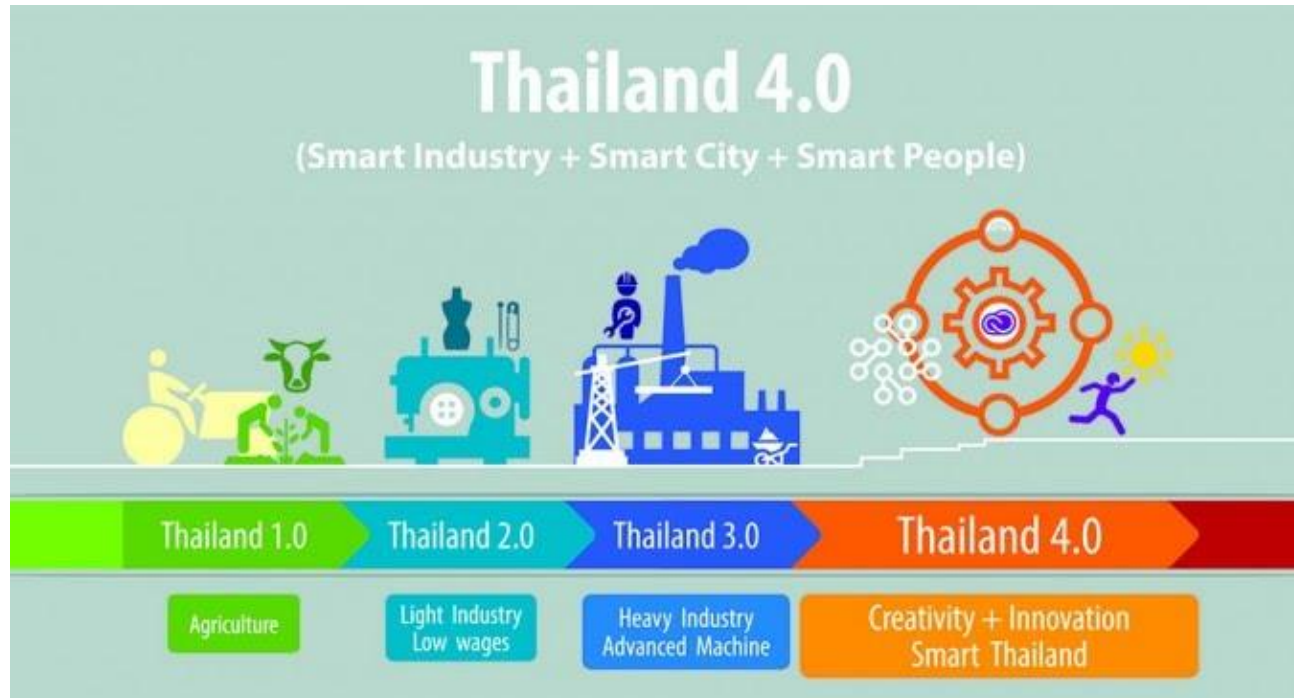
Dr. Suvaporn Phasuk  
Kasetsart University

Developed by Thailand Development Research  
Institute Foundation, Thailand

Funded by Agricultural Research Development  
Agency, Thailand



# 1.Introduction



*Source: Ministry of Industry, 2017*

- Thai government has launched the National Strategy Thailand 4.0 since 2018.
- It focuses on value-based and innovation-driven economy to develop 5 existing industrial sectors:
  - Automotive
  - Smart Electronics
  - High-Income tourism and Medical tourism
  - Efficient Agriculture and Biotechnology
  - Food Innovation.

## What is Agriculture 4.0?



**Agriculture 1.0**  
Traditional  
Farming



**Agriculture 2.0**  
Use of Light  
Machinery

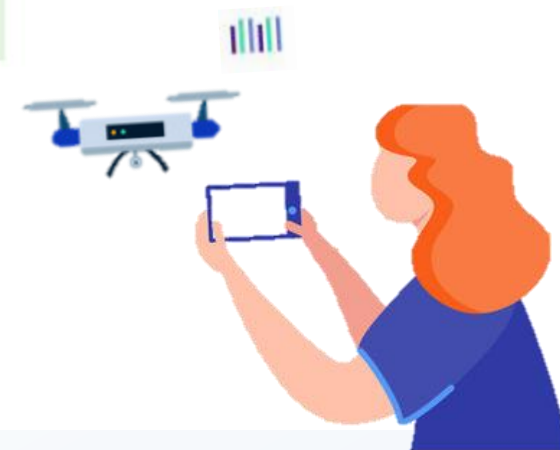


**Agriculture 3.0**  
Use of Heavy  
Machinery



**Agriculture 4.0**  
Smart  
Farming

- Innovative Technologies
- Precision Agriculture
- Internet of Things
- Utilizing of Big Data



# 1. Introduction



- The average income of Thai rice farmers was only 3,785 Baht per household in 2017
- 75% of total Thai rice farmer households had a debt problem (148,549 Baht per household)
- “Rice Farmer 4.0” campaign aims to increase rice yield and the income of rice farmers
- Assumption: if rice farmers can access to the advanced technology, their income will be raised.
- High income leads to the high saving. Hence, the farmers would be able to invest in an advanced technology resulting in the high productivity of rice and improving the life quality of farmers.  
  
(Cunquara & Darnhofer, 2011; Pfeiffer, Lopez-Feldman, & Taylor, 2009)
- Rice farmer skills must be prepared for the era of innovation

## 2. Research Question

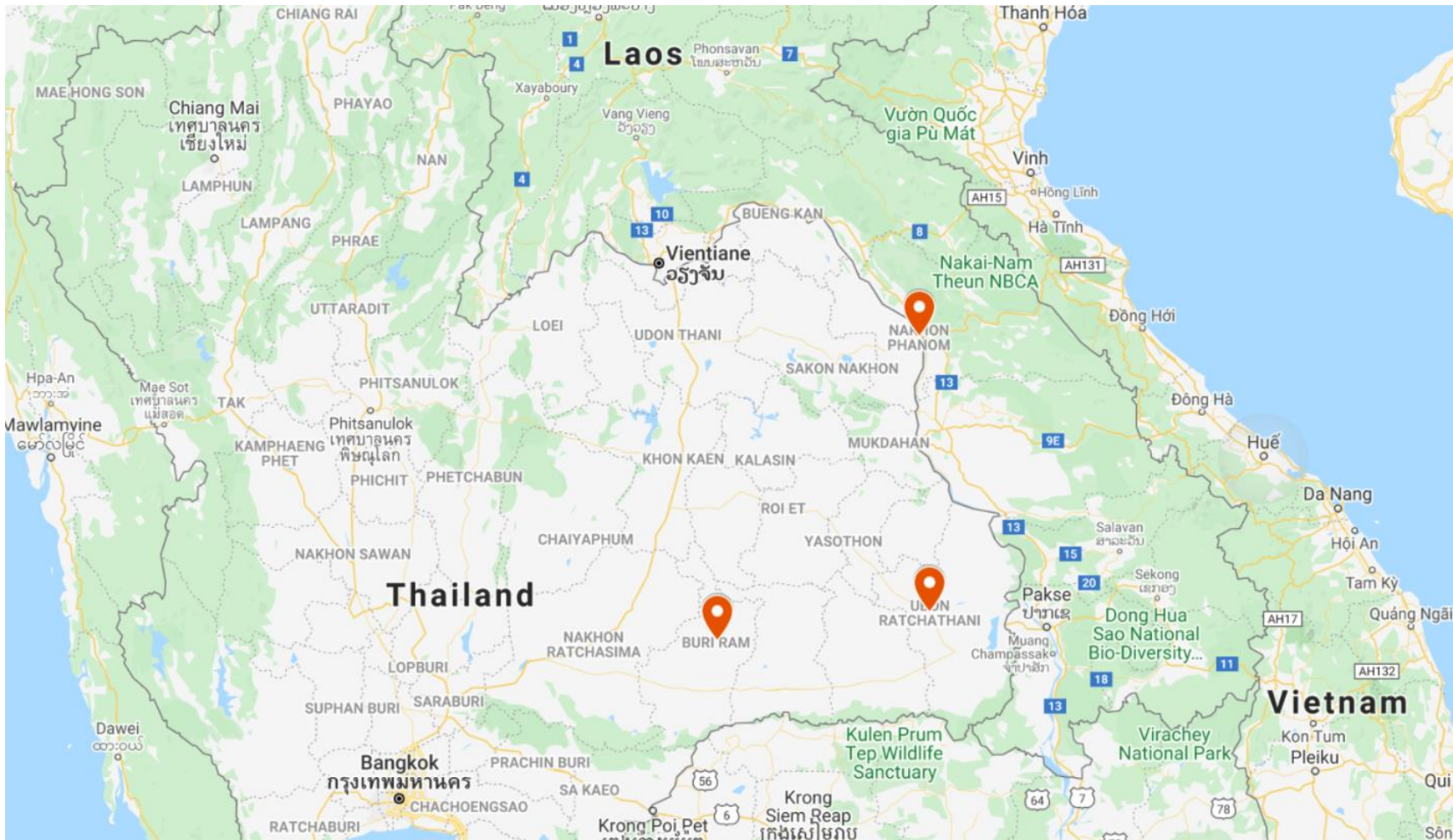
Do the technologies help rice farmers to acquire high income?



Smart Technologies  
&  
Mechanization



## 3.Data & Methods



### TVSEP Project

#### 5 Waves

- 2017
- 2016
- 2013
- 2010
- 2008

- The data of **rice farmers** in Buriram, Ubon Ratchathani, and Nakhon Phanom

## 3.Data & Methods.

### Number of Households

Year	Buriram	Nakhon Phanom	Ubon Ratchathani
2008	604	326	726
2010	610	322	703
2013	582	295	675
2016	548	270	648
2017	435	221	551



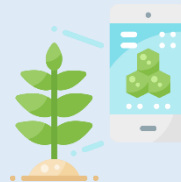
### 3.Data & Methods.

#### Fixed Effect Estimates of Cobb-Douglas Production Function by Provinces

Rice Yield by Quintiles



Farm Mechanics  
(tractor 2 wheels and 4 wheels)



Smart Technologies  
(Smart Phone, tablet, and computer)



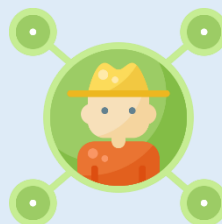
Labor Hiring Cost



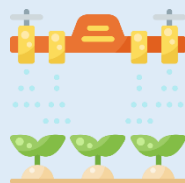
## 3.Data & Methods.

Using linear fixed effects regression model to identify the determinants of rice farmer income in each quintile

Rice Farmers' Income by Quintiles



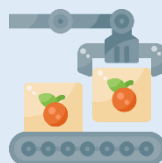
Demographic Characteristics of Household Head (Gender, Marital Status, Education, Age)



Technologies (Smart Technologies and Mechanization)






Labor Hiring Cost






Loan, Off-farm income, Remittance,  
Number of Household member

## 3.Data & Methods.

### 1. Yield (Kg. per Rai)

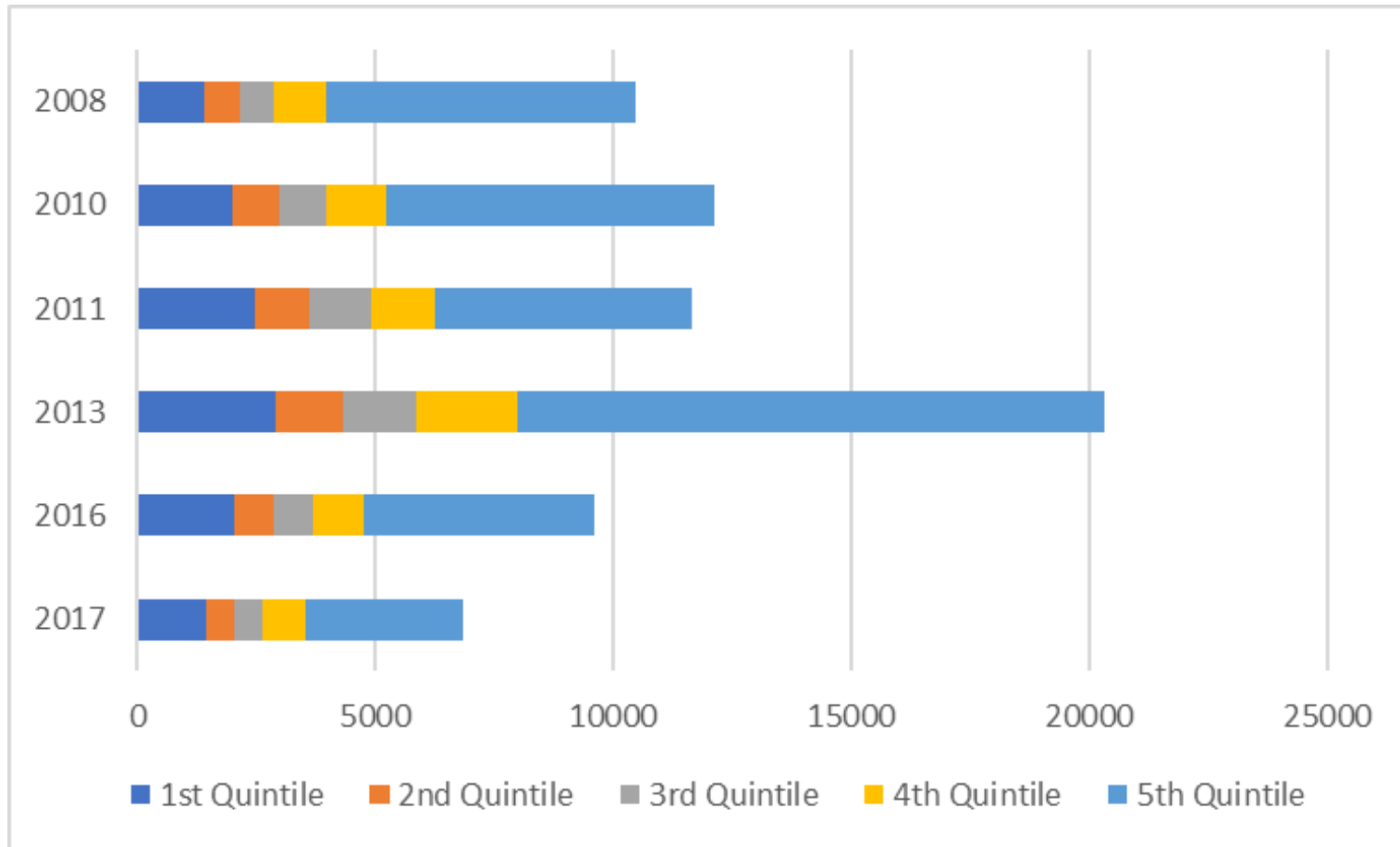
Province/Year	2008	2010	2013	2016	2017	TREND
Buriram	310.75	381.76	300.74	386.52	346.52	
Nakhon Phanom	257.22	373.07	284.86	342.52	270.08	
Ubon Ratchathani	298.36	326.43	347.79	218.39	318.62	

### 2. Average Income (Baht per Rai)

Province/Year	2008	2010	2013	2016	2017	TREND
Buriram	2988.53	4601.01	5116.08	3728.82	2839.16	
Nakhon Phanom	2517.45	2914.42	4945.54	3747.55	2473.76	
Ubon Ratchathani	2990.27	3734.00	7299.47	3415.72	2673.22	

## 4. Main Findings

There are some variations of farmer income



1<sup>st</sup> Quintile: 0 – 3,000 Baht per Rai

2<sup>nd</sup> Quintile: 1,400 – 4,000 Baht per Rai

3<sup>rd</sup> Quintile: 2,100 – 6,000 Baht per Rai

4<sup>th</sup> Quintile: 2,800 – 8,000 Baht per Rai

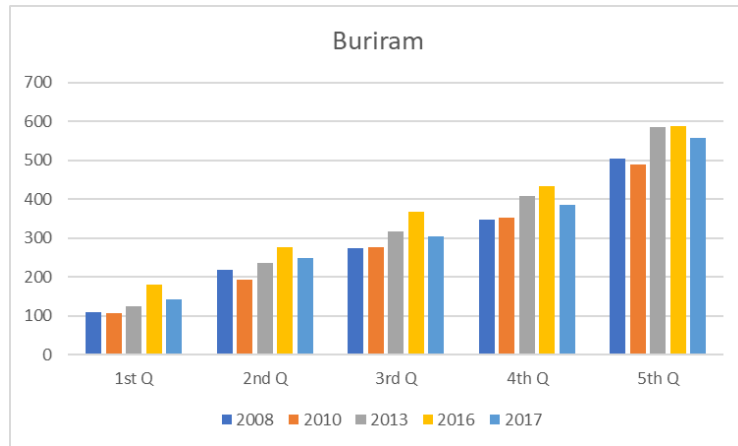
5<sup>th</sup> Quintile: 3,700 – 20,000 Baht per Rai



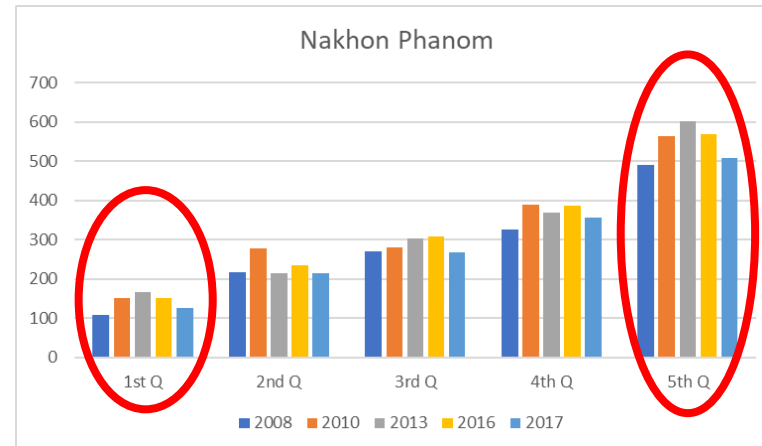
## 4. Main Findings

### Average Crop Yield (Kg. per Rai)

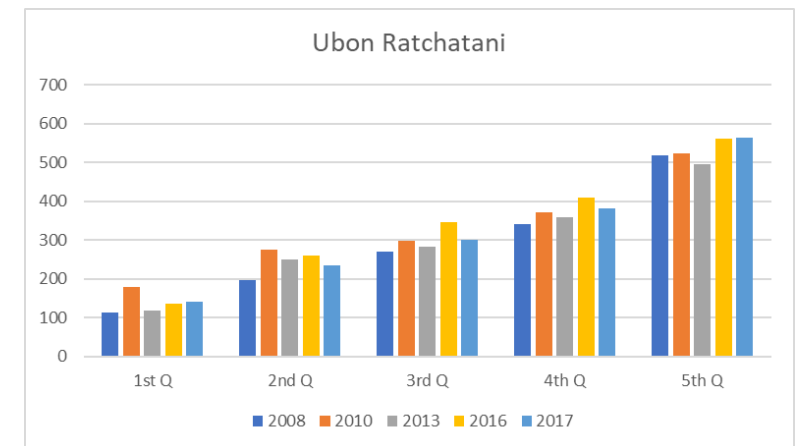
#### Tentative Increasing Trend



#### Unidentified Trend



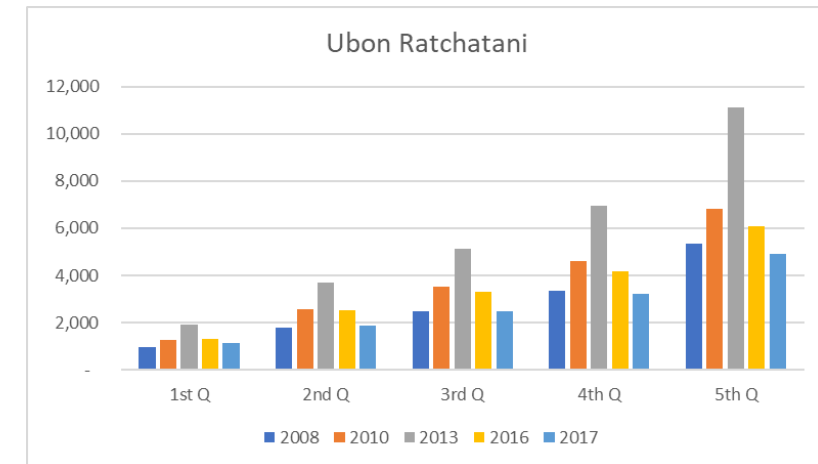
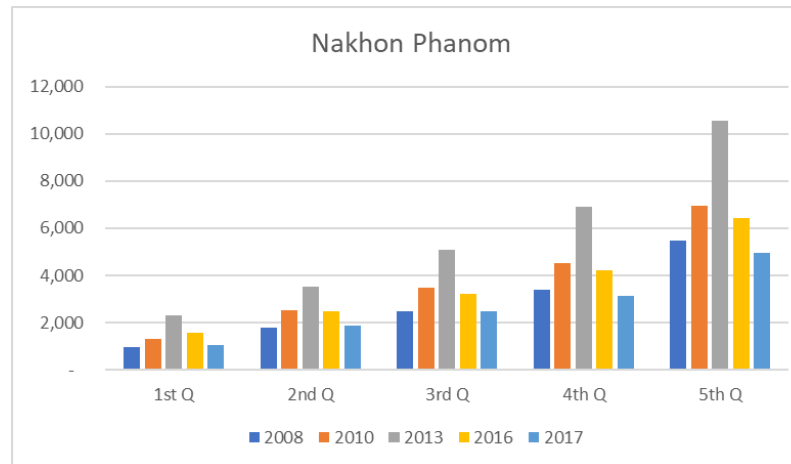
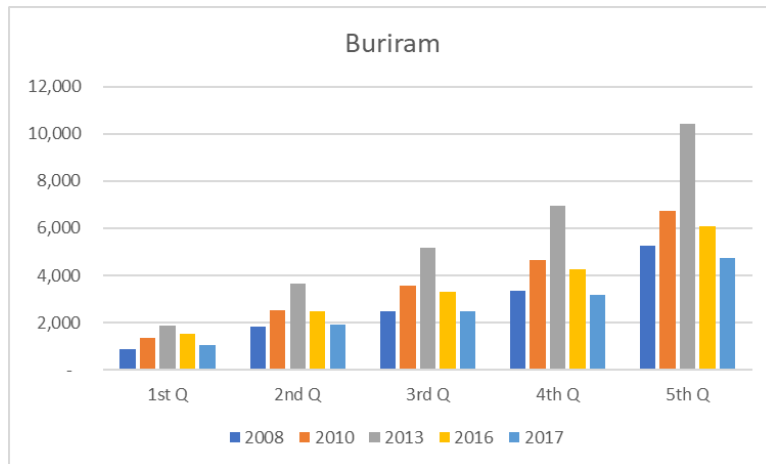
#### Possibility of Positive Trend



## 4. Main Findings

### Average Crop Yield (Kg. per Rai)

The intervention on prices does seems to impact farmers' income in all provinces.





## 4. Main Finding

### Buriram

Dependent Variable : GrossInc_rice						
Independent	All samples	Quintile1	Quintile2	Quintile3	Quintile4	Quintile5
Gender	163.5304	206.1295	-80.56916	36.70478	226.0737	709.9865
Married	187.8714	138.3622	423.0752**	-226.6724	143.4003	-667.6751
Education	99.41437	366.2598	242.3947	24.83577	717.9858	561.1227
Age	6.751854	41.68817*	-0.2672194	-31.76356	19.76931	-44.40849
Agesquared	-0.1239	-0.4430478*	0.1388863	0.4351972	-0.1592416	0.6108061
Household member	49.04926	157.2606*	295.6227***	252.7803**	411.3821**	72.17897
Smart technologies	-138.0645	13.90348	-402.6347***	143.0935	6.889069	-264.2275
Machine	-11.26424	49.15926	159.5243	-389.4654	-261.8206	23.70541
Loan	0.0003	0.0001046	-0.0020042**	-0.0005012	-0.0009316	0.000078
Labor hiring cost	0.3777172***	0.2857995	0.1778621	0.1417911	0.2529569	1.233489***
Income off farm	0.0026112	0.0006526	-0.0002213	0.0150122	0.0005509	0.019698
remittance	0.0014311*	0.005869**	0.0055169**	0.0054781	0.0010376	0.0014887*
constant	3124.436***	-744.0424	331.868	2382.379**	1344.638	5597.399***

## 4. Main Finding

### Nakhon Phanom

Dependent Variable : GrossInc_rice						
Independent	All Samples	Quintile1	Quintile2	Quintile3	Quintile4	Quintile5
Gender	-63.72071	21.90082	-148.9761	239.2886	315.3645	788.5865
Married	-92.79979	108.4645	-32.20341	18.10076	188.6679	226.18
Education	585.8052 *	243.5221	766.0098 **	854.8772 **	236.1297	-262.8673
Age	32.28731	13.23041	28.97287	47.55378	61.35774	-64.61192
Agesquared	-0.309056	-0.0947172	-0.1486521	-0.4830673	-0.5250908	0.4784776
Household member	235.5811 **	172.0297 ***	136.3269 *	206.2101 *	197.2668	437.3881
Smart technologies	-171.7183	-99.76977	118.839	-152.8797	-451.7557	-613.207
Machine	-557.3278 ***	11.76135	45.53377	342.332	-534.4585	-264.3828
Loan	1.188134	0.3214523	0.3404584	1.473723	1.893959	1.591785
Labor hiring cost	0.0033359 ***	0.0178501 ***	0.0134104 *	-0.0156495 ***	0.1508495 **	-0.041849 ***
Income off farm	-0.0008773	-0.0005089 **	-0.0113498	0.0004573	-0.0048596 **	-0.021177
remittance	1352.234	-97.81795	612.4861 *	339.3076	1120.303	5489.376
constant	-63.72071 ***	21.90082	-148.9761	239.2886	315.3645	788.5865

## 4. Main Finding

### Ubon Ratchathani

Dependent Variable : GrossInc_rice						
Independent	All Samples	Quintile1	Quintile2	Quintile3	Quintile4	Quintile5
Gender	163.2045	193.915	218.9646*	186.4988	-198.564	-3.91021
Married	109.6456	-196.1179*	63.04883	-144.2345	93.11611	-369.6628
Education	95.23663	231.2314*	169.27	301.9001	655.4028**	4.928717
Age	12.18344	16.64197	1.874178	18.28465	56.20232**	-48.1516
Agesquared	-0.121805	-0.1077407	0.0132325	-0.2266427	-0.6395452**	0.5658023
Household member	330.9328***	88.38923	171.6187***	243.8973***	644.7382***	585.0685**
Smart technologies	-572.6512***	100.0388	-263.9366**	-219.412*	-239.2682	-605.5114
Machine	154.6001	-1.019449	-41.65426	14.62389	-28.97697	1414.296***
Loan	-0.0004072	-0.0000616	0.0002159	0.0009098	-0.0008114	-0.0001668
Labor hiring cost	1.893257***	0.4169443*	0.7028125***	0.9778952***	0.6018349***	2.164404***
Income off farm	0.0009117	-0.0013266	0.0404934**	0.0219149	-0.0016916	-0.0188744
remittance	0.0012416	-0.0011293	-0.0011639	-0.0032091	0.0030744	0.006764
constant	1314.578***	289.0484	1162.89***	1342.422**	-153.6855	3049.48

## 4. Main Finding

### Buriram

Dependent Variable : lnTP						
Independent	All Samples	Quintile1	Quintile2	Quintile3	Quintile4	Quintile5
Machine	0.0534379*	0.235092*	-0.0316223	0.054145	0.0801555	0.0966521**
Labor hiring cost	0.0382341***	0.0799553**	0.0331446**	0.0047739	0.0213593	0.0239472**
Smart technologies	0.110964**	0.3516012*	0.0348583	-0.0934372	0.0442495	0.1670682**
Number of Family Labor	-0.0064075	-0.0280535	-0.0044866	-0.075313**	0.0473212	-0.0251691
constant	5.437908***	4.248235***	5.291902***	5.769054***	5.682875***	6.086405***

- The Machine and Smart technology has positive impact on rice yield significantly in 1<sup>st</sup> and 5<sup>th</sup> Quintiles
- There is an increase of 1.06 and 1.12 kg per rai in rice crop yield by using machine and smart technologies respectively.
- For the labor hiring cost show the greater impact on the rice crop yield in the lower level of quintile significantly.

## 4. Main Finding

### Nakhon Phanom

Dependent Variable : lnTP						
Independent	All Samples	Quintile1	Quintile2	Quintile3	Quintile4	Quintile5
Machine	-0.0142009	0.0800683	-0.047561	-0.1277413	-0.1196522*	-0.1524256
Labor hiring cost	0.0419639***	0.0407012**	0.0126091	0.0368305	0.0314282*	0.0852381
Smart technologies	-0.0894724	-0.0217571	-0.0744121	0.2516036	-0.091442	0.3912892
Number of Family Labor	-0.0535457**	-0.0615465	-0.0246591	-0.0671353	-0.0354951	0.2762186*
constant	5.385393***	4.740449***	5.389361***	5.660127***	5.832776***	5.464711***

- The increasing of labor hiring cost raises the rice crop yield approximately 0.04 kg. per rai on the 1<sup>st</sup> and 2<sup>nd</sup> quintile.

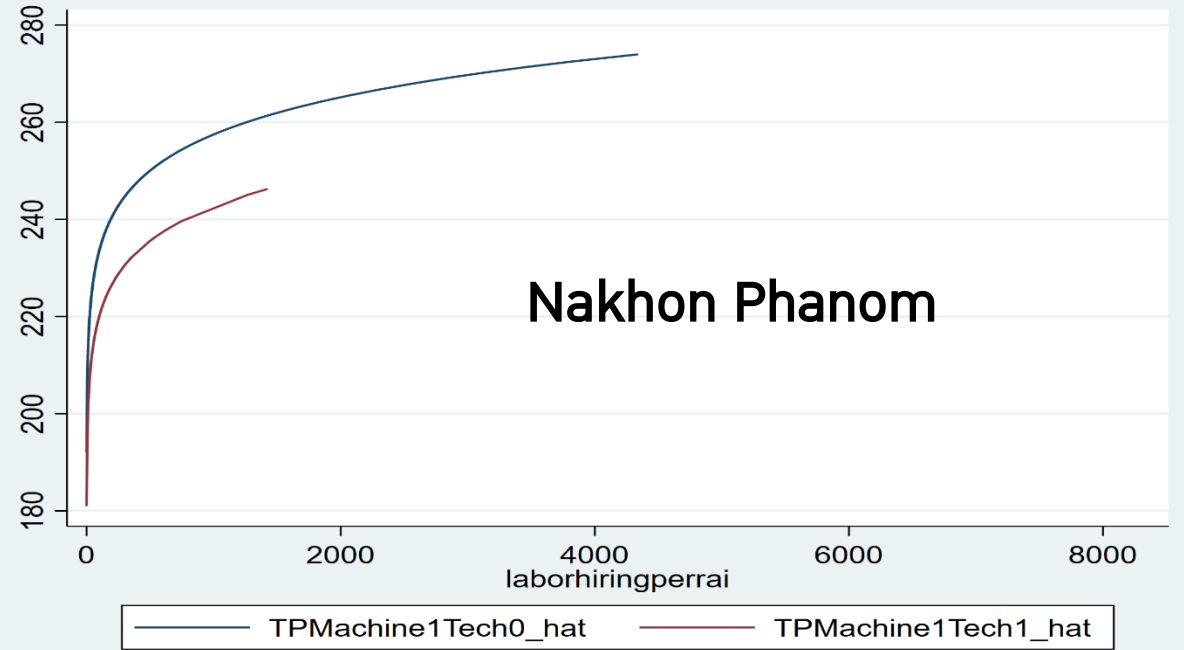
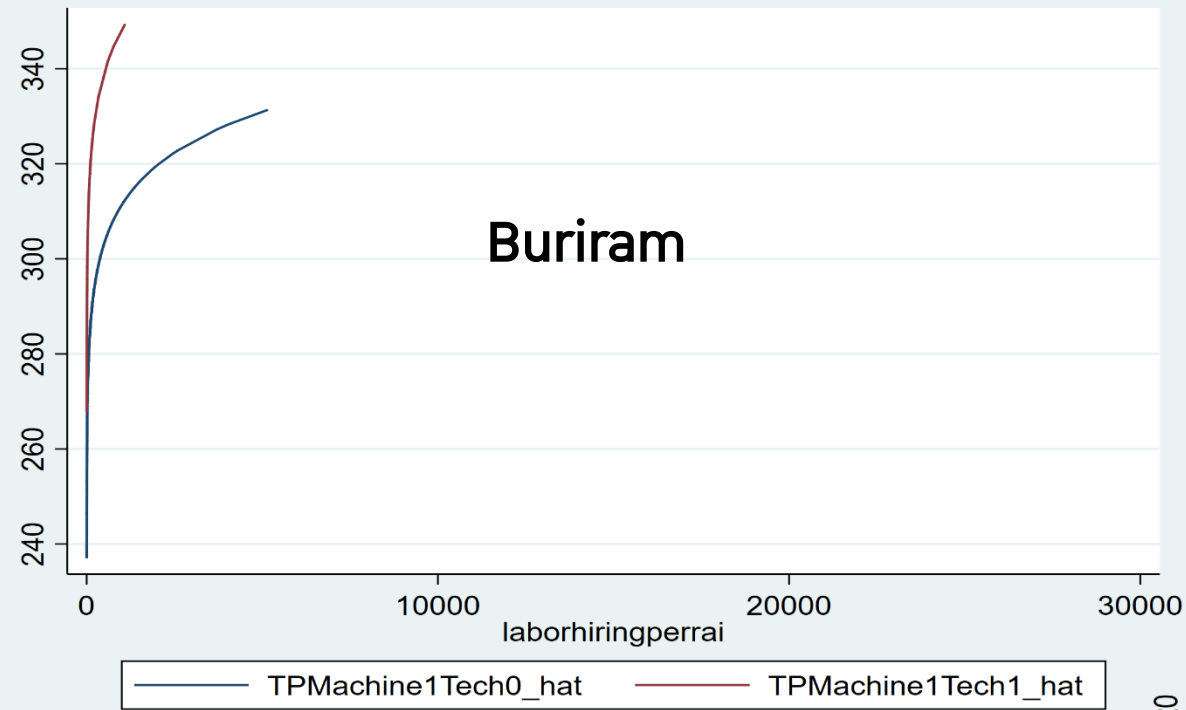


## 4. Main Finding

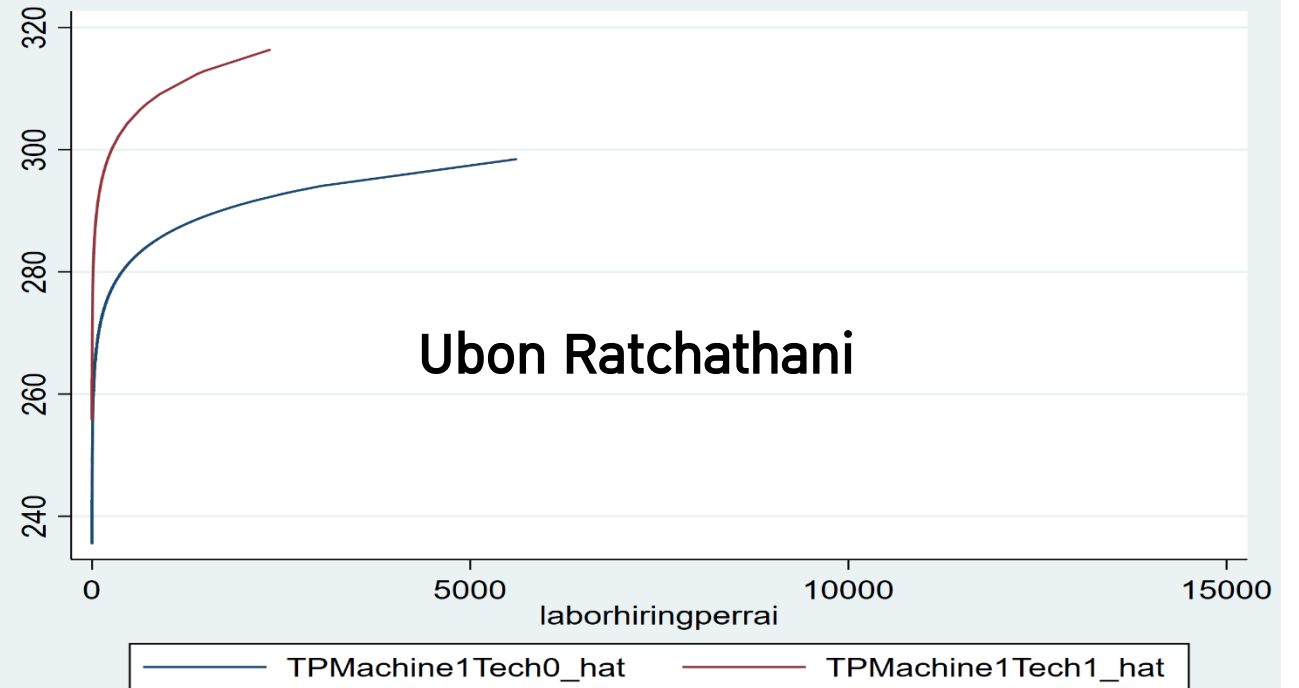
### Ubon Ratchathani

Dependent Variable : lnTP						
Independent	All Samples	Quintile1	Quintile2	Quintile3	Quintile4	Quintile5
Machine	0.0331412	0.0069645	0.0903855*	-0.0152345	0.0133962	0.071971
Labor hiring cost	0.0228665***	0.0319487	-0.0067075	-0.0057674	-0.0173274*	0.0022406
Smart technologies	0.0902096**	0.2408264	0.081251	0.0700087	0.2508318***	0.2106224**
Number of Family Labor	0.0199078*	0.1446442***	-0.0069833	0.002519	0.0134619	-0.0301458
constant	5.416276***	4.278453***	5.303397***	5.619693***	5.849717***	6.144385***

- There is an increase in 1.10 kg per rai of rice crop yield due to the smart technologies in the 4<sup>th</sup> and 5<sup>th</sup> quintiles.
- The number of family labor significant impacts in the low level of quintile by raising the rice crop yield of 1.02 kg per rai.



- Accounting for the role of smart technologies



## 5. Case Study

### Smart Phone usage behavior of Thai farmers\*



#### 1. Proportion of farmers with Smart Phone

With 68%

Without 32%



#### 2. Purpose for using Smart Phone

- Rank 1 Communication
- Rank 2 Entertainment
- Rank 3 Learning agricultural techniques and related information



#### 3. Technologies which farmers already known

Drones and Satellite

100 %

E-Commerce

59 %

Precision farm

38 %

IoT

22 %

Big Data & AI

16 %

#### 4. Important factors which farmers do not use technology in agriculture.

1

The Cost is too high to investment

2

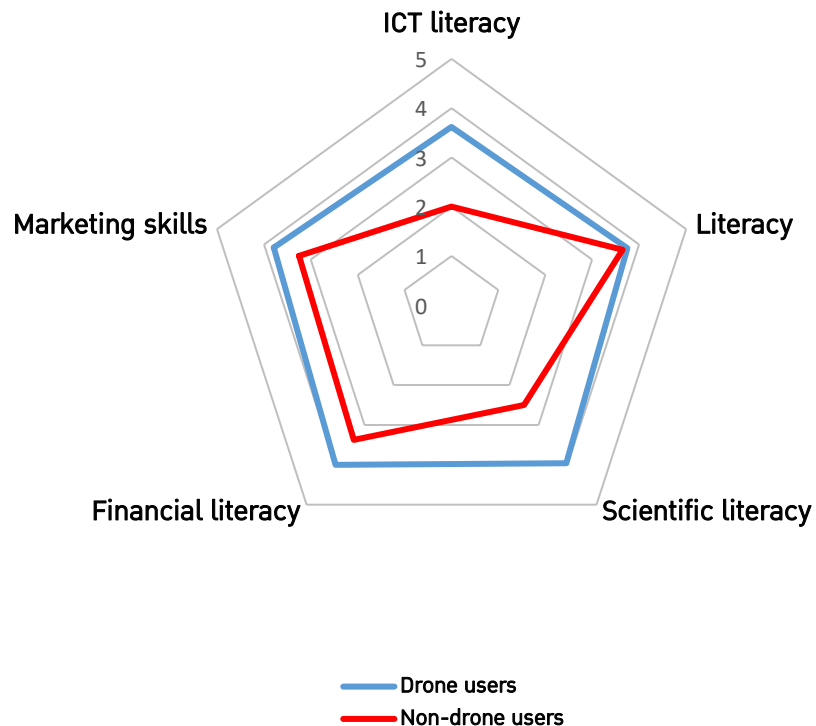
Lack of credibility

3

Lack of knowledge in agricultural technology

## 5. Case Study

### Attitudes of farmers on 4.0 agricultural skills



Notation: A group of samples are farmers in Phitsanulok Province, consisting of 37 persons

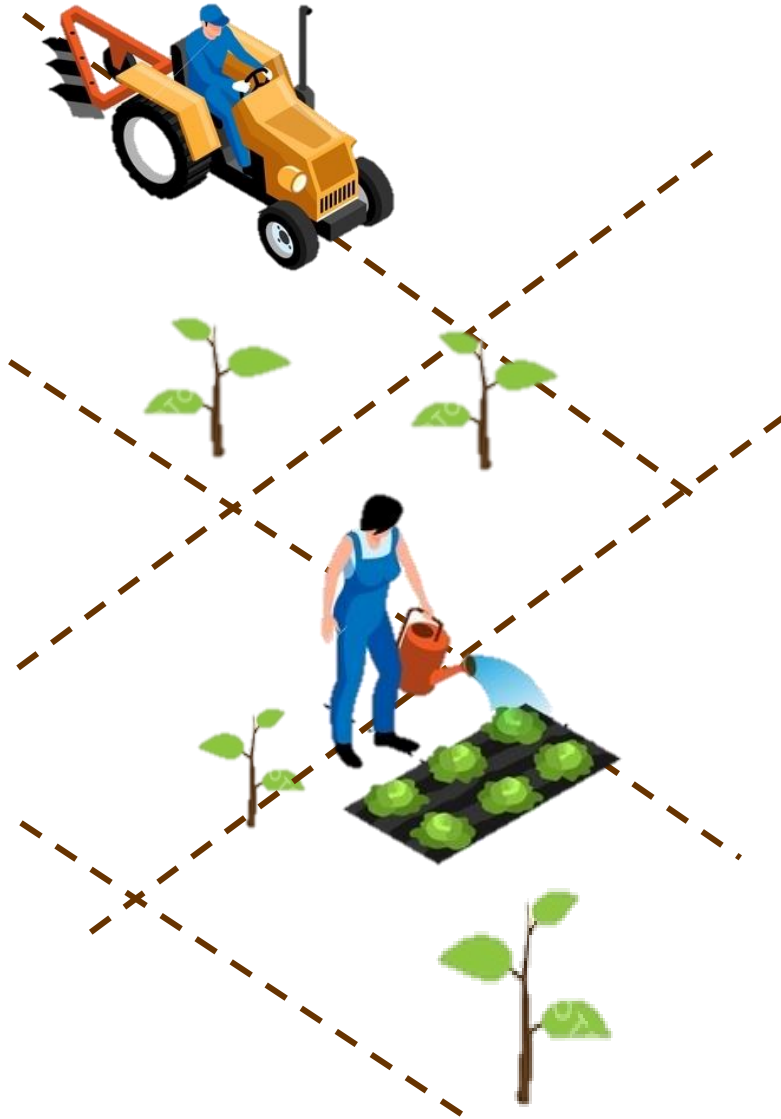
### Result

- Farmers use drones for spraying agricultural pesticides
- Most of farmers do not have their own drones; hiring is the most widespread practice
- Cost for hiring spraying drone is circa 60 baht per rai, which is equal to the wages of human-hired spraying
- Although the costs are not different, pesticide spraying drone is a better choice since it consumes less time and improves precision
- Farmers who utilize drones focus more on digital literacy skills compared to the non-users

## 4. Main Finding

- **The effect of technologies on farmers' income:**
  - The results do vary across quintiles and provinces.
  - The household member has a positive impact on farmers' income in every provinces.
  - Due to the high cost of farm machines, it seems to take a minimal role to improve farmer income according to the historical data.
  - However, the smart technologies have positive impact on rice yield significantly in Buriram and Ubon Ratchathani.
  - It possible to conclude that using technologies raise farmers' yield; however, Thai farmers have some difficulties to access all kind technologies resulting in a negative impacts on their incomes.





# Thank You

Suvaporn Phasuk  
suvaporn.p@ku.th

## Q&A

Two horizontal bars, one light blue and one light gray, positioned below the Q&A text.