Role of Information Technology in Agriculture: Productivity and Price Stabilization

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8villages

msmb

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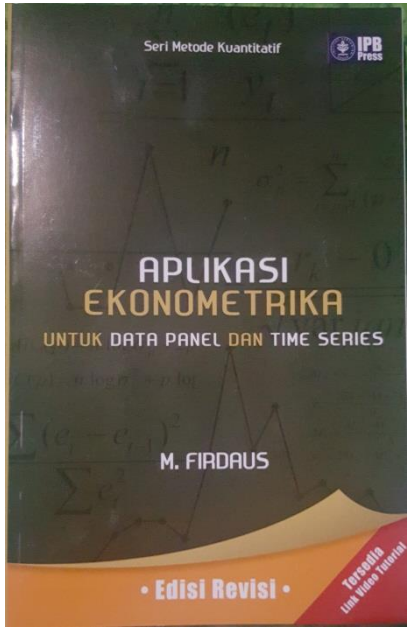

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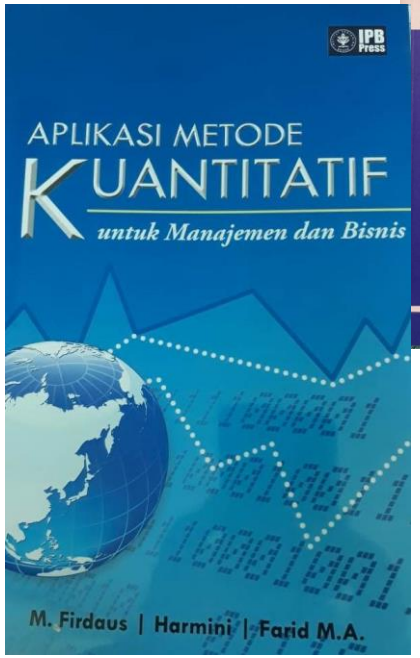
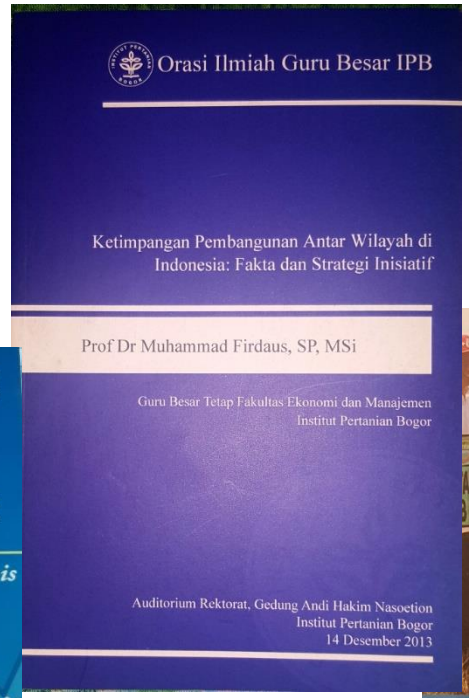
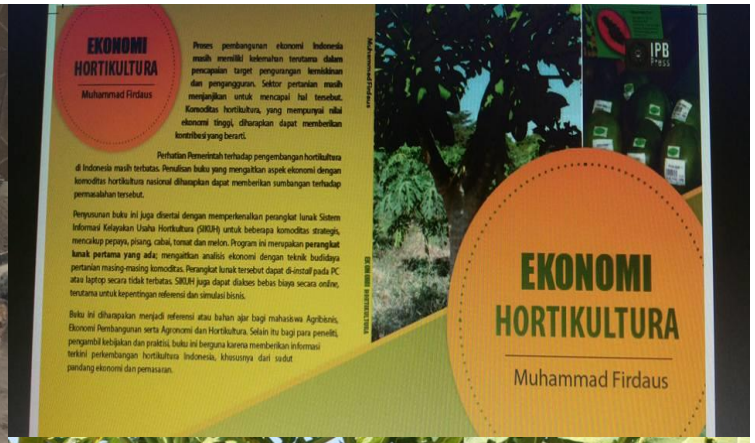




Peneliti PKHT & ITAPS IPB



Tim Ahli WTO untuk Pertanian

India, WTO, dan Indonesia

MUHAMMAD FIRDAUS
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Beberapa hari terakhir, media internasional maupun lokal ramai memberitakan hasil perundingan tingkat menteri negara anggota WTO di Bali (dikenal dengan MC-9). Saya sempat khawatir sebelumnya, karena pada hari pertama pertemuan menteri yang tergabung dalam kelompok G-33 (kelompok negara berkembang termasuk India dan Indonesia), hampir tidak ada pemberitaan di media lokal. Pertemuan WTO yang membahas tiga isu besar (disebut Paket Bali), mencakup: fasilitasi perdagangan, pertanian, dan pembangunan negara kurang berkembang, merupakan momen berharga, setidaknya bagi Dirjen WTO, Roberto Azevedo, yang baru menjabat sejak September lalu, untuk menjaga kredibilitas WTO di mata dunia. Namun, sebenarnya yang lebih urgen, bagaimana kepentingan negara berkembang terkait isu pertanian, kembali menjadi *konsen* bersama anggota WTO; setelah 12 tahun dianggap mati suri, pascakesepakatan para menteri di Doha, Qatar, yang dikenal sebagai Doha Development Agenda.

Terlepas dari apakah delegasi India mempunyai kepentingan terhadap pemilu tahun depan atau tidak, tetapi sebagian besar masyarakat sepertinya menyimpulkan bahwa India sangat alot memperjuangkan kepentingan sekitar 700 juta orang yang hidup di perdesaannya. Setidaknya hal itu yang terbaca dari banyak status media sosial perkawanan saya dan media *online*. Mereka bertanya: India vs AS, Indonesia ikut siapa? Apakah kita mengabaikan pertanian/pangan?

Peran Indonesia

Indonesia adalah koordinator kelompok G-33, yang saat ini terdiri atas 47 negara. Meskipun tuan rumah, Indonesia harus mengutamakan kepentingan negara berkembang; termasuk kepentingan India dan Pakistan yang berlawanan. Untuk mempersiapkan berhadapan dengan negara maju, dipimpin oleh Menteri Perdagangan Indonesia, dilakukan perundingan sehari sebelum pembukaan MC-9. Perundingan ini menghasilkan apa yang disebut G-33 Communique. Untuk mempersiapkan isi draftnya, sebelumnya telah dilakukan berkali-kali koordinasi dalam satgas yang terdiri atas perwakilan Kemendag, Kementan, Bulog, dan IPB. Koordinasi ini untuk menjamin isi draf tidak bertolak belakang dengan kepentingan nasional, yaitu menjaga stabilitas ketahanan pangan.

Selain sebagai koordinator, Indonesia tercatat sebagai anggota G-20, yang juga menaungi India dan Cina. Beban yang dipikul Indonesia semakin berat karena pengambilan keputusan di WTO tidak boleh menggunakan mekanisme *voting*, hanya satu negara, seperti halnya Kuba yang bersetuju dengan AS (bukan hanya India), menyebabkan perundingan menteri harus diperpanjang hingga satu hari. Perundingan tingkat menteri di Bali, meski alot, merupakan kali pertama kesepakatan dapat dicapai dalam perundingan WTO.

Secara ringkas MC-9 menghasilkan kesepakatan terkait sektor pertanian, khususnya isu *public stockholding* (PSH) untuk tujuan ketahanan pangan, berisikan: India, Indonesia, dan negara berkembang lain masih dibolehkan melakukan tiga hal terkait subsidi cadangan pangan secara bebas selama empat tahun ke depan. Pertama, memberikan subsidi dalam bentuk harga dasar. Kedua, menjalankan operasi pasar untuk penduduk miskin. Ketiga, dibolehkannya memiliki cadangan pangan untuk keadaan darurat atau bencana.

Dalam klausul yang disepakati anggota WTO, ketiga hal itu berlaku untuk makanan pokok utama. Selama empat tahun itu akan terus diupayakan negosiasi untuk mencari titik temu kepentingan negara maju dan berkembang sehingga diperoleh solasi yang lebih berimbang. Inilah jalan tengah untuk debat interim vs *permanent solution*.

Kebijakan pangan

Kepentingan menyubsidi atau tidak sektor pertanian salah satunya ditentukan oleh tingkat ketergantungan suatu negara terhadap produksi dalam negeri atau impor. Sebagai contoh, Malaysia yang berpenduduk sekitar sepersepuluh Indonesia merasa "nyaman" saja dengan ketergantungan impor makanan pokok utama 80 persen. (Statistik Bank Dunia, 2012). India dengan penduduk sekitar 1,25 miliar mengimpor gandum atau beras kurang dari satu persen. Sedangkan Indonesia, data dari berbagai sumber menunjukkan impor beras lima sampai 10 persen, bila diakumulasi kondisi tiga tahun terakhir, dan tingkat rawan pangan sekitar 20 persen. Peter Warr saja, cendekiawan Australia yang pro perdagangan bebas mengatakan suatu negara (besar) bila menggantungkan pasokan makanan pokok, utamanya dari luar negeri ada-

lah sesuatu yang *precarious*. Jadi, sdalah wajar bila India harus melakukan pengamanan terhadap ketersediaan pangan domestik; demikian pula sebenarnya dengan Indonesia.

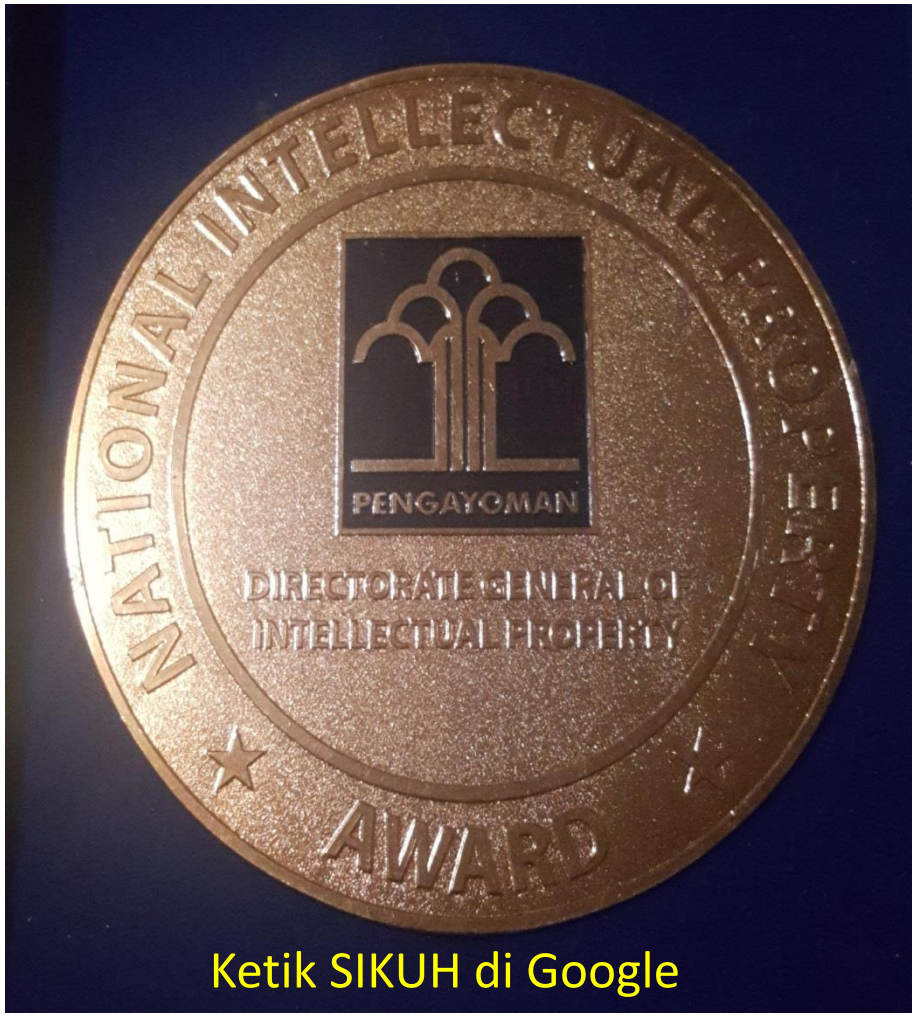
Kebijakan mengenai pangan Indonesia sudah diatur dalam UU No 18/2012 tentang Pangan. Dinyatakan tiga prinsip dalam pelaksanaan pembangunan terkait pangan: kedaulatan, kemandirian, dan ketahanan pangan. Secara tegas UU itu mengamanahkan pengembangan produksi pangan serta pemberdayaan petani dan nelayan. Isu PSH yang hangat diberitakan sebagai tuntutan India dalam MC-9, hanya sebagian saja dari isi pasal dalam UU Pangan. Secara eksplisit dalam pasal 23 dinyatakan pemerintah wajib menetapkan cadangan pangan nasional. Dalam pasal 55 dinyatakan pemerintah wajib mengamankan stabilisasi pasokan dan harga pangan pokok, baik di tingkat produsen (baca: minimum *support price*) maupun di tingkat konsumen. Terkait pasal 36 yang membahas impor pangan pokok, dinyatakan pada ayat 2: impor pangan pokok hanya dapat dilakukan apabila produksi pangan dalam negeri dan cadangan pangan nasional tidak mencukupi.

Bila isi UU Pangan dikaitkan dengan hasil MC-9, setidaknya terdapat dua catatan penting. Pertama, pertemuan tingkat menteri di Bali bila dikatakan menghasilkan kesepakatan, hanya mengandung lima-10 persen saja dari isi Putaran Uruguay. Banyak hal yang sudah pernah dibahas dalam berbagai pertemuan WTO seperti *special product* yang sangat relevan dengan UU Pangan pasal 36 ayat 2, atau *special safeguard mechanism* dengan ayat 1 pasal yang sama, belum sempat menjadi bahan pembicaraan utama di MC-9; meskipun sudah masuk dalam G-33 Communique. Artinya, ke depan Indonesia sebagai koordinator G-33 harus lebih alot memperjuangkan kepentingan negara berkembang yang sesuai dengan mamat UU Pangan.

Kedua, UU Pangan sarat dengan upaya meningkatkan produksi pangan dalam negeri dalam kerangka kedaulatan pangan, yaitu independensi dalam perentuan kebijakan pangan nasional. Memang, inilah yang menjadi tantangan terberat WTO, di mana bila semakin banyak negara yang menyadari pentingnya kedaulatan pangan seperti Indonesia, maka perjanjian dagang multilateral akan semakin susah diimplementasikan. Para pakar di Malaysia juga mulai berpikir membuat landasan kebijakan pangan pada asas kedaulatan, bukan sekadar ketahanan. Lantas muncul pertanyaan seperti berapa komoditas yang harus menjadi pangan pokok sebagai interpretasi Pasal 36? Ekuasion tentu akan berbeda: berapa biaya untuk mencapai itu? Yang sebenarnya menjadi landasan pokok perluasan perdagangan antarnegara? Dan pertanyaan-pertanyaan lain yang harus dijawab, seiring perlunya kita menjawab kapan UU Pangan tersebut mulai diimplementasikan? ■

REPUBLIKA

Peraih KI and WIPO Award 2016



Ketik SIKUH di Google

Daftar penerima nominasi

- Teuku Faisal Fathani dan Noryawati Mulyono (penemu)
- PT Dinamika Anak Muda Nasional (Daniel Mananta), PT GO-JEK, dan The Wali Studio (perusahaan)
- Kaihatu Thomas Stefanus (desain industri)
- Prof. Muhammad Firdaus[3] (Pencipta Aplikasi) mendapat Anugerah Kekayaan Intelektual Nasional (KIN) dan World Intellectual Property Organization (WIPO) Awards dari Direktorat Jenderal Kekayaan Intelektual, Kementerian Hukum dan Hak Asasi Manusia, Republik Indonesia (DJKI Kemenkumham RI). Penghargaan ini diberikan pada Firdaus atas karyanya berupa perangkat lunak (*software*) Sistem Informasi Kelayakan Usaha Hortikultura (SIKUH)[4].[5]
- Hanung Bramantyo (sutradara)
- Rafi Ridwan (perancang busana cilik)
- Aryanto Yuniawan (animator)
- Isyana Sarasvati (penyanyi)

UNIQUENESS OF FOOD PROBLEMS IN INDONESIA

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- Mostly countries face only the seasonal problem of food production
- Indonesia has two problems: seasonal variation of food production and geographical aspect, where Indonesia is the largest archipelago in the world
- The main reason of price stabilization in Indonesia is the POVERTY, which is strongly influenced by inflation. Indonesian farmers are also net consumers.
- Chilli price increases are mainly caused by scarcity/lack of production.
- In Indonesia, product diversification consumed by society is still limited. In some countries such as Thailand and Pakistan, dry chilli dominates market.
- This uniqueness requires “break through” such as ICT implementation in agriculture production and distribution.

UNIQUENESS OF FOOD PROBLEMS IN INDONESIA

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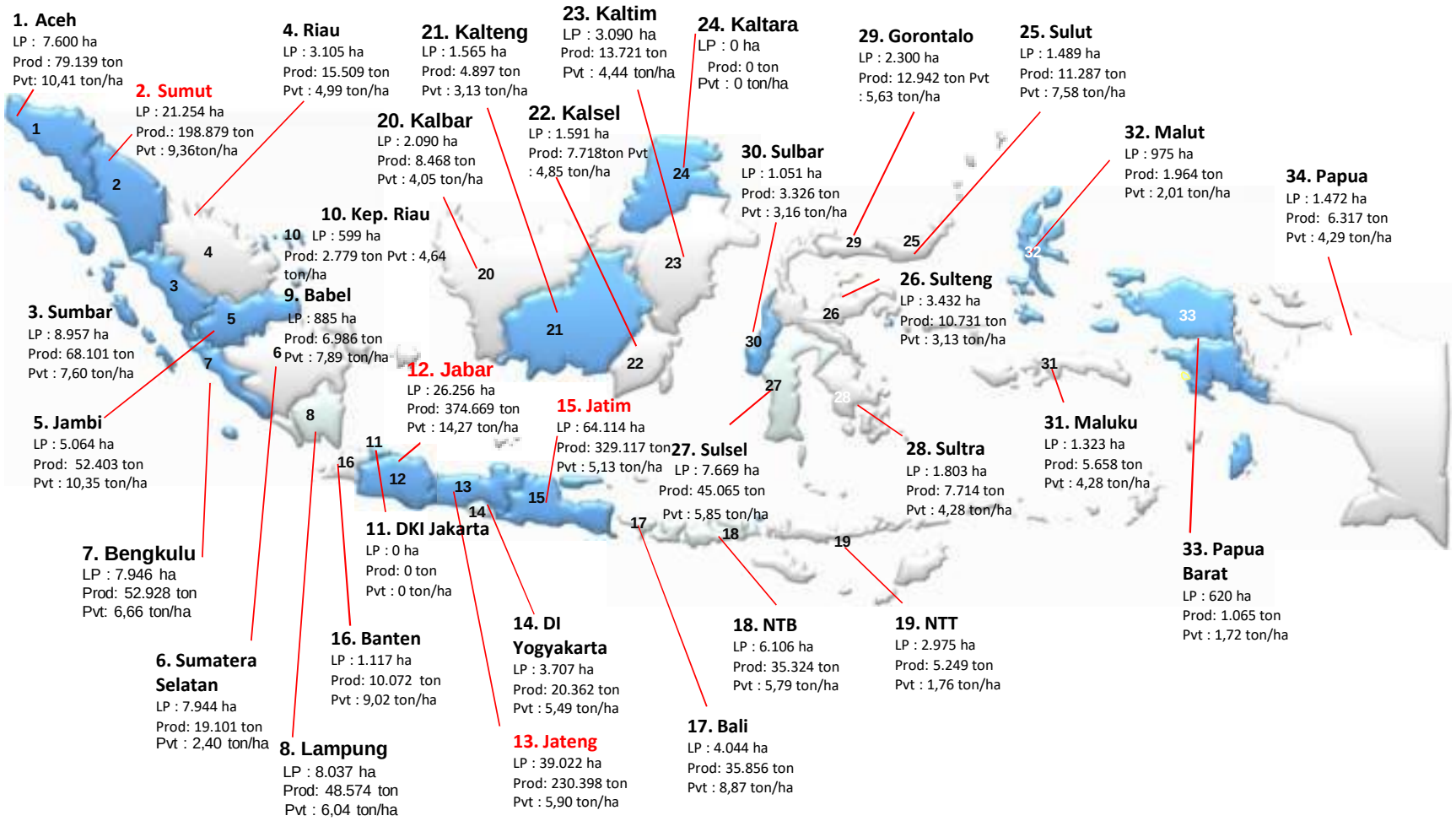
Chili Production Map in Indonesia



Seasonal Chili Production

Month	Harvest month	Scarce motnh
January		
Februariy		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

FOOD AND INFLATION

INFLATION OF VF, JULIY2019 (YOY, %)

Source : BPS, 2019

VF > 5%

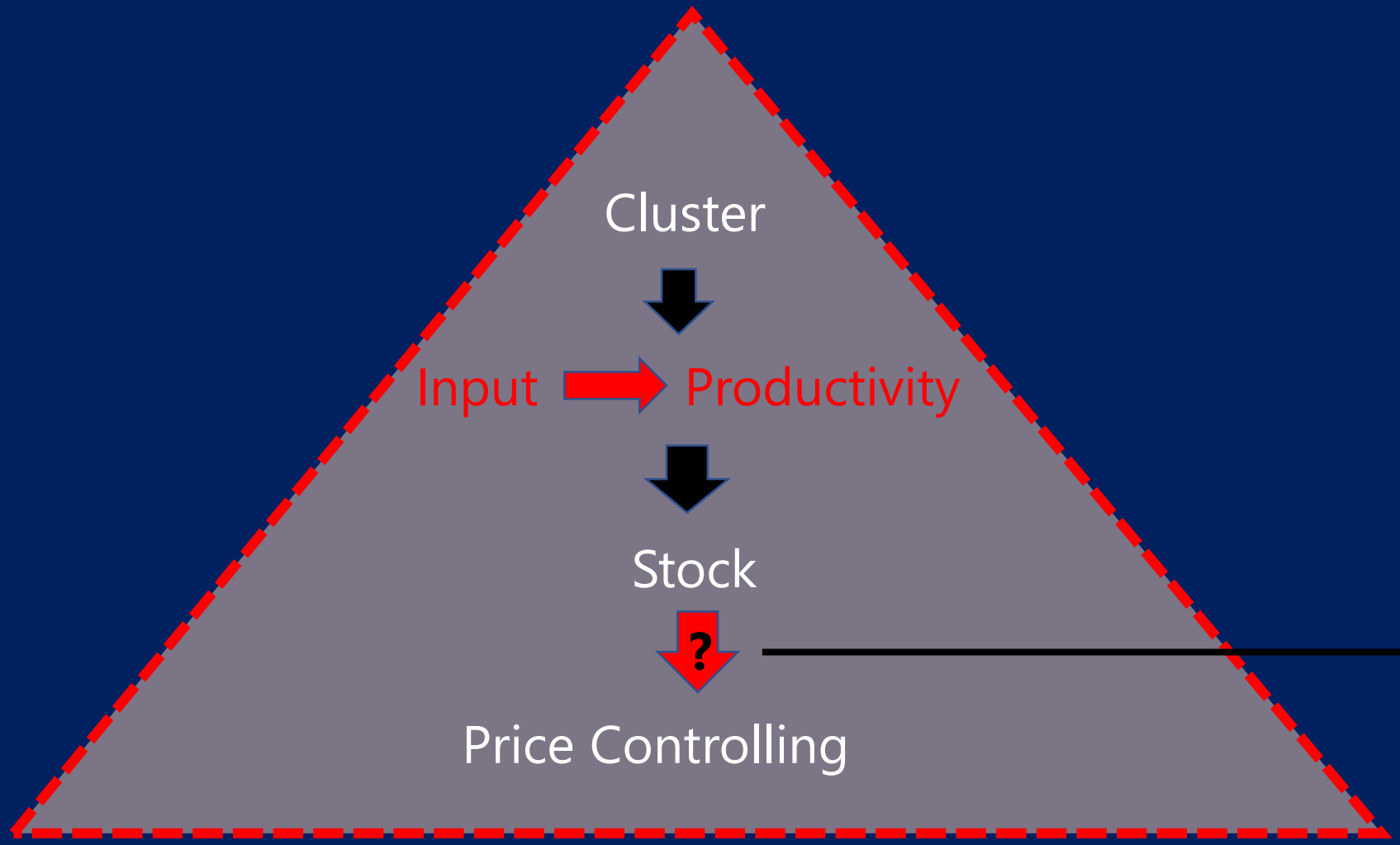
FOOD AND INFLATION

Do Clusters affect inflation control?

YES

How is development of cluster with IT use?

Basic Assumption



End to end business model development:

BMC with IT

FOOD AND INFLATION (RICE MODEL)

$$LnPrice_t = \alpha + \beta_1 LnPrice_{t-1} + \beta_2 LnStock_t + \beta_3 LnIHSG_t + \beta_4 LnKurs_t + \varepsilon_t$$

Variable	Coefficient	Probability
LNPRICE(-1)	0.853221	0.0000
LNKURS	-0.205751	0.0664
LNIHSG	0.40754	0.2750
LNSTOCK	-0.024137	0.0000
C	3.241154	0.0056
R-squared	0.976255	

FOOD AND INFLATION (RICE MODEL)

	Peningkatan Produksi (%)		Penurunan Harga (%)		Peningkatan Lahan (%)
SIMULATION 1	1	→	0.024	→	1.37
SIMULATION 2	25	→	0.6	→	34.25
SIMULATION 3	416	→	10	→	570

FOOD AND INFLATION (SHALLOT MODEL)

$$LnPrice_t = \alpha + \beta_1 LnPrice_{t-1} + \beta_2 LnStock_t + \beta_3 LnIHSG_t + \beta_4 LnKurs_t + \varepsilon_t$$

Variable	Coefficient	Probability
LNPRICE(-1)	0.686396	0.0000
LNKURS	3.148492	0.0714
LNIHSG	-1.929210	0.0118
LNSTOCK	-0.127267	0.0002
C	-9.517879	0.6160
R-squared	0.912702	

FOOD AND INFLATION (SHALLOT MODEL)

	Peningkatan Produksi (%)	Penurunan Harga (%)	Peningkatan Lahan (%)
SIMULATION 1	1	0.127	2.44
SIMULATION 2	35	4.445	85.4
SIMULATION 3	78.74	10	192

FOOD AND INFLATION (CHILI MODEL)

$$LnPrice_t = \alpha + \beta_1 LnPrice_{t-1} + \beta_2 LnStock_t + \beta_3 LnIHSG_t + \beta_4 LnKurs_t + \varepsilon_t$$

Variable	Coefficient	Probability
LNPRICE(-1)	-0.048566	0.7990
LNKURS	-0.520572	0.8049
LNIHSG	-7.219534	0.0000
LNSTOCK	**-0.417649**	0.0000
C	79.05753	0.0116
R-squared	0.819293	

FOOD AND INFLATION (CHILI MODEL)

	Peningkatan Produksi (%)		Penurunan Harga (%)		Peningkatan Lahan (%)
SIMULATION 1	1	→	0,41	→	1.02
SIMULATION 2	46	→	19.18	→	46.92
SIMULATION 3	23.98	→	10	→	24.47

BUSINESS MODEL DEVLEOPMENT

Key Partners

1. Lembaga riset (seperti IPB dan Balitbang)
2. Lembaga pembiayaan dan asuransi
3. Pemerintah pusat (K/L seperti BI)
4. Pemerintah daerah
5. Badan pengelola sertifikasi benih
6. Produsen benih (Penangkar) TSS (*True Seeds Shallots*)
7. Peternak dan supplier pupuk kandang
8. Supplier input lainnya seperti pupuk kimia (urea, SP-36, KCL), kapur dolomit, herbisida, fungisida, insektisida
9. Supplier peralatan : *sprayer*, cangkul, ember, keranjang plastik, gerobak sorong
10. Penyuluh
11. Kelompok tani
12. Pengepul
13. Retail modern
14. UMKM, industri besar, eksportir
15. Restoran dan hotel
16. Rumah tangga

Key Activities

1. Perencanaan tanam (lokasi, pola tanam, waktu tanam, waktu panen, perencanaan blok lahan untuk misi kontinuitas, teknologi, teknik budidaya)
2. Perencanaan pembiayaan, penyuluhan, dan pelatihan
3. Pelaksanaan tanam sesuai SOP budidaya, persiapan lahan, pengairan, penyediaan benih unggul, penyemaian, pemulsaan, penanaman, pemasangana ajir, pemupukan, pengairan, perempelan, pengendalian OPT, penyiraman
4. Pemanenan dan pasca panen (grading, standardisasi, packing, packaging, branding, labelling, pricing, penentuan pembeli)
5. Penyimpanan, pergudangan, transportasi, distribusi
6. Pemasaran, promosi penjualan
7. Pengelolaan keuangan (pembayaran upah kerja, input lain, panen, transportasi, dan pembayaran kredit

Key Resources

1. Ketersediaan benih unggul bawang merah serta faktor produksi dan peralatan lain
2. Ketersediaan pupuk organik dan pestisida
3. Ketersediaan lahan yang sesuai agroklimat
4. Ketersediaan penyuluh
5. Ketersediaan tenaga kerja
6. SOP budidaya bawang merah
7. Peralatan pasca panen dan sarana transportasi
8. Teknologi informasi dari lembaga terkait dan media lain
9. SDM petani dengan pengetahuan dan keterampilan yang meningkat, serta tenaga pendamping yang handal
10. Ketersediaan pasar (domestik dan ekspor)
11. Ketersediaan pembiayaan permodalan
12. Sarana jalan dan infrastruktur pemasaran
13. Kemitraan tertulis dengan industri pengolah, retail modern, pedagang besar

Value Propositions

1. Menghasilkan bennih bawang merah 6T (tepat mutu, tepat jumlah, tepat waktu, tepat harga, tepat varietas, dan tepat lokasi)
2. Menghasilkan bwanag merah yang sehat dan berkualitas (aroma, warna, tingkat kepedasan dan ukuran)
3. Menghasilkan bawang merah dengan harga bersaing terutama dengan harga bawang merah impor

Customer Relationships

1. Jaminan keaslian dan kesehatan benih
2. Pendampingan produksi umbi konsumsi
3. Adanaya supervisi kualitas
4. Adanya kontrak harga tertulis dengan customer seperti industri pengolah, pedagang besar, dan retail modern
5. Kemitraan penjualan kepada lembaga pemasaran sepanjang *supplu chain* secara kontinyu baik *offline* maupun *online*
6. Sistem pembayaran fleksibel
7. Bebas biaya pengiriman
8. Kemitraan dari industri besar ke petani berupa sharing faktor produksi dan transfer teknologi

Channels

1. Pelibatan TTI (Toko Tani Indonesia) dan Ditjen Hortikultura sebagai sarana promosi
2. Kemitraan dengan pasar modern, UMKM pengolah, industri dan BUMD
3. Pemasaran kolektif melalui kelompok tani
4. *E-commerce :* menghubungkan petani dengan pembeli seperti industri, konsumen akhir, eksportir
5. Internet dan medoa sosial
6. pameran

Customer Segment

1. Petani
2. Pedagangdaerah
3. Pedagang antar pulau
4. Pengepul
5. Rumah tangga dan konsumen lokal
6. Retail modern
7. UMKM dan industri besar
8. Eksportir

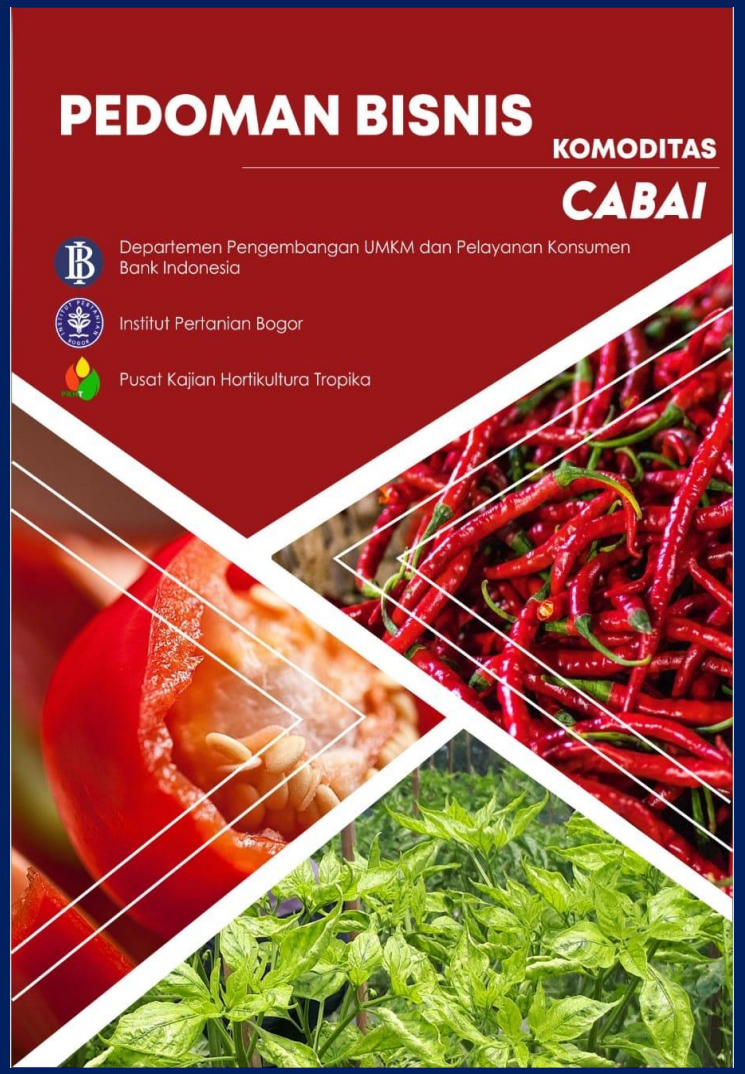
Cost Structure

1. Biaya produksi
2. Biaya pemasaran
3. Biaya penyuluhan
4. Biaya pelatihan
5. Biaya modal (pokok cicilan dan biaya bunga)
6. Biaya *research and development*

Revenue Streams

1. Penjualan bawang merah segar
2. Penjualan benih bawang merah

BUSINESS MODEL DEVLEOPMENT



Key Partners

1. Pemasok cabai merah segar
2. Pemasok peralatan dan mesin
3. Pendamping/konsultan untuk penyuluhan dan adopsi teknologi
4. Lembaga BP POM
5. Lembaga sertifikasi halal
6. Industri besar seperti Indofood, wings food, dll dan UMKM
7. Eksportir

Key Activities

1. Perencanaan bahan baku cabai segar dan bahan penolong sesuai mutu.
2. Pembelian cabai di saat panen raya (harga murah) lebih banyak
3. Pelatihan SDM untuk processing
4. Pencarian mitra kerjasama dengan pembeli dan penentuan order

Key Resources

1. Ketersediaan cabai segar yang bermutu dengan harga yang murah
2. SDM pengusaha dengan pengetahuan dan keterampilan yang cukup, serta tenaga pendamping yang handal
3. Ketersediaan pembiayaan permodalan
4. Kemitraan tertulis dengan industri pengolah, restoran, hotel, retail modern, pedagang besar

Value Propositions

1. Menghasilkan cabai olahan bermutu yang berdaya saing untuk pasar domestik dan ekspor

Customer Relationships

1. Pendampingan produksi, teknologi, dan supervisi kualitas dari industri besar pangan
2. Jaminan pengembalian barang jika tidak sesuai
3. Adanya kontrak harga tertulis dengan customer dalam jangka waktu tertentu.

Channels

1. Intervensi Ditjen Hortikultura dalam menjembatani pengolah dengan industri besar
2. Pelibatan pemerintah (Dinas Perindustrian dan Dinas Perdagangan) sebagai sarana promosi untuk ekspor
3. Internet dan media sosial
4. Pameran

Customer Segment

1. Industri besar pangan
2. Eksportir

Cost Structure

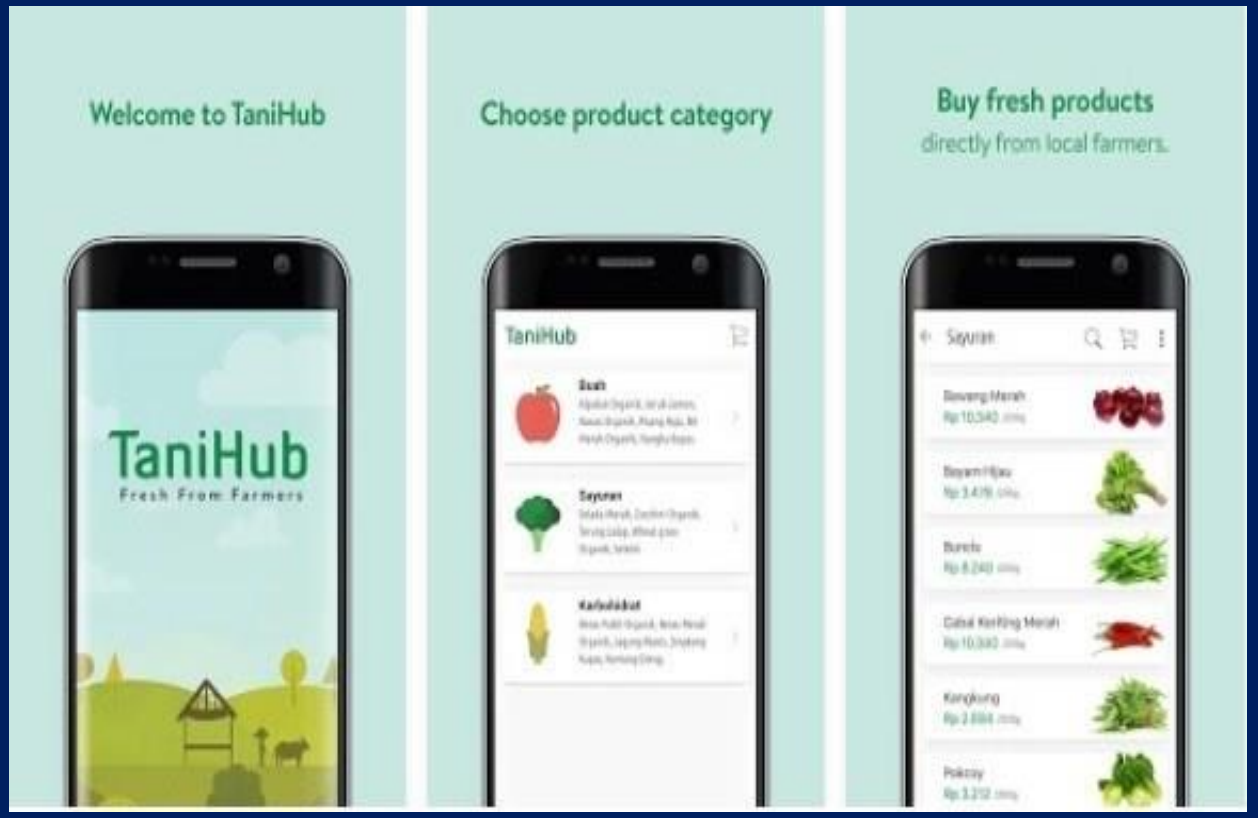
1. Biaya produksi dan kemasan
2. Biaya transportasi, pencarian pembeli, pemasaran dan promosi
3. Biaya penyuluhan, pelatihan, dan pendampingan
4. Biaya modal (pokok cicilan dan biaya bunga)
5. Biaya research and development

Revenue Streams

1. Penjualan cabai kering utuh ke segmen retail modern, restoran, hotel, rumah sakit, pdagang daerah, dan antar pulau, eksportir

BUSINESS MODEL DEVLEOPMENT

Customer Relationship

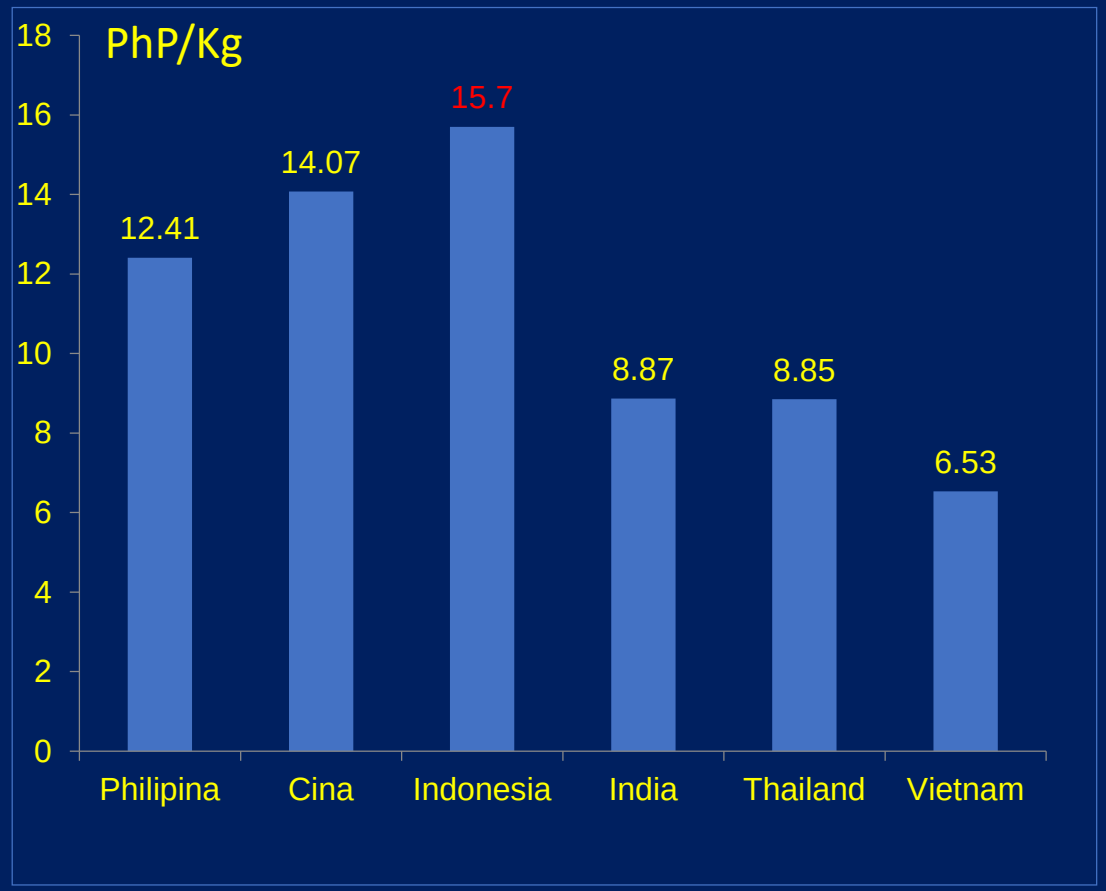


WHY AGRICULTURAL PRODUCTIVITY?

- Until recent years, agriculture sector in Indonesia still experiences deficit trade balance
- Some potential crops: maize and soya bean are still imported, while they have potential to be cultivated with higher productivity
- Mostly agriculture commodities are produced with under potential yields
- For rice, a study from IRRI (2016) shows that production cost in Indonesia is twice of paddy farming in Vietnam. Labour cost dominates farmer's spending, follows the land rent. Some efforts are devoted by GoI to reach self-sufficiency
- Warr (2011) reports that productivity is a key to have balance between food security and food self-sufficiency aims

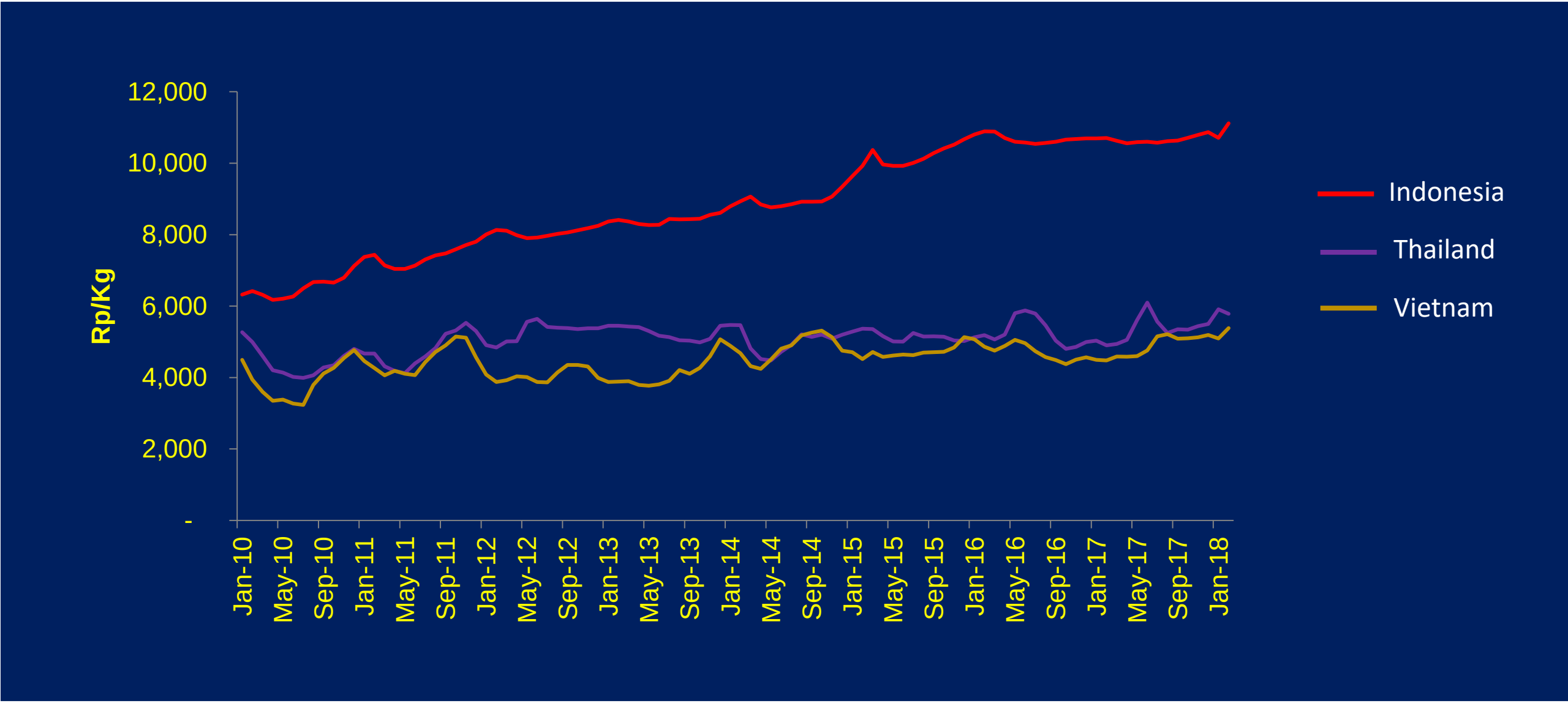
COST STRUCTURE OF RICE IN ASIAN

- IRRI, 2016:

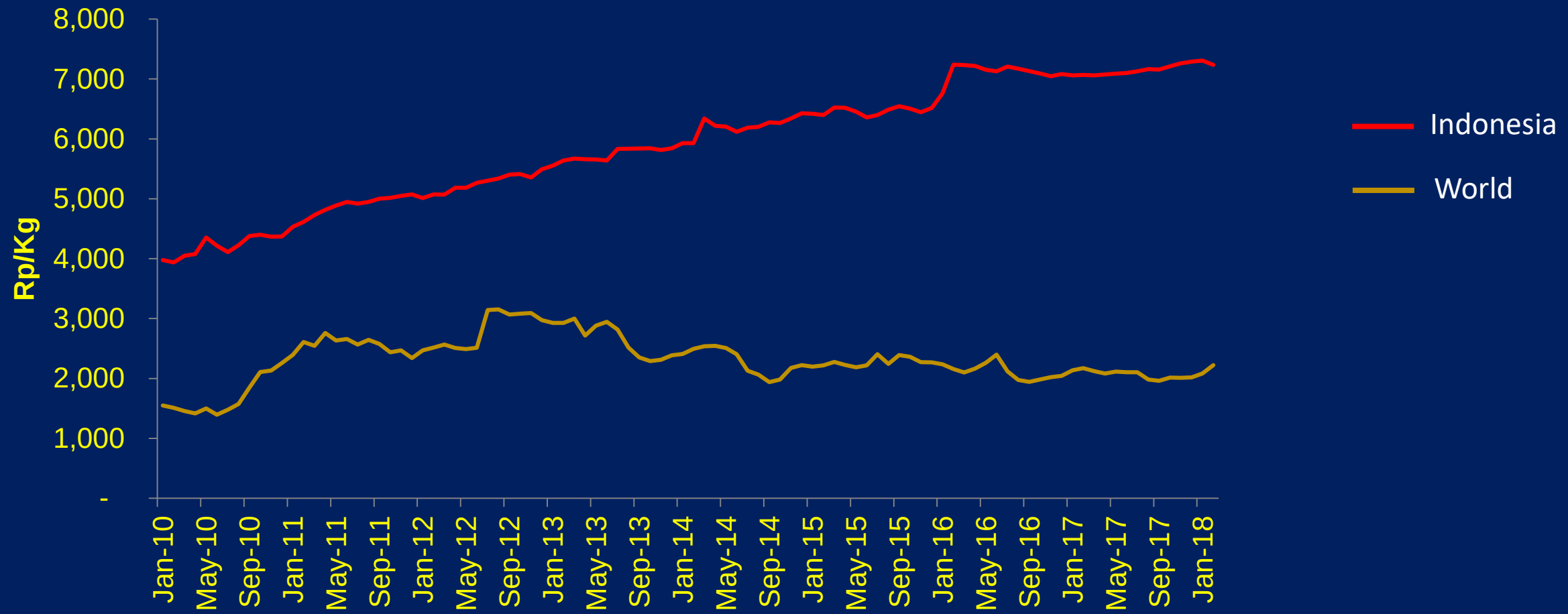


Item	Philippines	China	Indonesia	India	Thailand	Vietnam
	(PhP kg^{-1})					
Seed	0.54	0.93	0.14	0.51	1.13	0.39
Fertilizer	1.73	1.93	0.96	0.93	1.54	0.96
Chemicals	0.32	1.72	0.92	0.21	0.90	0.69
Hired labor	3.39	0.52	4.23	2.75	0.68	0.35
Operator, family, & exchange Labor	0.56	2.84	1.04	0.56	0.64	0.67
Animal, machine, fuel, & oil	1.54	2.88	0.48	1.78	1.83	0.63
Irrigation	0.45	0.00	0.14	0.12	0.13	0.08
Food	0.19	0.00	0.29	0.12	0.05	0.00
Transportation	0.05	0.11	0.10	0.04	0.16	0.03
Tax	0.03	0.00	0.19	0.03	0.00	0.00
Land rent	1.80	3.45	6.17	1.99	1.94	1.20
Interest on capital	0.40	0.01	0.31	0.10	0.06	0.04
Other inputs	0.10	0.02	0.12	0.13	0.00	0.09
Total cost	11.13	14.39	15.08	9.27	9.07	5.14

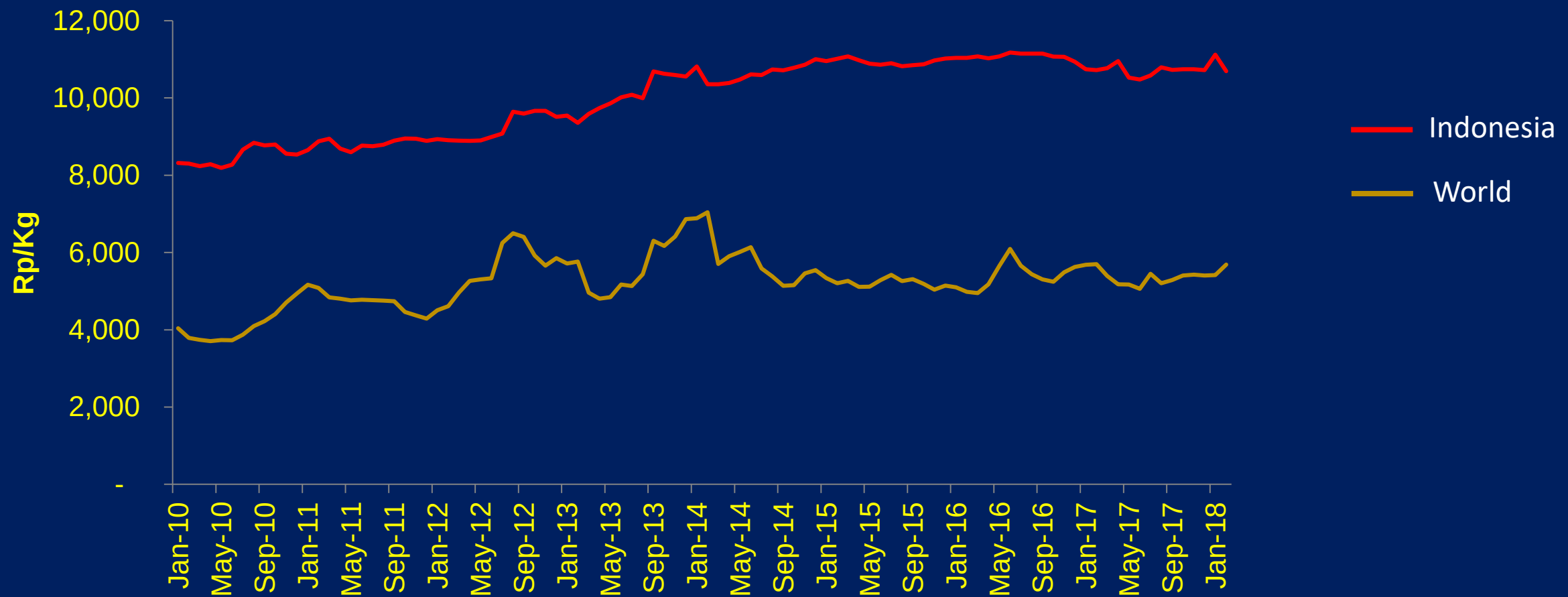
INDONESIA VS WORLD PRICE OF RICE



INDONESIA VS WORLD PRICE OF MAIZE



INDONESIA VS WORLD PRICE OF SOYABEAN



EXISTING PROGRAMS

IPB University
Inspiring Innovation with Integrity

- To accelerate the performance of agricultural production, gol provides access on the application of agricultural machinery. In some ways, government facilitates farmers by granting machinery for farmer groups

Selected Agricultural Machinery Grant	Unit		
	2015	2016	2017
Two-wheels Tractor	27,812	31,734	14,615
Four-wheels Tractor	1,472	2,250	1,572
Transplanter	5,879	5,854	1,730
Harvester	3,246	12,893	4,631

- The impact of agricultural machinery has been proven to enable of boosting productivity by up to 20.81% (Miyamoto et al., 2019). Unfortunately, when it comes to natural intervention such as climate change, production machinery only cannot be relied on. Farmers need to daily adapt with changing weather, water availability. One of solutions to optimize the use of machineries in agriculture is combining that with ICT

CHALLENGES FOR ICT USE IN AGRICULTURE

IPB University
Inspiring Innovation with Integrity

- The use of ICT in Indonesian agriculture is growing slowly. The extension schemes still employ manual methods in disseminating information for farmer groups. It is related to the adoption of digital technology since rural farmers due to human capital and economy condition

- Only well-educated and high profile farmers who can adapt the technology (Susanto, 2018)

- The other problem appears due to the lack of digital infrastructure. Government support is needed to tackle the obstacles for example by providing connectivity in the rural areas. Furthermore, those problems impede the development of ICT in agricultural extension (Purnomo and Kusnandar, 2018).

- Therefore, it is important to provide user friendly technology with proper infrastructure to improve the number of farmers involved.

CGE ANALYSIS OF PRODUCTIVITY IMPACT

IPB University
Inspiring Innovation with Integrity

- Results are generated from simulations:

Sector	Simulation (percentage of increase in productivity)					
	A	B	C	D	E	F
Paddy	5%	10%	5%	10%	5%	10%
Second Food Crops			5%	10%	5%	10%
Other Crops					5%	10%
Fishery					5%	10%

Macroeconomy	Base Value	Percentage of Change					
		A	B	C	D	E	F
ABSORP	11,288.1	0.077	0.147	0.194	0.375	0.358	0.685
PRVCON	6,597.2	0.133	0.251	0.331	0.641	0.612	1.173
FIXINV	3,568.0						
GOVCON	1,122.8						
EXPORTS	2,434.3	0.093	0.181	0.338	0.69	1.171	2.394
IMPORTS	-2,099.0	0.091	0.174	0.072	0.146	0.282	0.546
GDP	**11,623.4**	**0.078**	**0.149**	**0.246**	**0.482**	**0.542**	**1.068**

CGE ANALYSIS OF PRODUCTIVITY IMPACT

IPB University
Inspiring Innovation with Integrity

- Based on CGE analysis, productivity increase in Indonesian agriculture will bring positive impacts on Indonesian economy
- The effects of productivity increase on national output (GDP) range between 0.07% up to 1.07%
- The large effect is found only for simulation D, E and F. This means 4.0 must be implemented on all sectors in Indonesian agriculture, not only paddy, maize and soy bean (main food crops program in Ministry of Agriculture)
- The positive effects are found on three components of aggregate expenditure: private consumption (PRVCON), export (EXPORT) and import (IPORT). The two components of private investment (FIXIN) and government expenditure (GOVCON) are not influenced by increase in agriculture productivity

HOW TO BOOSTING PRODUCTIVITY

- To boosting productivity, Indonesian agriculture needs implementation of new technology, for example farmers are required to conduct more precise farming system. In the field, for excample farmers should apply fertilizing based on soil contents

- Usually Indonesian farmers use urea more than technical recommendation. Study from Osorio (2011) shows that in paddy, farmers apply urea around 400 kg per ha or more, while recommendation for their location in only 300 kg

- Farmers also should know water availability to increase effectiveness of fertilizer. Actually crop calendar from Ministry of Agriculture already delivers some information regarding water availability based on weather forecast. still covers sub-district level area. The crop calendar will inform when farmers should do planting; what kind and how much fertilizers must be used and some possibilities of disasters such as flood and drought. It still covers sub-district level area and web-based. More specific location information is needed to have more precise farming, and mobile application must be introduced to spread fast information

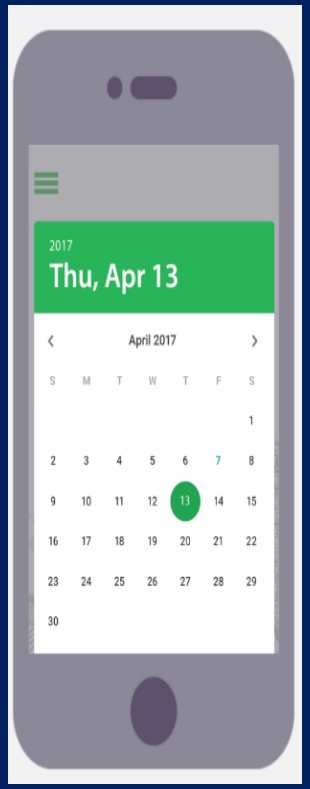
CASE STUDY OF ICT USE 1: AGRISOCIO

AgriSocio is an Indonesian social enterprise in food and agriculture. It was founded in 2013 with the goal to create products and services in an environmentally and socially responsible system, while empowering rural households

CASE STUDY OF ICT USE 1: AGRISOCIO

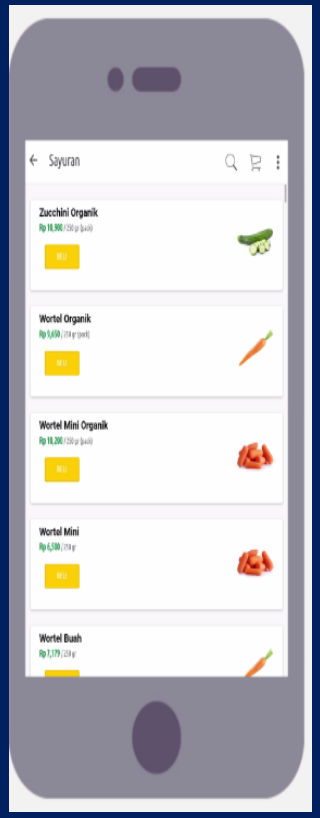
Social Mapping

Schedule Planting and

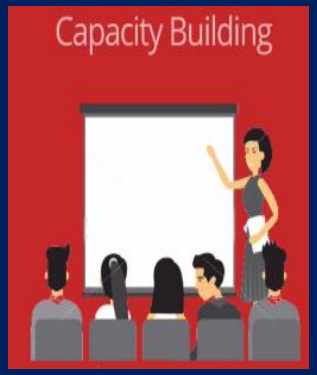


Risk Control

Marketing



Community Dvelopment



CASE STUDY OF ICT USE 1: AGRISOCIO

We grow 42 types of fresh products such as Vegetables, Fruits, and Spices for domestic and export market

CASE STUDY OF ICT USE 1: AGRISOCIO

- ☑ Traceability
- ☑ Premium Quality and Easy to Access

CASE STUDY OF ICT USE 1: AGRISOCIO

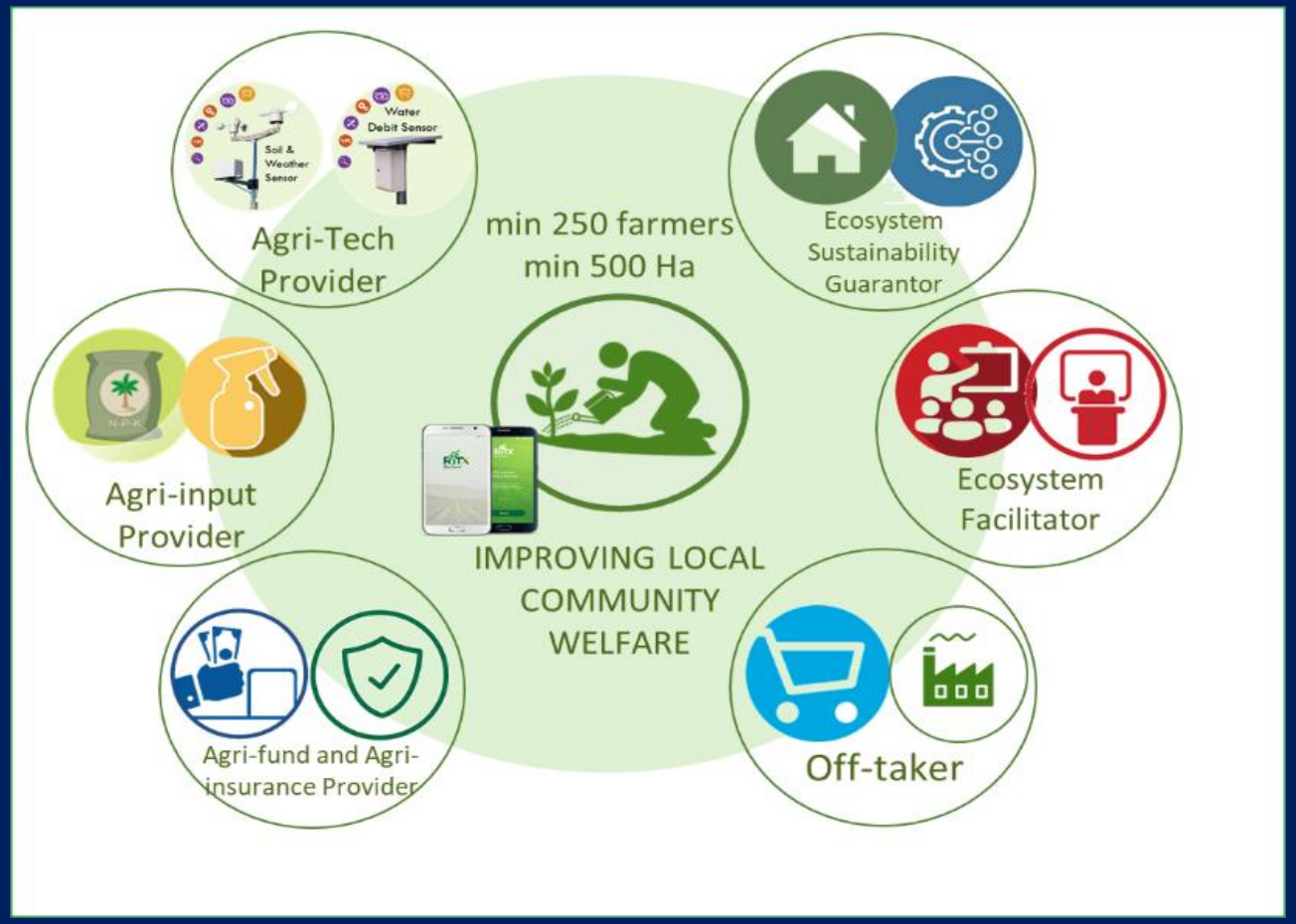
CASE STUDY OF ICT USE 2: MSMB

- MSMB is a start-up company concerning in agriculture envisioning to improve farmer's prosperity. It was established in 2018 based in Yogyakarta Special Region. Currently, it has 80 fulltime employees. Its main products are agro-tech and agribusiness services

Name of Project	Leader	Involved Stakeholder	Targeted Farmers	Implementation
Precision Agriculture 4.0 Implementation in Disadvantages Area	Ministry of Communication and Information	Ministry of Communication, Ministry of Agriculture, MSMB, Local Kiosk, BCA, BNI, ACA	750 farmers within 1,500 ha	Dompu, Situbondo Malang and Gunungkidul
Leveraging Agriculture Extension in Irrigated Land	Asian Development Bank	MSMB, BMC and MicroAid,	50,000 farmers within 25,000 ha	Sukabumi and Pasaman Barat

CASE STUDY OF ICT USE 2: MSMB

- Business model: integrated ecosystem. In the stakeholder chain, MSMB is working with relevant institutions to help farmers access technology, find the right financing and obtain premium price



CASE STUDY OF ICT USE 2: MSMB

- Revenue stream fo MSMB may be obtained from:
  1. Sales and rental of technology
  2. Margin from agri-input distribution
  3. Margin from being aggregator of products from farmers to off-taker
  4. User acquisition incentive from the addition of financial institutions members (farmers)
  5. Data Management including data subscribed by the ecosystem partners including land profiling, Good Agricultural Practice traceability and farmer profiling

- The other scheme is RiTx Bertani activation profit sharing model considering revenue. MSMB will provide spraying (for one crop calendar) for those who have filled all the apps questions at a low cost. One farmer has to invite at least five other farmers nearby to receive this service. Also, minimum number of farmers involved is 250. At the end, farmers can share their profit to MSMB based on the increase of the yield. For example: farmers may increase their yield by 4 ton/ha, so MSMB will receive 1 ton, while the remaining 3 ton is for farmers

CASE STUDY OF ICT USE 2: MSMB

- MSMB produces some technologies in the forms of hardware and software (apps): drone surveillance, drone sprayer, soil and weather sensor and water debit sensor

- Drone surveillance is aimed to identify land fertility and to determine the spots for soil and weather to be installed. Enhanced with NDVI technology, drone surveillance can generate 3D image to present the updated condition in the farm field, including the fertile and infertile areas in the farm overlay. After receiving and analysing the data, the map is sent to drone sprayer. With autonomous system, drone sprayer is capable of spraying agricultural land automatically based on the field need

- Soil and weather sensor is used to understand real-time situation on in the context of agro-climate aggregate. The information is updated every five minutes. Smallholder farmers will receive notification and recommendation on what to do via apps so called RiTx Bertani. Farmers will be notified and suggested to add relevant fertilizer with certain amount of dosage to the soil. The other example is rainfall warning. When tomorrow is going to be raining, farmers will be notified and recommended not to fertilize their field

CASE STUDY OF ICT USE 2: MSMB

- Project impact:
  - Ritx Indonesia has been used widely by more than 3,304 farmers in Indonesia. RiTx Bertani Apps was launched as a transformation from RiTx Indonesia. It provides various feature, mainly to support precision farming. At the moment, the number of farmers involved in the Smart Farming projects has reached up to 8,500 farmers. It will climb up to 1.8 million farmers this year since the company has started to collaborate with BNI to develop microcredit scheme for farmers, who are also the BNI customer.
  - The implementation of MSMB technology has reached to 22 regions in Indonesia, mainly utilizing soil and weather sensor. There are 55 unit of sensors installed. It plays a significant impact for farmer, especially in terms of fertilizer efficiency and productivity improvement. One of the special cases occurred in Malang. MSMB conduct Smart Farming 4.0 demonstration plot for shallot within 20 Ha of land between November 2018 and February 2019. It shows a significant growth of yield per hectare where in the previous planting farmers can attain 7 ton/ ha, while after technology involvement the productivity increased by 50%, peaking at 11 ton/ ha.

CASE STUDY OF ICT USE 3: 8villages

- 8villages offers a complete platform ecosystem that uses different services to empower small farmers

Upstream → **Downstream**

Farmer best practices and needed information

Agri chain logistics

Farm to entity logistics

Farm

Primary industry

Market

Consumer

DataHub

Connecting organization to data

Secondary industry

Tertiary industry

CASE STUDY OF ICT USE 3: 8villages

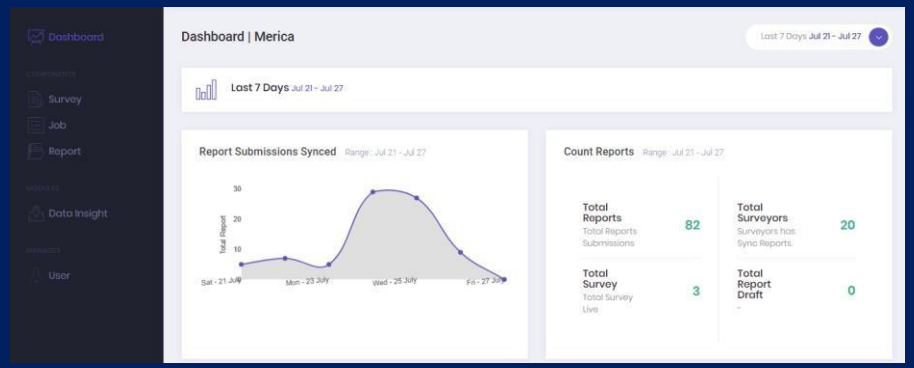
- A community platform for agriculture: PETANI (for farmers), GEMBALA (for animal breeder), NELAYAN (for fisheries), where farmers can ask questions to expert and receive daily tips and trick about good agriculture best practices
- Androind application for farmers, where they can:
  - ✓Ask question
  - ✓Advertise
  - ✓Read articles
  - ✓Watch videos
  - ✓Report harvest
  - ✓ Answer surveys
  - ✓ Check weather information
  - ✓ Check commodity price
  - ✓ Check fertilizer information

CASE STUDY OF ICT USE 3: 8villages

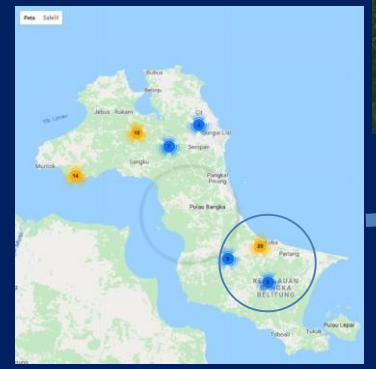
- Lisa has connected farmers in **250 districts** across the nation with dominant area still in the west because of data infrastructure limitation

CASE STUDY OF ICT USE 3: 8villages

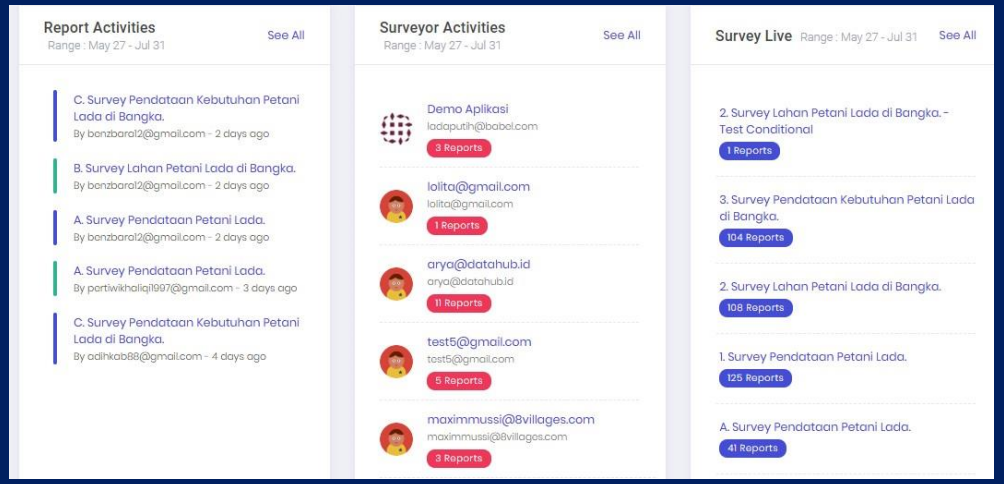
DataHub **improve visibility on field officer** activities and reports



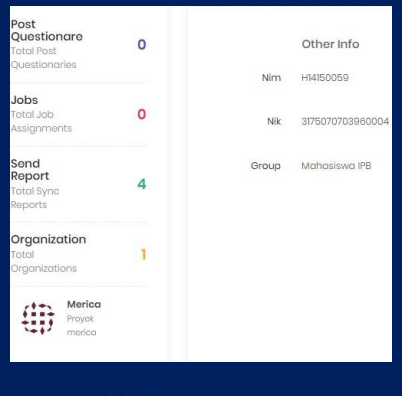
Dashboard

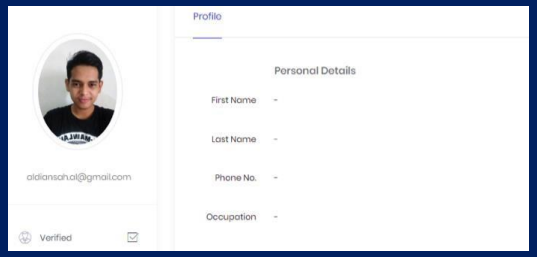


Integrated with Map

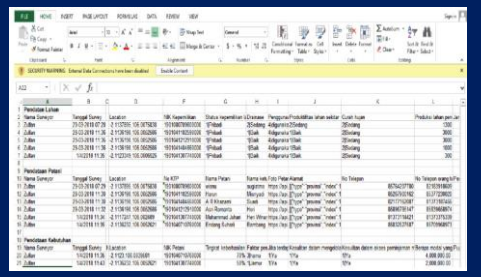


Realtime information from the field





Surveyor performance

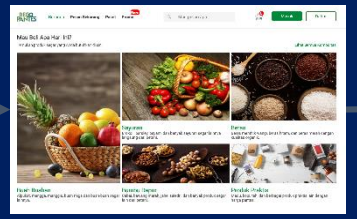


Integrated with external platform

CASE STUDY OF ICT USE 3: 8villages

- Develop an **online market solution for agricultural products** to help both farmers and customers to get a fair price of their products.

Customers needs



Customers order via website or application

Customers needs data is receiving by farmers

Farmers harvesting and send the products

Products is received by RegoPantes. RegoPantes delivery will distribute the products to the customers tracked by Vlogs platform

Free delivery to customers

Freshly quality, guarantee 24 hours after harvesting with safety packaging

QR Code consist of the product details about the land and the farmers information.

REGO PANTES

Terong
Kualitas Biasa

Sakhirin
Limpung, Kab Batang

* Kelompok TaniRaharjo 1
* Gapoktan RAHARJO
* Komunitas Padi, Cabai, Terong

Kualitas produk dijamin langsung oleh Petani, bila ada ketidaksesuaian harap menghubungi Suara Konsumen paling lambat 1 x 24 jam setelah menerima produk ini. Kami akan meneruskan masukan Anda kepada Petani yang bersangkutan dan memastikan Petani memberikan jawaban atau solusi yang tepat untuk Anda.

Untuk meminimalkan penyusutan berat, Petani menambahkan 10% dari berat yang dicantumkan.

Sebaiknya digunakan sebelum :
14 Aug 2018

Dipanen Tanggal :
09 Aug 2018

Suara Konsumen
Telp/WA : 0818663888
Email : info@regopantes.com

Berat :
1 kilogram (kg)

Saran Penyimpanan :
Segera simpan pada lemari pendingin setelah Anda menerima produk.

Terimakasih telah membantu Petani mendapatkan harga yang pantas

CASE STUDY OF ICT USE 3: 8villages

REGO PANTES

December 2017, initiate B2C
100 farmers sell

- Farmer's income **increased 17%**

December 2018
2.765 farmers sell

- Farmer's income **increased 26%**
- Capacity in average **2.500kg/month**

January 2019, initiate B2B
5.515 farmers sell

August 2019

- Farmer's income **increased 2.200%**
- Capacity in average **55.000kg/month**
- **150 outlets served**
- **Average monthly revenue for B2B IDR 1.000.000.000,-**

CASE STUDY OF ICT USE 3: 8villages

is a digital logistic platform which connecting customers with various Logistic Providers that giving service in Land Transportation, Domestic Cargo and Warehouse

CUSTOMER PROBLEMS

- Difficult to find logistic partner.
- Can't monitor the ral-time shipment.
- Wasted time with manual operation and paper work.

VENDORS PROBLEMS

- Difficult to find order.
- Price competition/unfair market competition.
- Difficult to manage driver and vehicle.

Solution for Customer

Solution for Partner

LESSONS-LEARNED FROM INDIA

- **India** is the world largest in food grain production and milk, and the second for fruits and vegetables.
- India experienced an emerging ecosystem of digital technologies in agriculture, which lead to **the rise of start-ups and young entrepreneurial firms:** 53 Indian start-ups raised US$ 313 in 2016 (2nd after China).
- The prominent venture: e.g. ITC's e-Choupal: covering over 35,000 villages and serving over 4 million farmers, launched in 2000 .
- Digital technology in Indian agriculture is not about big box solutions only, but a large number of young entrepreneurs have ventured into this sector to tackle specific challenges.

CONCLUSION

- Continuous improvement is needed to develop more productive agriculture in Indonesia. ICT is one of ways to accelerate the increase in agriculture yield
- This study finds that increase in agriculture productivity will bring significant impacts on macroeconomic indicators such as growth, poverty rate and welfare
- To deal with climate change and its impact on the crops, farmers demand technology. Some other problems are also appearing such as funding access and fair farm gate price
- AgriSocio, MSMB and 8villages are three examples of implementing Internet of Things in Agriculture. The replication into other regions are needed as existing projects have increased productivity and farmer's access to markets

THANK YOU