LANDSCAPING OF DIGITAL AGRICULTURAL SYSTEM OF INDONESIA

FINAL REPORT

NOVEMBER 2020

MERCY CORPS | AGRIFIN

Rabo Foundation

Report contents

Our report has covered research and analysis of demand-side, supply-side, and the broader ecosystem

Demand side (farmers)	Capture the needs, perceptions, aspirations and behavior of farming community (including allied activities) in the context of technology and digital channels
Supply (of financial services and digital solutions)	Map the landscape of technology play in Indonesia with specific reference to agriculture covering various aspects from input to farming to harvest/post-harvest on one hand and supply of adequate formal financing solution (by various entities) including provided by fintechs for agriculture
Ecosystem for DFS in agriculture	Understand the enabling environment in terms of legal, regulatory and policy issues, financial and capital needs and market / outreach inputs
Impactful interventions by development actors / funders	Advise on the role(s) development actors / funders can undertake in the ag-tech space in Indonesia

We conducted 35 interviews with agtechs, banks, donors, government / regulators, offtakers, and farmer associations

Sinarmas	Agricultural value chain actor
Indonesian Palm Oil Association (GAPKI)	Agricultural value chain actor
GAPKINDO (Rubber Association Indoensia	Agricultural value chain actor
East West Seed Indonesia (+ SIPINDO Application)	Agricultural value chain actor
Aspekpir (Palm Oil PIR Farmers Association)	Agricultural value chain actor
SPKS (Palm Oil Swadaya Farmers Association)	Agricultural value chain actor
Wirinsinge Cooperative, West Lombok	Agricultural value chain actor
Syngenta	Agricultural value chain actor
CGAP	Development actor / donor
Embassy of the Kingdom of the Netherlands	Development actor / donor
Mercy Corps Social Ventures	Development actor / donor
UNCDF	Development actor / donor
IFAD	Development actor / donor
Syngenta Foundation	Development actor / donor
Patamar	Independent expert
BNI Bank	Traditional FSP
ACA Asuransi	Traditional FSP
BPR PD Subang (Rural Bank)	Traditional FSP

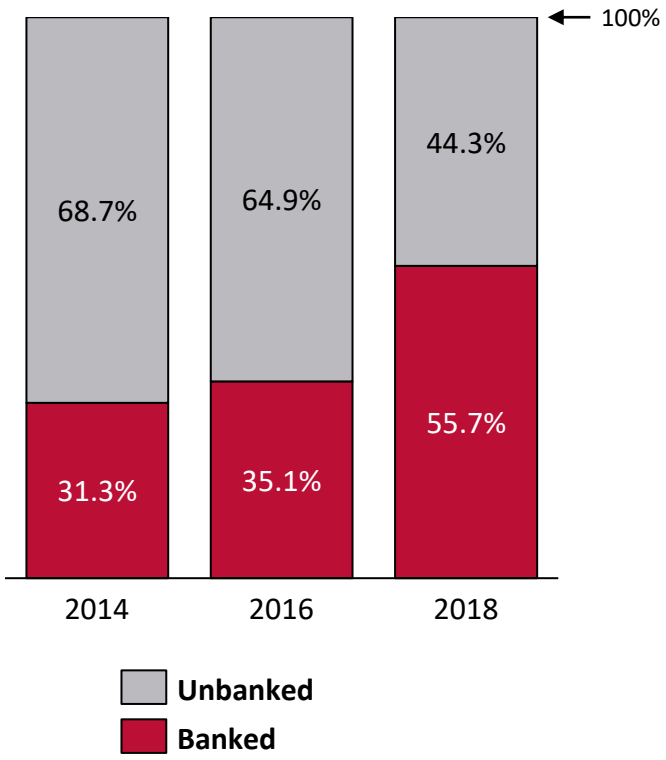
Bank Indonesia (Central Bank)	Public sector
Indonesia Financial Services Authority (OJK)	Public sector
Ministry of Agriculture	Public sector
DNKI (Financial Inclusion Secretariat)	Public sector
MSMB	Digital service provider (non-FS)
Koltiva (FarmXtension App)	Digital service provider (non-FS)
Hara	Digital service provider (non-FS)
Eden Farm	Digital service provider (non-FS)
Meridia Land	Digital service provider (non-FS)
TaniHub	Digital service provider (non-FS)
BCG Digital Ventures	Digital service provider (non-FS)
8villages	Digital service provider (non-FS)
Vasham	Digital service provider (non-FS)
iPangan	Non-traditional FSP / fintech
Crowde	Non-traditional FSP / fintech
Impact Credit	Non-traditional FSP / fintech
iGrow	Non-traditional FSP / fintech
LinkAja	Non-traditional FSP / fintech

Indonesia has made progress towards financial inclusion – particularly in rural segments where agriculture is mainstay of livelihoods

- While the formal definition of financial inclusion in Indonesia covers access to various products[1], **formal measures of financial inclusion primarily focuses around bank account ownership**
- **G2P programs have spurred account ownership** overall, with significant progress made in rural segment
- However, bank account use is often limited to receiving payments– immediately withdrawn; cash is used to facilitate consumption

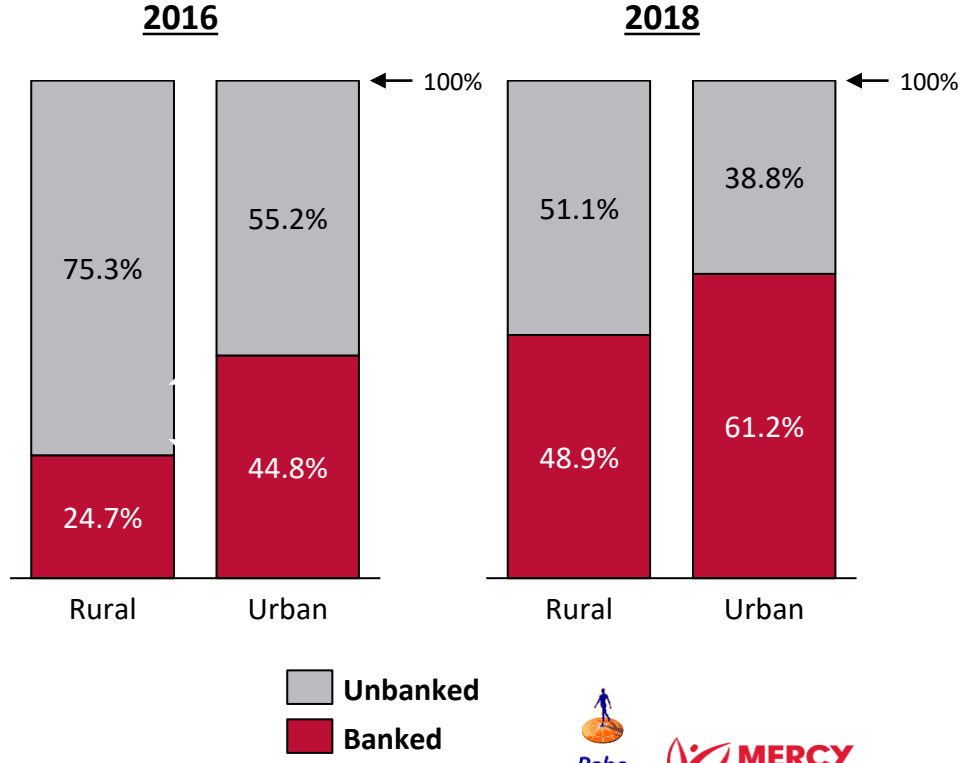
Bank account ownership - overall

% of adults



Bank account ownership – rural vs. urban

% of adults

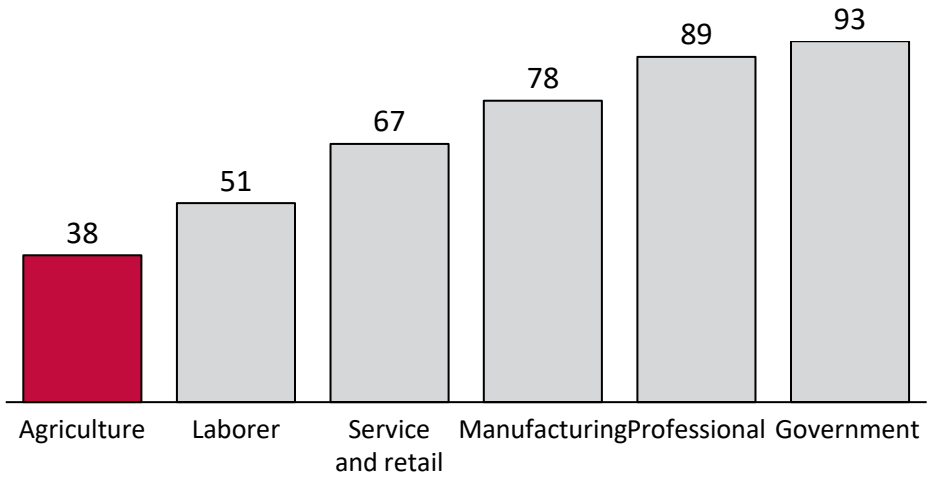


1. Financial Inclusion is the availability of access to various formal financial institution, product, and services in financial sector in accordance with the needs of the community in order to improve social welfare. (POJK No.76/POJK.07/2016) Source: National Strategy for Financial Inclusion (SNKI)

Agriculture continues to lag behind other segments in bank account ownership and access to credit

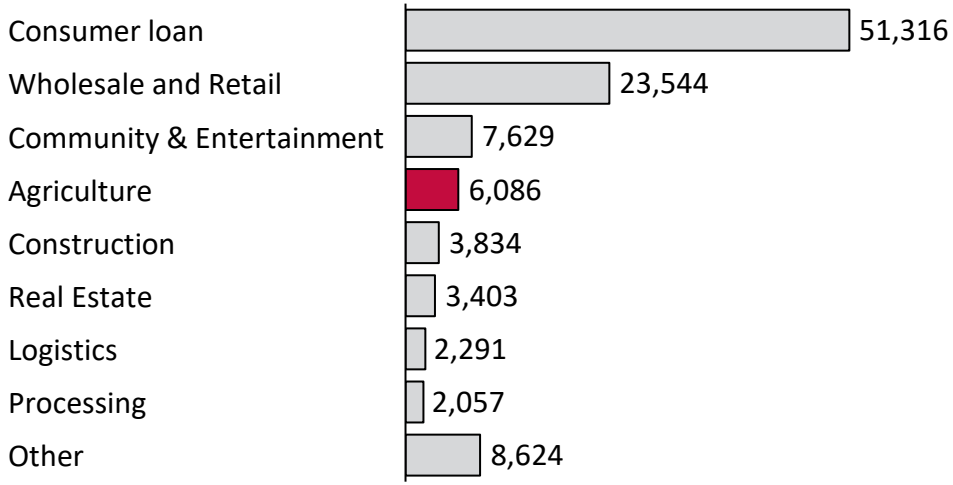
Account ownership by sector of livelihood (2018)

% of adults



Rural bank lending breakdown by sector (2019)

Bil IDR



Challenges for bank account ownership for farmers:

- Transactions in agriculture mostly still cash-based (including credit provided by traders), farmers do not require bank account to transact or obtain credit
- Large number of value chain actors, difficult to coordinate across all actors to convert to non-cash
- Lack of CICO or banking infrastructure in remote areas
- Lack of paper work (e.g., KTP (National ID), which is required for opening bank account

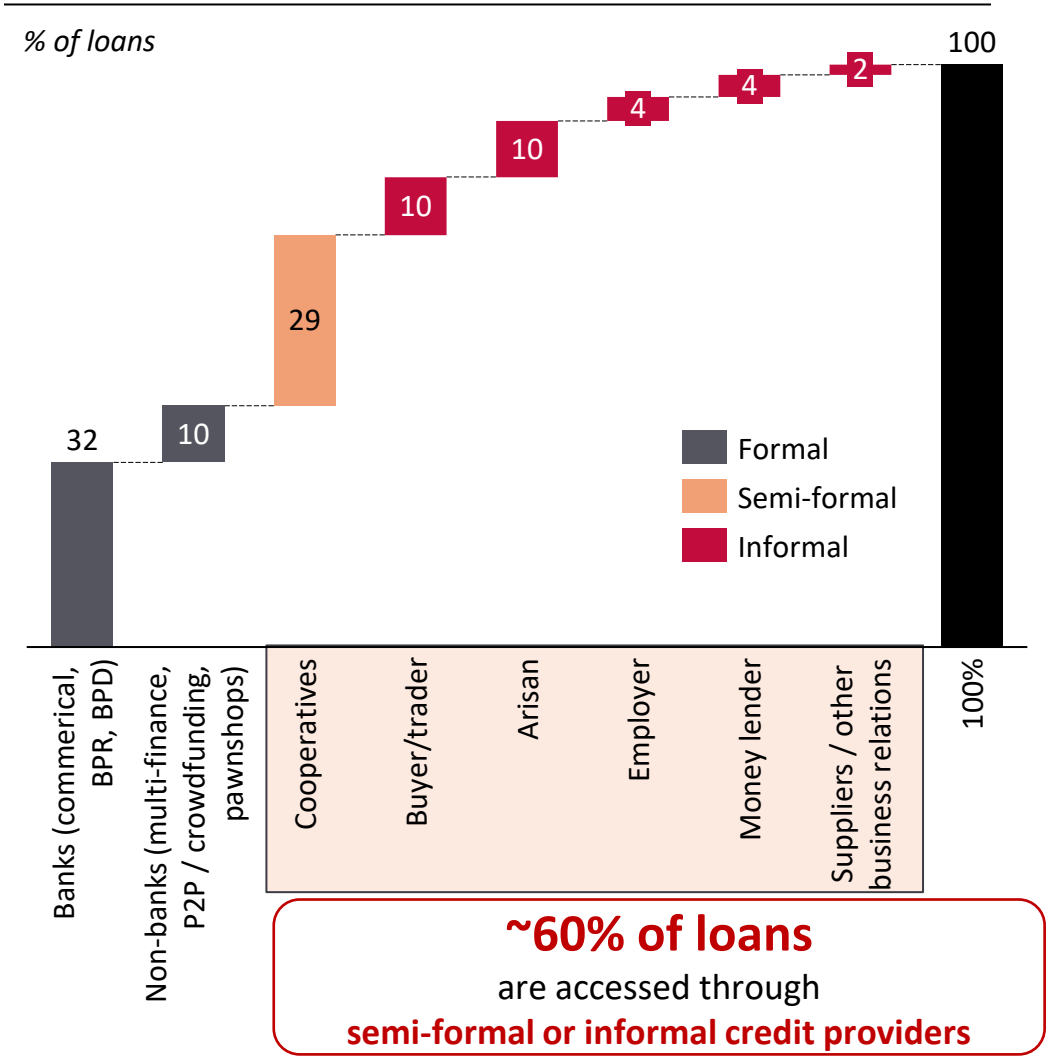
Key challenges for Agricultural lending:

- No digital / technological offering – requires specific license from OJK
- Limited knowledge in agriculture credit (and no access to data) and no particular incentive to lend to farmers
- Found that some agriculture credit used for consumption, rather than productive use
- Require strong on the ground relationships with farmers (e.g., with collectors and communities)

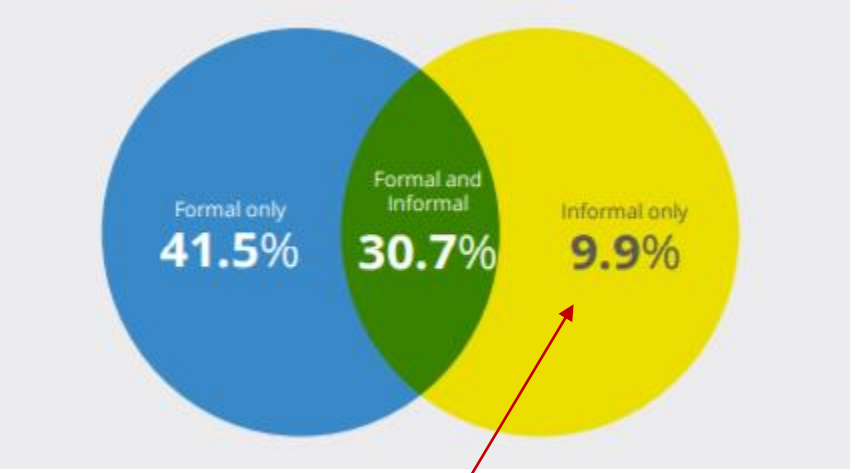
Source: SNKI (2018)

Credit is mostly sourced from semi-formal and informal sectors, even for those who have access to formal financial products

Access to loans by sources (2017)



~60% of loans
are accessed through
semi-formal or informal credit providers



Characteristics of population that access <u>only</u> informal services

- Rural-based
- Female
- Older than 54 years
- Have achieved SMP or lower levels of education
- Are from households in the lowest quintiles of the PPI distribution
- Involved in agriculture.

Source: Survey on Financial Inclusion and Access - Understanding people's use of financial services in Indonesia (2017)

Credit guarantee schemes (KUR) has helped to mobilize bank credit to underserved, and agriculture specifically, but more is required

Kredit Usaha Rakyat (KUR)

- Established in 2007, new KUR policy launched in 2015
- Provides credit guarantee facility to banks for lending to MSMEs and Cooperatives (UMKMK)
- Focused on productive business sectors

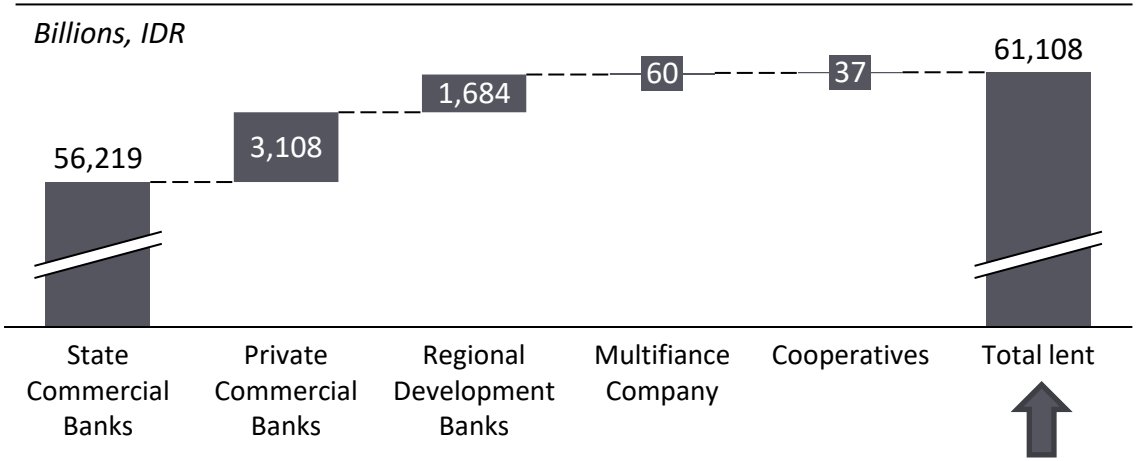
Key features

- **Risk sharing:** covers 70% of loan risk
- **Interest subsidy:** covers some cost of funding, resulting in interest rate of 6% p.a. effective interest rate

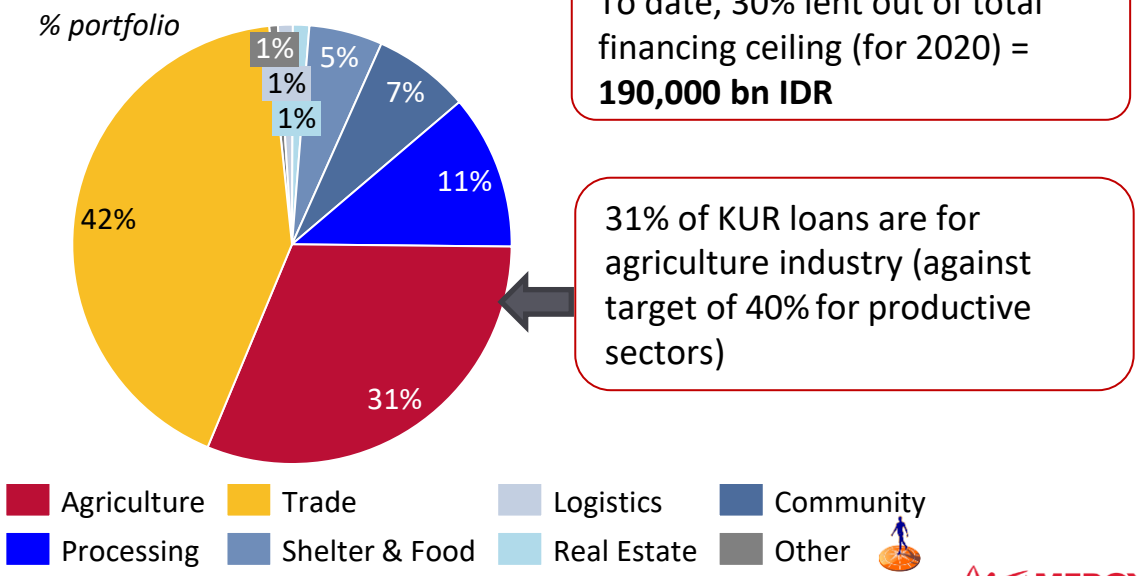
Challenges:

- Banks struggle to meet their quotas for agriculture

Kredit Usaha Rakyat (KUR)



To date, 30% lent out of total financing ceiling (for 2020) = **190,000 bn IDR**



31% of KUR loans are for agriculture industry (against target of 40% for productive sectors)

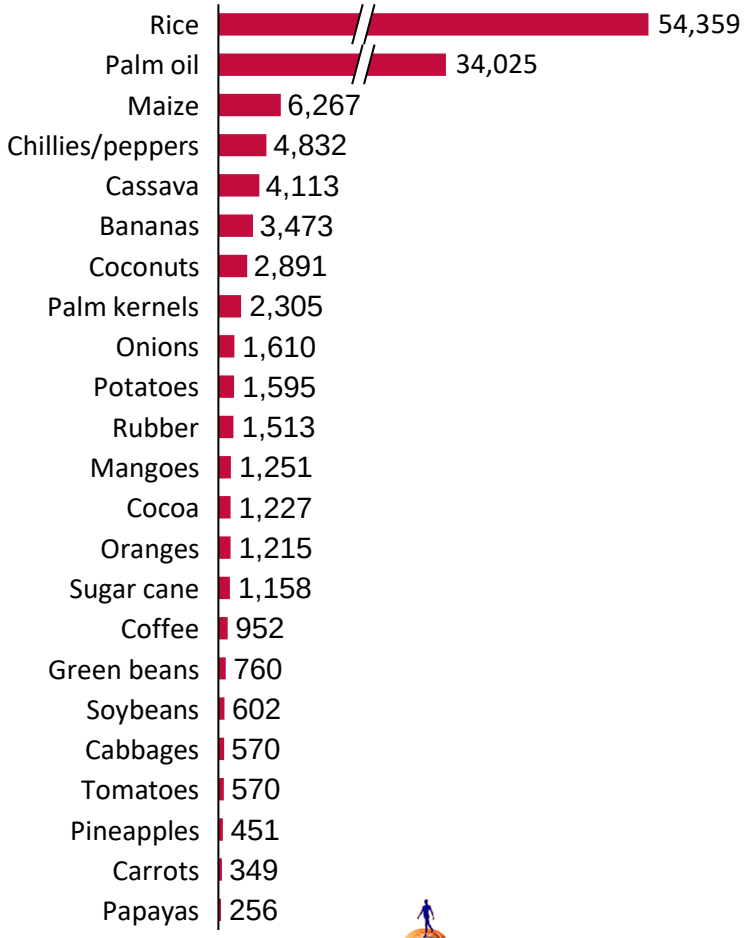
Source: Kredit Usaha Rakyat (KUR website), Coordinating Ministry of Economic Affairs (https://kur.ekon.go.id/realisasi_kur/2020/4)

Crops are dominated by palm oil, rice, and maize, together comprising 74% of all output; the top 7 crops by production make up 90% of total value

Top crops by production (2018), MT billions

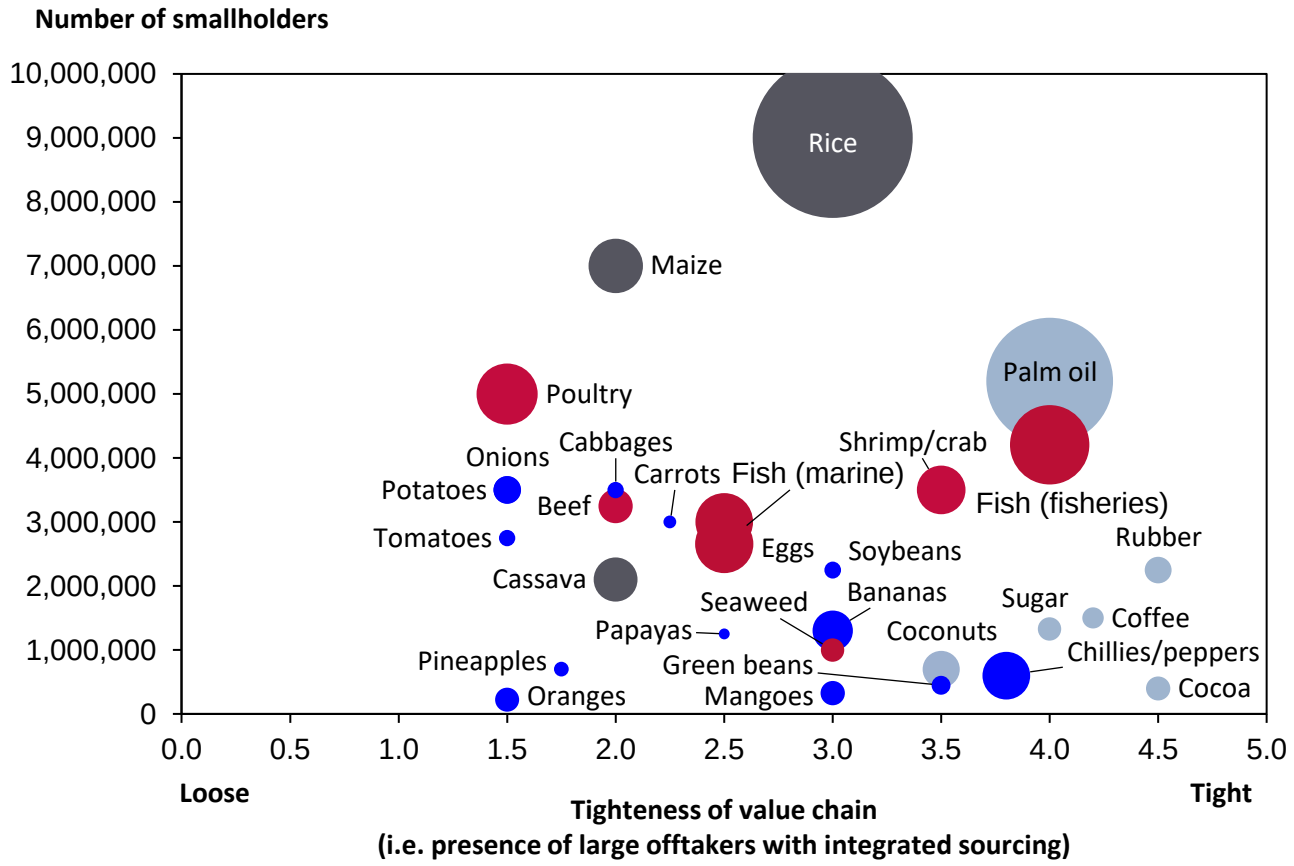
		10-year CAGR (2009-2018)
155.83	Palm oil	2.79%
83.04	Rice	2.86%
30.84	Maize	6.18%
21.74	Sugar cane	-2.13%
18.56	Coconuts	-0.26%
16.12	Cassava	-3.42%
10.33	Palm kernels	8.09%
7.26	Bananas	1.46%
3.85	Potatoes	4.51%
3.63	Rubber	2.05%
3.08	Mangoes	6.65%
2.54	Chillies/peppers	1.83%
2.51	Oranges	-1.44%
1.81	Pineapples	1.65%
1.50	Onions	5.05%
1.41	Cabbages	0.40%
0.98	Tomatoes	1.52%
0.95	Soybeans	-0.24%
0.94	Green beans	0.67%
0.89	Papayas	1.55%
0.72	Coffee	0.63%
0.64	Carrots	6.61%
0.59	Cocoa	-3.38%

Top crops by value (2018), USD 000's millions



Sources: FAOStat

We mapped out the top c.20 value chains by production size, number of smallholder farmers, and tightness of value chain



Tightness of value chain:

- Determined by level of formal procurement in sector.
- Where there are large offtakers who enter into formal relations with farmers, a value chain is considered tightly structured.
- The presence of offtakers provides greater certainty and support to farmers, crowidng in input firms and finance providers.
- Some value chains (e.g. fish, poultry) have part of value chain which is highly structured (outgrower/contract relationships), yet majority of farmers are independent and unstructured.

Legend

Size of bubble represents 2018 production value (USD)

Cash crop

Staple crop

Livestock / fish

Horticulture

Sources: (1) Ministry of Agriculture statistics (2) FAOStat (3) Interviews (4) Value chain studies

The structure of these value chains has impact on smallholder farmers, and the viability of reaching them with digital services

	Importance to small farmers	Importance to food/economy	Tight / loose?	Key export?	Economic outlook
Palm oil		Very high	Very tight	Yes	**Strong** (steady output and exports)
Rice		Very high	Loose	No, but potential	**Medium** (import protections)
Maize		Very high	Loose	No	**Medium** (imports to fill deficit)
Coconut		Medium	Mixed	Yes	**Medium** (stagnant output)
Poultry / eggs		Very high	Loose	No	**Strong** (rapid increasing demand)
Fish		Very high	Mixed	Yes	**Strong** (surging exports)
Coffee		High	Tight	Yes	**Medium to low** (flagging exports)
Cocoa		High	Tight	Yes	**Medium** (stagnant output)
Rubber		High	Very tight	Yes	**Medium to strong** (steady gains)
Mangoes		Medium	Mixed	No, but potential	**Strong** (rising output, exports)
Pineapples		Medium	Mixed	Yes	**Medium** (flat output, exports)
Chilis /peppers		Medium	Mixed	Yes	**Strong** (tapping export potential)
Tomatoes		Medium	Loose	No	**Medium** (steady output)
Potatoes		Medium	Loose	No	**Medium** (steady output)
Cassava		Medium	Loose	No	**Low** (declining output, imports up)
Sugar		High	Tight	Yes	**Low** (low productivity)
Beef		Medium	Loose	No	**Medium** (increasing demand)
Bananas		High	Mixed	No, but potential	**Medium** (flat output)

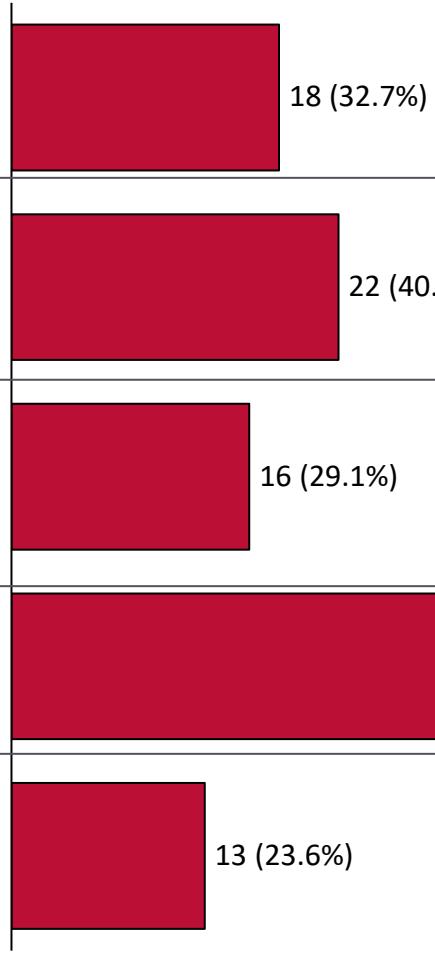
We identify four main categories of value chains which present varying levels / types of opportunities for digital services and impact

	Summary	Prime examples	Viability for digital services?	Impact potential?
1. Plantation crop value chains	Value chains with finite set of large buyers/trading houses; farmers either work directly with buyers in schemes, or via traders	Palm oil, rubber, cocoa, coconut, coffee	***Easier to serve:*** *can partner with estates for market entry; more secure cashflows; more de-risked for FSPs*	***Medium:*** *Many farmers already served by offtakers/donors; have more stable livelihoods*
2. Large but loose value chains of national importance	Significant value chains in terms of size and important to food security for fast-growing population	Shrimp, fish, maize, rice, soybeans, poultry, eggs	***Harder to serve:*** *high costs of customer acquisition; volatile cashflows; higher perceived credit risk*	***High:*** *Many farmers are sub-commercial; play critical role for national food security*
3. Small-to-medium premium / export value chains	Higher-value crops with export potential and presence of premium offtakers	Chilies, mangos, avocados, green beans, garlic, spices, ginger, seaweed	***Easier to serve:*** *farmers are higher income, more commercial; can partner with premium offtakers*	***Low-to-medium:*** *Low-hanging fruit for intervention; farmers are more commercial, can invest*
4. Horticulture and staple crops (i.e. fast-moving, high demand)	Food crops which are grown across country in large volumes for domestic market	Rice, cassava, tomatoes, potatoes, onions, cabbages	***Mixed bag:*** *less formal value chain, but crops are prevalent so lowers transaction costs*	***Medium-to-high:*** *high variance in farmer profile; crops are critical for domestic consumption*

We identified 55 agriculture-specific digital solutions in Indonesia across 5 key areas

SHF digital service providers across key product / service areas

# of digital solutions



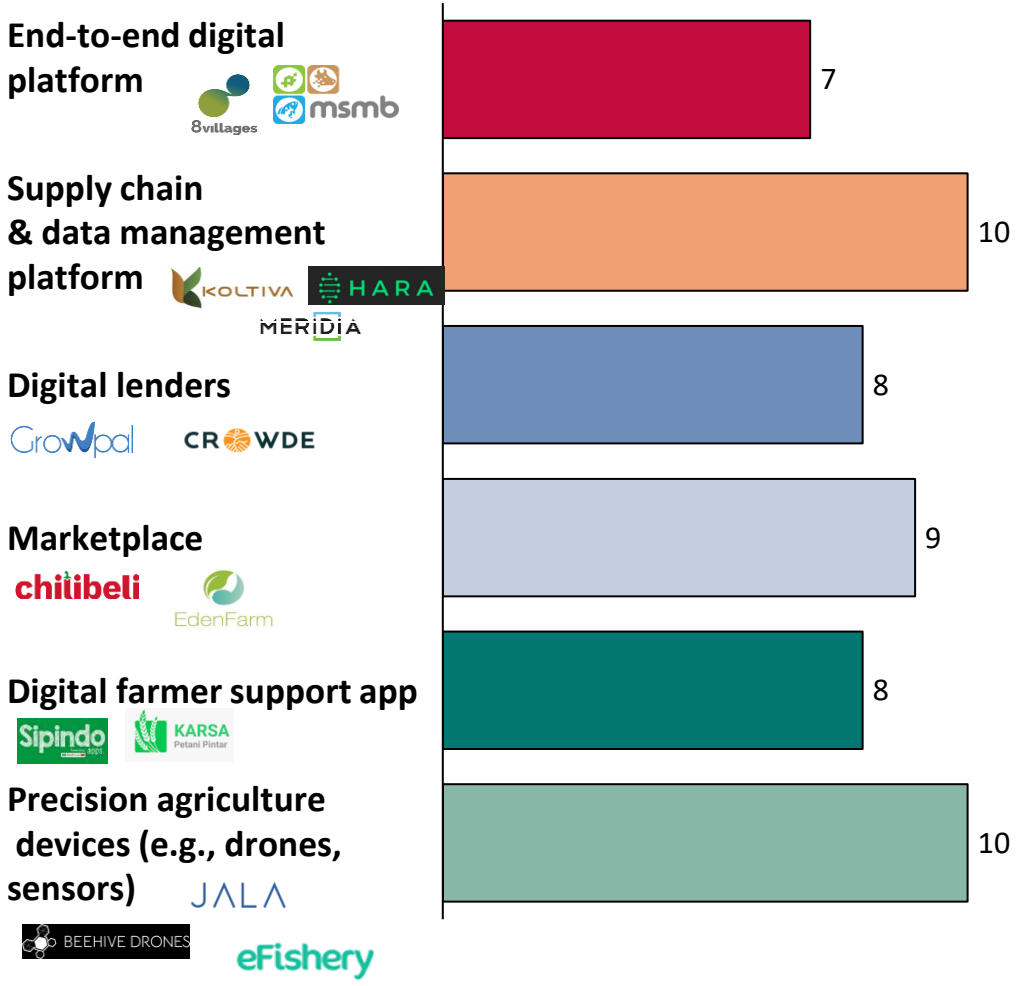
Supply chain & Data management	• Traceability and certification systems • Digital ID / farm data digitalization • Supply chain management
Market access	• E-commerce platform • Offtaker matching & aggregation • Warehousing, delivery & logistics • Trading platform for Ag inputs
Digital financial services	• Digital payments / e-wallet • Digital lending / crowdfunding platforms • Savings • Micro-insurance
Digital information	• Farm / inventory management tools • Market / price information • Agronomy advisory (e.g. chatbot, digital content)
Precision agriculture	• Drone, aerial & satellite (remote technology) • On-site technology (soil / temperature sensors) • Farm-level mechanization / input technology

Note: Sum of # of digital players across different solutions do not add up to total number of players reviewed, given many players provide several different types of services across different areas. Source: Analysis based on stakeholder interviews & company websites

We can classify players into 6 archetypes based on business model and their primary focus area

SHF digital service providers by Archetypes

# of digital solutions



Key findings:

- The 55 digital solutions have a **fairly equal spread** (7-10 companies) across each archetype
- Because many of the companies are still at early stages and have not yet achieved scale, there is some **competitive tension across key players** – few of them are open to partnering with one another
- We see potential in business models **that foster partnerships across key players** that focus on different sets of services, such as the data platform provided by HARA *(see case study in supply chain & data management section)*

Source: Analysis based on stakeholder interviews & company websites

Value chain is an important driver for type of digital solutions offered to SHFs

Archetypes / Value chain	Plantation / Cash Crops	Food Crops	Horticulture	Livestock & dairy	Fisheries	No data[2]
End-to-end digital platform	0	5 (2)	3	2	2	0
Supply chain & data management platform (1)	7	2	2	0	0	3
Digital lenders	0	2	3	2	4 (4)	0
Marketplace	1	1	6 (3)	2	5 (3)	1
Digital farmer support app	1	3	2	0	0	4
Precision Ag	1	1	2	1	3	5

Key takeaways:

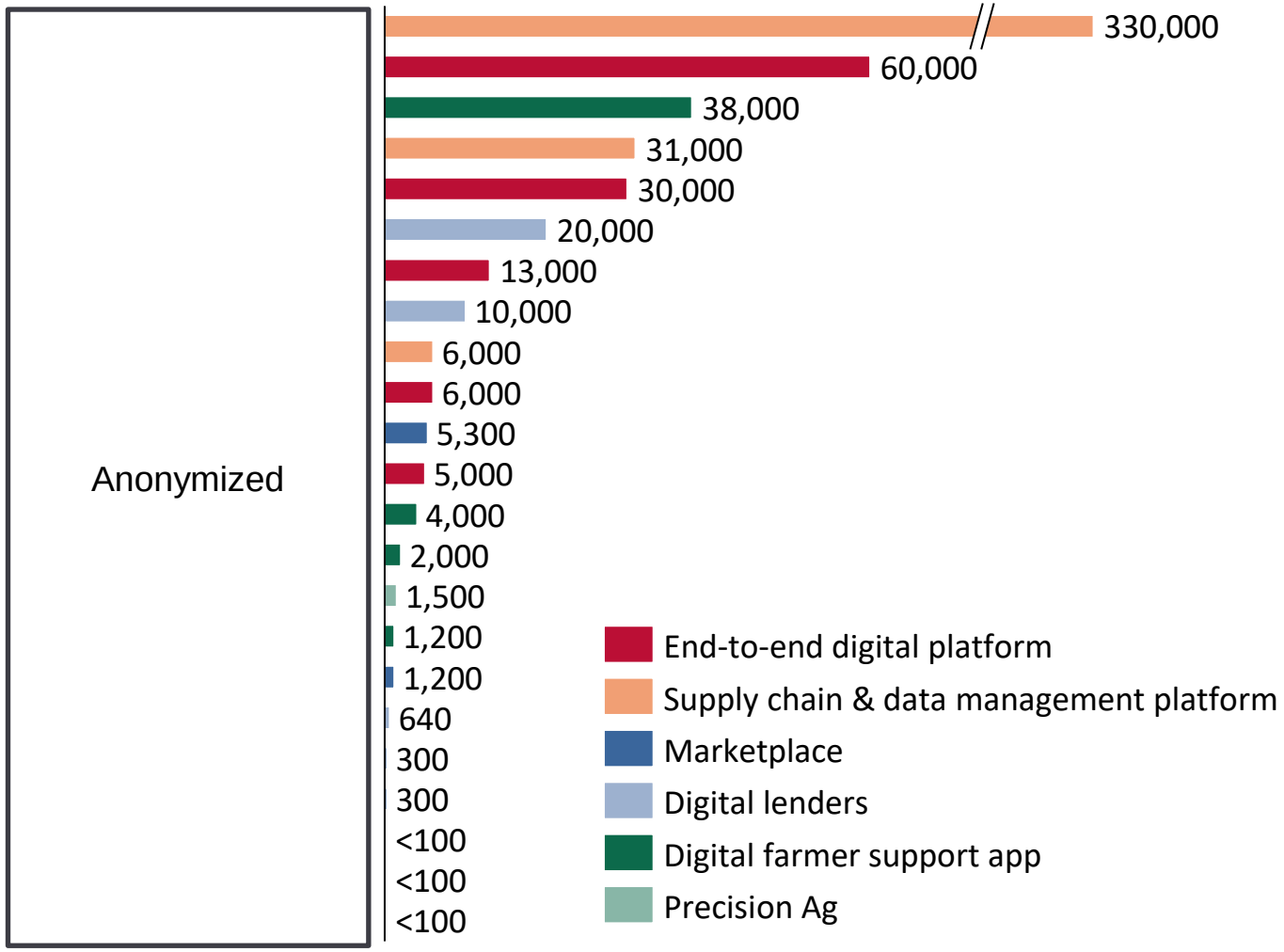
1. High number of **supply chain and data management platforms in plantation crops** given requirement for **certification, traceability** and farmer information tracking requirements by large agribusinesses
2. Many players **end-to-end service providers** operate across **food crops, horticulture & livestock** value chains at once. Most start in food crops before expanding to others.
3. **Online marketplaces** are becoming increasingly popular for **horticultural & fisheries value chain** given increasing demand from consumers to purchase high quality / premium produce directly from farmers ("farm to table")[1]
4. Players that operate in the **fisheries value chain** tend to be **exclusively focused** on fisheries. There has been a rising trend of **P2P lending / crowdfunding platforms** in this space.

Note: 1) companies that solely provide grocery deliveries (no linkages to farmers), were ignored from this analysis. 2) No data on specific value chains for many digital farmer support apps & precision agriculture technology – either value chain agnostic or limited information available
Source: Analysis based on company website data & stakeholder interviews

Many solutions are still in early stage with less than 10,000 users; supply chain, data & end-to-end platforms have acquired more users than others

Indicative scale of digital service providers (numbers estimated)

# of farmers reached

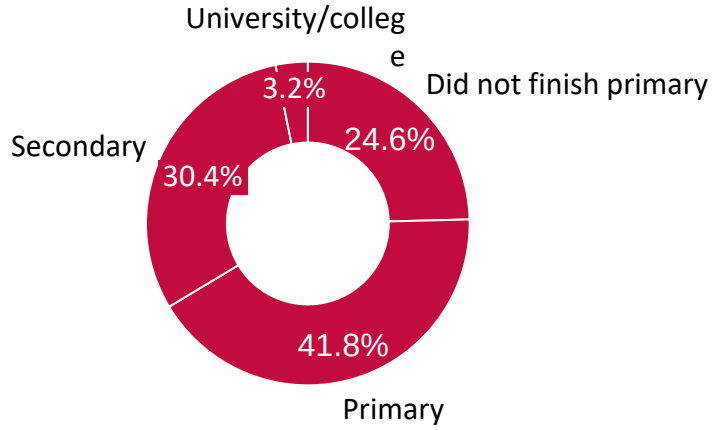


- Only a few digital solution providers have scaled beyond 10,000 users
- Consequently, **very few tech start-ups have broken even** – although majority are in "seed" or "early venture" stage, hence still too early to assess profitability
- Supply chain, data management and end-to-end platforms *(red and pink in graph)* have higher number of users, one reason being a longer operating history compared to other digital solutions

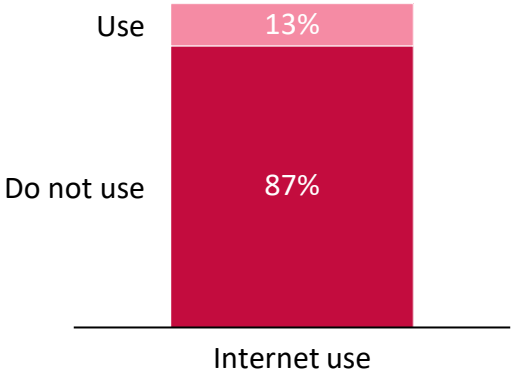
Note: Dataset based on available data only.
Source: stakeholder interviews and company websites

The majority of farmers in Indonesia: (i) did not advance beyond primary school (ii) are over 45 (iii) do not use the internet and (iv) farm less than 0.5 hectares

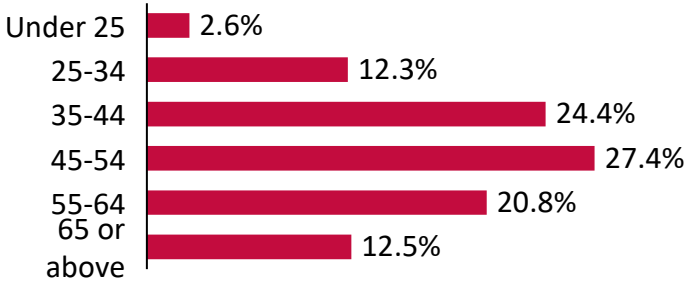
Level of education attained of farmers, % (2018)



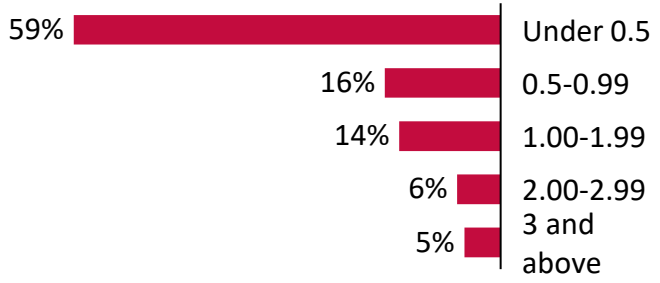
Usage of internet by farmers, % (2018)



Farmers by age bracket, % (2018)

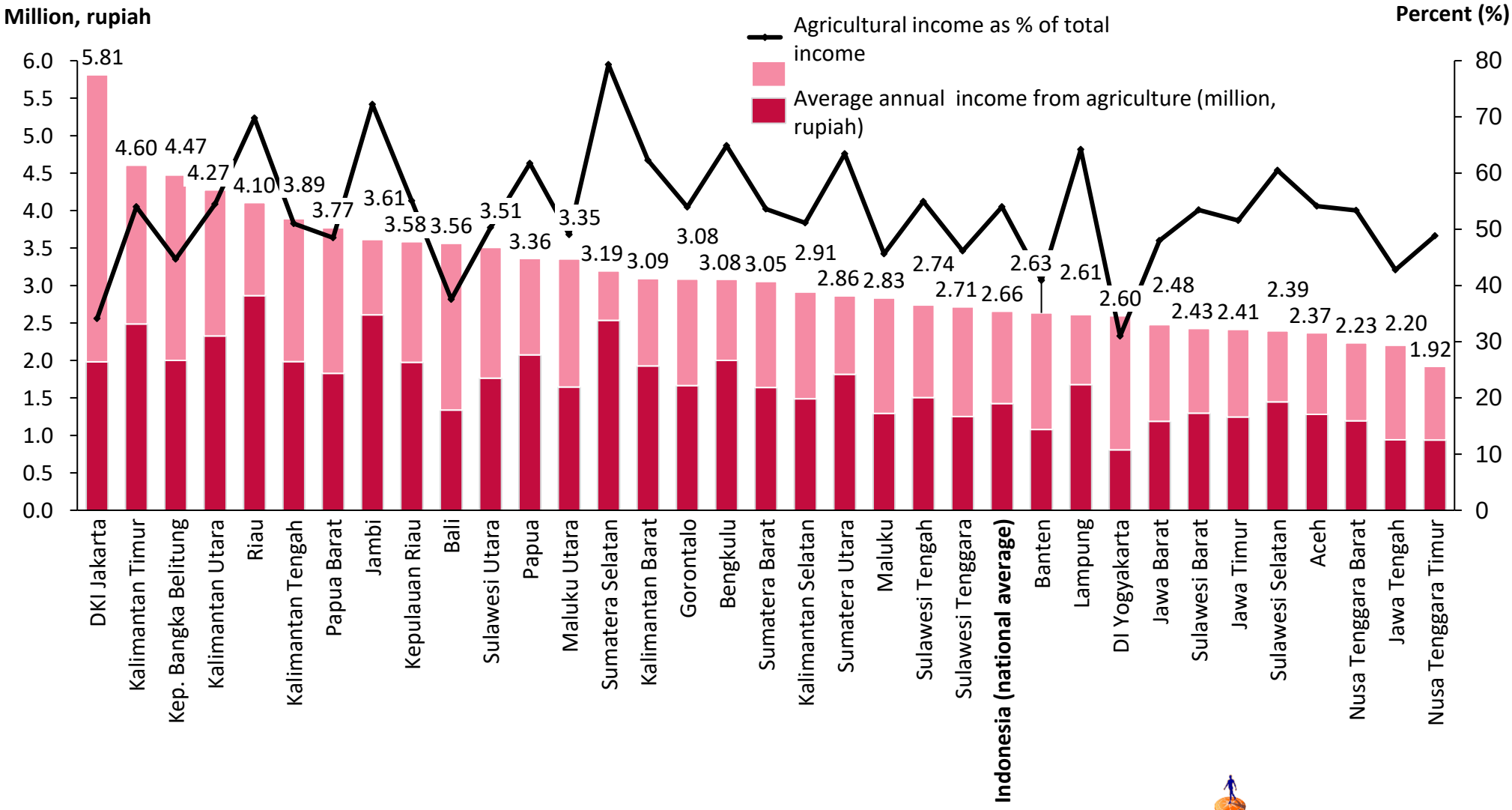


Size of land holding, % (2018)



Source: National Agriculture Census (2014)

Farmers in Kalimantan, Sumatra, and Papua are wealthiest (income from plantation crops); farmers in Java, Nusa Tenggara are poorest (staple/food crops)



Source: National Agriculture Census (2014)

We identify 4 primary categories of smallholder farmers, with varying levels of need and readiness for digital services

	1. Plasma / estate outgrower farmers	2. Independent farmers in structured value chains	3. Independent farmers in unstructured value chains	4. Subsistence farmers
Who are they?	• Farmers in palm oil, shrimp, rubber, cocoa, coffee, coconut • Estates provide support to farmers (typically organized in cooperatives) – inputs, credit • Backed by forward contracts	• Farmers in palm oil, coffee, fish, etc. who do not work as outgrower or under contract • Flexible on who they sell produce to and for what price • Do not receive input packages, training, credit	• Farmers in less structured value chains, but who have commercial operations • E.g. poultry, rice, avocados, green beans, etc.	• Farmers in staple crops, livestock, vegetables; operate at sub-commercial scale • Grow for consumption, and sell surplus into local markets
How do their needs vary?	• No need for market linkages as already have offtake relationship • Need for capex (replanting) and input credit via estates, who are constrained in what they provide • Estates / plantations have need for supplier management systems which enable them to track and manage interactions	• Often receive credit terms from traders who buy direct from farms / groups; but generally lack access to credit • Need training in agronomy, pest management, etc. – rely on public extension workers • Need market/pricing info and route to market	• Largest farmer segment of the 4 here – needs vary significantly • Market linkages are important, as buyers are fragmented • Need for capex/input credit, data / precision agriculture solutions, e-commerce	• High level of needs to get to commercial farm operations • Need for agronomy / training, financing for inputs / planting; and adoption of modern farming techniques e.g. irrigation
What are implications for digital service providers?	Low customer acquisition costs; can use estates / plantations as channel (B2B/SaaS opportunities); no need for e-commerce, rather financing and data management	Medium customer acquisition costs; some plantations work with traders to reach independent farmers (can use as delivery channel); need agronomy training, financing, and input packages	High customer acquisition costs; must use farmer unions/groups as sales/delivery channel, as fragmented offtakers; easier to target premium horticulture crops, like mangoes, avocados, garlic, herbs/spices	Very high acquisition costs; hard to serve profitably; low education and income; unlikely to be digital adopter; low bankability

Farmers have diverse financial, informational, and commercial needs; credit/savings, agronomy, market linkages are most pressing

	Area of need	Status quo	Level of unmet need	Addressable by digital?
Financial needs	Ability to make/receive payments	Mostly farmers transact in cash, or by bank transfer; limited uptake of mobile money; farmers often receive delayed cash payments	●	●
	Access to credit	Limited from formal FIs, more available from informal groups however in low amounts; traders/offtakers extend credit throughout season, but more common in certain value chains	●	◕
	Ability to protect against weather/crop risks	Few smallholder-focused insurance products available for weather or crop risks; formal FIs include insurance in loan pricing; Syngenta Foundation index insurance pilot was unsuccessful	◑	◔
	Ability/incentive to save	Farmers typically do not have e-wallets; many have bank accounts, but they are often inactive; farmers rely on storing cash and / or informal savings & loan groups in local village	◕	◕
Education / information	Knowledge of up-to-date market/pricing info	Market prices are often not transparent, especially as they can vary a lot based on island / region and import volumes; farmers rely a lot on middlemen / traders, who capture margin	◑	●
	Knowledge of agronomy/farming best practices	Varies by value chain; yields often low relative to global average; farmer groups have improved yields significantly in last few decades	●	◕
	Understanding of basic financial/business concepts	Often low; farmers do not understand financial products, and cannot commercialize their farm operations; more than 60% of farmers did not go beyond primary education	◑	◕
	Understanding / familiarity with digital tools, to enable use	Low; even farmers with smartphones often do not know how to use apps, beyond call and message; agtechs focus on app use for agents / farmer group leaders, instead of trying to get each individual farmer to use app	●	◔
Productivity improvement	Access to appropriate inputs (seed, fertilizer)	Generally inputs are available, especially in more densely populated islands like Java and Sumatra; however, often not affordable due to upfront outlay and farmers' seasonal income	◔	◑
	Use of machinery (e.g. pump, grinder, etc.)	Very limited; government has done recent push in irrigation; cost for mechanization typically prohibitive; no rental models focused on smallholders emerged from our research	◔	◔
Markets	Ability to transport, store, and aggregate produce for best return	In densely populated islands, like Java, aggregating and storage is not major issue; in more remote islands, infrastructure is often weak, with limited cold storage capacity and often long distance from local markets	◔	◕
	Ability to find fair market for produce	Where farmers are in more remote areas, they often have limited flexibility on when and to whom they sell; therefore, prices can fluctuate a lot and hit lows where demand is subdued	◕	●

Summary of key challenges for digital service providers in agriculture

Based on our landscape work and interviews, these are the key challenges which constrain growth in digital services for agriculture in Indonesia

General to agtechs

- Access to growth / working capital
- Ability to acquire customers / farmers quickly to scale
- Striking partnerships with value chain actors or FIs
- Finding reliable revenue model / paying customers
- Building out agent network / field force model
- Logistical capabilities (having to do too many things across different aspects)
- Front / back end product development / robustness of tech

Specific to digital lenders / P2P platforms

- Ability to raise capital for on-lending
- Slow fundraising cycles from retail lenders (2-3 weeks)
- Striking partnerships with traditional FIs / non-bank lenders (and regulatory constraints)
- Developing credit scoring algorithms / use of alternative data
- Implementing robust credit processes (lack of basic documentation / farming data)
- Effective collections procedures and channels (e.g. calls, SMS, visits; frequency, etc.)
- Covid-19 impacting perceptions on repayments

FIs / value chain actors looking to innovate in digital platforms

- Knowledge of which agtech/fintech partners to work with
- Financial / reputational risks associated with partners
- Expertise in digital product development and channels
- Understanding of customer segment
- Lack of buy-in at executive level
- Organizational bureaucracy and constraints

Plantation and premium export crop value chains can offer some quick wins; staple crops and general horticulture can unlock big impact if successful

	Summary	Prime examples	Viability for digital services?	Impact potential?
1 **1. Plantation crop value chains**	Value chains with finite set of large buyers/trading houses; farmers either work directly with buyers in schemes, or via traders	Palm oil, rubber, cocoa, coconut, coffee	***Easier to serve:*** *can partner with estates for market entry; more secure cashflows; more de-risked for FSPs*	***Medium:*** *Many farmers already served by offtakers/donors; have more stable livelihoods*
2 **2. Large but loose value chains of national importance**	Significant value chains in terms of size and important to food security for fast-growing population	Shrimp, fish, maize, rice, soybeans, poultry, eggs	***Harder to serve:*** *high costs of customer acquisition; volatile cashflows; higher perceived credit risk*	***High:*** *Many farmers are sub-commercial; play critical role for national food security*
3 **3. Small-to-medium premium / export value chains**	Higher-value crops with export potential and presence of premium offtakers	Chilies, mangos, avocados, green beans, garlic, spices, ginger, seaweed	***Easier to serve:*** *farmers are higher income, more commercial; can partner with premium offtakers*	***Low-to-medium:*** *Low-hanging fruit for intervention; farmers are more commercial, can invest*
4 **4. Horticulture and staple crops (i.e. fast-moving, high demand)**	Food crops which are grown across country in large volumes for domestic market	Rice, cassava, tomatoes, potatoes, onions, cabbages	***Mixed bag:*** *less formal value chain, but crops are prevalent so lowers transaction costs*	***Medium-to-high:*** *high variance in farmer profile; crops are critical for domestic consumption*

Possible modes of interventions

There are opportunities to make impactful interventions in financing, technical assistance, partnerships development, and ecosystem level interventions

Type	Mode of intervention	Are other actors (philanthropic / governmental) doing this?	Typical for Rabo Foundation?	Typical for Mercy Corps AgriFin?
Financing	Direct financing of loan portfolio	**Some** – several digital lenders have partnered with FIs / donors, but primarily rely on P2P funding; some FIs lending to farmers via agtech but few have digital component	Yes	No
	Indirect financing of loan portfolio (via intermediaries)	**Some**, e.g. KUR program - but majority of funds do not go to smallholders	Yes	No
	Corporate loan / working capital	**Limited** – agtechs/fintechs often cannot raise venture/mezz debt as too early stage and most investors focus on equity	Yes	No
	Credit risk guarantee / first loss	**Some -** e.g. KUR program and some donor initiatives – but not always enough to get banks lending to farmers	Yes	Yes
	Equity / quasi-equity	**Yes** – there are various VC investors active in agtech/fintech	No	No
	Innovation grants	**Some** – there are various grant awards / competitions	Yes	Yes
Technical assistance	Tech / product development	**Limited** – there are few donors supporting product development	No	Yes
	Data / platform development and analytics	**Limited** – there are few donors supporting product development	Yes	Yes
	Credit scoring / process improvement	**Some** – there are some TA programs focused on support to banks / FIs for agricultural lending, but none for digital agri lenders	Yes	Yes
	Strategy and operational support	**Some** – there are some TA programs focused on general org support	No	Yes
Partnerships development	Linkages to FIs and large value chain actors as buyers of services	**No**	Yes	Yes
	Linkages to value chain actors for customer acquisition / growth	**No** – agtechs/fintechs	No	Yes
	Facilitate partnerships for bundled services	**No**	No	Yes
Ecosystem building	Convenings and networking	**Some**	Yes	Yes
	Research and market intelligence	**Some**	Yes	Yes
	Policy & advocacy	**No** – limited to no specific focus on digital services for agriculture	No	No
	Technical assistance / funding to accelerators and innovation competitions	**Some** – organizations like GSMA	Yes	No

Priority interventions (1/3)

	Rationale	Intervention
1. Providing debt funding directly to digital lenders	• There is an emerging set of digital lenders who are at or post Series A stage with portfolios of approx. $2.5M-$25M • Several of these players have started out raising crowdfunding from retail investors; this gives them low cost of capital, but is not scalable	*Provide wholesale financing to fintechs for on-lending to farmers; technical assistance around credit systems and risk management; linkages to structured value chains via offtakers / input firms*
2. Setting up special digital credit fund / facility managed by intermediary(-ies)	• High transaction costs and risk concentration associated with supporting digital lenders individually • Supporting one or two digital lenders does not necessarily build the ecosystem as a whole; RF can have wider reach setting up fund	*Set up dedicated Indonesia Farmer Digital Loan Facility focused on digital loans to eligible farmers; facility to be managed by specialist fund manager e.g. Impact Credit Solutions; can have TA component to build capacity of digital lenders*
3. Providing venture / mezz debt to agtechs	• There are diverse VC investors focused on providing equity and growth capital • Venture debt is less available, but can play a critical role in funding start ups through growth stage	*Develop venture debt product targeting growth-stage companies – e.g. 2-year tenor, repayable on achieving certain revenue/margin thresholds; can layer in concessional rates, FX risk transfer, etc.*
4. Facilitating partnerships between digital lenders (or agtechs) and traditional FIs/MFIs	• Most digital lenders are exploring commercial partnerships with traditional banks and MFIs, but finding it difficult to do • Many agtechs are also starting to realise the potential of farmer data to unlock credit and are seeking partnerships	*Broker partnerships between fintechs /agtechs and traditional lenders; technical assistance and support in product development can go alongside*

Priority interventions (2/3)

	Rationale	Intervention
5. Digitizing bulk payments in the agricultural sector via e-wallets	• Mobile money account ownership and usage remains very low, especially in rural areas and among farmers • One way to drive mobile money adoption is by digitizing the existing flow of transactions in the sector, working with source of those payments (government, buyers/ offtakers)	*Facilitate bulk payments partnerships between major e-wallet providers and large agribusiness, government fertilizer subsidy schemes, to drive mobile money adoption*
6. Connecting data platforms with financial institutions / large agribusiness / other use cases	• Several leading agtechs are developing B2B platforms for farmer-level data and big data (satellite, drones, etc.) – e.g. Hara, Koltiva, Meridia • Key use cases for this data is around credit scoring / risk assessment (for banks, MFIs, insurance firms), supply chain management (for offtakers), and demand forecasting (for input companies)	*Provide product development support to data platforms and facilitate partnerships with B2B clients from FIs to large agribusiness*
7. Supporting roll-out of commercial models around PrecisionAg-as-a-Service	• There are various companies who are using devices plus software and IoT analytics to facilitate precision agriculture; these models are relatively capital intensive • Other markets have seen innovation around leasing models and shared-use infrastructure to make the technology more available	*Financing and product development for drone / remote sensor to expand use of technology into new segments*
8. Supporting scaling of e-learning solutions for financial literacy and agronomy	• E-learning tools can play a critical role in driving uptake / usage of other digital services, lowering training and extension worker costs, and ensuring farmers derive full benefit from inputs and credit • Standalone solutions are not commercially viable and must be plugged into bundled offerings with partners	*Providing grant funding for content development / licensing and facilitating partnerships between learning platforms and partners for bundled offerings*

Priority interventions (3/3)

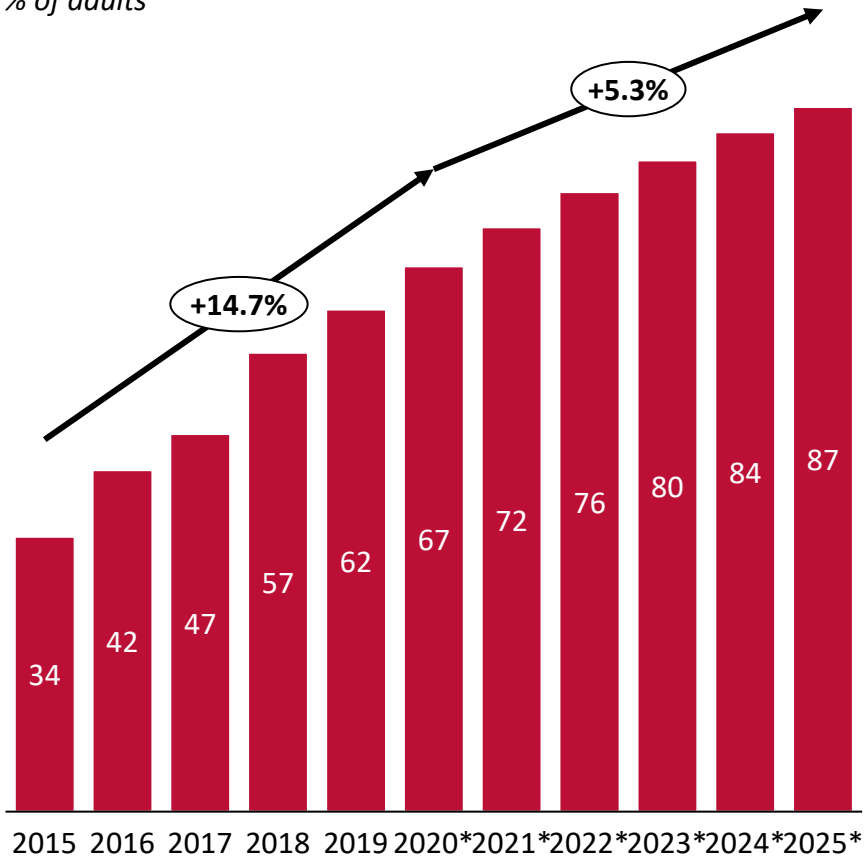
	Rationale	Intervention
9. Helping agtechs build out field force and agent networks	• Agtechs are building out their own networks of agents who are touchpoint with farmers for sales, training, and relationship management • Effective field force requires partnerships and use of agent apps to manage efficiently – this is complex and costly, with high variance in quality and performance	*Provide grant funding for field force recruitment; support development of agent network management apps; facilitate partnerships with field staff of input companies, plantations, parastatals*
10. Supporting marketplaces / e-commerce to integrate backwards in supply chain with farmers	• There are a number of marketplace / e-commerce players; some models create linkages between farmers / producers and retailers / buyers, such as through kiosks • Going further back in supply chain to small farmers is costly and has high logistics requirement to ensure order fulfilment	*Provide grant funding / concessional debt to support e-commerce players to link agri-kiosks back in supply chain and source more directly from farmers; facilitate partnerships with farmer organizations*
11. Support data platforms / insurtech to develop agri insurance products	• Even with digital credit and new channels, issuing loans to farmers carries inherent risks related to weather and crop disease • Embedded insurance models have worked to good effect in other markets; insurtech firms can partner with underwriters and data providers to offer agri insurance	*Facilitate partnerships between innovative insurance players and lenders in agriculture; support product development and scale up; connect with data providers to enable better risk pricing*
12. Organize convenings / industry events	• Agtech firms often operate in different ecosystem to large agribusiness (VC ecosystem as opposed to agriculture) • There is an important role to play in bridging divide between agtechs and broader agriculture sector	*Fund and organize industry events specifically focused on bridging gap between tech firms and agribusiness, such as AgriFIn's annual learning events or partnership pitch days*

Report contents

Digital landscape: Internet connected mobile usage will reach 87% in 2025, with social communication and networking use cases being most popular

Mobile phone internet user penetration in Indonesia from 2015 to 2025

% of adults

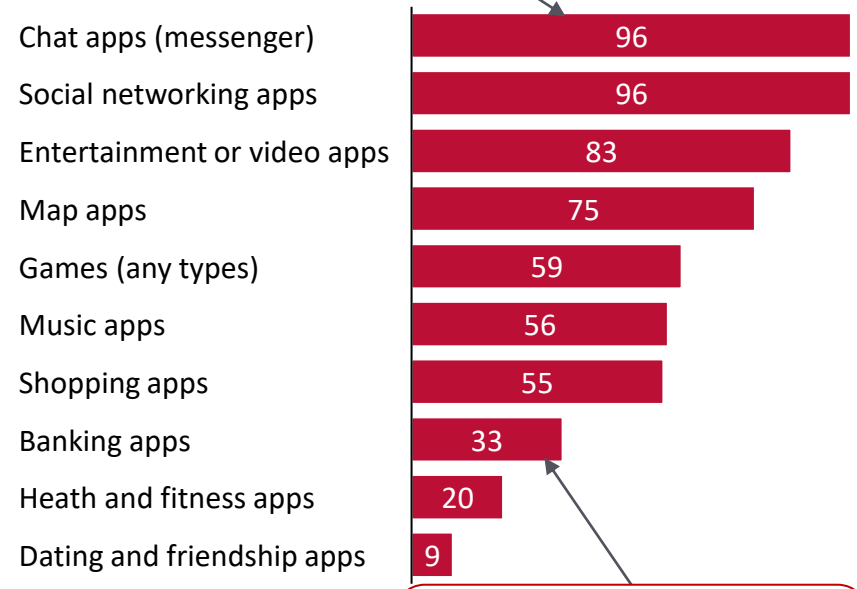


**forecasted*

Share of internet users using mobile apps in Indonesia as of Q3 2019, by category

% of internet users

Communication and social networking are top use cases for Indonesian internet users

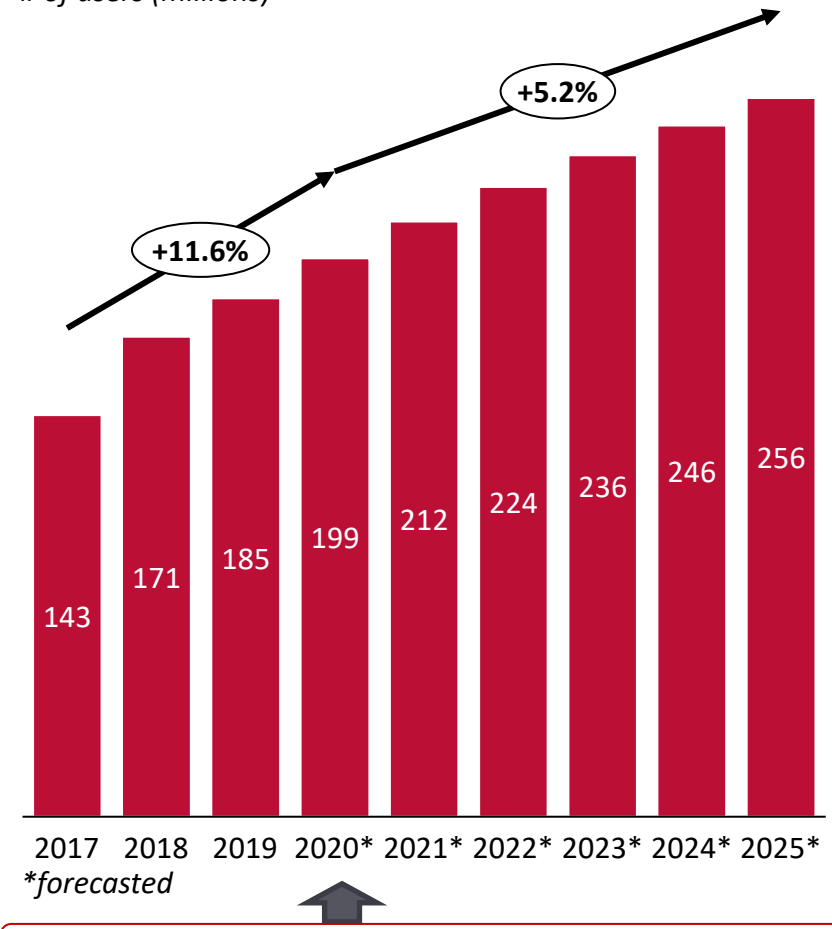


Indonesian users have been **slow to adopt digital financial services** offered by banks

Source: We Are Social; GlobalWebIndex; Statista Digital Market Outlook

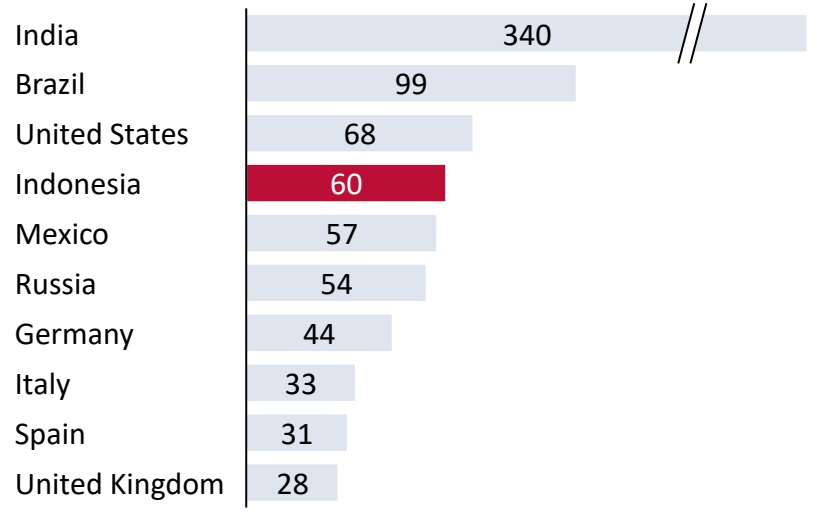
Digital landscape: Indonesia leads on number of Facebook users (rank #3) and Whatsapp users (rank #4)

Number of Facebook users in Indonesia from 2017 to 2025



In 2020, Indonesia ranks #3 after India & US

Leading countries based on number of WhatsApp users in 2019



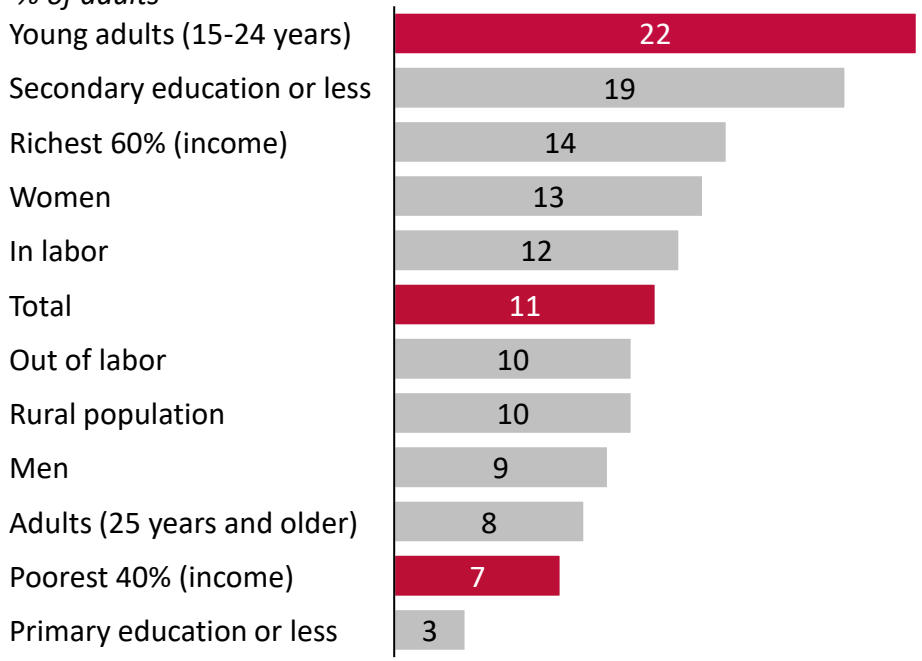
Interview findings:

- Whatsapp is essential for conducting business and maintaining customer relationships (e.g., taking orders, disseminating marketing materials)
- Can be used for initial testing of ideas (e.g., Whatsapp chatbot to gauge interest and types of question farmers want answered for an advisory platform)

Source: eMarketer; Statista Digital Market Outlook

Digital landscape: Increasingly digital savvy youth population play an important role in digitalising communities

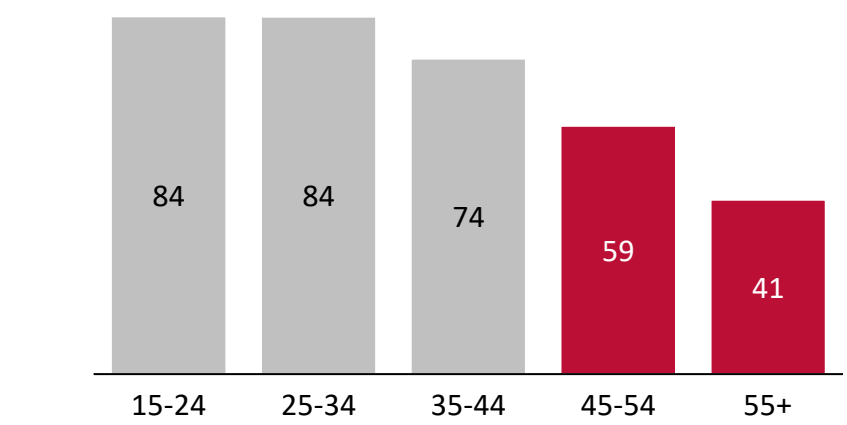
Percentage internet usage to pay bills or shop Indonesia 2017, by type



Interview findings:

- Engaging with youth in the community as "digital ambassador" is crucial for success of rural-focused digital services programs (e.g., UNCDF, IFAD, Embassy of Netherlands projects)

Mobile phone ownership by demographic group (2018)



Interview findings:

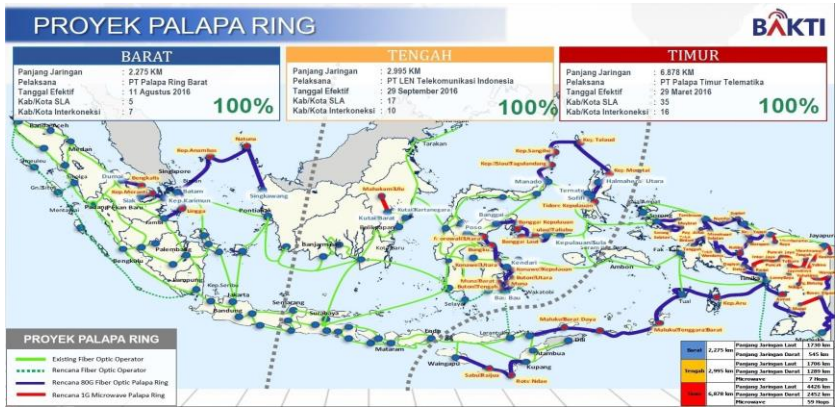
- Farmer demographics are typically in the 40-50+ age segment, and are 2-3x less likely to own a smartphone
- Digital literacy is a huge barrier for adoption or digital services
- Farmers are not familiar with use cases outside of texting, and often rely on their children to help facilitate online activities

Source: Gates Foundation, Indonesia National Financial Inclusion Strategy 2018, stakeholder interviews

Digital ecosystem: The government of Indonesia has put in place pro-digital policies and regulatory frameworks to accelerate digital adoption

- Indonesia aims to become **Southeast Asia's largest digital economy and be recognized as the region's digital hub.**
- Government has been working on several regulatory frameworks and key projects that aims to support development of digital ecosystem

Indonesia's Palapa Ring: Bringing Connectivity to the Archipelago



- In late 2019, the government announced the completion of the Palapa Ring project – a priority infrastructure project that aimed to provide access to 4G internet services to more than 500 regencies across the country.
- The project is estimated to have cost US$1.5 billion and comprises of 35,000km (21,747 miles) of undersea fiber-optic cables and 21,000km (13,000 miles) of land cable

Government Regulation 80 of 2019

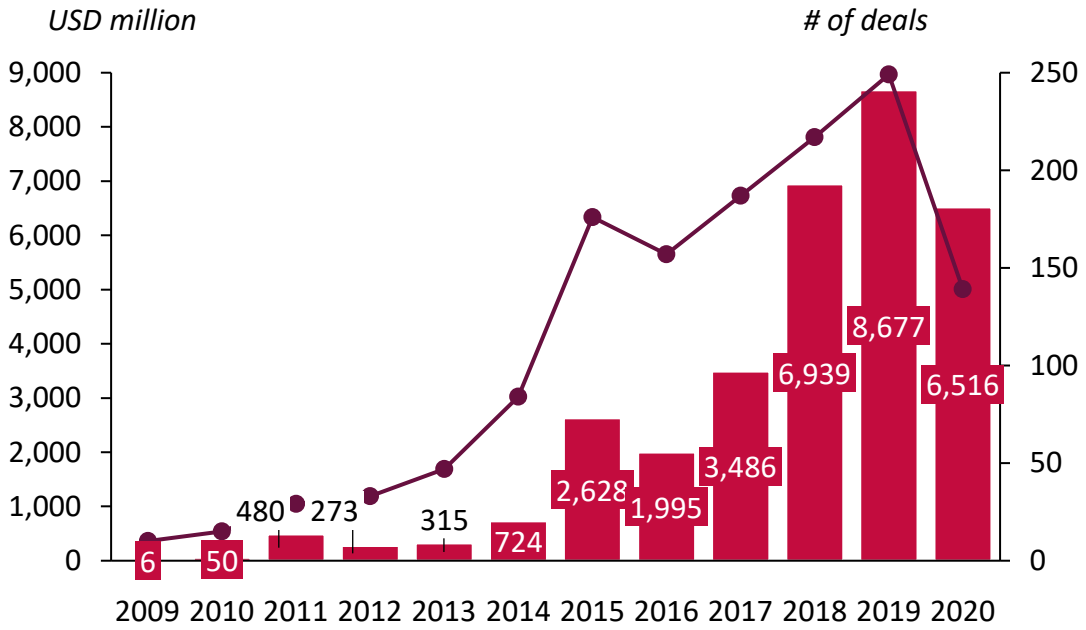
- Indonesia's Law on E-Commerce (Clear Guidelines and Compliance by November 2021)
- Requires e-commerce businesses to:

1. Obtain a business license (business license, tax identification number, technical license, business identification number)
2. Prioritize the trade of domestic goods or services, improve their competitiveness, and facilitate a special section or area to promote such goods or services on online marketplaces.
3. Report taxes
4. Uphold consumer protection and rights (including specific guidance on personal data protection)

Source: ASEAN briefing (https://www.aseanbriefing.com/news/indonesias-law-on-e-commerce-clear-guidelines-and-compliance-by-november-2021/); EIBN https://www.eibn.org/news/15/towards-a-more-digitized-indonesia

Digital ecosystem: Venture Capital funding has been abundant in recent years, a reflection of Indonesia's thriving technology start-up ecosystem

Venture Capital backed companies: Capital Invested and Deal Count in Indonesia (2009-2020)



Example Indonesian technology unicorns[1] and amount raised to date

GO-JEK ~$5bn

On-demand logistics services that started with Ojek (motorcycle taxi) transportation services. Currently provides a suite of digital consumer services, including digital payments (e-wallet), food delivery and online shopping.

tokopedia ~$3bn

Online C2C **e-commerce marketplace** / platform

traveloka ~$1bn

Online travel aggregator and flights / hotels booking services

Indonesia has

8 digital startups per 1 million people,

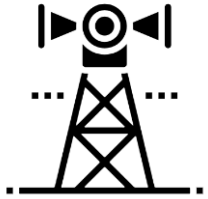
a higher ratio than Japan (6 per 1 million people).

- Many internet economy businesses have primarily **focused their operation in big cities**, but some are starting to venture beyond, in search of further growth
- Tokopedia has announced its **intention to "go rural"** by signing a memorandum of understanding to develop "digital villages" with the West Java administration

Note: (1) Unicorns refer to start-up companies with >$1bn valuation. Source: Pitchbook, Hinrich Foundation

Digital challenges: Indonesia has progressed on connectivity, literacy and affordability, but these challenges remain, particularly in rural areas

Indonesia ranks 57th (out of 100) in Inclusive Internet Index – a reflection of progress & development in recent years

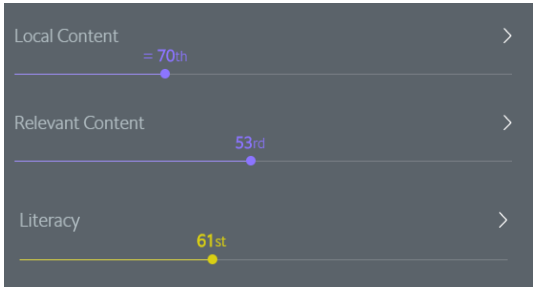


Connectivity

- Coverage of internet in rural areas are intermittent and inconsistent, network expansion programs still heavily focused in Indonesia's more populated areas
- Most network operators struggle to provide coverage for coastal areas
- Digital solutions need to be able to work in "offline mode" - making product features limited
- Many apps are built on the cloud, which require constant internet connection – rural areas are not able to benefit from these apps

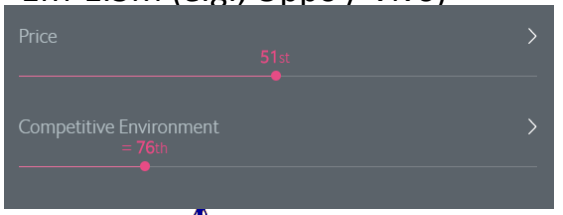
Digital literacy

- Foreign app requires local customization to cater to non-English speakers
- Language barriers further excarbate understanding of English-derived tech terms (e.g. OTP / PIN)



Affordability

- Market is highly concentrated (HHI index of 6,570), which lowers competitive price pressures
- Only Telkomsel have nationwide coverage, but is least affordable
- Average price of 1GB prepaid mobile broadband = 1% of GNI
- Smart phones are available at Rp 1M-1.5M (e.g., Oppo / Vivo)



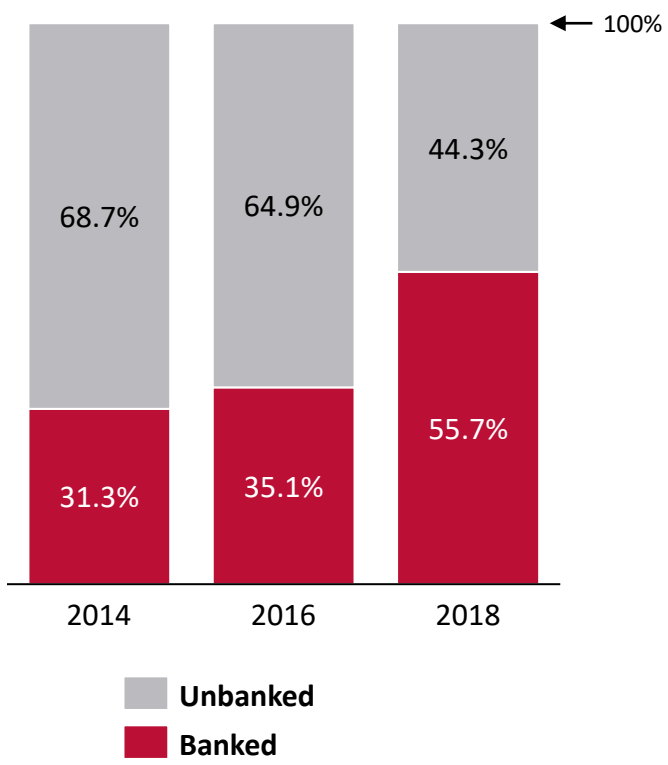
Source: stakeholder interviews, Jakarta post, Economist Intelligence Unit (EIU) The Inclusive Internet Index (2020)

Financial landscape: Indonesia have made progress towards financial inclusion – particularly in rural segment where agriculture is the main livelihood

- While the formal definition of financial inclusion in Indonesia covers access to various products[1], **formal tracked measures of financial inclusion primarily focuses on bank account ownership**
- **G2P programs have spurred account ownership** overall, with significant progress made in rural segment
- However, bank account use is often limited to receiving payments– cash is immediately withdrawn as transactions are mostly cash-based

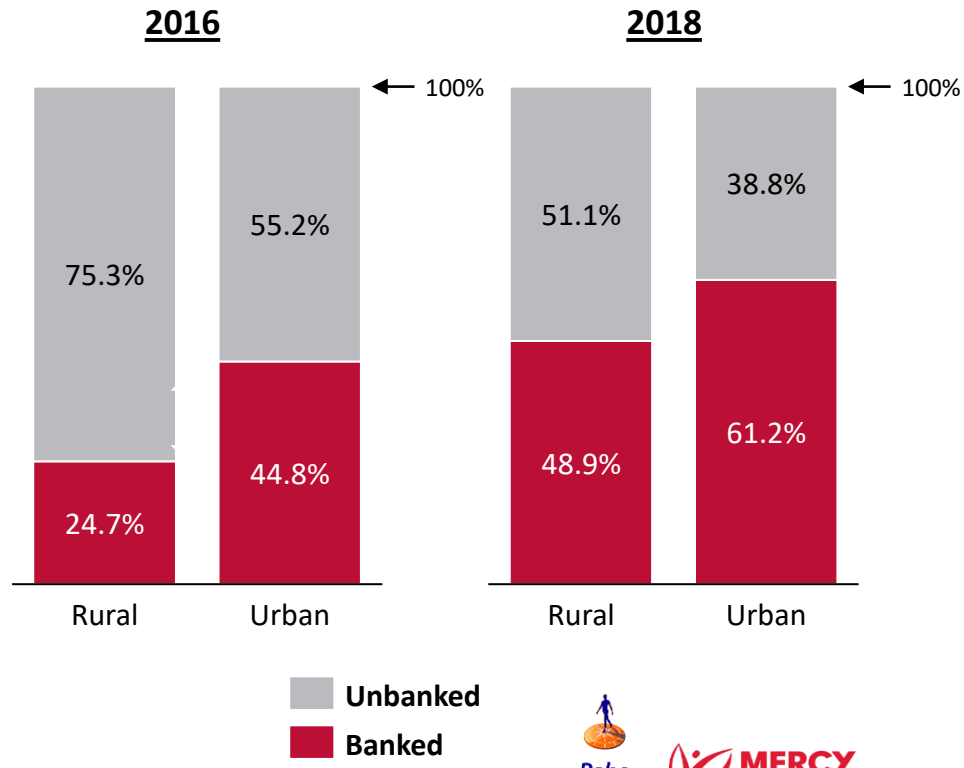
Bank account ownership - overall

% of adults



Bank account ownership – rural vs. urban

% of adults



1. Financial Inclusion is the availability of access to various formal financial institution, product, and services in financial sector in accordance with the needs of the community in order to improve social welfare. (POJK No.76/POJK.07/2016) Source: National Strategy for Financial Inclusion (DNKI)

Financial landscape: The National Financial Inclusion Strategy prioritizes both financial inclusion and literacy, but the latter lags behind

National Strategy for Financial Inclusion

- Development started in 2012; officially launched in 2016
- Three dimensions of financial inclusion:

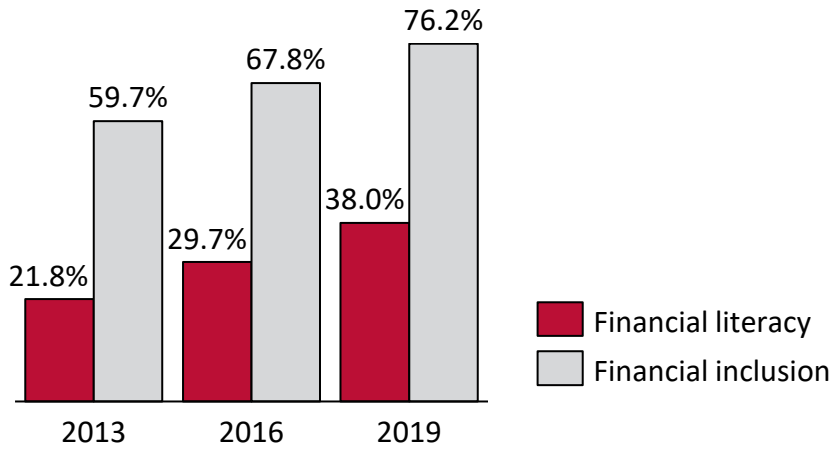
1. **Access** (# of financial services offices, ATMs and agents per 100,000 adults)

2. **Usage** (# of saving, credit, e-money accounts; % of credit going to MSME; % of lands certified; non-cash social assistance distributions)

3. **Quality** (financial literacy index, complaints to financial institutions)

The Financial Services Authority (OJK) together with the Financial Services Industry and related institutions continue to strive to increase financial inclusion that covers four elements: expanding access to finance, availability of financial products and services, use of financial products and services, and improving the quality of both the quality of use of financial products and services as well as the quality of financial products and services themselves.

Comparison of financial inclusion vs. literacy indicators[1]



Financial literacy remain lagging behind financial inclusion

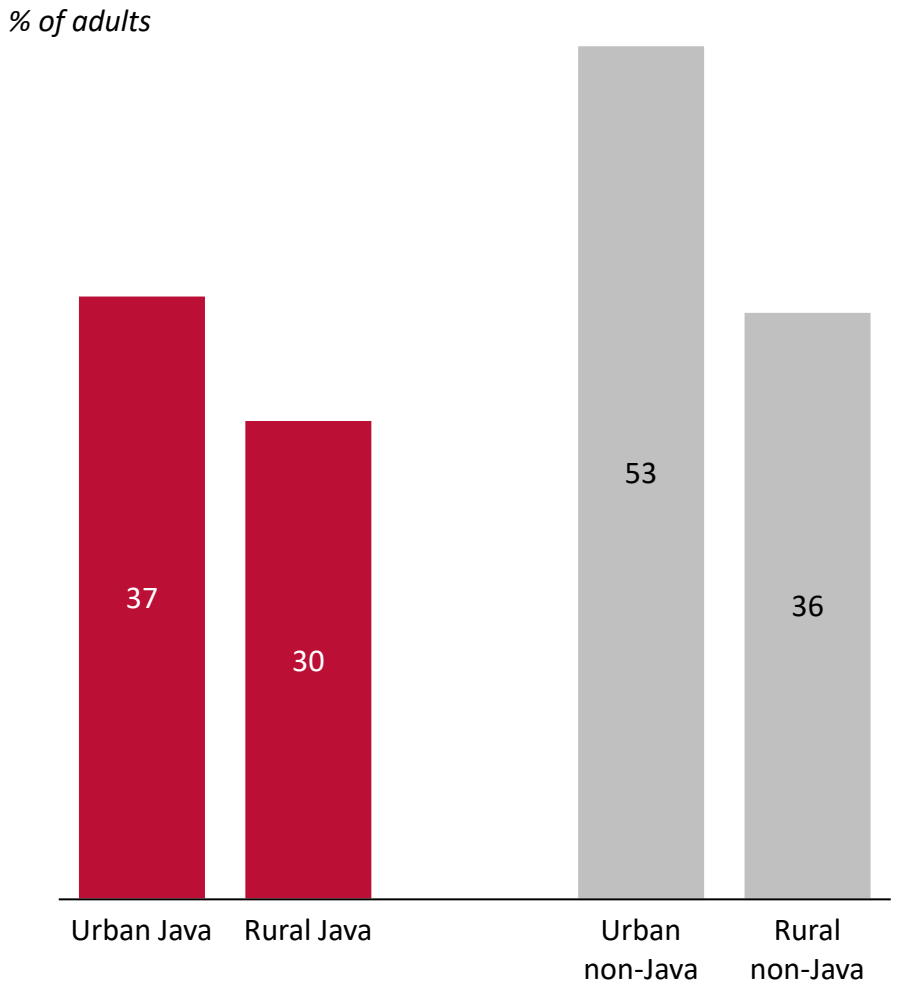
Training of trainers model for financial literacy

- To achieve scale in financial literacy training
- Commissioned / supported by government & OJK, in partnership with key stakeholders (NGOs, banks)
- Engage with people who are "in the front line" (e.g., students, extension workers) – to provide community-based education models

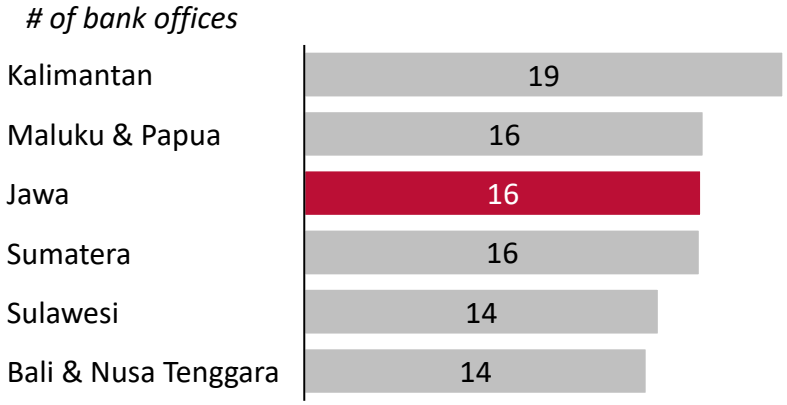
Notes: 1. Based on OJK financial literacy and financial inclusion index – [definition TBD]
Source: OJK National Survey, DNKI website

Financial landscape: Java falls behind in bank ownership measures

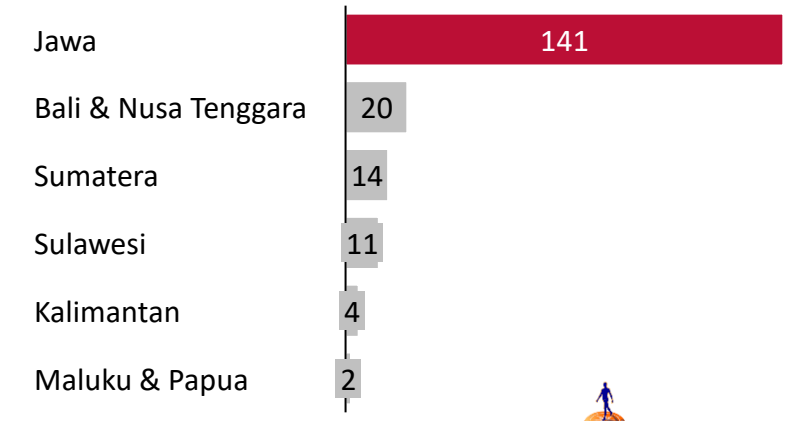
Bank account ownership (2018) – Java vs. non-Java



Number of bank offices per 100,000 adults (2020)



Number of bank offices per 100 km² (2020)

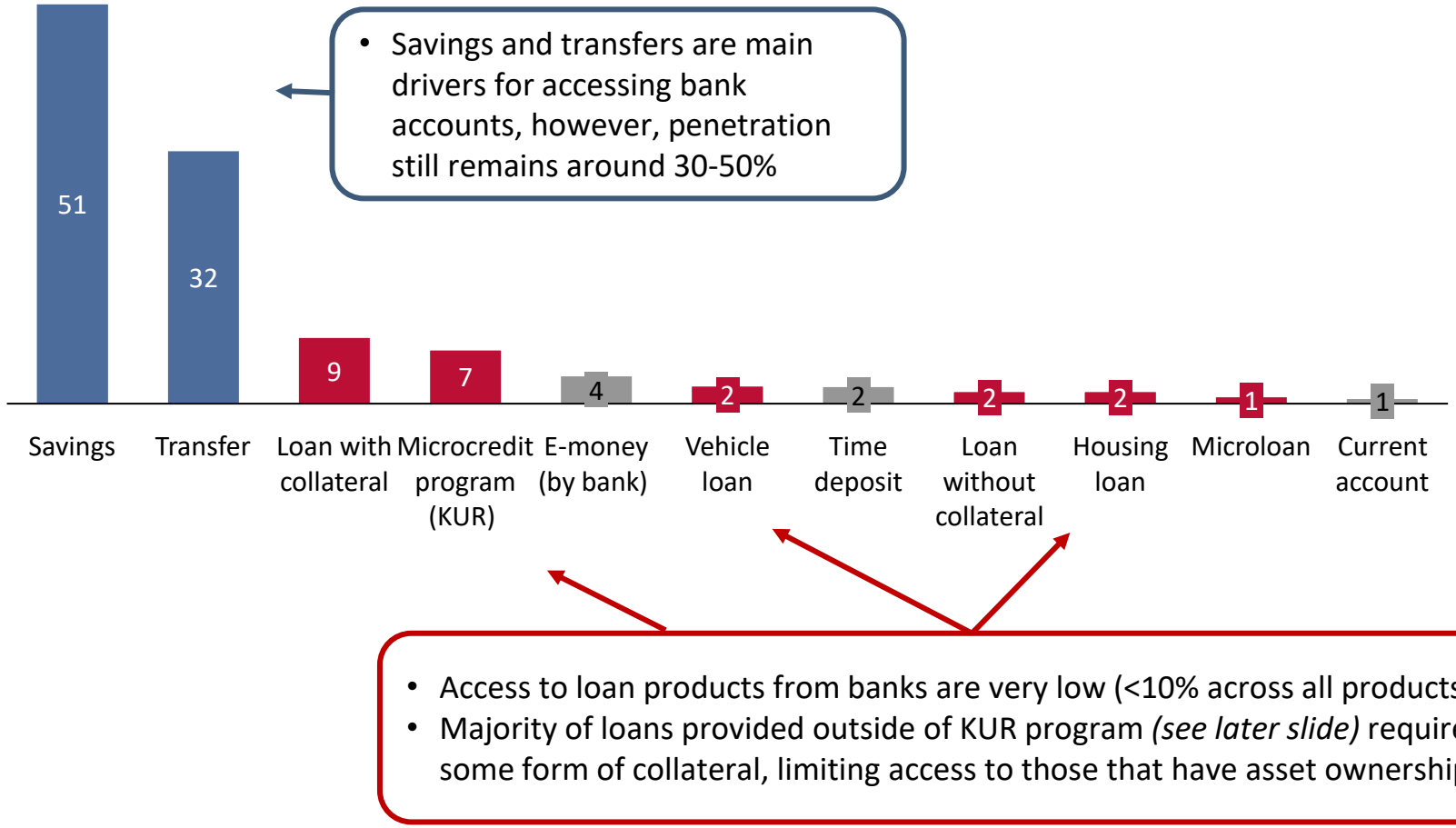


Source: DNKI (2018), SSKI (May 2020)

Financial landscape: Despite overall increase in bank account ownership, banking products have limited usage

Usage across financial product type among Indonesian adults (2018)

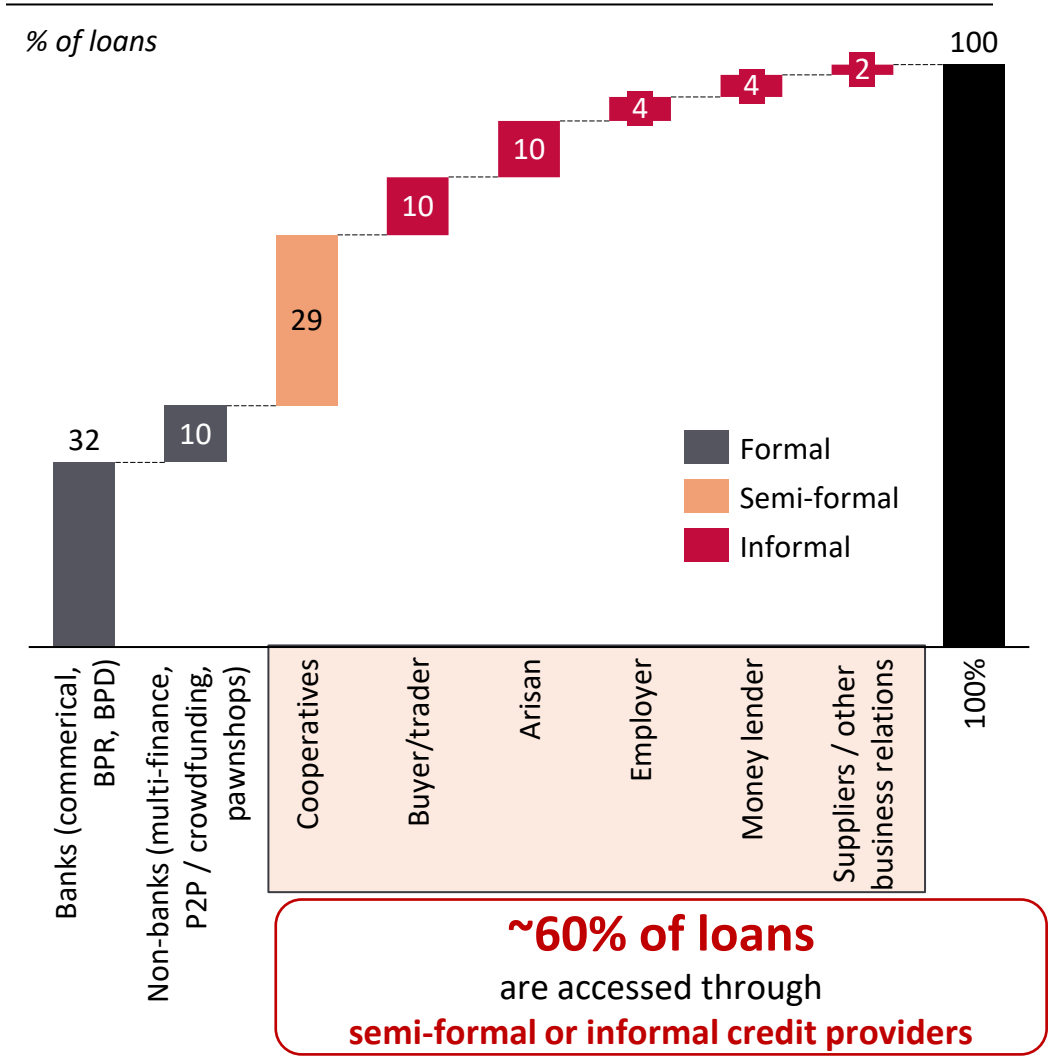
% of adults



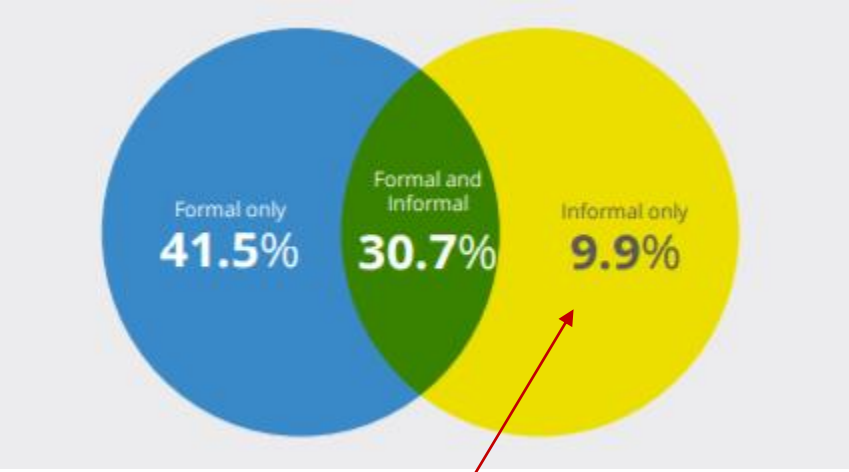
Source: DNKI (2018)

Financial landscape: Credit is mostly sourced from semi-formal and informal sectors, even for those who have access to formal financial products

Access to loans by sources (2017)



~60% of loans
are accessed through
semi-formal or informal credit providers



Characteristics of population that access only informal services

- Rural-based
- Female
- Older than 54 years
- Have achieved SMP or lower levels of education
- Are from households in the lowest quintiles of the PPI distribution
- Involved in agriculture

Source: Survey on Financial Inclusion and Access - Understanding people's use of financial services in Indonesia (2017)

Financial landscape: There is limited progress on digital lending by banks; however partnerships with digital companies show some potential

Bank	Digital Loan Application	Partnerships with start-ups
BRI	**BRISPOT Application** • Used by loan officers (Mantri Kredit) to input field data on behalf of applicants	• **KUR lending for farmers and MSMEs**: Gojek, Grab, Tokopedia, Shopee, Bukalapak ~ Rp 1.1 bil
Mandiri	**Mandiri Pintar Application** • Used by loan officers to input data on behalf of applicants • Decision in 15 minutes ~Rp 193 bil	• **Lending via e-commerce** channels: Bukalapak, Tokopedia, Shopee • **Funding P2P projects**; Amartha, Crowde, Investree, Akseleran, and Koinworks
BNI	**BNI MOVE Application** (Mobile Innovation for SME Ecosystem). • Digital platform for SME lending (for KUR) • Very recently launched (July 2020)	• **Lending via Agritech companies**: Aruna, FishON, FisTx, HARA & MSMB ~ Rp 16.7 tril

- Digital services offered by banks is primarily used by field officers for **quicker administrative processes**
- Very few consumer facing digital credit products are provided by traditional banks **– most digital user interface are fronted via digital companies**

Government backed digital lending initiatives:

Digital Lending Program for MSMEs

- Launched Jul 2020
- Government *aims to provide IDR 4.2 trillion* for 1 million MSMEs who are in the digital ecosystem

KUR Bali

- Launched Aug 2019
- Digital applications for commercial banks that have branches in Bali

~Rp 3 bil

Notes: 1) Launched by Ministry for Maritime and Investment Affairs in partnership with State Commercial Bank Association (HIMBARA) and Digital ecosystem players as part of Gerakan Nasional Bangga Buatan Indonesia (BBI); Sources: Corporate Secretary of BRI, Mandiri and BNI

Financial landscape: "Cash-in Cash-out" (CICO) agents play a large role in facilitating cash and transfers

- In 2014, regulators allowed banks and e-money providers to use individual agents to expand their market reach.
- **Two types of agent networks:**

1 LAYANAN KEUANGAN DIGITAL (LKD)

For digital wallet services, offered by both banks and non-banks – regulated by BI

Number of LKD agents (June 2019): 433,261

- Convenience store franchises such as Alfamart & Indomaret provide agent networks primarily for non-bank institutions such as e-wallets
- They each operate 15,000+ franchises across Indonesia
- Service provided is limited to "cash-in" or payments only for digital wallets – "cash out" mainly for bank account holders (BCA, Mandiri)

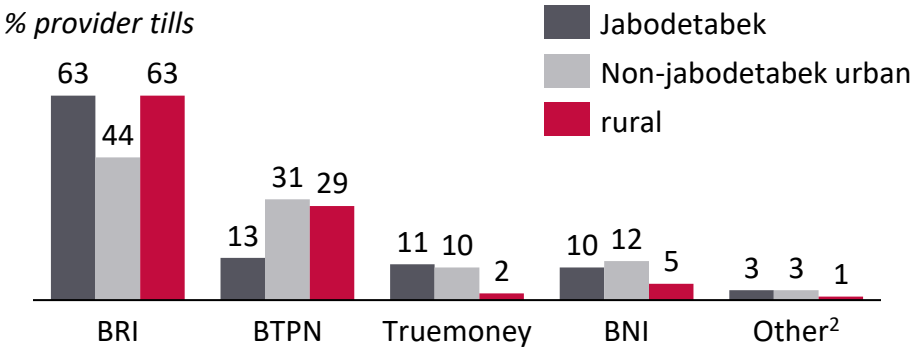
2 LAKU PANDAI

LAKU PANDAI
Sahabat Masyarakat
Layanan Keuangan Tanpa Kantor Dalam Rangka Keuangan Inklusif

Basic savings accounts which can only be offered by banks – regulated by OJK

Number of Laku Pandai agents (June 2019): 933,628

Market presence of DFS agents (2017)



BANK BRI

BRI agents consist primarily of existing customers (mom and pop shop) – coverage may already overlap with where their services can be accessed through branches

bank btpn

BTPN made significant progress in covering areas outside of its reach through external recruiting of agents targeting rural / non-Jabodetabek areas

Note: 1. Jakarta metropolitan area; 2. Includes Bank Mandiri, BCA, Bank Sinarmas

Source: http://www.helix-institute.com/sites/default/files/Publications/ANA%20Indonesia.pdf; DNKI (2018)

Financial landscape: There has been increasing awareness of banking agents in rural segment, but challenges prevent widespread uptake

LAKU PANDAI
Sahabat Masyarakat
Layanan Keuangan Tanpa Kantor Dalam Rangka Keuangan Inklusif

Types of agents:

- Existing businesses such as cornerstores ("warung"), laundromat, petrol station that is domiciled in particular location
- Need to obtain official certification

Role of agents:

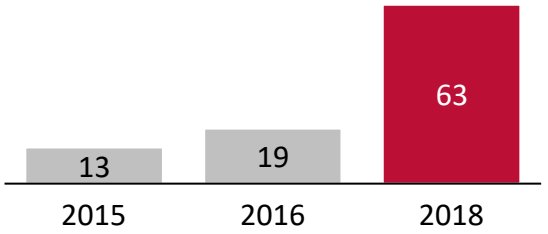
- Provide branchless banking services – promote products of affiliated bank

Challenges and constraints:

- **Product knowledge:** Limited capacity to learn about multiple products (e.g., insurance), often provides only CICO services
- **Exclusivity:** Agents cannot partner with multiple service providers (97% of agents serve only one FI, and any agent can only serve up to 2 DFS at once)
- **Location:** Many agents are clustered around bank branches, which does not necessarily expand the reach of FI providers
- **Paperwork:** Onboarding requires formal paperwork and identification (e.g., business registration) – many rural businesses do not have this
- **Low profitability:** due to low usage of services (4 transaction per day vs. 30 in Bangaldesh)

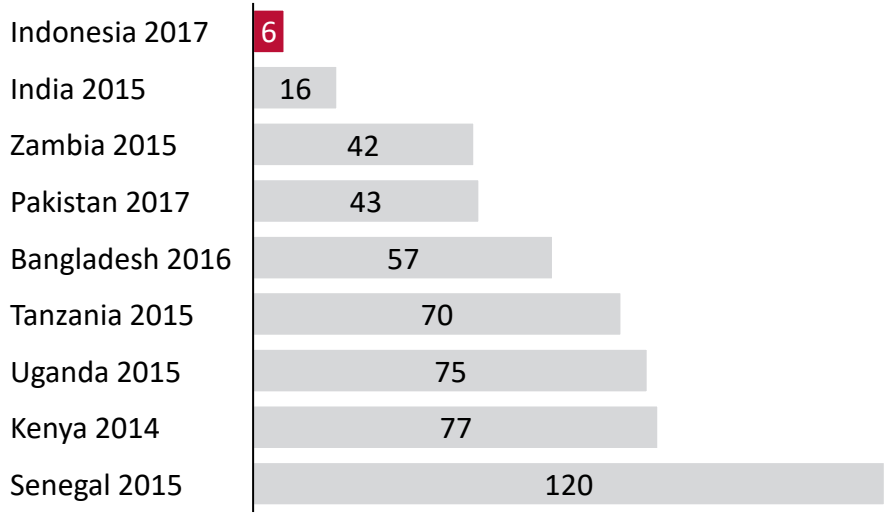
Rural residents who know the location of a bank agent

% of adults



Median monthly profitability comparison at outlet level

USD (Current prices)



Source: DNKI, http://www.helix-institute.com/sites/default/files/Publications/ANA%20Indonesia.pdf

Rabo Foundation MERCY CORPS

Financial landscape: Mobile money is in early stage of development; its use is limited to urban areas with only 4-5% adoption rate overall

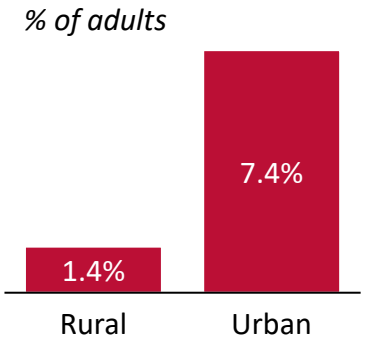
There are 5 e-wallet providers and 32 e-money providers in Indonesia.

	Wallet	# of registered users *(estimate)*	Owner/Operator
Recently merged	OVO	110M	Lippo group, large conglomerate (shopping malls)
Recently merged	DANA	63M	Emtek (media conglomerate) & Alibaba Group
	gopay	30M	Gojek (ride-hailing tech company)
(replaced T-Cash, first mobile money in Indonesia)	LinkAja!	40M	Telkomsel & state-owned banks
	Shopee	*Limited to Shoppee transactions only*	Garena (owned by Airpay)

*Competition is intense across mobile wallet operators – their user acquisition strategy relies upon significant cash burn activities such as **promotions and discounts to onboard large merchants & users***

Source: Mobile wallet websites, DNKI Report 2018, stakeholder interviews

Mobile wallet penetration - rural vs. urban (2018)



Use case for mobile wallets primarily focus on middle or higher-income urban consumer use cases (e.g., e-commerce, ride hailing, food delivery)

Interview findings:

- There is a strong view that rural adoption is not going to be the key driver for mobile wallet growth at this current juncture in Indonesia
- However, **Linkaja!** have decided to take a crack at driving mobile wallet adoption in lesser ventured areas – Tier 2 & 3 cities.
- They adopt an **ecosystem approach** by onboarding daily payment points (e.g., utility bills, petrol stations, school payments) to cater to their users
- They also build relationships with **traditional market traders** to support adoption in the agriculture sector – this is crucial to building trust and cooperation
- As LinkAja! Is backed by state-owned banks, they are able to offer CICO for its mobile wallet at banks

Financial ecosystem: Since 2014[1], Indonesia's financial system has been regulated by two separate entities – BI and OJK

REGULATORY BODIES OF INDONESIA'S FINANCIAL SYSTEM

1 Bank Indonesia (Indonesian Central Bank)

BANK INDONESIA
BANK SENTRAL REPUBLIK INDONESIA

Role: Maintain Rupiah stability and implement monetary policy

Types of licenses issued:

- eWallets
- eMoney
- Payment Gateways
- Principals
- Switching companies
- Card issuers & acquirers
- Clearing houses
- Settlement Agencies
- Cryptocurrency & Blockchain
- National Payment Gateway
- Support of payment transations (e.g., ATM, EDC & data centers)

2 Otoritas Jasa Keuangan (Financial Service Authority)

OJK | OTORITAS JASA KEUANGAN

Role: Regulate and supervise the banking and non-banking financial services industry in Indonesia

Types of licenses issued:

- Peer-to-peer (P2P) lending
- Crowdfunding
- Digital banking
- Insurtech
- Fintech in capital markets
- Venture Capital
- Online financing
- Data Security
- Consumer Protection

As of August 2019, there are 111 banks operating as Commercial Banks in Indonesia, with 6 controlling more than 50% of the total banking assets in the markets.

Note: OJK was launched in 2013 and officially started operating in 2014. Source: Global Legal Insight – Banking Regulation in Indonesia 2020.

Financial ecosystem: Regulators have been keeping up with a thriving Fintech ecosystem in Indonesia; key frameworks have been implemented recently

Ecosystem of Fintech start-ups in Indonesia (May 2018)

167
# of fintech companies

$176M
Fintech investments disclosed

$22B
Transaction value in Fintech market

- Apart from a few digital lenders (see supply section), **few fintech companies are serving the agriculture segment**
- Many are **focused more on urban, middle to high income consumers**

Key regulatory frameworks enabling / supporting development of fintech ecosystem

- OJK Regulation No.77/POJK.01/2016 on Information Technology-based Lending **(for P2P lending)**
- OJK Regulation No.12/POJK.03/2018 on the Implementation of Digital Services by Commercial Banks **(requires all banks that want to provide digital services to obtain licensing)**
- OJK Regulation No.13/POJK.02/2018 on Digital Financial Innovation in the Financial Services Sector **(any fintech not yet licensed must go through regulatory sandbox)**
- OJK Regulation No.37/POJK.04/2018 on Equity Crowd Funding **(for start-ups/ SMEs to raise funds electronically)**
- Bank of Indonesia Regulation No.19/10/PBI/2017 on Fintech Companies (**payment businesses must register with BI and cannot use digital currency; 1 year testing in regulatory sandbox)**
- Bank of Indonesia Regulation No.20/6/PBI/2018 on Electronic Money **(capital and ownership requirements for e-money issuers)**

Source: www.fintechnews.sg

Financial ecosystem: BI-led QRIS program aims to accelerate mobile wallet adoption, however, implementation challenges hinder proper uptake

Bank Indonesia introduced the QRIS program to streamline mobile wallet use across players

QRIS* Menuju Indonesia Maju

- Provides a standardized QR code for making digital payments across all existing licensed methods
- Requires merchants to only have one QR code to accept any digital payments
- Acquiring payments player are required to register the merchant on QRIS database and obtain merchant ID code
- Objective is to move away from CICO model to cashless payments

Today:

- **4.2 million merchants** registered
- **2.1 million transactions** per month
- **39 connected payments player** (to be expanded to 55) – including local, foreign banks and mobile wallets

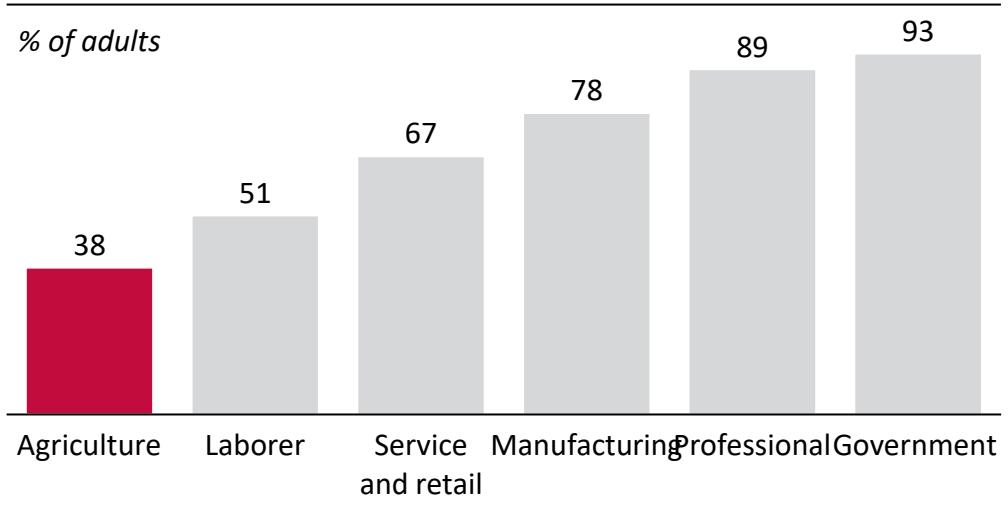
Interview findings:

- Implementation of QRIS has not been consistent as there is lack of resources to police proper compliance to QRIS regulations
- Many mobile wallet companies still "double register" merchants
- Disagreements on MDR (merchant discount rate) – i.e., the fee payment players get from facilitating transactions cause scepticism of effectiveness

Source: Bank Indonesia information on QRIS, stakeholder interviews

Financial Challenges: Agriculture continue to lag behind other segments in bank account ownership

2018: Account ownership by sector of livelihood



Challenges for bank account ownership for farmers:

- Transactions in agriculture mostly still cash-based (including credit provided by traders), farmers do not require bank account to transact or obtain credit
- Large number of value chain actors, difficult to coordinate across all actors to convert to non-cash
- Lack of CICO or banking infrastructure in remote areas
- Lack of paper work (e.g., KTP (National ID), which is required for opening bank account

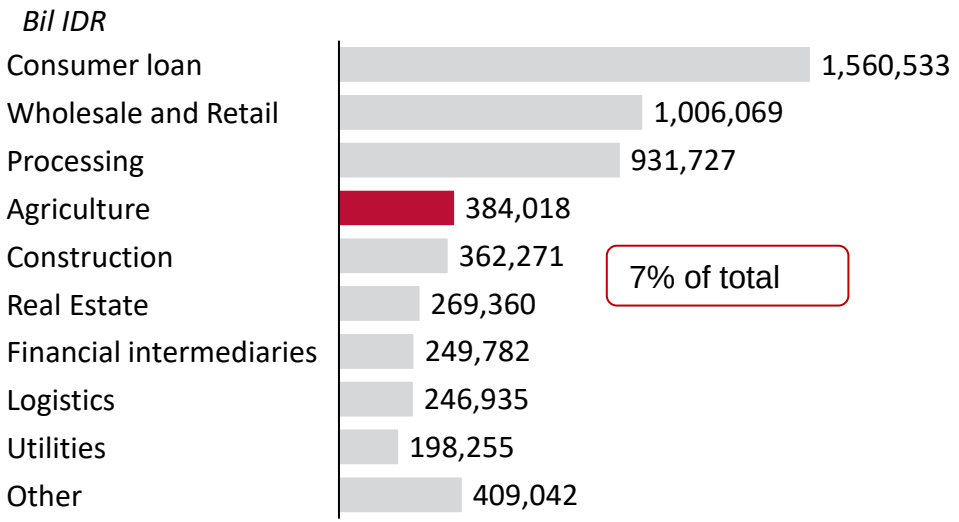
Interview findings:

- % of cash-based transactions highly value chain dependent
- Entire palm oil / rubber value chain still operates on cash (rubber traders carry millions of Rp of cash in plastic bag after executing deals)
- Horticultural farmers tend to have higher economic status compared to other types of crops – this segment has higher likelihood of transacting using bank account
- Off-takers sometimes pay community leaders (e.g., aggregators for farmers) via bank account transfers, and community leaders will disburse cash to individual farmers

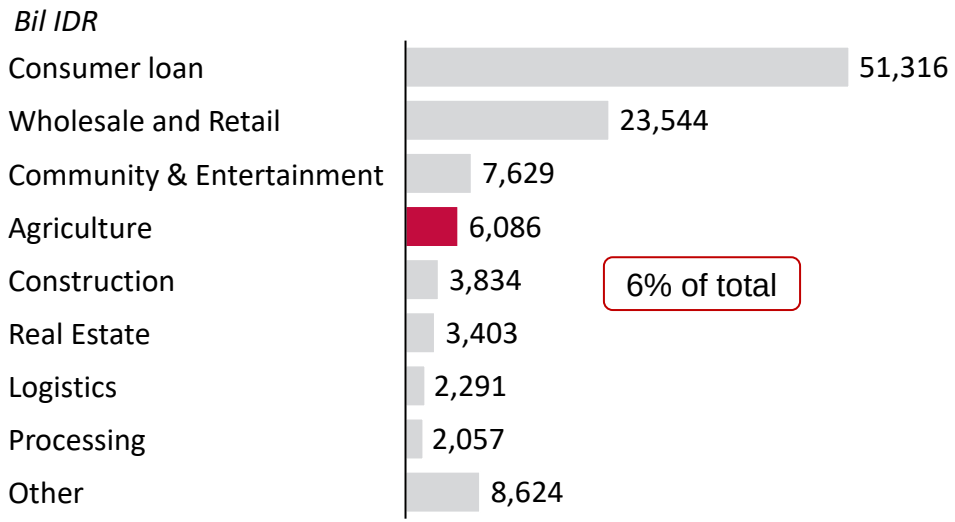
Source: DNKI (2018)

Financial Challenges: Despite their name, "rural banks" are not focused on agriculture lending – only 6% of their portfolio are in agriculture

Commercial bank lending breakdown by sector (2019)



Rural bank lending breakdown by sector (2019)



Bank Perkreditan Rakyat (BPR):

- BPR, "People's Credit Bank", are Indonesia's local banks / "rural banks"
- Operates in in rural areas and cities and aims to finance MSMEs, specifically in the informal sector
- BPR activities are limited to: savings, deposits, loans, and placing funds with BI / other banks
- Full ownership by government or joint ownership by government and private sector
- Typical loan to farmer: 2% per month interest, 1-5mil IDR, 3-6 months

Key challenges for Agricultural lending

- No digital / technological offering – requires specific license from OJK
- Limited knowledge in agriculture credit (and no access to data) and no particular incentive to lend to farmers
- Found that some agriculture credit used for consumption, rather than productive use
- Require strong on the ground relationships with farmers (e.g., with collectors and communities)

Source: Indonesia Banking Statistic December 2019, OJK

Report contents

Agriculture & fisheries are backbone of Indonesian economy; while relative importance is declining, they formally employ 1/3 of population

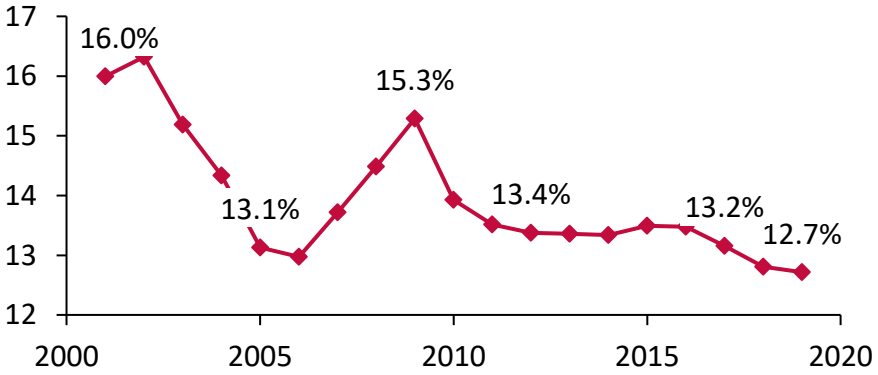
Role of agriculture in the Indonesian economy

- Indonesia has seen impressive economic growth over the past two decades, at an **average GDP growth rate of 5.4%**
- It has the **4th highest population in the world**, with c.270 million inhabitants across more than 17,000 islands
- Indonesia's **rural population consists of 119 million people**, or 44.3% of total population (down from 53% in 2000 **due to rapid urbanization**)
- Agriculture and fisheries sectors play a central role in the economy; however, their **relative share of GDP has been declining** due to rapid growth in services industries

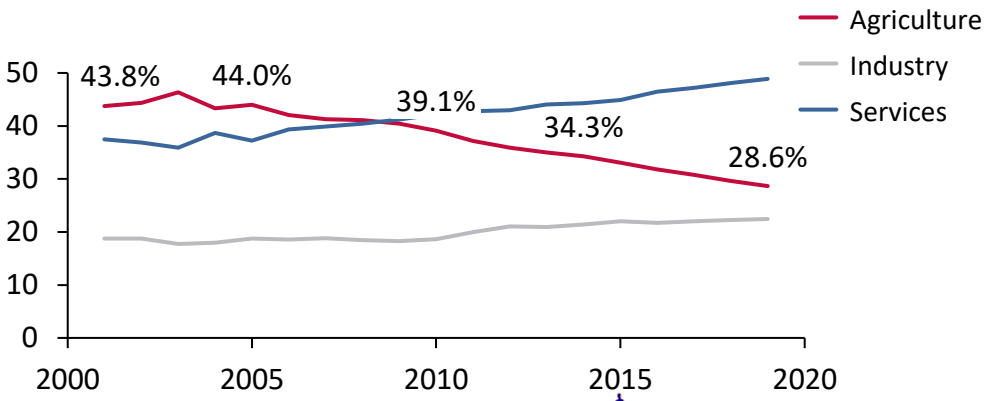
Employment

- Agriculture **employs just under 30% of the workforce**; however this share has been declining rapidly
- It is estimated there are **more than 26 million smallholder farming households;** from these, agriculture provides **employment for 49 million farmers**
- As of today, **9% of the population live under the national poverty line**, down from 20% in 2000; majority of those in poverty are in rural areas engaged in agriculture

Agriculture production value as % of GDP (2000-2019)



Sector contribution to employment, % (2000-2019)

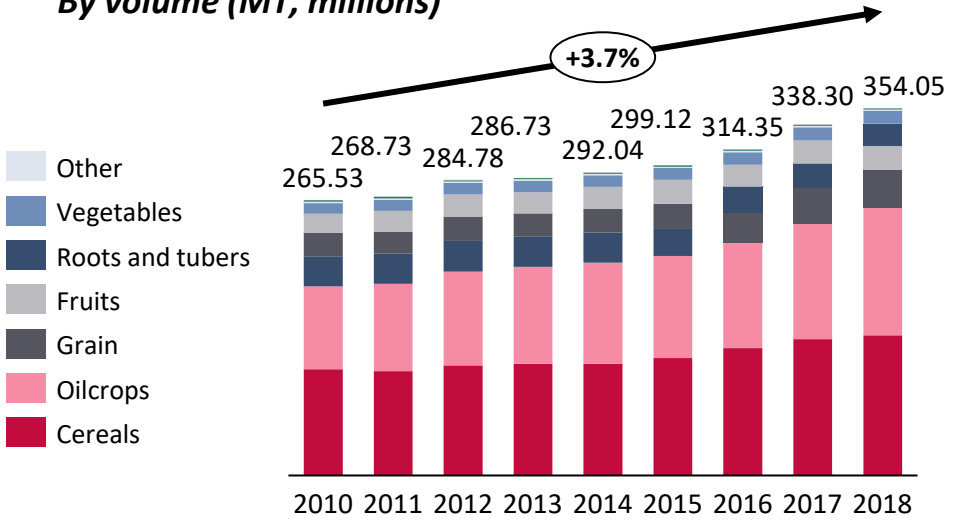


Sources: FAOStat; FAO Country Profile: Indonesia; World Bank Datasite; Ministry of Agriculture; Government of Indonesia National Bureau of Statistics

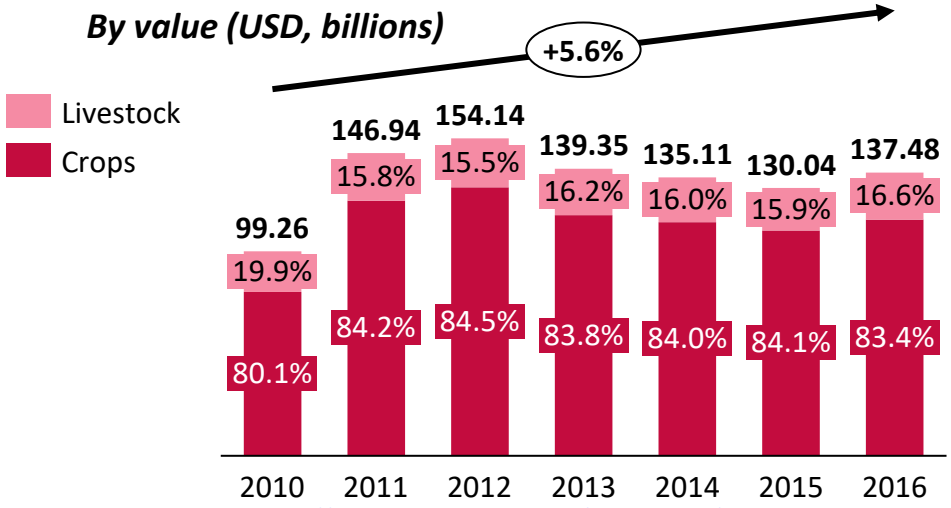
Indonesian agriculture is dominated by plantation crops, staple crops, and marine / aquaculture

Industry Performance

By volume (MT, millions)



By value (USD, billions)

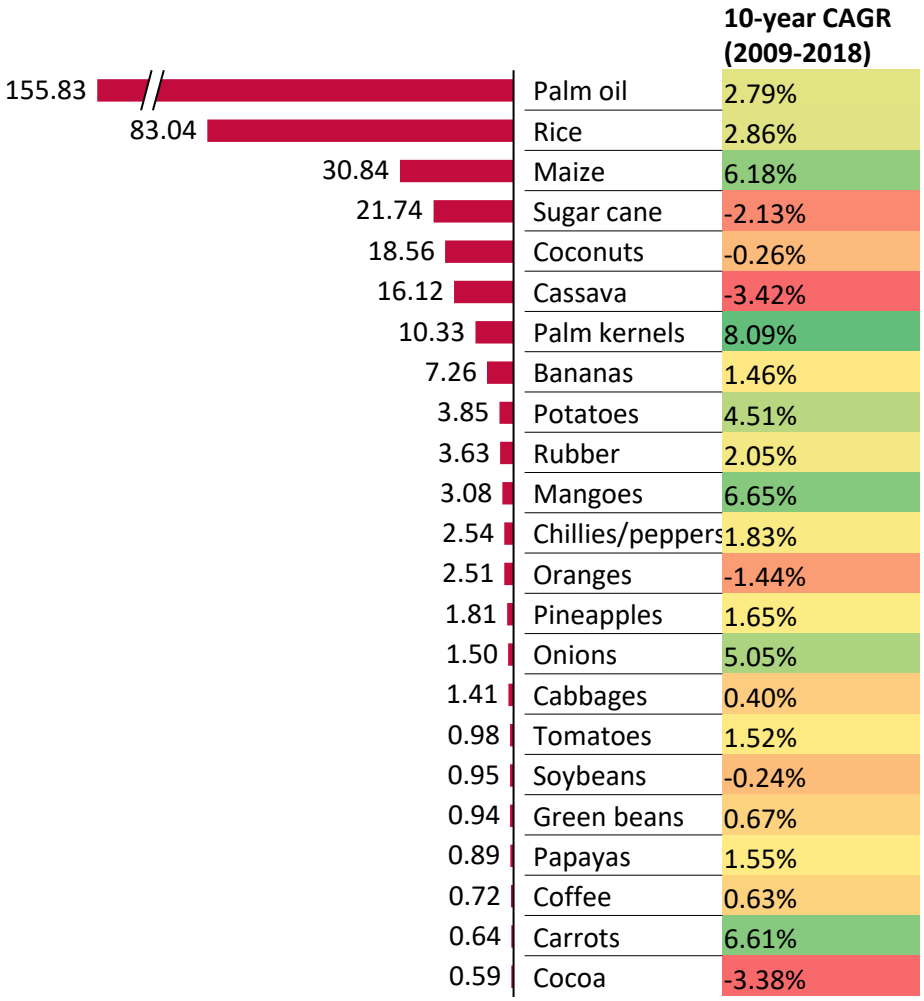


- Crop production has been **growing at 3.7% year-on-year** in the past decade, with fastest growth in cereals, grains, and oil crops
- Indonesia is a **leading producer of palm oil** and a major global producer of cocnuts, rubber, cocoa, coffee; key food crops include rice, maize, cassava
- It is the **second largest fisheries producer** in the world, behind China, in both marine capture and fish farms; it is also one of the **world's largest wood products exporters**
- Commercial plantations grow export crops on 22.4 million hectares, comprising 13% of the country's land mass, or 42% of the land used for agriculture
- 93% of farmers in Indonesia are smallholders, and 75% are **operating on less than one hectare**

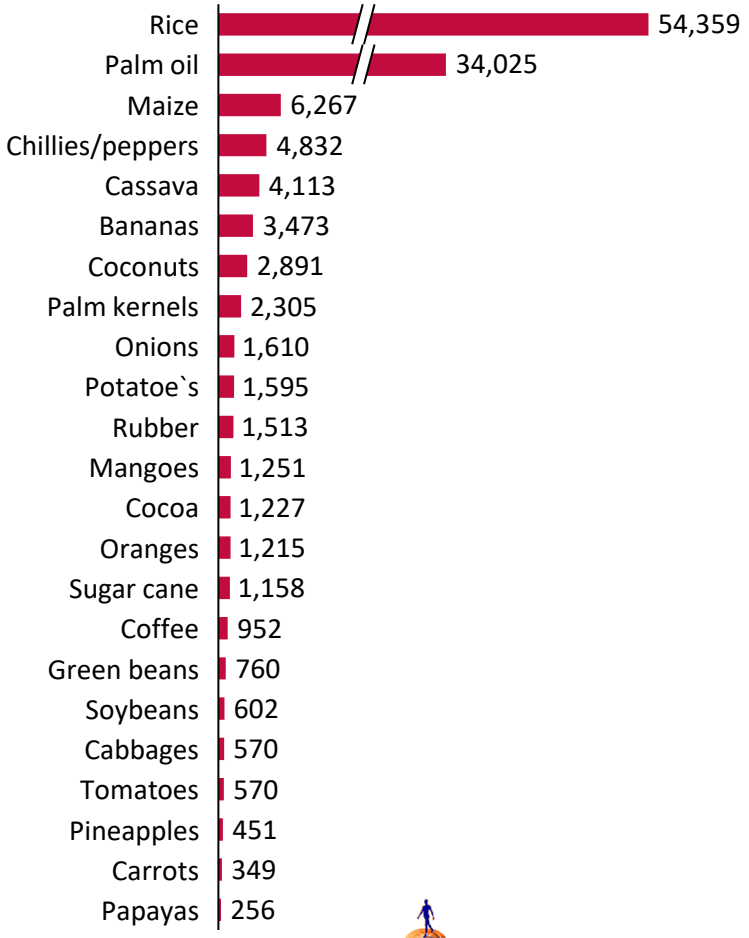
Sources:FAOStat;https://www.researchgate.net/publication/305141930_Sustainable_agriculture_in_Indonesia_Facts_and_challenges_to_keep_growing_in_harmony_with_environment", "Sustainable agriculture in Indonesia: Facts and challenges to keep growing in harmony with environment

Crops are dominated by palm oil, rice, and maize, together comprising 74% of all output; the top 7 crops by production make up 90% of total value

Top crops by production (2018), MT billions



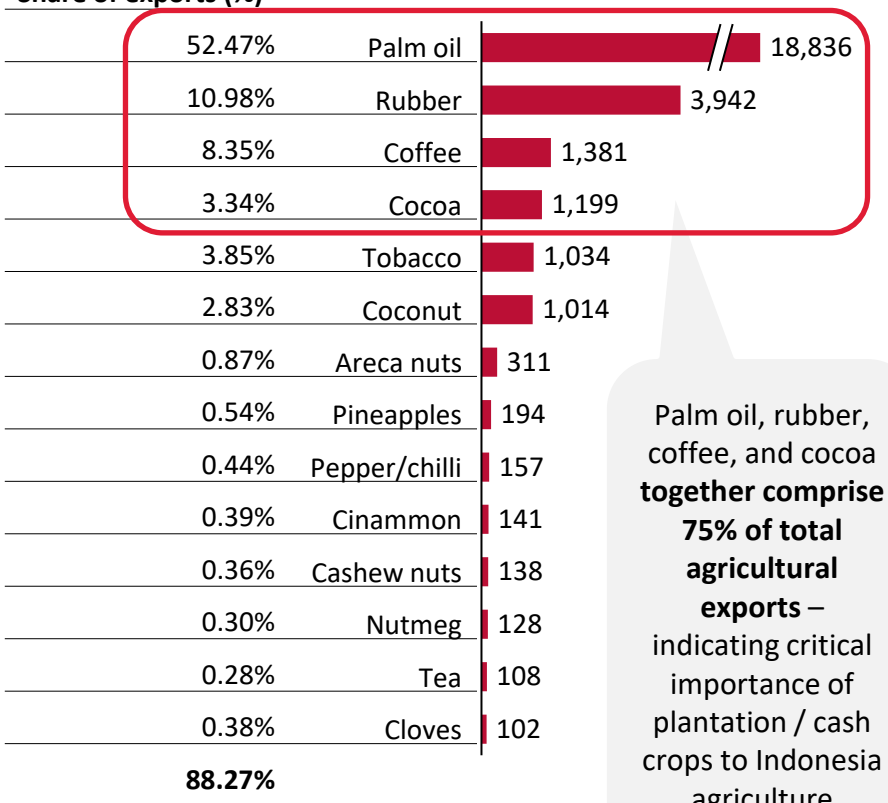
Top crops by value (2018), USD 000's millions



Sources: FAOStat

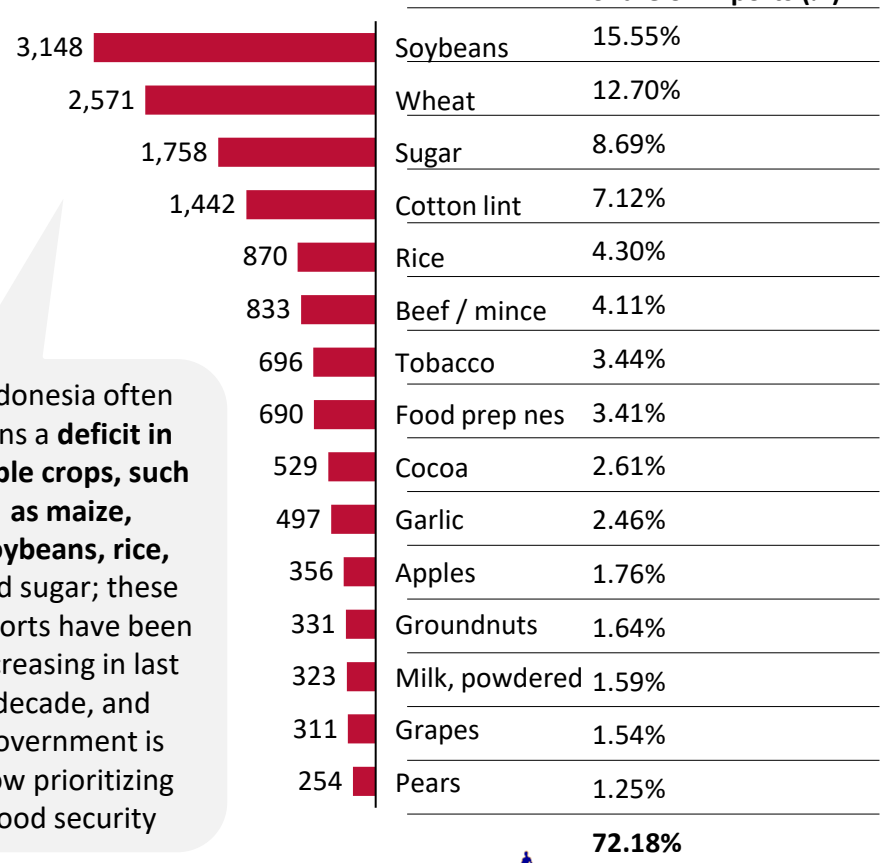
Palm oil is the key export, with other estate crops like rubber, coffee, and cocoa; Indonesia often runs a deficit in grains, requiring imports from region

Top agricultural exports (2018), value (000's millions, USD)



Palm oil, rubber, coffee, and cocoa **together comprise 75% of total agricultural exports** – indicating critical importance of plantation / cash crops to Indonesia agriculture

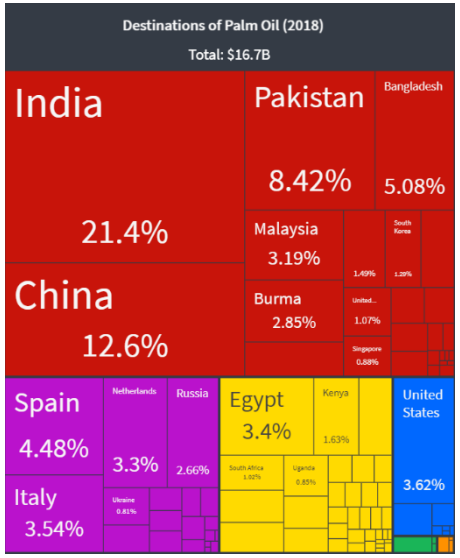
Top agricultural imports (2018), value (000's millions, USD)

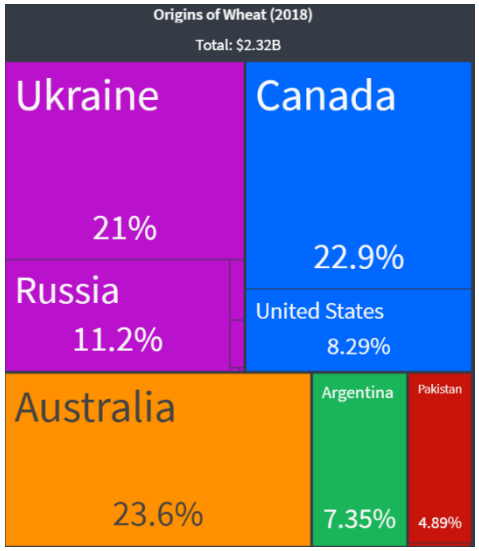


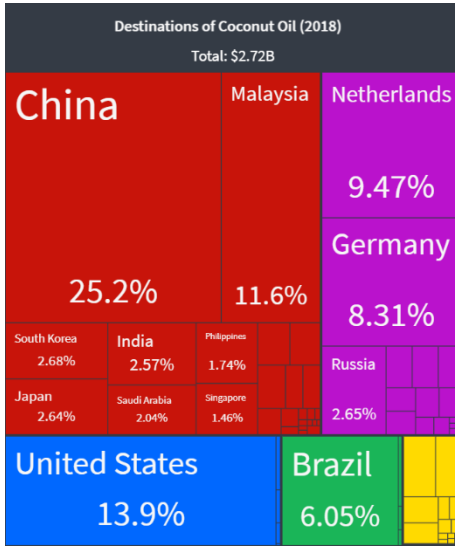
Indonesia often runs a **deficit in staple crops, such as maize, soybeans, rice,** and sugar; these imports have been increasing in last decade, and government is now prioritizing food security

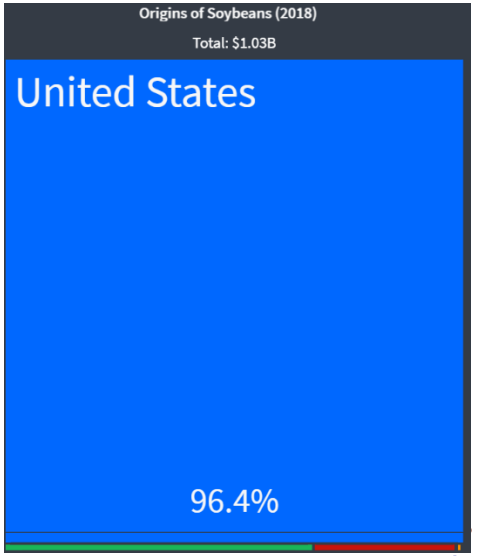
Sources: FAOStat

Exports of key oil crops are focused mainly on regional giants, India and China; imports of key grains / legumes come from Europe and N. America



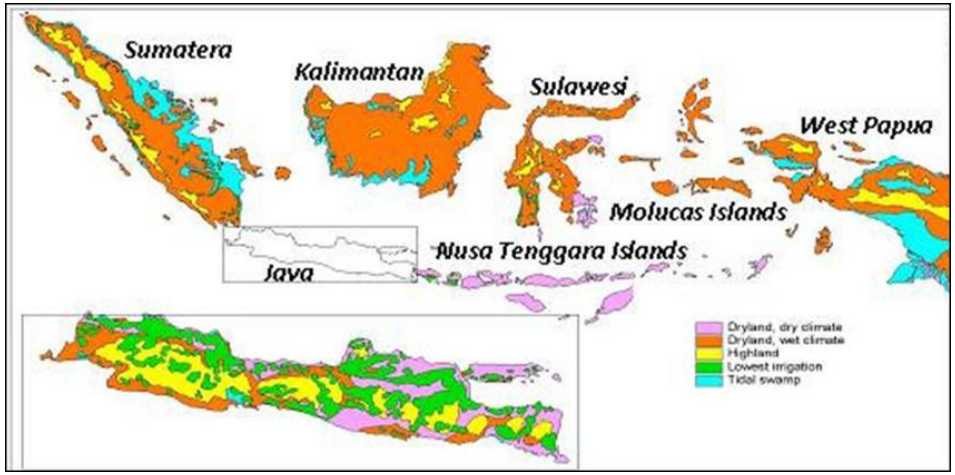






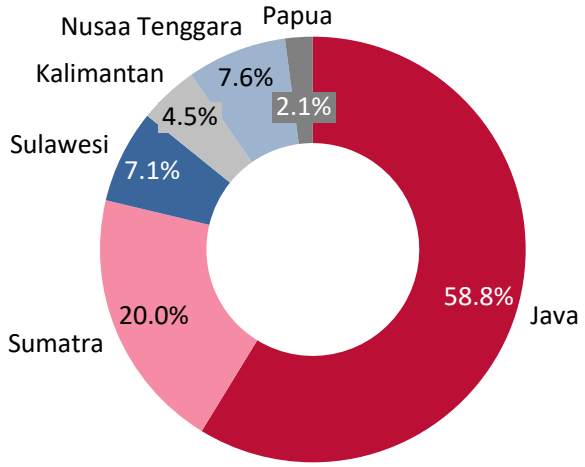
Source: https://oec.world/en/profile/country/idn; MIT Trade Atlas Observatory

Cultivation potential varies across country, notably between Java's lowlands, where majority of farmers live, and rain-irrigated wetlands



Farming households, by region (%)

Est. total no. of farming households = 26,135,469

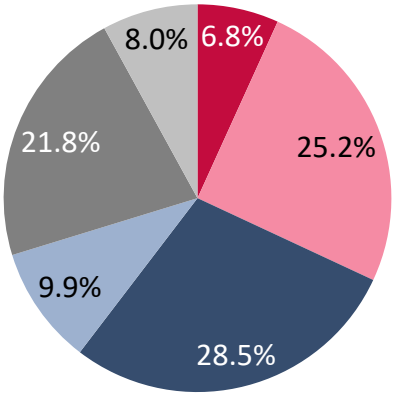


- **Indonesia has diverse agro-ecological conditions** across its main regions, which determine what smallholder farmers grow.
- **Java is the most fertile land** in the country for crop production; it only covers 6.8% of total land area, however, it contains more than 29% of total arable land. Key crops are rice, grains, and horticulture in the lowlands, and tea/coffee in the highlands.
- **Sumatra and Kalimantan have less fertile land** with swampy lowlands, yet are **home to many of Indonesia's commercial plantations** in the higher dryland areas, primarily palm oil, rubber, and coffee
- The islands of **Nusa Tenggara and Maluku are relatively barren** and the landscape is predominated by savanna and steppes
- **Papua has more than 40% of Indonesia's fallow land**, with only 1.3% of total arable land despite having 21.8% of total land area

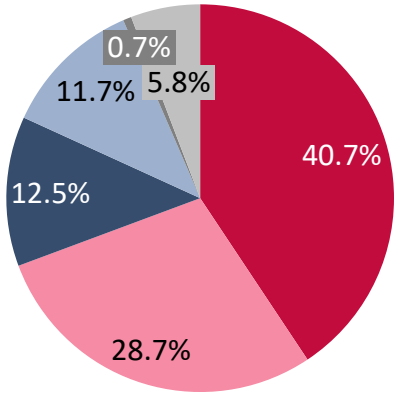
Sources: (1) Agro-ecological zones of Indonesia (adapted from Central Agency of Soil and Agro-climate) (2) United State Department of Agriculture, Foreign Agriculture Service (https://ipad.fas.usda.gov/rssiws/al/seasia_cropprod.aspx); (3) Sustainable agriculture in Indonesia: Facts and challenges to keep growing in harmony with environment (4) National Agriculture Census 2014

Java has 29.1% of arable land and 40% of paddy fields, despite having 6.8% of total land mass; Sumatra has more than 50% of commercial plantations

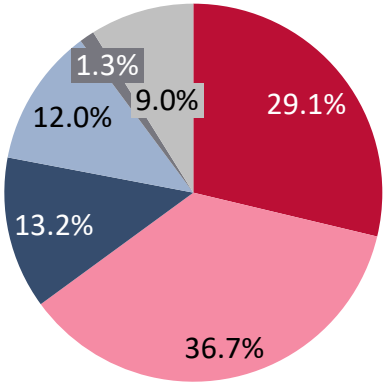
Total land surface area by region, km2 (2014, %)



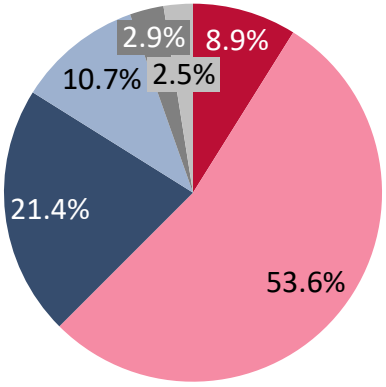
Wetland paddy field area by region, km2, (2014, %))



Total arable land by region, km2 (2014, %)

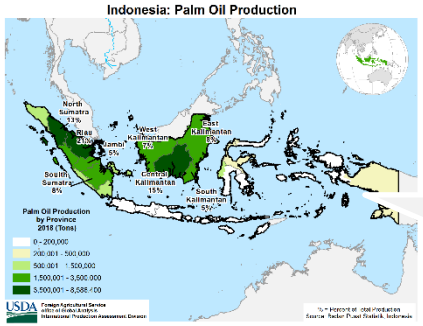


Commercial plantation by region, km2 (2014, %)

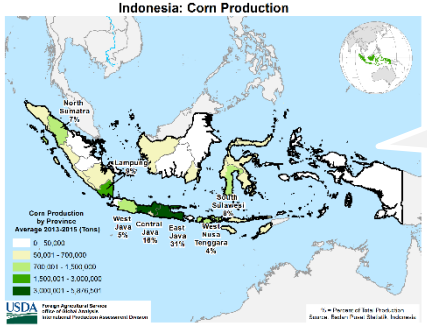


Sources: (1) Agro-ecological zones of Indonesia (adapted from Central Agency of Soil and Agro-climate) (2) Indonesia Central Bureau of Statistics

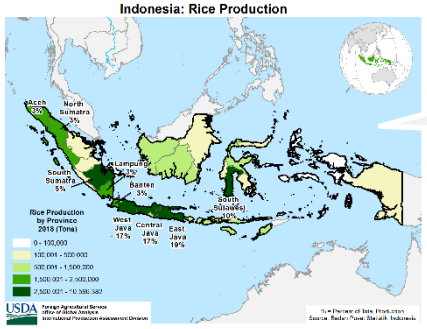
Ecological differences significantly impact the types of crops which smallholder farmers in different regions grow



Palm oil is mainly produced in Sumatra and Kalimantan, where all of major estates are located; Java has almost no production

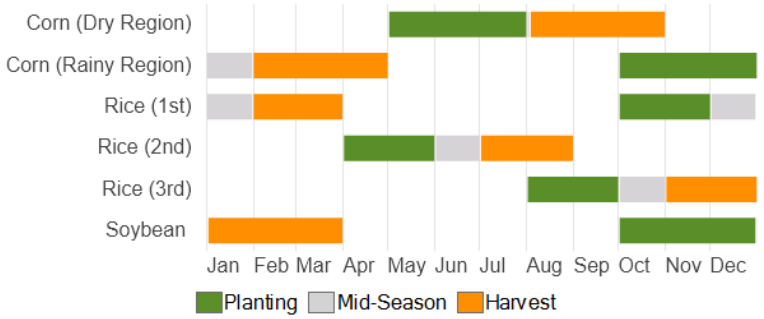


Corn/maize is grown to some degree in most regions; however it is most cultivated across Java and parts of Sumatra and Sulwaesi



Rice is also a perennial staple crop, but highest yields are found in Java and Sulawesi

Indonesia key crops calendar

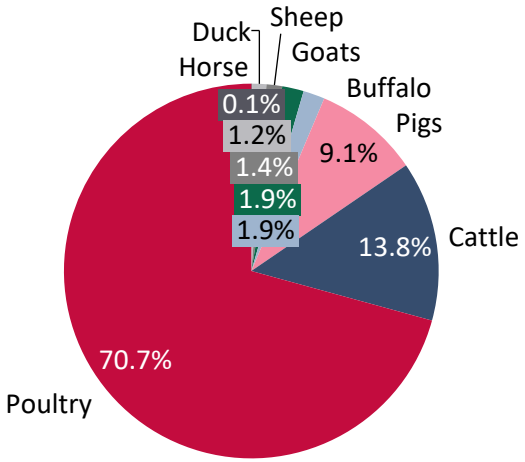


- Indonesia has a **relatively consistent agricultural climate;** there is no extreme change on temperature, with ranges between 23C to 33C in the lowlands and 15C to 27C in highland areas.
- Average rainfall in the country is about 2400 mm annually, but **there is wide diversity between the dry and wet regions**, recording rainfall between 1000 mm and 4500 mm annually.
- The **crop calendar for grains and horticulture varies significantly** across dry and wet regions; there are typically **three crop cycles for rice each year**

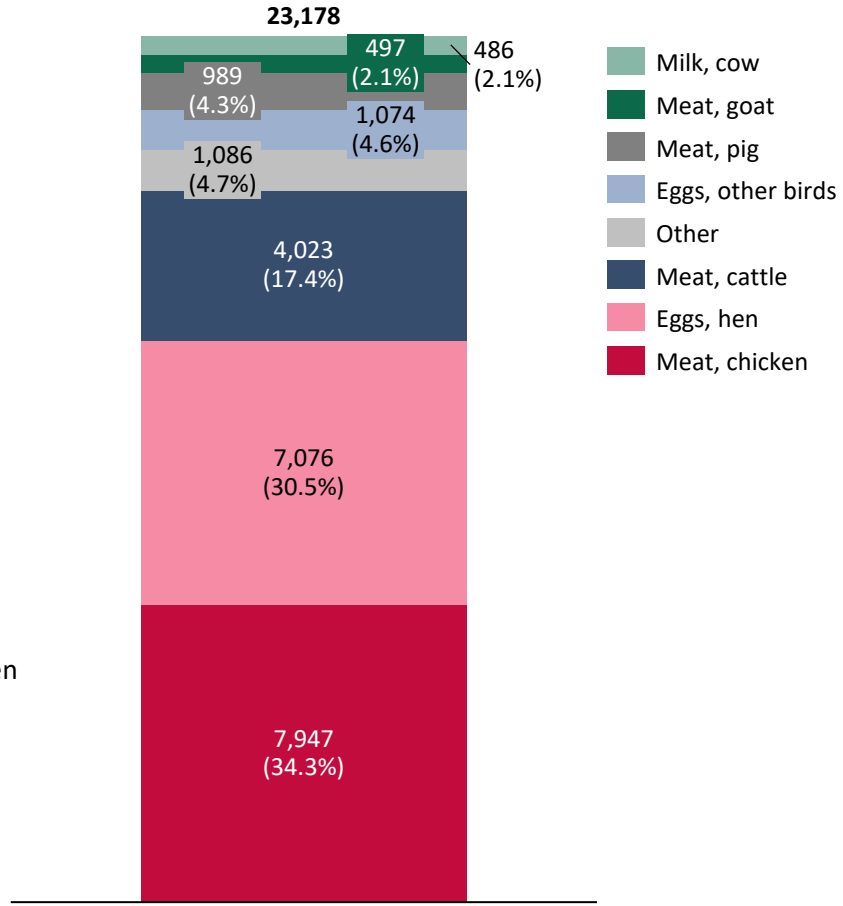
Source: United State Department of Agriculture, Foreign Agriculture Service (https://ipad.fas.usda.gov/rssiws/al/seasia_cropprod.aspx);

Livestock production is dominated by poultry and cattle, almost entirely for domestic market; per capita consumption is growing at 3%-5% per annum

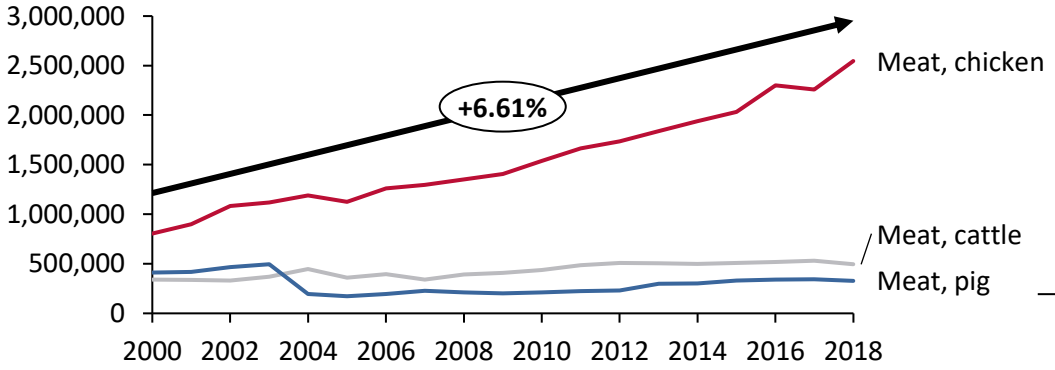
Top animals by production (2018), tonnes



Top livestock products by value (2018), USD millions



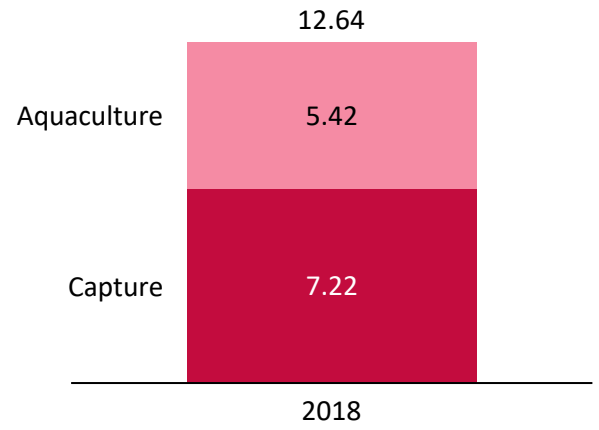
Indonesia meat production, 2000-2018 (000's MT)



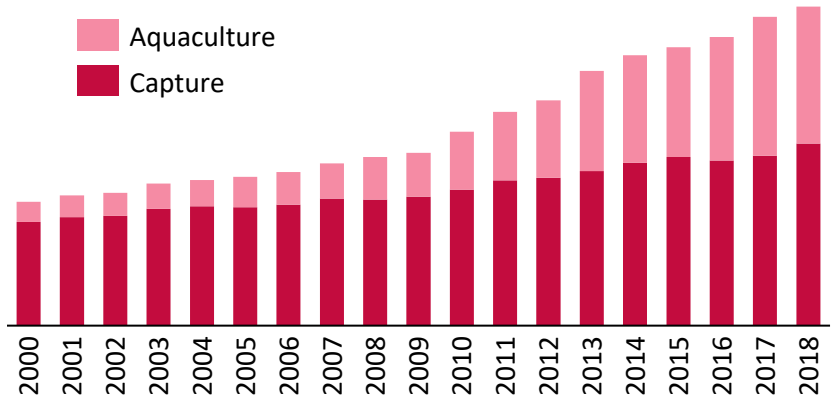
Sources: (1) FAOStat (2) https://repository.cips-indonesia.org/publications/271878/policy-reform-on-poultry-industry-in-indonesia

Indonesia is the 2nd largest fish producer in the world; aquaculture production (fish farms) has been growing at 11.3% year on-year

Fish production in Indonesia (2018), million tonnes



Fish production in Indonesia (2018), million tonnes



- Indonesia's fish industry is the **second largest in the world** (behind China), contributes approximately **3% of national GDP**, and has been **growing at 5%-8% year-on-year** for the past 8 years.
- At 95,181km, the country has **the world's second longest coastline**, and the interior has **more than 5,500 rivers and lakes**, providing vast marine potential
- Major species produced **are shrimp** (comprising more than 40% of fish exports)**, tuna** (Indonesia is top 5 producer globally of canned and processed tuna**,** and **seaweed** (where Indonesia is second largest producer globally behind China)
- Aquaculture has been **growing at a rapid 11.3% year-on-year** over the past two decades, and now **comprises more than 40% of total production**
- There are **more than 60,000 commercial fish processing plants** throughout Indonesia, with **75% located in Java and Sumatra**.

Source: (1) FAO FishStat (2) Government of Indonesia Ministry of Marine & Fisheries (3) Indonesia Investment Coordinating Board

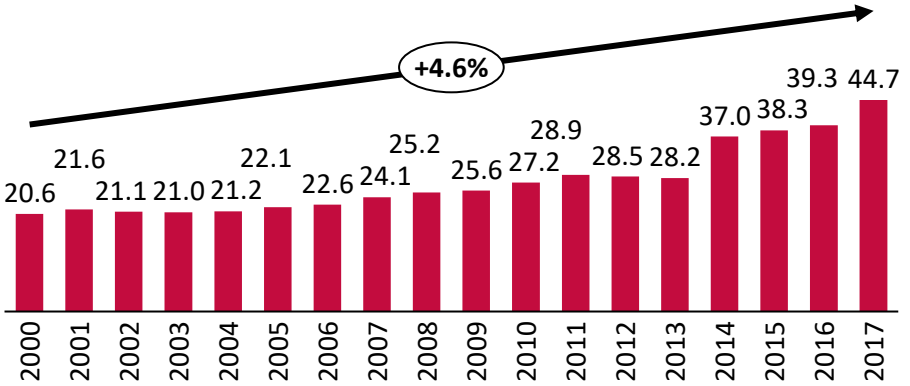
Production is expected to grow to 2030, driven by both domestic consumption (top 20 in the world) and export; sustainability is a concern

Projected fish production growth, 2018-2030

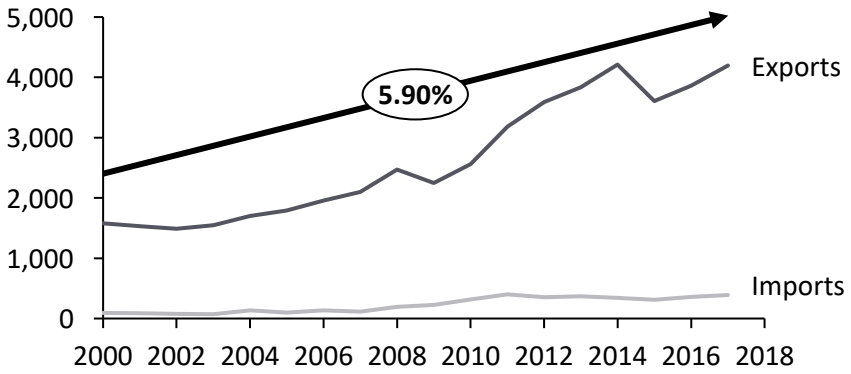
TABLE 17
PROJECTED FISH PRODUCTION, 2030 (live weight equivalent)

	Production			Of which aquaculture		
	2018	2030	Growth of 2030 vs 2018	2018	2030	Growth of 2030 vs 2018
	(1 000 tonnes)		(%)	(1 000 tonnes)		(%)
Asia	**122 404**	**145 850**	**19.2**	**72 820**	**96 350**	**32.3**
China	62 207	73 720	18.5	47 559	60 450	27.1
India	12 386	15 610	26.0	7 066	10 040	42.1
Indonesia	12 642	14 940	18.2	5 427	7 710	42.1
Japan	3 774	3 520	–6.7	643	740	15.1
Philippines	2 876	3 220	12.0	826	905	9.6
Republic of Korea	1 905	1 850	–2.9	568	605	6.4
Thailand	2 598	2 790	7.4	891	1 220	36.9
Viet Nam	7 481	9 590	28.2	4 134	6 020	45.6

Fish consumption per capita, kilograms per annum



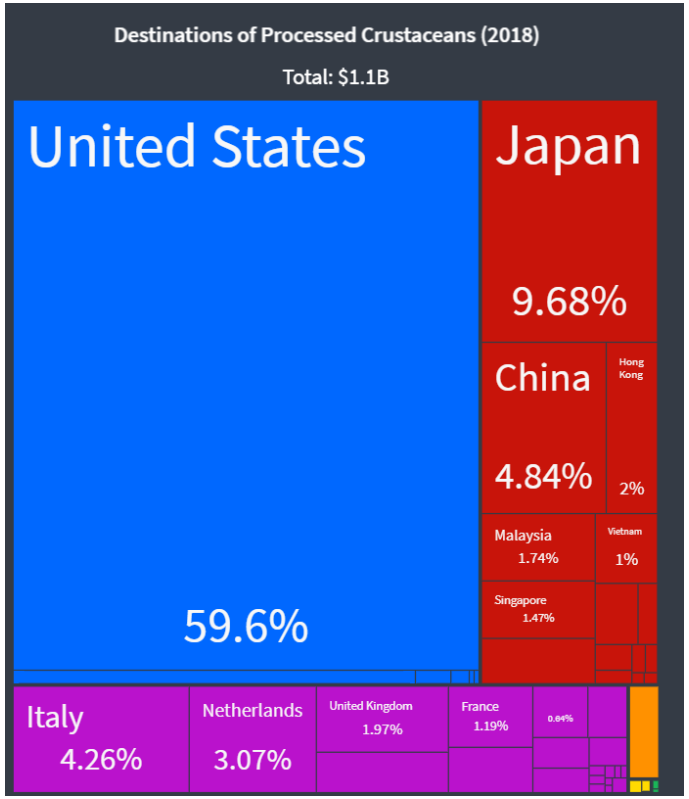
Fish imports and exports, 2000-2017 (millions, USD)

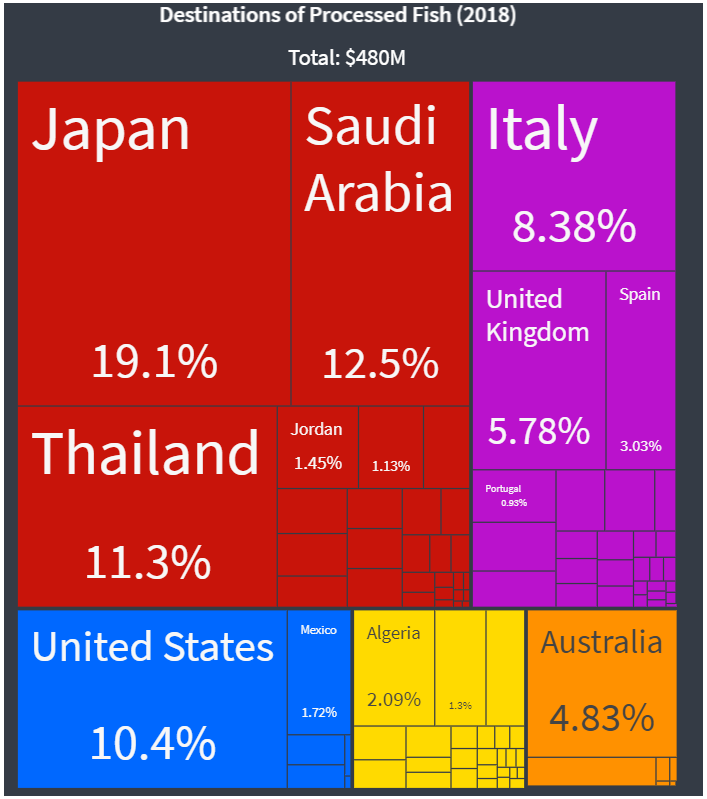


- Fish production is expected to continue growing, driven by both exports and domestic fish consumption. **Exports have been growing at 5.90% year-on-year** over the past two decades.
- Fish is a central part of the Indonesia diet and has become increasingly so with rising income levels and mass production making fish more available.
- Per capita consumption has been **growing at 4.6% year-on-year** over past two decades, and now stands at 44.7 kg per annum per capita, which **ranks in the top 20 in the world**.

Source: http://www.fao.org/fishery/statistics/global-consumption/en

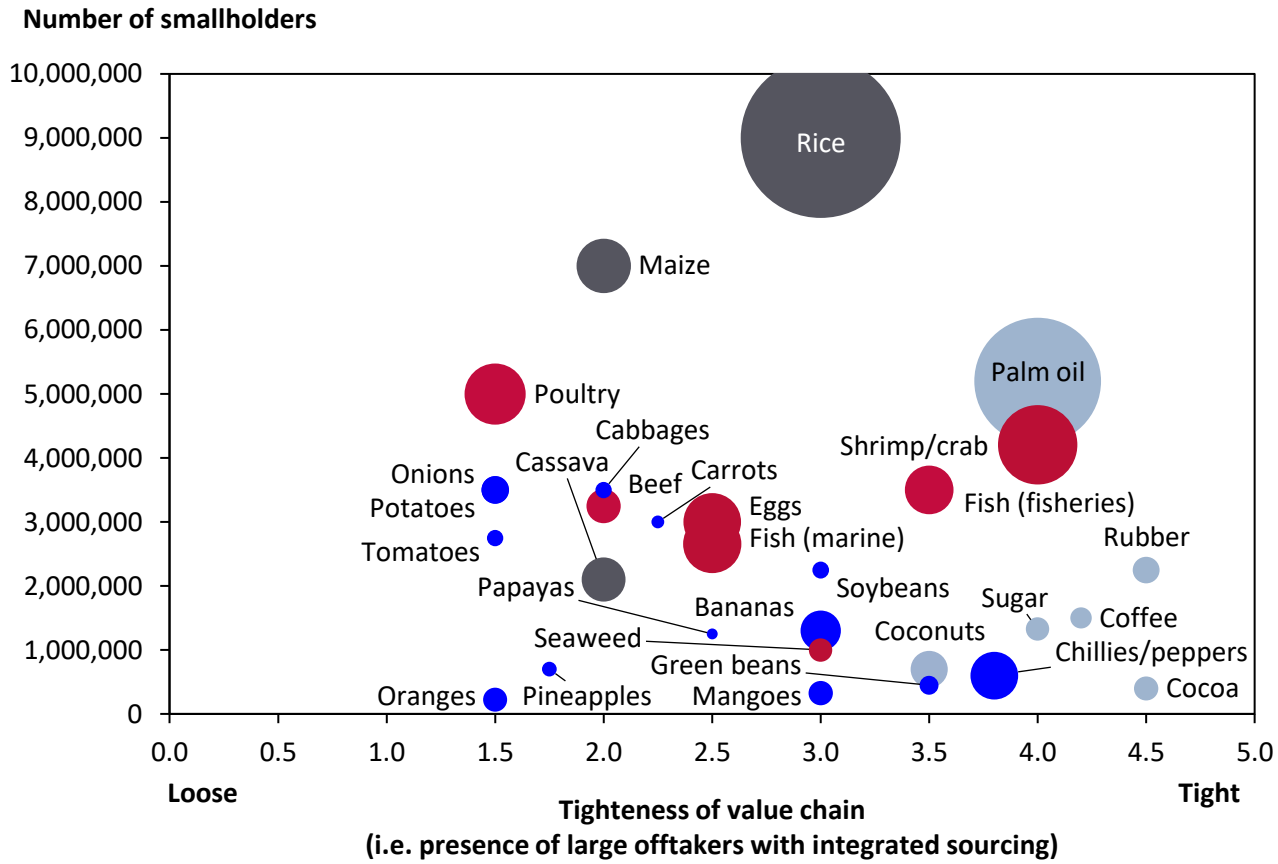
Fish exports are mainly to Asia and North America, with more than half of shrimp exports directed to the US, and majority of fish to Japan and Thailand





Source: https://oec.world/en/profile/country/idn

We mapped out the top c.20 value chains by production size, number of smallholder farmers, and tightness of value chain



Tightness of value chain:

- Determined by level of formal procurement in sector.
- Where there are large offtakers who enter into formal relations with farmers, a value chain is considered tightly structured.
- The presence of offtakers provides greater certainty and support to farmers, crowidng in input firms and finance providers.
- Some value chains (e.g. fish, poultry) have part of value chain which is highly structured (outgrower/contract relationships), yet majority of farmers are independent and unstructured.

Legend

Size of bubble represents 2018 production value (USD)

Cash crop

Staple crop

Livestock / fish

Horticulture

Sources: (1) Ministry of Agriculture statistics (2) FAOStat (3) Interviews (4) Value chain studies

The structure of these value chains has impact on smallholder farmers, and the viability of reaching them with digital services

	Importance to small farmers	Importance to food/economy	Tight / loose?	Key export?	Economic outlook
Palm oil		Very high	Very tight	Yes	**Strong** (steady output and exports)
Rice		Very high	Loose	No, but potential	**Medium** (import protections)
Maize		Very high	Loose	No	**Medium** (imports to fill deficit)
Coconut		Medium	Mixed	Yes	**Medium** (stagnant output)
Poultry / eggs		Very high	Loose	No	**Strong** (rapid increasing demand)
Fish		Very high	Mixed	Yes	**Strong** (surging exports)
Coffee		High	Tight	Yes	**Medium to low** (flagging exports)
Cocoa		High	Tight	Yes	**Medium** (stagnant output)
Rubber		High	Very tight	Yes	**Medium to strong** (steady gains)
Mangoes		Medium	Mixed	No, but potential	**Strong** (rising output, exports)
Pineapples		Medium	Mixed	Yes	**Medium** (flat output, exports)
Chilis /peppers		Medium	Mixed	Yes	**Strong** (tapping export potential)
Tomatoes		Medium	Loose	No	**Medium** (steady output)
Potatoes		Medium	Loose	No	**Medium** (steady output)
Cassava		Medium	Loose	No	**Low** (declining output, imports up)
Sugar		High	Tight	Yes	**Low** (low productivity)
Beef		Medium	Loose	No	**Medium** (increasing demand)
Bananas		High	Mixed	No, but potential	**Medium** (flat output)

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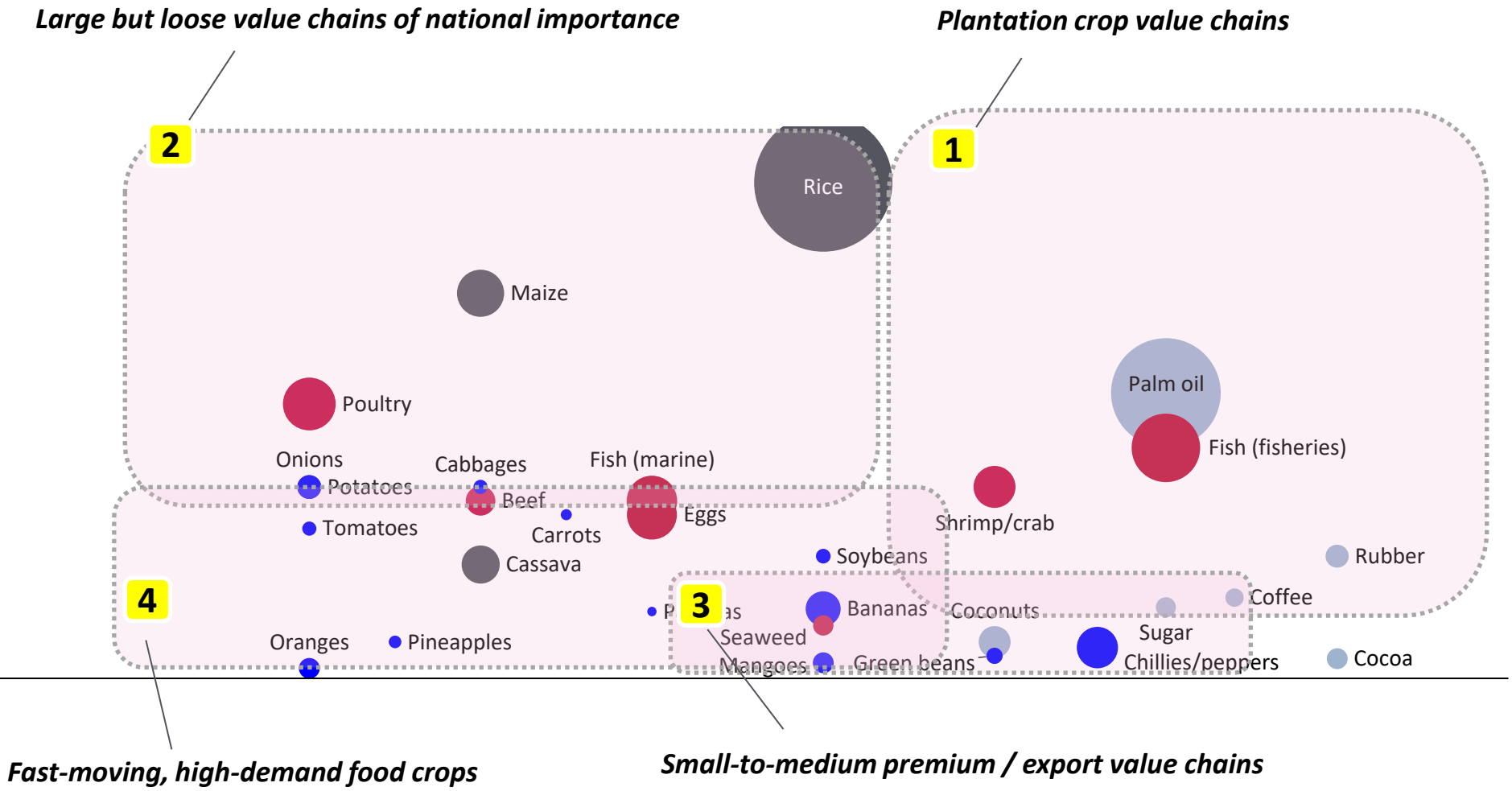
We identify four main types of value chains which are helpful for applying a digital agriculture lens



Sources: (1) Ministry of Agriculture statistics (2) FAOStat (3) Interviews (4) Value chain studies

We identify four main categories of value chains which present varying levels / types of opportunities for digital services and impact

	Summary	Prime examples	Viability for digital services?	Impact potential?
1. Plantation crop value chains	Value chains with finite set of large buyers/trading houses; farmers either work directly with buyers in schemes, or via traders	Palm oil, rubber, cocoa, coconut, coffee	***Easier to serve:*** *can partner with estates for market entry; more secure cashflows; more de-risked for FSPs*	***Medium:*** *Many farmers already served by offtakers/donors; have more stable livelihoods*
2. Large but loose value chains of national importance	Significant value chains in terms of size and important to food security for fast-growing population	Shrimp, fish, maize, rice, soybeans, poultry, eggs	***Harder to serve:*** *high costs of customer acquisition; volatile cashflows; higher perceived credit risk*	***High:*** *Many farmers are sub-commercial; play critical role for national food security*
3. Small-to-medium premium / export value chains	Higher-value crops with export potential and presence of premium offtakers	Chilies, mangos, avocados, green beans, garlic, spices, ginger, seaweed	***Easier to serve:*** *farmers are higher income, more commercial; can partner with premium offtakers*	***Low-to-medium:*** *Low-hanging fruit for intervention; farmers are more commercial, can invest*
4. Horticulture and staple crops (i.e. fast-moving, high demand)	Food crops which are grown across country in large volumes for domestic market	Rice, cassava, tomatoes, potatoes, onions, cabbages	***Mixed bag:*** *less formal value chain, but crops are prevalent so lowers transaction costs*	***Medium-to-high:*** *high variance in farmer profile; crops are critical for domestic consumption*

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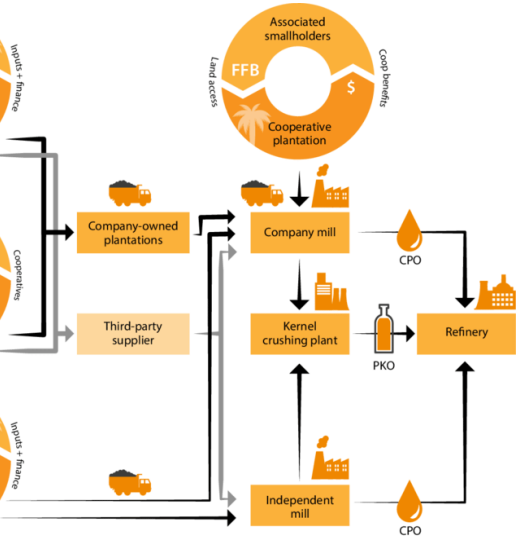
Palm oil: most of the large off-takers have smallholder initiatives; digital opportunity is around traceability and supply chain certification

Key players in value chain

- 53% of total palm oil cultivation (by land) is private estates, 7% state-owned estates, and 40% smallholders
- 3.3M workers employed in plantations, with 2.1M smallholder producers
- There are c.1,500 medium-to-large firms with plantations and mills (and 10 state-owned enterprises); the larger 50-100 firms also own refineries
- Top 15 firms comprise approximately 30% of all land under cultivation



Financing along the value chain

- For plasma/PIR farmers, palm oil companies extend credit through cooperatives and under KUR scheme
- For independent farmers, financing often available via traders and agri-kiosks
- Replanting finance available under GoI's Oil Palm Plantation Fund (BPDPKS)

Opportunity/need for digital innovations

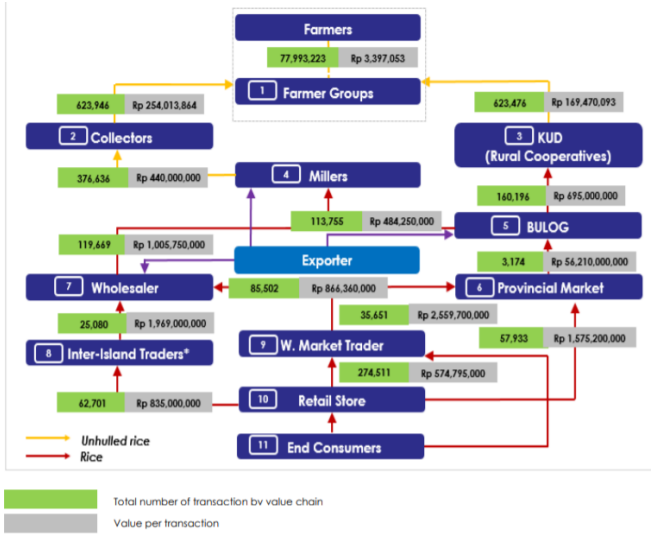
1. *B2B SaaS platforms for supply chain management/traceability*
2. *P2P/digital credit for inputs / longer-term financing for replanting*

Sources: (1) https://www.eco-business.com/news/palm-oil-the-pros-and-cons-of-a-controversial-commodity/(2) https://www.researchgate.net/figure/Simplified-palm-oil-value-chain-Authors-elaboration-taking-elements-from-Suharno-et_fig4_315477419 (3) Interviews

Rice: there are few out-grower schemes; govt fertilizer subsidies are common; digital solutions led by P2P lending and digital payments

Key players in value chain

- Largest value chain by number of farmers and in cultivation (9-10 million in commercial trade)
- BULOG, state procurement agency, is dominant buyer to regulate supply and price – more than half of all supply is traded via BULOG
- Vast network of local traders / collectors buy directly from farmers; rarely extend credit
- KUD / rural cooperatives play central role providing extension to farmers, and often access to credit



Financing along the value chain

- Offtaker landscape is very fragmented so limited financing via buyer-cooperative relationships
- Farmers may get credit from rural cooperatives, agri-kiosks, local traders / collectors
- Some financing under KUR program, but low volumes to smallholders

Opportunity for digital innovations

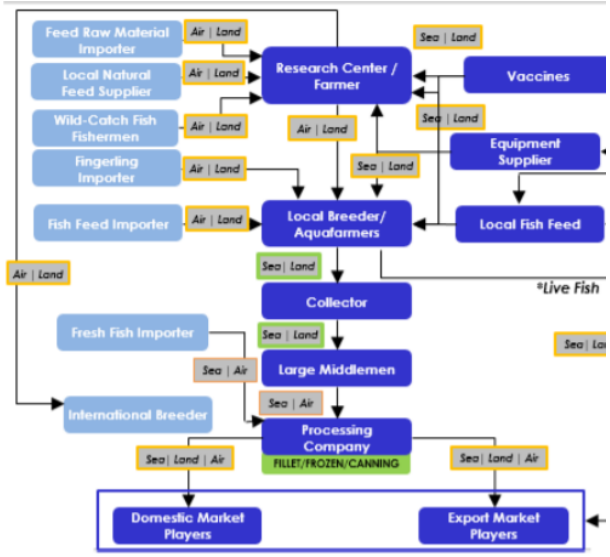
1. *Digital credit for inputs*
2. *Advisory services / agronomic best practices / pest control / seed technology*
3. *Crop / weather information*
4. *Digital bulk payments for harvest*
5. *Traceability*

Sources: (1) Indonesia Market Assessment for Agricultural Value-Chain Payments via Mobile Technology

Fish: mostly independent and contract fishermen with limited access to finance; innovation in smart devices, P2P lending, and e-commerce

Key players in value chain

- Highly fragmented industry
- More than 4 million capture and aquaculture fishermen in the country, and 800,000 fishing boats (mostly small-sized)
- 500-900 medium-to-large fisheries in the country; approximately 60,000 fish processing plants, with 2/3 being in Java and Sumatra
- Largest firms are top fisheries and exporters



Financing along the value chain

- Medium to large fishery operations can raise financing from formal FIs and under the KUR program
- Small-scale operators have limited access to finance for equipment, stock, fish feed
- Limited financing available from traders / collectors, given rapid sales cycle

Opportunity for digital innovations

1. *Digital credit / P2P investment for fish feed, fish stock, fish farm equipment*
2. *E-commerce*
3. *Data platform / traceability (for B2B clients with sustainability requirement)*

Sources: Ministry of Marine Affairs and Fisheries; FishStat

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Ministry of Agriculture
Republic of Indonesia

GoI's Agricultural Strategy 2020-24 is focused on food security, productivity, and mechanization; digital tech is seen as important, but not well-defined

Strategic targets

The key high-level strategic targets set out are:

1. **Achieving self-sufficiency on staple crops** like rice, corn, soybean, and increasing production of sugar and meat
2. **Increasing crop diversification**
3. **Increasing production of commodities with competitiveness for export market**, such as chilies/peppers, spices, garlic, herbs, etc.
4. **Supplying raw materials for bioindustry and bioenergy**
5. **Increasing income of smallholder farmer households**

Implementation priorities

1. Increasing **availability and use of land**
2. Increasing **agriculture infrastructures and tools,** such as irrigation, processing, storage equipment
3. **Developing and expanding seed logistics**, to ensure quality seeds are available to farmers where needed
4. **Strengthening farmer institutions**, such as farmer groups, unions, and cooperatives
5. **Developing and strengthening financing**, including credit for smallholders as well as value chain actors
6. Strengthening agriculture products market networks

Role of digital technology

- The National Agricultural Strategy references digital technology as being important to the sector, **but its role is left loosely defined; there is no specific e-agriculture strategy**
- The strategy acknowledges the **Industrial 4.0 Revolution** and how it will change the face of agriculture and nature of work
- The strategy sets out the following high-level policy areas to support digital transformation:
  - ✓ **Adoption of global technology** (Big Data, IoT, AI) to support one data (see Agricultural War Room on next slide)
  - ✓ Supporting the **use of Big Data analytics to increase development planning** precision, implementation performance, and supervision.
  - ✓ Supporting **formation of national data dashboard to support data-based policy making** and decision making with interoperability, standardized, and sharable mechanisms.
  - ✓ **Digitalization of information systems** and promotion and acceleration of export and investment permits
  - ✓ **Increasing digital training for farmers**, both in digital literacy and agronomic best practices

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The Government has several major digital / data initiatives for agriculture which are in early stages of being rolled out, and other "pilot" initiatives

	Initiative	Overview
Major initiatives	**Agriculture War Room (AWR)** 	• AWR is a strategic command centre for national agricultural development, established in the Ministry of Agriculture. It was launched in 2019 and is still being rolled out. • The idea is to establish a central repository of all agricultural data in the country, to inform development planning, unlock efficiencies, and improve productivity outcomes. • AWR will collect and analyse data such as rainfall intensity, wind movement, crop calendar, fertilizer allocation, cattle birth and slaughtering, crop yield, machinery monitoring, and flood risk metrics, to inputs into national policy and decision-making.
	Kostratani 	• Kostratani is a major new initiative of MoA, launched in 2019 in tandem with AWR, which sets out to transform the way data is collected and reported at sub-distract level. • The government plans to transform the existing network of Agricultural Extension Centers (BPPs), a network of c.26,000 public sector extension workers throughout the country under district government control, into Kostratani "spokes" at local level (reporting back AWR as "hub"). • World Bank and IFAD are providing funding towards Kostratani, in particular for procurement of ICT devices and technical assistance on digitalization process.
Other "pilot" initiatives	**Depo Tani**	• Collaboration between BNI Bank and HARA, with support from Ministry of Economy and Ministry of Agriculture. Its aim is to use Hara's digital data platform to digitize small loans extended to farmers and MSMEs under the KUR program. Initial focus in East Java.
	Telkom Rice Digitization Program	• GoI partnered with state-controlled Telkomsel to develop a digital platform which collects demographic and farm-level data to facilitate provision of subsidized input loans for seeds and fertilizers. The project extended to thousands of farmers across nine rice-producing regencies. Plans follow to further develop the platform to include a marketplace application.
	Smart Farming 4.0	• Ministry of Villages has partnered with MSMB to pilot Smart Farming 4.0 in several villages in East Java, a IoT / drone initiative developed around the concept of Agriculture 4.0 and using MSMB's RiTX product offering

Sources: (1) Interviews (2) Ministry of Agriculture website

Major donors in agriculture are focusing on smallholder farmers, extension, and credit; however, there are very few initiatives with a digital focus

Donors / funders	Overview of focus	Initiatives relevant to agriculture finance or digital agriculture	Specific digital focus?
JICA	• One of largest donors to Indonesia since 1980s; ODA to agriculture has focused on infrastructure development (e.g. irrigation), crop technology, agricultural policy	• **Indonesia and Japan Horticulture Project (IJHOP4:** smallholder loan program in partnership with BTPN and HARA. • **Cocoa export promotion and small farmer support** – financing of up to 56M USD to Olam International for strengthening value chain support to farmers and extending credit. Co-financed with IFC.	Yes, some
USAID FROM THE AMERICAN PEOPLE	• Major donor, but priorities are outside agriculture; most relevant focus is sustainability/deforestation	• **Seafood Import Monitoring Program (SIMP):** partnered with parastatal to implement a tuna traceability system, using the TraceTales database.	Yes, some
Royal Netherlands Embassy	• Long-term donor to Indonesia in agriculture; scaling back initiatives given shift in economic status	• **FDOV programme**: focused on expanding access to finance for smallholders in rice and dairy (closing this year); 4M EUR to support dairy cooperatives in Java • **SGDP facility:** supporting cocoa farmers in Sulawesi, Bali, Nusa Tenggara.	No
Australian Government Department of Foreign Affairs and Trade Australian AID	• Significant bilateral donor; flagship agriculture program PRISMA has farm-to-market focus	• **Australia-Indonesia Partnership for Promoting Rural Incomes through Support for Markets in Agriculture (PRISMA)**: smallholder livelihoods program; access to finance component; focused on Java, Papua, Nusa Tenggara.	No
ADB Asian Development Bank	• Major donor; 14 active agriculture projects in Indonesia	• **Leveraging ICT for Irrigated Agricultural Information**: strengthen use of ICT to improve delivery of extension and build capacity of extension workers.	Yes, some
IFAD Investing in rural people	• IFAD has programs on extension, financial literacy, linkages to credit providers; nothing specific in digital	• **IPDMIP:** Partner with MoA and Mercy Corps - focused on extension services, and financial literacy and linkages to FSPs • **READ-SI:** Partner with MoA; focus in Sulawesi on staple crops (rice, maize - subsidy packages as well as linkages to FSPs	No
PISAgro	• PISAgro is multi-stakeholder initiative comprised of large corporates and donors (AusAid, IFC, GiZ, SDC), focused on smallholder farmers	• **Partnership for Indonesia's Sustainable Agriculture (PISAgro):** has directly engaged 440,000 smallholders in different initiatives focused on finance, productivity, and markets • PISAgro has working group on Finance and ICT which has explored different ways to partner with banks to provide digital financial solutions	Yes, some

Sources: (1) Interviews (2) Donor websites

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There are particular challenges facing agriculture in Indonesia around infrastructure, farmer demographics, organization, climate & sustainability

Challenge	Summary	Opportunities for digital?
Topography makes communities hard to reach and lacking infrastructure in remote areas	• Indonesia has highly dispersed geography and much farming activity is located in remote areas. • Distribution and connectivity infrastructure (roads, warehousing, mobile towers, etc.) is weak in many rural parts of the country; this results in a long supply chain, with many middlemen playing a role and sharing thin margins across the chain.	*Supply chain management; transport & logistics matching; route optimization; e-commerce*
Farmer population is ageing and youth are moving to cities	• More than 60% of Indonesia's farmers are over 45 years and only 2.6% are under 25 years of age. • Older farmers are less likely to adopt modern farming practices; they are also less likely to adopt digital tools than younger farmers would be. This makes customer acquisition more burdensome and costlier.	*Recruitment of young farmers as early adopters/ ambassadors*
Farmer groups / cooperatives play are less formally structured than in other markets	• The government made a significant push in the 1980s to establish farmer groups throughout the country • While this was successful in providing a channel for extension services to farmers, for the most part it did not translate into a network of cooperatives which can provide finance, inputs, and buying power for farmers	*Aggregation tools; cooperative management platform; direct-to-farmer financing*
Indonesia's agricultural industry generates a lot of GHG emissions, and needs to be sustainable	• Indonesia is the largest global contributor of GHG emissions from land, emitting 240 to 440 million tons of CO2 annually from agriculture; driven by conversion of carbon-rich forests to plantations • In fish industry, the government is trying to combat illegal net-fishing and over-fishing of its coastal areas, which threatens to undermine major industry for its economy	*Precision agriculture; data platforms; tracking / surveillance tools*

Sources: (1) World Bank

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Trends and challenges which affect Indonesian agriculture

Some key trends or challenges and what opportunities they present for digital

	What is driving the trend?	Opportunities for digital?
Demand-side/regulatory pressure on buyers to trace supply chain	• Pressure from international community to develop inclusive and sustainable supply chains • Consumers starting to switch brands where corporates are not seen as sustainable • Government policies require supplier development	*Traceability/supply chain certification*
Government push/investment in irrigation and mechanization	• Top-down policy to promote use of modern technology to increase productivity • Increased public and private investment into irrigation and value-adding mechanization • Centrality of data to improve cost and efficiency	*Precision agriculture; smart irrigation/cold storage systems; IoT*
Import substitution policies to promote domestic production of key crops	• Stated government aim to enhance food security and increase productivity for staple crops • Increased availability of input subsidies for cultivation of these crops	*Focus on staple crops with digital credit, input purchase, education, e-commerce*
Investment in replanting of plantation crops	• Focus on replanting and supporting plasma and independent farmers to bridge the capex gap • Ongoing efforts of public and community extension workers to drive this agenda	*P2P credit for replanting*

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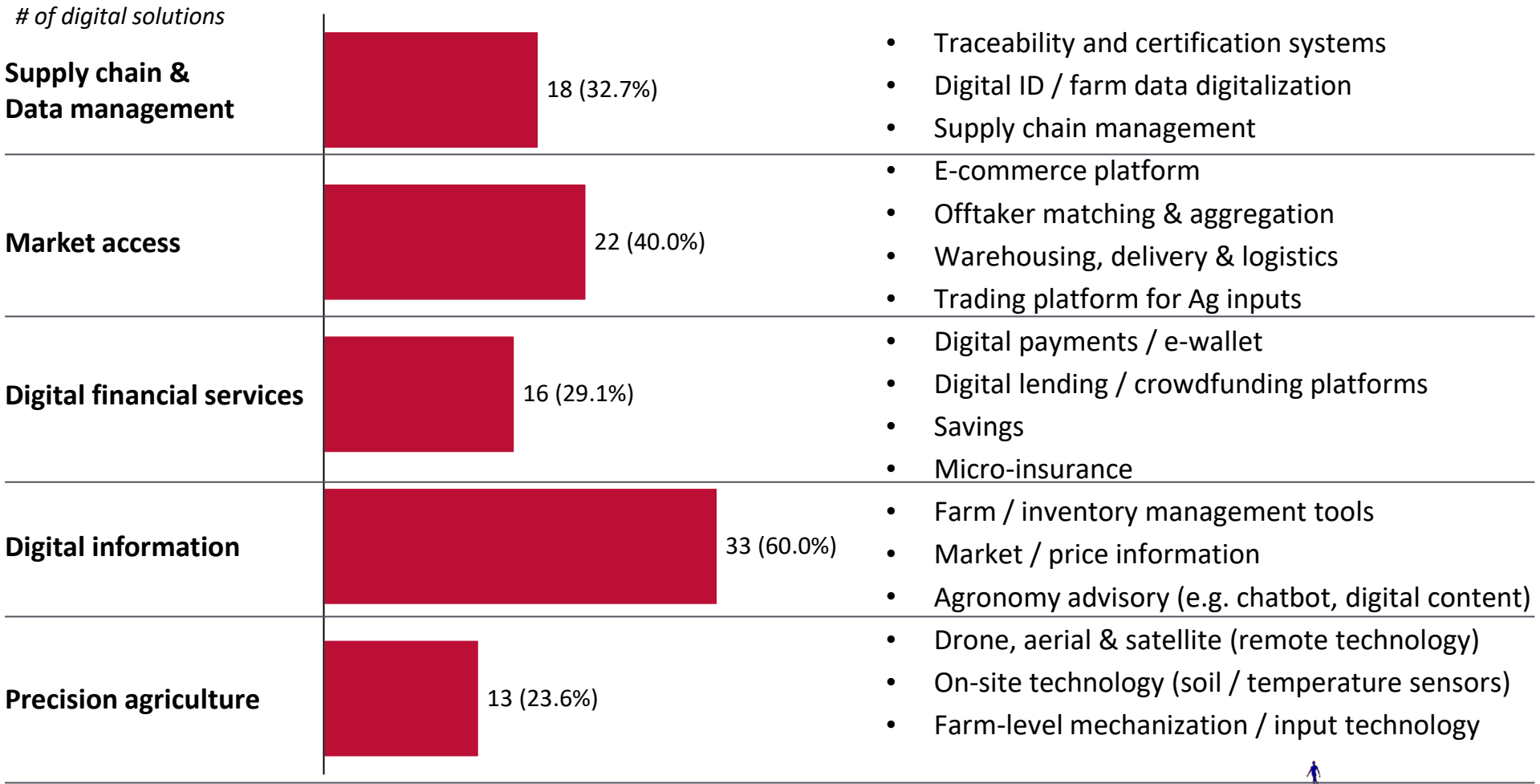
Report contents

Supply overview: Digital agriculture solutions cover 5 key areas; 60% players provide digital information services through their platforms

We identified 55 agriculture-specific digital solutions in Indonesia across 5 key areas:



Note: Sum of # of digital players across different solutions do not add up to total number of players reviewed, given many players provide several different types of services across different areas. Source: Analysis based on stakeholder interviews & company websites

Supply overview: Many prominent agriculture digital players provide a range of products & services across the 5 different areas

Company	Digital solution	Supply chain & data management	Market access	Digital Financial Services	Digital information services	Precision agriculture
HARA	Hara					
KOLTIVA	FarmCloud, FarmGate, FarmXtension, Farm Retail			*(new)*		
msmb	RiTx, LiTx, FiSTx					
TaniHub TaniFund	TaniHub, TaniSupply, TaniFund					
8villages	RegoPantes, LISA, DataHub, VLOGS					
CROWDE	Crowde					
iGrow	iGrow					
EdenFarm	Eden Farm					
eFishery	eFishery			*(planned)*		
EAST-WEST SEED	SIPINDO		*(provide inputs for seed production farmers only)*			

Primary activities

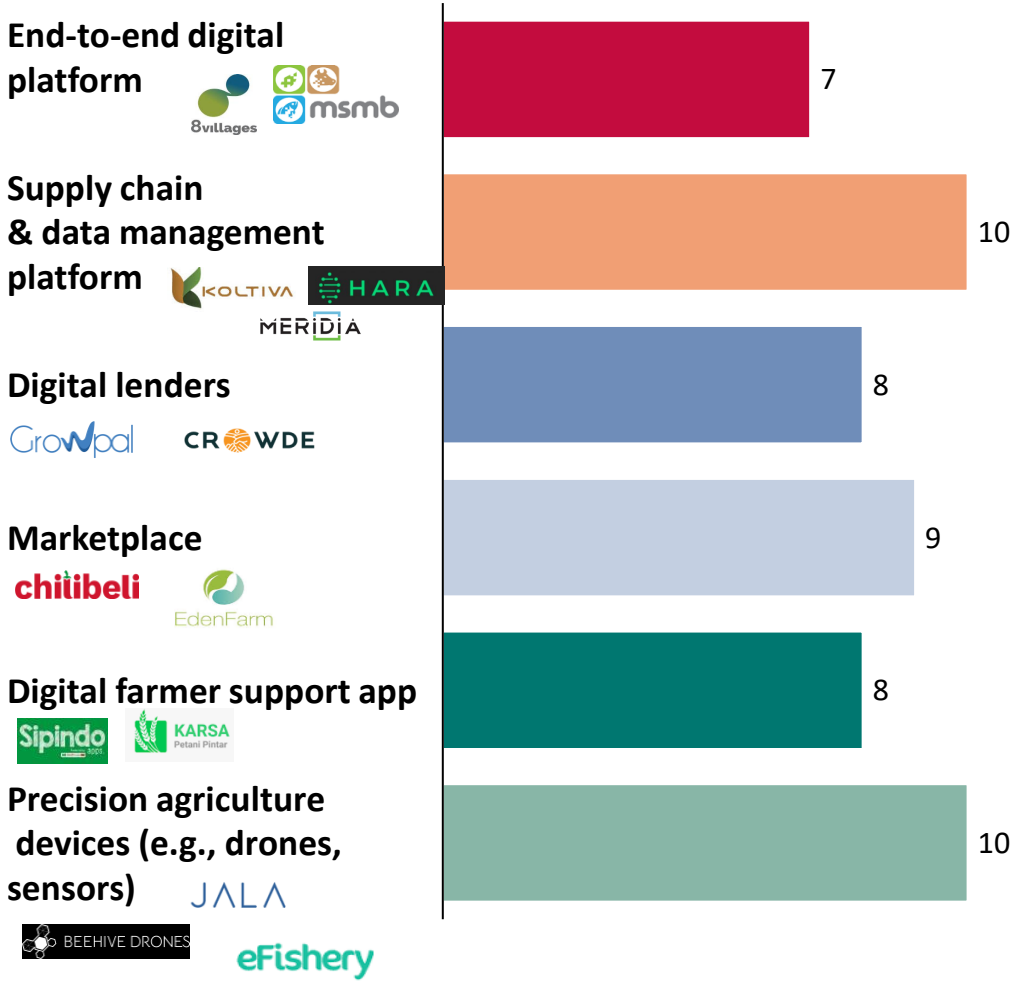
Secondary activities / facilitate access through partnership

Source: Analysis based on stakeholder interviews & company websites

Archetypes: We can classify players into 6 archetypes based on business model and their primary focus area

SHF digital service providers by Archetypes

# of digital solutions



Key findings:

- The 55 digital solutions have a **fairly equal spread** (7-10 companies) across each archetype
- Because many of the companies are still at early stages and have not yet achieved scale, there is some **competitive tension across key players** – few of them are open to partnering with one another
- We see potential in business models **that foster partnerships across key players** that focus on different sets of services, such as the data platform provided by HARA *(see case study in supply chain & data management section)*

Source: Analysis based on stakeholder interviews & company websites

Archetypes: Value chain is an important driver for type of digital solutions offered to SHFs

Archetypes / Value chain	Cash Crops	Food Crops	Horticulture	Livestock & dairy	Fisheries	No data[2]
End-to-end digital platform	0	5	3	2	2	0
Supply chain & data management platform	7	2	2	0	0	3
Digital lenders	0	2	3	2	4	0
Marketplace	1	1	6	2	5	1
Digital farmer support app	1	3	2	0	0	4
Precision Ag	1	1	2	1	3	5

Key takeaways:

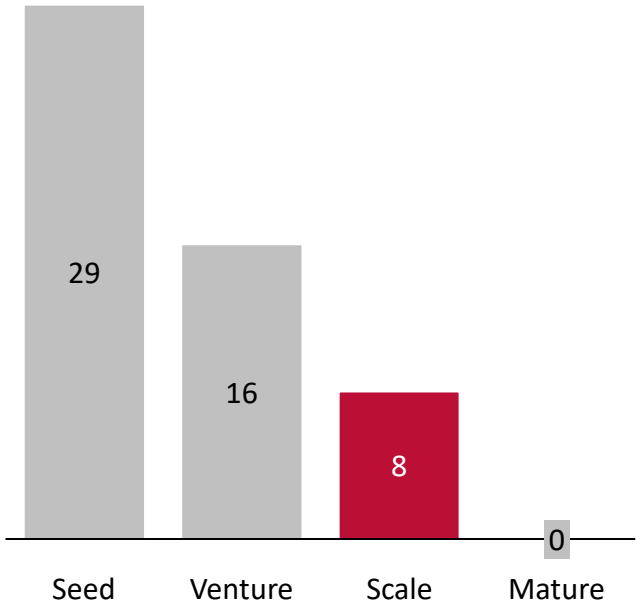
1. High number of **supply chain and data management platforms in cash/plantation crops** given requirement for **certification, traceability** and farmer information tracking requirements by large agribusinesses
2. Many **end-to-end service providers** operate across **food crops, horticulture & livestock** value chains together. Most start in food crops before expanding to others.
3. **Online marketplaces** are becoming increasingly popular for **horticultural & fisheries value chain** given increasing demand from consumers to purchase high quality / premium produce directly from farmers ("farm to table")[1]
4. Players that operate in the **fisheries value chain** tend to be **exclusively focused** on fisheries. There has been a rising trend of **P2P lending / crowdfunding platforms** in this space.

Note: 1) companies that solely provide grocery deliveries (no linkages to farmers), were ignored from this analysis. 2) No data on specific value chains for many digital farmer support apps & precision agriculture technology – either value chain agnostic or limited information available
Source: Analysis based on company website data & stakeholder interviews

Majority of solutions are still in the “seed” stage; more mature ones are in precision agriculture or supply chain management

Level of maturity of digital solution

# of digitals solutions



Note: This is based on traction rather than parent company stage. E.g., if a large agri corporate is providing a new digital solution (mobile app to farmers), and have only just pilot the solution, it will be considered as “seed” stage.

Example of “scale” level solutions

End-to-end platform

8villages

8 villages is an end-to-end agritech platform that provides: data collection by field services, education & communications with farmers, marketplace for produce, last mile delivery and procurement. They are planning to add IoT, payments and incentives, as well as credit to their platform.

Supply chain & data management platform

KOLTIVA

Koltiva provides a data collection tool to track traceability and supply chains, primarily for cash crops (e.g., coffee, palm oil, rubber). They also provide B2B ERP / CRM software, and recently launched a farmer-facing app that allows them to access information and inputs.

Precision Agriculture Devices

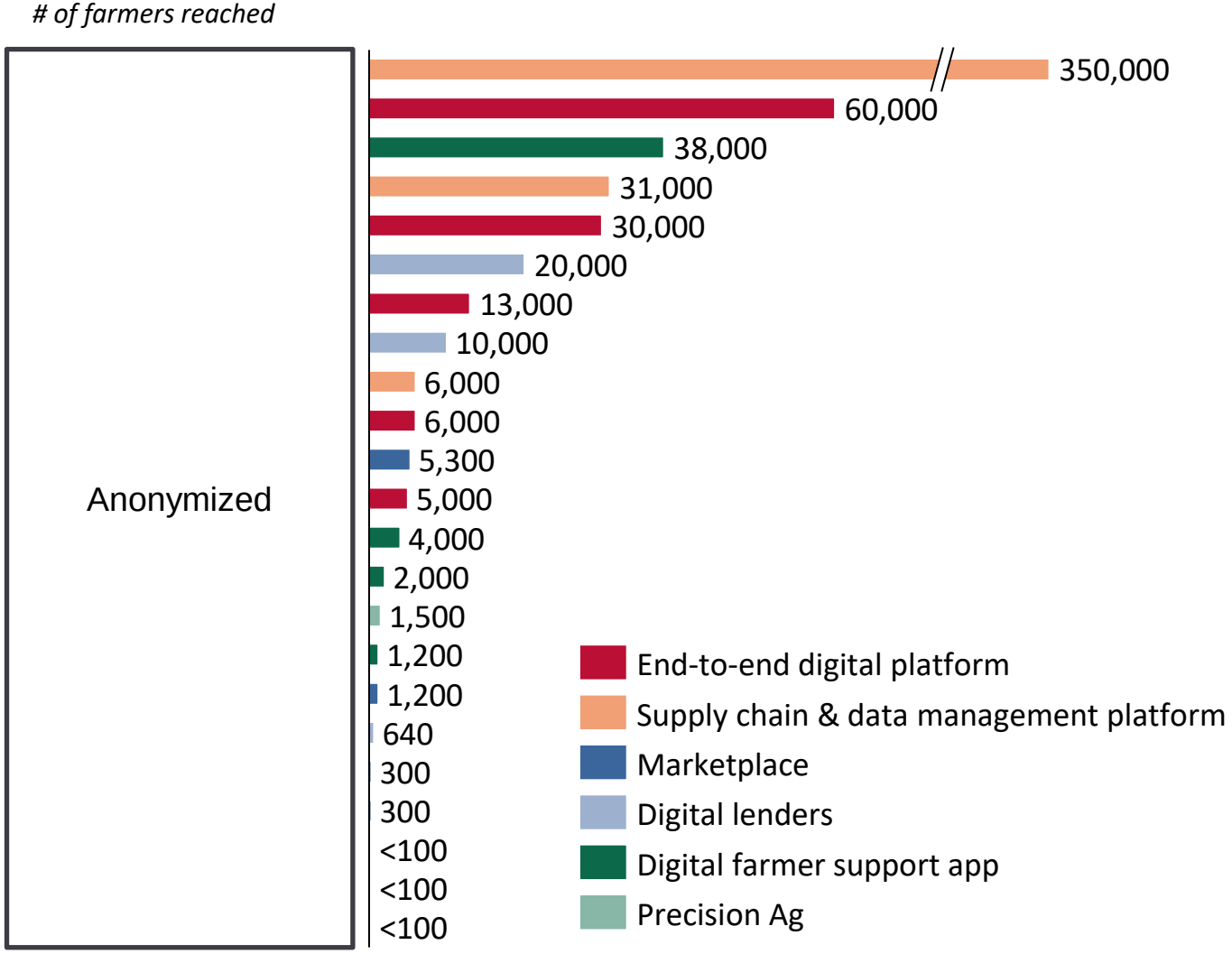
Poladrone

Poladrone is an all-in-one drone solutions provider for enterprises looking to modernise and streamline their operations workflow. Their solution provides efficient farm monitoring, disease prevention and harvest forecasting. It can also be used in industries outside of agriculture (e.g., construction, surveillance).

Source: Analysis based on stakeholder interviews, Tech Crunch, company websites

Many solutions are still in early stage with less than 10,000 users; supply chain, data & end-to-end platforms have acquired more users than others

Indicative scale of digital service providers (numbers estimated)



- Only a few digital solution providers have scaled beyond 10,000 users
- Consequently, **very few tech start-ups have broken even** – although majority are in "seed" or "early venture" stage, hence still too early to assess profitability
- Supply chain, data management and end-to-end platforms *(red and pink in graph)* have higher number of users, one reason being a longer operating history compared to other digital solutions

Note: Dataset based on available data only.
Source: stakeholder interviews and company websites

Getting the balance between tech and human resource right is key for scaling successfully

Agtech companies often require a high-touch model with farmers / community leaders, typically facilitated through field agents.

This is due to:

1. **Low level of digital access and literacy of farmers** (requires significant "hand-holding" by field agents to onboard user)

2. **Importance of relationship building** (to facilitate trust and support with farmers)

3. **Requirement for monitoring and data validation** (for traceability and certifications)

Example field agent roles:

- Data collection (e.g., farm surveys)
- Monitoring and validation of farming information & activities
- Providing agronomy / information support
- Facilitating loan application
- Assist farmer with digital apps

Key interview findings

HARA

Employs a **decentralized data collection model - field agents are not employees,** but part-timers who are incentivized by issue of **blockchain tokens** which they can redeem (calls agents "agri-preneurs")

mapan [1]

Income has to be **meaningful the agent. Employ female agents** who did not have formal jobs, who were more incentivized to generate income through agent services

TaniHub TaniFund

Partnership with university that works with farmers, who then become "agents" of Tanihub to recruit farmers

MERIDIA

Make use of a **combination of satellite / macro data as well as farm-level data,** collected door-to-door via agents, who they always **hire locally from communties**

Note: MAPAN is a company that provides Microfinance / group saving "Arisan" for small shops, not really operating in agriculture sector

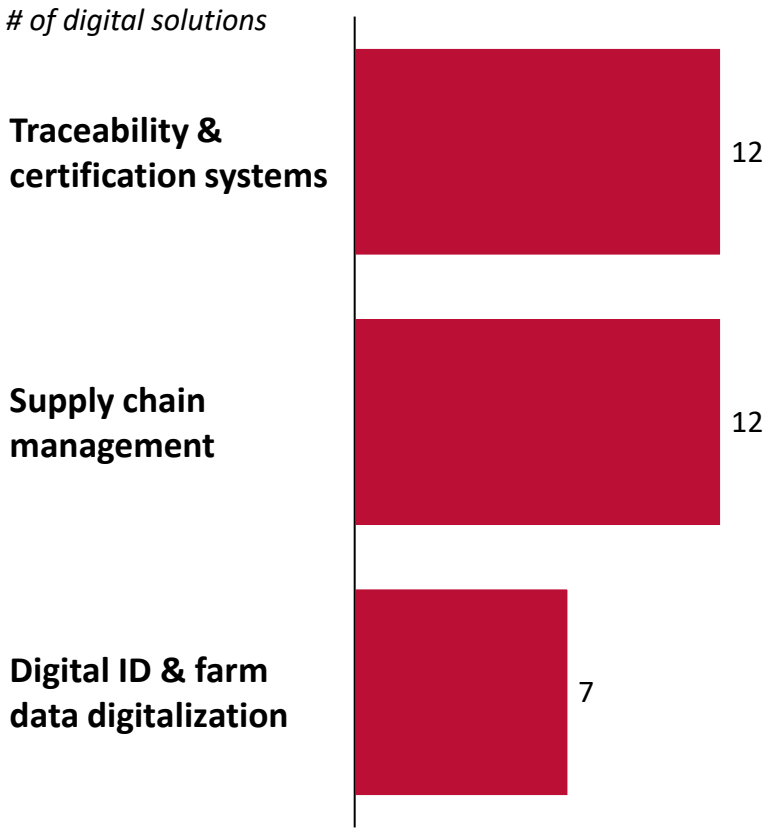
Players have to choose between different business models in order to grow, but they all come with a set of challenges

Business model	"Stand alone" product / service expansion	Partnership model	Do-it-all model
Description	Provision of standalone single service (e.g., precision ag providers solely focused on providing devices to farmers)	Specific projects or platforms that enable collaboration across multiple parties (e.g., POWER program partnership between Mercy Corps, ACA Asuransi, BPR Subang and Nufarm)	Closed-loop system where almost all services are provided by one service provider (e.g., 8 villages providing credit, sourcing, aggregation, e-commerce services to farmers)
Challenges	• Often find that due **to existing gaps in the market,** service providers themselves need to **extend their services to other areas** to get business model to work, e.g.,: • Lack of data on farmers (digital lenders need to have monitoring / support services) • Quality of produce low (marketplaces need to provide information / training)	• Requires **high degree of collaboration and alignment of incentives** between development and commercial stakeholders (ACA Asuransi & Syngenta Foundation weather index insurance case) – therefore limited examples in Indonesia compared to other countries • Hard to determine commitment of field agent resources from different players	• **Agents need to be trained across different types of products and services** (if done well, can more efficiently make use of field resources) • Very difficult to "do everything at once" and do it well • Difficult to scale • Require deep understanding and relationships across stakeholders in value chain

* Note: apart from lending where regulation requires outsourcing

Key product / service areas: 1) Supply chain & data management

# of digital solutions providing service / product



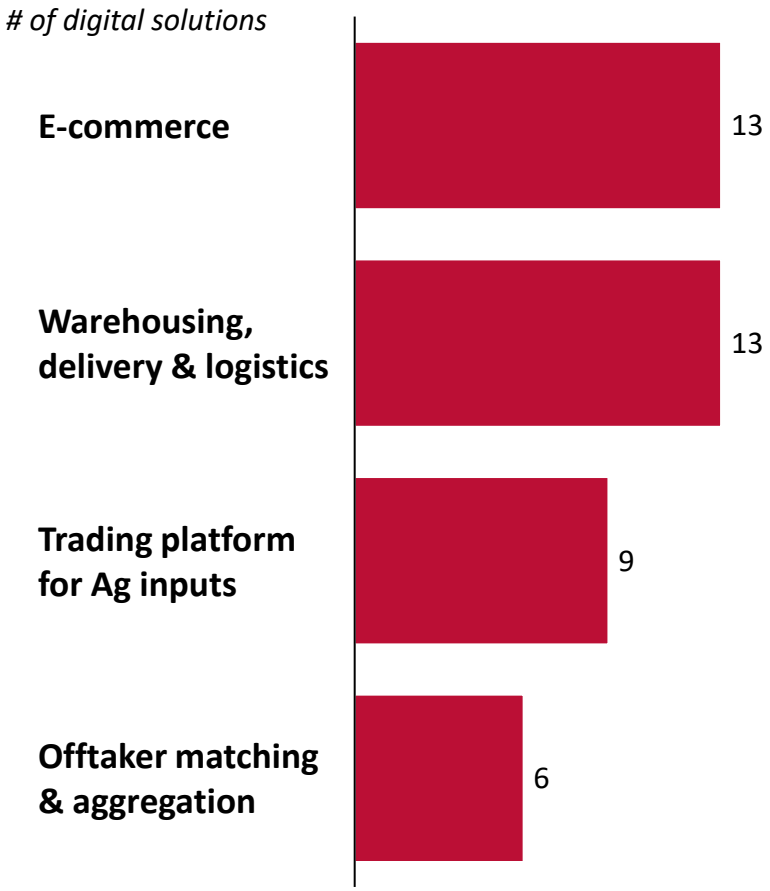
Key learnings

- Most supply chain and data management platforms operate in **cash-crop value chains**, where the value chain is much more structured
- Large corporates commission data collection for the purpose of managing farmers and to **verify traceability and certification requirements**
- **A large number of field agents are mobilized** with digital apps to collect data directly on the farm
- **Farmer data is becoming increasingly valuable** in the context of providing digital services (e.g., for forecasting input demand, pricing insurance products, screening for credit)
- This type of tool is **largely lacking in other value chains** that are less structured and do not command premiums due to certification/ traceability

Source: Digital solutions database analysis & stakeholder interviews

Key product / service areas: 2) Market access

# of digital solutions providing service / product



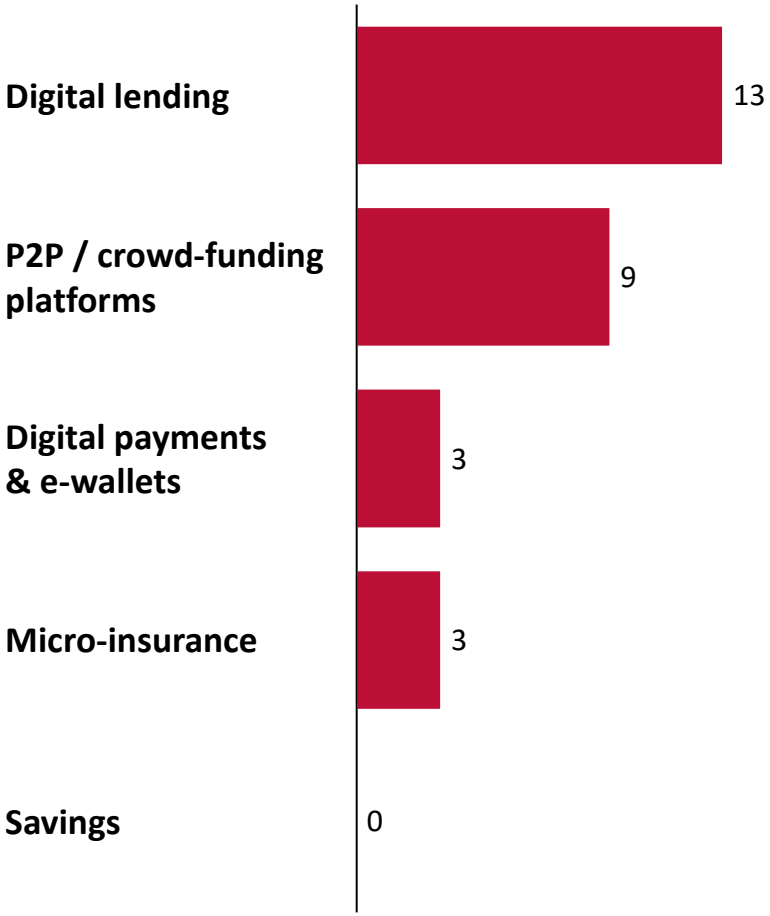
Key learnings

- Due to low development of infrastructure across agricultural areas, many e-commerce companies have to **combine their marketplace services with warehousing, delivery & logistics services**
- Marketplace solutions exist mostly where **there is low post-harvest processing requirements** – e.g., fruits, vegetables, fish
- While agricultural marketplaces claim to provide "direct access" to farmers, many struggle to do so due to the **strength of the first-layer of middlemen that buys from farmers**. At least some proportion of their produce are sourced from these middlemen to meet demand of the marketplace customers
- **B2C platforms are much more common** / established that B2B platforms (selling to restaurants/ hotels).
- Most solutions also primarily focus on urban / metropolitan areas. *(Note: we have excluded a number of pure-play "grocery delivery services" that were not active in the supply chain / reaching farmers, but simply providing a platform for customers to order groceries)*

Source: Digital solutions database analysis & stakeholder interviews

Key product / service areas: 3) Digital Financial Services

# of digital solutions providing service / product



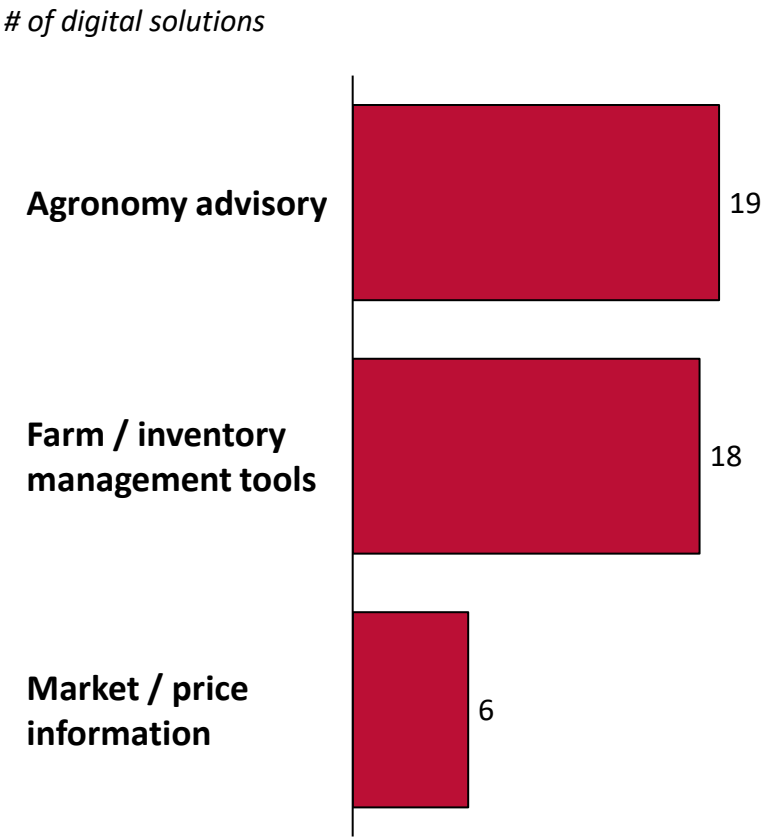
Source: Digital solutions database analysis & stakeholder interviews

Key learnings

- **P2P and crowdfunding regulatory frameworks** have spurred interest in a number of start-ups to provide alternative financing platforms for farmers
- All "digital lenders" (whose primary business model is to provide credit to farmers) operate using this (P2P/crowdfunding) model. **The other four simply facilitate loan origination for banks** (as they do not have a lending license).
- Most lenders end up having to **provide other services** (e.g., off-taker matching / aggregation, farmer information services) alongside lending, which **makes credit rather expensive**
- E-wallet use by farmers is very low due to primarily cash-based transaction. Digital payments are at very early stage and slow to adopt
- Micro-insurance is available typically via big established insurance companies (e.g., ACA Asuransi), and few providers offer digital services for micro-insurance.
- **Weather-indexed insurance, specifically, lack reliable, localized data for underwriting to be done accurately** – this leads to farmers receiving pay-outs even if their harvest goes well, and vice versa.
- There are virtually **no digital saving products** offered to farmers.

Key product / service areas: 4) Digital Information Services

# of digital solutions providing service / product



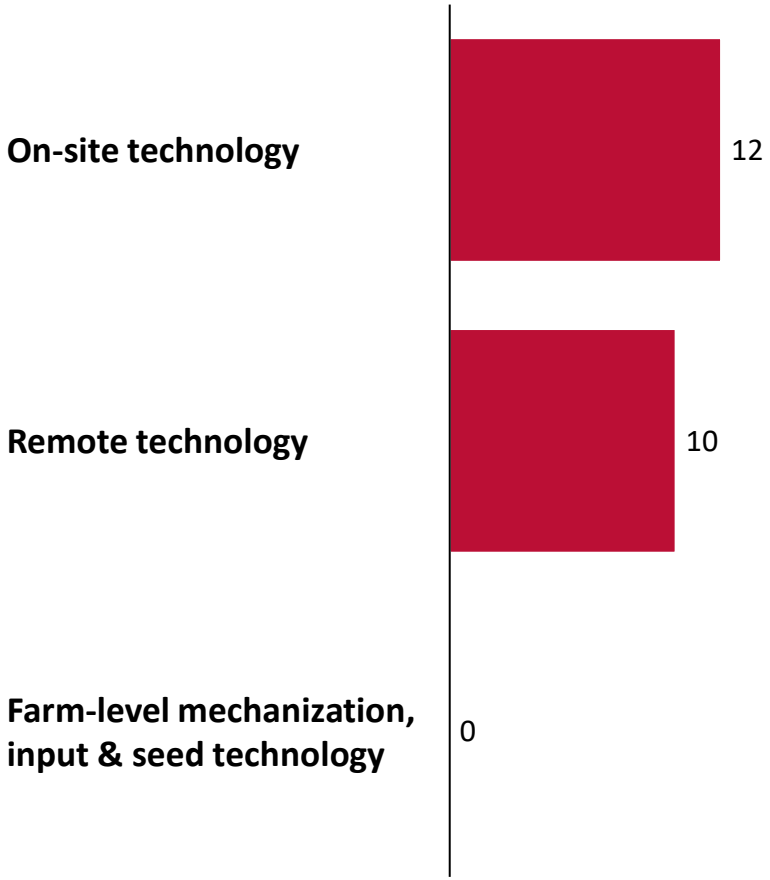
Key learnings

- A large number of Agtech players provide information services to supplement their existing solutions – these primarily sit across agronomy advisory and farm inventory & management
- Information around **market & prices are lacking** – particularly in less structured value chain. This information is shared informally (e.g., using whatsapp) amongst farmers.
- Many stakeholder interviewees suggest **transparency on pricing data could support farmers in making better trading** / selling decisions
- Information provision requires supplement of "**in-person training" –** to help farmers with troubleshooting issues, and making use of the information that is provided
- Pilot programs that incorporate **whatsapp chatbots** are more friendly for farmers and are likely to spur better initial adoption

Source: Digital solutions database analysis & stakeholder interviews

Key product / service areas: 5) Precision Agriculture Devices

# of digital solutions providing service / product



Key learnings

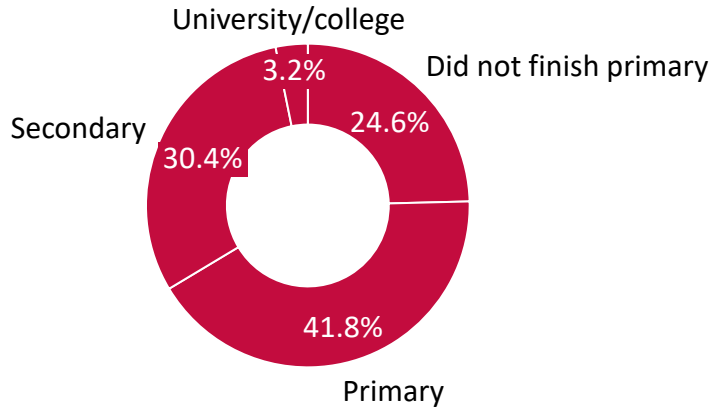
- Two of the common use cases that we have observed:
  (i) **Fisheries-specific precision tech devices** (e.g., water temperature, automated feed machinery)
  (ii) **Drones for crop management** (e.g., for spraying fertilizer, pictures for detecting harvest / diseases)
- These devices are generally **quite expensive** and are not affordable for SHFs – SHFs still face barriers to invest in cheaper technology such as better inputs and basic mechanization
- Precision Ag devices are primarily sold to **larger farmers or off-takers / buyers** that work with a large number of SHFs. In the latter situation, SHFs benefit from being able to use the drone "outputs" (e.g., data) indirectly through their relationship with the offtakers
- There is an emergence of **rental business models – "Precision agriculture-as-a-Service"** whereby service providers retain ownership of the hardware devices and make available the information those devices are generating alongside actionable data analytics
- **Mechanization solutions are available but not yet digitized**. Due to **low mobile wallet penetration** amongst farmers, models such as Pay As You Go irrigation have not yet emerged in Indonesia.

Source: Digital solutions database analysis & stakeholder interviews

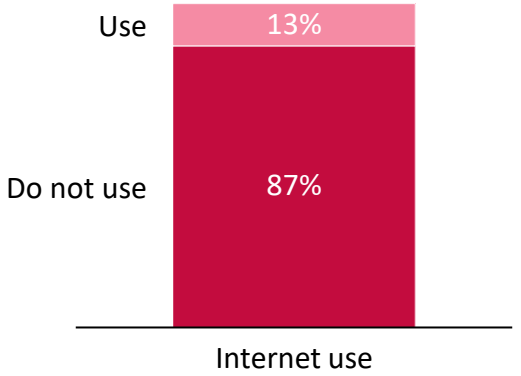
Report contents

The majority of farmers in Indonesia: (i) did not advance beyond primary school (ii) are over 45 (iii) do not use the internet and (iv) farm less than 0.5 hectares

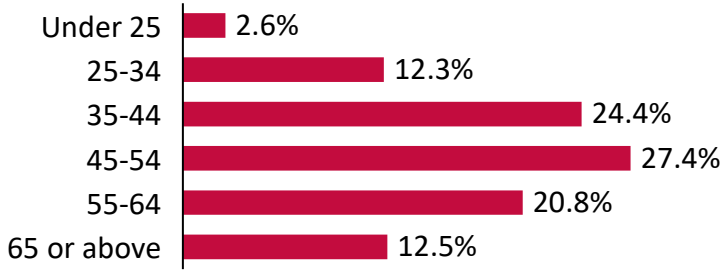
Level of education attained of farmers, % (2014)



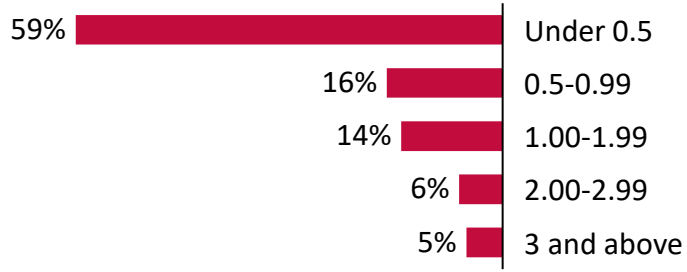
Usage of internet by farmers, % (2014)



Farmers by age bracket, % (2014)



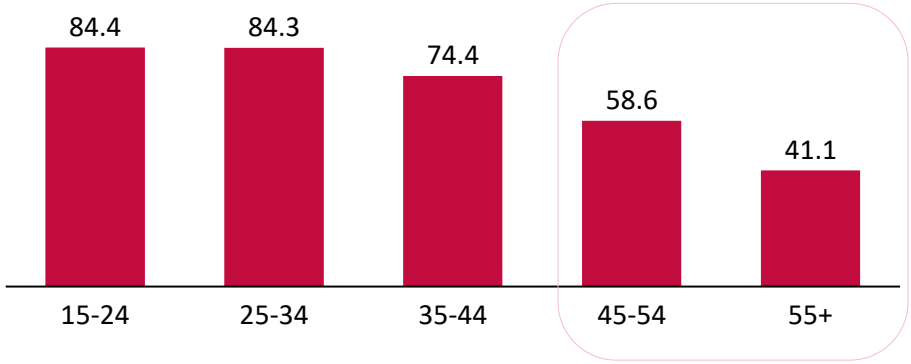
Size of land holding, % (2014)



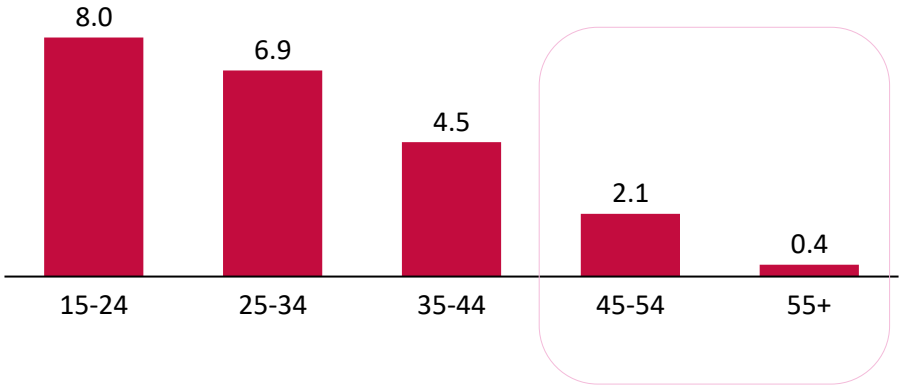
Source: National Agriculture Census, 2014

Give these demographics, it is inherently challenging to reach farmers through digital channels; young farmers should be targeted as "early adopters"

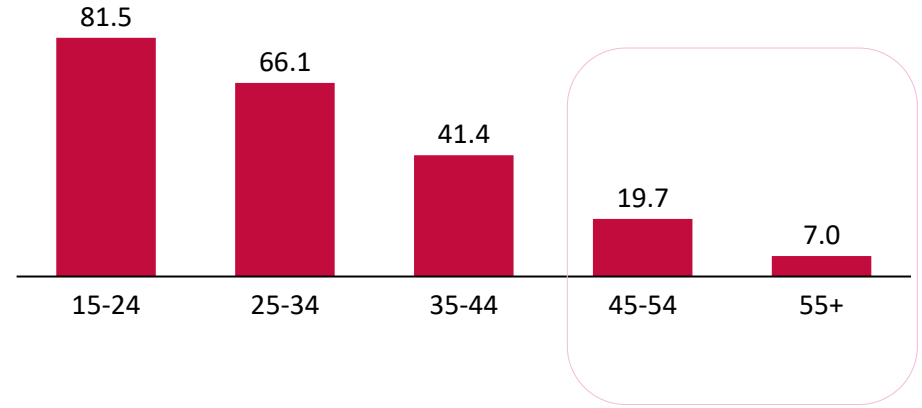
Mobile phone ownership by demographic group, 2018 (%, adults)



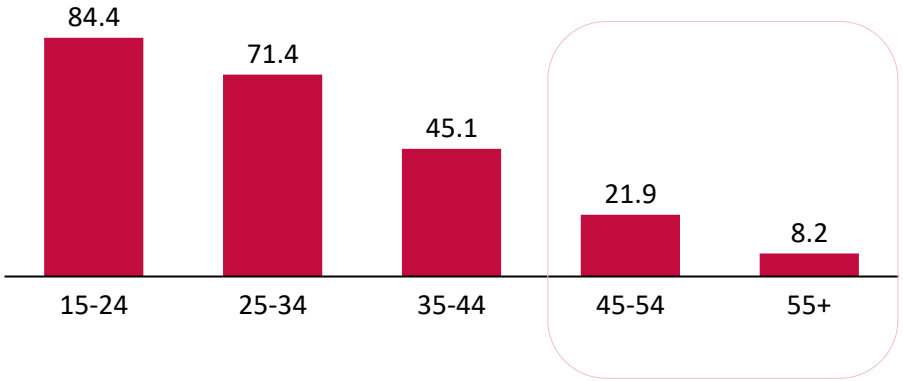
Mobile e-money users by demographic group, 2018 (%, adults)



Ever downloaded an application, 2018 (%, adults)



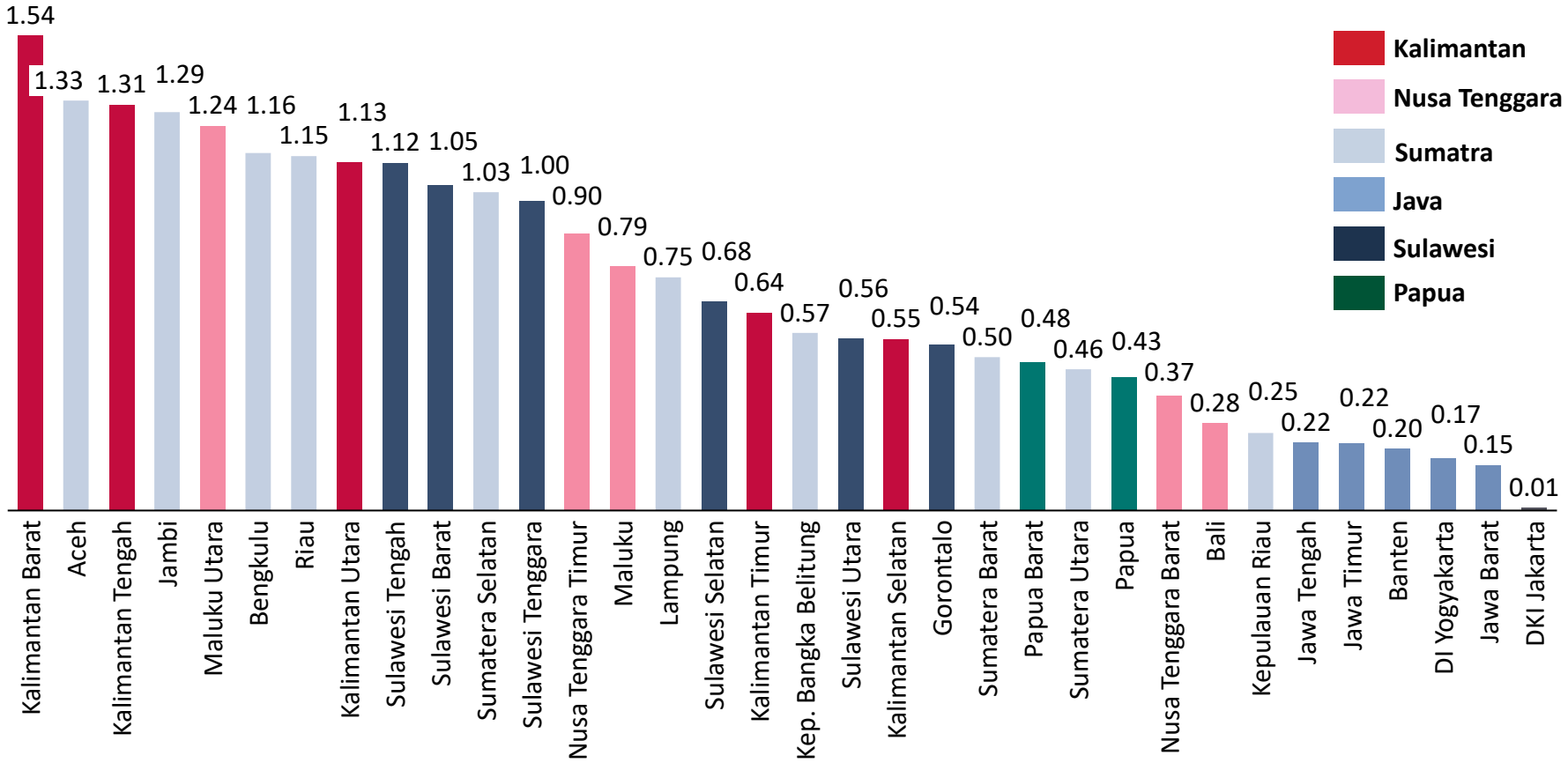
Ever searched the internet, 2018 (%, adults)



Sources: *Financial Inclusion Insights Indonesia, 2018,* National Financial Inclusion Secretariat

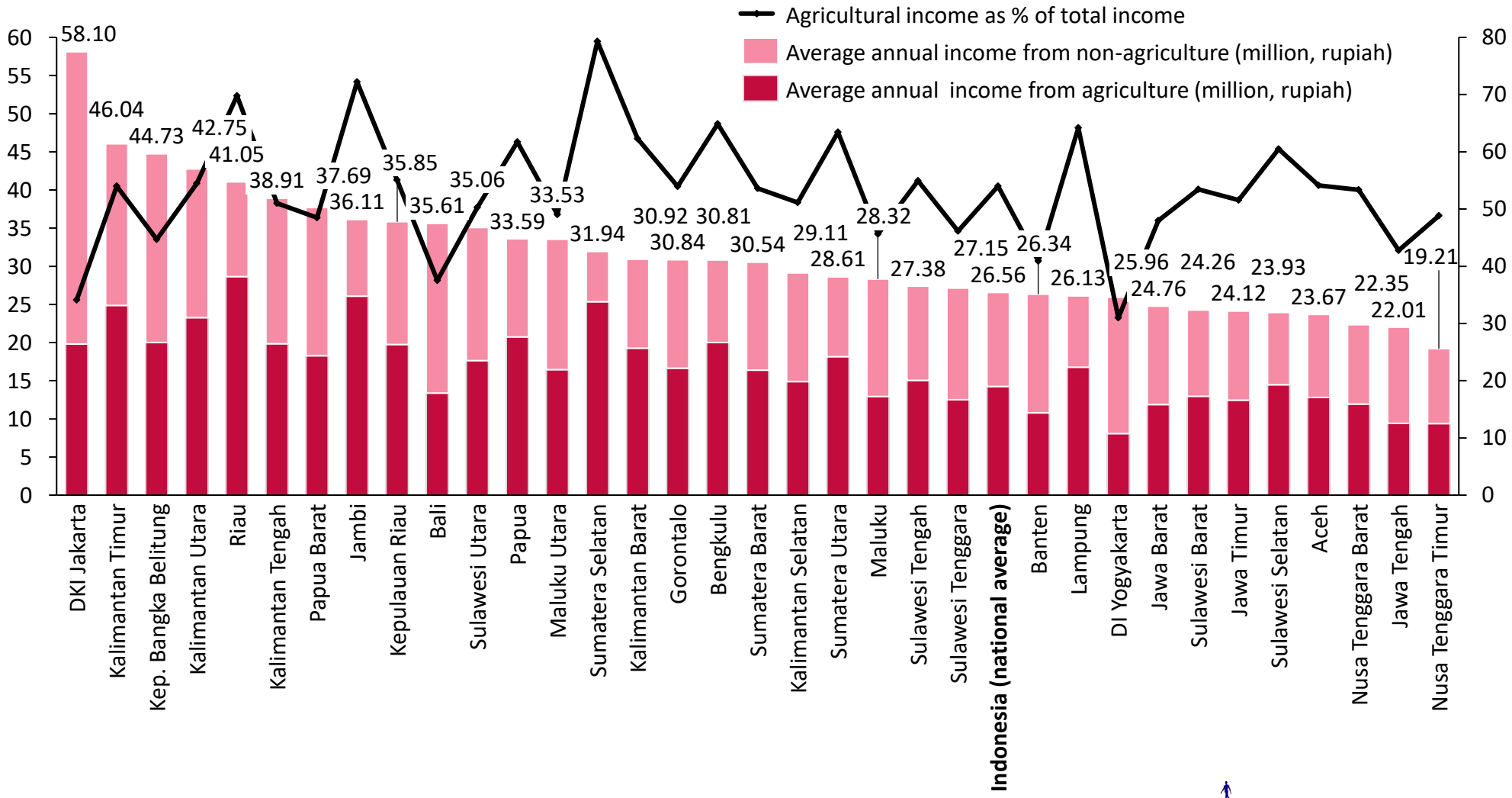
Landholding size varies dramatically across regions, from Kalimantan and Sumatra where averages are above 1 hectare, to Java where below 0.25

Average farm landholding by province, hectares (2018)



Source: National Agriculture Census, 2014

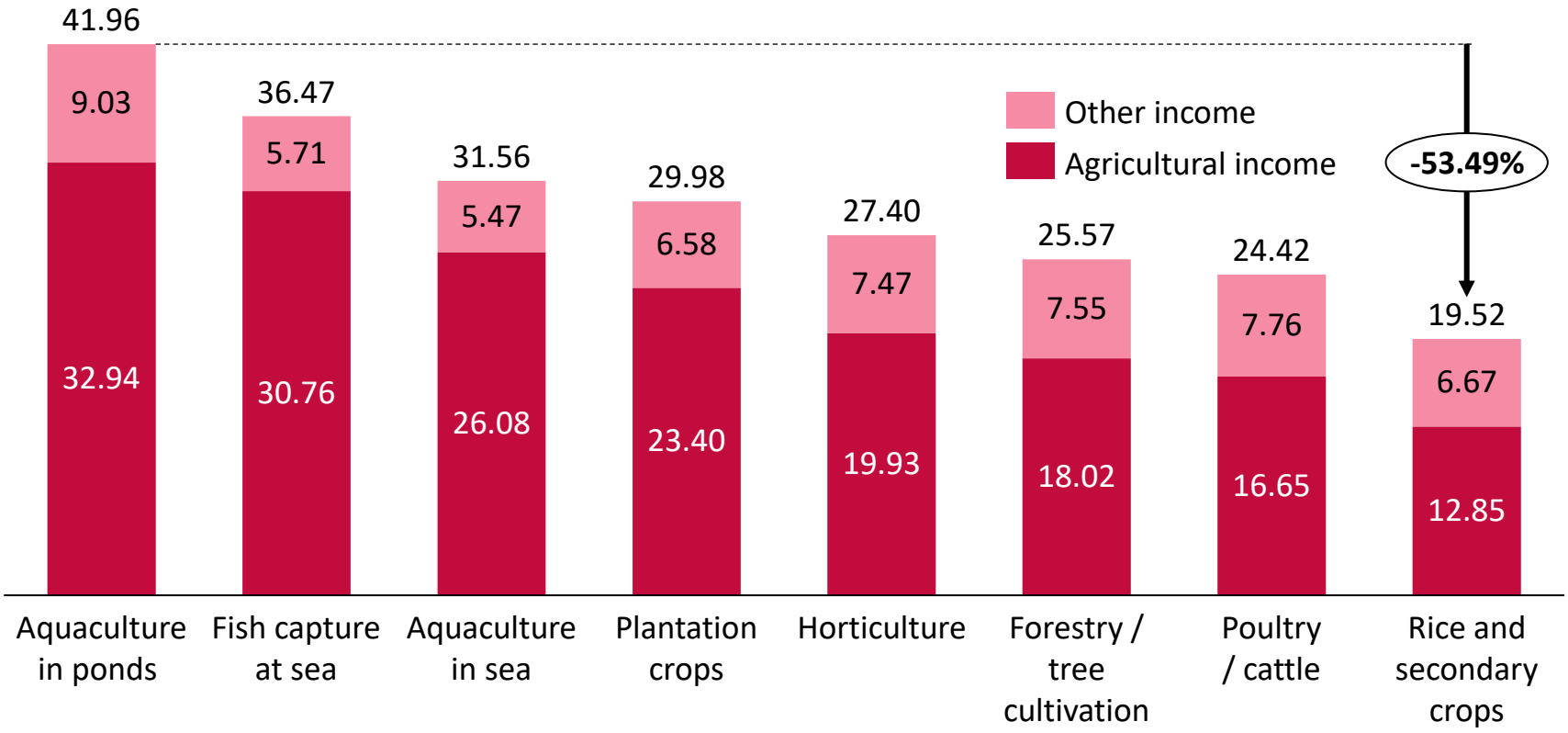
Farmers in Kalimantan, Sumatra, and Papua are wealthiest and get higher share of income from agriculture; farmers in Java and Nusa Tenggara are poorest



Source: National Agriculture Census, 2014

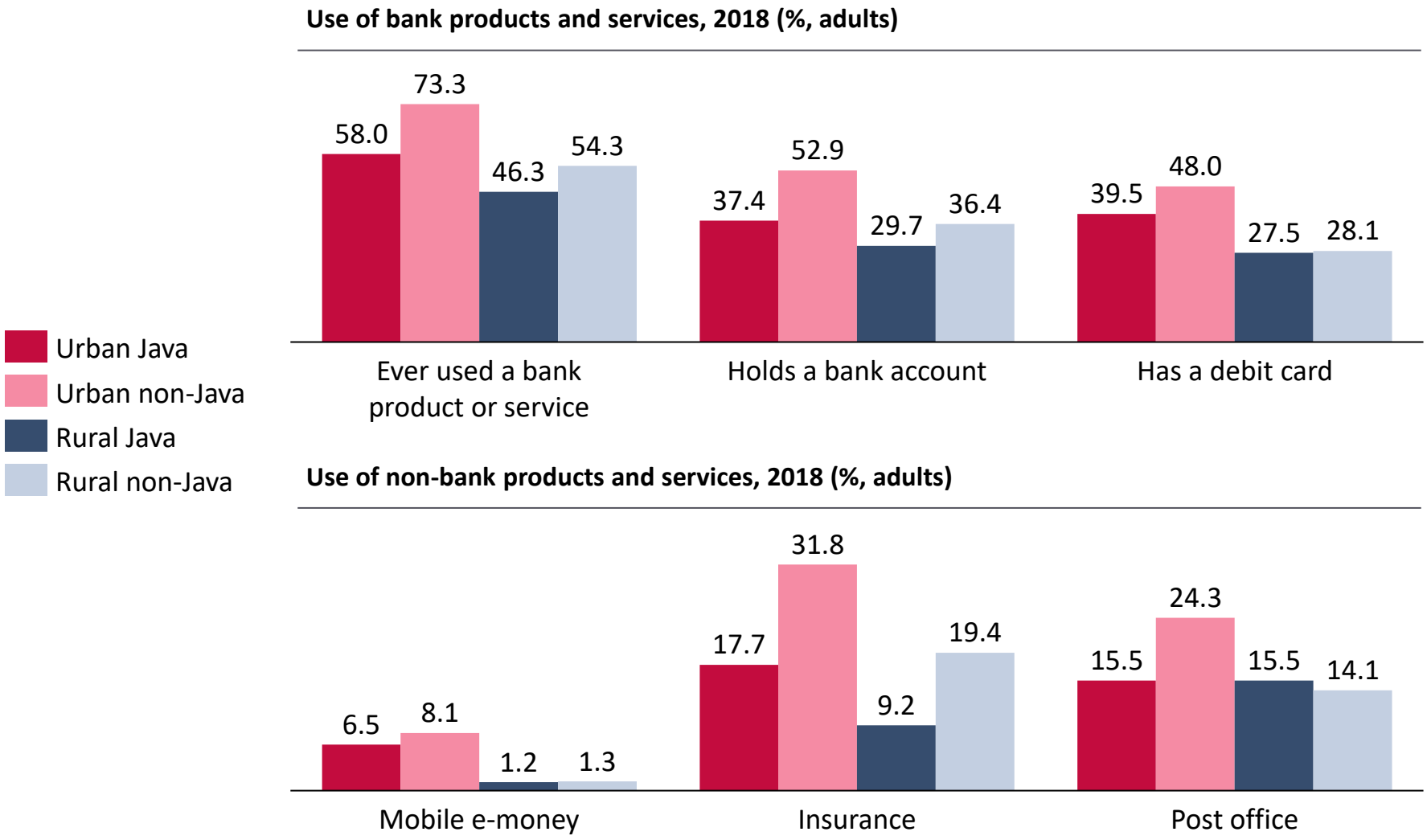
Fisheries and plantation crop farmers are on average wealthiest; farmers who derive most of their income from rice, other staples are more than half as poor

Average farming household income, by primary agricultural source of income, 2014 (million, rupiah)



Source: National Agriculture Census, 2014

Rural populations in Java are most financially excluded, with 50%+ of households having never used a formal financial product or service at all in their lives

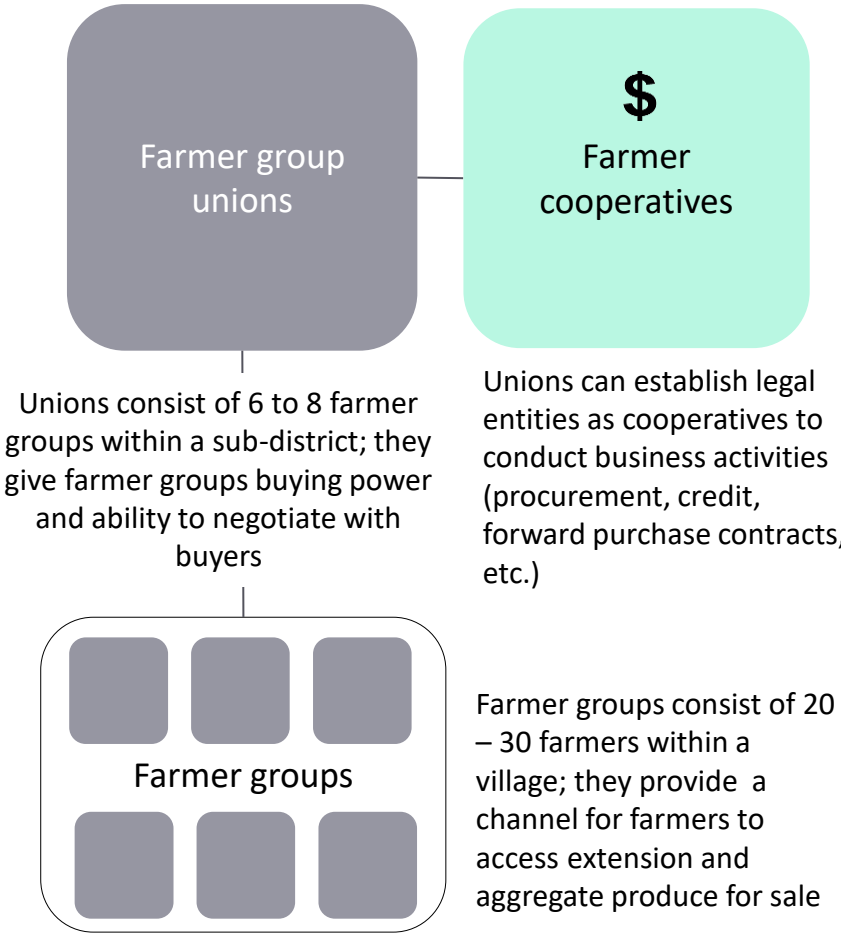


Sources: *Financial Inclusion Insights Indonesia, 2018,* National Financial Inclusion Secretariat

Farmer groups are an important feature of agriculture; while most are not well-organized, they provide a route-to-market and entry point for extension

- Farmer groups and agricultural cooperatives have a long 100-year history in Indonesia, with different cycles of groupings formed through successive national directives
- **Village Unit Cooperatives (KUD)** often play role of credit provider, input distributor, extension, and marketing
- Where they provide credit, there is usually cap (e.g. up to 5M rupiah), and credit is offset against payment at harvest
- Agricultural cooperatives / KUD are overseen by the Ministry of Cooperatives and MSMEs, not the Ministry of Agriculture

Organization type	No. in Indonesia (2014 registered)
Farmer cooperatives	10,065
Farmer group unions	37,632
Farmer groups	322,930
Farmers in groups	10.4 million (est.), comprising 39% of all farmers in Indonesia



Farmer groups and cooperatives can provide an effective customer acquisition channel for agtechs, but are not a reliable aggregation mechanism for scale; still, agtechs need to have boots on ground and high touch-point with farmers

Source: Mercy Corps; Ministry of Agriculture

We identify 4 primary categories of smallholder farmers for these purposes, with varying levels of need and readiness for digital services

	1. Plasma / estate outgrower farmers	2. Independent farmers in structured value chains	3. Independent farmers in unstructured value chains	4. Subsistence farmers
Who are they?	• Farmers in palm oil, shrimp, rubber, cocoa, coffee, coconut • Estates provide support to farmers (typically organized in cooperatives) – inputs, credit • Backed by forward contracts	• Farmers in palm oil, coffee, fish, etc. who do not work as outgrower or under contract • Flexible on who they sell produce to and for what price • Do not receive input packages, training, credit	• Farmers in less structured value chains, but who have commercial operations • E.g. poultry, rice, avocados, green beans, etc.	• Farmers in staple crops, livestock, vegetables; operate at sub-commercial scale • Grow for consumption, and sell surplus into local markets
How do their needs vary?	• No need for market linkages as already have offtake relationship • Need for capex (replanting) and input credit via estates, who are constrained in what they provide • Estates / plantations have need for supplier management systems which enable them to track and manage interactions	• Often receive credit terms from traders who buy direct from farms / groups; but generally lack access to credit • Need training in agronomy, pest management, etc. – rely on public extension workers • Need market/pricing info and route to market	• Largest farmer segment of the 4 here – needs vary significantly • Market linkages are important, as buyers are fragmented • Need for capex/input credit, data / precision agriculture solutions, e-commerce	• High level of needs to get to commercial farm operations • Need for agronomy / training, financing for inputs / planting; and adoption of modern farming techniques e.g. irrigation
What are implications for digital service providers?	Low customer acquisition costs; can use estates / plantations as channel (B2B/SaaS opportunities); no need for e-commerce, rather financing and data management	Medium customer acquisition costs; some plantations work with traders to reach independent farmers (can use as delivery channel); need agronomy training, financing, and input packages	High customer acquisition costs; must use farmer unions/groups as sales/delivery channel, as fragmented offtakers; easier to target premium horticulture crops, like mangoes, avocados, garlic, herbs/spices	Very high acquisition costs; hard to serve profitably; low education and income; unlikely to be digital adopter; low bankability

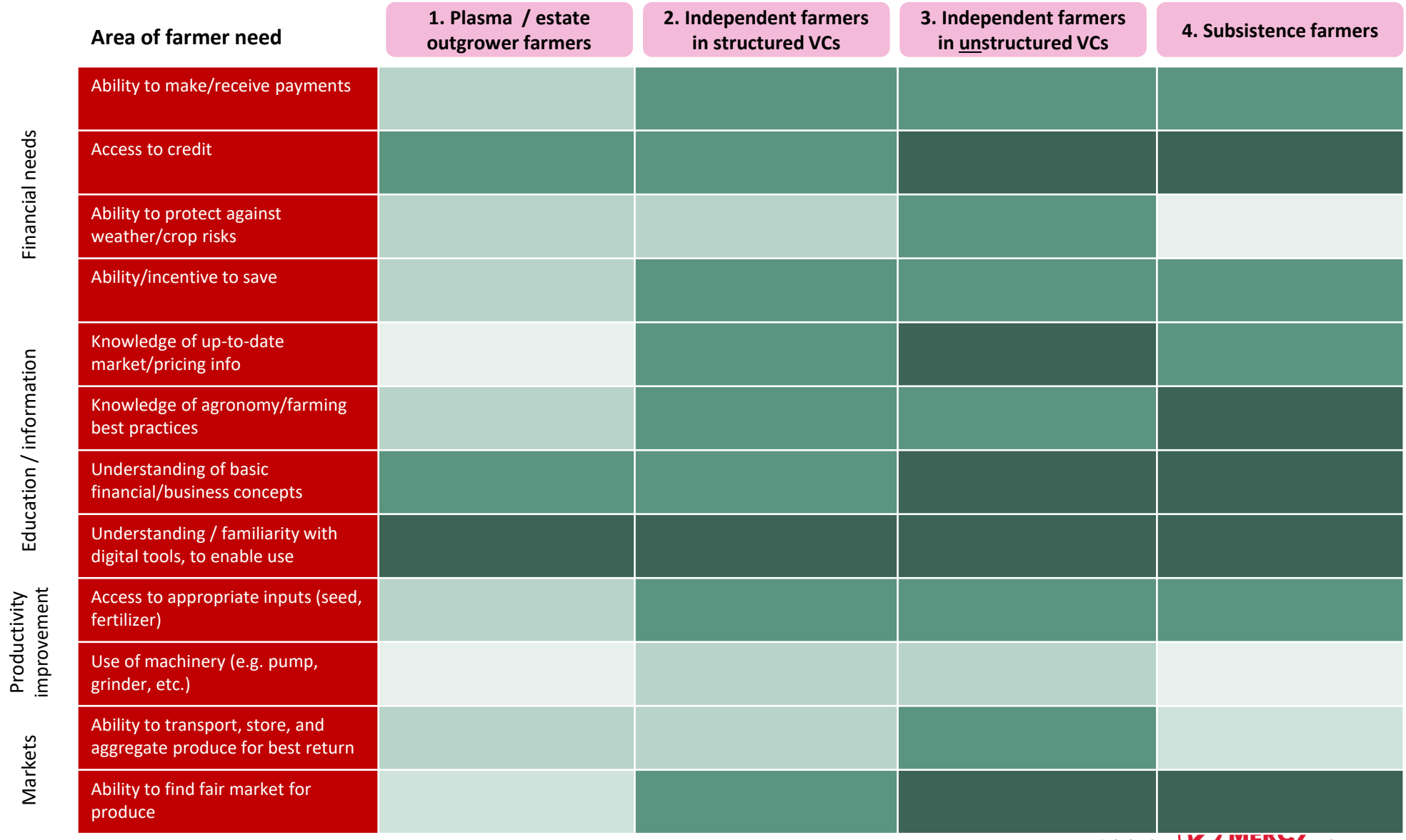
Rabobank Foundation

MERCY CORPS

Farmers have diverse financial, informational, and commercial needs; credit/savings, agronomy, market linkages are most pressing

	Area of need	Status quo	Level of unmet need	Addressable by digital?
Financial needs	Ability to make/receive payments	Mostly farmers transact in cash, or by bank transfer; limited uptake of mobile money; farmers often receive delayed cash payments	●	●
	Access to credit	Limited from formal FIs, more available from informal groups however in low amounts; traders/offtakers extend credit throughout season, but more common in certain value chains	●	◕
	Ability to protect against weather/crop risks	Few smallholder-focused insurance products available for weather or crop risks; formal FIs include insurance in loan pricing; Syngenta Foundation index insurance pilot was unsuccessful	◑	◔
	Ability/incentive to save	Farmers typically do not have e-wallets; many have bank accounts, but they are often inactive; farmers rely on storing cash and / or informal savings & loan groups in local village	◕	◕
Education / information	Knowledge of up-to-date market/pricing info	Market prices are often not transparent, especially as they can vary a lot based on island / region and import volumes; farmers rely a lot on middlemen / traders, who capture margin	◑	●
	Knowledge of agronomy/farming best practices	Varies by value chain; yields often low relative to global average; farmer groups have improved yields significantly in last few decades	●	◕
	Understanding of basic financial/business concepts	Often low; farmers do not understand financial products, and cannot commercialize their farm operations; more than 60% of farmers did not go beyond primary education	◑	◕
	Understanding / familiarity with digital tools, to enable use	Low; even farmers with smartphones often do not know how to use apps, beyond call and message; agtechs focus on app use for agents / farmer group leaders, instead of trying to get each individual farmer to use app	●	◔
Productivity improvement	Access to appropriate inputs (seed, fertilizer)	Generally inputs are available, especially in more densely populated islands like Java and Sumatra; however, often not affordable due to upfront outlay and farmers' seasonal income	◔	◑
	Use of machinery (e.g. pump, grinder, etc.)	Very limited; government has done recent push in irrigation; cost for mechanization typically prohibitive; no rental models focused on smallholders emerged from our research	◔	◔
Markets	Ability to transport, store, and aggregate produce for best return	In densely populated islands, like Java, aggregating and storage is not major issue; in more remote islands, infrastructure is often weak, with limited cold storage capacity and often long distance from local markets	◔	◕
	Ability to find fair market for produce	Where farmers are in more remote areas, they often have limited flexibility on when and to whom they sell; therefore, prices can fluctuate a lot and hit lows where demand is subdued	◕	●

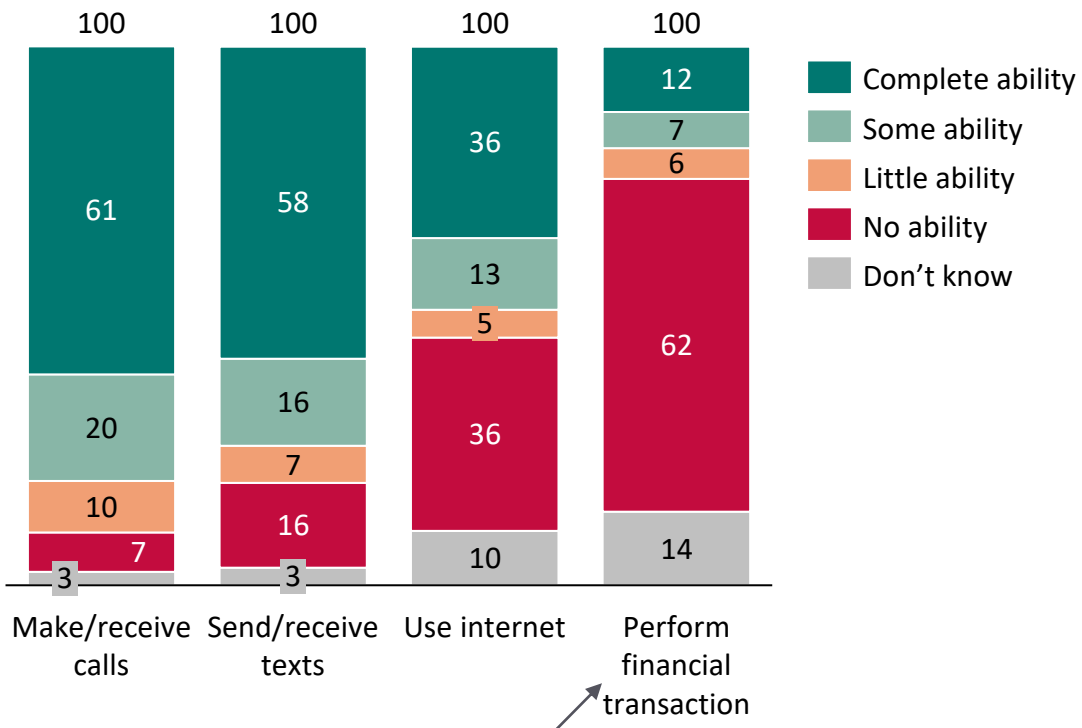
Plasma farmers have least need overall but still need credit, digital, and financial literacy; independents also need extension, market info, and market access



Farmer needs relating to financial services

Phone user capability (2018)

% of adults



~80-90%

of Indonesia's population are

not familiar with performing a financial transaction online

Quotes from interviews

"Often farmers have wait to get paid; if they sell to middlemen, they get paid immediately, sometimes in cash and sometimes payment in kind with fertilizers, etc."

"Accessing credit is really challenging for farmers; that's why the traders are very strong, because they offer credit"

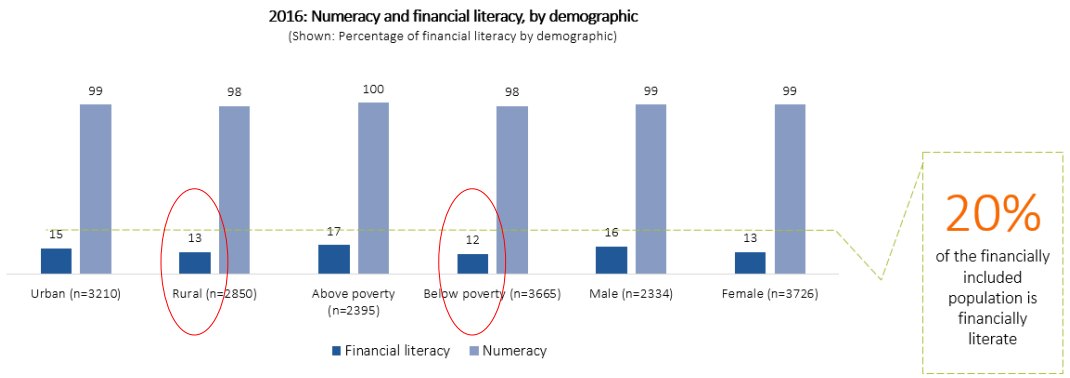
"Many of the farmers do not have legal ownership of the land they cultivate. As a consequence, it is difficult for farmers to obtain credit from banks because they do not have the required collateral"

"Farmers in the cooperative do use mobile money anymore due to LinkAja requiring smartphones while the old solution could [e-Cash] be used by basic mobile phones

Source: DNKI (2018)

Farmer needs relating to agronomy services, and financial / digital literacy

Low financial literacy in Indonesia remains a significant barrier to inclusion and could be hindering uptake of new products and services



Key agronomy needs:

- Indonesia has diverse topology and **best practices require precision in terms of optimal inputs**, combinations of inputs, and volumes used
- Numerous sources cited pest control as a major issue for smallholder farmers, who often **lack the knowledge and tools to manage pests and crop disease**
- There is a significant network of extension workers in the country, **approximately 550 workers for every smallholder farmer**; however, the quality and engagement of these extension officers varies significantly

Quotes from interviews

Farmers won't really understand digital solutions –there is low literacy though plasma farmers are better than independent farmers for this"

""Old farmers are not savvy enough using cellphones and would be a huge challenge for digital literacy

"There is low ownership of smartphones. Even where phones are owned, often farmers don't want to take them into the field or do not know how / when to use them effectively

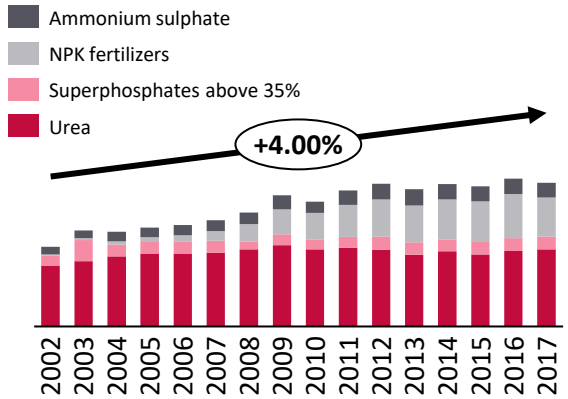
"How to see whether the plants are healthy or not, when to put more fertilizer, signs of pests and how to treat, would be most useful information"

"Farmers often don't know how to buy or how to use the inputs""

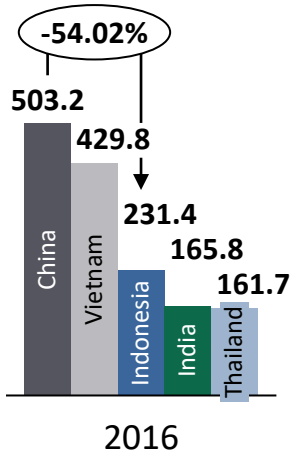
Sources: (1) FinInsights 2016, Intermedia (2) Interviews

Farmer needs relating to retail access to inputs and access to markets

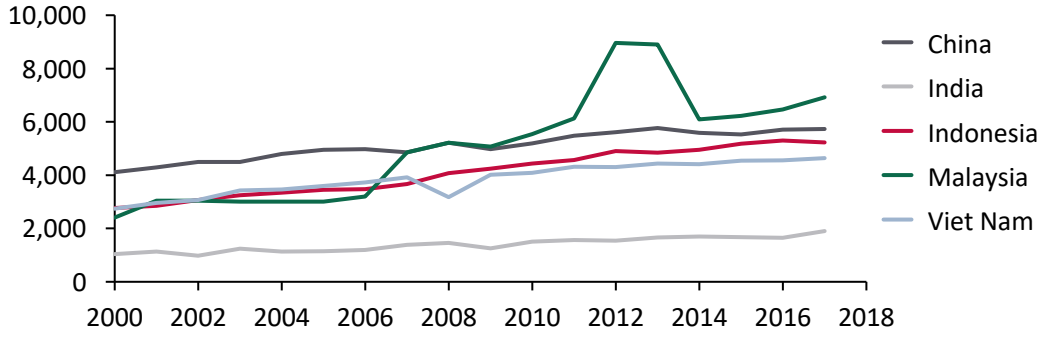
After sharp increase in 2002-2010 of 5.74% year-on-year, <u>fertilizer use (tonnes)</u> grew at only 0.91% in 2011-2016



Indonesia still lags behind some neighbors in terms of <u>fertilizer use (kg) per hectare of arable land</u>



Growth in yields per hectare (kgs), grains (2000-2017)



Quotes from interviews

"The middlemen have all the bargaining power, with limited transparency, farmers do not know what price to demand"

"Transport of crop to the mills is far so creates dependence on middlemen who capture large share of margin; this is more problem for independent farmers, not plasma schemes"

"The lowest hanging fruit is to distribute market information to farmers who are pressured by middlemen"

'Farmers really need a better distribution channel, other than to sell to community head or local traders"

"We have tried to do inputs on credit, but not much. It tends to be difficult; farmers often do side-selling and do not pay to supplier of inputs on time"

Sources: (1) FAOStat (2) World Bank Datasite (3) Interviews

Report contents

Summary of key challenges for digital service providers in agriculture

Based on our landscape work and interviews, these are the key challenges which constrain growth in digital services for agriculture in Indonesia

General to agtechs

- Access to growth / working capital
- Ability to acquire customers / farmers quickly to scale
- Striking partnerships with value chain actors or FIs
- Finding reliable revenue model / paying customers
- Building out agent network / field force model
- Logistical capabilities (having to do too many things across different aspects)
- Front / back end product development / robustness of tech

Specific to digital lenders / P2P platforms

- Ability to raise capital for on-lending
- Slow fundraising cycles from retail lenders (2-3 weeks)
- Striking partnerships with traditional FIs / non-bank lenders (and regulatory constraints)
- Developing credit scoring algorithms / use of alternative data
- Implementing robust credit processes (lack of basic documentation / farming data)
- Effective collections procedures and channels (e.g. calls, SMS, visits; frequency, etc.)
- Covid-19 impacting perceptions on repayments

FIs / value chain actors looking to innovate in digital platforms

- Knowledge of which agtech/fintech partners to work with
- Financial / reputational risks associated with partners
- Expertise in digital product development and channels
- Understanding of customer segment
- Lack of buy-in at executive level
- Organizational bureaucracy and constraints

Possible modes of interventions

There are opportunities to make impactful interventions in financing, technical assistance, partnerships development, and ecosystem level interventions

Type	Mode of intervention	Are other actors (philanthropic / governmental) doing this?	Typical for Rabo Foundation?	Typical for Mercy Corps AgriFin?
Financing	Direct financing of loan portfolio	**Some** – several digital lenders have partnered with FIs / donors, but primarily rely on P2P funding; some FIs lending to farmers via agtech but few have digital component	Yes	No
	Indirect financing of loan portfolio (via intermediaries)	**Some**, e.g. KUR program - but majority of funds do not go to smallholders	Yes	No
	Corporate loan / working capital	**Limited** – agtechs/fintechs often cannot raise venture/mezz debt as too early stage and most investors focus on equity	Yes	No
	Credit risk guarantee / first loss	**Some -** e.g. KUR program and some donor initiatives – but not always enough to get banks lending to farmers	Yes	Yes
	Equity / quasi-equity	**Yes** – there are various VC investors active in agtech/fintech	No	No
	Innovation grants	**Some** – there are various grant awards / competitions	Yes	Yes
Technical assistance	Tech / product development	**Limited** – there are few donors supporting product development	No	Yes
	Data / platform development and analytics	**Limited** – there are few donors supporting product development	Yes	Yes
	Credit scoring / process improvement	**Some** – there are some TA programs focused on support to banks / FIs for agricultural lending, but none for digital agri lenders	Yes	Yes
	Strategy and operational support	**Some** – there are some TA programs focused on general org support	No	Yes
Partnerships development	Linkages to FIs and large value chain actors as buyers of services	**No**	Yes	Yes
	Linkages to value chain actors for customer acquisition / growth	**No** – agtechs/fintechs	No	Yes
	Facilitate partnerships for bundled services	**No**	No	Yes
Ecosystem building	Convenings and networking	**Some**	Yes	Yes
	Research and market intelligence	**Some**	Yes	Yes
	Policy & advocacy	**No** – limited to no specific focus on digital services for agriculture	No	No
	Technical assistance / funding to accelerators and innovation competitions	**Some** – organizations like GSMA and Rabo Foundation	Yes	No

Priority interventions (1/3)

	Rationale	Intervention
1. Providing debt funding directly to digital lenders	• There is an emerging set of digital lenders who are at or post Series A stage with portfolios of approx. $2.5M-$25M • Several of these players have started out raising crowdfunding from retail investors; this gives them low cost of capital, but is not scalable	*Provide wholesale financing to fintechs for on-lending to farmers; technical assistance around credit systems and risk management; linkages to structured value chains via offtakers / input firms*
2. Setting up special digital credit fund / facility managed by intermediary(-ies)	• High transaction costs and risk concentration associated with supporting digital lenders individually • Supporting one or two digital lenders does not necessarily build the ecosystem as a whole; RF can have wider reach setting up fund	*Set up dedicated Indonesia Farmer Digital Loan Facility focused on digital loans to eligible farmers; facility to be managed by specialist fund manager e.g. Impact Credit Solutions; can have TA component to build capacity of digital lenders*
3. Providing venture / mezz debt to agtechs	• There are diverse VC investors focused on providing equity and growth capital • Venture debt is less available, but can play a critical role in funding start ups through growth stage	*Develop venture debt product targeting growth-stage companies – e.g. 2-year tenor, repayable on achieving certain revenue/margin thresholds; can layer in concessional rates, FX risk transfer, etc.*
4. Facilitating partnerships between digital lenders (or agtechs) and traditional FIs/MFIs	• Most digital lenders are exploring commercial partnerships with traditional banks and MFIs, but finding it difficult to do • Many agtechs are also starting to realise the potential of farmer data to unlock credit and are seeking partnerships	*Broker partnerships between fintechs /agtechs and traditional lenders; technical assistance and support in product development can go alongside*

Priority interventions (2/3)

	Rationale	Intervention
5. Digitizing bulk payments in the agricultural sector via e-wallets	• Mobile money account ownership and usage remains very low, especially in rural areas and among farmers • One way to drive mobile money adoption is by digitizing the existing flow of transactions in the sector, working with source of those payments (government, buyers/ offtakers)	*Facilitate bulk payments partnerships between major e-wallet providers and large agribusiness, government fertilizer subsidy schemes, to drive mobile money adoption*
6. Connecting data platforms with financial institutions / large agribusiness / other use cases	• Several leading agtechs are developing B2B platforms for farmer-level data and big data (satellite, drones, etc.) – e.g. Hara, Koltiva, Meridia • Key use cases for this data is around credit scoring / risk assessment (for banks, MFIs, insurance firms), supply chain management (for offtakers), and demand forecasting (for input companies)	*Provide product development support to data platforms and facilitate partnerships with B2B clients from FIs to large agribusiness*
7. Supporting roll-out of commercial models around PrecisionAg-as-a-Service	• There are various companies who are using devices plus software and IoT analytics to facilitate precision agriculture; these models are relatively capital intensive • Other markets have seen innovation around leasing models and shared-use infrastructure to make the technology more available	*Financing and product development for drone / remote sensor to expand use of technology into new segments*
8. Supporting scaling of e-learning solutions for financial literacy and agronomy	• E-learning tools can play a critical role in driving uptake / usage of other digital services, lowering training and extension worker costs, and ensuring farmers derive full benefit from inputs and credit • Standalone solutions are not commercially viable and must be plugged into bundled offerings with partners	*Providing grant funding for content development / licensing and facilitating partnerships between learning platforms and partners for bundled offerings*

Priority interventions (3/3)

	Rationale	Intervention
9. Helping agtechs build out field force and agent networks	• Agtechs are building out their own networks of agents who are touchpoint with farmers for sales, training, and relationship management • Effective field force requires partnerships and use of agent apps to manage efficiently – this is complex and costly, with high variance in quality and performance	*Provide grant funding for field force recruitment; support development of agent network management apps; facilitate partnerships with field staff of input companies, plantations, parastatals*
10. Supporting marketplaces / e-commerce to integrate backwards in supply chain with farmers	• There are a number of marketplace / e-commerce players; some models create linkages between farmers / producers and retailers / buyers, such as through kiosks • Going further back in supply chain to small farmers is costly and has high logistics requirement to ensure order fulfilment	*Provide grant funding / concessional debt to support e-commerce players to link agri-kiosks back in supply chain and source more directly from farmers; facilitate partnerships with farmer organizations*
11. Support data platforms / insurtech to develop agri insurance products	• Even with digital credit and new channels, issuing loans to farmers carries inherent risks related to weather and crop disease • Embedded insurance models have worked to good effect in other markets; insurtech firms can partner with underwriters and data providers to offer agri insurance	*Facilitate partnerships between innovative insurance players and lenders in agriculture; support product development and scale up; connect with data providers to enable better risk pricing*
12. Organize convenings / industry events	• Agtech firms often operate in different ecosystem to large agribusiness (VC ecosystem as opposed to agriculture) • There is an important role to play in bridging divide between agtechs and broader agriculture sector	*Fund and organize industry events specifically focused on bridging gap between tech firms and agribusiness, such as AgriFIn's annual learning events or partnership pitch days*

The AgriFin model has demonstrated success using both corporate / institutional partners and agtechs as entry point

Corporate-led

Types
- Banks/MFIs
- Plantation owners / trading houses
- Multinational buyers
- Input firms
- Parastatals / govt agencies

What they can offer
- Access to large pools of potential clients/farmers
- Networks and value chain relationships
- Existing back-end and distribution infrastructure
- Deep pockets

Challenges
- Lack of senior buy-in / investment
- Institutional bureaucracy
- High aversion to risk
- Limited expertise in digital

Examples

syngenta, gar agribusiness and food, BANK BRI, BULOG

Agtech-led

Types
- Digital lenders
- Data platforms
- E-learning platforms
- Precision ag / drone / IoT / remote

What they can offer
- Digital native profile
- Ability to innovate and pivot quickly
- Dedicated focus on serving farmers and agri-SMEs
- Openness to partnerships

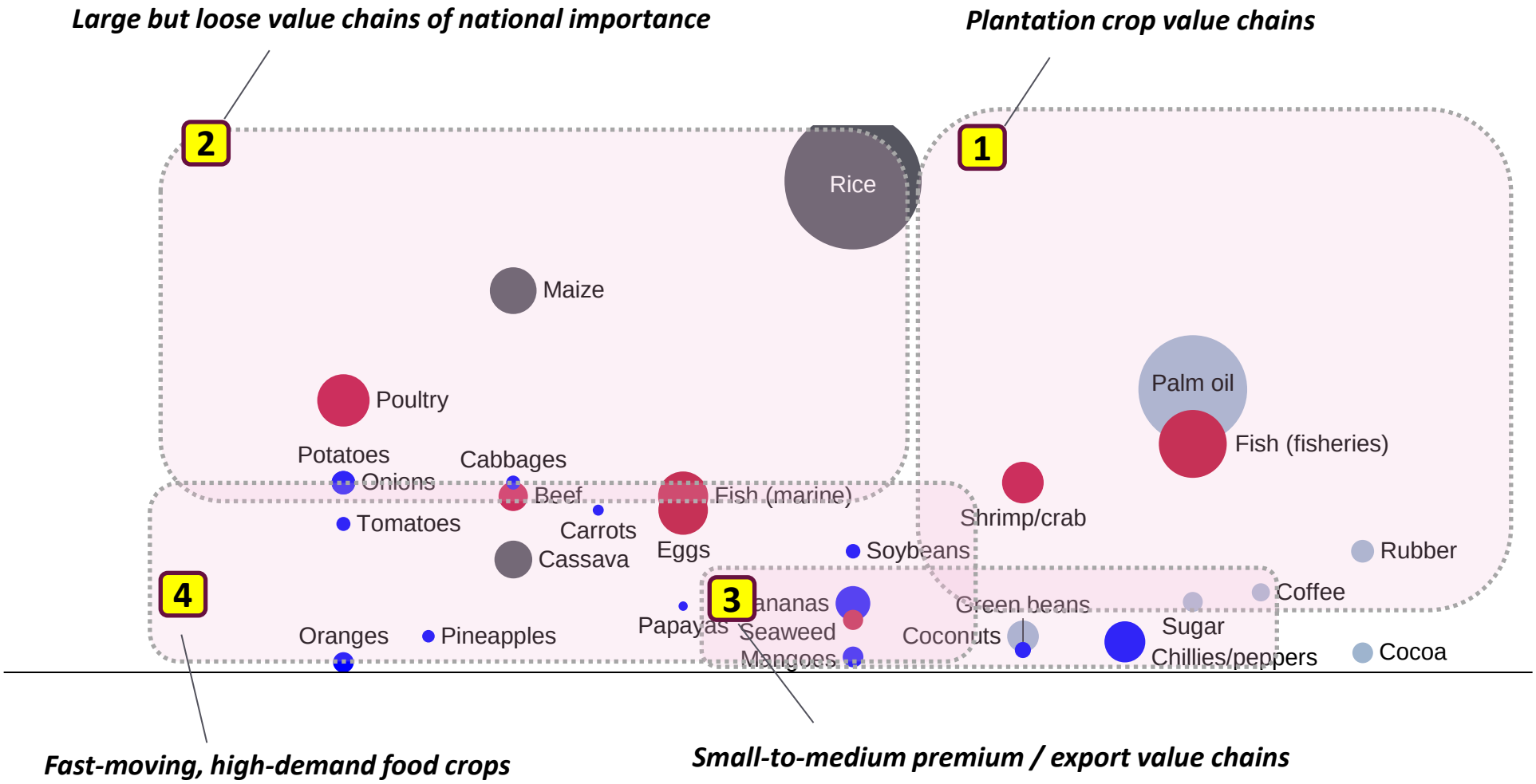
Challenges
- Lack of access to capital
- Organizational immaturity and growing pains
- Limited logistical capabilities and boots-on-the-ground
- High risk tolerance

There are merits to both standalone products and do-it-all models; however, both can be enhanced with greater linkages to partners and bundled offerings

Business model	"Stand alone" product / service expansion	Partnership model	Do-it-all model
Description	Provision of standalone single service (e.g., precision ag providers solely focused on providing devices to farmers)	Specific projects or platforms that enable collaboration across multiple parties (e.g., POWER program partnership between Mercy Corps, ACA Asuransi, BPR Subang and Nufarm)	Closed-loop system where almost all services are provided by one service provider (e.g., providing credit, sourcing, aggregation, e-commerce services to farmers)
Challenges	• Often find that due **to existing gaps in the market,** service providers themselves need to **extend their services to other areas** to get business model to work, e.g.,: • Lack of data on farmers (digital lenders need to have monitoring / support services) • Quality of produce low (marketplaces need to provide information / training)	• Requires **high degree of collaboration and alignment of incentives** between development and commercial stakeholders (ACA Asuransi & Syngenta Foundation weather index insurance case) – therefore limited examples in Indonesia compared to other countries • Hard to determine commitment of field agent resources from different players	• **Agents need to be trained across different types of products and services** (if done well, can more efficiently make use of field resources) • Very difficult to "do everything at once" and do it well • Difficult to scale • Require deep understanding and relationships across stakeholders in value chain

* Note: apart from lending where regulation requires outsourcing

Development actors / funders should curate portfolios to focus on a mix of value chains, which offer different opportunities for impact and challenges



Sources: (1) Ministry of Agriculture statistics (2) FAOStat (3) Interviews (4) Value chain studies

Plantation and premium export crop value chains can offer some quick wins; staple crops and general horticulture can unlock big impact if successful

	Summary	Prime examples	Viability for digital services?	Impact potential?
1 **1. Plantation crop value chains**	Value chains with finite set of large buyers/trading houses; farmers either work directly with buyers in schemes, or via traders	Palm oil, rubber, cocoa, coconut, coffee	***Easier to serve:*** *can partner with estates for market entry; more secure cashflows; more de-risked for FSPs*	***Medium:*** *Many farmers already served by offtakers/donors; have more stable livelihoods*
2 **2. Large but loose value chains of national importance**	Significant value chains in terms of size and important to food security for fast-growing population	Shrimp, fish, maize, rice, soybeans, poultry, eggs	***Harder to serve:*** *high costs of customer acquisition; volatile cashflows; higher perceived credit risk*	***High:*** *Many farmers are sub-commercial; play critical role for national food security*
3 **3. Small-to-medium premium / export value chains**	Higher-value crops with export potential and presence of premium offtakers	Chilies, mangos, avocados, green beans, garlic, spices, ginger, seaweed	***Easier to serve:*** *farmers are higher income, more commercial; can partner with premium offtakers*	***Low-to-medium:*** *Low-hanging fruit for intervention; farmers are more commercial, can invest*
4 **4. Horticulture and staple crops (i.e. fast-moving, high demand)**	Food crops which are grown across country in large volumes for domestic market	Rice, cassava, tomatoes, potatoes, onions, cabbages	***Mixed bag:*** *less formal value chain, but crops are prevalent so lowers transaction costs*	***Medium-to-high:*** *high variance in farmer profile; crops are critical for domestic consumption*

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