

GROWTH STRATEGY DOCUMENT

**MUNG BEAN SUB-SECTOR
IN EAST JAVA**

OCTOBER 2015

**PERKUMPULAN UNTUK PENINGKATAN USAHA KECIL
(PUPUK) SURABAYA**

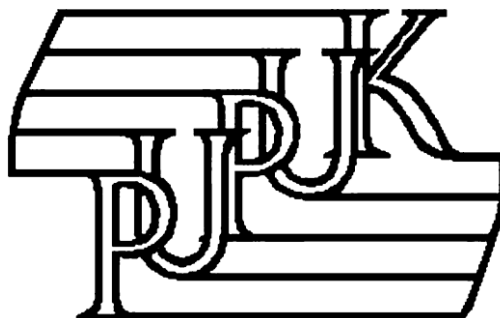


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AIP-PRISMA

Australia-Indonesia Partnership for
Promoting Rural Income through
Support for Markets in Agriculture



Abbreviations

AIP-PRISMA	Australia-Indonesia Partnership for Promoting Rural Income through Support for Markets in Agriculture
AVDRC	The World Vegetables Centre
FAO	Food and Agriculture Organization of the United Nations
ha	Hectare
ILAF	Intervention Logic Analysis Framework
KG	Kilogram
MT	Metric Tonnes
NTB	Nusa Tenggara Barat (West Nusa Tenggara)
NTT	Nusa Tenggara Timur (East Nusa Tenggara)
PPI	Progress out of Poverty Index
PT	Means limited company in Bahasa Indonesia. Similar to Ltd.
PUPUK	Perkumpulan Untuk Peningkatan Usaha Kecil
R & D	Research and Development
RDKK	Rencana Definitif Kebutuhan Kelompok (Definitive Plan for Group Needs; online agriculture application).
USA	United States of America
USD	United States Dollar

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1. Executive summary

Mung bean, a common staple in Asian diets, is rich in easily digestible protein and other nutrients. Mung bean adds nitrogen to the soil, requires less water and has a short crop-duration – therefore is widely used in crop rotation. **Transformed into an important crop from a marginalized one from the 1970s, mung bean is grown mainly in South and Southeast Asia.** Its cultivation has also expanded into Australia, USA, Canada and Ethiopia. Production of mung bean in Asia increased from 2.3 million metric tonnes (MT) in 1985 to 3.1 million MT in 2000. China is the largest exporter of mung bean in the world, followed by Myanmar, while India is the largest importer. **Global demand of mung bean remains consistently high and stable. Demand from the food processing industry has also increased over the years.**

The majority of mung bean demand in Indonesia is met by domestic production. Nationally, production has been declining, particularly since 2012. This results in persistent increase in imports to cater for the food processing industry which dominates domestic demand. Availability of mung bean based food products has increased significantly in the recent years and the market price of mung bean in Indonesia has remained relatively stable.

Central Java is the leading producer of mung bean in Indonesia followed by East Java. These two provinces produced 64% of Indonesia's total production of mung bean in 2014. **East Java has around 155,000 mung bean farmers spread throughout 38 districts / cities. Since 2005, both production and cultivation area has decreased in East Java,** although productivity has increased. However, East Java it is still far away from its potential optimum productivity.

Farmers generally do not use appropriate quality and quantity of inputs to grow mung beans in East Java. Minimizing cost and effort dominates their cultivation methods. Production and distribution of quality mung bean seed on a commercial basis does not exist in East Java. Seed producers are reluctant to instigate production as they are not assured of the demand and profit. Farmers mostly rely on residual fertiliser present in the soil from previous crops. Fungicides, herbicides, and pesticides are widely available in the markets, but are not targeted to mung bean production. **Information regarding better cultivation practices, improved seeds and inputs, and about the overall potential of mung bean as a more profitable cash crop is not actively supplied by any actor in the market.** Post-harvest services and storage services for mung bean are also very limited; in many locations they are absent. Mung bean is not considered a nationally important crop by government development strategy. **Extension services with limited knowledge and resources do not focus on mung bean.**

Mung bean remains particularly relevant to the poor, from the perspective of both income and nutrition. Mung bean is cultivated as an attainable interval cash crop in the dry season due to its low-maintenance and small production costs. **Poor farmers have the potential to increase mung bean productivity without significantly raising production cost.** There is still unutilized and underutilized land suitable for interval crops like mung bean

in East Java. There is potential to encourage additional poor farmers to take up mung bean farming as it is suited to them. **There is viable scope for import substitution due to escalating domestic demand coupled with the rising sale prices witnessed over the last years.**

The vision of change for the mung bean sub-sector in East Java is to increase income of mung bean farmers by improving quality and productivity by ensuring availability and application of appropriate inputs and proper cultivation techniques. This document proposes the following interventions to realise the vision:

- Assist the seed producers and suppliers in producing, distributing, and promoting quality mung bean seeds in East Java.
- Assist fertiliser and pesticide companies in promoting the application of fertiliser (particularly micronutrients and compost), appropriate pest control solutions and better farming practices for mung bean cultivation.
- Assist the local agro-tool producers in promoting appropriate sowing tools for mung bean
- Assist the public extension agencies in promoting the existing and successful extension model for mung bean to other districts
- Assist local agro-tool producers / agents in promoting threshing services for mung bean

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2. Background

The Australia-Indonesia Partnership for Promoting Rural Income through Support for Markets in Agriculture (AIP-PRISMA) is a multi-year program that is a part of the Government of Indonesia's midterm development strategy to accelerate poverty reduction through inclusive economic growth. With the support from the Government of Australia, the program aims to achieve a 30% increase in the net incomes of 300,000 male and female smallholder farmers in eastern Indonesia by June 2017. AIP-PRISMA works in East Java, West Nusa Tenggara (NTB), East Nusa Tenggara (NTT), Papua, and West Papua.

This Sub-Sector Growth Strategy Document aims to provide a logic and rationale for market-based interventions which can support the mung bean sub-sector to the benefit of smallholder farmers in East Java.

3. Sector description

3.1 Sector profile

The sector profile provides information on the current status and potential of the target sector. This has been derived predominantly from secondary data and literature relevant to the sector.

3.1.1 Overall context

Native to the Indian subcontinent and southern China, mung bean is an important legume crop; a common item in Asian diet in various preparations. In South Asia mung bean is consumed as *dal* (thick soup made of split grain) whereas in East Asia, mung bean sprouts and processed noodles are more popular. Food processing industries use mung bean as an ingredient to make different food products.

Over the last decades, mung bean has been providing the poor population and particularly anaemic women and children with vital nutrition, and poor farmers with additional income opportunities across Asia.¹

Also known as green gram, mung bean supplements the cereal-heavy diets of the poor in Asia with easily digestible protein and other necessary but often missing nutrients like folate and iron. Mung bean adds nitrogen to the soil, requires less water and has a short crop-duration – therefore is widely used in crop rotation. Cereals grown after mung bean are likely to achieve higher yields and better quality due to the additional nitrogen in the soil².

¹ DFID, AVRDC. 2009, Counting on beans: mungbean improvement in Asia;
http://r4d.dfid.gov.uk/PDF/Outputs/AVRDC/DFID_impact_case_study_Mungbean_FINAL%5B1%5D.pdf

² Schafleitner, Roland et al, The AVRDC – The World Vegetable Center mungbean (*Vigna radiata*) core and mini core collections; <http://www.biomedcentral.com/1471-2164/16/344>

International context

With the advent of the green revolution, there was increased focus on staple grains resulting in a decline in mung bean production in Asia by the 1960s. However, from the 1970s mung bean transformed from a marginalized wild crop into a domesticated profitable crop, thanks to reinforced efforts in developing and promoting improved varieties and farming techniques. For example, The World Vegetables Centre (previously known as Asian Vegetable Research and Development Center; AVRDC), with its partners, has released over a hundred improved mung bean varieties in 27 Asian countries. Improved varieties boast shorter growing cycles, higher yields and greater resistance to pests and diseases³.

Mung bean has now become one of the most important grain legumes in Asia. Historically grown predominantly in South and Southeast Asia, it is rapidly expanding into Australia, USA, Canada and Ethiopia. Production of mung bean in Asia increased from 2.3 million metric tonnes (MT) in 1985 to 3.1 million MT in 2000. The total area under mung bean cultivation now exceeds six million hectares globally⁴, approximately half of which is planted with improved mung bean varieties in Bangladesh, Bhutan, China, India, Myanmar, Nepal, Pakistan, Sri Lanka and Thailand.

China is the largest exporter of mung bean in the world, followed by Myanmar, while India is the largest importer. China plays a major role in determining the world price. With national annual consumption of mung bean increasing from 0.3 kg/capita in 1985 to 0.5 kg/capita in 2000, China has still increased its export (from USD 45 million in 1986 to USD 50 million in 2000) and significantly decreased its import from USD 13.6 million to USD 1.4 million over the same period⁵. Disaggregated and updated statistics for mung bean trade and production are very difficult to obtain. For example, in the Food and Agriculture Organization of the United Nations (FAO) statistics mung bean is aggregated with other “dry beans”. According to an estimate by AVRDC, increases in mung bean consumption has ranged between 22% and 66% in various countries over the years.⁶ **Global demand of mung bean remains consistently high and stable, especially from India, Taiwan and the Philippines etc. Demand from the food processing industry has also increased over the years.**

National context

The majority of national demand for mung bean is met by domestic production which satisfied on an average 90% of total domestic consumption between 2005 and 2014.

³ Improved virus-resistant varieties released by AVRDC have 55-65 days maturity and a productivity of at least 2 MT per hectare, as opposed to 90-110 days and 400kg/ha with the traditional varieties.

From: DFID, AVRDC. 2009, Counting on beans: mungbean improvement in Asia;

http://r4d.dfid.gov.uk/PDF/Outputs/AVRDC/DFID_impact_case_study_Mungbean_FINAL%5B1%5D.pdf

⁴ Schafleitner, R. et. al., The AVRDC – The World Vegetable Center, mungbean (*Vigna radiata*) core and mini core collections; <http://www.biomedcentral.com/1471-2164/16/344>

⁵ Easdown, W. et. al, International Collaboration to Develop the Australian Mungbean Industry, Proceedings of the 1st Australian Summer Grains Conference, Gold Coast, Australia, 21st – 24th June 2010. Edited paper https://www.grdc.com.au/uploads/documents/2010ASGCEditedPapersPDF/Easdown_InternationalCollaboration_edited_paper.pdf

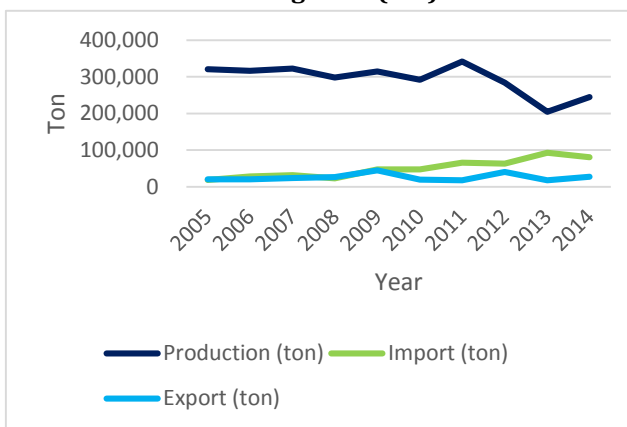
⁶ DFID, AVRDC. 2009, Counting on beans: mungbean improvement in Asia;

http://r4d.dfid.gov.uk/PDF/Outputs/AVRDC/DFID_impact_case_study_Mungbean_FINAL%5B1%5D.pdf

However production has declined in Indonesia, particularly since 2012, resulting in a subsequent increase in imports. Indonesia, now a net importer, also exports mung bean during the harvest seasons.

Production of mung bean in Indonesia was relatively stable between 2005 to 2011, however, it has varied more widely since 2011, falling from 341,000 MT in 2011 to 205,000 MT in 2013 to rebound to 250,000 MT in 2014. Mung bean imports and exports remain relatively low when compared to national production; neither export was depleting nor was import topping up the national production by more than 15% until 2009. The import and export figures were also almost identical up to 2009.

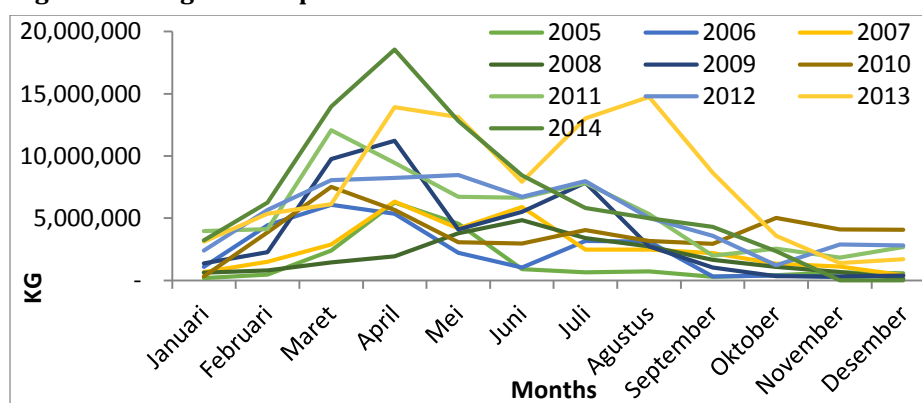
Figure 1: Indonesia: production, import and export of mung bean (MT)



From 2010 onwards import figures started swelling, adding more than 25% on top of the total production on an average between 2010 and 2014, with a staggering 45% in 2013, the lowest production year. Indonesia exported mung bean during those years as well, on an average by less than 10% of national production. Figure 1 depicts the declining production and increasing import of mung bean between 2005 and 2014.⁷ Indonesia imports mung bean, usually of superior quality, mainly from Australia and Myanmar. Export destination of Indonesian mung bean are India, the Philippines and other Asian countries.

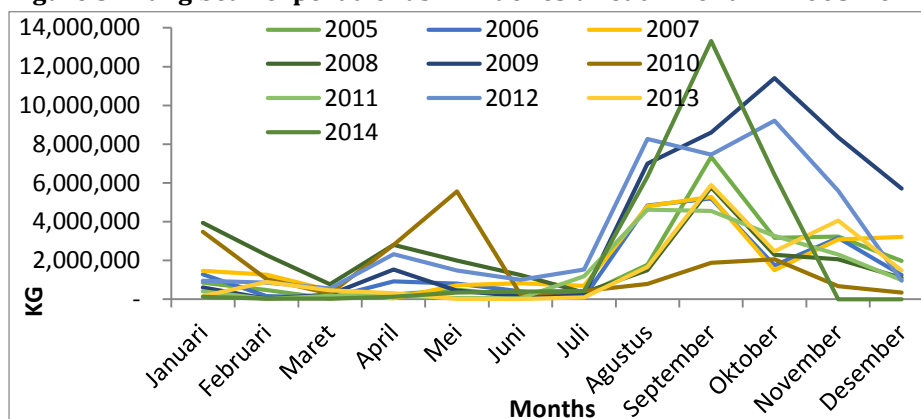
The majority of demand for mung bean in Indonesia comes from the food processing industry. The availability of mung bean based food products has increased significantly during recent years. Domestic food processors often choose imported mung beans, predominantly during the lean periods because, primarily, they require an uninterrupted guaranteed supply, and secondly, favour superior quality ingredients. Import naturally increases during the months of March – April, when local supply is low, as depicted in figure 2. During the harvest season (September to November), export of mung bean increases (figure 3).

Figure 2: Mung bean import trends in Indonesia: each month in 2005-2014



⁷ Source of figure 1,2 and 3: <http://www.bps.go.id>

Figure 3: Mung bean export trends in Indonesia: each month in 2005-2014



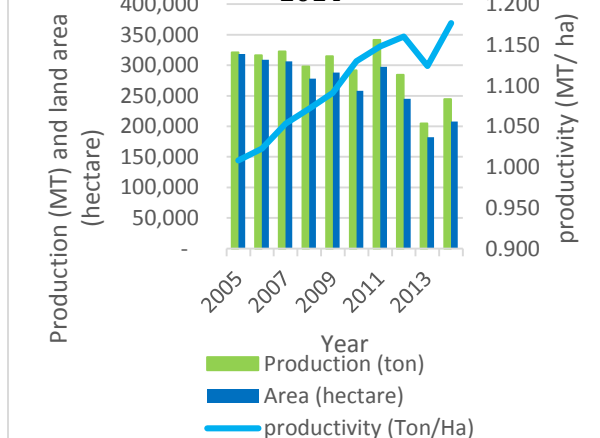
The market price of mung bean in Indonesia is quite stable. Interestingly as figure 4 suggests⁸, in 2011 mung bean price was very good despite having a bumper harvest. Apart from a dip in 2012, the price has increased year on year between 2010 and 2014. Productivity of mung bean has increased nationally over the same period in the face of declining production and cultivation area (figure 5)⁹.

Central Java is the highest producer of mung bean in Indonesia followed by East Java. These two provinces produced 64% of Indonesia’s mung bean in 2014. The top five producing provinces contributed around 90% of the total national production (figure 6)¹⁰. Highest productivity is seen in West Sulawesi Province, followed by South Sumatera Province. Annex 3, 4 and 5 depict the average area under cultivation, average production and the average productivity of mung bean between 2005 and 2014 in the provinces. Like the national scenario, **production in East Java have been decreasing** (see figure 7).¹¹

Figure 5: Domestic mung bean production and average price - 2010-2014



Figure 4: Domestic mung bean production, land area, and average productivity - 2005-2014



⁸ Source: BPS and Trading Ministry; (<http://www.kemendag.go.id/id/economiprofile/prices/national-price-table>), processed.

⁹ Source: <http://bps.go.id/>

¹⁰ Source: <http://bps.go.id/>

¹¹ Source: <http://bps.go.id/>

Figure 6: Leading mung bean producing provinces (%) – 2005-2014 average

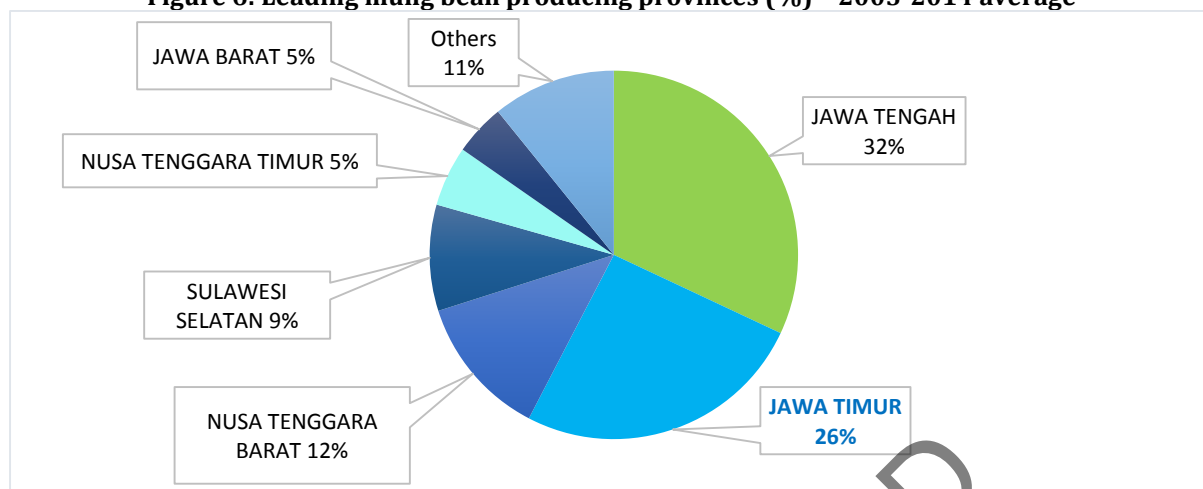
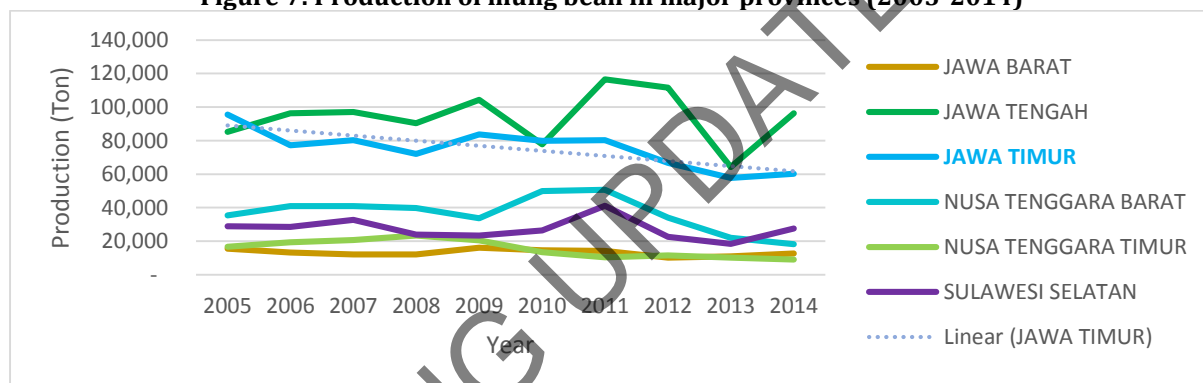


Figure 7: Production of mung bean in major provinces (2005-2014)



3.1.2 Local context

East Java as the nation's second largest mung bean producer has around 155,000 mung bean farmers throughout 38 districts/cities. Between 2005 and 2014, East Java contributed more than a quarter of domestic annual production, producing, on average, 75,000 MT. East Java also has the second largest land area under mung bean cultivation; about 50,000 hectare (ha) in 2014.

Both production and cultivation area has been decreasing in East Java; from 95,500 MT in 2005 to 60,000 MT in 2014 and from 88,000 ha in 2005 to 50,000 ha in 2014 for production and cultivation area respectively. Increased irrigation facilities in many cases resulted in many farmers shifting to paddy production of rice and abandoning mung bean production. This is one of the reasons why total harvested land for mung bean now is significantly lower than what it used to be in the late 2000s.

Mung bean remains particularly relevant to the poor, from the perspective of both income and nutrition. Mung bean is cultivated as an attainable interval cash crop in the dry

season due to its low-maintenance and lesser production costs.¹² Women are involved in each step of mung bean production. The mung bean sector has potential for growth for the following reasons: (1) poor farmers have the potential to increase productivity of mung bean without significantly raising cost of production; (2) unutilised and underutilised land exists, suitable for interval crops like mung bean; (3) there is potential to encourage additional poor farmers to take up mung bean farming as it suits them; and finally (4) there is a viable scope for import substitution, due to escalating domestic demand coupled with the rising sales price witnessed over the recent years./

Although productivity of mung bean in East Java has increased from 1.08 MT/ha in 2005 to 1.2 MT/ha in 2014, it is still far from its potential optimum productivity; it is ranked 8th nationally. Productivity is affected by poor quality seeds, deteriorating soil fertility, poor cultivation practices and inadequate maintenance by the farmers. However, productivity can be increased without significantly increasing cost, for example by introducing better quality seed and more suitable varieties, which has been successful in many other Asian countries. **Demonstration plots (small scale trial cultivation) in Sidoarjo, for example, yielded up to 3.2 MT per hectare with better quality seeds and better farming practices.**

Mung bean in east Java can also grow horizontally, reversing the declining trend of harvested area, at least for the poor farmers. Usually mung bean is cultivated in the land that is typically less productive for paddy, or is generally dry land that has no irrigation facilities. The majority of irrigated land, that is suitable for paddy cultivation, is owned by relatively wealthy farmers. Poorer farmers usually own land that is suitable for mung bean cultivation. Being a short duration interval crop, mung bean also does not take away opportunities for growing rain-fed rice for the poor farmers. In addition, approximately around 10,500 ha of uncultivated land exists in east Java that can be utilised for mung bean cultivation besides other crops. Table 1 shows a breakdown of the different land types available for mung bean cultivation in East Java by year.

Table 1: Area of different types in East Java (Hectare)¹³

Types of Land/ Year	2008	2009	2010	2011	2012
Irrigated Field	874,133	879,958	879,618	876,835	910,533
Non-irrigated Field	234,445	220,559	227,658	229,614	242,342
Tegal/garden	1,118,717	1,131,247	1,114,530	1,128,083	1,129,772
Field/Huma	31,953	42,564	44,312	37,331	37,800
Temporarily not used	16,644	11,788	10,813	10,814	10,474
East Java (Total)	2,275,892	2,286,116	2,276,931	2,282,677	2,330,921

The number of poor farmers engaged in mung bean production can also be increased if the potential of improved productivity, profit, nutritional benefits and the overall suitability can be demonstrated to them. Within East Java the highest number of poor farmers live in Sumenep district, which also has the second largest number of mung bean farmers. Sampang district has the highest number of mung bean farmers followed by Sumenep district, Lamongan district and Bangkalan district, which have more than 20%

¹² See Annex 6 for cost comparison between mung bean and other crops.

¹³ Source: Agricultural Land Statistic 2013.

poverty with the exception of Lamongan (16%). Annex 7 shows percentage of mung bean farmers and the poverty rates in East Java districts.

3.2 Sector dynamics

3.2.1 Market overview

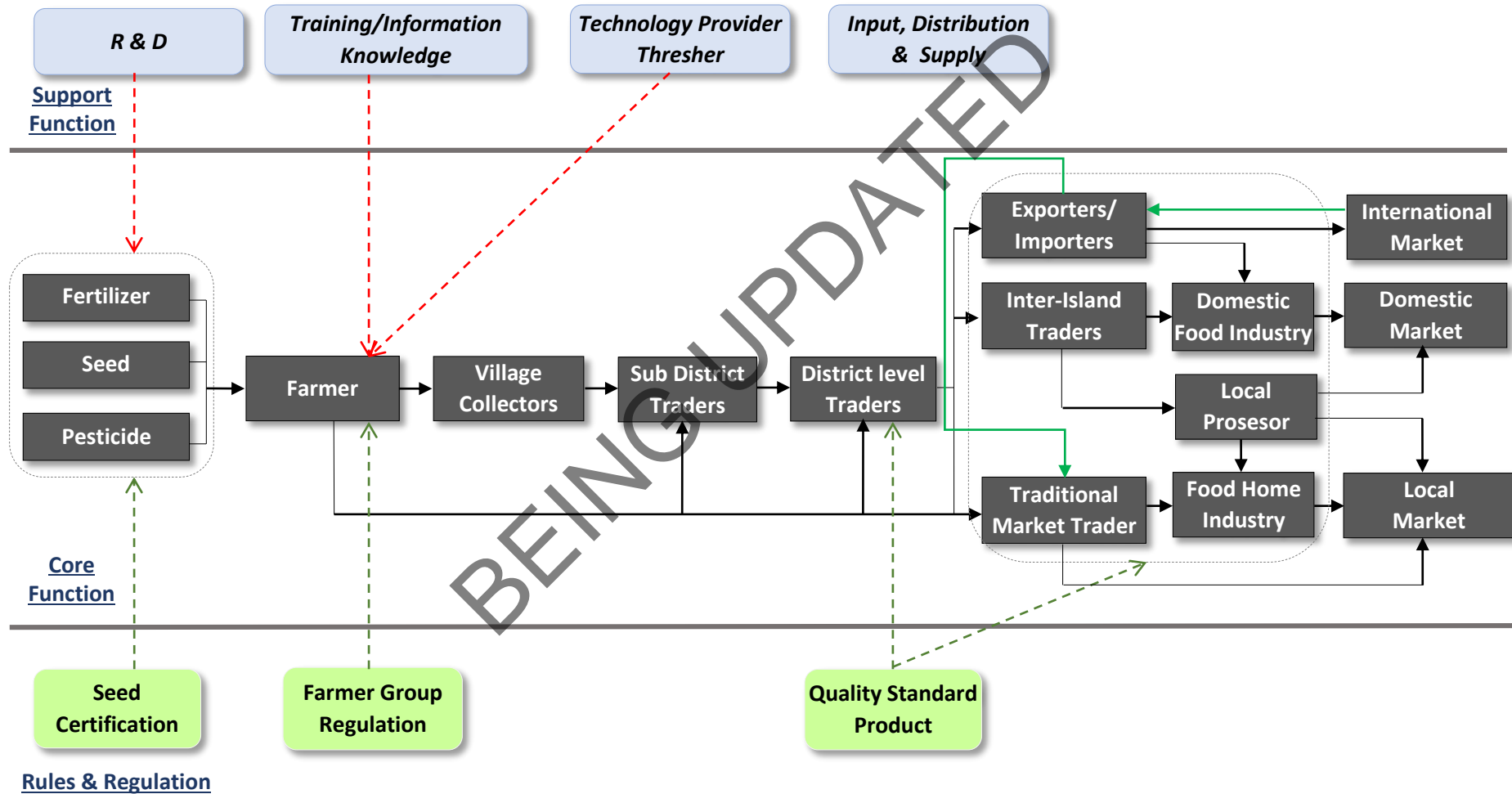
Mung bean has encouraging market potential in Indonesia. Large scale processed food and beverage companies are displaying strong demand for mung bean every year. Due to declining production in Indonesia, such actors are turning towards imported mung bean to meet their needs. Imported mung bean (e.g. from Australia) is also available, in the major markets, directly to individual consumers.

With respect to demand, Indonesia's growing population and a market that is far from becoming saturated, creates potential to both substitute import and add value at various stages in the value-chain via increasing production and quality of mung bean.

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3.2.2 Sector map

Figure 8: Sector map



3.2.3 Core value chain

Inputs

There is a complete absence of quality mung bean seeds in East Java; suppliers of quality seeds are yet to enter the market. Farmers also do not typically retain seed from the previous harvest; when they do, the quality (of seed) is almost always compromised. When farmers need seed, they buy from groceries mung bean, which is meant for consumption and which does not qualify as “seed” in terms of quality and other critical features.

Fertiliser is largely subsidised in Indonesia. At present subsidized fertiliser scheme is based on a price-subsidy system, distributed by using the enclosed pattern of ‘Definitive Plan Needs Group’ (RDKK)¹⁴. Although subsidised fertiliser is believed by many to be contributing positively to agriculture in general (Kementan, 2010), significant problems prevail in distribution of the subsidies and in implementation of the system as a whole. **Non-subsidised fertiliser is also available in the market, but farmers find the non-subsidised fertiliser too costly to use with low value crops such as mung bean.**

Fungicides, herbicides, and pesticides are widely available in the market, but there is a general lack of knowledge, interest and demand among farmers for using correct inputs judiciously to boost mung bean production.

Production and post-harvest

Minimizing costs and effort dominates Farmers’ mung bean cultivation methods. Farmers generally do not use appropriate quality and quantity of inputs to grow mung beans in East Java. They, for example, mostly rely on residual fertiliser in the soil from the previous crops (commonly rice paddy¹⁵). Invariably this results in sub-optimal application of fertiliser, inadequate supply of nutrients to the plants and consequently sub-optimal production of mung bean. **There are already examples in East Java that demonstrate that mung bean can be much more profitable than currently perceived by the majority of unaware farmers.** Results from the demonstrations are very encouraging. In Sidoarjo, for example, farmers applied better practices and good quality retained seeds and as a result production went up to 3.2 MT/ha as opposed to the average productivity of 1.2 MT/ha in east Java. Quality of mung bean, in terms of size, colour, and vigour, is also superior in Sidoarjo. The government plans to extend the demonstration in an area of around 50 hectare in 2015.

Production of mung bean requires several post-harvest procedures. Harvesting is done manually as are most post-harvest activities, such as drying, thrashing and cleaning, using

¹⁴ Source: “Studi Pendahuluan: Rencana Pembangunan Jangka Menengah Nasional (RPJMN) Bidang Pangan dan Pertanian 2015-2019”.

¹⁵ <http://cybex.deptan.go.id/penyuluhan/pemupukan-pada-tanaman-kacang-hijau>.

traditional technologies (e.g. cleaning with traditional tools like *tampi/tampah*¹⁶). The maximum number of harvests per year depends on the bean variety and usually varies between one and three.

Farmers in Sidoarjo have access to ‘grinding’ facilities which are used to remove mung bean seeds from their pods and other unwanted elements. Farmers pay IDR 20,000 per 50 Kg of processed mung bean. They also dry the mung up to 8-10% water level before storing it in Sidoarjo¹⁷

Trade

There are many different kinds of actors involved in mung bean trading. **In general, there are no large-scale buyers who are big enough to have noteworthy influence on the market. Big players in the food-industry and exporters do not usually require big amount of mung bean, hence can easily buy mung bean from the open market via traders.** Thus, they do not invest in a dedicated supply chain of mung bean.

Farmers primarily sell mung to village collectors and secondly to sub-district and district level traders. Farmers also sell mung bean to traditional local traders who sell it directly to consumers in the local markets as well as to small home-based food processors in the locality. The district traders sell mung bean to the inter-island traders who then cater to the domestic market and the national food processing industry, besides the local home-based food-processors. Exporters predominantly source mung bean from district level traders, obtaining very little directly from farmers. Exporters undertake grading and sorting, where the mung bean is separated according to colour and size requirements prior to export. Many of those exporters also import mung bean and supply to the domestic food industry and to the local markets.

Processing

Some large processed-food and beverage companies use mung bean as a major ingredient in low calorie milk, baby food, fresh drinks and *hun kwe* flour amongst others. In East Java, food companies that use mung bean include PT Indofood Sukses Makmur (to produce baby food), CV HunKwe Cap Enam (Hankwe flour), PT Garuda food, Putra Putri Jaya (nuts and snacks), PT Ultra Prima Abadi (energy drinks), and PT Nestle Indonesia (baby food). The aforementioned companies also buy imported mung bean to cover shortages in supply outside harvest seasons or when local mung bean does not meet their quality standards.

In the small industry scale, mung bean is commonly processed into porridge; and beverages like *wedang ronde*, mung bean juice, mung bean drinks; cakes such as mung bean *bacang*, *yangko*, *gandasutri*, *kue satu*, *bakpia*, *onde-onde*; mung bean *rempeyek*, *bakpau*; and biscuits. **The local home-based food and snack producers use mung bean for onde-onde, bakpia, bean sprouts, and other food products.** Peeled mung bean is traded for the

¹⁶ Traditional tool made from woven bamboo, round-shaped, used to winnow paddy or rice from its bran with the help of the wind. Also can be used to dry the paddy up.

¹⁷Ume Humaedah, Legumes and Tubers Researcher Center (<http://cybex.deptan.go.id/penyuluhan/panen-dan-pasca-panen-kacang-hijau>).

home-based food processors, usually for making cakes. Peeling factories are located in Pasuruan/Malang. There are factories in Surabaya that also produce mung bean flour (Hunkwe 6).

Different kinds of processed food require different types and quality of mung beans. Dull coloured varieties that can be cooked quickly and swell easily are suitable for porridge, while the small and shiny varieties are used for bean sprouts as they produce more shoots.

3.2.4 Supporting functions

Distribution of quality mung bean seed on a commercial basis does not exist in East Java. With only a few exceptions like in Sidoarjo, farmers in general do not (or cannot) retain mung bean seed. They actually actively look for better quality seeds before the sowing season. In absence of a proper supply chain (production / sourcing and distribution) for mung bean seed, farmers settle with an easier way of buying mung bean (that is actually sold for consumption) from the traditional market (and from groceries) and using that as seed. In the agro input market, the input sellers do not deal with mung bean seed.

Research and development facilities are weak for mung bean in Indonesia. Asian countries that transformed mung bean from a marginalised crop into a profitable cash crop, relied heavily on highly productive mung varieties and practices, developed and promoted by their domestic R&D facilities and related stakeholders (e.g. AVRDC and its development partners). Improved varieties that are developed in Indonesia are also not properly promoted and distributed to the farmers in the absence of a seed supply chain.

Information regarding better cultivation practices, improved seeds and the overall potential of mung bean as a more profitable cash crop is not actively supplied by any actor in the market; except for the efforts, albeit very limited and often unsustainable, by the government. This provokes to lack of motivation and poor effort from the farmers when they grow mung bean. Interestingly, farmers in general, and particularly the poor and smallholder farmers, consider mung bean an essential crop they should grow, but due to the limited information mentioned above, they adhere to traditional practices and beliefs regarding mung bean as nothing more than a low-return crop. In order to attract farmers' interest in mung bean, the Government of East Java province organised mung bean demonstration plots in 5 districts (Sidoarjo, Gresik, Lamongan, Bojonegoro, and Pasuruan) comprising 2 hectares of land. The Government provided the demonstration with seed varieties (selected specifically for each location's environmental characteristics) and fertiliser.

Financial products, services or schemes offered to mung bean farmers are too few. Financial institutions, amongst other service providers, regard mung bean as a low importance crop compared to other crops such as rice.

Post-harvest services and storage services for mung bean are also underdeveloped in East Java; in many places absent altogether. There is no storage facilities that could ensure proper post-harvest handling and maintain supply continuity for the food processing industries during the off season.

3.2.5 Supporting rules and regulations

The East Java Government's policies and development agendas (2009-2014) state that developing agroindustry / agribusiness and building and improving agriculture infrastructure have been identified as key tools for boosting economic growth¹⁸. Revitalization of agriculture is envisioned by the following:

- Empowering farmers and improving the supporting institutions;
- Improving productivity, competitiveness, and value-additions of agricultural products;
- Improving agroindustry and agribusinesses; and
- Improving food security.

However, mung bean is not considered nationally to be a strategically important crop. In the framework of the national program for food sovereignty, the Government's agriculture programs currently target rice, corn and soya bean.

Rules and regulations related to seed certification, formation and operation of farmer groups etc, in practice, do not affect the sector positively; for there is no such 'mung bean seed' market, and as farmer groups seldom work around mung bean as an important crop.

Rules related to food safety and compliance as well as rules connected to export and import have an impact on the sector, as mung bean is widely used in processed food products and is also traded in the international markets.

4. Analysis

This section analyses the sector-specific problems, underlying causes and the weaknesses in support functions, rules and regulations. Discussion follows the Intervention Logic Analysis Framework (ILAF) which is summarised in tabular form in Annex 1.

4.1 Problems in the core function and underlying causes

4.1.1 Problems affecting farmers

The overarching problems (or rather the "symptoms") faced by mung bean farmers in East Java are low productivity and inferior quality of harvested mung bean. This also leads to low incomes from, and consequently low interest in, mung bean cultivation. The specific problems faced by farmers and their underlying causes can be summarised as follows:

¹⁸Source: RPJMD Propinsi Jawa Timur 2009-2014
(http://blh.jatimprov.go.id/index.php?option=com_docman&task=doc_view&gid=9&Itemid=131)

- Mung bean farmers do not apply fertilizer, cannot control pest attacks, do not use appropriate sowing techniques and overall do not apply best agricultural practices.
- Mung bean farmers rarely have knowledge of best cultivation practices; they seldom seek out such knowledge as they are not aware of the benefits better practices bring.
- There is limited dissemination of information regarding best practices in mung bean cultivation and the untapped potential of mung bean for the farmers.
- There is demand for good quality seed from mung bean farmers, but the supply of quality seed is extremely limited.
- Mung bean farmers do not apply optimal threshing and drying practices due to the limited availability of threshing and drying services in the market.

Farmers do not apply fertiliser to mung bean plantations. As explained in previous sections, **mung bean farmers tend to rely on the residual fertiliser in the land from the previous crops (usually paddy).** Although mung bean adds nitrogen to the soil which is better for the cereal crops grown after mung bean, residual fertiliser from the previous crop is insufficient for mung bean cultivation.

Farmers do not always have the knowledge of proper cultivation practices of mung bean. Mung bean has a reputation for being a low-cost, low-maintenance, low-return, short-duration, interval crop which makes it an essential and frequently used low-investment cash crop for poor farmers. Paradoxically, for those features of mung bean, it remains a low-importance crop for farmers in terms of their investment decisions. Improving select farming practices while adopting better seeds and inputs has the potential to increase mung bean production significantly, without becoming cost prohibitive for poor farmers. However, this knowledge is not widespread among the farmers.

There is minimal effort from the government and private sector actors to disseminate information and raise awareness about mung bean production. Both subsidised and unsubsidised fertiliser distribution networks mostly target rice and other major crops, disregarding mung bean. **The same is true for other inputs such as pesticides, herbicides and fungicides.** Chiefly, farmers do not use such inputs, despite the negative impact it may have on yields, as they cannot justify the cost. Private sector input providers do not target mung bean farmers, although in general, the products are available in the market.

Products such as mung bean seed-sowing tools, which could be used to optimise yields, are not available in the market, mostly due to low or no demand. **Demand for good quality seed exists amongst most of the farmers; but there is no supply.** No major seed company has mung bean seed in their portfolio. Input retailers do not always sell mung bean seed in their shops. Farmers buy mung bean from grocery stores (meant for consumption) for use as seed. Some advanced farmers (in Sidoarjo, for example) retain seed from previous harvests but most other farmers are either unable or unwilling. Although the research centre in Balitkabi in East Java has been able to develop several superior varieties of mung bean, there is little effort for promoting those varieties among farmers and making the seeds commercially and sustainably available to the farmers.¹⁹

¹⁹List of 'qualified' seeds will be attached separately in the next iteration

Farmers do not apply best post-harvest practices; impacting product quality and their income. Farmers have insufficient knowledge about proper drying and other good post-harvest handling practices. However, irrespective of awareness, mung bean threshing and drying services are not available in the market, except for Sidoarjo.

4.1.2 Problems affecting farmers via other actors

There are problems and underlying causes faced by the other market actors that have knock on impacts on mung bean farmers. Two key issues affecting the farmers due to the problems faced by the market actors are summarised below:

- Agro-input shops do not sell mung bean seeds as few seed producers produce it. Seed producers do not produce mung bean seed as they are not assured of the demand and profit. Farmers cannot use quality seeds as a result.
- Mung bean traders and industrial buyers in Indonesia import mung bean as they do not get a year-round supply of quality mung bean from the national market. This in the off-season increases potential competition for the farmers.

Seed producers are not assured of the market potential for mung bean seed. They are risk averse and consider mung bean seed as a low-profit product for their portfolio. Seed companies also do not get seed producers who can produce mung bean seed for them. Input sellers neither get mung bean seed from the companies nor from the seed producing farmers. This results in the absence of quality seeds available in the market for the farmers.

Mung bean traders and industrial buyers in Indonesia do not get a year-round uniform supply of locally produced mung bean. Quality of Indonesian mung bean also fluctuates which leads to increased imports of mung bean. Farmers face increased competition and perceive the market price unfavourable, which often goes down because of the import. This coupled with limited availability of storage and post-harvest facilities discourage farmers from increasing the quality and yield of mung bean and stocking a portion of the yield to sell at a better price in the off season.

4.2 Weaknesses in services, rules and regulations

Key weaknesses in services, rules and regulations (also mentioned in the ILAF table - annex 1) are elaborated in this section and are also summarised in the box below.

- Government extension services exhibit limited knowledge and insufficient resources to promote best agricultural practice in mung bean cultivation.
- Relevant private sector actors do not disseminate knowledge or provide extension services to mung bean farmers.
- A limited number of mung bean seed producers and companies, and weak distribution channels exist within the sector.
- Limited information is available to the input and post-harvest service providers regarding the market potential for their products / services within the sector.

The Government extension services for agriculture, with limited resources, focus only on the priority crops. Quite understandably, **mung bean is not one of those in the priority list of the government**, for it is still a secondary source of income for most of the farmers. There are, however, examples in one district in East Java where the district agro-extension department successfully worked with mung bean farmers, addressing the key constraints of the farmers and increasing the productivity and quality of mung bean. Mung bean became one of the major sources of income for the farmers benefitted by the government efforts. It is however not evident how to replicate that model in other districts in East Java. Replication would be heavily dependent on the willingness and capacity of the extension agencies in each district.

Relevant private sector actors including input companies, input-sellers, manufacturers of post-harvest tools and agricultural service providers do not provide any extension service to mung bean farmers. Demand for inputs, such as fertiliser, herbicides and pesticides, tools such as sowing, threshing and drying machines and post-harvest services, is very limited despite the vast number of mung bean farmers. The private sector actors do not try to explore the untapped market potential of their products and services for mung bean cultivation.

There are improved seed varieties developed by the government research institutes in Balitkabi, however, those seeds are not multiplied, promoted or distributed to an extent that can positively affect farmers. A commercial model has yet to be trialled which could sustainably supply those seeds to farmers. **The typical small-scale seed producers are more interested in waiting for the demand of seed from the government, if any, than trialling commercial models for selling seeds. They do not produce mung bean seeds as the government also does not demand it.** They also do not have the market intelligence to understand the demand and lack capacity in distributing seed to the farmers. **Large seed companies focus on major field crops and vegetable and do not have mung bean in their portfolio.** They do not ask their network of seed producers to produce mung bean seeds for them, although they have established strong distribution channels in East Java for other seeds. Despite the low importance given to mung bean by the farmers themselves, one item they always look for is seed, which remains absent in the market.

Generally, all input and service providers have limited understanding of the potential for their products and services among mung bean farmers. The whole sector is suffering from a “low-importance syndrome”; despite the fact that the farmers, particularly the small-holder farmers, are most likely to continue with mung bean production because of the unique features of the crop (as explained earlier, mung bean is a perfect interval crop which is short-duration, low-cost, high-in-nutrition and also increases soil-fertility). Input and service providers do not seem to be interested yet in crafting a ‘win-win’: selling their products and services to additional farmers (increased market penetration and revenue) through helping farmers to grow more with better inputs and (embedded) services.

4.3 Cross cutting issues (gender and environment)

Women play an important role in all stages of mung bean production.²⁰ Based on the discussions between the project team and farmers, women are involved in taking decisions throughout the season; including post-harvest activities, selling mung bean and saving the proceeds of mung bean sales to provide money for cultivation and household expenditure. Women typically play a more significant role in the post-harvest activities and selling of mung bean than male farmers. In many countries in Asia, the inclusion of mung bean in diets had a significant impact on reducing malnutrition of poor anaemic women and children.²¹

Mung bean cultivation is beneficial to soil- health. It increase the natural soil fertility by adding nitrogen to the soil. Mung bean also requires less water. Cereals grown after mung bean are likely to require less fertiliser and yield better.²²

5. Strategy for change

5.1 Market potential

Mung bean has encouraging market potential in East Java. It may sound paradoxical since the production of mung bean and the area harvested have been decreasing in East Java, and nationally, over the last decade. However, **it remains a common crop grown by a huge number of small-holder farmers in the Java Island.** As explained earlier, mung bean is a low cost cash crop for them. It is a short duration crop, does not require much water, and can be grown in dry season as an interval crop. Mung bean is easy to grow in less fertile soils and is widely used in crop rotation due to its ability, as with most legumes, to increase soil fertility for subsequent crops by adding nitrogen to the soil. In addition, mung bean is valued by poor farmers and other consumers as a cheap source of easily digestible protein and minerals. All those features combined in one crop, mung bean is naturally a widely grown crop. **Given more importance, and grown with better seeds, fertiliser and improved practices, mung bean can markedly increase the income of poor farmers without significantly raising the cost. Productivity of mung bean has increased in Indonesia and can increase more particularly in East Java.**

Demand for mung bean is increasing in Indonesia, particularly by the food processing and the beverage companies. Increasing trends in both price and import data demonstrates strong domestic demand. **Increased production, improved post-harvest handling and storage can meet the increasing domestic demand of mung bean and help substitute imports.** There is also strong potential to increase exports of mung bean in future to meet the strong international demand.

²⁰ More insights into the cross cutting issues in mung bean will be included in the next iteration

²¹ DFID, AVRDC. 2009, Counting on beans: mung bean improvement in Asia; http://r4d.dfid.gov.uk/PDF/Outputs/AVRDC/DFID_impact_case_study_Mungbean_FINAL%5B1%5D.pdf

²² Schalleitner, Roland et. al., The AVRDC – The World Vegetable Center mung bean (*Vigna radiata*) core and mini core collections; <http://www.biomedcentral.com/1471-2164/16/344>

Following tables estimate the market potential in scenarios following different the interventions.

Table 2: Market potential for introduction and usage of quality seeds

Description/Years	Total Business in The Target Area (s)
Existing Production (MT)	17,353
Potential New Production in Existing Areas (MT)	3,471
Total Potential Production (MT)	20,824
Average Selling Price Mung Bean per kg (IDR)	10,000
Current Value of Production (million IDR)	173,533
Total value of potential production (million IDR)	208,239
Total value of potential production (AUD)	20,823,905
Total potential value of increased production (million IDR)	34,707
Total potential value of increased production (AUD)	3,470,651

Table 3: Market potential for introduction/usage of planting tools

Description/Years	Total Business in The Target Area (s)
Existing Production (MT)	17,353
Potential New Production in Existing Areas (MT)	5,206
Total Potential Production (MT)	22,559
Average Selling Price Mung Bean per kg (IDR)	10,000
Current Value of Production (million IDR)	173,533
Total value of potential production (million IDR)	225,592
Total value of potential production (AUD)	22,559,230
Total potential value of increased production (million IDR)	52,060
Total potential value of increased production (AUD)	5,205,976

Table 4: Market potential for introduction/usage of on farm post-harvest management tools

Description/Years	Total Business in The Target Area (s)
Existing Production (MT)	17,353
Potential New Production in Existing Areas (MT)	-
Total Potential Production (MT)	17,353
Average Selling Price Mung Bean per kg (IDR)	11,500
Current Value of Production (million IDR)	199,562
Total value of potential production (million IDR)	199,562
Total value of potential production (AUD)	19,956,242
Total potential value of increased production (million IDR)	-
Total potential value of increased production (AUD)	-

Table 5: Market potential for education and training of cultivation technique, and proper post-harvest management

Description/Years	Total Business in The Target Area (s)
Existing Production (MT)	17,353
Potential New Production in Existing Areas (MT)	6,941
Total Potential Production (MT)	24,295
Average Selling Price Mung Bean per kg (IDR)	11,000
Current Value of Production (million IDR)	190,886
Total value of potential production (million IDR)	267,240
Total value of potential production (AUD)	26,724,011
Total potential value of increased production (million IDR)	76,354
Total potential value of increased production (AUD)	7,635,432

5.2 Vision of change

Focusing on achieving the potential outlined above for the mung bean sub- sector in East Java, a vision of change can be outlined for both the sub-sector and service levels.

The vision of change at the Sub- sector level

To increase incomes of mung bean farmers in East Java by improving the quality and productivity through ensuring availability and usage of appropriate inputs and proper cultivation techniques

Vision of Change in Service Level

At the service level, it is envisaged that:

- Seed industry actors supply quality mung bean seed and embedded services to educate farmers about better cultivation practices.
- Fertiliser and pesticide companies promote better cultivation practices and proper usage of their inputs to farmers
- Agro tool companies promote appropriate tools (planting, threshing etc.) and provide embedded services to educate farmers about better practices and application of the tools.
- The Government improves their support for mung bean farmers

5.3 Interventions

To unlock the potential of the mung bean sub-sector in East Java for the benefit of poor farmers, by improving the service markets in the support functions, the following interventions are proposed -

- **Intervention 1:** Assist the seed producers and suppliers in producing, distributing, and promoting quality mung bean seeds in East Java.
- **Intervention 2:** Assist fertiliser and pesticide companies in promoting the application of fertiliser (particularly, micronutrients and compost), appropriate pest control solutions, and better farming practices for mung bean cultivation.
- **Intervention 3:** Assist the local agro-tool producers in promoting appropriate sowing tools for mung bean
- **Intervention 4:** Assist the public extension agencies in promoting the existing and successful extension model for mung bean to other districts
- **Intervention 5:** Assist local agro-tool producers/ agents in promoting threshing services for mung bean

Intervention 1 - Assist the seed producers and suppliers in producing, distributing, and promoting quality mung bean seeds in East Java: Under this intervention the project will initially assist the local seed producers in assessing the untapped market potential of mung bean seeds. Once the potential is understood, they will be assisted in expanding their existing seed production. The intervention will also facilitate the distribution and promotion of mung bean seed through input retailers and suitable distribution agents. Embedded information services will also be promoted with seeds. At a later stage this model will be replicated with other seed producers and retailers. The project will also start negotiating with large seed companies to scale up the model in future.

Intervention 2 - Assist fertiliser and pesticide companies in promoting the application of fertiliser (particularly, micronutrients and compost), appropriate pest control solutions, and better farming practices for mung bean cultivation: The project will work with fertiliser and pesticide companies to develop a business model targeting the mung bean farmers, who are large in number but yet to be considered as clients of the companies. It will pilot the model with at least one company, stimulating the use of micronutrients-fertiliser, compost and pest control solutions appropriate for mung bean. The partner will also disseminate knowledge on better cultivation practices to the farmers through distribution agents and demonstrations. Besides expanding with the same partner, additional partners will be added as the project progresses to scale-up the intervention.

Intervention 3 - Assist the local agro-tool producers in promoting appropriate sowing tools for mung bean: As part of promoting improved cultivation practices, the project will facilitate the production and promotion of sowing tools for mung bean with the local agro-tool producers. Such basic tools, along with simple changes in cultivation practices, can make significant improvements in yield. To scale-up the intervention, the project will work with additional agro-tool producers in future.

Intervention 4 - Assist the public extension agencies in promoting the existing and successful extension model for mung bean to other districts: The project will work with the provincial and district level public agencies to replicate the existing models of public extension service successfully targeting mung bean farmers in the Sidoarjo district in East Java. The project will try to facilitate a system where the provincial government, will fund and guide the district agencies to replicate the model. The project will also assist the district agencies in better implementing the model.

Intervention 5 - Assist local agro-tool producers and agents in promoting threshing services for mung bean: This intervention will promote better post-harvest practices and increase the quality of mung bean prior to sale, resulting in better returns for the farmers. It envisions a commercial model of threshing services for mung bean farmers. The project will work with local agro-tool producers and potential providers of commercial threshing services to conduct a pilot first. Gradually, the number of service providers and agro-tool producers will be increased to scale-up the intervention.

5.4 Sequencing and prioritization of intervention

Figure 9: Sequencing and prioritization of intervention

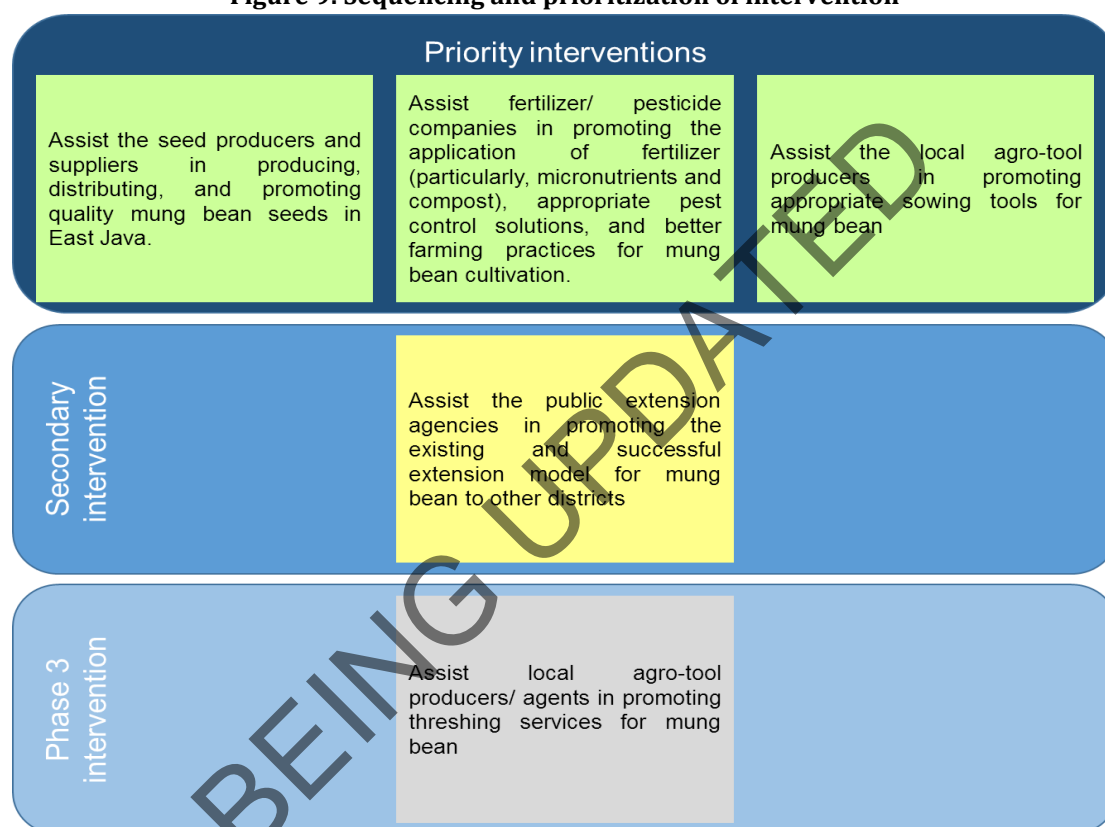
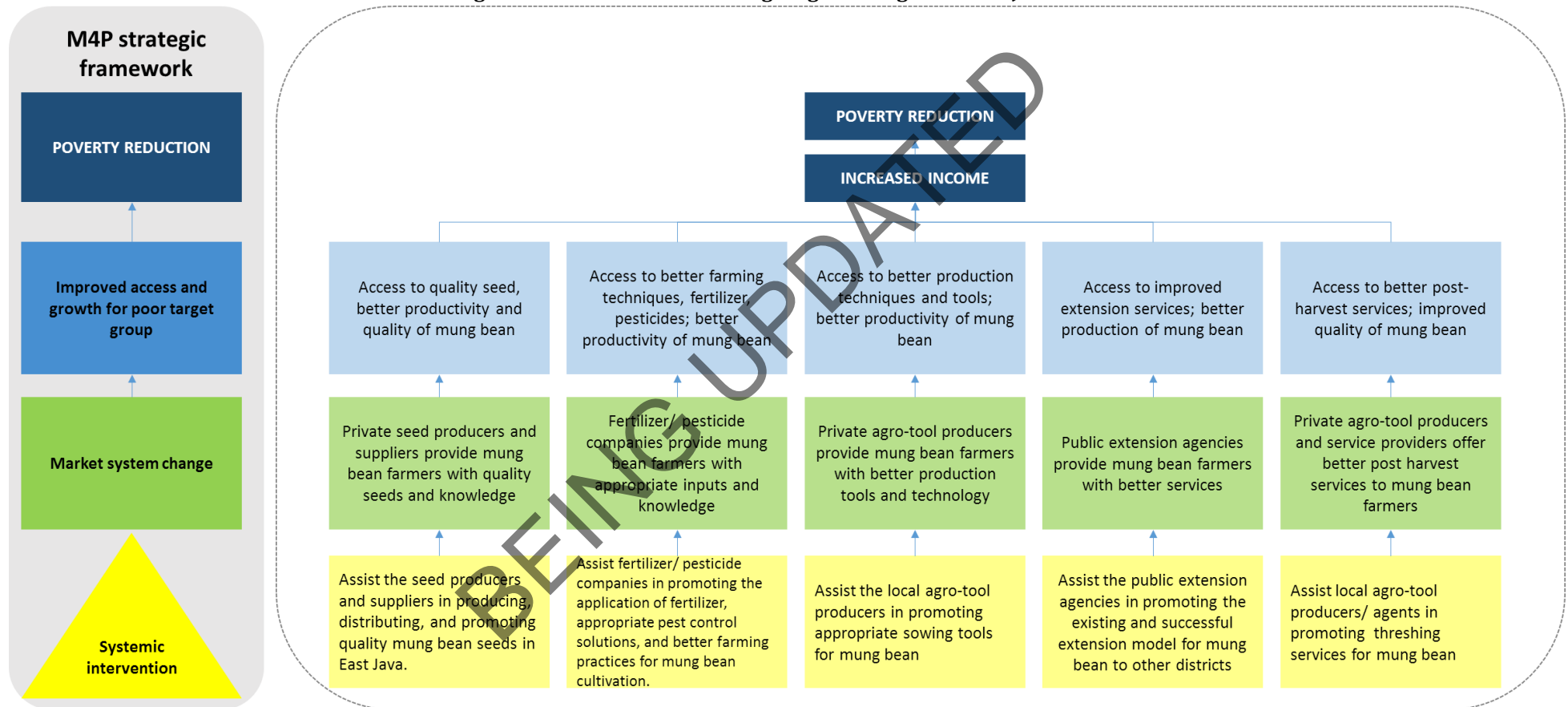


Figure 9 depicts the sequencing and the prioritization of the interventions. Three interventions, that focus on increasing the productivity by better availability and application of inputs, technology, and practices, are prioritised in the first tier of implementation. Besides working with the private sector, the intervention with the public extension services is designed as a secondary line of effort to boost the yield of mung bean. Finally, the intervention related to better threshing services is designed for future implementation: with an anticipated success of the production related interventions and the consequent increase in the demand for post-harvest services.

5.5 Sector vision of change logic

Figure 10: Sector vision of change logic - mung bean East Java



Annex 1: Summary table - intervention logic analysis framework (ILAF) - mung bean east java

(1) Problem/Symptom	(2) Underlying Cause	(3) (4) Supporting function/Rules	(5) Weaknesses	(6) Intervention	(7) Service Providers / Partners
Low productivity and quality					
Why-1 Farmers do not use fertiliser. - Farmers do not have knowledge on better cultivation practices. - Farmers are not aware of benefit for applying better practices.	Limited provision of information on better cultivation practices and its benefit for mung bean yields.	Information knowledge technology services Extension services District policy.	Limited knowledge and resource of government extension services. No provision from relevant private sector actor.	Support the promotion of fertiliser (micronutrients and compost)/pesticide usage and improve cultivation practices by fertiliser / pesticide companies for mung bean farmers in East Java.	Fertiliser / pesticide company. Fertiliser / pesticide agents / distributor. District government.
Why-2 Farmers cannot control pest attack. - Farmers do not have knowledge on better cultivation practices. - Farmers are not aware of benefit applying on better cultivation practices.	Limited provision of information on better cultivation practices and its benefit for mung bean yields.	Information knowledge technology services.	Limited knowledge and resource of government extension services. No provision from relevant private sector actor.	Support the public extension agencies in promoting the existing successful extension model to other districts.	
Why-3 Farmers do not apply appropriate sowing technique	Limited provision of information on better cultivation practices and its	Information knowledge technology services	Limited knowledge and resource of government extension services.	Support the promotion and usage of sowing tools by the local	Agro-tool producers Agro tool agents/distributor

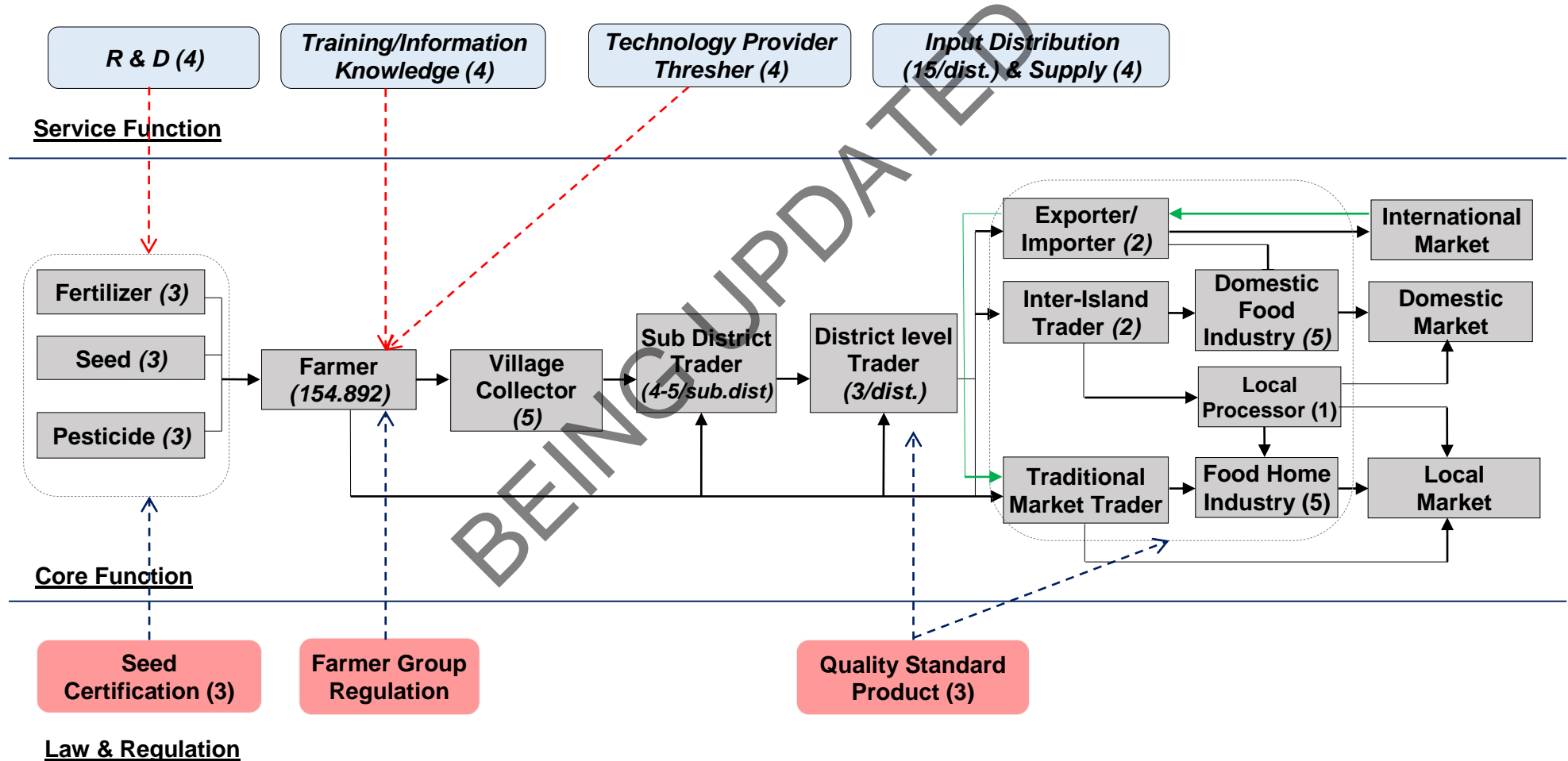
(1) Problem/Symptom	(2) Underlying Cause	(3) (4) Supporting function/Rules	(5) Weaknesses	(6) Intervention	(7) Service Providers / Partners
<ul style="list-style-type: none"> - Farmers do not have knowledge on better cultivation practices. - Farmers are not aware of benefit applying better cultivation practices in mung bean. - Farmers do not find appropriate sowing tools available in the market. 	<p>benefit for mung bean</p> <p>Limited availability of sowing tool.</p>	<p>Agro tool supply services.</p>	<p>No provision from relevant private sector actor.</p> <p>Agro tool producers are unaware of potential of sowing tool.</p>	<p>Agro tool producers for mung bean farmers (men and women in East Java)</p>	
<p>Why-4 Farmers do not use good quality seeds.</p> <ul style="list-style-type: none"> - Farmers do not find good quality seed available in the market. - Farmers do not know how to produce good quality of seed 	<p>Seed producer are unaware of the market potential of mung bean seed</p> <p>Limited provision of information how to produce good quality of seed</p>	<p>Seed supply and distribution service.</p>	<p>Limited information regarding on market potential.</p> <p>Limited number of seed producer.</p> <p>The absence of seed distribution channel.</p>	<p>Support the supply, promotion and usage of good quality of seed by local seed sellers and seed producers for Mung Bean farmers in East Java.</p>	<p>Seed producers.</p> <p>Seed Sellers.</p>
Poor post-harvest handling further deteriorating the quality					
<p>Why Farmers do not apply good threshing and drying practices</p>	<p>Limited provision of information regarding good post-harvest</p>	<p>Information knowledge technology services</p>	<p>Limited information regarding on market potential</p>	<p>Support local agro tool producers/ agents to promote the supply and</p>	<p>Thresher.</p> <p>Farmer Groups.</p>

(1) Problem/Symptom	(2) Underlying Cause	(3) (4) Supporting function/Rules	(5) Weaknesses	(6) Intervention	(7) Service Providers / Partners
<ul style="list-style-type: none"> - Farmers do not find threshing services available in the market. - Farmers do not have enough knowledge about proper drying and other good post-harvest handling practices 	<p>techniques including threshing and drying</p> <p>Limited availability of threshing services</p>	<p>Threshing services</p>	<p>for threshing service.</p> <p>Limited supply of threshing machines.</p> <p>Agro tool producers are unaware of potential of threshing services.</p>	<p>usage of threshing services.</p>	<p>Agro tool producer company.</p> <p>Agro tool agents/distributor.</p>

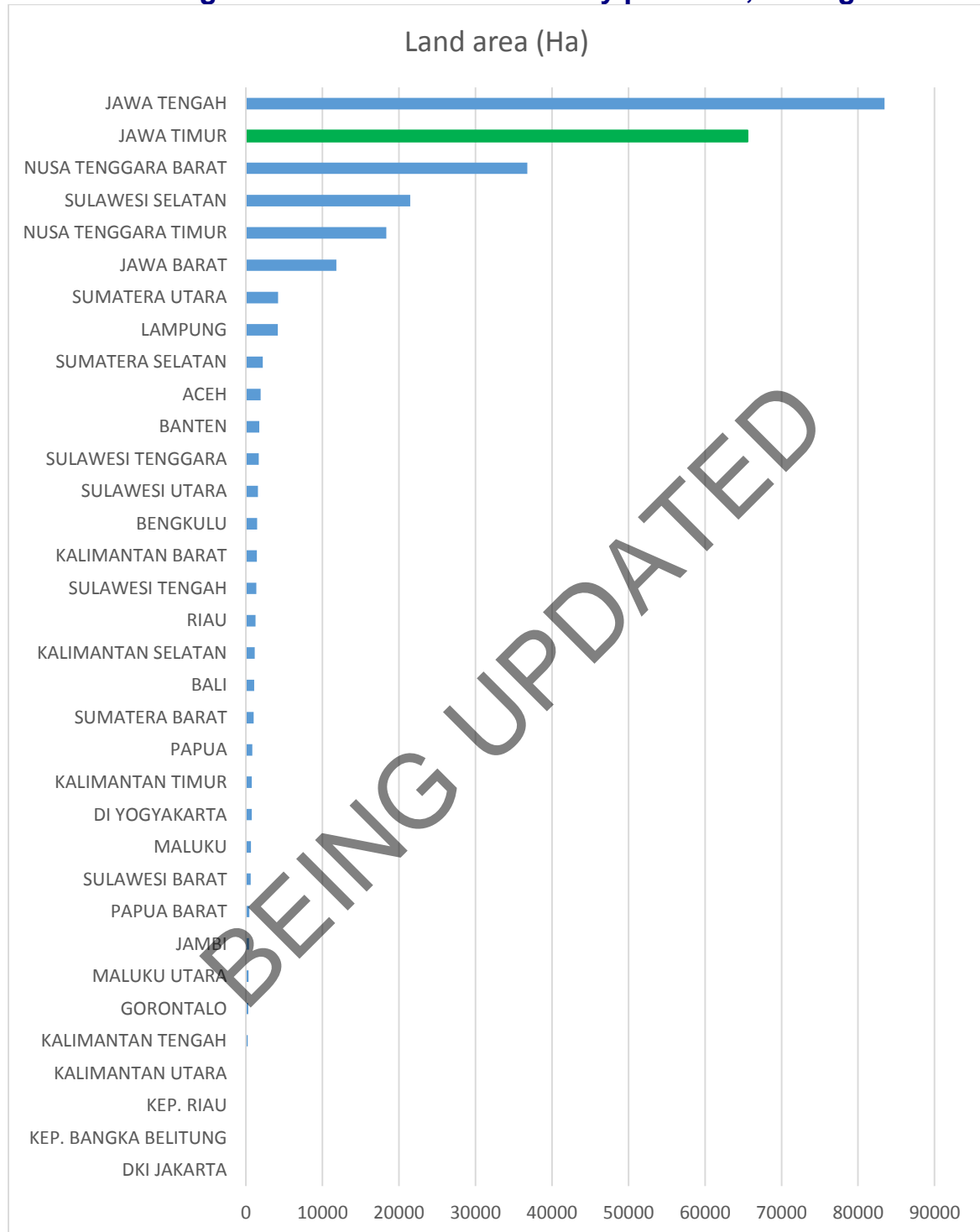
BEING UPDATED

Annex 2: Sector map with additional information

The figure below furnishes additional information (number of actors) to the sector map in Section 3.2.2. More information will be added in the next iteration.



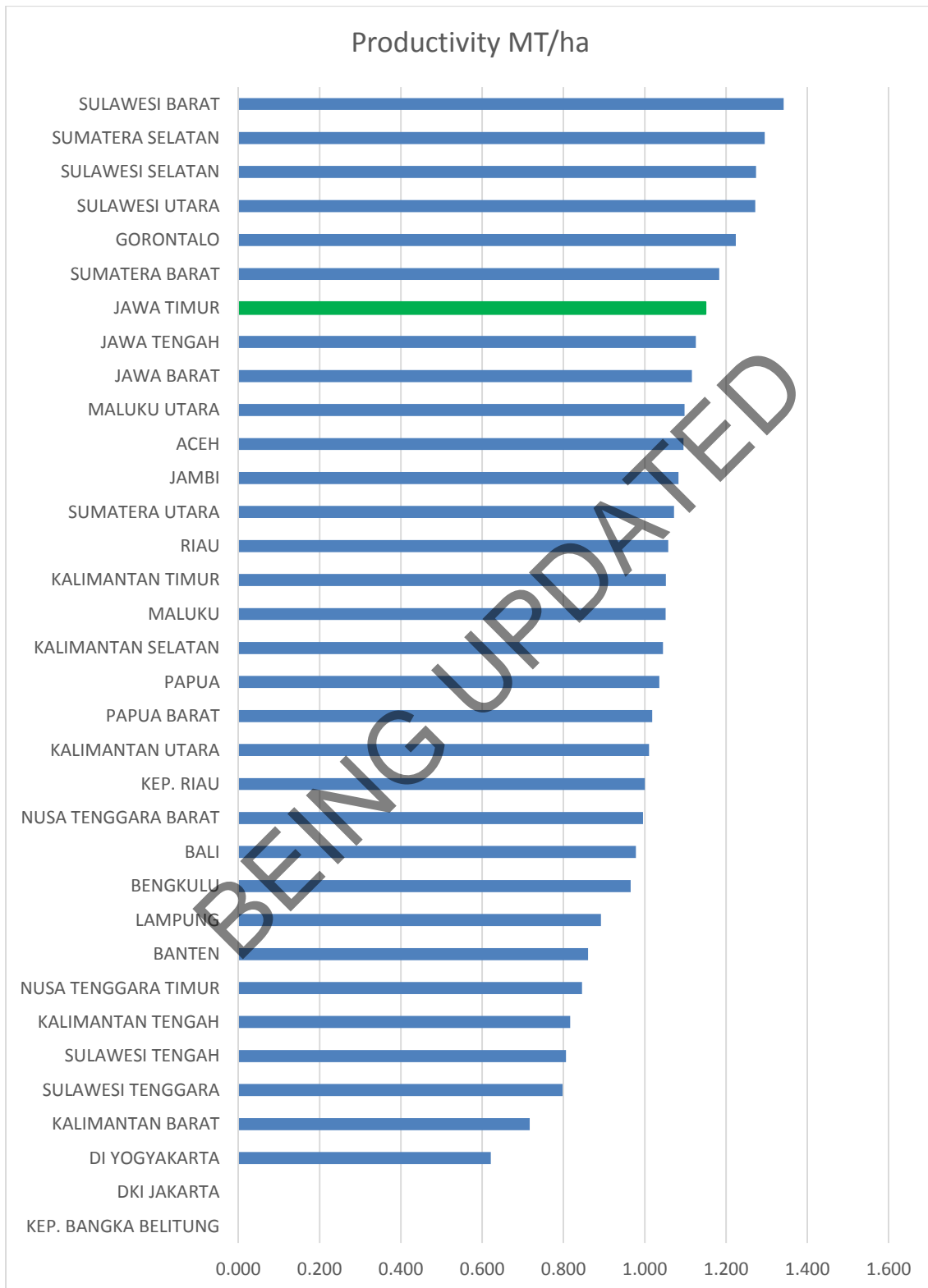
Annex 3: Mung bean total area cultivated by province, average 2005-2014



Annex 4: Mung bean production by province, annual average 2005-2014



Annex 5: Mung bean productivity by province, average 2005-2014



Annex 6: Cost comparison of damp paddy, field paddy, corn, soybean, peanut, mung bean, cassava, and sweet potato production (in million rupiah)

Source: Foods and Crops Sub-Unit, RPJMN 2015-2019.

Production Expenses	Damp Paddy	Sweet Potato	Cassava	Peanut	Field Paddy	Corn	Soybean	Mung bean
Others	0.467	0.446	0.344	0.278	0.255	0.310	0.255	0.153
Agriculture Service	1.049	0.577	0.596	0.314	0.505	0.514	0.363	0.163
Pesticide	0.281	0.026	0.047	0.080	0.148	0.138	0.259	0.259
Tool Rent/Business Facility	0.532	0.414	0.459	0.351	0.387	0.253	0.176	0.271
Seeds	0.537	0.964	0.759	1.222	0.497	0.679	0.524	0.416
Fertilizer	1.845	1.178	1.155	1.069	1.375	1.665	1.055	0.506
Land Lease	3.349	2.516	2.292	1.998	1.803	1.945	2.165	1.419
Wage	5.000	5.739	5.619	5.218	5.342	4.506	5.003	3.824
Total	13.060	11.860	11.270	10.530	10.310	10.010	9.800	7.010

Annex 7: Percentage of mung bean farmers and percentage poverty rate in regencies/cities of east java, 2013

Regency/City	Mung bean Farmer (%)	Poverty Rate (%)
Sampang Regency	24,09	26,97
Sumenep Regency	15,92	21,13
Lamongan Regency	8,58	16,12
Bangkalan Regency	7,32	23,14
Tuban Regency	6,32	17,16
Banyuwangi Regency	5,88	9,57
Madiun Regency	5,25	12,40
Bojonegoro Regency	5,17	15,95
Malang Regency	3,15	11,44
Ponorogo Regency	3,04	11,87
Mojokerto Regency	2,82	10,94
Pasuruan Regency	2,20	11,22
Gresik Regency	1,81	13,89
Pamekasan Regency	1,78	18,45
Sidoarjo Regency	1,76	6,69

Probolinggo Regency	1,53	21,12
Nganjuk Regency	0,75	13,55
Situbondo Regency	0,62	13,59
Blitar Regency	0,37	10,53
Ngawi Regency	0,32	15,38
Bondowoso Regency	0,25	15,23
Jombang Regency	0,22	11,12
Tulungagung Regency	0,20	9,03
Jember Regency	0,20	11,63
Magetan Regency	0,12	12,14
Lumajang Regency	0,11	12,09
Madiun City	0,09	5,00
Pacitan Regency	0,07	16,66
Trenggalek Regency	0,04	13,50
Probolinggo City	0,02	17,35
Surabaya City	0,01	5,97
Kediri Regency	-	13,17
Kediri City	-	8,20
Pasuruan City	-	7,57
Blitar City	-	7,39
Mojokerto City	-	6,63
Malang City	-	4,85
Batu City	-	4,75

Source: TKPKD of East Java Province 2014 dan mung bean farmers estimated (From '13, processed).

Annex 8. Investigation team

1. Buddhi Hastanti Pancarini (PM)
2. Abdul Rahman (PC)
3. Andri Afianto (FC)

BEING UPDATED

Annex 9: List of interviewees

No.	Name	Profession / Position	Position in the Market Map
<i>Kabupaten Sampang</i>			
1	Hary Setyanto	Head of Bappeda	Government Services
2	Didik Achmadi (08113408732)	Head of Bappeda Economic Division	Government Services
3	Suyono (082131607928)	Head of Technical Fields, Department of Agriculture	Government Services
4	Eko (082143334837)	Department of Agriculture	Government Services
5	Achmadi (081331936570)	Head of Natural Resources Division	Government Services
6	Kusnul Yakin (082301651477)	Natural Resources Seller	Sub-districts Collector
7	H. Abu Bakar (081703170383)	Natural Resources Seller	Inter-Regencies Collector
8	H. Amir (081939442144)	Kec. Karang Penang Head of Natural Resources Sellers' Association	Inter-Regencies Collector
9	Muh Pardi	Farmer	Production
10	Nayuki	Farmer	Production
11	Muaiyeh	Seller	Village Collector
12	Zunaidi	Farmer	Production
13	Yakin	Saprotan Seller	Input supplier
14	Sukur	Farmer	Production
<i>Kabupaten Sumenep</i>			
1	Bambang (087750155666)	Head of Sumenep Bappeda Economic Division	Government Services
2	Salaf (085232275643)	Head of Staple Food Division, Sumenep Department of Agriculture	Government Services
3	Supri (082333861861)	Staff of Staple Food Division, Sumenep Department of Agriculture	Government Services
4	Joko (085334653529; 081331874484; 081803062935)	Kec. Saronggi, Sumenep Head of UPT Agriculture	Government Services
5	Suryadi (08175018640)	Kec. Guluk-guluk, Sumenep Head of UPT Agriculture	Government Services

No.	Name	Profession / Position	Position in the Market Map
6	Tabrani (081945407333)	Kec. Saronggi, Sumenep Local Trader	Inter-Regencies Trader
7	Harianto (087860248509)	Farmer Kec. Saronggi, Sumenep	Production
8	Syaiful (085330500755)	Kec. Bluto, Sumenep Local Trader	Inter-Regencies Trader
9	Samsul (087850074332)	Kec. Bluto, Sumenep Farmer	Production
<i>Kabupaten Bangkalan</i>			
1	Ruslan 081913565781	Head of Social and Culture Division Bappeda	Government Services
2	Ronny 085230757172	Head of Economic Division Bappeda	Government Services
3	Ridwan 087849469650	Head of Programme Division, Department of Agriculture	Government Services
4	G Heri	Head of Horticulture	Government Services
5	Imam	MT Coordinator	Government Services
6	Bakri	MT Burneh	Government Services
7	Hasan	Head of Programme Division	Government Services
8	Sidin	Farmer	Production
9	H. Tapik	Seller	Inter-Regencies Collector
10	Suwondo	Medicine Seller	Input supplier
<i>Kabupaten Sidoarjo</i>			
1	Ibu Yuliati (082143455126)	Economic Division of Bappeda	Government Services
2	Bap Zulkarnain Fitri (081703923926)	Head of Food Security	Government Services
3	Rokhimin (03171342474)	Head of Farmers' Association	Production
4	Ponadi	Trader	Village Local Trader
5	Ri'yamin	Trader	Village Local Trader
6	H. Talka	Natural Resources Trader/ Saprotan Seller	Input Supplier
7	Cak Lan	Machine of mung bean production rental	Processing Service
8	Umi (Porong)	Saprotan Seller	Input Supplier
9	Toko Tani Jaya (Porong)	Saprotan Seller	Input Supplier
<i>Kabupaten Lamongan</i>			
1	Siti (081357323295)	Head of Economic Division, Lamonga Bappeda	Government Services

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No.	Name	Profession / Position	Position in the Market Map
2	Yusi (08123410562)	Staff of Lamongan Department of Agriculture	Government Services
3	Jolo Maruto (081231106488; 085755915626)	Head of UPT for Kec. Tikung, Lamongan	Government Services
4	Sujianto (08121642369)	Head of UPT for Kec. Sugio, Lamongan	Government Services
5	Rumiatun (085290804429; 081327537290)	Head of UPT for Kec. Pucuk, Lamongan	Government Services
6	Gunari (085234825860)	Kec. Pucuk, Lamongan UPT Staff	Government Services
7	Roslan (08563469655)	Ds. Soko, Kec. Tikung, Lamongan Farmer	Production
8	Juri (081553632550)	Kec. Tikung, Lamongan Local Trader	Kec. Tikung Local Trader
9	Jalil (081322565316; 08570565446)	Ds. Cungkup, Ke. Pucuk, Lamongan Farmer	Production
10	Tiong (08123538938)	Kec. Babat, Lamongan Local Trader	Inter-Regencies Trader
11	Zainuri (03224-54201)	Kec. Babat, Lamongan Local Trader	Inter-Regencies Trader
12	Sukarni (08563024574)/Sis (08563282950)	Ds. Cungkup, Kec. Pucuk, Lamongan Local Trader	Village level Trader
Kabupaten Madiun			
1	Evi Dyah	Economic Division of Bappeda	Government Services
2	Titik Suyati	Bappeda Head of Social and Culture Division	Government Services
3	Utami	Head of Data	Government Services
4	Yoko	Head of Agribusiness Driperta	Government Services
5	Yatno 081335930599	Instructor	Government Services
6	Suyatno	Farmer	Production
7	Suyanto 0351383316	Sub-district Trader	Sub-district Trader
Kabupaten Banyuwangi			
1	Pratmaja (081230612306)	Head of Food Security Department	Government Services
2	Lusi	Department of Food Security	Government Services
3	Sari Mulyono (081358239123)	PPL Kec. Wongsorejo	Government Services
4	Bakpia Glenmore (081249300041)	Bakpia Producer	Home Industri

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No.	Name	Profession / Position	Position in the Market Map
5	Suyoto (085236178711)	Head of Gakpotan Mungbean	Produksi
6	Ilyas Yunus (08123454312)	Saprotan Seller	Input Supplier
7	Hj. Umi (085237171443)	Natural Resources Trader	Inter-Regencies Trader
8	H. Zaini	Natural Resources Trader	Inter-Regencies Trader
9	H. Hassan	Natural Resources Trader	Inter-Regencies Trader
<i>Kabupaten/Kota Malang</i>			
1	Wahyu (081555617078)	Seed Trader	Input Supplier
2	Dr. Rudy (081334771711)	Balitkabi Expert of Mung Bean Breeding	R&D for Government Services
3	Erliana (08123305867)	Balitkabi Post-Harvest Handling Expert	R&D for Government Services
4	Arum	Production Manager for UPBS Balitkabi	R&D for Government Services
5	Andri Susanto (081555610262)	UD Sumber Mas (Giok Sanbrand)	Peeled Mung Bean Processor
<i>Kabupaten Nganjuk</i>			
1	Timin (081335911619)	Seed Breeder	Input Supplier
<i>Kabupaten Gresik</i>			
1	Waji	Seed Breeder	Input Supplier
2	Wahyu (081334488325)	Gresik Petroseed	Seeds Industry
<i>Kabupaten Blitar, Jombang, Malang, Tuban</i>			
1	Maksum	Farmer	Production
2	Rochmad	Head of Social and Culture	Government Services
3	Darmatin	Head of Agriculture	Government Services
4	Agus P	Diperta Head of Plants	Government Services
5	Anis	Food Security	Government Services
6	Imron Achmadi	Head of Trading Division	Government Services
7	Totok Tumini	Staff	Government Services
8	Wiyono	Farmer	Production
9	Solekan	Saprotan Seller	Input Supplier

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No.	Name	Profession / Position	Position in the Market Map
10	Budi	Farmer	Production
11	Edy	PPL	Government Services
12	Imron	Trader	Trader
13	Teguh 08123253118	Big Trader	Trader
14	Yusuf 08123254913	Trader	Trader
15	Budi 08123538938	Trader	Trader
16	Anggie0321 861049	Trader	Trader
17	M. Tosin	Trader	Input Supplier
<i>Kota Surabaya</i>			
1	Andi	Bappeda of East Java Province	Government Services
2	Dhani (0817316744)	Kasi Kabi for Department of Agriculture, East Java	Government Services
3	Anggraheni (081331566065)	Head of Agro-chemical Industry Division, East Java Province Department of Industry and Trading	Government Services
4	Rendi	East Java Province Department of Industry and Trading	Government Services
5	Henri (08123545831)	Exim Staff of International Trading Division, East Java Province Department of Industry and Trading	Government Services
6	Anthony (08123268689)	Mung Bean Exporter	Seller
7	Fifi (08123002022)	Mung Bean Exporter	Seller
8	Hendrik Wijaya (03170120001)	PT Hunkwee 6	Mung bean Processing Industry
9	Hana (0318493013)	PT Ultra Jaya	Mung bean Processing Industry
10	Anik	PD Pasar Surya (Pabean Unit)	Market Infrastructure Provider