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## List of Abbreviations

ACIAR	Australian Centre for International Agricultural Research
AIPD-Rural	Australia-Indonesia Partnership for Decentralisation - Rural Economic Program
AVRDC	The World Vegetable Center
BPTP	Assessment Institute for Agricultural Technology
DFAT	Department of Foreign Affairs and Trade
EI-ADO	Analysing Agribusiness Development Opportunities in Eastern Indonesia
Ha	Hectare
IDR	Indonesian Rupiah
Kg	Kilogram
NTB	West Nusa Tenggara
NTT	East Nusa Tenggara

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## Preface

This report, entitled *Eastern Indonesia Agribusiness Development Opportunities (EI-ADO) - Analysis of Chilli Value Chains*,<sup>1</sup> was prepared by the Collins Higgins Consulting Group Pty Ltd as commissioned by the Australian Centre for International Agricultural Research (ACIAR). The information and recommendations from this study will inform DFATAID in the design of the Australia Indonesia Partnership for Decentralisation – Rural Economic Development Program (AIPD-Rural).

The report involved the analysis of background data, field trips and interviews with actors involved in all sectors of the value chain. Field work was conducted for 30 days (shallots, tomatoes, chillies) during November and December 2012. Additional follow up field work was performed by Krisnadi Ly and Teddy Kristedi in January and May 2013, and Tiago Wandschneider in May 2013.

The author of this study is Tiago Wandschneider, with support from Kuntoro Boga Andri, Paul Gnifke, Witono Adiyogo, Teddy Kristedi, Krisnadi Ly and Ketut Puspadi. Environment and gender inputs were overseen by Emmanuel Santoyo Rio.

Thanks must go to all the value chain actors - input suppliers, farmers, collectors, processors, and traders - who provided time and valuable information to the team.

The views expressed in this report are those of the consultants and do not necessarily reflect the views of the Collins Higgins Consulting Group, ACIAR or the Governments of Australia or Indonesia.



Stuart Higgins

Director, Collins Higgins Consulting Group

January 2015

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## Executive Summary

This study was conducted to inform pro-poor interventions in the chilli value chain under a new DFAT program: the Australia-Indonesia Partnership for Decentralisation - Rural Economic Program, or AIPD-Rural. A wide range of issues deemed important for characterisation of the chilli sub-sector in Indonesia are covered. There is a particular focus on understanding the potential of the chilli sub-sector as a vehicle for poverty reduction in the AIPD-Rural target district of Malang in East Java. Within this report the chilli value chain is analysed in detail, gender and environmental issues are discussed, and possible entry points for pro-poor chain innovations are proposed.

### ***Socio-economic importance***

As the main vegetable crop in Indonesia, the harvested area of chilli ranges between 230,000 ha to 245,000 ha annually. Given the small average size of chilli farms, it could be conservatively estimated that at least half a million households grow chilli in Indonesia. As in the case of other highly perishable crops, production is concentrated near the main consumption centres (over 50% of domestic production comes from Java).

East Java has about 60,000 ha under cultivation, a far larger area than any other province, but ranks second, after West Java, in terms of output. North Sumatra and Central Java are the third and fourth largest producers. These four provinces alone supply 60% of the chillies consumed in Indonesia.

### ***Production trends***

In 2011 Indonesia achieved a record harvest of nearly 1.5 million tonnes, about one-third more than in 2007. Productivity gains were the main source of growth, with average yields increasing by 28% for big chilli and 24% for small chilli, compared to an expansion of harvested areas of just 3% and 6%, respectively.

### ***Seasonality***

Chilli is grown all year round with two peak harvesting seasons; late April to late June, and September to early November. Production levels in a given season can vary significantly from one year to another due to the influence of weather conditions, pests and diseases.

### ***Productivity***

Differences in chilli productivity across provinces is significant. During the period from 2009-11 farmers in North Sumatra harvested on average 15.8 tonnes of big chilli per hectare (ha) while those in West Java produced 12 tonnes/ha, well above the national average of 7.1 tonnes/ha. The average yield in West Nusa Tenggara Province (NTB) was 7.9 tonnes, considerably higher than in Central Java, East Java or East Nusa Tenggara Province (NTT).

Similarly for small chilli over the same period, farmers in East Java and Central Java harvested on average 3.9 and 4.9 tonnes/ha, respectively, compared to 12.8 tonnes/ha in West Java and 12 tonnes/ha in North Sumatra.

### ***Demand***

Given a demand curve that is both income and price inelastic, any significant expansion in domestic production will have major negative impacts on farm-gate prices, even in a context where the economy is performing well and household incomes are rising. The impact of rising production on domestic prices are exacerbated in a context where imports are very low, with limited scope for import substitution, and exports are unlikely to be developed at scale in the foreseeable future. Consequently, increases in the chilli harvest will have to be absorbed by the domestic market.

### ***Exports and Imports***

Fresh chilli exports from Indonesia are too small to have an impact on domestic market conditions. Between 2007 and 2011, exports averaged 1,217 tonnes per annum, i.e. 0.1% of average annual production during that period. Fresh chilli imports have been rising, but the volumes remain too small to influence domestic market conditions.

### ***Prices***

Chilli prices are very erratic, with significant daily, weekly and monthly volatility. Short-term price volatility cannot be explained by changes in import and export flows, as these are too small to have a significant impact on prices. Neither can it be attributed to fluctuations in domestic demand, as this is fairly stable throughout the year, with the exception of the holy month of Ramadan, a period characterized by a spike in household consumption. Rather, short-term price volatility is mainly a consequence of fluctuations in the quantities harvested at any given point in time, which can be fairly significant, depending on past planting decisions by farmers, weather conditions, and the incidence of pests and diseases.

Changes in supply will have considerable impact on the market value of the crop because consumer demand is fairly inelastic in relation to prices. The report suggests that short-term storage under low temperatures would reduce market instability, as supplies could be released during periods of high prices or kept in storage when prices are low, but private traders are yet to invest in cold chains for chilli and other vegetables.

## **The chilli value chain in Malang**

### ***Production***

In Malang, chilli represents largest cultivated area amongst all vegetable crops. About 3,340 ha were harvested in 2012, compared to 3,640 ha in 2011. While East Java province specializes in the production of small chilli, red and curly varieties account for over 50% of the chilli cultivated area in Malang. Local vegetable farms typically range from 0.2 to 1 ha, or 1.5 ha in rare cases. Some farmers grow the crop only once a year, some twice.



Compared to other regions in East Java, chilli production in Malang is more advanced, in terms of the tendency of farmers to use better quality seeds. Farmers have high input costs establishing the crop, purchasing fertilizers and pesticides, and hiring labour to work on the farm.

### ***Input distribution***

Within the context of the chilli value chain in Malang, this study suggests that there is no problem with regards to input distribution. In the main vegetable growing areas of Malang, farmers may have five or six shops in their own village supplying agricultural inputs. These are generally well stocked, selling different seed varieties and a wide range of agro-chemicals. Prompt payment in cash is the norm, although some input retailers may occasionally provide credit in kind to select farmers they know well and trust. A significant number of chilli farmers in Malang access trader finance.

Many chilli farm households grow their own seedlings in order to reduce costs, for logistical convenience and/or because they are unsure about the quality of the seedlings supplied by local nurseries. However, in villages where chilli is a major crop, 40-70% of growers purchase seedlings from small commercial nurseries. Some farmers access seedlings on credit from village traders, an important client for the larger nursery businesses in sub-districts such as Poncokusumo and Pujon. In most cases, the seed to be grown into seedlings will be provided by the farmer or trader.

### ***Spatial flows and market channels***

Most of the chilli harvest in Malang is consumed within the district, in Malang City, and in other parts of East Java, particularly in and around Surabaya. Some supplies are channelled to other important market destinations such as Bali, greater Jakarta, Central Java and Kalimantan. The chilli crop is distributed and retailed through traditional channels. Only a very small share of production is channelled to modern retail outlets.

### ***Intra-district chains***

Malang City represents an important market for local chilli growers. Gadang market is the main wholesale distribution centre, supplying large numbers of urban retailers. About half the wholesalers in Gadang specialize in sales to retailers. The other half specializes in long-distance trade, supplying wholesalers in Bali, greater Jakarta and Central Java.

Both collectors and inter-district traders in Poncokusumo and Pujon normally sell between 1 and 3 tonnes of chilli per day and have 40 to 80 regular suppliers.

### ***Intra-provincial chains***

Porong market in Sidoarjo, near Surabaya, is a major distribution centre for Malang chilli. Many inter-district traders go to Porong daily and each of them has several regular buyers in Porong. These are “large” market retailers from Sidoarjo, Surabaya, Gresik, Mojokerto, Pasuruan and Madura, or mobile traders who supply market and street vendors in these locations. The fact that inter-district traders have been doing business with buyers in Porong for many years is important for efficient coordination and negotiation of transactions. Prices are determined when the parties meet at the

market. Some Gadang wholesalers and some inter-district traders also supply Keputran, the main wholesale market for fresh produce in Surabaya, but this is a secondary channel. Supplies to neighboring Blitar and Lumajang districts are channeled through village assembly markets.

### ***Inter-provincial chains***

A few traders in Malang supply wholesalers in and around Jakarta. Despite the distance, Malang is the preferred supply source as it can provide a continuous supply. There are a handful of village traders that supply greater Jakarta directly. One of the largest chilli traders has been doing business with one wholesaler in Tangerang since 1996.

Inter-provincial traders handle larger volumes of fewer vegetables than inter-district traders. They normally supply one or two buyers in one or two markets. Inter-provincial traders face difficulties in dealing with many wholesale customers because each needs a continuous supply of relatively large consignments and because high levels of trust are required for long-distance transactions.

### ***Contract farming and collective action***

No formal contract farming arrangements were found in the Malang chilli chain. Contract farming schemes are costly to develop and can only be justified where firms are targeting premium markets in Indonesia or abroad. Currently, such chains are very under-developed. This is actually the main conclusion of the report about contract farming situation in Malang chilli chains. References regarding the existing contract scheme are somewhat difficult to duplicate since they are dealing with non-chilli vegetables and organic chilli.

### ***Information and knowledge flows***

Farmers, nursery operators, and traders are constantly trialling new varieties, rotation crops, inter-crops, and agro-chemicals. These experiences are shared through family, social, and market networks. Seed and agro-chemical companies have played an important role in local technology adoption processes.

Government extension services are a more impartial source of technical advice. However, they face acute resource and institutional constraints, resulting in only a marginal role in local innovation processes. Extension officers lack key knowledge and skills, as well as the performance-related incentives that are so critical for the delivery of an effective service.

Information about spot market prices has obvious relevance for farmers as without it they cannot assess the fairness of the terms offered by village traders. It is not difficult for farmers to access spot price information, however, both farmers and traders seem to have difficulties making sense of intra-annual price patterns and forming reasonable expectations about price outlook scenarios.

Lack of knowledge of pest and disease management strategies was identified as another important constraint. Understanding of pests and diseases, their causal

factors, optimal timing for intervention and the relative cost-effectiveness of different control technologies is often weak. Location-specific research is therefore needed to determine possible improvements over current practices but such services are costly and rare.

### **Quality Management Systems**

Chilli has a shelf-life of just three or four days after harvest. In a context where cold storage is not an option, village traders and wholesalers cannot afford to hold inventories. Once harvested, chilli is channelled to retailers in Malang and other parts of East Java within 24 hours. Farmers, collectors, inter-district traders, wholesalers and retailers do not grade their chilli. Prices along the chain may differ, however, depending on product attributes such as water content and colour. Some wholesalers and retailers will sell broken fruits separately for a discount. Traditional retailers de-stem some of the chilli fruit as a value-addition strategy.

### **Margins**

Price and marketing cost data along the Poncokusumo-Porong chain was collected at a time when chilli prices were particularly high. Chilli growers received approximately 70% of the retail price. Inter-district traders, distributors, and retailers “appropriated” 12% of the crop’s retail value as net margin. Marketing costs accounted for 19% of the retail price. Retailers earned a relatively low margin due to product losses and high transportation costs per kilogram, representing 40% and 20%, respectively, of total marketing costs from the farm through to retailing. Some caution is required when interpreting margin data. Net margins are known to fluctuate considerably between transactions. Village traders and retailers operate in highly atomistic or competitive spot markets where prices are constantly changing in response to changing supply conditions.

### **Problems and constraints**

Despite the fact that traders interviewed for this study had been in business for years, the level of knowledge in basic business skills is mostly very low and the businesses are rarely growing. Particularly in rural areas (intra-district chains), the traders are frequently unable to distinguish between revenue and profit. Unfortunately, this lack of business skills is even more evident at the farmers’ level. Farmers do not maintain any records of their activities and therefore are not in a position to accurately determine profitability.

On the production side, intensive use of labour is becoming a problem, not from the perspective of rural labour absorption (employment), but from the efficiency of production costs. Decreasing labour availability and quality in rural areas may lead to a larger proportion of production costs allocated to labour that eventually may cause a significant decline in chilli agribusiness’ competitiveness.

### **Opportunities for pro-poor intervention**

This study has identified the following four value chain intervention opportunities:

1. The piloting of small hybrid chilli varieties

2. The development of local markets for Gemini-free seedlings
3. The expansion and improvement of existing contract farming schemes
4. The development of market outlook services

Two of the interventions focus on the commercial development of new technologies with potential to increase farm productivity. One targets lead firms that are working under a vertical coordination model that appears to offer farmers higher returns and lower risks compared to spot market sales. The fourth intervention looks at the delivery of market outlook services as an innovation that could potentially stabilize and improve net farm incomes. Whilst all proposed interventions require further validation, two offer greater opportunities for scalable impacts: the production of Gemini-free seedlings by commercial nurseries and the development of market outlook services by the East Java Chilli Agribusiness Association.

### ***1. The piloting of small hybrid chilli varieties***

Farmers' lack of experience growing small hybrid chilli and the opportunity to partner with leading seed companies may justify an intervention by AIPD-Rural. East West Seed, the leading vegetable seed company in Indonesia, has two small hybrid chilli varieties in its product portfolio. BISI, the second largest vegetable seed company in the country, has one.

Although hybrid varieties are unlikely to gain significant market share in the foreseeable future, they may offer opportunities for raising net incomes from chilli farming in the more commercialized production areas of Eastern Indonesia, such as Malang and Kediri, where many vegetable growers already invest significant resources in their farms. AIPD-Rural could therefore consider working with East West and BISI to expose small chilli growers in those districts to hybrid varieties and to assess their impact on farm profitability.

### ***2. The development of local markets for Gemini-free seedlings***

The white-fly transmitted Yellow Leaf Curl (Gemini) virus poses an increasing threat to the chilli crop. If the chilli plants become infected at an early seedling stage, they can be rendered almost completely unproductive. Until resistant varieties can be developed and distributed, incorporation of fine-mesh screening fabric in the shading structures used for seedling production provides the most effective control strategy. Fine-mesh netting delays the onset of the disease, thereby reducing crop losses.

If successful, the intervention would create the necessary demand for Gemini virus-free seedlings and increase sales by specialist nursery operators, the profits earned from seedling production, and wage employment in nursery farms. More importantly, it would raise the productivity and profitability of chilli farms, generating higher incomes for chilli farm households.

### ***3. The expansion and improvement of existing contract farming schemes***

Contract farming may have impacts on farmer incomes through changes in yields, production costs, and farm-gate prices. An analysis of the ABC Heinz scheme

suggests that this is having a positive impact on farm productivity. Access to input credit and reduced exposure to marketing risk are likely to be associated with increased investment in chilli farms, whereas the delivery of technical advisory services should result in improved crop management practices.

It is also important to note that few farmers in East Java are currently involved in the production of chilli under contract with large lead firms. About 500 growers scattered across five or six districts participate in the ABC Heinz scheme. While there may be scope for expanding these schemes, one should not expect major increases in the number of participating farmers, even in a context whereby the associated costs and risks incurred by contracting firms are reduced through external intervention. It would be unrealistic to expect an increase of more than 200 or 300 contract growers over a two- or three-year period.

Any decision by AIPD-Rural to support an expansion and improvement of current chilli contract farming schemes should be part of a wider intervention targeting a number of agribusiness firms working with contract growers or willing to develop contract farming arrangements for the production of different agricultural commodities.

#### **4. The development of market outlook services**

Timely access to relevant market outlook information and analysis can have significant positive impacts on farmer incomes. If farmers can anticipate adverse market scenarios at harvest time, they will reduce planted areas and grow other crops instead. If many farmers adjust cultivated areas accordingly, then there will also be a systemic market stabilization or correction effect: while some growers will no longer enjoy steep price hikes, situations where thousands have to sell their crop for a significant loss or marginal profits will be avoided.

AIPD-Rural could consider working with the East Java Chilli Agribusiness Association to improve the outreach as well as the relevance of its information service. Planting decisions should be based on an understanding of short-term market outlook scenarios: a farmer planting red or curly chilli today needs to have some understanding of price prospects in three to four months' time, i.e. at harvest time.

Further consultations with the leadership of the Association to discuss different design options and the implications for members and other big chilli growers in East Java are needed before a decision by AIPD-Rural to support the development of market intelligence services can be taken. Different service design options will have different impact consequences.

#### **Areas for future research**

Nearly all proposed interventions outlined in this report would benefit to some extent from applied research during an implementation phase.

As mentioned previously, there would be benefits in allowing nursery operators and farmers to trial first-hand the protective netting to minimise the incidence of the highly yield limiting Gemini Virus in chilli seedling production.

Comparative research into chilli cultivation systems adopted in higher-productivity provinces compared to the lower chilli producing AIPD-Rural districts within the province of East Java would shed light on specific technical innovations with potential to increase yields and/or lower costs of production.

Smallholder farmers may benefit from more analysis into the upgrading of contract chilli production strategies and improvements in contract design and delivery of input supply, credit, technical assistance and other embedded services by the contracting party.

And finally, the proposed intervention of piloting small hybrid chilli production would benefit from further research into better understanding the dynamic between the higher production levels hybrid chilli varieties offer farmers and the lower preference (lower market price) for hybrid chilli by the consumer.

# 1 Introduction

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## 1.1 Project Background

This study was conducted in the context of EI-ADO (Analysing Agribusiness Development Opportunities in Eastern Indonesia). EI-ADO is a project funded by the Department of Foreign Affairs and Trade (DFAT) aid program, overseen by the Australian Centre for International Agricultural Research (ACIAR), and implemented by the Collins Higgins Consulting Group. Its aim is to identify agricultural value chains and private sector agribusiness development opportunities with greatest potential to increase the incomes of poor men and women in East Java, West Nusa Tenggara (NTB), and East Nusa Tenggara (NTT).

EI-ADO comprises a number of research activities. A prioritisation of value chains was carried out during the first six months of 2012. Five commodity chains, including vegetables, were selected for research based on a range of socio-economic criteria and perceived opportunity for pro-poor chain upgrading. Research on vegetable value chains was disaggregated into three separate studies: one on tomato, another on shallot, and a third on chilli. This report presents the findings for the chilli value chain. A comparative assessment of all selected agricultural value chains will also be conducted in order to draw lessons and implications for government, the private sector, development projects, and donor agencies.

EI-ADO research outputs will inform value chain interventions under a new DFAT Aid program: the Australia-Indonesia Partnership for Decentralisation - Rural Economic Program (AIPD-Rural). The goal of this program is to increase the incomes of one million poor male and female farmers in four provinces of Eastern Indonesia by at least 30% by 2022. This is to be achieved through better farm practices, improved access to input and output markets, and a more enabling agribusiness environment, all of which are critical for increasing farm profitability and value chain competitiveness. AIPD-Rural is particularly interested in partnering with the private sector for the design and implementation of chain interventions that can contribute to target outcomes and impacts.

This area of research is also of interest to ACIAR. There is growing recognition of the need to embed agronomic research within market and value chain development frameworks and processes. This is regarded as critical for enhancing the relevance and impact of research-for-development efforts. The EI-ADO studies will provide useful insights about value chain development opportunities, the incentives for technical, product, and process upgrading along whole chains, and key research gaps.

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## 1.2 Study Team

The study team included two value chain specialists, one vegetable expert, and two research assistants. Tiago Wandschneider, the International Value Chain Specialist, acted as Team Leader. Paul Gniffke, a plant breeder employed by the World Vegetable Center (AVRDC) prior to retirement, joined the team as the International Commodity Specialist. Kuntoro Boga, an economist with the East Java Assessment Institute for Agricultural Technology (BPTP), was the National Value Chain Specialist. Teddy

Kristedi, ACIAR's Project Coordinator, and Krisnadi Yohannes, from BTPT East Java, assisted the team during the initial fieldwork and conducted several follow-up discussions and interviews with key informants.

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### 1.3 Analytical Framework

The tool book "Making Value Chains Work Better for the Poor" (M4P, 2008) for practitioners of value chain analysis was used as a main reference for the development of the analytical framework that guided this and other EI-ADO chain studies. However, a selective approach to data collection and the choice of analytical methods was followed, taking into consideration the resources and time available.

The current study covers a wide range of issues deemed important for understanding the structure, conduct and performance of the chilli value chain, its potential as a vehicle for poverty reduction, and the opportunities and incentives for chain upgrading. Some of the analysis is disaggregated by gender, one of the research cross-cutting themes alongside poverty and the environment. These study themes reflect the purpose of AIPD-Rural, which has been developed to promote pro-poor outcomes and impacts that benefit both men and women, without compromising the natural resource base available to future generations. The three themes are also present in ACIAR's work.

A presentation of the analytical framework would be incomplete without some consideration of cost and margin analysis. This is a critical component of value chain research, and one that was discussed at some length during the design and planning of the EI-ADO studies. Analysis of costs and margins along whole product chains provides valuable quantitative evidence about key chain dimensions, which can then be used to guide public policy and other interventions. For example, much can be learned about the efficiency of the marketing system, the distribution of value or benefits along the chain, the profitability of different production strategies and market channels, and opportunities for efficiency gains and value creation.

Farm gross margin data was collected from a few farms in order to gain insights about chilli production costs and on-farm labour use. However, not much was learned about farm profitability. A much larger sample would be needed, especially in view of the high variability in gross margins. The price of fresh chilli in Indonesia is known to fluctuate widely in the short term. Moreover, yields vary widely across farms due to the significant influence that cultivation practices, weather conditions, pests and diseases have on farm productivity.

Likewise, while some marketing cost and price data for intra-provincial chilli chains was collected, this cannot be used to estimate net marketing margins because of significant inter-daily price variations. Much more time and resources would have been required to collect robust net margin data along different chains and for different seasons.

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### 1.4 Study Methodology

Existing studies, reports, and official statistics were reviewed early in the research process to evaluate the information available and identify data gaps. Daily wholesale



price data for 2009-11 was obtained from the Management Board of Pare market in Kediri, an important agricultural trading centre in East Java.

Collection of primary data was largely based on qualitative methods:

- *Semi-structured interviews* were carried out to collect information a few input retailers, different categories of traders, supermarket managers and some knowledgeable observers. Checklists were used to guide these interviews (see Annex 1).
- *Focus group discussions* were the main method used to gather information from farmers. Nursery operators, village traders, and extension officers joined some of the focus group discussions.
- *Direct observation* methods were employed during visits to farms, markets and supermarkets. Much was learned about the scale of farm and trading businesses, the marketing functions performed, and quality standards through direct observation.
- *Triangulation* and *direct observation* methods were used to cross-check the quality of the data collected from key informants and evaluate their views and perspectives.

Qualitative methods were chosen because they are particularly suited to rapid appraisals of production and marketing systems, allowing researchers to explore a wide range of issues flexibly and in some depth in a short period of time. While large structured questionnaires would have enabled the research team to quantify important production and marketing system features, say farm profits or choice of market channel, they could not be employed due to time and resource constraints. *Structured formats* were only used to collect margin data from a small number of farmers and traders (see Annex 2).

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## 1.5 Fieldwork

A first round of field interviews was conducted over a two-week period in November and December 2012. The fieldwork covered three crops: chilli, tomato and shallot. An additional two weeks of field work was performed during May and June 2013. The focus at this time was on chilli and tomato:

- Five days were spent during the initial field work phase in Malang and Batu districts interviewing key informants in the chilli (and tomato) chains, as well as a few commercial vegetable farms and trading enterprises that target export and niche domestic markets. One team member spent another one and a half days in late December collecting additional data from chilli chain actors in Malang.
- A four-day visit to Kediri was organised to meet seed companies and gain a broader understanding of chilli (and tomato) production and marketing systems.
- Three days were spent in Surabaya interviewing traditional wholesalers and retailers and visiting modern retail outlets. Some of the interviews involved key informants in the tomato chain, but most targeted actors in the chilli and shallot chains.

Additional interviews were carried out in June and July 2013 to address some key data gaps. Two team members spent three days in Kediri talking to vegetable nursery

operators, another two days in Malang meeting chilli (and tomato) chain participants, and two days following chilli (and tomato) consignments from Malang to Porong market in Sidoarjo and from Porong to traditional retail markets in and around Surabaya.

In total, the study team conducted 9 focus group discussions, carried out 7 structured and semi-structured interviews with smallholder farmers and commercial farms, and had discussions with two seed companies, one chemical company, 12 input retailers, 15 intermediary traders, 10 retailers, 2 researchers, and 7 government officers (see Table 1).

**Table 1 Key informants and respondents**

Districts	Input chain	FGD	Producers	Trade	Retail	Research	Govt.	Total
Malang	2	4	4	2		2	1	15
Batu	4	2	2	6			2	16
Kediri	6	3	1	3			2	15
Sidoarjo				2	4		2	8
Surabaya				2	6			8
<b>Total</b>	<b>12</b>	<b>9</b>	<b>7</b>	<b>15</b>	<b>10</b>	<b>2</b>	<b>7</b>	<b>62</b>

Source: Author's field notes

## 1.6 Report Structure

This report comprises six sections. Following this introduction, Section 2 provides an overview of the Indonesian chilli sub-sector, with a focus on production patterns and trends, consumption, international trade, and prices. Section 3 focuses on the Malang chilli chains, including production systems, farm employment patterns, farm profitability, spatial product flows, vertical chain linkages, quality standards and management systems, and problems and constraints. Opportunities for pro-poor chain upgrading are discussed in Section 4. Key findings and some areas for future research are highlighted in Section 5. Section 6 lists the references used in the study.

Two annexes are included after the main report sections. The checklists used during the key informant interviews are shown in Annex 1. The structured questionnaires used to collect farm gross margin data and net marketing margin data are presented in Annex 2.

## 2 The Chilli Sub-Sector in Indonesia

### 2.1 Production

#### 2.1.1 Geographical distribution

Chilli is the main vegetable crop in Indonesia. Between 230,000 ha to 245,000 ha are harvested every year, a much larger area than that allocated to other vegetables. Given the small average size of chilli farms, one can conservatively assume that at least half a million households grow the crop. A much higher figure (more than one million) is mentioned in Maryono and Bhattarai (2009).

As in the case of other highly perishable crops, production is concentrated near the main consumption centres (see Table 2). Over 50% of domestic production comes from Java, Indonesia's most populated and urbanised island, with Sumatra accounting for another 35%. East Java has about 60,000 ha under cultivation, a far larger area than any other province, but ranks second in terms of output, after West Java. North Sumatra and Central Java are the third and fourth largest producers. These four provinces alone supply 60% of the chillies consumed in Indonesia. NTB accounts for just 2%, with most production coming from East Lombok. NTT has less than 1% of the total cultivated area and contributes less than 0.5% of domestic production.

**Table 2 Chilli harvested area and production in Indonesia (2010-12)**

Province	Average harvested area Ha	Share %	Average production Tonnes	Share %
West Java	24,353	10.2	279,375	18.8
East Java	60,946	25.4	270,957	18.2
North Sumatra	22,149	9.2	225,126	15.1
Central Java	37,461	15.6	198,153	13.3
NTB	5,382	2.2	27,294	1.8
NTT	1,639	0.7	6,397	0.4
Other provinces	87,817	36.6	482,217	32.4
<b>Indonesia</b>	<b>239,747</b>	<b>100</b>	<b>1,489,519</b>	<b>100</b>

Source: Author's calculations based on BPS (Statistics Indonesia) data

Different regions specialize in the production of different types of chilli (see Table 3). Big chillies, including straight red and curly red or green, are the dominant type in Sumatra, West Java and Central Java. In East Java more than 75% of the production area is allocated to small chilli, particularly the red type. In NTB small chilli accounts for an even larger share of total cultivated area.

These spatial patterns are strongly influenced by agro-climatic conditions. Regions with higher rainfall levels, such as Sumatra and West Java, offer more suitable conditions for cultivation of big chilli, which has much higher water requirements. For this reason,

big chilli production in East Java is concentrated in highland areas, with the lowlands specializing in small chilli. According to some key informants, farmers' choice of chilli type is also influenced by consumer preferences: it was reported that consumers in Sumatra and West Java have a stronger preference for big red and curly chilli than in East Java.

**Table 3 Contribution of small chilli and big chilli to the total harvested area in different provinces (2009-11)**

Province	Harvested area (%)	
	small chilli	big chilli
North Sumatra	21	79
West Java	32	68
Central Java	38	62
East Java	77	23
NTB	88	12
NTT	57	43
Other provinces	37	63
<b>Indonesia</b>	<b>47</b>	<b>53</b>

Source: Author's calculations based on BPS (Statistics Indonesia) data

Big chilli accounts for 60% of Indonesia's chilli crop. West Java, North Sumatra and Central Java are the three leading producers, with a combined share of nearly 60%. East Java ranks fourth, with just under 10% of domestic production, but stands out as the largest supplier of small chilli, responsible for nearly one-third of the country's harvest (and 40% of the harvested area), followed by West Java, Central Java and North Sumatra (see Table 4).

**Table 4 Average production of small chilli and big chilli in Indonesia (2009-11)**

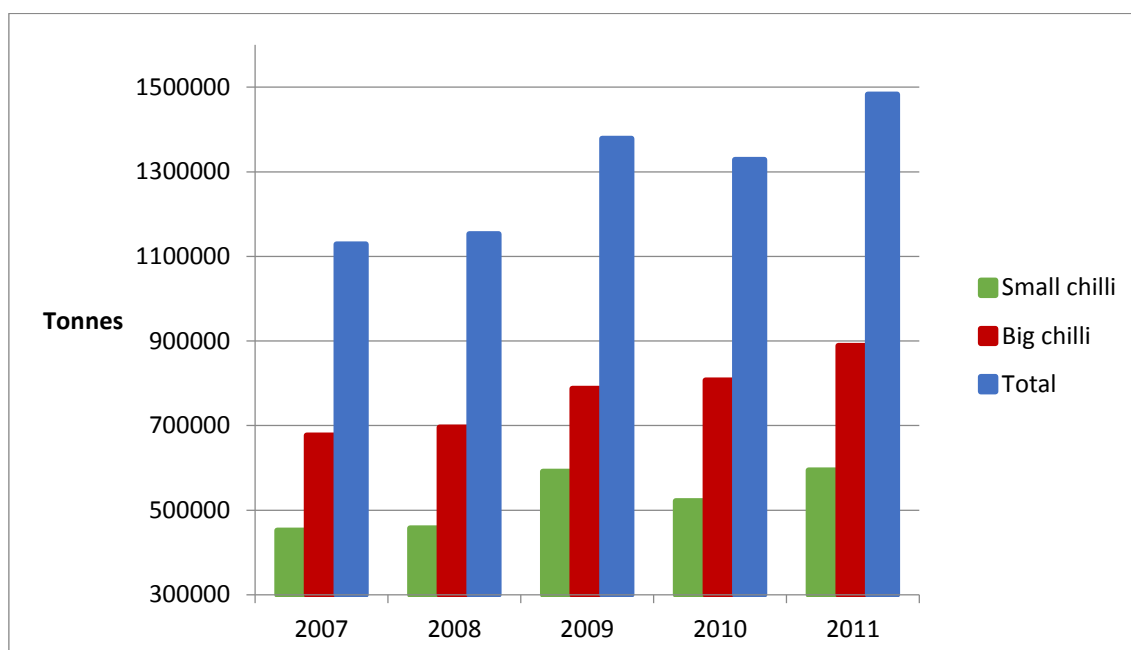
Province	Small chilli		Big chilli	
	Average production Tonnes	Provincial share %	Average production Tonnes	Provincial share %
North Sumatra	35,826	6.3	158,975	19.2
West Java	98,816	17.4	190,446	23
Central Java	68,854	12.1	131,232	15.9
East Java	167,236	29.4	70,336	8.5
NTB	22,530	4	5,580	0.7
NTT	4,060	2.4	3,253	0.4
Other provinces	171,753	30.2	267,993	32.4
<b>Indonesia</b>	<b>569,075</b>	<b>100</b>	<b>827,815</b>	<b>100</b>

Source: Author's calculations based on BPS (Statistics Indonesia) data

## 2.1.2 Trends

The chilli harvest has increased in recent years, after a decade of erratic production due to significant inter-annual variations in cultivated area and weather conditions (Maryono and Bhattarai, 2009). In 2011 Indonesia achieved a record harvest of nearly 1.5 million tonnes, about one-third more than in 2007 (see Figure 1). The production of small and big chilli has expanded at similar rates (also see Figure 1).

Productivity gains were the main source of growth, with average yields increasing by 28% for big chilli and 24% for small chilli, compared to an expansion of harvested areas of just 3% and 6%, respectively. It should be noted, however, that most yield gains during the period under analysis occurred in 2011. In the previous years the average productivity of chilli farms was fairly stable.



Source: BPS 2013.

**Figure 1 Production of small chilli and big chilli in Indonesia (2007-11)**

Growth patterns varied across regions (see Table 5). North Sumatra has enjoyed by far the best performance of all major chilli producing provinces in recent years. Its production of small chilli doubled, and production of big chilli expanded by 75% during the period under analysis, with productivity gains making the greatest contribution to growth. Central Java achieved robust growth in the production of both small and big chilli. The small chilli crop also performed well in West Java and East Java, but that was not the case of big chilli due to a reduction in harvested area (West Java) and poor yields (East Java). In NTB and NTT the chilli sub-sector overall performed poorly, as both provinces experienced a decline in yields. In NTB the production of big chilli did increase by about 50% following a strong increase in cultivated area, but there was a similar decline in the small chilli harvest.

**Table 5 Growth in area, yield and production of small chilli and big chilli in different provinces (2007-11)**

Province	Small chilli			Big chilli		
	change in area %	change in yield %	change in production %	change in area %	change in yield %	change in production %
North Sumatra	33	52	102	22	44	75
West Java	14	16	32	(7)	13	6
Central Java	0	34	34	16	13	31
East Java	13	14	29	42	(30)	0
NTB	(36)	(16)	(47)	68	(9)	52
NTT	(12)	(7)	(18)	25	(14)	7
<b>Indonesia</b>	<b>6</b>	<b>28</b>	<b>31</b>	<b>3</b>	<b>24</b>	<b>31</b>

Source: Author's calculations based on BPS (Statistics Indonesia) data

### 2.1.3 Seasonal patterns

Chilli is grown all year round. There are two peak harvesting seasons - one between late April and late June and another from September to early November (Webb *et al*, 2012). Production levels in a given season can vary significantly from one year to another due to the influence of weather conditions, pests and (to a larger extent) diseases (Webb *et al*, 2012; Maryono and Bhattarai, 2009).

An assessment of seasonal patterns is a complex exercise due to differences in the timing of production between different chilli types and spatial variations, not only across provinces and districts but also between lowland and highland areas within the same district. For example in the highlands of Kediri the harvesting season for small chilli extends from November to early April, with a peak in December-February, whereas in the district's lowlands most of the small chilli crop is harvested in September and October. In Banyuwangi, most of the small chilli crop is harvested in December, January and February. In general the peak of harvest of chilli in East Java is during the month of May with early harvest start in the last week of end April.

### 2.1.4 Farm productivity

North Sumatra and West Java have the most productive chilli farms (see Table 6). During the 2009-11 period farmers in North Sumatra harvested on average 15.8 tonnes of big chilli per ha while those in West Java produced 12 tonnes/ha, well above the national average of 7.1 tonnes/ha. The average yield in NTB was 7.9 tonnes/ha, considerably higher than in Central Java, East Java or NTT. Differences in the productivity of small chilli farms across provinces are equally significant: during the 2009-11 period farmers in East Java and Central Java harvested on average 3.9 and 4.9 tonnes/ha, respectively, compared to 12.8 tonnes/ha in West Java and 12 tonnes/ha in North Sumatra.

**Table 6 Average chilli farm yields in different provinces (2009-11)**

Province	Small chilli tonnes/ha	Big chilli tonnes/ha
North Sumatra	8.9	15.8
West Java	12.8	12
Central Java	4.9	5.7
East Java	3.9	5.3
NTB	4.2	7.9
NTT	4.9	5.2
<b>Indonesia</b>	<b>5.1</b>	<b>7.1</b>

Source: Author's calculations based on BPS (Statistics Indonesia) data

Large differences in the productivity of chilli farms in North Sumatra or West Java, on the one hand, and other provinces, on the other, cannot be attributed solely to agro-climatic differences. Technology and farm management must be playing a significant role. Comparative research on cultivation systems in higher-productivity provinces could shed light on specific technical innovations with potential to increase yields in provinces such as East Java or Central Java.

## 2.2 Consumption

Chillies in Indonesia are mainly consumed fresh or used in the preparation of *sambal*, i.e. chilli sauce, an essential item in many local dishes. While Indonesian households will typically buy fresh chillies for home preparation of *sambal*, large food processing companies such as ABC Heinz and Indo-Food produce their own brands of chilli sauce, which are widely available in supermarkets, mini-marts and shops. In addition to the large scale processing, there are some home-industry level *sambal* producers which supply wet-markets in their district as well as other districts. Different to large food companies, their products are channelled via wet-markets.

There is limited substitutability between small chilli and big chilli, as these play different roles in the local cuisine. Small green chilli is very pungent and used mainly for decorative purposes. Small red chilli is appreciated for its spiciness and big red chilli for its colour. These are the two most widely-consumed chilli types. Curly red chilli has many similar uses to big red chilli, but is not utilized by the processing industry. Lack of substitutability in consumption is reflected in differences in price levels and movements. A comparison between Figure 3 and Figure 5 shows that small chilli is generally more expensive than big chilli. More significantly, while the prices of product substitutes tend to move in tandem, often this is not the case for small chilli and big chilli. During January-February 2011, for example, the wholesale price of big chilli in Kediri fell consistently, from IDR 25,000 per kilogram to IDR 10,000, whereas the price of small chilli fluctuated around the IDR 70,000 mark (see Figure 3 and Figure 5).

In 2010 Indonesian households spent, on average, an estimated IDR 13,404 per month on red, green and small chilli (BPS, 2011). This was equivalent to 1% of average household expenditure, the highest share in the vegetables' category. However, as in

the case of other food items that are used as condiments, the demand for chilli is income inelastic. In 2012, Indonesians in the lowest income quartile consumed, on average, an estimated 0.317 ounces of big chilli and 0.269 ounces of small chilli per week, compared to an estimated average weekly consumption by those in the highest income quartile of 0.319 ounces and 0.287 ounces, respectively (BPS, 2013).

If rising household income levels have little or no impact on chilli consumption, then an expansion of the domestic market will have to come mainly from population growth, a decline in the real price of chilli, or both. While Indonesia's population is currently growing at 1.1% per annum, the country is undergoing a demographic transition, with annual growth rates projected to continue falling over the next decade (BPS, 2014). The implication is that changes in population growth will not be a major driver of future increases in chilli consumption. Regarding prices, these would need to fall considerably in order to trigger a significant rise in consumption. Indonesians are not very responsive to reductions in the price of chilli because this ingredient is already widely used in the preparation of home and restaurant meals. Likewise, Indonesian consumers are reluctant to reduce purchases in a context of rising prices due to the importance of chilli as a condiment, the lack of product substitutes, and its relatively small share of household expenditures. In short, consumer demand is price-inelastic.

This discussion has important implications. Given a demand curve that is both income and price inelastic, any significant expansion in domestic production will have major negative impacts on farm-gate prices, even in a context where the economy is performing well and household incomes are rising. The impact of rising production on domestic prices are exacerbated in a context where imports are very low, with limited scope for import substitution, and exports are unlikely to be developed at scale in the foreseeable future. Consequently, increases in the chilli harvest will have to be absorbed by the domestic market.

In this context, the strategic importance of farm productivity gains, i.e. a reduction in cultivation costs per unit of output, cannot be overemphasized. Reductions in transportation and other marketing costs along the chilli chain can also mitigate the negative farm income impacts of increased production: in a marketing system that is characterised by strong competition between traders, some of the cost savings would be passed on to farmers in the form of higher farm-gate prices.

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## 2.3 International Trade

### **Fresh chilli exports from Indonesia are too small to have an impact on domestic market conditions (see**

Table 7). Between 2007 and 2011, exports averaged 1,217 tonnes per annum, i.e. 0.1% of average annual production during that period. In a context of small and stagnant exports, increases in domestic production had to be absorbed by the domestic market. This situation is unlikely to change in the foreseeable future. In the absence of cold chains, it is not possible to develop a significant export trade in fresh chillies, a highly perishable commodity. Concerns in regional markets over high levels of pesticide residues in Indonesian vegetables have been reported as another important barrier to export development (Menegay and Darmono, 2007).



**Table 7 Fresh chilli exports (tonnes) in Indonesia (2007-11)**

	2007	2008	2009	2010	2011	Average 2007-11
Exports	1,362	1,218	555	1,504	1,448	1,217
Production	1,128,793	1,153,060	1,378,727	1,328,864	1,483,079	1,294,505
Exp/Prod (%)	0.1	0.1	0	0.1	0.1	0.1

Source: Pusdatin, FAOSTAT (2013) and author's calculations

Fresh chilli imports have been rising, but the volumes remain too small to influence domestic market conditions (see Table 8). In 2007 Indonesia imported just 300 tonnes of fresh chilli. Imports increased to 500 tonnes in 2008; 900 tonnes in 2009; and 1,850 tonnes in 2010. They then jumped to 7,500 tonnes in 2011, a fourfold increase, but this was equivalent to just 0.5% of estimated domestic supplies, measured by production minus net exports.

**Table 8 Fresh chilli imports (tonnes) in Indonesia (2007-11)**

	2007	2008	2009	2010	2011	Average 2007-11
Imports(a)	301	501	905	1,850	7,501	2,212
Prod (Exp - Imp)(b)	1,127,732	1,152,343	1,379,077	1,329,210	1,489,132	1,295,500
[(a) / (b)] * 100 (%)	0	0	0.1	0.1	0.5	0.2

Source: Pusdatin, FAOSTAT (2013) and author's calculations

Indonesia enjoys a fair amount of natural protection for highly perishable crops, such as fresh chilli, due to the high packaging and transportation costs and significant post-harvest losses associated with overseas' trade. That is not the case, however, of dried chillies, which have a long shelf-life. Dry chilli imports have been rising, peaking in 2011 at about 20,000 tonnes (FAOSTAT, 2013). According to some of the key informants interviewed, this trade is driven by the needs of the food industry: most of the dry chilli used in the preparation of instant noodle sauces is imported. Recent growth in the importation of fresh and processed chilli has prompted the Indonesian government to include this commodity in the list of horticultural products subject to a temporary import ban for the first six months of 2013 (DFAT, 2013). These concerns are perhaps unjustified due to the small scale of the chilli import trade in relation to the size of the domestic market and its fairly limited impact on farm-gate prices.

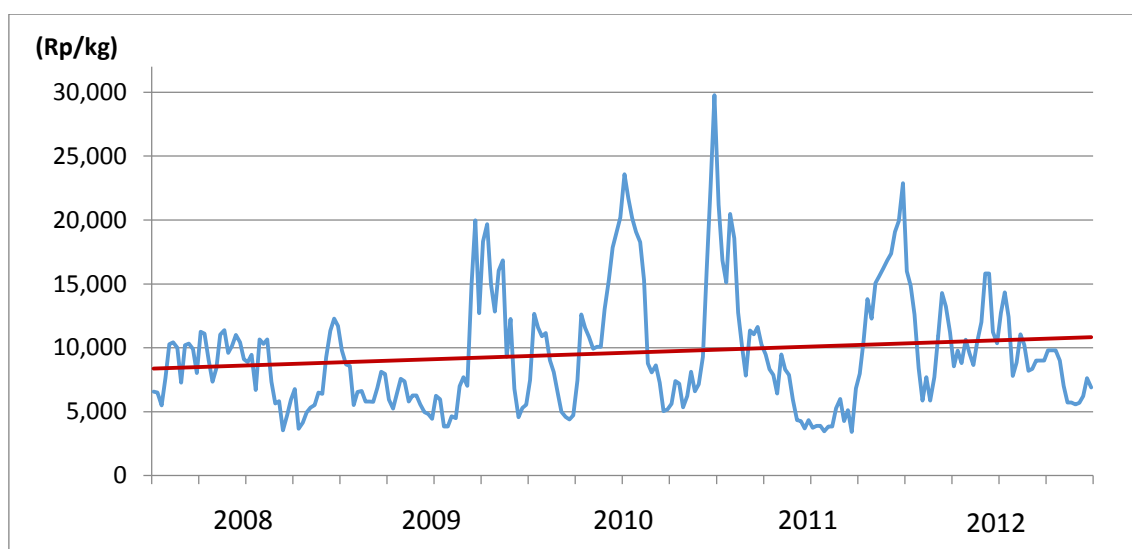
## 2.4 Price Patterns

### 2.4.1 Big chilli

Time series price data was collected from the Management Board of Pare assembly market in Kediri district, the most important reference market for chilli in East Java, and adjusted for inflation (see Figure 2). According to this data, the real price of big chilli in East Java has followed a slightly upward trend, but with rather extreme variations around the trend.

Chilli prices are very erratic, with significant daily, weekly and monthly volatility. For example, in 2009, between the second week of August and the third week of September, i.e. within a period of six weeks, the average price of big chilli increased more than fourfold. Then, in just one week, it fell by 36%. As another example, during December 2010 the price of big chilli increased more than threefold to IDR 33,850 per kilogram, but by late February it had dropped to IDR 9,000, a 73% reduction in just two months.

Short-term price volatility cannot be explained by changes in import and export flows, as these are too small to have a significant impact on prices. Neither can it be attributed to fluctuations in domestic demand, as this is fairly stable throughout the year, with the exception of the holy month of Ramadan, a period characterized by a spike in household consumption. Rather, short-term price volatility is mainly a consequence of fluctuations in the quantities harvested at any given point in time, which can be fairly significant, depending on past planting decisions by farmers, weather conditions, and the incidence of pests and diseases. Changes in supply will have considerable impact on the market value of the crop because, as noted, consumer demand is fairly inelastic in relation to prices. Short-term storage under low temperatures would reduce market instability, as supplies could be released during periods of high prices or kept in storage when prices are low, but private traders are yet to invest in cold chains for chilli and other vegetables.



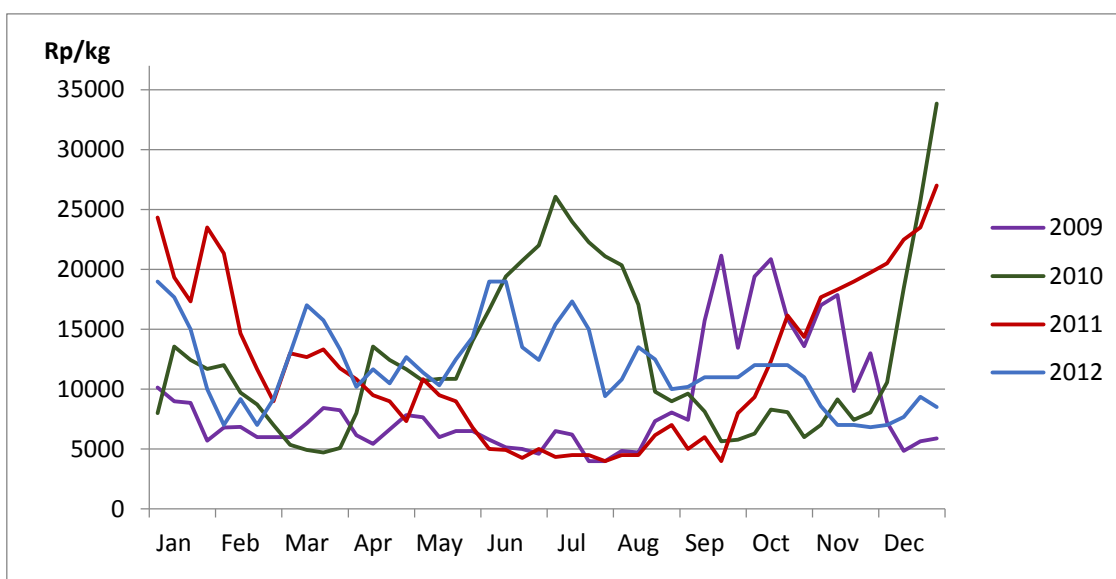
Source: Author's calculations based on unpublished data by Dinas Pertanian, Kediri District

**Figure 2 Real weekly prices of big chilli, Pare market, Kediri (2008-12)**

Intra-annual price patterns for big chilli are represented in Figure 3. In 2009 prices were fairly low and stable from January to August, increased significantly from September to mid-November, and then followed a steep downward trend until the end of the year. As in 2009, prices were low during the first three months of 2010, but unlike the previous year, they rose significantly over the following months, a period characterized by excessive rainfall, peaking in July at about IDR 25,000, about five times higher than in the same month of 2009. Prices stabilized over the next five months, but overshoot in December, when big chilli was being wholesaled for a price nearly seven times higher than in the same month of the previous year. In 2011, prices kept rising from late

September to late December, a very different pattern from 2010. Likewise, contrary to 2009 and 2011, the summer of 2012 was a period of high prices.

In short, farmers growing big chilli face highly erratic prices, not only within but also between seasons. As mentioned, weather conditions and pest and disease pressures can significantly disrupt inter-seasonal supply (and price) patterns. In this context, it is very difficult for farmers to make informed planting decisions. Farmers may be lucky and fetch a very high price for their crop, in which case they will make a healthy profit, but often they will find themselves in a position where they have to sell their harvest for a low price, thereby incurring a loss or just breaking even. Unsurprisingly, during the field interviews, farmers singled out exposure to adverse price fluctuations as their main issue of concern, alongside diseases.



Source: Author's calculations based on unpublished data by Dinas Pertanian, Kediri District

**Figure 3 Intra-annual price patterns for big chilli in Pare market, Kediri (2009-12)**

Farmers' concerns over price volatility are reflected in the activity focus of the East Java Chilli Agribusiness Association, which represents commercial chilli growers and traders in the province. With offices in Kediri and a fee-paying membership scattered across 19 districts of East Java, the Association has developed an information-sharing system aimed at reducing members' exposure to depressed market conditions. The Association members meet twice a year. In these meetings, data on current and projected planted areas and information about incidence of pests and diseases and market prices are shared and discussed. The provincial government covers part of the meeting costs in exchange for access to the Association's data. This is collected through a network of farmers across the 19 districts covered and cross-checked with seed companies and some large input retailers. Three representatives from each district attend those meetings. These members then share the information within their respective districts. The focus is on red and curly chilli, not small chilli. While the aim is to restrict cultivated areas in East Java to about 12,000 ha per season, which according to the Association leadership would ensure that farmers would normally fetch a price of at least IDR 8,000 per kilogram, the actual area planted with red and curly chilli often exceeds this target. It appears that the system is not forward-looking

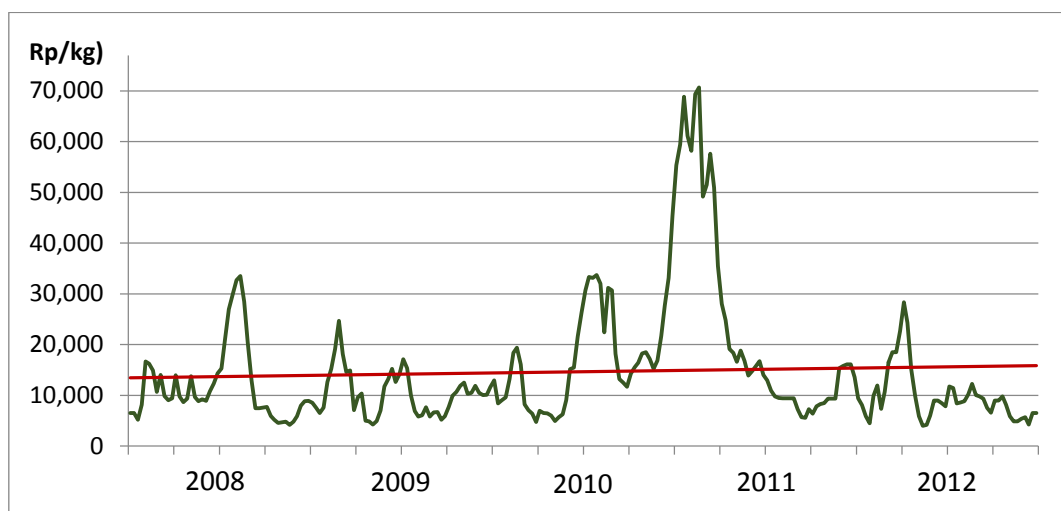
enough: once the data has been collected, it may be too late to influence farmers' planting decisions and market supplies. Furthermore, current dissemination channels appear to have limited outreach compared to a system where the information is broadcast on media such as the television and radio.

Price volatility is one of the reasons why both ABC Heinz and Indo-Food have in place contract farming arrangements for red chilli across Java, including East Java. Forward contracts reduce the exposure of these companies to high market prices while also enabling better forecasting of procurement costs. These contracts are also regarded as a tool for improving access to preferred red chilli varieties and spreading supplies throughout the year, which is critical to ensure a smooth and efficient running of processing operations. Being seen by government as a company that supports farmers may provide further motivation for the development of contract farming.

Still, these schemes involve a small number of farmers, thereby accounting for a relatively low share of supplies channelled to ABC Heinz and Indo-Food. First, contracts only apply to big red chilli, not small chilli, which is also used in the production of *sambal* and procured through spot market channels. Second, most of ABC Heinz and Indo-Food red chilli needs are met through weekly supply agreements with large traders because of the costs involved in setting-up and managing contract farming operations, past strategic default (or side-selling) problems, and high barriers to farmer participation. These issues will be further discussed in Sections 3.5 and 5.4.

#### 2.4.2 Small chilli

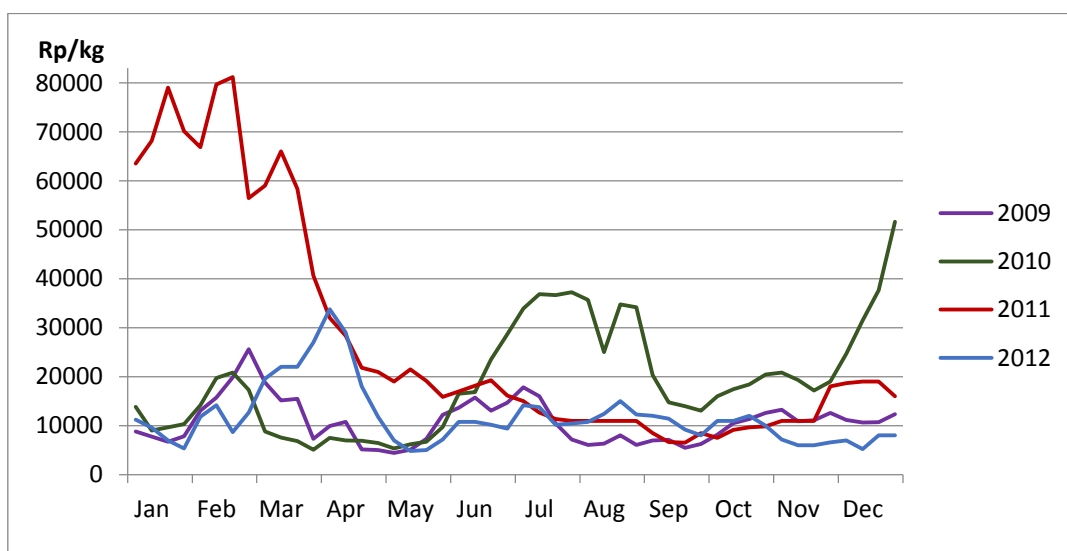
In recent years the overall trend in the real price of small chilli in East Java has been fairly stable (see Figure 4). As in the case of big chilli, however, there is significant volatility around the trend. For example, in 2008 the wholesale price in Pare market ranged from IDR 6,500 to IDR 34,000. In 2009 the market was more stable, but there was still a fourfold difference between the lowest and highest prices. The period between late November 2010 and mid-March 2011 was particularly striking: in seven weeks the weekly wholesale price rose from IDR 20,000 to IDR 80,000, dropping to IDR 22,000 in the following eight weeks.



Source: Author's calculations based on unpublished data by Dinas Pertanian, Kediri District

**Figure 4 Real weekly prices of small chilli, Pare market, Kediri (2008-12)**

Seasonal price patterns for small chilli are somewhat more predictable than for big chilli, particularly between the months of May and November, a period of relatively “low” and “stable” prices (see Figure 5)<sup>2</sup>. There are two reasons that may explain why small chilli has a more stable supply than big chilli: lower susceptibility to pests and diseases and longer harvest periods. A small chilli plant is typically harvested every five or seven days over a three-month period. In less commercialized areas, farmers may extend their harvest period for another month or two. In the case of big chilli, however, weekly harvests are conducted over one or two months only.



Source: Author's calculations based on unpublished data by Dinas Pertanian, Kediri District

**Figure 5 Intra-annual price patterns for small chilli in Pare market, Kediri (2009-12)**

<sup>2</sup> There are exceptions, as in 2010, a year characterized by excessive and prolonged rains.

## 3 The Chilli Value Chain in Malang, East Java

### 3.1 Production System

Having several mid- to high-elevation areas with a relatively cool climate and good access to water, Malang has developed as a year-round supplier of a wide range of vegetables, including chilli, cabbage, tomato, potato, sweet corn, broccoli, cucumber, carrot, celery, beans, and leafy greens. Favourable market access conditions have also played a role. Malang is located less than two hours away from greater Surabaya, the second largest conurbation in Indonesia, with over 5 million inhabitants. Malang City itself, the second largest city in East Java, with a population of more than 800,000, and Malang district, with a population of nearly 2.5 million, also provide a significant market for locally grown chillies and other vegetables.

In Malang, chilli has the largest cultivated area amongst all vegetable crops. About 3,340 ha were harvested in 2012, compared to 3,640 ha in the previous year (see Table 9). Two sub-districts, Poncokosumo and Pujon, account for over 40% of the chilli area. Wajak ranks third and Karangploso fourth, with about 10% each of the total production area. Interestingly, while East Java province specialises in the production of small chilli, red and curly varieties account for over 50% of the chilli cultivated area in Malang.

**Table 9 Chilli harvested area in Malang (2011-12)**

Sub-districts	Harvested area (ha)		Share (%)	
	2011	2012	2011	2012
Poncokosumo	744	858	20	26
Pujon	922	542	25	16
Wajak	342	374	9	11
Karangploso	248	346	7	10
Other sub-districts	1,382	1,219	38	36
Total Malang	3,638	3,343	100	100

Source: Dinas Pertanian, Malang

Local vegetable farms typically range from 0.2 to 1 ha, or 1.5 ha in rare cases. As several vegetables are grown on the same farm at any given point in time, a block of chilli may be as small as a tenth of a hectare or less. Rarely will it exceed 0.5 ha. Some farmers grow the crop only once a year, some twice. One can conservatively assume, therefore, that least 10,000 farm households in Malang earn some income from chilli cultivation.

While chilli is produced throughout the year, most chilli farm households grow the crop between March and October. In the main vegetable production areas of Malang, rice and maize are the dominant crops during the early wet-season months, between November and February. September and October are the peak chilli harvesting

months. Curly chilli is usually grown twice a year, whereas small chilli cultivation is concentrated during the months of July to October.

In lowland areas there is a three-month lag between planting and the first harvest. In higher-elevation villages, farmers have to wait four months before they can start harvesting. Big chilli is harvested every five or six days, up to 10 or 12 times. Small chilli is harvested 15 times or more over a three-month period.

For small chilli, farmers plant open-pollinated varieties, often using seed retained from the previous harvest. In the case of big red chilli and big curly chilli, hybrid seed is used. TM99 and Fantastik are the two most common curly chilli varieties in Malang.

Chilli cultivation in Malang is an expensive venture. Farmers have to spend a fair amount of money establishing the crop, purchasing fertilisers and pesticides, and hiring labour to work on the farm. Compared to other regions in East Java, chilli production in Malang is more advanced, in terms of the tendency of farmers to use quality inputs such as seed. This is indicated by the number of nurseries that provide the seedling services to farmers. The other area in Java that is also quite advanced in terms of chilli farming is Kediri, which is also a hub for chilli trading.

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### **3.2 Farm Profitability**

While farmers in Malang invest significant resources in their chilli farms, production costs vary considerably across farms. Farm investment levels are closely linked to the financial resources available to farmers, the priority accorded to the chilli crop, and farm size. Smaller farms, say under 0.2 ha, tend to be more intensively managed, as farmers can afford a higher level of external input use. Replicating such practices in larger farms is beyond the financial capacity of most chilli farm households. In some areas of East Java, such as Malang and Kediri, there are some specialized individuals who finance farmers or a group of farmers to grow chilli. Those individuals provide farmers with seeds and agro-inputs and also play a role as a buyer or sales broker during the harvest season.

Data collected from two curly chilli farms and one red chilli farm (see Table 10) indicates that farmers invest significant resources into their operations, particularly for agro-chemicals (fertilizers, herbicides, insecticides and fungicides), which can account for up to 25 to 50% of the total investment. External non-family labour is the second largest farm cost and accounts for 20 to 30% of total farm cost.

**Table 10 Farm production costs (IDR/Ha) in Malang (N = 3)**

	<b>Farmer 1 Curly chilli (dry season)</b>	<b>Farmer 2 Curly chilli (wet season)</b>	<b>Farmer 3 Red chilli (March - June)</b>
Farm rent	2,500,000		3,300,000
Tractor rental cost	1,000,000	2,700,000	
Seed	1,300,000	2,080,000	1,300,000
Stakes and plastic mulch	4,050,000	8,808,000	4,533,000
Fertilizer	11,717,000	13,280,000	6,260,000
Insecticides	5,073,000	9,000,000	1,280,000
Fungicides	5,322,000	11,400,000	1,350,000
Herbicides	275,000		340,000
Hired labour	17,677,000	14,000,000	6,675,000
Taxes	250,000	80,000	280,000
<b>Total</b>	<b>49,164,000</b>	<b>61,348,000</b>	<b>25,318,000</b>

Source: Fieldwork data (November 2012)

Data collected from the same farms also indicates chilli farming can deliver quite strong gross margins per hectare, as well as positive returns on family labour (see Table 11).

**Table 11 Farm gross margins in Malang (N = 3)**

	<b>Farmer 1 Curly chilli (dry season)</b>	<b>Farmer 2 Curly chilli (wet season)</b>	<b>Farmer 3 Red chilli (March - June)</b>
Cultivation cost (IDR/Ha)	49,164,000	61,348,000	25,318,000
Revenue (IDR/Ha)	140,000,000	180,000,000	60,000,000
Yield (Tonnes/Ha)	20	12	10
Price (IDR/Kg)	7,000	15,000	6,000
<b>Gross margin (IDR/Ha)</b>	<b>90,847,000</b>	<b>118,652,000</b>	<b>34,682,000</b>
<b>Return on family labour (IDR/person days)</b>	<b>2,096,000</b>	<b>n.a.</b>	<b>518,000</b>

Source: Fieldwork data (November 2012)

However, it should be noted that this is not always the case. Profit is highly dependent on yield and most importantly price per kg which can be very erratic. In the case of farmer 3 in Table 11, yield was only 50% of the yield of farmer 1. This has contributed significantly in reducing profitability.



The potential for high profit from chilli compared to other vegetables also explains a farmer's willingness to invest in chilli, although they are fully aware of the volatility in prices and the influence this has on profitability.

Interpretation of margin data regarding farm profitability from this report should be used very carefully due to sample bias (very small number of samples). Some studies suggest that the variance of measures like gross revenue, gross margin and profit are higher than the variance of measures of inputs or total costs. This means that the small sample size used may possibly provide useful estimates of inputs or costs, but provide more unreliable estimates of gross revenue, gross margin and profit.

### 3.3 On-Farm Labour Use

While the data collected from just three farms cannot be extrapolated to the entire population of chilli growers in Malang, it is consistent with the qualitative information gathered from key informants, who stated that chilli is a labour-intensive crop. The labour used in the three sample farms ranged from 277 to 408 person-days per ha (see Table 12). Labour use varies considerably across farms, depending on a household's ability to pay for labour and the priority accorded to the chilli crop.

**Table 12 On-farm labour use in Malang (N=3)**

	<b>Curly chilli</b>	<b>Curly chilli</b>	<b>Big red chilli</b>
Farm employment (person-days / ha)	307	408	277
Hired farm labour / total farm labour (%)	86	100	76
Hired female labour / total hired labour (%)	58	67	21
Female employment / total employment (%)	50	67	16

Source: Fieldwork data (November 2012)

Chilli farming generates significant wage employment, as most of the workforce involved in planting, fertilization, weeding, spraying, or harvesting activities consists of hired labour (see Table 12). On two of the Malang farms surveyed women accounted for 60-65% of hired labour, whereas on the third men contributed 80% of the labour input. Women play a particularly important role during the weeding and harvesting stages and may also be involved in the transplanting of seedlings and application of fertilisers. However, they very rarely spray the crop. Men are therefore much most affected by intensive (and inappropriate) spraying practices than women.

There is a gender wage gap. In the three farms surveyed in Malang, the daily wage rate for women was IDR 25,000-30,000, whereas men were paid IDR 30,000-35,000 per day. Men received 17-20% more than women, even when performing the same task. Interestingly, women are often employed for half-day shifts so that they can have time to take care of household chores, whereas men typically work full-day shifts.

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## 3.4 Chain Actors and Linkages

### 3.4.1 Input distribution

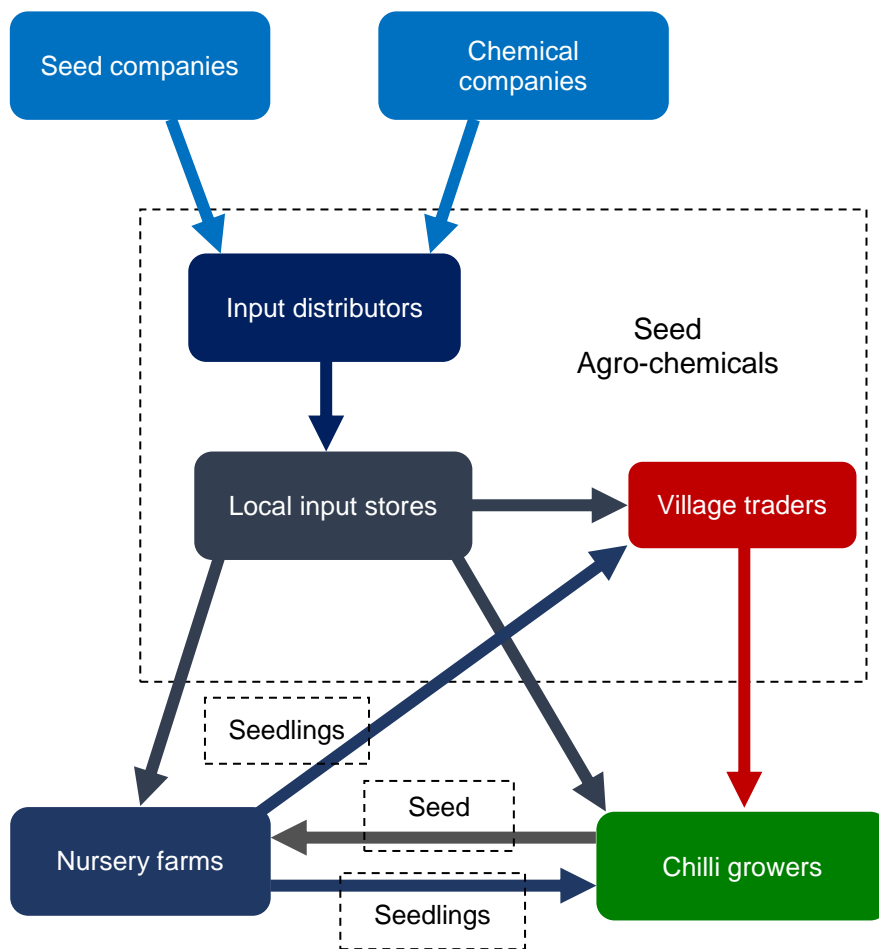
In the main vegetable growing areas of Malang, farmers may have five or six shops supplying agricultural inputs in their own village. These are generally well stocked, selling different seed varieties and a wide range of agro-chemicals. Prompt payment in cash is the norm, although some input retailers may occasionally provide credit in kind to select farmers they know well and trust.

A significant number of chilli farmers in Malang access trader finance. In Karanganyar village of Poncokusumo, for example, it was mentioned that 20-30% of vegetable growers receive production credit from traders as an embedded service. A similar estimate was provided to the EI-ADO team in Tawangargo village of Karangploso: about 10% receive seed credit and 20% or 25% cash loans from traders. In Codo village of Wajak sub-district, as many as 70% reportedly benefit from such services, although this is likely to be an inflated figure. Credit functions as an implicit verbal contract whereby the farmer agrees to sell the harvest to the trader, an arrangement that minimises search and other transactions costs for both parties. While no interest is charged, borrowers may sell their harvest for a small discount, although this is not always the case. Criteria for selection of borrowers include the scale and productivity of the farmer, the personal relationship between the trader and farmer, the farmer's reputation within the community, and his past history in selling to the trader.

Whilst the practice may be quite common, the amount of credit provided by traders is in fact relatively small. According to farmers in Codo, it covers about 10% of farm investment costs. In Karanganyar, the value of in-kind and cash loans provided to an individual farmer rarely exceeds IDR 6 million, a fraction of the amount spent on seed, agro-chemicals, labour and other external inputs. Farmers therefore have to rely mainly on their own funds to finance farm production activities. Only a minority of vegetable growers, perhaps 10% at best, have access to seasonal bank loans.

Many chilli farm households grow their own seedlings. Reasons for this include reducing costs, logistical convenience and/or because they are unsure about the quality of the seedlings supplied by local nurseries. However, in villages where chilli is a major crop, 40-70% of growers purchase seedlings from small commercial nurseries. This option saves time and labour. Access to quality seedlings is another important motivation. Farmers may buy from nurseries because they have poor access to water, a critical input for successful seedling production, or because it may be necessary to replant following poor establishment of their own seedlings, or to align the timing of their production system, which may consist of several horticultural commodities (for cash flow and risk distribution purposes). Some farmers access seedlings on credit from village traders, an important client for the larger nursery businesses in sub-districts such as Poncokusumo and Pujon.

Figure 6 depicts the input chain in Malang.



**Figure 6 Input chain in Malang**

Traders and farmers often order seedlings in advance from local nurseries. In most cases, the seed to be grown into seedlings will be provided by the farmer or trader. When purchased by the nursery operator, clients are often asked to pay part of the value of the transaction in advance and part upon delivery of the seedlings. The study team met with nursery businesses that primarily service farmers who bring their own seed and nurseries that also produce seedlings for opportunistic, spot market sales. The latter strategy has a higher level of risk. In order to develop a good understanding of local demand for different varieties, the nursery operator will be in close contact with staff from seed companies, local input stores, and farmers themselves.

While chilli accounts for a significant share of local nursery businesses, most also produce tomato and cabbage seedlings. Other vegetable crops have little expression in local nursery portfolios. Product diversification allows nurseries to operate all year, even though there is some seasonality in sales, with a peak in the early dry-season months.

Most local nurseries produce between 20,000 and 100,000 vegetable seedlings per month. A few have a monthly output of 200,000 to 400,000 seedlings. There are four such nurseries in Poncosumo. They are large by Malang standards, but in Pare sub-district of Kediri, which has a more developed nursery cluster, there are a couple of businesses producing up to 600,000 or 700,000 seedlings per month. These nurseries

grow seedlings in greenhouses, whereas in Malang only plastic roof protection is used. Only a few larger nurseries have adopted the more expensive UV plastic. Unlike their smaller competitors, these nurseries use polybags, a standard technology in Kediri. Female labour is employed to fill the bags by hand, a very labour-intensive activity. In the larger Kediri nurseries, equipment is used to perform this task.

As expected, larger nurseries employ much more labour than their smaller counterparts. The larger nursery operator interviewed in Malang has nine permanent workers. Another has a permanent workforce of four. Smaller nursery operators rely more on their own and casual wage labour. Smaller nurseries supply farmers in their vicinity. Larger nurseries have a broader market outreach, which may extend beyond the sub-district, as well as a more diversified client portfolio that includes larger growers and traders.

### **3.4.2 Spatial flows and market channels**

Most of the chilli harvest in Malang is consumed within the district, in Malang City, and in other parts of East Java, particularly in and around Surabaya. Some supplies are channelled to other important market destinations such as Bali, greater Jakarta, Central Java and Kalimantan.

The chilli crop is distributed and retailed through traditional channels. Only a very small share of production is channelled to modern retail outlets. According to unpublished data collected from a representative sample of consumers in Surabaya, Solo and Bogor, only 1% of households in these three cities rely on hypermarkets and supermarkets as the main outlets for their chilli purchases (Wendy Umberger, pers. comm.). Interviews with staff of different supermarket chains confirmed that sales of chilli (and other vegetables) are negligible. When buying their daily vegetables, Indonesian consumers show a strong preference for traditional markets, despite the fact that these are often over-crowded and unhygienic. Street vendors and small traditional shops are also important sources of vegetables. Traditional outlets are considerably cheaper than supermarkets and appreciated for the freshness of the produce on offer. Many consumers also seem to enjoy the experience and the convenience of buying chilli and other vegetables from traditional retailers.

None of the traders interviewed in Malang sell exclusively to the food industry. There are however, a handful of traders that supply ABC Heinz and participate in their regular procurement/ bidding process. Although these traders are normally large-scale traders, the volume of chilli supplied to food processors is not significant to their total chilli trading. Even for those large scale traders, their main markets remain the wet markets in urban areas of Java and occasionally Kalimantan and Bali.

A discussion of traditional chilli chains is presented in the next few sections of this report. This is structured around spatial flows (intra-district, intra-provincial, inter-provincial and inter-island). The supermarket chain is not discussed as it has little relevance for a project such as AIPD-Rural, which aims to deliver pro-poor impacts at scale within a five-year timeframe. Supermarkets have a very residual share of the chilli retail market and this is unlikely to change in the foreseeable future. Chilli and other vegetables retailed through modern channels are procured from wholesale markets and dedicated suppliers who buy from a small number of farmers or market

wholesalers, in a system that is not so different from the traditional trade. Dedicated supermarket suppliers handle relatively small volumes but benefit from high prices. They are able to meet strict contractual conditions, including delayed payment and high penalties for failure to deliver agreed volumes. According to some key informants, personal relationships with supermarket procurement managers and the payment of informal fees are often necessary conditions for entry into the modern retail channel.

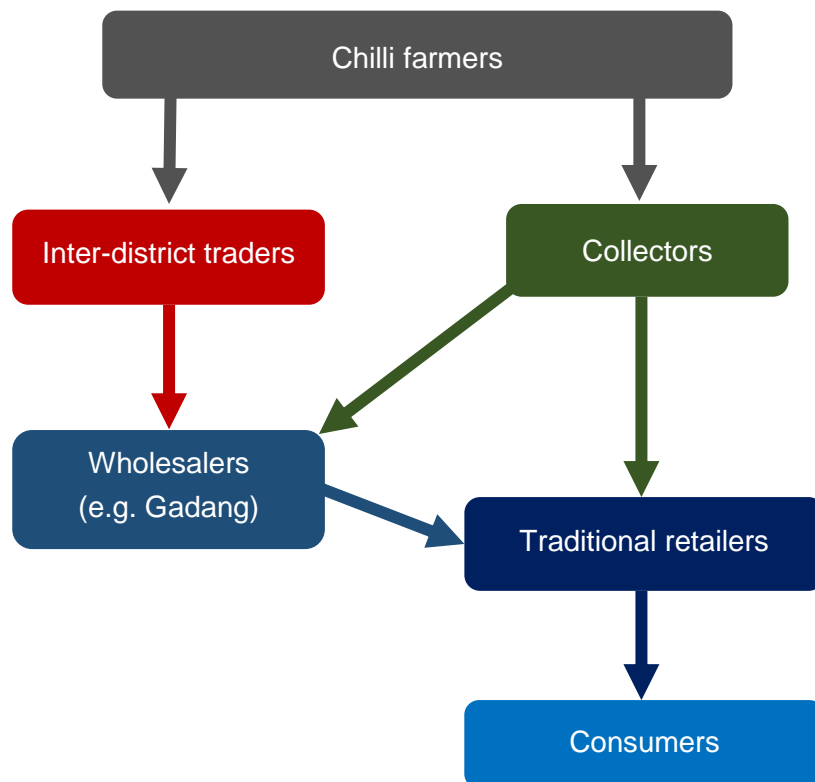
### **3.4.3 Intra-district chains**

The intra-district chain is depicted in Figure 7. Malang City represents an important market for local chili growers. Gadang market is the main wholesale distribution centre, supplying large numbers of urban retailers. There are some wholesalers in Gadang that sell chilli (along with other vegetables). About half specialise in sales to retailers, handling between 0.1 and 0.5 tonnes of chilli per day. The other half specialise in long-distance trade, supplying wholesalers in Bali, greater Jakarta and Central Java. Gadang traders get their supplies from collectors and inter-district traders.

Village assembly markets, of which Karangploso is perhaps one of the largest, supply peri-urban and rural retailers. Many collectors bring their supplies to these markets. Inter-district traders may occasionally sell at these markets, but they primarily target markets outside the district. Mantung is another village assembly market for farmers around Batu. It's located next to Malang and supplies wet markets in Malang as well as Surabaya and its satellite cities. Mantung also plays important role in inter-island trading.

Village traders usually pay farmers upon collection of the crop or within a day. These traders often employ their own "workers" to collect the crop on farm. Likewise, wholesalers pay their suppliers upon delivery of a consignment or within days. Wholesalers only accept delayed payment from select regular customers. Wholesalers in Malang City do not provide cash advances to their suppliers. The only significant credit flows along intra-district chains are between village traders and farmers. These were discussed in section 3.4.1.

Inter-district traders are a much more important source of credit than collectors because they handle larger volumes and deal with a larger number of growers. Both collectors and inter-district traders sell a variety of vegetables, but for most part, chilli is a key crop in their portfolio, especially in Poncosumo and Pujon. In these two sub-districts, inter-district traders normally sell between 1 and 3 tonnes of chilli per day and have 40 to 80 regular suppliers. Collectors tend to handle less than 1.5 tonnes per day. They will normally purchase vegetables from 20 to 40 growers.



**Figure 7 Intra-district chilli chain**

### 3.4.4 Intra-provincial chains

The intra-provincial chain is depicted in Figure 8 below. Porong market in Sidoarjo, near Surabaya, is a major distribution centre for Malang chilli. Many inter-district traders go to Porong every day with mixed vegetable loads, including chilli. They have been participating in this trade for many years. The produce is transported in 2-ton pick-up trucks owned by the traders. Each has several regular buyers in Porong. These are “large” market retailers from Sidoarjo, Surabaya, Gresik, Mojokerto, Pasuruan and Madura, or mobile traders who supply market and street vendors in these locations. Some of the retailers buying directly from Porong also supply market and street vendors. Interestingly, some market retailers in and around Surabaya buy their supplies collectively from Porong market. The fact that inter-district traders have been doing business with buyers in Porong for many years is important for efficient coordination and negotiation of transactions. Prices are determined when the parties meet at the market.

Some Gadang wholesalers and some inter-district traders also supply Keputran, the main wholesale market for fresh produce in Surabaya, but this is a secondary channel. Inter-district traders prefer to send most of their supplies to Porong because this market is closer to Malang. Moreover, buyers in Porong purchase a range of vegetables and pay on the spot, whereas those in Keputran specialise in specific vegetable crops and pay within a few days of delivery.

Supplies to neighbouring Blitar and Lumajang districts are channelled through village

assembly markets. Many mobile traders from these districts source their daily supplies from village markets in Malang. Local collectors are their main suppliers.

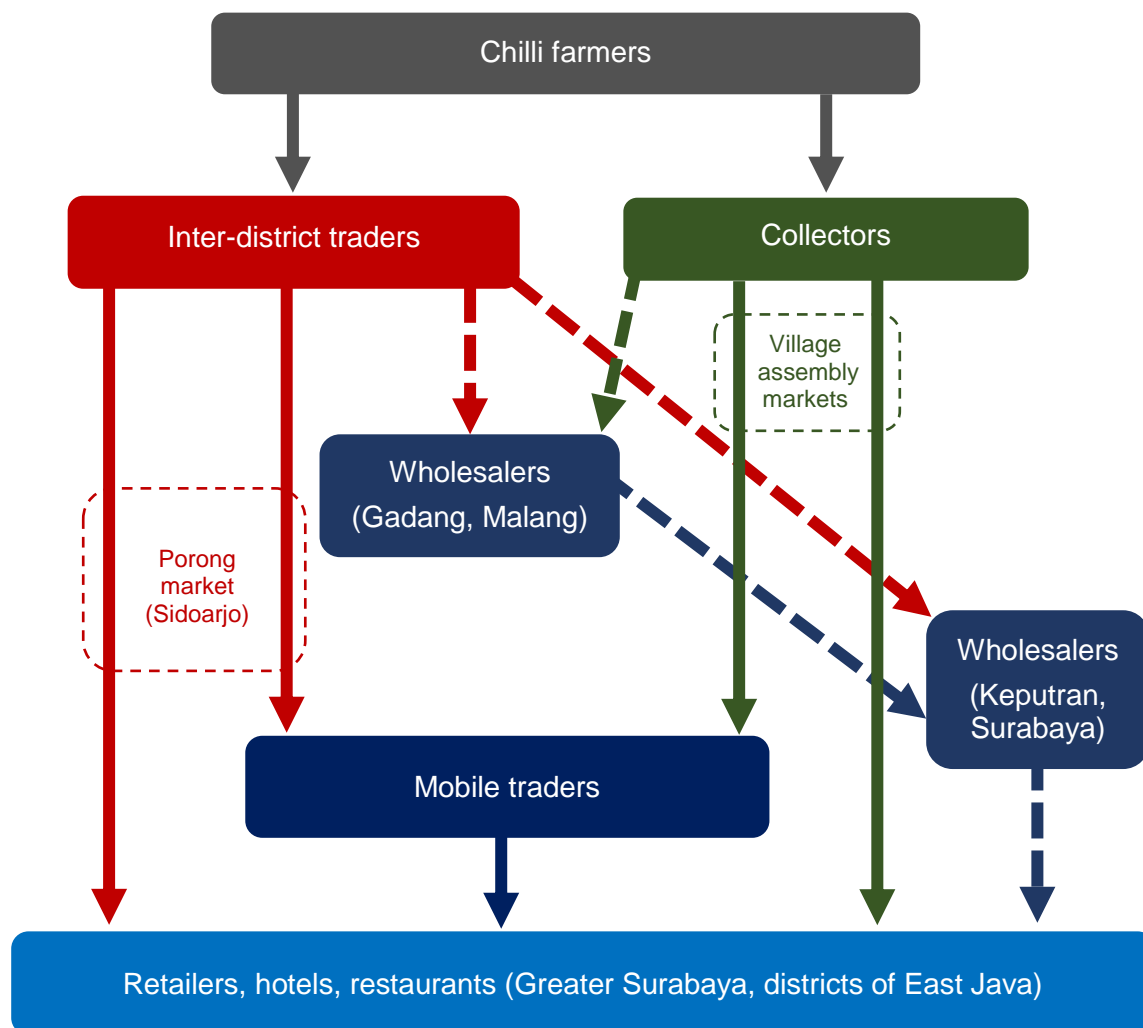


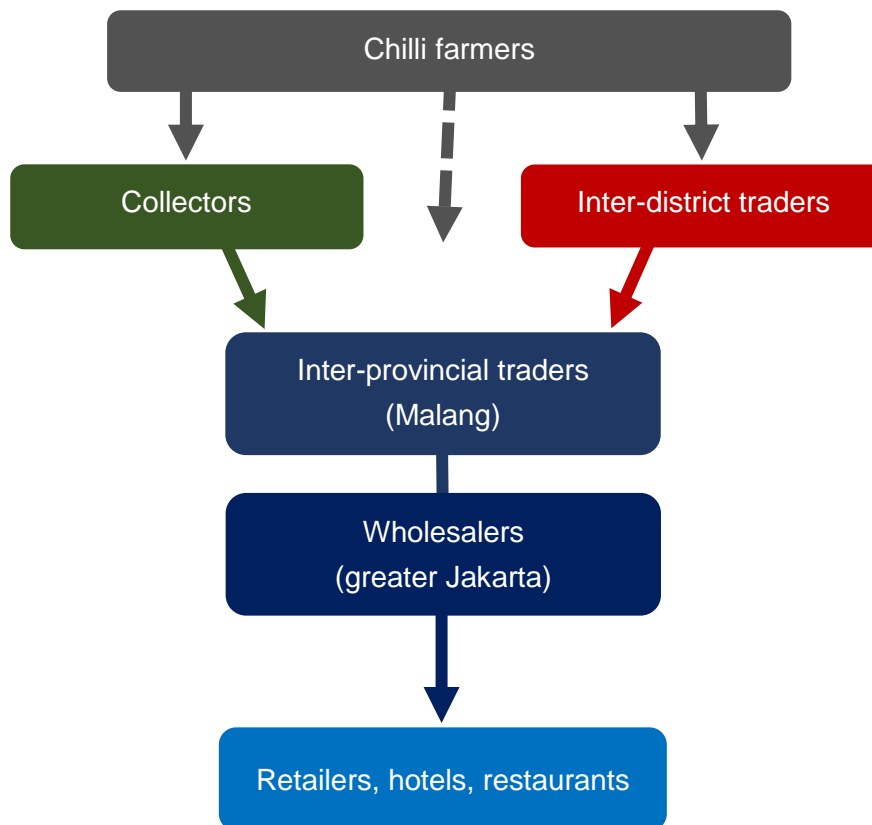
Figure 8 Intra-provincial chilli chain

### 3.4.5 Inter-provincial chains

The pathway and participants in inter-provincial chains are depicted in Figure 9. A few traders in Malang supply wholesalers in and around Jakarta. This trade takes place throughout the year, peaking around Ramadan and in late December, before the New Year. Despite the distance, some wholesalers in Jakarta and surrounding cities source chillies from Malang because the district can provide a continuous supply.

There are a handful of village traders that supply greater Jakarta directly. One of them is Ibu Lulu who is one of the largest vegetable traders in Poncokusumo. Ibu Lulu has been doing business with one wholesaler in Tangerang since 1996. Chilli is the main vegetable in her portfolio. Ibu Lulu works closely with 150 local growers, but she also buys from other districts in East Java. Sometimes she even procures chilli from Keputran market or local collectors in Surabaya. The other trader that was interviewed,

Pak Ahmad (poncokusuman), applies a similar business model. His business focus is on chilli, tomato and cucumber, depending on the season. He provides half a ton of chilli per day to the Jakarta market. From field work interviews, there are at least 10 traders like him who supply Jakarta on a regular basis and many more who switch to chilli when the price is attractive. This business model is also applied by some large traders in Malang and to a larger degree to traders in Kediri (pare).



**Figure 9 Pathways and participants in inter-provincial chilli chains**

Inter-provincial traders handle larger volumes of fewer vegetables than inter-district traders. They normally supply one or two buyers in one or two markets. Inter-provincial traders face difficulties in dealing with many wholesale customers because each needs a continuous supply of relatively large consignments and because high levels of trust are required for long-distance transactions. Transactions are coordinated over the phone, so the parties do not meet face to face. Prices are determined before a consignment is sent from Malang, but the payment will normally be settled five to seven days after the produce arrives at its destination. Inter-provincial traders do not receive advances from buyers, having to rely on their own funds and bank loans for working capital.

### 3.4.6 Contract farming and collective action

No formal contract farming arrangements were found in the Malang chilli chain. Contract farming schemes are costly to develop and can only be justified where firms are targeting premium markets in Indonesia or abroad. Currently, such chains are very



under-developed. The study team only identified one formal contract farming scheme in Malang. The scheme is managed by Horti Bima, a Taiwanese export company that has forward contracts with 150 vegetable growers, but these are for the production of snow peas, sown pea shoots, and sugar snap peas, not chilli. The company also produces jam from a range of fruits and vegetables. All production is exported to Taiwan. The company's contracting system is currently functioning well. While some participating farmers may face exclusion due to side-selling, during the past five years their number has remained fairly stable.

Likewise, the current market landscape does not favour the emergence of collective, farmer-owned enterprises. A clear demand for premium quality produce, purchased for a significant price premium, provides the strongest justification and incentive for the development of informal and formal farmer cooperative enterprises with linkages to modern trading firms. Such demand is currently too small to justify the costs of collective action in the production and marketing spheres.

The team met the management of NOFAR, one vegetable trading enterprise in Batu that is working with certified farmers for the production of a wide range of organic vegetables, including chilli. After more than five years in operation, the enterprise is still facing many challenges: less than 30 growers supply organic chillies and the volumes are small; a significant share has to be sold in conventional markets due to a lack of premium buyers; there is limited demand for expensive organic vegetables; only selected, relatively wealthy farmers, located far from each other, participate in the NOFAR chain, making monitoring and coordination challenging and costly. The enterprise is at a difficult juncture. NOFAR is hoping that investment by ATK in an organic tomato puree factory in Surabaya will address current marketing problems. At the time of writing there were no assurances that the investment would go ahead.

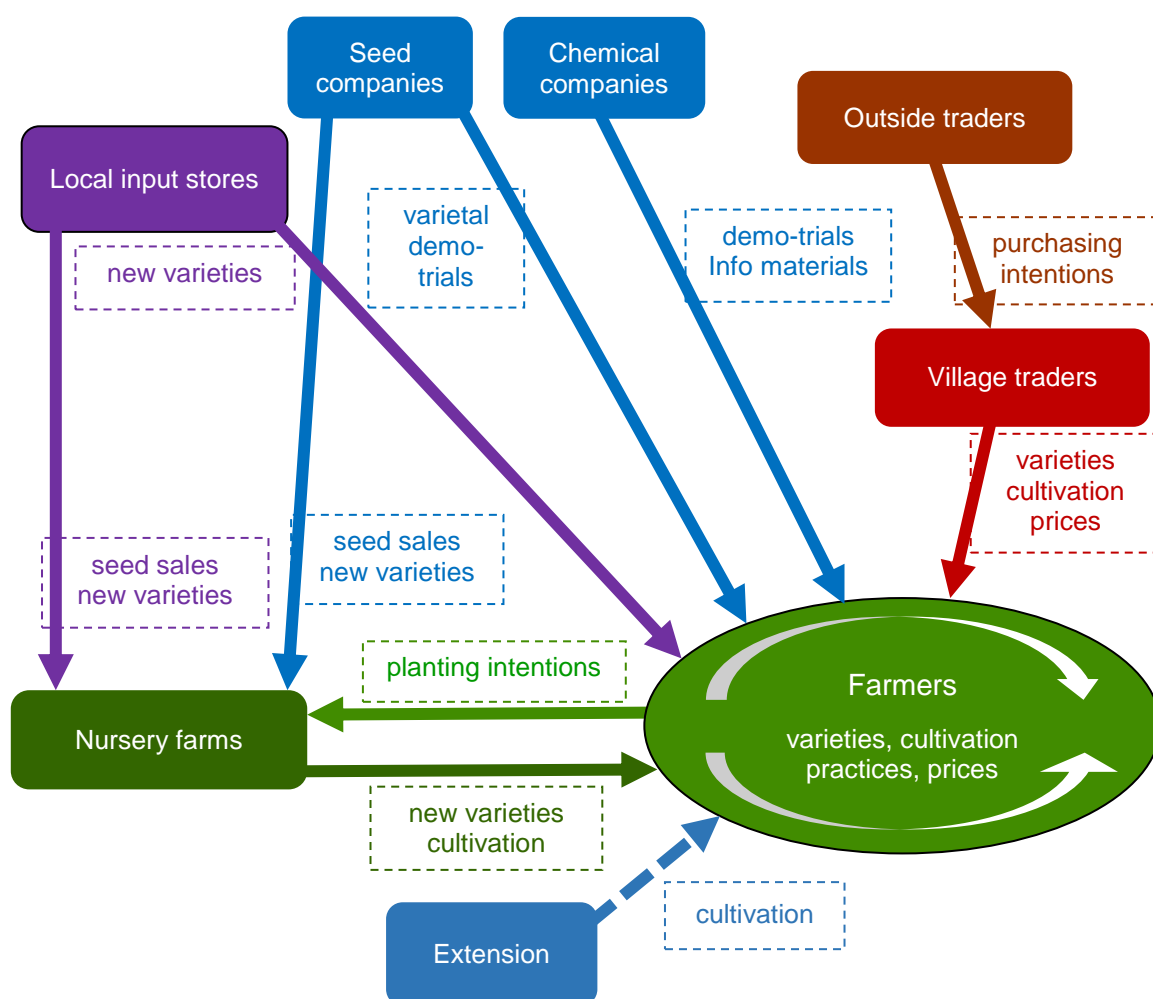
The team also interviewed the management of Herbal Estates, an organic venture in Batu, and PT. Bahtera Agrikultura Indonesia, a safe vegetable operation in Mojokerto. Both companies had more professional management than NOFAR. Additionally, they were supplied with produce grown on their own farms, each extending over an area of just 3 ha. Small additional supplies were procured from a few scattered contract growers. Both Herbal Estates and PT Bahtera Agrikultura were very cautious about expanding their supply base due to the technical challenges of producing organic and safe vegetables and the small size of premium market channels. Herbal Estates sells to high-end hotels and specialised retail chains, such as Ranch and Papaya, while PT Bahtera supplies consumers in affluent neighbourhoods of Surabaya through its own network of door-to-door retailers. Another vertically integrated organic farming business in Batu was mentioned during the interviews, but the enterprise relies solely on its own small farm as a source of supplies. It does not buy organic vegetables from smallholder farmers.

These different enterprises have some key features in common. They are very small ventures; they have low scalability potential; and they have very limited or no upstream links to smallholder farmers. NOFAR is the only enterprise that relies on smallholder farmers for the bulk of its supplies and this may contribute to the challenges it is facing in the production, management and marketing spheres.

### 3.4.7 Information and knowledge flows

In sub-districts such as Poncokusumo, Pujon, Wajak and Karangploso there is a large presence of commercial vegetable growers, traders who also have their own vegetable farms, input retailers, and nurseries. These areas also have a clear commercial interest for seed and agro-chemical companies, who have some marketing and field staff stationed in Malang. Such a concentration of chain actors creates a favourable context for exchange of production- and market-related information (see Figure 10).

Farmers, nursery operators, and traders are constantly trialling new varieties, rotation crops, inter-crops, and agro-chemicals. These experiences are shared through family, social, and market networks. For example, nursery farmers that trial new varieties as part of their business development will share their experience with relatives, neighbours, and clients.



**Figure 10 Knowledge and information flows in the Malang chilli chain**

Seed and agro-chemical companies have played an important role in local technology adoption processes, even though their services are driven by their own commercial interests, i.e. promotion of their products, not necessarily the best options available to farmers. Marketing and field staff working for the main seed companies interact with many input retailers, nursery farmers, and vegetable growers when promoting recently

released varieties. Demo-trials are sometimes implemented in order to expose potential users of these varieties. Likewise, all major agro-chemical companies have staff based in Malang who organise local demo-trials as part of their product promotion responsibilities. These companies also distribute information materials e.g. brochures about specific agro-chemicals, through local input retail outlets.

Government extension services are a more impartial source of technical advice. However, they face acute resource and institutional constraints, resulting in only a marginal role in local innovation processes. Extension officers lack key knowledge and skills, as well as the performance-related incentives that are so critical for the delivery of an effective service.

A good understanding of local demand for seedlings is critical for the success of nursery businesses, especially those selling in spot markets. Information about farmer planting intentions is obtained from farmers' themselves and local traders. Nursery operators also consult seed company staff and input retailers on a regular basis in order to access information on local seed sales.

Information about spot market prices has obvious relevance for farmers as without it they cannot assess the fairness of the terms offered by village traders. With numerous daily transactions and the existence of local assembly markets, it is not difficult for farmers to access spot price information. However, both farmers and traders seem to have difficulty making sense of intra-annual price patterns and forming reasonable expectations about price outlook scenarios. These abilities are critical for making informed planting decisions. As discussed in section 4.6, this weakness could be addressed through the transfer of strategic market assessment capacities and facilitation of linkages to selected sources of information within and outside Malang.

Knowledge of pest and disease management strategies was identified as another important gap. Farmers often improvise or follow local practice in their attempt to deal with pest and disease problems. The understanding of pests and diseases, their causal factors, optimal timing for intervention and the relative cost-effectiveness of different control technologies is often weak. Control options will often differ between villages due to the influence of local agro-climatic conditions and production systems. Location-specific research is therefore needed to determine possible improvements over current practices but such services are costly and rare.

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### **3.5 Quality Management Systems**

Chilli has a shelf-life of just three or four days after harvest. In a context where cold storage is not an option, village traders and wholesalers cannot afford to hold inventories. Once harvested, chilli is channelled to retailers in Malang and other parts of East Java within 24 hours. Supplies to Greater Jakarta reach retailers within two days. Because of perishability, transportation by sea is not an option in the Kalimantan trade. Instead, small volumes are shipped by plane, an expensive practice that adds IDR 7,000 to the cost of the chilli.

In short, the chilli supply chain is organized to minimize physical and quality losses. None of the village traders or wholesalers interviewed in Malang reported significant physical and quality losses. A large traditional retailer in Surabaya reported losses of

just 1%. One wholesaler in Keputran market stated that 1-2% of his chillies are normally sold for a discount (one-third of the normal price) due to broken fruit and rots. In the case of one small retailer in Sidoarjo, product losses accounted for 3% of her revenues.

Farmers, collectors, inter-district traders, wholesalers and retailers do not grade their chilli. Prices along the chain may differ, however, depending on product attributes such as water content and colour. Some wholesalers and retailers will sell broken fruit separately for a discount. Traditional retailers de-stem some of the chilli fruit as a value-addition strategy.

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### 3.6 Margins

Price and marketing cost data along the Poncososumo-Porong chain was collected on 16-17 July 2013, just before Ramadan, at a time when chilli prices were particularly high (see Table 13). Chilli growers received approximately 70% of the retail price. Inter-district traders, distributors, and retailers “appropriated” 12% of the crop’s retail value as net margin. Marketing costs accounted for 19% of the retail price. Retailers earned a relatively low margin due to product losses and high transportation costs per kilogram, representing 40% and 20%, respectively, of total marketing costs from the farm through to retailing. The net margin for inter-district traders was also small when measured as a percentage of the price received in Porong, but less so in absolute terms because of high market prices. As highlighted by many key informants, inter-district traders earn very small profits on average, and may even incur financial losses when the market is over-supplied and the price of chillies very low.

**Table 13 Gross and net marketing margins along the Malang-Porong chain**

	Farmer	Inter-district trader Malang	Large retailer Sidoarjo	Small retailer Sidoarjo
Selling price (IDR/kg)	9,000	9,750	10,500	13,000
Share of retail price (%)	69	75	81	100
Gross margin (IDR/kg)*		750	750	2,500
Gross margin (%)		7.8	7.1	19.2
Variable costs (IDR/kg)		410	273	1,811
Labour		32	16	0
Packaging		108	110	37
Transportation		164	38	500
Product losses		0	98	1,050
Other		106	11	224
Net margin (IDR/kg)*		340	477	689
Net margin (%)		3.5	4.5	5.3

Source: Fieldwork data, 16-17 July 2013

\* Gross margin per kg = selling price – purchasing price

\*\* Net margin per kg = selling price – purchasing price – other variable costs per kg

Some caution is needed when interpreting margin data. Net margins are known to fluctuate considerably between transactions, especially those earned by inter-district traders, who face the highest marketing risks. Inter-district traders only know the price they will receive in Porong after they bring the chillies to the market, i.e. after the produce has been purchased from farmers. This is very risky because prices may vary significantly from one day to another, or even within the same day. In order to protect themselves against adverse price fluctuations, some inter-district traders have developed commission-based marketing arrangements with farmers to whom they provide credit services. In such cases, the trader will keep a share of the farmer's supply, say five kilograms for every 60-65 kilograms, or charge a fixed amount, say IDR 600 or 700 per kilogram sold.

All actors in the Malang-Porong chain are price takers. In other words, traders have limited scope to determine purchasing and selling prices. Village traders and retailers operate in highly atomistic or competitive spot markets where prices are constantly changing in response to changing supply conditions. It is true that village traders may have some flexibility in determining the price paid to farmers to whom they have provided credit. However, this comes at a cost. Scarce working capital has to be allocated to these farmers as credit. More importantly, there is a mutual understanding that traders must purchase all vegetables produced by those farmers, even when that is not in their interest, i.e. at times when market prices are very low. Access to credit services and guaranteed sales are the two main reasons why many farmers prefer to sell repeatedly to the same trader. However, it should be noted that they face no

shortage of potential buyers in their village and can easily shift from one to another if they feel that they are not getting a fair deal.

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### 3.7 Problems and Constraints

In such a traditional chilli market chain in Malang, a lack of entrepreneurial skills is a constraint for the farmer, who has traditionally been producing the same crops and starts finding the markets for them only at the time for harvesting. When the market demand is low and prices fall, the government is often called to come to the rescue. A better understanding of the roles of the government and market would help avoid large dissatisfaction amongst the producers: it is not a market failure nor the fault of the government if urban consumers do not wish to purchase chillies for a high price. Despite the fact that traders interviewed for this study had been in business for years, the level of knowledge in basic business skills is mostly very low and the businesses are rarely growing. Particularly in rural areas (intra-district chains), the traders are frequently unable to distinguish between revenue and profit. Unfortunately, this situation exists at the farmers' level to an even greater extent, largely due to an absence of record keeping of any farm activities.

Despite the high risks in production and marketing, farmers still cultivate chilli due to its perceived higher likelihood of providing greater profits as compared to other crops. This lack of knowledge leads to speculative behaviour in area planted and possibly the overuse of chemical inputs. Small-sized rented landholdings also intensifies this behaviour because it forces farmers to have a short-term business orientation. This situation is exacerbated by the fact that farmers have a limited understanding of their own self risk tolerance. In dealing with chilli profit/income uncertainties, farmers need to adopt risk management strategies that are in accordance with their own risk attitudes, preferences, and business and family conditions.

On the production side, intensive use of labour is becoming a problem, not from the perspective of rural labour absorption (employment), but from the efficiency of production costs for chilli producers. Decreasing labour availability and quality in rural areas may lead to an increase in the proportion of production costs being redirected to labour that eventually may cause a decline in chilli agribusiness' competitiveness.

Inadequate management skills and the absence of strong farmer associations/organizations in the Malang chilli agribusiness sector leads to a loss of advantages of economies of scale. Farmer organisations can play a critical role in making input and output markets work transparently and competitively. Unfortunately, the role and timing of the substantial public and private investment needed to establish and maintain these organisations remains poorly understood. There is limited information regarding the need to better understand the costs and margins along the chilli value chain to ensure the services provided by the farmer associations/organizations are sustainable.

No formal contract farming arrangements were found in the Malang chilli chain, implying that the firms are not targeting premium markets in Indonesia or abroad. Furthermore, a very small demand for premium quality produce, purchased for a

significant price premium, has justified the absence of informal and formal farmer cooperative enterprises with linkages to modern trading firms. In the meantime, the insignificant demand justifies the high costs of collective action in the production and marketing spheres, so that it is hardly developing in Malang.

As a dimension of poverty, the negative impacts of oversupply and decline in prices due to seasonality is as glaringly obvious as it is still grossly neglected. Seasonality is predictable and regular in its occurrence. Seasonal over-production of chillies in Malang is not widely supported by infrastructure or marketing advisory services.

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## 4 Opportunities for Pro-Poor Chain Innovation

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### 4.1 Area Targeting

This study focused on the AIDP-Rural district of Malang, where chilli has significance as a source of rural household income. Chilli is an important crop in many other districts of East Java, and these should also be considered for possible intervention, as this would increase the number of farm households who could potentially benefit from chain innovation processes. NTB or NTT should not be targeted for interventions in the chilli chain because in these two provinces the crop has limited socio-economic relevance. Other agricultural chains offer greater opportunities for improving rural incomes and livelihoods.

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### 4.2 Proposed Interventions

This study has identified the following four value chain intervention opportunities:

1. The piloting of small hybrid chilli varieties
2. The development of local markets for Gemini-free seedlings
3. The expansion and improvement of existing contract farming schemes
4. The development of market outlook services

Two of the interventions focus on the commercial development of new technologies with potential to increase farm productivity. One targets lead firms that are working under a vertical coordination model that appears to offer farmers higher returns and lower risks compared to spot market sales. The fourth intervention looks at the delivery of market outlook services as an innovation that could potentially stabilize and improve net farm incomes. Whilst all proposed interventions require further validation, two offer greater opportunities for scalable impacts: the production of Gemini-free seedlings by commercial nurseries and the development of market outlook services by the East Java Chilli Agribusiness Association. Finally, all interventions have a strong action-research component due to the level of innovation envisaged.

Although the research focused on Malang, an AIPD-Rural district where chilli has socio-economic importance, a much broader geographical targeting within East Java is recommended in order to enhance the impact from program interventions.

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### 4.3 Piloting Small Hybrid Chilli Cultivation and Marketing

#### 4.3.1 Rationale for intervention and impact logic

Farmers' lack of experience growing small hybrid chilli and the opportunity to partner with leading seed companies may justify an intervention by AIPD-Rural. East West Seed, the leading vegetable seed company in Indonesia, has two small hybrid chilli varieties in its product portfolio (Juwita F1 and Dewata F1). BISI, the second largest vegetable seed company in the country, has one (Bashkara F1).



While hybrid chilli has much greater genetic potential than open-pollinated varieties, it is unclear whether increased farm yields would compensate farmers for higher production costs and lower market prices. Hybrid chilli fetches lower market prices because consumers prefer the more pungent local varieties. It also requires greater investment and more intensive care than traditional varieties. These factors explain why there has been so little adoption of small hybrid chilli by Indonesian farmers to date, including in East Java.

Although hybrid varieties are unlikely to gain significant market share in the foreseeable future, they may offer opportunities for raising net incomes from chilli farming in the more commercialized production areas of Eastern Indonesia, such as Malang and Kediri, where many vegetable growers already invest significant resources in their farms. AIPD-Rural could therefore consider working with East West and BISI to expose small-chilli growers in those districts to hybrid varieties and to assess their impact on farm profitability. If it is demonstrated that these varieties can, indeed, deliver higher returns to farmers, then many are likely to adopt the technology, with positive impacts on farm household incomes. Seed companies should have a clear interest in the initiative and be willing to fund a significant share of the intervention costs, as they would benefit directly from the development of a market for their seed. The intervention would also provide seed companies with valuable evidence that they could use to design and implement more effective seed market development strategies.

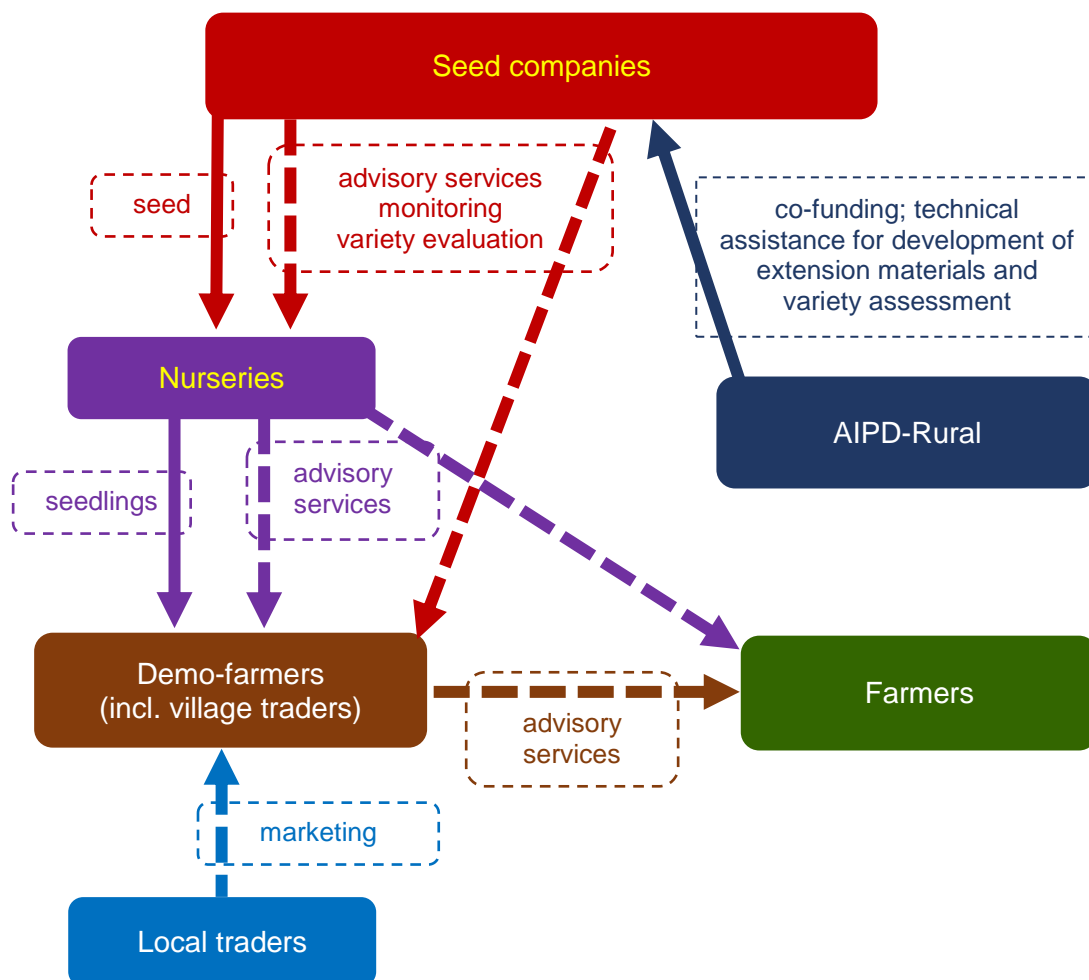
#### **4.3.2 Intervention strategy and service delivery model**

It is recommended that the intervention is implemented over two years in three or four districts of East Java, with several demonstration farms established in each district. If successful, seed companies could subsequently replicate the process in other districts (and provinces) on their own. It is also recommended that both East West and BISI are involved as partners, as this would enable greater outreach and widen the varietal options available to farmers.

Districts with a more commercialized vegetable farming sector and where small chilli cultivation is widespread, such as Malang and Kediri, offer the most favourable context for adoption and should therefore be targeted. In these districts farmers already follow intensive crop management practices such as transplanting seedlings, thereby having some ability and willingness to invest in new technologies. These districts also have many specialist nursery businesses that can play an important role in variety adoption processes. In poorer districts, such as in Madura, chilli production is still at a very incipient development stage. Tradition and considerations about cost and risk are likely to take precedence over profitability in farmers' choice of technologies and crop management practices.

In Malang, Poncokosumo, Pujon and Wajak sub-districts should be targeted, as they have the largest chilli production areas and the most developed nursery farms. Pare sub-district, which has the larger and most advanced vegetable nursery sector in Eastern Indonesia and is an important vegetable trading centre, should be one of the target sites in Kediri. Identification of other locations should be based on consultations with private sector partners and their perceptions about adoption potential. It is important that locations with diverse agro-climatic conditions and seasonal production

patterns are targeted, as this may offer important insights about the contexts where hybrid varieties are most likely to be successfully adopted. See Figure 11 below.



**Figure 11 Piloting small hybrid chilli cultivation and marketing: service delivery model**

Impacts on farm profitability will depend on the cost of growing hybrid varieties, the yields achieved, and the farm-gate prices fetched, and how these compare with the profits earned from conventional small chilli production. This has important implications for the design of a farm-demo trial program. First, control farms need to be included for varietal assessment purposes. Second, village traders should be actively involved. Their participation will enable AIPD-Rural and private sector partners to develop a better understanding of the marketability of different hybrid varieties. Local traders can also play an important role in variety adoption processes: many grow chilli in their own farms and some have close links with farmers to whom they provide embedded credit services. Nursery businesses, in turn, should be involved in the supply of seedlings to demo farmers and targeted for provision of technical advisory services to farmers.

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## 4.4 Developing Local Markets for Gemini-Free Seedlings

### Rationale for intervention and impact logic

As found during the fieldwork and reported by various researchers (Gniffke, 2011; Hydayat et al, 2011; Maryono and Bhattarai, 2009), the white-fly transmitted Yellow Leaf Curl (Gemini) virus poses an increasing threat to the chilli crop. If the chilli plants become infected at an early seedling stage, they can be rendered almost completely unproductive. Until resistant varieties can be developed and distributed, incorporation of fine-mesh screening fabric in the shading structures used for seedling production provides the most effective control strategy. Fine-mesh netting delays the onset of the disease, thereby reducing crop losses.

There is potential for wide adoption of this technology if additional farm revenues from increased yields exceed the additional seedling costs incurred by chilli growers. In other words, the technology may be financially feasible in production areas where farmers are facing significant crop losses due to high Gemini virus infection rates during the seedling production stage. Participatory action-research to pilot the use of protective netting during seedling production would enable nursery operators and farmers to test this technology. If successful, the intervention would create the necessary demand for Gemini virus-free seedlings and increase sales by specialist nursery operators, the profits earned from seedling production, and wage employment in nursery farms. More importantly, it would raise the productivity and profitability of chilli farms, generating higher incomes for chilli farm households.

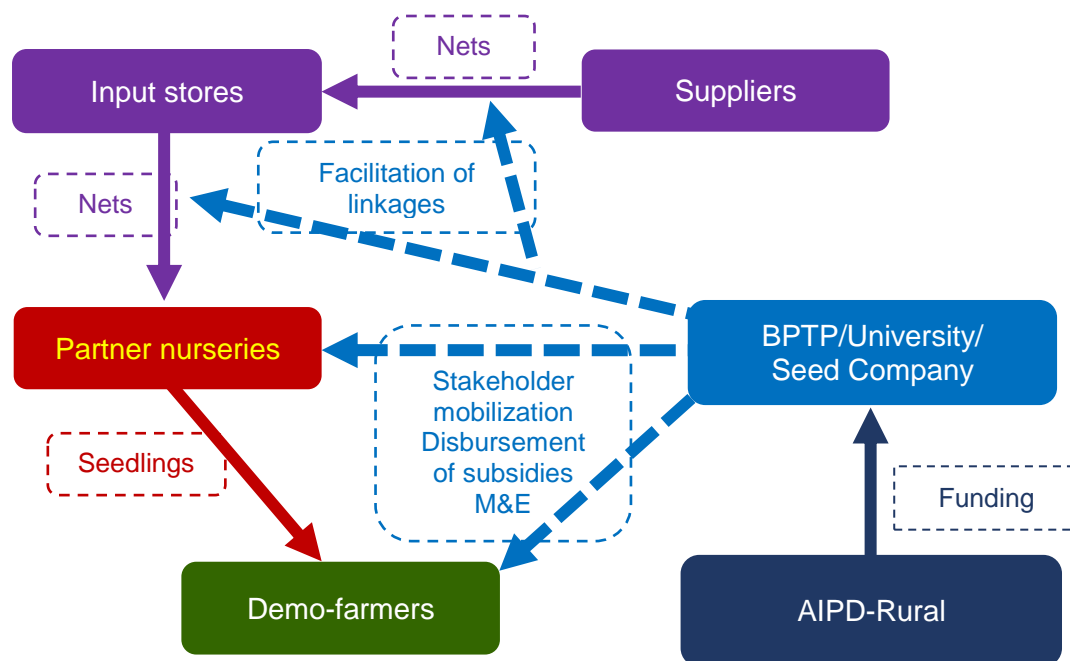
#### 4.4.1 Intervention strategy and service delivery model

It is recommended that AIPD-Rural works closely with selected nursery farms in different production areas to test the commercial feasibility of incorporating fine-mesh netting into shading structures and develop local demand for seedlings produced under these protected conditions. The program should target larger nursery operators: these not only have wider market outreach, but are also likely to have greater capacity (and perhaps willingness) to pilot technical innovations.

Districts with a more developed vegetable nursery sector, such as Malang and Kediri, should be initially targeted. One or two other major chilli production districts with a reasonably developed nursery sector, to be identified, could also be targeted to enhance outreach and impact potential. If successful, the technology could be subsequently scaled-out to poorer districts where chilli production is less commercialized. A two-year timeframe should provide enough time to expose a significant number of nurseries and farmers in target sites to the technology and assess its adoption potential.

Careful targeting of nurseries, subsidization of inputs during a short trial period, and reliance on commercial channels for the purchase of nets and sale of seedlings will be critical for the development of the technology. This strategy offers much greater scope for achieving scalable and sustainable impacts than more conventional demo-trial interventions.

This is a relatively simple intervention (see Figure 12). In order to develop commercial supply channels for the trial technology, nets should be purchased from selected input retail outlets located in or near the nursery clusters targeted. These stores could be linked to wholesale suppliers of fine-mesh fabric, if need be. AIPD-Rural could pay for the purchase of the nets by the partner nurseries during the first trial year. From then onwards, nursery operators would need to purchase the nets with their own funds and sell their seedling production for a profit, i.e. charge clients a price that reflects the additional material and labour costs incurred. This would provide a good indication of the emerging demand for the technology.



**Figure 12 Piloting Gemini-free seedling production and marketing: service delivery model**

In each target location, seedlings produced by partner nurseries would be transplanted in demo-trial farms. During the first year, demo farmers could be asked to pay the price charged for conventional seedlings, with AIPD-Rural covering the additional labour costs incurred by the nurseries. Demo-farm yields would be monitored and compared with those achieved in control farms. Local nursery operators would mobilize their clients, including chilli growers and traders, for group visits to demo and control farms, during which the crop would be inspected and yield and financial data shared and discussed. Other nursery operators should also be invited to participate in these field days. A significant number of nurseries, farmers and traders would thus develop an understanding of the impact of the technology on yields, production costs and more importantly farm profits. This is important for the development of local demand for Gemini-free seedlings.

BPTP East Java or a local university could be involved as service providers. They would be responsible for implementation of the intervention, including identification and mobilization of partner nurseries, involvement of selected input stores, facilitation of linkages between these and suppliers of fine-mesh netting material, disbursement of

subsidies to participating nurseries during an initial trial period, selection of demo and control farms, monitoring and evaluation of these farms, and organization of field days. Partner nurseries would be actively involved in the selection of demo and control farmers, monitoring and evaluation activities, and organization of field days.

Alternatively, AIPD-Rural could seek the involvement of a seed company. It is unlikely however, that these would have an interest in the innovation, as it has no obvious impacts on company seed sales.

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## **4.5 Supporting an Expansion and Improvement of Contract Farming Schemes**

### **4.5.1 Rationale for intervention and impact logic**

ABC Heinz and Indo-Food buy big red chilli in the spot market as well as through forward contracts with farmer cooperatives and trading enterprises in production areas. Contract farming is part of a strategy on the part of these lead firms to ensure a steady supply of preferred varieties, stabilize procurement costs, and be seen by government as making a positive contribution to farmers' incomes and the development of the rural economy. The research team collected some useful information about the design of the ABC Heinz scheme from one company manager, but was unable to interview staff from Indo-Food or some of its contract growers. The analysis presented here is therefore based on incomplete information.

Contract farming impacts on farmer incomes through changes in yields, production costs, and farm-gate prices. An analysis of the ABC Heinz scheme suggests that this is having a positive impact on farm productivity. Access to input credit and reduced exposure to marketing risk are likely to be associated with increased investment in chilli farms, whereas the delivery of technical advisory services should result in improved crop management practices.

Price impacts are less clear, however. ABC Heinz offers its contract growers a floor price around IDR 10,000 per kg, high enough to ensure minimum farm profits under normal production conditions. This minimum guarantee price reduces marketing risk, which in a context of extreme price volatility is a major source of concern for farmers, who can make a loss on their chilli crop when the market is unduly depressed. However, when spot market prices are higher than the floor price, farmers only receive 50% of the difference between the two. In short, contract growers are insured against low prices, but are paid less than non-contract farmers when markets overshoot.

Chilli contract growers are likely to belong to relatively wealthy strata of their communities. Cultivation of big red chilli is an expensive venture. Furthermore, membership of registered farmer cooperatives is likely to be skewed towards better-off farmers due to the entry costs involved and requirements about minimum farm size. Likewise, intermediary trading enterprises with forward contracts with ABC Heinz are likely to target credit-worthy farm households with the capacity to allocate a reasonable area to chilli production. It should be noted, however, that participation in contract farming is likely to encourage crop intensification, thereby increasing the demand for

hired labour, an outcome that will benefit resource-poor rural households, for whom on-farm wage employment represents a significant source of income.

It is also important to note that few farmers in East Java are currently involved in the production of chilli under contract with large lead firms. About 500 growers scattered across five or six districts participate in the ABC Heinz scheme. Several key informants mentioned that the scale of Indo-Food's contract farming operations in East Java is even more modest. While there may be scope for expanding these schemes, one should not expect major increases in the number of participating farmers, even in a context the associated costs and risks incurred by contracting firms are reduced through external intervention. It would be unrealistic to expect an increase of more than 200 or 300 contract growers over a two- or three-year period.

Hence, a decision by AIPD-Rural to support an expansion and improvement of current chilli contract farming schemes should be part of a wider intervention targeting a number of agribusiness firms working with contract growers or willing to develop contract farming arrangements for the production of different agricultural commodities. Moreover, further validation of the rationale for intervening in chilli contract farming schemes is necessary. Engagement with ABC Heinz and Indo-Food is required in order to assess the interest of these firms in partnering with AIPD-Rural, determine possible program roles, partnership modalities, and evaluate potential impacts from program investments. Detailed information about the design and implementation of chilli contract farming schemes, comparative data on the profitability of contract and non-contract production, and farmer perspectives on the advantages and disadvantages of participation will also need to be gathered for an ex-ante assessment of potential impacts.

#### **4.5.2 Intervention strategy and service delivery model**

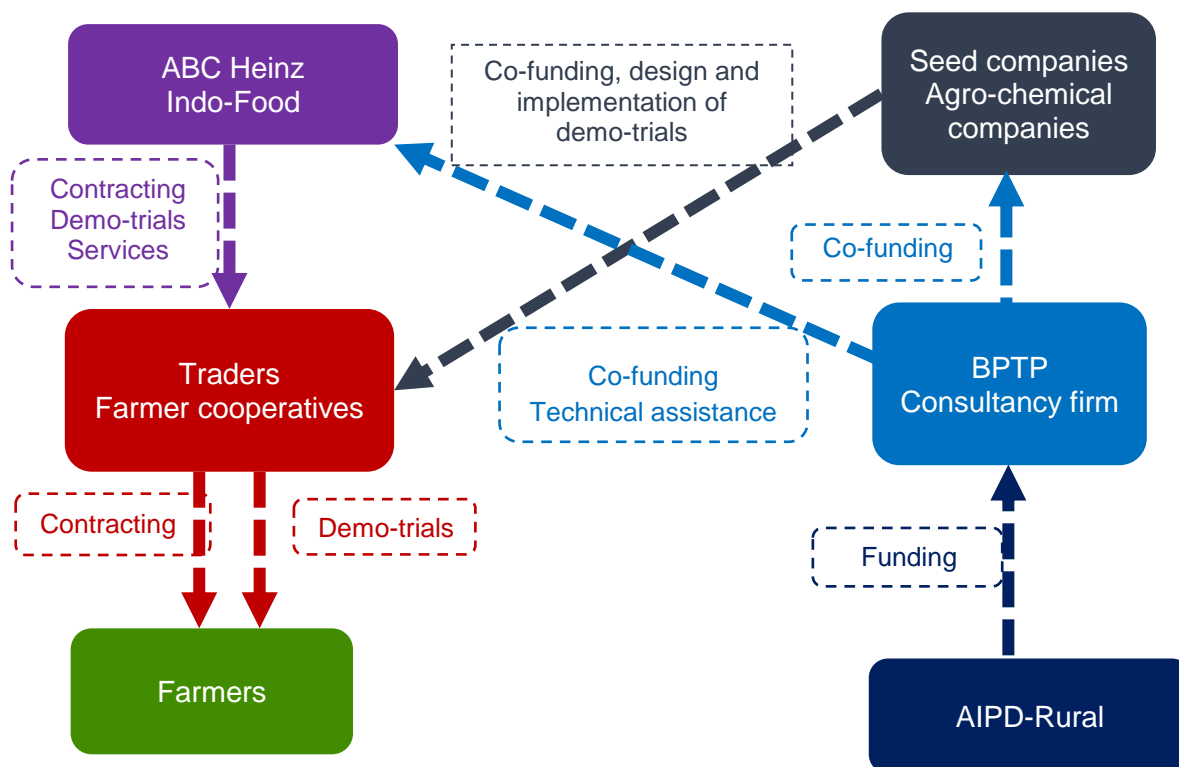
Interventions targeting an expansion of existing contract farming schemes should focus on East Java, and perhaps East Lombok, rather than on particular AIPD-Rural districts, an option that would significantly limit the scope for impact. A fairly flexible geographical targeting strategy would also be in line with the preferences of potential partner firms. These have an obvious interest in managing diversified location portfolios, not only to minimize the risk of poor crop performance in any given area, but also to take advantage of agro-climatic complementarities between zones, i.e. have contract parties in different locations deliver their crop at different times so as to spread supplies throughout the year.

Fine-tuning of varietal choices is one area where AIPD-Rural can make a difference. The program could work with ABC Heinz and Indo-Food to implement participatory trials of preferred varieties in farmers' fields to determine the best options for different locations and seasons. East West and BISI, the two leading vegetable seed companies in Indonesia, could contribute to the funding, design and implementation of farm trials. The initiative could be expanded to include crop management trials with the participation of agro-chemical companies. Large traders and farmer cooperatives with a contractual relation with ABC Heinz and Indo-Food should be targeted. They have an important role to play in the selection of trial farmers and the mobilization of other growers as part of technical knowledge transfer processes.

AIPD-Rural could also consider supporting contracting firms in their efforts to expand contract farming operations. This may include co-funding of initial costs, assistance in the identification of new contract traders or growers, or both. It should be noted that a trader-centred model is likely to outperform the farmer cooperative model, both in terms of performance and outreach. Cooperatives supplying red chilli under contract have to be formally registered, at least in the case of ABC Heinz. These group enterprises have high entry and participation costs and an exclusive and small membership. Furthermore, they take time to develop and mature, often requiring significant and prolonged external assistance, are complex and costly to manage, and frequently suffer from poor management and governance. On the other hand, the distribution of benefits in the trader model is still unclear and would need to be investigated.

Finally, there may be scope for improving the design and implementation of existing contract farming schemes in ways that benefit both the contracting firm and participating farmers. AIPD-Rural should therefore consider funding research that could inform an upgrading of contracting strategies and improvements in contract design and the delivery of input supply, credit, technical assistance and other embedded services.

Selection of implementation agencies should be based on an assessment of existing capacity to work with seed, agro-chemical, and lead chilli processing firms in the context of technology transfer processes and contract farming development processes. Possible choices include BPTP and consultancy firms (see Figure 13).



**Figure 13 Supporting an expansion and improvement of contract farming schemes: service delivery model**

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## 4.6 Developing Market Outlook Services

### 4.6.1 Rationale for intervention and impact logic

Improvements in the relevance and outreach of an information-sharing system developed and managed by the East Java Chilli Agribusiness Association, described in Section 2.4.1 of this report, could potentially benefit a large number of chilli farm households. The system was established with a view to influence planting decisions by farmers in East Java, so as to reduce the incidence of gluts in red and curly chilli markets, or at least their exposure to low market prices. However, despite its broad district coverage, the effectiveness of the service provided can be questioned due to weaknesses in design, particularly the fact that information about big chilli areas and market prices is shared twice a year only, in meetings attended by representatives of 19 districts. In other words, the information provided is reaching few chilli farm households. And by the time it does, it may be too late to influence their planting decisions.

AIPD-Rural could consider working with the East Java Chilli Agribusiness Association to improve the outreach as well as the relevance of its information service. Use of radio and television for dissemination of information would ensure that a large audience is reached in a timely manner. At the same time, there is an opportunity to refocus the system to make it more forward-looking. Planting decisions should be based on an understanding of short-term market outlook scenarios: a farmer planting red or curly chilli today needs to have some understanding of price prospects in three to four months' time, i.e. at harvest time.

Timely access to relevant market outlook information and analysis can have significant positive impacts on farmer incomes. If farmers can anticipate adverse market scenarios at harvest time, they will reduce planted areas and grow other crops instead. In so doing, they will avoid a situation where they will have to sell their big chilli crop for very low prices. Likewise, if there is a reasonable prospect that future prices will be high, farmers will expand cultivated areas to take advantage of favourable market conditions. If many farmers adjust cultivated areas accordingly, then there will also be a systemic market stabilization or correction effect: while some growers will no longer enjoy steep price hikes, situations where thousands have to sell their crop for a significant loss or marginal profits will be avoided.

While the East Java Chilli Agribusiness Association has an obvious interest in protecting members from low-equilibrium market traps, the incentive for wide dissemination of information about likely product scarcities is much weaker, as this would prevent associated farmers from enjoying high prices. In other words, the Association may have an interest in keeping its system relatively closed so that benefits are internalized, particularly when the information available points towards tight market conditions.

This has implications for the design and impacts of an information service. The chilli agribusiness association will be reluctant to use the mass media for dissemination of information and analysis, especially when there is an expectation that market prices will be high. The service would function mainly as a price warning system, there would be no systemic market stabilization effects, and benefits would be largely confined to



Association members and their close relations at the village level. To ensure this proposed intervention is ‘pro poor’, a more detailed understanding of the demographic of Association members is advised. Clearly, further consultations with the leadership of the Association to discuss different design options and the implications for members and other big chilli growers in East Java are needed before a decision by AIPD-Rural to support the development of market intelligence services can be taken. Different service design options will have different impact consequences.

#### 4.6.2 Intervention strategy and service delivery model

This intervention should focus on the delivery of technical assistance to the East Java Chilli Agribusiness Association and the strengthening its capacity to collect, process, analyse, and disseminate market outlook data. These services could be provided by a consultancy firm or a local university (see Figure 14).

The idea is to work with existing Association staff, not to subsidize new and expensive structures that cannot be sustained over time. Cost-efficient data collection strategies, based on the use of mobile phone and e-mail, and good linkages with strategic sources of information such as weather forecasting services, seed companies, and input dealers and extension officers in major production areas across Java, not just East Java, will therefore be critical. Simple data processing and analysis methods will need to be mainstreamed. Opportunities for revenue generation, for example through private sector sponsorships and advertising spots in radio and television, will need to be actively pursued.

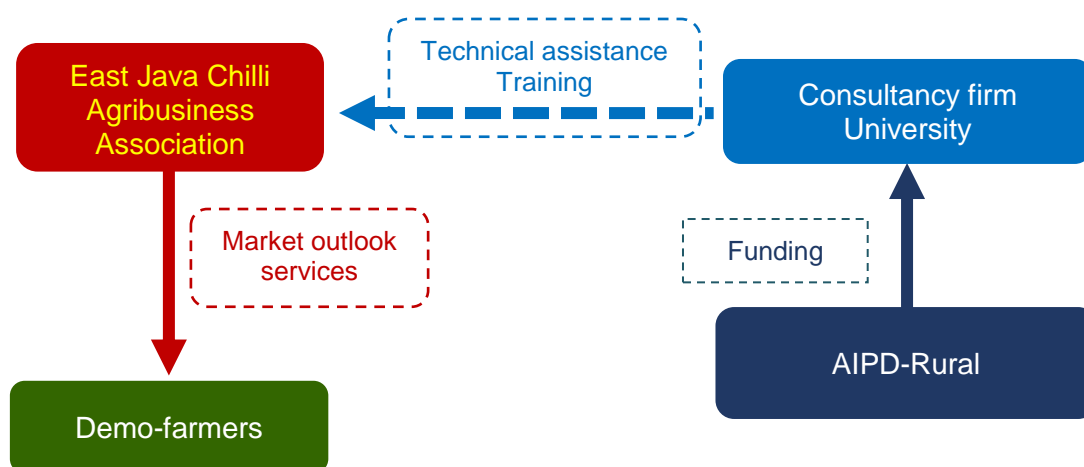


Figure 14 Developing market outlook services: service delivery model

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## 5 Conclusions and Areas for Future Research

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### 5.1 Poverty

Chilli cultivation is an important source of income for approximately 10,000 vegetable farm households in Malang. Local vegetable farm size typically ranges from 0.2 to 1 ha, or in very rare cases as many as 1.5 ha. It is common practice to grow several vegetables on the same farm at any given point in time, hence a block of chilli may be as small as a tenth of a hectare or less. Despite being one of highest-value vegetable crops the small size of landholdings and areas planted may constrain chilli's household income-generating potential.

Chilli farming generates significant wage employment. Labour is hired to work in almost all activities of chilli cultivation, such as planting, fertilization, weeding, spraying, or harvesting activities. Up to 300 days per hectare of hired labour was reported in chilli cultivation in Malang. These workers are often the poorest service providers along the chilli chain. Most of them have very small or no landholdings. Therefore, labour hired by chilli farms is very critical for sustaining their livelihoods.

This study identifies two technical innovations: (a) the piloting of small hybrid chilli varieties and (b) the development of local markets for Gemini-free seedlings; and two institutional innovations: (a) the expansion and improvement of existing contract farming schemes and (b) the development of market outlook services. Assuming these interventions are run as expected, smallholder farmers' productivity should be able to be improved. However, it should be noted that achieving success from each of them will present challenges. It should be anticipated that it may take quite some time to obtain positive responses from farmers.

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### 5.2 Gender

Female labour contributes significantly to the chilli chain's output and value. Gender issues fundamentally shape the totality of chilli production, distribution, and consumption in Malang but gender issues have often been overlooked in chilli value chain development. The chain interventions proposed in this study are largely neutral in their gender effects. Nonetheless, those interventions should be designed to create equitable benefit sharing mechanisms.

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### 5.3 Environment and Human Health

There are several scenarios where increases in chilli production may pose increased negative environmental and human health impacts. For example, increases in farm-gate prices may induce an intensified use of land, potentially resulting in soil erosion. Higher quality standards imposed by retailers/consumers or more likely higher incidence of pests and diseases may lead to an increase in the use of pesticides.

Pesticide application is the key control tactic for the management of pests and

diseases in chilli. Excessive and indiscriminate use of pesticides not only increases the cost of production but also can result in many human health problems along with environmental pollution. The most damaging ecological disturbance of injudicious use of pesticides is the potential for high concentrations of pesticide residues in the food chain, including water sources for drinking.

The study indicates that the use of hybrid varieties results in both a lower number of spray applications and types of pesticide used for pest and disease control, due to hybrid varieties being more resistant or tolerant than open pollinated varieties. Furthermore, farmers tend to apply pesticides more cautiously when applying a single pesticide for a targeted pest than when using a cocktail of several pesticides.

A supporting strategy that should therefore be embedded in the proposed technical interventions is to develop locally appropriate, integrated pest and disease management solutions that are affordable and more cost-effective than current practices. Training farmers on proper use and application of pesticides will go a long way towards improving their capacity and skill in selecting the most suitable pesticide types and applying the appropriate dose at the appropriate time. One of the most effective strategies to minimize the level of pesticide use on chilli farms in Malang may be to focus efforts on enhancing farmers' capacity to observe and accurately diagnose pest- and disease-related symptoms, the nature of damage to crops in the field, and enhance farmers knowledge base on complex agro-ecological factors affecting the level of pest infestation at any moment of time. This can be achieved through the adoption of the Integrated Pest Management (IPM) practices that are properly embedded in each proposed intervention along with the crop-specific extension efforts.

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## 5.4 Areas for Future Research

Nearly all proposed interventions outlined in this report would benefit to some extent from applied research during an implementation phase.

As mentioned previously, there would be benefits in allowing nursery operators and farmers to trial first-hand the protective netting to minimise the incidence of the highly yield-limiting Gemini Virus in chilli seedling production.

Comparative research into chilli cultivation systems adopted in higher-productivity provinces compared to the lower yielding AIPD-Rural districts within the province of East Java would shed light on specific technical innovations with potential to increase yields and/or lower costs of production.

Smallholder farmers may benefit from more analysis into the upgrading of contract chilli production strategies and improvements in contract design and delivery of input supply, credit, technical assistance and other embedded services by the contracting party.

And finally, the proposed intervention of piloting small hybrid chilli production would benefit from further research into better understanding the dynamic between the higher production levels hybrid chilli varieties offer farmers and the lower preference for hybrid chilli by the consumer.

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## 7 Annexes

### Annex 1: Checklists

<b>Input Suppliers: seed and chemical companies, input retailers, nurseries</b>	
1. Background information	<ul style="list-style-type: none"> <li>▪ Location/address/contact</li> <li>▪ No. and location of field staff (if seed or agro-chemical company)</li> <li>▪ Product portfolio</li> <li>▪ Other background information</li> </ul>
2. Seedling production (nurseries)	<ul style="list-style-type: none"> <li>▪ Product portfolio</li> <li>▪ Scale of production</li> <li>▪ Seasonality in seedling production</li> <li>▪ Technologies employed</li> <li>▪ Varieties grown (w/ indication of their advantages and disadvantages)</li> <li>▪ Employment of male and female labour</li> </ul>
3. Technical know-how	<ul style="list-style-type: none"> <li>▪ Knowledge of chilli cultivation and post-harvest technologies</li> <li>▪ Sources of technical information and knowledge about chilli</li> <li>▪ Knowledge gaps</li> </ul>
4. Environment and human health	<ul style="list-style-type: none"> <li>▪ Environmental and human safety issues associated with agro-chemical use</li> <li>▪ Are farmers aware of these issues? Are these issues discussed with farmers?</li> </ul>
5. Input sales	<ul style="list-style-type: none"> <li>▪ Location of buyers</li> <li>▪ Inputs sold to chilli growers</li> <li>▪ Gaps in product portfolio and reasons</li> <li>▪ Importance of chilli growers as clients</li> <li>▪ Main barriers to an increase in sales to chilli growers</li> <li>▪ Strategies to increase sales</li> </ul>
6. Linkages with suppliers	<ul style="list-style-type: none"> <li>▪ From whom does the input supplier buy inputs from?</li> <li>▪ Services provided by suppliers (training, trials and demos, technical information, samples, credit, etc.)</li> <li>▪ Strengths and weaknesses in the relationship with suppliers</li> </ul>
7. Linkages with buyers	<ul style="list-style-type: none"> <li>▪ Profile of buyers (farmers versus traders, gender, location, etc.)</li> <li>▪ Services provided to buyers (technical information and advice, trials and demos, product samples, credit, ...)</li> <li>▪ Strengths and weaknesses in the relationship with buyers</li> </ul>
8. Constraints, opportunities and interventions (wrap-up)	<ul style="list-style-type: none"> <li>▪ Key constraints faced (w/ranking)</li> <li>▪ Opportunities for increasing sales to chilli growers</li> <li>▪ Does the key informant see any opportunities for collaboration with a development project intervening in the chilli sub-sector? If yes, what are the opportunities for collaboration?</li> </ul>

<b>Farmers (Focus Group Discussions)</b>	
1. Background information	<ul style="list-style-type: none"> <li>▪ Village / district</li> <li>▪ Number of households living in the village</li> </ul>
2. Socio-economic importance of chillies	<ul style="list-style-type: none"> <li>▪ Ranking of crops in terms of area and income</li> <li>▪ Importance of livestock</li> <li>▪ Ranking of household income sources (farm and non-farm)</li> <li>▪ Contribution of chilli to household income</li> <li>▪ How typical or atypical is the village as far as the socio-economic importance of chilli is concerned?</li> </ul>
3. Chilli development processes	<ul style="list-style-type: none"> <li>▪ Timeline of chilli production and marketing development in the village; comparison w/ other villages</li> </ul>
4. Typology of chilli growers	<ul style="list-style-type: none"> <li>▪ Approximate % of households in the village that grow chilli</li> <li>▪ Typical farm size and range</li> </ul>
5. Chilli production systems	<ul style="list-style-type: none"> <li>▪ Chilli varieties grown in the village, ranking of varieties, and differences with other villages in the area</li> <li>▪ Reasons behind varietal choices</li> <li>▪ Planting and harvesting times</li> <li>▪ Irrigation, fertilization, disease and pest control, other cultivation practices</li> <li>▪ Harvest and post-harvest practices</li> <li>▪ Hiring of labour</li> <li>▪ Key changes in cultivation and post-harvest practices (last 5 years)</li> <li>▪ Possible improvements to current production and post-harvest systems</li> <li>▪ Factors driving or hindering technology adoption (e.g. price incentives, technical know-how, physical access to inputs, cost of inputs, other)</li> </ul>
6. Gender (production)	<ul style="list-style-type: none"> <li>▪ Gender division of labour within the household</li> <li>▪ Gender composition of hired labour</li> <li>▪ Gender roles in input purchases and product sales</li> </ul>
7. Environment and human safety	<ul style="list-style-type: none"> <li>▪ Key environmental issues in chilli cultivation</li> <li>▪ On-farm use of chemicals; storage and handling of agro-chemicals</li> </ul>
8. Input purchases	<ul style="list-style-type: none"> <li>▪ Input suppliers (profile and location)</li> <li>▪ No. of input dealers and nurseries in the area</li> <li>▪ Input payment procedures (prompt/delayed payment; payment in kind)</li> <li>▪ Provision of technical information and advice by input suppliers</li> <li>▪ Other services provided by input suppliers (e.g. credit, trials and demonstrations, free product samples)</li> <li>▪ Constraints/problems in access to inputs (price incentives, technical know-how, physical access, cost, credit, etc.)</li> </ul>
9. Buyers and transactions	<ul style="list-style-type: none"> <li>▪ Buyers and their relative importance</li> <li>▪ Number of chilli collectors/buyers in the area</li> <li>▪ Stability in farmer-buyer relationship</li> <li>▪ Forms of payment (advance payment, on the spot, delayed payments)</li> <li>▪ Services provided by collectors and other buyers (inputs, credit, ...)</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Information flows between farmers and buyers (technical/market)</li> <li>▪ Strengths and weaknesses in the relationship with buyers</li> </ul>
10.Product quality	<ul style="list-style-type: none"> <li>▪ Quality standards of buyers</li> <li>▪ Who sorts and grades the chilli crop?</li> <li>▪ Farmers' awareness and assessment of the quality of their chilli</li> </ul>
11.Prices	<ul style="list-style-type: none"> <li>▪ Price trends (farm-gate) and expectations about future prices</li> <li>▪ Price seasonality (farm-gate)</li> <li>▪ Price differences between different varieties, grades, and qualities</li> <li>▪ Price determination processes (negotiation, competition between buyers)</li> </ul>
12.Sources of technical information	<ul style="list-style-type: none"> <li>▪ Main sources of technical information (ranking and gender differences)</li> <li>▪ Assessment of different sources (regularity of interaction, type of information provided, and reliability of the information provided)</li> <li>▪ Knowledge gaps (cultivation and post-harvest, incl. gender differences)</li> </ul>
13.Sources of market information	<ul style="list-style-type: none"> <li>▪ Main sources of market information (ranking and gender differences)</li> <li>▪ Assessment of different sources (regularity of interaction, type of information provided, and reliability of the information provided)</li> <li>▪ Strengths and weaknesses in farmers' knowledge of markets (incl. differences between men and women)</li> </ul>
14.Credit	<ul style="list-style-type: none"> <li>▪ Sources of credit for households in the village (formal and informal)</li> <li>▪ Ranking of credit sources in terms of their importance</li> <li>▪ Advantages and disadvantages of different sources of credit</li> <li>▪ Changes in access to credit over the past 5 years</li> <li>▪ Gender differences in access to credit</li> </ul>
15.Constraints and opportunities	<ul style="list-style-type: none"> <li>▪ Key problems and constraints (production and marketing)</li> <li>▪ Key opportunities (production and marketing)</li> <li>▪ Barriers to access to these opportunities</li> <li>▪ Recommendations for intervention: what type of interventions would enable farmers to improve chilli production and marketing? Please prioritize...</li> </ul>

<b>Village Traders</b>	
1. Background information	<ul style="list-style-type: none"> <li>▪ Location/address/contact</li> <li>▪ Number of years trading chillies</li> </ul>
2. Chilli sales	<ul style="list-style-type: none"> <li>▪ Tons of chilli traded per day/month/annum (last 3 years)</li> <li>▪ Distribution of sales within the year and changes over the past 3 years</li> <li>▪ Challenges and strategies to increase chilli sales</li> </ul>
3. Linkages with suppliers	<ul style="list-style-type: none"> <li>▪ Villages from where the trader procures chilli</li> <li>▪ Number of chilli farmers supplying the trader</li> <li>▪ Does the trader buy from the same farmers in different years?</li> <li>▪ Services provided to farmers (e.g. input credit)</li> <li>▪ Information flows from the trader to farmers, and vice-versa</li> <li>▪ Purchasing conditions set by the trader (variety, quality, pricing, payment procedures, other)</li> <li>▪ How does the trader coordinate purchases from farmers? How is the negotiation process conducted?</li> <li>▪ Strengths and weaknesses in the relationship with farmers</li> </ul>
4. Linkages with buyers	<ul style="list-style-type: none"> <li>▪ Main buyers, their profile (location, legal status, scale)</li> <li>▪ Changes in the last 3 years and reasons</li> <li>▪ Stability in the relationship with buyers</li> <li>▪ Services provided by buyers (e.g. advances)</li> <li>▪ Information flows from the trader to buyers, and vice-versa</li> <li>▪ Conditions set by buyers (quality, volumes, delivery times, pricing, payment procedures, other)</li> <li>▪ Contractual relationship with buyers, coordination of supplies, negotiation of transactions...</li> <li>▪ Strengths and weaknesses in the relationship with buyers</li> </ul>
5. Quality management systems	<ul style="list-style-type: none"> <li>▪ Quality grades and standards applied by the trader and buyers</li> <li>▪ Quality management systems by the trader, upstream suppliers and downstream buyers (e.g. sorting, grading, packaging, transportation)</li> <li>▪ Coordination systems for compliance with quality grades and standards</li> <li>▪ Sanctions for non-compliance</li> <li>▪ Strengths and weaknesses in quality management systems</li> <li>▪ Typical quantitative and qualitative product losses experienced</li> <li>▪ Strategies to improve quality management and challenges</li> </ul>
6. Sources of market information	<ul style="list-style-type: none"> <li>▪ Main sources of information about chilli markets (ranking)</li> <li>▪ Assessment of different sources of market information (regularity of interaction, type of information provided, and reliability of the information)</li> <li>▪ Gaps in market information and market know-how</li> </ul>
7. Gender	<ul style="list-style-type: none"> <li>▪ Gender of suppliers</li> <li>▪ Gender of collectors and assembly traders</li> <li>▪ Gender of buyers</li> </ul>



8. Prices	<ul style="list-style-type: none"> <li>▪ Current purchasing and selling prices</li> <li>▪ Price trends, expectations about future prices, and reasons</li> <li>▪ Differences in the prices paid by different buyers</li> <li>▪ Price seasonality</li> <li>▪ Current chilli purchasing and selling prices for different varieties and grades</li> </ul>
9. Costs	<ul style="list-style-type: none"> <li>▪ Main marketing costs (variable and fixed)</li> <li>▪ Costs per ton sold</li> </ul>
10. Constraints, opportunities and interventions (wrap-up)	<ul style="list-style-type: none"> <li>▪ Opportunities for the development of the chilli collection business</li> <li>▪ Strategies and barriers to develop or access these opportunities</li> <li>▪ Key challenges and constraints (w/prioritization)</li> <li>▪ What should be done to address challenges and constraints?</li> <li>▪ Recommendations for public and project interventions aimed at enabling these developments</li> <li>▪ Does the trader see any opportunities for collaboration with a development project intervening in the chilli sub-sector? If not, why not? If yes, what are the opportunities for collaboration? How would s/he rank them?</li> </ul>

<b>Wholesalers / Inter-island Traders</b>	
1. Background information	<ul style="list-style-type: none"> <li>▪ Location/address/contact</li> <li>▪ Range of vegetables traded</li> <li>▪ Number of years trading chillies</li> </ul>
2. Chilli sales	<ul style="list-style-type: none"> <li>▪ Tons of chilli traded per annum</li> <li>▪ Distribution of sales within the year</li> <li>▪ Different market channels and their relative importance</li> <li>▪ Growth trends in different market channels/segments</li> <li>▪ Challenges and strategies to increase chilli sales</li> </ul>
3. Varieties	<ul style="list-style-type: none"> <li>▪ Varieties traded</li> <li>▪ Ranking of different varieties according to sales, and reasons</li> <li>▪ Differences in varieties traded per market channel or type of client</li> <li>▪ Key changes in the variety portfolio (last 3 years) and reasons</li> <li>▪ Assessment of different varieties in terms of seasonality, appearance, eating quality, consumer demand, export potential, and market prices</li> </ul>
4. Supplying areas	<ul style="list-style-type: none"> <li>▪ Relative importance of different provinces / districts, and reasons</li> <li>▪ Differences between supplying areas in terms of variety and quality</li> <li>▪ Changes in the relative importance of different supplying areas, and reasons</li> </ul>
5. Linkages with suppliers	<ul style="list-style-type: none"> <li>▪ Type and profile of suppliers, and relative importance</li> <li>▪ Services provided by the trader to suppliers (e.g. advances)</li> <li>▪ Information flows from the trader to suppliers, and vice-versa</li> <li>▪ Purchasing conditions set by the trader (variety, quality, pricing, payment procedures, other)</li> <li>▪ Does the trader have a contractual relationship with suppliers? If yes, what are the terms of the contract? If not, how does s/he coordinate with suppliers? How is the negotiation process conducted?</li> <li>▪ Strengths and weaknesses in the relationship with suppliers</li> <li>▪ Trader's strategy to address weaknesses in the relationship with suppliers</li> </ul>
6. Linkages with buyers	<ul style="list-style-type: none"> <li>▪ Main buyers: location, legal status, and scale</li> <li>▪ Changes in buyer portfolio during the last 3 years, and reasons</li> <li>▪ Services received from buyers (e.g. advisory, market information, ...)</li> <li>▪ Information flows from the trader to buyers, and vice-versa</li> <li>▪ Conditions set by buyers (quality, volumes, delivery times, pricing, payment procedures, other)</li> <li>▪ Does the trader have a contractual relationship with buyers? If yes, what are the terms of the contract? If not, how does s/he coordinate with buyers? How are transactions negotiated?</li> <li>▪ Strengths and weaknesses in the relationship with buyers and strategies to address weaknesses</li> </ul>

7. Quality management systems	<ul style="list-style-type: none"> <li>▪ Quality grades and standards of the trader and buyers</li> <li>▪ Quality management systems by the trader, upstream suppliers, and downstream buyers</li> <li>▪ Coordination systems for ensuring that quality grades and standards are met</li> <li>▪ Sanctions to suppliers and the trader for non-compliance</li> <li>▪ Strengths and weaknesses in quality management systems</li> <li>▪ Typical quantitative and qualitative product losses experienced</li> </ul>
8. Sources of market information	<ul style="list-style-type: none"> <li>▪ Trader's assessment of his/her access to information about chilli markets</li> <li>▪ Main sources of information about chilli markets</li> <li>▪ Assessment of different sources of market information (regularity, type of information, and reliability of the information)</li> <li>▪ Gaps in market know-how</li> </ul>
9. Prices	<ul style="list-style-type: none"> <li>▪ Current purchasing and selling prices (different varieties, different grades)</li> <li>▪ Chilli price trends for different varieties, and reasons</li> <li>▪ Are there any clear differences in the prices paid by different buyers?</li> <li>▪ Price seasonality</li> </ul>
10. Costs	<ul style="list-style-type: none"> <li>▪ Main costs to the wholesaler (variable and fixed)</li> <li>▪ Costs per ton sold</li> </ul>
11. Business environment	<ul style="list-style-type: none"> <li>▪ Assessment of the policy and regulatory environment in Indonesia</li> <li>▪ Trader's assessment of support infrastructure</li> <li>▪ Trader's assessment of other important business environment dimensions</li> </ul>
12. Constraints, opportunities and interventions (wrap-up)	<ul style="list-style-type: none"> <li>▪ Key opportunities for the development of the chilli trading business</li> <li>▪ Barriers to develop or access these opportunities</li> <li>▪ Strategies to develop or access these opportunities</li> <li>▪ Key challenges and constraints (w/prioritization)</li> <li>▪ What should be done to address challenges and constraints?</li> <li>▪ What are the key changes or developments that can enable the development of chilli trading? What needs to change? What are the key innovations required?</li> <li>▪ Recommendations for public and project interventions aimed at enabling these developments</li> <li>▪ Does the trader see any opportunities for collaboration with a development project intervening in the mango sub-sector?</li> </ul>

<b>Traditional Retailers</b>	
1. Background information	<ul style="list-style-type: none"> <li>• Location/address/contact</li> </ul>
2. Chilli sales	<ul style="list-style-type: none"> <li>• Quantity of chilli sold per week/month/year</li> <li>• Seasonality in chilli sales</li> </ul>
3. Linkages with suppliers	<ul style="list-style-type: none"> <li>• Type and profile of suppliers</li> <li>• Information flows from the retailer to suppliers, and vice-versa</li> <li>• Strengths and weaknesses in the relationship with suppliers</li> </ul>
4. Quality management systems	<ul style="list-style-type: none"> <li>• Quality grades and standards at the retail end</li> <li>• Typical quantitative and qualitative product losses at the retail end</li> </ul>
5. Gender	<ul style="list-style-type: none"> <li>• Gender of traditional retailers</li> </ul>
6. Prices	<ul style="list-style-type: none"> <li>• Price differences between varieties and grades, and reasons</li> <li>• Price seasonality, and reasons</li> <li>• Current chilli purchasing and selling prices (different varieties, different grades)</li> </ul>
7. Costs	<ul style="list-style-type: none"> <li>▪ Main costs to the retailer (variable and fixed)</li> <li>▪ Costs per kg</li> </ul>

<b>Modern Retailers</b>	
1. Background information	<ul style="list-style-type: none"> <li>▪ Location/address/contact</li> <li>▪ Number of outlets and geographical distribution</li> <li>▪ Offices responsible for procurement of vegetables</li> </ul>
2. Chilli sales	<ul style="list-style-type: none"> <li>▪ Weekly / monthly / annual chilli sales</li> <li>▪ Trends in chilli sales (last 3 years)</li> <li>▪ Seasonality in chilli sales</li> </ul>
3. Linkages with domestic suppliers	<ul style="list-style-type: none"> <li>▪ Origin of chillies sold, and reasons</li> <li>▪ Who supplies chillies to the retailer?</li> <li>▪ Requirements to become a registered supplier</li> <li>▪ Number and profile of suppliers (location, scale, legal status, etc.)</li> <li>▪ Stability/changes in the supplier portfolio</li> <li>▪ Terms of the contract with chilli suppliers (e.g. quality, volumes, delivery times, pricing, payment procedures, other)</li> <li>▪ Strengths and weaknesses in the relationship with suppliers</li> </ul>
4. Quality management systems	<ul style="list-style-type: none"> <li>▪ Quality specifications of the retailer</li> <li>▪ How have these changed over the past 3 or 5 years?</li> <li>▪ Sanctions for non-compliance with quality standards (and other contractual requirements)</li> <li>▪ Strengths and weaknesses in quality management systems along the retailer's chilli chain</li> </ul>
5. Prices	<ul style="list-style-type: none"> <li>▪ Price differences across varieties and grades</li> <li>▪ Seasonality of chilli prices</li> </ul>
6. Opportunities and interventions (wrap-up)	<ul style="list-style-type: none"> <li>▪ Opportunities for development of contractual relationships with new suppliers</li> <li>▪ Recommendations for public and project interventions aimed at supporting the development of high-quality modern retail chains for chilli</li> <li>▪ Does the supermarket see any opportunities for collaboration with a development project intervening in the chilli sub-sector? If yes, what should be the focus of the collaboration?</li> </ul>

## Annex 2: Structured format for collection of farm gross margin data

**Crop :** **Farmer:**  
**Variety :** **Village:**  
**Season :** **Subdistrict**  
**Hectares:** **District**

**Primary Crop**

**Secondary Crop**

No	Component	Unit	Measurement	Primary Crop				Secondary Crop			
				Price/ Unit	Value (Rp)	Unit	Measurement	Price/ Unit	Value (Rp)		
A	<b>Production Cost</b>										
	<b>1. Material Costs</b>										
	a. Seed : var:		kg		-						-
	- var:				-						-
	- var:				-						-
	b. Fertilizer				-						-
	Phonska (NPK 15-15-15 slow)				-						-
	Mutiara (NPK 16:16:16 fast release)				-						-
	SP-36				-						-
	Urea				-						-
	ZA (Amm. Sulphate)				-						-
	Dolomite				-						-
	KCl				-						-
	Manure (Compost)				-						-
	c. Pesticide :				-						-
	Agromex				-						-
	Pegasus				-						-
	Endure				-						-
	Arjuna				-						-



-String					-					-		
- Plastic Mulch					-					-		
-Basket/Pail					-					-		
-Nails for hanging					-					-		
	Labour (Days)				Price per day	Value (Rp)	Labour (Days)				Price per day	Value (Rp)
	Family		Hire				Family		Hire			
	M	F	M	F			M	F	M	F		
<b>3. Labour Costs</b>												
a. Land preparation						0					0	
b. Nursery : -						0					0	
c. Planting : -						0					0	
d. Fertilizing						0					0	
e. Weeding						0					0	
f. Stick (plant holder)						0					0	
g. Spraying						0					0	
h. Irrigation						0					0	
i. Harvesting						0					0	
j. Cleaning						0					0	
k. Handling ( grading)						0					0	
l. Drying						0					0	
m. Transporting						0					0	
n. Packaging						0					0	
n. Other :						0					0	



B	<b>4. Other costs :</b>											
	- Land rents						0					0
	- Loans						0					0
	- Taxes						0					0
	- Water Contribution						0					0
	<b>Total 1 Production Costs 1 + 2 + 3 + 4 + 5</b>											
	<b>Return and Profit</b>											
	<b>1. Yield</b>											
	- Main product											
	- Secondary product											
	<b>2. Production Cost</b>											
	<b>3. Net Income</b>											