



Australian Government

Australian Centre for
International Agricultural Research



Developing a clean market chain for poultry products in Indonesia

ACIAR TECHNICAL REPORTS

82

Research that works for developing countries and Australia

Developing a clean market chain for poultry products in Indonesia

*Ian Patrick, Geoff Smith, Hasnah, Ni Putu Sarini, Hasmida Karim,
Bugie Kurnianto, Dewa Dharma, Anak Agung Sagung Putri Komaladara and Tristan Jubb*



ACIAR

Research that works for developing
countries and Australia

aciar.gov.au

2014

The Australian Centre for International Agricultural Research (ACIAR) was established in June 1982 by an Act of the Australian Parliament. ACIAR operates as part of Australia's international development cooperation program, with a mission to achieve more productive and sustainable agricultural systems, for the benefit of developing countries and Australia. It commissions collaborative research between Australian and developing-country researchers in areas where Australia has special research competence. It also administers Australia's contribution to the International Agricultural Research Centres.

Where trade names are used this constitutes neither endorsement of nor discrimination against any product by ACIAR.

ACIAR TECHNICAL REPORTS SERIES

This series of publications contains technical information resulting from ACIAR-supported programs, projects and workshops (for which proceedings are not published), reports on Centre-supported fact-finding studies, or reports on other topics resulting from ACIAR activities. Publications in the series are distributed internationally to selected individuals and scientific institutions, and are also available from ACIAR's website at <aciarc.gov.au>.

© Australian Centre for International Agricultural Research (ACIAR) 2014

This work is copyright. Apart from any use as permitted under the *Copyright Act 1968*, no part may be reproduced by any process without prior written permission from ACIAR, GPO Box 1571, Canberra ACT 2601, Australia, aciarc@aciarc.gov.au

Patrick I., Smith G., Hasnah, Sarini N.P., Karim H., Kurnianto B., Dharma D., Putri Komaladara A.A.S. and Jubb T. 2014. Developing a clean market chain for poultry products in Indonesia. ACIAR Impact Technical Reports No. 82. Australian Centre for International Agricultural Research: Canberra. 53 pp.

ACIAR Technical Reports – ISSN 0816-7923 (print), ISSN 1447-0918 (online)

ISBN 978 1 925133 18 9 (print)

ISBN 978 1 925133 19 6 (PDF)

Editing by James Dixon

Design by Peter Nolan

Printing by CanPrint Communications

Cover: Rahmawati (from the egg-supplying company UD Rezky Utama) and Hasmida Karim (Provincial Project Coordinator, South Sulawesi) with 'Healthy Farm' eggs in Makassar. Aman & sehat means 'Safe & healthy'. (Photo: Ian Patrick)

Foreword

The poultry industry is a major supplier of protein to the people of Indonesia. Poultry diseases such as highly pathogenic avian influenza (HPAI) continue to influence both the industry and Indonesian communities through their effect on production and human health. The reasons why HPAI continues to be a problem in Indonesia include the nature of the market chain and the lack of incentive for stakeholders to invest in improved management practices and infrastructure.

The Australian Centre for International Agricultural Research (ACIAR) has supported research into strengthening Indonesia's poultry biosecurity systems. This report describes a trial in three Indonesian provinces that developed a niche market for poultry products produced on farms that implemented appropriate biosecurity activities. Those farms were then able to sell their product through approved slaughterhouses and egg suppliers to selected supermarkets. The aim of the trial was to test whether a market chain could provide incentives for all chain participants to produce and market these 'Healthy Farm' products.

The trial showed that supermarket consumers were prepared to pay a premium price for meat and eggs produced on approved biosecure farms. In the egg industry, all stakeholders—from the farmer to the supermarket—benefited financially. The nature of contract production in the broiler (meat-chicken) industry meant that a significant proportion of the premium price did not flow back to smallholders, although supermarkets and slaughterhouses benefited. Nonetheless, broiler producers in Bali now have a better understanding of disease movement and risk factors, and continue to invest in improving the biosecurity of their farms. They see benefits to production and feed efficiency, and they understand that improved biosecurity can reduce the risk of disease outbreaks. It appears that these benefits are sufficient incentive for producers to adopt improved and effective biosecurity.

To support the trial, the project developed institutions such as the *Pusat Biosekuriti Unggas Indonesia* (Indonesian Poultry Biosecurity Centre) to implement stakeholder training programs and farm biosecurity planning, implementation and auditing. The project has shown that the existing market chain can be used to improve biosecurity in smallholder poultry farms in Indonesia. It is now the responsibility of the industry to facilitate the sale of products originating from approved farms so that they are not a niche product requiring a premium price but the regular product demanded by all consumers.



Nick Austin
Chief Executive Officer, ACIAR

Contents

Foreword	3
Abbreviations	8
Acknowledgments	9
Authors	10
Summary	11
Background and aims	13
The need for improved biosecurity	13
The rationale for establishing a clean market chain	13
Poultry market chain stakeholders in Indonesia	16
Integrated poultry companies	16
Contract and non-contract broiler farmers	17
Village chicken farmers	17
Poultry shops	18
Collectors	18
Transporters	19
Sub-brokers	19
Slaughterhouses and processors	19
Vendors	19
Consumers	20
Description of poultry market chains	21
Meat-chicken market chain	21
Layer and egg market chain	23
Establishing a clean market chain	25
Case study areas	25
Consumer survey	26
Industry leadership	27
Development of market protocols and stakeholder capacity	28
Preparing for the launch of the Healthy Farm product	31
Soft audit of slaughterhouses	35
Farmer of the Year competition	35
Farm signage, product packaging and video production	36
Healthy Farm product launch	37

The results of the Healthy Farm product trial	39
Healthy Farm chicken in Bali	39
Healthy Farm eggs in Bali	41
Healthy Farm eggs in Makassar	41
Lessons learned from the trial	43
The training program	43
Existing contractual arrangements between stakeholders	43
The nature of the market and perceptions of food safety and biosecurity	45
Product quality	45
Smallholder benefits of improved biosecurity	47
Importance of the contract	47
Modelling smallholder benefits from the sale of Healthy Farm chicken	47
Policy initiatives to improve biosecurity implementation	50
References	52
Tables	
1. Consumers' willingness to pay a premium for broiler chicken in Bogor, West Java	26
2. Consumers' willingness to pay a premium for broiler chicken in Makassar, South Sulawesi	27
3. Consumers' willingness to pay a premium for broiler chicken in Denpasar, Bali	27
4. Broiler farmers participating in the CMC project	28
5. Identified costs in implementing biosecurity measures for broiler CMC	31
6. Timetable of major activities leading to the product launch, 2011	32
7. Types of training developed and implemented by the PBUI	33
8. Participants in ACIAR poultry biosecurity training, 2009–2013	33
9. Sales of regular and Healthy Farm chickens by the slaughterhouse to the supermarket, July 2011 – July 2012	39
10. Sales of Healthy Farm chickens at the supermarket, July 2011 – September 2012	40
11. Base scenario—no disease outbreak, biosecurity investment or price premium (Rp million)	48
12. Scenario 1—no disease outbreak, with biosecurity investment and a premium (market price bonus) of Rp500/chicken (Rp million)	48
13. Scenario 2—base scenario with a disease outbreak (loss of 1 cohort) (Rp million)	49

Figures

1. Stakeholder relationships in the meat-chicken marketing chain	16
2. Meat-chicken market chain in Bali, including the proportions of birds in different sections	21
3. Egg, layer-chicken and cockerel marketing chain	23
4. Case-study areas for the project	25
5. Stakeholders in the broiler CMC	31
6. Stakeholders in the egg CMC	32
7. Healthy Farm meat chicken logo	36
8. Farm biosecurity signs: (a) farm office, (b) farm gate, (c) shed door	36
9. Healthy Farm egg carton	37
10. Brochures and the supermarket booth at the Healthy Farm product launch	38
11. Healthy Farm product launch in Bogor, June 2011	38
12. Healthy Farm chicken sales in Carrefour supermarket, Bali	40
13. Egg sales in Bali, November 2012 – June 2013	41

Abbreviations

ACIAR	Australian Centre for International Agricultural Research	NKV	<i>Nomor Kontrol Veteriner</i> (veterinary control number)
ASUH	<i>aman, sehat, utuh, halal</i> (safe, healthy, pure, permitted)	PBUI	<i>Pusat Biosekuriti Unggas Indonesia</i> (Indonesian Poultry Biosecurity Centre)
CMC	clean market chain	PT	<i>perseroan terbatas</i> (limited liability company)
DOC	day-old chick	RPA	<i>rumah potong ayam</i> (slaughterhouse)
FAO	Food and Agriculture Organization of the United Nations	USAID	United States Agency for International Development
HPAI	highly pathogenic avian influenza		
ICASEPS	Indonesian Center for Agricultural Socio Economic and Policy Studies		
NICP	non-industrial commercial poultry		

Acknowledgments

The authors would like to acknowledge the support of ACIAR and the partners in ACIAR project AH/2006/169, *Cost-effective biosecurity for non-industrial commercial poultry operations in Indonesia*. Particular thanks go to the project partners: Directorate General Livestock and Animal Health Services (Indonesian Ministry of Agriculture), *Forum Masyarakat Perunggasan Indonesia* (the Indonesian Poultry Industry Society), *Institut Pertanian Bogor* (Bogor Agricultural University), the Indonesian Center for Socio Economic and Policy Studies, and Udayana University.

We also acknowledge the poultry producers, traders, collectors, processors and supermarket managers

who were keen to develop systems that improved biosecurity in smallholder layer and broiler farms in the three case-study areas. Special thanks go to the farmer leaders—Bambang Agus (West Java), Suryawan Dwimulyanto (Bali) and Wahyu Suhadji (South Sulawesi)—who drove the development of the market chains in their provinces in order to benefit their fellow farmers. Thanks also to Don Utoyo (Head, *Forum Masyarakat Perunggasan Indonesia*), who ensured that the project was relevant to the national poultry industry. The support of the relevant provincial and regional agricultural department offices is also acknowledged; they consistently facilitated project activities and encouraged industry development.

Authors

Associate Professor Ian Patrick

Director (International Development), Institute for Rural Futures, School of Behavioural, Cognitive and Social Sciences, University of New England, Australia
ipatrick@une.edu.au

Dr Geoff Smith

Senior Research Fellow, Institute for Rural Futures, School of Behavioural, Cognitive and Social Sciences, University of New England, Australia
geoff.smith@une.edu.au

Dr Hasnah

Research Fellow, Institute for Rural Futures, School of Behavioural, Cognitive and Social Sciences, University of New England, Australia
Lecturer, Agricultural Economics, Faculty of Agriculture, Andalas University, Padang, Indonesia
hbimbo@une.edu.au

Dr Dewa Dharma

Project Manager (Training and Management), ACIAR project AH/2006/169, Disease Investigation Center, Bali, Indonesia
drdewadharm@gmail.com

Ir. Ni Putu Sarini

Provincial Project Coordinator (Bali), ACIAR Project AH/2006/169, Lecturer, Animal Production, Faculty of Livestock, Udayana University, Bali, Indonesia
npsarini@gmail.com

Ir. Hasmida Karim

Provincial Project Coordinator (South Sulawesi), ACIAR project AH/2006/169, ACIAR Program Office, Makassar, South Sulawesi, Indonesia
midha.midhi@gmail.com

drh. Bugie Kurnianto

Provincial Project Coordinator (West Java), ACIAR project AH/2006/169, Bogor Agricultural University, Bogor, Indonesia
bugiekurnianto@gmail.com

Ms Anak Agung Sagung Putri Komaladara

Research Fellow, Institute for Rural Futures, School of Behavioural, Cognitive and Social Sciences, University of New England, Australia
akomalad@une.edu.au

Dr Tristan Jubb

Director, Livestock Health Systems Australia
tristan@livestockhealthsystems.com

Summary

Biosecurity on smallholder poultry farms in Indonesia is becoming increasingly important to the Indonesian poultry industry. Highly pathogenic avian influenza (HPAI – H5N1) and other poultry diseases continue to reduce poultry farm productivity, cause human mortalities and reduce consumer confidence in poultry products. Since HPAI was first diagnosed in Indonesia in 2004 (FAO 2004), it has become endemic in 31 of the 33 provinces and been responsible for 146 human fatalities (FAO 2012), the most recent in Bali in 2012.

Like any transboundary disease, HPAI has a range of impacts on multiple stakeholders in the value chain. It affects smallholders' livelihoods, provincial and regional trade, and public health. Initial outbreaks had significant effects on poultry supply due to deaths and slaughterings and a decrease in the availability of day-old chicks. However, price was not affected dramatically because there was a corresponding decrease in consumer demand because of food safety concerns.

It is the smallholder producers in Indonesia who are most affected by the increasing prevalence of poultry disease. However, it is not understood whether the current market and farm contract structures encourage smallholders to invest in biosecurity.

The smallholder poultry production environment is characterised by a number of factors, including:

- a lack of accountability and traceability in the value chain
- a lack of understanding by smallholders of how disease spreads and the biosecurity measures that could reduce the risk of spread
- a contract production system that limits the smallholder's ability and incentive to invest in biosecurity and improve management.

This report presents the results of a trial conducted as part of ACIAR project AH/2006/169 (*Cost-effective biosecurity for non-industrial commercial poultry operations in Indonesia*). In three provinces

in Indonesia (Bali, West Java and South Sulawesi), the project aimed to develop a value chain that rewarded smallholders who implemented recommended biosecurity interventions with a higher price, or a price premium, for their product. The report describes the establishment of the clean market chain (CMC) and some sales data on the poultry products from biosecure farms, and provides an analysis of the flow of benefits from the supermarket back to the smallholder.

A consumer survey in 11 supermarkets in the three provinces assessed whether or not there is a demand for chicken meat and eggs sourced from biosecure farms. The survey results indicated that most consumers were prepared to pay at least 10% more for chickens from approved farms.

The next step was to test whether it was possible to establish a market structure that delivered chicken from approved biosecure farms and provide financial benefits to all value-chain stakeholders and a trusted, safe product to the consumers. With support from the Government of Indonesia, contract companies and the poultry industry, the project developed a system of farm biosecurity training and approval, in which farmers who implemented approved farm biosecurity plans were allowed access, through agreed slaughterhouses, to a premium price in partner supermarkets. The 'Healthy Farm' logoed chicken was launched in June 2010 in Bali, West Java and South Sulawesi. The differentiating characteristic of this product was that it originated from approved biosecure farms and was transported and processed through a differentiated CMC.

There have been difficulties in establishing the CMC, but the trial has shown that even though the supermarket prices are 38% higher (as opposed to the 10% estimated through the survey), they are still at a level where there is consumer demand, and that there may be potential to increase that demand in the future.

The substantial price differential takes into account profit margins and management, labelling and packaging costs. With this price margin, the supermarkets are able to sell 10% of their chickens under the Healthy Farm banner.

This study has indicated that there is also a willingness on the part of farmers, slaughterhouses and supermarkets to be involved in supplying this niche market.

While challenges remain in ensuring a consistent supply of fresh product to the supermarkets

and ensuring that the financial benefits flow to all value-chain stakeholders, it appears that buyers of poultry products in Indonesian supermarkets are concerned about the origin of the products and are prepared to pay premium prices for them.

The responsibility for encouraging better bio-security now lies with the contract companies, which control production processes, to target chicken products for specific markets and use bonus systems to encourage productivity and farm management improvements.

Background and aims

The trials reported here were part of a project funded by the Australian Centre for International Agricultural Development (ACIAR) in three provinces of Indonesia (AH/2006/169, *Cost-effective biosecurity for non-industrial commercial poultry operations in Indonesia*).

The need for improved biosecurity

Highly pathogenic avian influenza (HPAI) first entered Indonesia in 2003 and is now endemic in 31 of the country's 33 provinces. It has the potential to cause significant economic losses for producers (through reductions in income and protein), consumers (through higher prices) and service providers (through reduced demand). There is also a continuing risk of a global pandemic (240 million Indonesians live closely with poultry and have close cultural ties to the birds), and a risk of HPAI entering Australia because of the two countries' geographic proximity and close trade and tourist links. HPAI has been responsible for 146 human fatalities (FAO 2012), the most recent in Bali in 2012.

In Indonesia, the poultry industry employs more than 10 million people and has an annual turnover of US\$30 billion. A total of US\$35 billion is invested in the industry, and 13,000 poultry markets are held daily.

Numbers of poultry in Indonesia are difficult to estimate. Official statistics state that the layer population in 2006 was 95 million (up from 79 million in 2003) and that 956 million broilers were processed (up from 771 million). There are 800,000 broilers slaughtered in Jakarta every day, which is about 30% of the national daily total. As there are on average seven cycles of broiler production per year (broilers are kept for 30–40 days), there is an average of about 190 million broilers in sheds at any one time.

The economic loss caused by HPAI has been estimated at \$1 billion (ABCRC 2007), and it is estimated that direct costs in Indonesia could amount to 0.2% of Indonesia's gross domestic product of

US\$300 billion. Official Government of Indonesia estimates in 2006 put the number of commercial poultry dying and culled since 2003 at 11 million and 7 million, respectively. This equates to direct losses of up to US\$36 million, and does not take losses of village poultry into account. The Indonesian Center for Agricultural Socio Economic and Policy Studies estimated that in the first 2 years after the HPAI outbreak, average farm income declined by between US\$711 and US\$2,944 per farm—a 20% decline in household income (ICASEPS 2004). The Food and Agriculture Organization of the United Nations (FAO) reported a 45–60% drop in demand for day-old chicks, plus drops in feed demand and a reduction in employment in the poultry industry of over one-third (McLeod et al. 2005). While these effects have now subsided with increasing consumer and producer acceptance, HPAI is still regarded as a significant production and food safety risk.

The rationale for establishing a clean market chain

The poultry industry in Indonesia is at the beginning of a revolution. The poultry sector is playing an increasingly important role in meeting Indonesian consumers' demand for cheap, safe, food products. Although over 90% of broiler products are still being sold through traditional markets, an increasing proportion of chicken meat is being sold chilled or frozen, through a growing supermarket system.

Power is shifting from the producer to the retailer. The larger retailers' buying power is allowing them to dictate price and use suppliers as intermediaries. In the higher end markets, it is more often the supermarket that decides which suppliers will meet their requirements and how they will do it (Lee et al. 2012; Reardon et al. 2004; Memedovic and Shepherd 2009). Lee et al. (2012, p. 12326) believe that:

... competitive advantage increasingly lies in products that allow lead firms to distinguish themselves from competitors and cater to premium-paying consumers

... lead firms handle a small group of preferred, generally large scale suppliers capable of meeting their stringent and costly requirements. Small farms unable to do so are marginalized.

Smallholder poultry producers, and the contract companies that they work with, need to understand this change in momentum and develop methods to deliver what consumers demand, rather than simply providing the market with a generic product.

Consumers in Indonesia are increasingly demanding products that are 'ASUH', which stands for *aman* (safe), *sehat* (healthy), *utuh* (whole/pure/intact) and *halal* (permitted), and may be prepared to pay higher prices for those products. They are becoming more affluent, and it has been shown that with increasing affluence comes a greater demand not only for stock-derived protein (McMichael et al. 2007; Silbergeld et al. 2008) but also for humanely grown livestock products (Fanatico 2010). Landes et al. (2004) found that growth in the poultry industry in India was influenced by gains in real per capita income and that per capita consumption was greater in the urban areas. Income levels and price were important drivers of demand.

Greater consumer consciousness of health and safety issues generally translates into a demand for products that are not only healthy but also are produced in a healthy environment. Consumers may be prepared to pay a premium for products that originate from approved biosecure farms, even though the products' quality might not differ from the quality of products from ordinary farms. Nerlich et al. (2009) found that farm-gate biosecurity was not only beneficial in reducing disease risk but also sent out a symbolic message to consumers that the product was safe.

The focus of research and development has shifted from building up farmers' production capabilities to facilitating their access to markets (Shepherd 2007). Understanding consumer perceptions of poultry products may help the industry to decide whether there is a market for safe and high-quality poultry products. A better understanding would also inform other players in the value chain of consumers' willingness to pay for perceived safe and healthy poultry products. Hence, determining consumers' perceptions of products from biosecure farms and their willingness to pay for them is a first step in assessing potential economic incentives that may encourage farmers to improve their farm biosecurity.

Much of the chicken consumed in Indonesia is produced by the non-industrial commercial poultry

(NICP) sector, which includes all farms that are producing meat or eggs for sale, but with low biosecurity and at a relatively small scale (typically fewer than 20,000 birds). Current poultry market chains in the NICP sector involve the transport of live birds to traditional markets. At present, consumers have a preference for purchasing live birds because they are cheaper and the consumer can be confident that they are fresh and healthy. Chilled market chains are not well developed, and consumers lack confidence in the product quality. Providing products from biosecure farms marketed through a clean market chain (CMC) has the potential to increase confidence in the products.

Recent advances in biosecurity in the industrial sector have not been matched in the NICP sector. The nature of the market chains requires approaches that appreciate the socioeconomic factors that make the sector difficult to regulate. With low to minimal biosecurity systems, the NICP and *kampung* (village) chicken sectors are exposed to higher risk of HPAI infections compared with the industrial sector.

The lack of biosecurity in the NICP sector ensures that HPAI cannot be effectively controlled in Indonesia. Lack of biosecurity past the farm gate, limited trace-back, multiple production cycles, the low level of understanding of biosecurity and minimal price differentiation between healthy and sick birds lead to the poor implementation of farm biosecurity systems. The adoption of appropriate biosecurity measures in the NICP sector, if demonstrated to be simple, affordable and effective, may substantially change the productivity and zoonotic threat of the poultry industry.

In a CMC, the spread of virus is reduced because all the links in the chain have measures in place to minimise the risk of virus accumulation and the outbreak and spread of disease. The CMC requires that poultry from farms that have implemented approved biosecurity measures will pass through audited slaughterhouses and be sold in supermarkets that are able to charge a premium price for the product. The potential for obtaining a premium price, along with productivity benefits provided by better biosecurity, may encourage NICP producers to improve their biosecurity with support from other actors along the chain. If a CMC becomes established, it will drive biosecurity implementation throughout the sector as more retail outlets (such as fast-food chains) demand these products.

The CMC developed in this project began as a pilot project in three provinces: Bali, South Sulawesi and West Java. In each province, the aim was to develop a niche market for chicken meat and eggs from biosecure farms by creating economic incentives for all market-chain stakeholders, including consumers, retailers, processors and smallholders. The long-term goal of the CMC is for the premium market chain for the two differentiated products (chicken meat and eggs) to be developed and expanded throughout Indonesia by the industry stakeholders and local communities in an industry-driven approach. Growth in the supermarket sector (driven by Indonesia's continuing economic growth) and government determination to increase biosecurity should assist in the longer term.

The aim of the CMC trial was to facilitate the implementation of a CMC through the creation of economic incentives for industry stakeholders, rather than being a 'donor'. The project did not have a large enough budget to generate a significant market intervention, such as a subsidy for the premium products. Instead, the aim was the sustainable adoption of cost-effective biosecurity measures in the NIPC sector and heightened awareness of the control and prevention of animal disease across the entire marketing chain, from farm gate to consumers.

Apart from the positive effect on the poultry industry of reducing the spread of disease, better biosecurity should also boost farm income by improving productivity and reducing disease risk.

Poultry market chain stakeholders in Indonesia

The stakeholders in the meat-chicken (broiler) market chain in Indonesia and the relationships between them are summarised in Figure 1, which shows who deals with whom, from vertically integrated poultry companies supplying inputs and advice through to consumers. In chains such as this, which rely more on social rather than contracted relationships, it is often difficult to separate the various roles: a farmer may be a collector, a large collector may own a poultry shop or a farm, and all stakeholders are consumers.

Integrated poultry companies

Integrated poultry companies dominate the production of broilers in Indonesia. They provide contracts to farmers to produce broilers for sale in the local market. While the contract conditions vary among

companies, the basic premise is that farmers will be guaranteed a minimum price for broilers produced under the conditions agreed to in the contract. The conditions include purchasing the company's day-old chicks (DOCs) and feeds, receiving company technical advice and selling finished product back to the company. In most contracts, birds become the property of the farmer and inputs are paid for by the farmer at the time of resale to the company.

The main roles of the companies in the broiler supply chain are to:

- encourage and receive farmers' proposals (with a reference letter from an existing contract farmer)
- undertake field assessments of potential contract farmers
- provide production inputs to the farmers
- purchase broilers from contacted farms

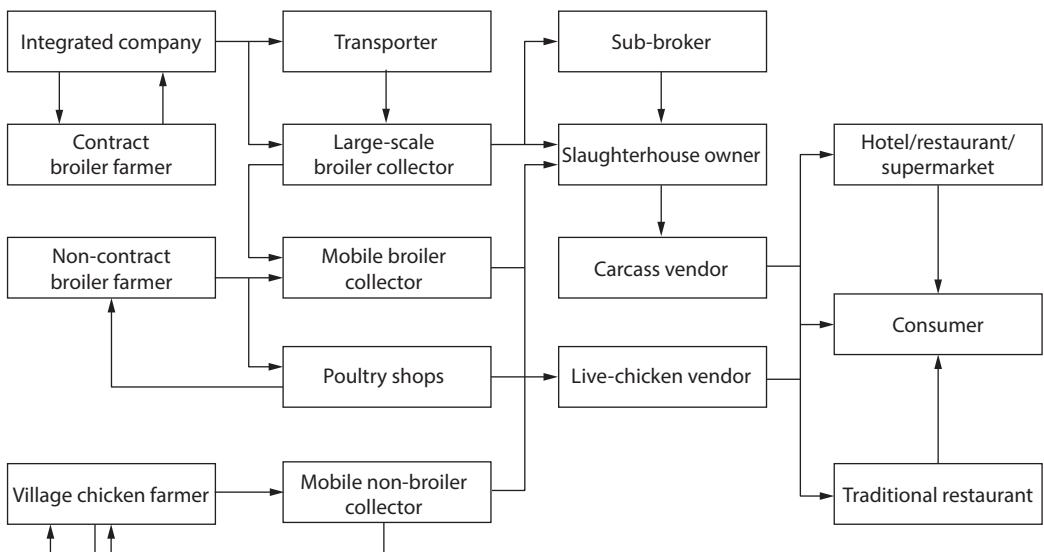


Figure 1. Stakeholder relationships in the meat-chicken marketing chain

- sell broilers to the large collectors (the companies identify the farmers who are ready to harvest and then inform the collectors; all broilers from contract farms are sold in this way)
- provide delivery orders to the big collectors, once the collectors and poultry shops transfer their cash to the companies
- undertake monitoring and evaluation and provide technical production support to contract farmers
- manage contracts and guarantee prices.

These companies are also producers in their own right. The seven large multinational companies operating in Indonesia produce a highly valued product with complete control over inputs and outputs. The farms are known collectively as the ‘industrial farms’ or Sector 1.

Also providing inputs to the chain are the Sector 2 or breeding farms, some but not all of which are Sector 1 farms. The industrial breeding farms are included in Sector 2 (along with those breeding farms not owned and managed by the multinational companies), because as breeding farms they require special licensing and management.

Contract and non-contract broiler farmers

In Indonesia, about 95% of broiler farms participate in the contract farming system. Contract producers receive all production inputs from their ‘nucleus’ or contractor company, as well as technical and marketing support. When ready for sale, all birds are purchased live by the company. The company has its own collectors who transport the birds to dressed-broiler vendors, sub-brokers or the slaughterhouse. The company informs the collectors that they have birds to sell on a certain day. If the collectors find a good price and need the chickens, the company requests the collector to transfer the payment through a bank. The collector then receives a letter from the company giving permission to catch the birds. The collector gives the letter to the contract farmer and is then responsible for the transportation cost. The farmer and collector check and catch the birds and load them into the transport. There will also be a representative from the company present to monitor the transaction.

The remaining 5% of broiler farmers are non-contract farmers, and their number is decreasing rapidly under market pressure from the large contracting

companies. Some are responding by getting together and developing linkages to poultry shops (which are their main suppliers of inputs) in order to develop their purchasing power and, potentially, their ability to obtain consistent, good-quality inputs. It is becoming difficult for the non-contract farmers to sell broilers without stronger long-term relationships with the shops. Non-contract producers have greater flexibility in deciding to whom they sell, but most broilers are sold back to the poultry shops. The price paid to the producer is based on the market price at the time of sale.

Independent producers still have opportunities to obtain inputs from various sources and thereby reduce their costs, but that may increase the risk of disease. For example, buying uncertified DOCs and transporting them in dirty crates and vehicles could increase the risk of HPAI spreading.

Contract and non-contract producers in the broiler supply chain have some similar responsibilities, including:

- constructing appropriate chicken sheds
- implementing approved biosecurity measures
- undertaking approved feeding and poultry health activities
- catching and weighing broilers ready for sale
- preparing farm records.

While these activities are undertaken under contracting companies’ (and sometimes poultry shops’ or large independent farmers’) recommendations, farmers must also take responsibility for other inputs, such as electricity, extra feed (such as rice husks), lime, fuel and labour.

Village chicken farmers

Most rural households have village (*kampung*) chickens. In this type of chicken (and duck) management system (referred to as Sector 4), chickens typically range freely and minimal inputs are provided. Producers do not use purchased commercial inputs, such as DOCs and special feed. Farmers feed their chickens and ducks with bran (a by-product of rice milling called *dedak*) or simply allow them to scavenge. They use no animal health management systems, do not vaccinate the chickens, and do not separate or treat sick birds.

Ducks are managed differently. Farmers usually use simple bamboo fences to control the ducks’ movements and to aid feeding and egg collection.

At times, Sector 4 farmers go the market themselves to buy and sell. In summary, Sector 4 farming is characterised by:

- household and backyard production (free range, with minimal input)
- its non-commercial nature—it uses no commercial inputs, such as DOCs, feed and chemicals, and has no links with poultry shops and integrated companies
- the small numbers of birds farmed
- the absence of biosecurity measures.

Poultry shops

In the broiler sector, the main role of the poultry shop is to provide production inputs, such as DOCs, feed, equipment, drugs and vaccines, to the non-contract producers and to the farms owned directly by the shops.

The poultry shops are a useful alternative or counterbalance to the contract companies. Although they are finding it increasingly difficult to compete, they are still considered an alternative source of inputs, technical advice and collectors. They reduce the potential for the large companies to monopolise the production of broilers. If farmers no longer wish to be part of the vertically integrated company structure, they can still produce broilers as ‘independent’ producers.

The shops have difficulty in accessing high-quality DOCs and feed, which are produced by the large companies and hence are accessible, in the first instance, to their contracted farmers.

In summary, the poultry shops:

- buy broilers from the companies and from their partner producers (non-contract producers)
- supply chicken catchers as well as a weighing and broiler transport service
- provide a slaughtering service as an additional support for their regular vendors, customers, or both
- sell both live and processed chickens to vendors, slaughterhouses and consumers
- prepare and clean collecting pens
- negotiate agreements with companies on harvesting times, schedules and price
- collect payments from their partner vendors (fortnightly) and restaurants (weekly)
- deliver dead chickens to fishers (as catfish bait) and manure to farmers
- sell production inputs to non-contract producers

- provide technical assistance to non-contract producers
- dispose of slaughter wastes (into waterways or rivers).

Collectors

Collectors (*pengumpul*, *pengepul*) are responsible for the collection of chickens and ducks from all sectors of the poultry industry. The collector picks up chickens either from farms on the way to the live-bird market or at a central village collection point after they have been delivered to that point by farmers or other collectors. There are two types of collectors: broiler collectors and non-broiler collectors (who collect spent layers, *kampung* chickens and ducks).

Broiler collectors

The collection procedure is determined by the type of transport available to the collector (which ranges from public transport to a motorcycle or small truck) and the frequency of available markets. In some more isolated areas, there are live-bird markets only once a week, so collectors move from one market to another to buy and sell chickens and ducks. They work as both collectors and as vendors and in multiple locations. While they mostly sell live birds to small collectors, slaughterhouses or carcass vendors, in some instances they also provide a slaughter service.

Most of the large-scale broiler collectors are based in the poultry shops, while some are brokers who work closely with the integrated companies. These collectors usually have their own transport (typically a minibus) and move freely between farms.

Non-broiler collectors

The smaller scale mobile non-broiler collectors usually collect birds using motorbikes and bicycles. They usually buy *kampung* chickens and ducks, take them to the local market for sale and bring chickens back to the village for sale. The smaller collectors tend to trade between villages, rather than trading in the bird markets.

The larger scale collectors use cars and micro-buses. They also travel from one market to the next or from village to village to collect and distribute chickens. They know exactly where and on which days the bird markets are working and manage their travel and poultry pick-up and sales based on that knowledge.

In summary, collectors of *kampung* chickens and ducks:

- transport poultry using their own vehicles (mostly motorcycles or bicycles) and public transport
- move from one market to the next (within a district or between districts) to buy and sell birds
- sometimes provide a slaughter service to their consumers.

At the end of the market day, mobile collectors may also sell their unsold birds to non-mobile vendors who have stalls at the markets.

Collectors can also have regular buyers, such as restaurants and ‘street restaurants’.

Transporters

The large contract companies that work with the NIPC sector either have their own transporters or use contract collectors to act as transporters. A transporter does not take ownership of the chickens. If required, they pick up chickens from various company-owned farmers and transport the birds to a designated (usually company-owned) slaughterhouse.

Sub-brokers

In some areas, small groups of brokers work between big collectors and the broiler carcass vendors. They do not have access to the poultry managed by the integrated companies. They obtain birds from big collectors and distribute them live or dressed to the vendors. There are few sub-brokers, as the big collectors mostly supply live or dressed birds straight to the broiler vendors. More often, the sub-brokers operate in the more remote subdistricts or at the village level.

According to the big collectors, the brokers earn income from buying and transporting birds from contract and non-contract farms to the collectors or direct to the carcass vendors.

There are no sub-brokers involved in the *kampung* chicken and duck marketing chain.

Slaughterhouses and processors

The slaughtering of birds is done at various levels and by various stakeholders. While there are purpose-built slaughterhouses (*rumah potong ayam*, RPAs), slaughtering and processing are also done by farmers, collectors, carcass vendors and consumers.

On average, 20–25% of broilers are sold live to consumers; the remainder are sold freshly killed. Small slaughterhouses are mostly run by households.

The slaughterhouses:

- receive chickens from big collectors (who get them from companies), from non-contract farms, or both
- slaughter and clean the birds, ready to be sold at the wet markets
- deliver dressed chicken to restaurants and carcass vendors
- provide slaughter services to individual consumers, especially during important religious and cultural celebrations
- store live birds in their collection or transit pens (for up to 2 days)
- undertake limited biosecurity activities (such as cleaning pens and cages and spraying the floors)
- organise transport for dressed carcasses to carcass vendors (paid by the vendors).

Vendors

Live birds

There are two types of live-bird vendor: permanent and mobile. The permanent vendors have permanent stalls at the markets, while the mobile vendors do not.

The mobile vendors keep their birds in one or two cages attached to their motorcycles. They usually move from one market to another in order to buy and sell birds (in effect, acting as collectors). They sell birds directly to regular customers, such as traditional restaurants.

Carcasses

Carcass vendors buy dressed (killed and cleaned) birds at the slaughterhouse. Most carcass vendors purchase live broilers from the integrated companies (via collectors) and then slaughter them. They also buy dressed birds from private slaughterhouses and sell them at the early morning markets near the slaughterhouse, transport the birds to smaller village markets or sell direct to the hotel and restaurant sector.

There are two types of vendors who sell dressed birds: those who sell fresh broilers and those who sell half-cooked (grilled) broilers. The former usually sell 35–40-day-old broilers, while the latter usually sell smaller 25-day-old birds.

Consumers

Most broilers are sold at wet markets by broiler carcass retailers. Only a small proportion of broilers go to restaurants and small commercial vendors (street *warung*). Some consumers purchase live or dressed birds from collectors or vendors who deliver to their homes or pass through their village.

Description of poultry market chains

The structure of the poultry production and marketing system in Indonesia partly determines the risk of the spread of disease.

This section describes in detail the institutions in the market chains for meat chickens (broilers) and layer chickens in Bali. While there are differences in market chains throughout Indonesia (depending on the size of the market, the strength of marketing institutions and the demand for product), the arrangements in Bali are fairly representative of market chains throughout Indonesia.

Meat-chicken market chain

Figure 2 shows a combined chain for all meat-producing chickens in which broilers and meat products move from the DOC stage through to the consumer. It also provides some insights into the percentage of product in different parts of the chain.

Broilers into a large slaughterhouse

If birds are picked from a single contract farm and are taken to a modern, clean facility for slaughter, there is unlikely to be any disease spread. Inspection processes are more developed in medium-size to large slaughterhouses than in smaller ones. Therefore, there is potential for a ‘dead-end’ marketing chain to minimise the incidence of HPAI.

The only large slaughterhouse in Bali is in Kediri, in Tabanan regency. It is privately owned and has the capacity to slaughter 2,500 birds per day. The owner has a contract with PT Wonokoyo to slaughter the company’s birds to the specifications of McDonald’s restaurants and the large supermarket chains in Denpasar (such as Tiara Group, Hero and Carrefour). The slaughterhouse employs 25 workers, and slaughters twice a day, at 7 am and 7 pm. All carcasses and meat cuts produced must meet the company’s food safety, biosecurity and *halal* standards.

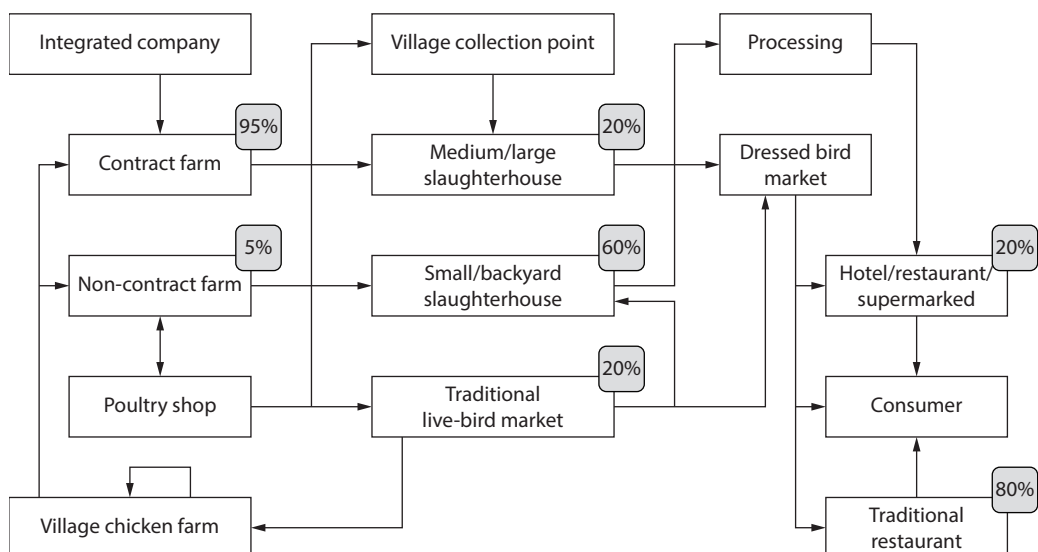


Figure 2. Meat-chicken market chain in Bali, including the proportions of birds in different sections

Medium-size slaughterhouses, such as PT Siap Bali, obtain chickens from PT Ciomas contract farmers. This company has a slaughtering capacity of 300–750 birds per day. The birds are delivered by the Ciomas collector/transporter without the collector taking ownership. Ciomas pays the contract farmer cash as the birds leave the farm. The carcasses and chicken cuts produced by Siap Bali are intended for high-end markets, such as star-rated hotels and restaurants. The average demand is 20 kg/day per outlet, and a monthly payment system is used. Medium-size slaughterhouses try to obtain birds from one or only a few sources to minimise transport costs and the spread of disease.

While approximately 20% of broilers go to RPAs with inspection facilities and protocols, the remainder are sent to smaller slaughterhouses without such arrangements (60%) or to collectors or vendors for sale live in traditional markets (20%).

Collectors purchase from the integrated companies and either deliver direct to the slaughterhouse or, if direct delivery would be inefficient, to a collection point for combination with other consignments before delivery to the slaughterhouse.

Broilers into a traditional market/ slaughterhouse

While traditional or smaller RPAs are also potentially a dead-end, there is certainly more potential for birds to be mixed with others, sold live and distributed back to households. Collectors or farmers purchase birds at large markets, such as Beringkit (near Denpasar), and then resell at smaller markets away from the city. This adds another dimension to the marketing chain and another role for collectors and vendors.

Village collection points are used to combine birds into groups for easier marketing and lower transport costs. From there, they go to either the traditional live-bird markets or to a slaughterhouse, which are often in the same location.

Live *kampung* chicken and duck

The marketing system for *kampung* chicken is less formal than for other poultry types. *Kampung* chickens are scavengers, as most village farmers are not prepared to invest money in nutrition or vaccine. Virtually every rural household in Bali keeps *kampung* chickens for food and for traditional ceremonies. The cultural role of *kampung* chickens has influenced farmers' management systems, which

have proven very difficult to change. Farmers are prepared to accept high mortality rates and to pay high prices for appropriately coloured and plumed chickens and ducks.

The market chain is quite simple but difficult to monitor and influence. If farmers need to sell *kampung* chickens or ducks, they use a local collector to pick up their birds and deliver them to a live-bird market. Birds that are not sold that day are usually kept at the collector's house or a village collection place, or sometimes at the marketplace, for sale on the following day. The next market day may be at a different site, requiring further transport and mixing of birds. Some live birds do not reach the market but are sold along the way.

Many farmers do not buy replacement birds from the market but purchase them from neighbours or breed their own replacements. The high cultural and economic value of *kampung* chickens in Bali has led to the establishment of a significant illegal trade from East Java of both *kampung* chicken and ducks. *Kampung* chickens are mostly purchased live by the household and returned to the village. There is no dedicated slaughterhouse for *kampung* chickens and ducks, but some villagers provide this service at the live-bird market.

The market chain for ducks is the same as the market chain for *kampung* chickens. The farmers do not use special feed and chemicals in their production systems, and ducks and duck eggs go to traditional live-bird markets or wet markets through duck and egg collectors.

The processing of birds

Processing is done either by specific staff at the larger markets or by collectors and carcass vendors at the smaller markets, their homes or collection sites. At the higher end of the market, processing involves dressing, packaging and selling the product either fresh or frozen at supermarkets and restaurants. At the lower end, it involves cleaning the carcass and selling in the morning meat-markets, which is where most broilers are sold. Cleanliness is a serious problem in these markets, where work practices create a great risk of spreading disease.

On a given day, lower demand for broilers, greater supply or both can lead to surplus dressed broilers being distributed to the traditional village markets. Excess dressed birds that do not sell on a particular day have been known to be injected with formalin or frozen and kept over to be sold as 'fresh' dressed

carcasses the following day. Unsold dressed broilers are usually taken home by the carcass vendors, who will either consume them or cook them and attempt to sell the product in that form.

Consumers

Domestic consumers purchase frozen and fresh chicken products from restaurants (including fast-food outlets, such as McDonald’s and KFC), hotels and supermarkets, mainly in Badung regency and Denpasar City.

Consumers can buy live broilers direct from the live-bird market, but that is unusual in Bali. Broilers for consumption are likely to be purchased as dressed birds from the morning meat-markets or from small-scale food-sellers and the hotel and restaurant sector.

Layer and egg market chain

Figure 3 shows the egg and layer-chicken market chain in Bali. Most DOCs originate in East Java. Spent layers end up in the traditional markets, and the eggs are sold to consumers in a range of markets.

Eggs

Poultry shops work with farmers to produce eggs. The shops usually sell all production inputs, such as DOCs, feed, chemicals and equipment. They are also the main buyers (collectors) of the eggs and spent layers from the farms they work with. Some small collectors of culled or spent layers also buy the birds

from farms and then sell them at traditional live-bird markets.

While not contracted to the integrated poultry companies, layer farmers depend on them for the supply of DOCs and fertile eggs. PT Charoen Pokphand, PT Multibreeder Adirama and PT Wonokoyo distribute approximately 2.3 million DOCs per year to farmers in Bali. Only PT Charoen Pokphand has a hatchery in Bali; the others import DOCs from Java.

Poultry shops are taking an increasingly integrated approach to egg production, as many shops also become involved in the production and the sale of eggs. They are increasingly providing whole-of-market support for other layer producers, including inputs and a marketing channel.

Depending on their size, poultry shops sell either to egg distributors or directly to consumers. They can also purchase eggs from other farmers and act as distributors themselves.

Another actor in the egg market chain is the egg collector. Farmers inform the poultry shop or collector of the number of eggs they have available for sale on a particular day. The shop or collector picks up the eggs using their own transport, moving from one farm to another until the vehicle is full. On average, a small truck can carry about 18,000 eggs.

A collector usually swaps empty crates for full ones, leaving the empty crates with the producer. Farmers should make sure the crates are clean before they enter the farm, but that does not happen very often in practice.

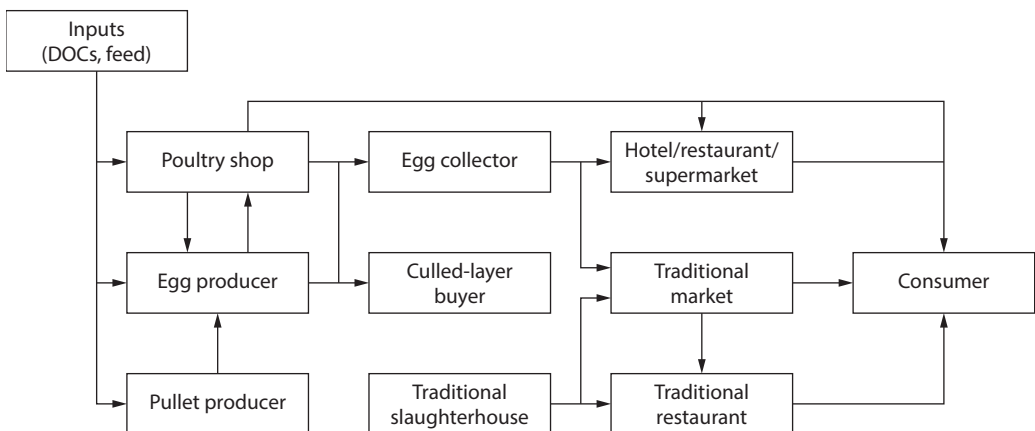


Figure 3. Egg, layer-chicken and cockerel marketing chain

Ownership of the eggs changes at the farm gate, and payment is usually made in cash. In some cases, there can be a delay in payment for 2–3 days if the farmer trusts the collector or poultry shop. Because they relinquish ownership, the egg producers do not have much control in deciding where the eggs go. The collectors or shops usually sell the eggs to retailers, who then deliver to general markets, small local restaurants (*warung*) or bakeries. Some collectors have direct links to larger hotels and restaurants. Egg deliveries to the hotels are usually carried out under contracts with monthly payments. Egg deliveries to restaurants are not necessarily under contracts; they mainly meet daily demand and are based on a telephone call and payment at pick-up.

It is important for the poultry shops to maintain consistent supply to their regular customers, such as egg retailers, hotels and restaurants. If there is a local shortage of eggs, the poultry shops buy them from farmers in other districts, creating a potential disease risk.

The use of crates for transporting eggs, and easy access to farms by trucks and cars to pick up and deliver eggs, may also be an important contributor to the risk of disease spread.

Culled and spent layers

Spent layers in Bali are marketed in a similar way to non-contract broilers. They do not go to the large and medium-size slaughterhouses. About 80% go to small slaughterhouses, and the rest are sold live in the wet market. Collectors and poultry shops pick up the birds from the farms. Some collectors specialise in collecting layers, while others also collect broilers. The poultry shops purchase both types.

Balinese buy spent layers to make special Balinese dishes, and there is high demand during festivals. At those times, the price of spent layers is the same or higher than the price of broilers, because particular types and colours of bird are required for ceremonial purposes. They must be purchased and taken home alive.

Spent layers sent to traditional slaughterhouses are sold in a similar way to broilers, by direct sales of dressed birds from the wet market or via local restaurants and small village shops.

The movement of spent layers may be a particular problem in spreading disease. For example, small mobile collectors usually pick up small numbers of ducks and *kampung* chickens on the same motorbike. These birds are then often sold live to consumers, who take them home.

Because layers are kept for up to a year, they have a higher on-farm mortality rate than broilers; the hygienic disposal of dead birds can be a problem.

Cockerels and pullets

Cockerels are reared to meet demand for ceremonial purposes and for grilled chicken in Taliwang and Padang restaurants. For ceremonial purposes, cockerels are kept until 3–6 weeks old and then sold in live-bird markets or direct to households. Pullets are raised for 50 days to meet restaurant demand.

DOCs to meet this demand are produced by the four main companies: PT Multibreeder Adirama (1,800,000 per year), PT CP (110,700), PT Wonokoyo (246,000) and PT Sierad (14,200). The larger farmers (those with more than 10,000 birds) buy DOCs from one of the companies, which delivers to the farm. Small growers are more likely to purchase their DOCs from the poultry shops, which arrange delivery. The transport cost depends on the agreement between buyer and seller (the price of DOCs usually includes the cost of transport).

There are about 50 independent pullet producers in Bali, owning between 5,000 and 50,000 birds per production cycle. They are different from broiler and layer producers. Two main producers based at Buduk and Mengwi (Badung regency) also act as collectors. The marketing system for pullets is similar to that for broilers, in which collectors and vendors play a major role. Collectors pick up the birds from the farmers and then resell to vendors or direct to small slaughterhouses. Vendors sell the birds to consumers at the traditional markets. Change of ownership occurs at the farm gate.

Establishing a clean market chain

There were four steps in establishing a CMC:

1. Select case study areas.
2. Survey consumers.
3. Establish industry management processes.
4. Develop the protocols and train the stakeholders.

This section describes the process and details the activities of project personnel and the methods used to prepare for a 'Healthy Farm' chicken product launch into supermarkets in June 2012.

Case study areas

The project was conducted in three cities in Indonesia: Bogor (West Java), Denpasar (Bali), and Makassar (South Sulawesi) (Figure 4).

Bali

The market for poultry in Bali currently handles about 120,000 to 130,000 birds a day, and the sector has sheds able to hold around 6.0–6.5 million birds.

The industry is dominated by seven national companies, some of which are multinationals. The two largest companies, PT Charoen Phokphand and PT Japfa Comfeed, control about 70–80% of the market.

Bali has developed tourist and supermarket sectors that demand safe, clean, healthy products. It was seen as a useful case-study area because it has more modern marketing arrangements than the other two provinces. Potentially, there may be greater potential for the niche Healthy Farm product to be successful in this market. There is also continued evidence of HPAI in the province and a determination by the provincial government to eradicate the disease.

West Java

Bogor, West Java, is close to Jakarta. There is demand for approximately 1 million birds a day in the Jakarta market. Currently, 85% of poultry products are sold at 200 traditional markets; the remainder are sold in supermarkets (FAO 2004). There is potential

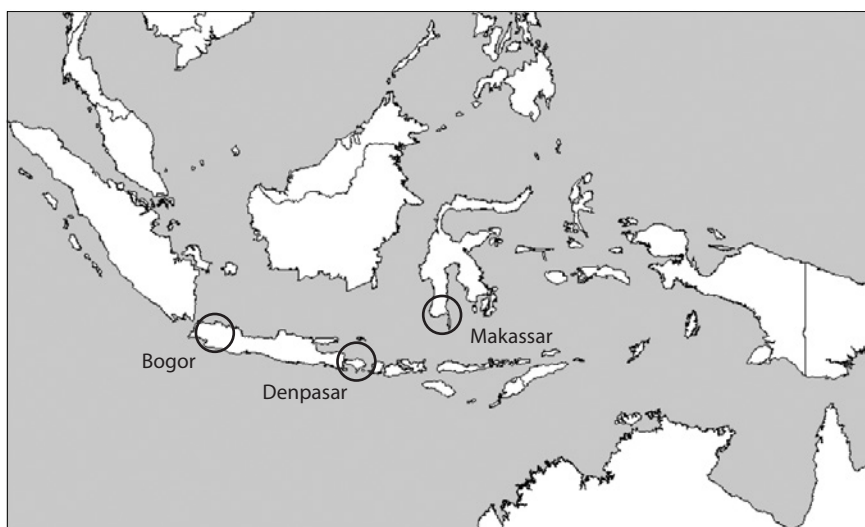


Figure 4. Case-study areas for the project

to increase the proportion sold in supermarkets. Bogor is a municipality of 5 million people, so demand in its market is also significant.

Due to the very high disease risk presented by the Jakarta market chain, the government is working towards having all poultry in Jakarta marketed through a chilled market chain, thereby removing the disease risk posed by wet markets. New policies now being implemented limit the transport and slaughter of chickens in Jakarta, meaning that neighbouring regencies, including Bogor, will have increasing importance as suppliers of poultry products, rather than whole chickens, to this market. This has big implications for the market chain in West Java.

South Sulawesi

The poultry industry in South Sulawesi is dominated by three large companies: PT Charoen Phokphand, PT Japfa Comfeed and PT Sierad. Some 15 subsidiaries supply a market for around 1 million broilers a week. There are also about 4 million layers in the province.

The poultry industry is less varied in South Sulawesi than in Bali and West Java, as there are fewer high-end consumers and smaller expatriate and tourist communities. However, the production facilities are quite sophisticated due to the presence of the Ciomas (Japfa Comfeed) factory, which produces large quantities of sausages for markets in Kalimantan and Papua. Makassar is also an important thoroughfare for trade from Java to the eastern islands and a potentially important disease conduit. DOCs and feed sourced from Makassar are traded through to Bali, West Nusa Tenggara and East Nusa Tenggara.

Consumer survey

The project surveyed consumers in 2010, in Bogor, Denpasar and Makassar.

Design

At 11 supermarkets, 240 consumers were surveyed. The survey was limited to supermarkets, as it was expected that supermarket customers would have the capacity and desire to pay a premium price.

Over 75% of respondents purchased poultry products at the supermarket. Their reasons for shopping there included their perception that products were of better or at least more consistent quality, easier shopping access and their enjoyment of ‘mall’ shopping.

Stated preference techniques (Abley 2000) were used to elicit consumer preferences for products originating from an approved biosecure farm. Respondents were offered a choice between two products: the first a regular whole chicken, and the second a chicken from a biosecure farm. They were shown photos of an approved farm and an unapproved farm of a similar size and in a similar location. They were also shown photos of the packaged product from the approved farm and a regular chicken product.

The consumers’ willingness to pay a premium was measured using elicitation techniques.

Willingness to pay for chicken meat from biosecure farms

Of those consumers surveyed in Bogor, 92% stated that they would be prepared to pay more for products from approved biosecure farms. Forty-eight per cent stated that they would pay a premium of up to 10% above the regular price, and 43% said that they would pay more than that (Table 1). The average premium that respondents in Bogor were prepared to pay was Rp2,990/kg¹, in addition to Rp24,160/kg for a regular chicken (that is, 12% more) (Iqbal et al. 2010).

¹ An exchange rate of Rp9,000 = A\$1 is used in this study.

Table 1. Consumers’ willingness to pay a premium for broiler chicken in Bogor, West Java

		Respondents (%)
No premium (regular price)	Rp24,160	8
Premium of up to 10% above regular price		48
Premium of between 11% and 20%		29
Premium of between 21% and 30%		12
Premium of greater than 30%		2
Average premium—all respondents	Rp2,990	

Respondents were asked about the most important characteristics of a meat product that they consider when purchasing. The most important criterion, particularly among the female respondents, was that it was *halal*. It was also important that it was regarded as a ‘safe’ product, which supports the contention that food safety is becoming increasingly important to Indonesian supermarket customers.

In Makassar, 92% of respondents believed that they would spend more on this product if it were available (Table 2). However, their willingness to pay was lower than that of respondents in Bogor, even though prices for ordinary chicken meat in Makassar were similar to Bogor prices at Rp24,400/kg. Respondents in Makassar would be prepared to pay a Rp2,140/kg premium (8.8%) (Lestari et al. 2011).

For all respondents, the main driver for selection was that the products are *halal*. This was important for both males and females: gender appeared to have no effect on their perceptions.

In Denpasar, most consumers (94%) stated that they would be prepared to pay Rp5,000 more than the regular price (Table 3). One consumer would spend between Rp5,000 to Rp10,000 more, and one would pay more than Rp10,000 above the regular price (Yusuf 2011).

Industry leadership

The project made use of existing industry groups and also established some new structures.

Biosecurity Consultative Group

Because the smallholders were contract farmers, it was necessary to ensure that the CMC concept was agreed to and supported by the industry at the national level. To that end, the project established the Biosecurity Consultative Group, which was used to inform the industry of the CMC activities and to provide a forum in which biosecurity issues and the nature of contracts could be discussed.

The Biosecurity Consultative Group functioned as a subcommittee under the *Forum Masyarakat Perunggasan Indonesia*, with broad responsibility for the development of industry-wide policy and the adoption of biosecurity interventions in the poultry industry. Membership of the group included representatives from government, contract companies (PT Charoen Pokphand and PT Japfa Comfeed), farmer associations (Pinsar and GOPAN), a university (the Bogor Agricultural University, IPB) and the ACIAR project team.

Indonesian Poultry Biosecurity Centre

The Indonesian Poultry Biosecurity Centre (*Pusat Biosekuriti Unggas Indonesia*, PBUI) was established in 2008. It was funded by the project and was the institution through which all project and CMC activities were implemented. It had no legal status or financial support from government or industry partners.

The PBUI’s aims were twofold:

- facilitate project biosecurity training activities

Table 2. Consumers’ willingness to pay a premium for broiler chicken in Makassar, South Sulawesi

		Respondents (%)
No premium (regular price)	Rp24,400	10
Premium of up to 10% above regular price		50
Premium of between 11% and 20%		38
Premium of between 21% and 30%		2
Premium of greater than 30%		0
Average premium—all respondents	Rp2,140	

Table 3. Consumers’ willingness to pay a premium for broiler chicken in Denpasar, Bali

		Respondents (%)
No premium (regular price)	Rp23,500	0
Premium of up to Rp5,000 (21% above regular price)		94
Premium of between Rp5,000 and Rp10,000 (40%)		3
Premium of greater than Rp10,000		3

- become established as an independent biosecurity auditor for small-scale poultry farms and poultry slaughterhouses.

Through the PBUI, the project developed training programs for all stakeholders in poultry market chains. It also trained master trainers to ensure the sustainability of the system. The PBUI took responsibility for developing and implementing the farm biosecurity plans required for audits of farmers and RPAs, which were necessary components of the CMCs.

Clean market chain provincial working groups

Project activities at the provincial level were assisted by CMC working groups, which were responsible for the planning and implementation of the CMC in each province. The groups provided access to farmer groups and other provincial stakeholders, advised on processes required to develop stakeholder relationships and assisted in ensuring the sustainability of the CMCs. Their structure was similar to that of the Biosecurity Consultative Group, comprising provincial government, industry (contract company, supermarket and RPA), farmer and university representatives.

Development of market protocols and stakeholder capacity

At each of the locations (Bali, West Java and South Sulawesi), focus group discussions involved local government and all industry stakeholders. The aim was to identify stakeholders who were keen to be part of the CMC trial and who were prepared to develop relationships with other stakeholders. Further, more detailed discussions were then held through a contracted ‘Pricing Study Team’, whose role it was to further strengthen the relationships and begin developing a sustainable pricing system along the chain.

Identification of participants

Criteria for final selection of CMC participants included:

- the current extent of their biosecurity measures and rules
- their location in relation to other stakeholders
- existing supply arrangements between stakeholders
- the existence of suitable contractual arrangements between stakeholders for the introduction of a new product.

The process for selecting CMC participant stakeholders varied between provinces:

- In West Java, the project contacted a small, privately owned RPA that was already supplying supermarkets and restaurants in Bogor. Supermarkets were identified through the RPA. The farmers were identified separately.
- In South Sulawesi, the project identified a vertically integrated chain (managed by Japfa Comfeed/ Ciomas) that had contracts with supermarkets and fast-food outlets in Makassar, such as KFC. This was considered ideal, as the company could ensure that the linkages between stakeholders were functioning. Japfa Comfeed ran feedmills, imported good-quality DOCs, contracted its farmers and owned a modern RPA.
- In Bali, the supermarket and farmers were identified, but there were difficulties in identifying a suitable RPA. Eventually, the project identified a small, privately owned slaughterhouse that had contracts with the supermarket. Later, in March 2013, the Ciomas RPA and contract farmers also became involved in the CMC in Bali.

The following section details the selection process in the three provinces.

Contract companies and broiler farmers

The selection of broiler farmers began with discussions with the contract companies. The key consideration was whether the farmers had been trained and the level of biosecurity implementation on their farms. By June 2012, 71 broiler farmers were involved in the CMC trial (Table 4).

Table 4. Broiler farmers participating in the clean market chain project

Province	Number of farmers	Contract companies
Bali	20	MSJ and Ujadi
West Java	30	Perdana Putra Chicken, Tunas Mekar Farm, Pandu Putra Mandiri and Inasa
South Sulawesi	21	PT Ciomas Commercial Farms

Two contract companies, MSJ and Ujadi, were selected in Bali because they provided support for farmers to implement biosecurity measures. They were also located in the same area, had existing relationships with the RPA and had been trained by

PBUI. Twenty broiler farmers were selected from the two companies.

In West Java, GOPAN (a national farmers' organisation) was appointed as the project counterpart. Therefore, farms that were members of GOPAN, including Perdana Putra Chicken, Tunas Mekar Farm, Pandu Putra Mandiri and Inasa, were involved in the project. Thirty farmers approved by the PBUI were chosen.

In South Sulawesi, PT Ciomas Commercial Farms was willing to participate in the CMC project, and 21 broiler farmers from the company were selected.

Slaughterhouses

Although disease is not a problem in RPAs because of the short time between the farm gate and the market, CMC products need to be traceable so that they can be differentiated from regular products in the market.

The main considerations in selecting the RPAs were their application of food safety measures, their ability to separate birds from biosecure farms and their ability to supply target supermarkets. The slaughterhouse needed *Nomor Kontrol Veteriner* (veterinary control number, NKV) certification (or to be working towards NKV certification) and to pass a soft audit from the PBUI to ensure that these criteria were met. As most Indonesians are Muslim, *halal* certification of the slaughterhouse was also important.

The Bali CMC Working Group was unable to select an NKV-certified RPA. The certified RPAs in Bali were not interested in participating, as they believed that they were unable to be sure that farms were implementing appropriate levels of biosecurity. As a Carrefour supermarket had already been identified in Bali, other RPAs that had supply contracts were approached to be involved. Budi Jaya RPA was identified and willing to participate. This RPA had a sufficient capacity of 3,000 birds per day and was also supplying Lotte, KFC, Mydea and Hardys retail outlets. It had *halal* certification and was in the process of obtaining its government-issued NKV certification. Although initially apprehensive about auditing requirements, its management was persuaded by Carrefour and agreed to be audited and advised by the PBUI.

In Bogor, CV Jambu Raya was suggested by the Department of Agriculture and was selected because it had *halal* certification and was applying for NKV certification. It is the only semi-modern

slaughterhouse in Bogor City and has a production capacity of 10,000 – 15,000 birds per day. It is the main supplier of chicken meat (80%) at Yogya supermarkets in Bogor.

In South Sulawesi, Ciomas RPA was selected because it had *halal* and NKV certificates. It is a semi-automatic slaughterhouse processing 6,000 – 7,000 birds per day and employs about 50 workers. The average cost of slaughter is Rp230 per live bird. It sells its products to various customers, including hotels (Clarion and Hilton), restaurants (KFC, AW and Scolaria) and supermarket chains (Alfa Midi, Carrefour, Giant, Hero, Hypermart, Lotte and Ramayana).

Layer farmers

The market chain for eggs from biosecure farms was trialled in only Bali and South Sulawesi. The marketing system in Bogor was complex and involved five big players that controlled price and egg supply to the supermarkets and were unwilling to be involved. The project had trained some layer farmers (Pinsar members) in Bogor, but they sold eggs in Jakarta and so were not suitable for the project.

In Bali, many layer farmers were interested but were located too far from Denpasar. In addition, too much work and money were needed to improve their farms. CMC working group members recommended involving MSJ. Its farms had implemented adequate biosecurity measures and had the capacity (6,000 birds) to supply Carrefour Supermarket.

In South Sulawesi, the independent Satria Jaya Farm was selected. It is close to Makassar City and had good biosecurity, having been a pioneer in biosecurity adoption. Some of its employees had been trained by the PBUI and it had a large capacity of about 35,000 birds, which it sold to supermarkets, restaurants, hotels and catering firms, in partnership with the egg supplier UD Rezky Utama.

Egg supplier

In Bali, Carrefour Supermarket recommended an egg supplier, UD Limas, which supplied about 25,000 eggs per day to supermarkets, restaurants and hotels. The PBUI facilitated the linkage between the UD Limas and MSJ layer farms.

In South Sulawesi, UD Rezky Utama was selected to be involved in the CMC trial because it had an established relationship with Satria Jaya Farm. This egg supplier purchases 700–1,000 kg of eggs per day from Satria Jaya in order to supply supermarkets and

hotels. It has supplied 40 cartons of eggs per day from biosecure farms to Lotte Mart since June 2011.

Supermarkets

Supermarkets are potentially the key drivers in a CMC. Of the many supermarkets in Bali, Carrefour (Kuta) was selected because it has the highest sales of broiler chickens. It also has 'higher end' customers compared with other supermarkets. Carrefour sells 50–150 packaged chickens per day and was very keen to participate in this trial. Carrefour was also selected to sell eggs.

Among several supermarkets operating in Bogor, three (Yogya Supermarket, Ada Swalayan and Matahari Foodmart) were initially identified to be involved in the CMC trial. Matahari Foodmart representatives were invited to the first focus group discussion and stated that they were willing to participate. However, their chicken products were not supplied by CV Jambu Raya. The project facilitated registration for CV Jambu Raya to become a new supplier, but negotiations and the partnership broke down due to disagreements about the rate of commission. Therefore, Yogya supermarkets were selected; the project team had conducted the consumer survey there and CV Jambu Raya was already a contracted chicken-meat supplier. Yogya has two supermarkets in Bogor. Yogya Cimanggu was initially chosen for launching the products, by agreement with the manager. In 2010, however, the manager was appointed to manage the new Yogya Supermarket at Bogor Junction and the project moved the launch there.

In South Sulawesi, Lotte Mart was selected because it was used for the consumer survey, had existing supply arrangements with broiler and layer farms, and worked with RPA Ciomas, so Ciomas was able to register a new product easily. Lotte Mart was a wholesale supermarket servicing restaurants, hotels, catering firms and households. In June 2011, it opened a new outlet at Panakukang Mall that targeted end-user customers. Both the supermarkets participated in the trial.

Pricing study

A pricing study was conducted after the focus group discussions and the identification of stakeholders willing to be participants. The main objective was to determine a market chain and pricing structure that would deliver mutual benefits to all participants in the CMC. The study was conducted in Bali, South

Sulawesi and West Java in October and November 2010. Primary data were collected through interviews of identified stakeholders.

The pricing team concluded that there was potential to develop a CMC for products from biosecure farms sold in high-end retail outlets at premium prices. However, a wide range of issues and difficulties along the market chain meant that the economic incentive should be combined with an estimation of other potential benefits, such as higher productivity and reduced risk, in order to encourage CMC stakeholders to change their production systems.

Potential market chain for premium broiler chicken

The pricing study found that because of the size of the trial and the characteristics and existing relationships between farmers, RPAs and supermarkets, the structure of the broiler CMC could be reduced to involve just contract companies, farmers, RPAs and supermarkets. The broiler CMC market chain participants are highlighted in Figure 5.

The study also began a discussion about the extra costs required for farmers to prepare their farms and the expected benefits to all the CMC stakeholders. The extra costs expected to be incurred by each participant are shown in Table 5.

The expected gross margin for products from biosecure farms varied among stakeholders along the chain. Farmers expected to receive a premium of between Rp800 and Rp1,800 per live bird. While MSJ and Ujadi in Bali and Ciomas in South Sulawesi did not expect any additional profit from CMC products, Perdana Putra Chicken and Pandu Putra Mandiri in West Java expected to receive an additional profit of Rp1,000–2,000/kg and would be prepared to distribute those profits to their farmers.

Slaughterhouses in Bali and West Java expected to receive an extra Rp1,500–2,000 per bird to cover extra handling costs. At the supermarket in Bali, handling costs (packaging) were estimated to be about Rp900 per pack, and the supermarket expected to receive a 4% profit margin from premium poultry products.

The study concluded that the contract company plays a significant role in influencing the adoption of biosecurity activities. It is possible for contract broiler farmers to receive the premium price if the contract company is willing to modify its conventional contract system.

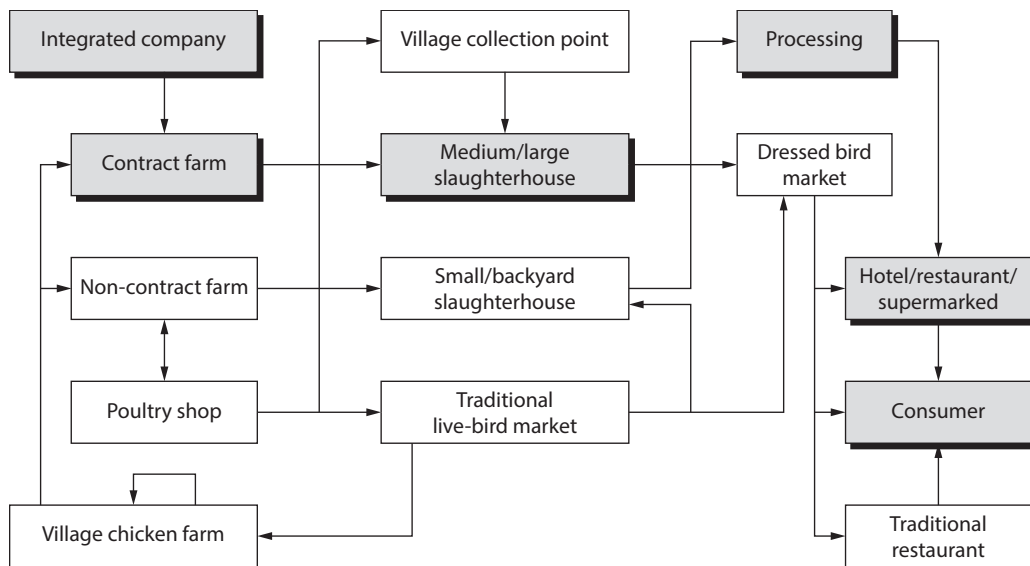


Figure 5. Stakeholders in the broiler clean market chains

Table 5. Identified costs in implementing biosecurity measures for broiler clean market chain

Participant	Costs
Farmer	Fixed costs: Front gate (Rp2,000,000) Fence (Rp2,000,000) Footbath (Rp1,000,000)
Slaughterhouse	Fixed costs: Packaging machine, colour-coded basket, stainless steel table (Rp10,000,000) Variable costs: Packaging labour and materials (Rp1,000 per bird)
Supermarket	Variable costs: Packaging labour and materials (Rp900 per bird)

Potential market chain for eggs from biosecurity farms

The three major egg CMC participants are the layer farmers, egg suppliers and supermarkets (Figure 6). Most layer farms are owned and managed independently of contract companies. In Bali, 97% of layer farmers were independent, compared with 18% of broiler farmers (Ambarawati et al. 2011).

Stakeholders estimated the potential benefits they expected to receive from being involved in a premium niche market. The layer farmers sought an extra Rp500–2,000 per kilogram of eggs. The egg supplier in Bali expected to receive an additional Rp100 per egg. Even though the supermarket did not

expect any additional income, it asked for the product to be promoted on its premises.

Preparing for the launch of the Healthy Farm product

With the institutions established and protocols in place, there was a period of preparation before the products were launched in supermarkets in the three case-study areas. This involved getting the farms approved by the PBUI and producing advertising and packaging materials. These activities were undertaken between March and June 2011 (Table 6).

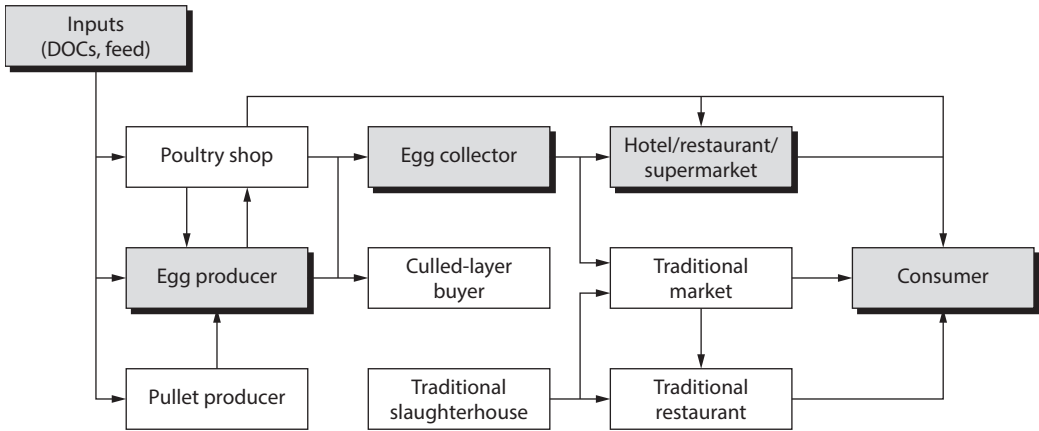


Figure 6. Stakeholders in the egg clean market chain

Table 6. Timetable of major activities leading to the product launch, 2011

Pre-launch activities		March	April	May	June
Signs, T-shirts, packaging, flyer, booth	Design		■		
	Production		■	■	
	Delivery		■	■	
Farm planning	Implementation	■	■	■	
	Audit		■	■	
	Accreditation		■	■	■
Staff training	Farm		■	■	
	RPA		■	■	
	Outlet sales assistants and product promotion staff		■	■	
Venue setup	Bogor			■	
	Makassar				■
	Bali				■

Farmer training and approval

Background to the training program

To develop a CMC in which consumers could be confident that the product they were purchasing had the characteristics they required, it was necessary to develop a farm approval process that provided other CMC participants (transporters, RPAs, supermarkets and consumers) with assurance that the farms providing the Healthy Farm products met the required standard.

The first step was to give farmers biosecurity training and develop a system in which trained advisers

and auditors could independently assess and approve a farm's adoption and level of biosecurity. The aims of the training program were:

- to develop a generic training program that could be run by PBUI master trainers for all participants in the poultry CMC
- to train enough farmers, advisers and auditors to assist in the development and implementation of the CMC in the three case-study provinces.

PBUI staff prepared five specific training packages that were designed as highly interactive sessions that encouraged maximum participation and involvement by all participants (Table 7).

Table 7. Types of training developed and implemented by the PBUI

Type of training	Days	No. of participants	Participants
Adviser	4–5	20	Veterinarians, company technical staff, farmers
Farmers	2	20	Broiler and layer farmers
Auditor	2	15	ACIAR-certified advisers
Train the trainer	1	15	ACIAR-certified advisers
Stakeholder	1	15	Industry, government, associations, poultry shops, drug companies, feed companies, outlets, banks, consumers

To ensure maximum involvement in the training, the numbers of participants were limited to 20 for the adviser and farmer training and 15 for the auditor, stakeholder and train-the-trainer training. The participants were divided into groups of four or five, each of which discussed questions and solved problems put by the master trainer, then presented answers to the class. These were participative, interactive problem-solving sessions. At the end of the workshop, participants took home the reference manual and the workbook for future reference. The workbook was used as an indicator of how much participants had learned during the training and allowed the facilitator to make corrections or add suggestions so that participants had a correct understanding of biosecurity and a record of what was done.

Implementation of the training was limited to those who had become accredited, PBUI-certified master trainers in a three-step process:

1. Develop two farm biosecurity plans (one with a broiler farm and the other with a layer farm).
2. Plan, prepare and participate in two biosecurity adviser workshops.
3. Plan, prepare and deliver a farmer and a stakeholder workshop under the supervision of a master trainer.

At the beginning of the project, there were only two master trainers, so the early training activities allowed the provincial project coordinators to develop their skills and meet the requirements for accreditation as PBUI master trainers. Later training in the

provinces was run by the provincial project coordinators with assistance from PBUI-trained advisers who were also moving towards master trainer status. By the conclusion of the project, there were nine master trainers: five in Bali, three in South Sulawesi and one in West Java. During the project, 613 value-chain stakeholders participated directly in PBUI training activities (Table 8).

The PBUI biosecurity training program

Adviser training

The basis for all training was the 4–5-day adviser training workshop. All the other training workshops used relevant modules from the adviser workshop. Participants included veterinary and animal production staff working with industry or government. The adviser training included a half-day farm visit to give the participants experience in identifying farm risks as the basis for farm assessments and farm biosecurity planning. After training, the advisers were able to identify farm risk factors, make comprehensive risk assessments and make cost-effective, risk-based farm plans suitable for individual farms' circumstances.

Through the PBUI, the project implemented seven adviser training workshops from 2008 to 2013: two in Bali, three in West Java and two in South Sulawesi. Two were supported by FAO and one by the United States Agency for International Development (USAID).

Table 8. Participants in ACIAR poultry biosecurity training, 2009–13

Province	Adviser	Farmer	Auditor	Train the trainer	Stakeholder
Bali	35	178	16	15	15
Java Barat	61	67	11	15	18
Sulawesi Selatan	41	72	13	34	22
Total	137	317	40	64	55

Farmer training

The project conducted 16 farmer training workshops between 2008 and 2013. The workshops were facilitated by the provincial project coordinators and an extra PBUI-trained adviser in each province and supervised by the PBUI master trainer. Training was held in venues appropriate to the locations of the participants. A total of 317 farmers received training and adopted improved biosecurity, but not all continued on to become approved providers of Healthy Farm products.

The 2-day training package for broiler and layer farmers was a simplified version of the adviser program, including the workbook, schedules and tests. After training, the farmers were expected to have a thorough understanding of poultry biosecurity and a willingness to change the way they control risk on their farms.

Auditor training

Auditor training was carried out at the end of 2010 to supply certified auditors to support the Healthy Farm CMC. It was conducted over 2 days and included a half-day farm visit. By the end of the project, 40 auditors had been certified. Auditor training was carried out in Bali, West Java and South Sulawesi, facilitated by the provincial project coordinators in each province and the PBUI training manager. The workshop could be attended only by certified advisers who had successfully completed the adviser training. After completing the course, participants were able to carry out a poultry farm biosecurity audit and recommend corrective actions.

Stakeholder workshop

One stakeholder workshop was conducted in each province. These 1-day workshops were attended by 15, 18 and 22 participants in Bali, West Java and South Sulawesi, respectively, and involved higher level decision-makers from the industry, poultry associations and government. Training packages used for stakeholder training covered the same material as the package used for advisers, except that the schedule was condensed into 1 day. This training was designed to help participants better understand poultry biosecurity principles and become better decision-makers on biosecurity risk control.

Train the trainer

Train-the-trainer training was conducted in all three provinces: once in Bali, once in West Java

and twice in South Sulawesi (one course funded by FAO and one by ACIAR). There were 64 participants (15 in Bali, 15 in West Java and 34 in South Sulawesi). Completion of the train-the-trainer course was a necessary condition for master trainer accreditation.

Farmer approval process

It was found that the Indonesian broiler farmers who were more likely to adopt biosecurity were older and more educated and had larger families and farms (Susilowati et al. 2012). Some farm characteristics influenced adoption: farms with more land area or larger capacity and farms that were further from the neighbour's farm and the nearest road tended to have higher levels of adoption.

To participate in the production and marketing trial, each smallholder was required to implement an agreed farm biosecurity plan and then to be approved by the PBUI as a registered supplier of Healthy Farm chicken meat. The plan is a biosecurity audit designed to advise the farmer what needs to be done to better restrict the movement of people, animals and equipment into and around the farm. A trained PBUI planner advised on what needed to be done with physical infrastructure (such as fences, gates, locks and footbaths) and people management (for example, staff movements, use of protective clothing and restrictions on visitor entry). Farmers were then given a month to implement the farm biosecurity plan before an independent auditor (once again trained by the PBUI) returned to evaluate their progress and approve their arrangements, if appropriate.

In Bali, 70 broiler farmers have now been audited.

Costs

Training course costs were approximately \$1,500 per day for the 1-, 2- and 4-day courses for up to 20 participants, not including any salaries, airfares or accommodation for the participants. The 4-day courses were slightly more expensive, as accommodation for participants was included. Costs included accommodation for presenters, per diems for presenters and participants, and room and transport hire.

The farm biosecurity plans prepared and implemented by the farmers incurred the following costs:

- The average cost of upgrading broiler farms to approved status was Rp2.7 million (US\$300). This included ensuring adequate fencing, gates, signage and footbaths.

- Additional annual costs of Rp500,000 included the purchase of protective clothing and repairs and maintenance of the shed and surrounds.
- The costs of detergents, vaccines and time spent in accessing quality feed and DOCs were estimated to be Rp250,000 per cohort of chickens or Rp1.75 million per year (assuming seven cohorts per year).
- The cost of farmer training and the management of the farm plan implementation and audit process was Rp1.95 million per farmer in Year 1.

These are total costs per farmer of Rp6.9 million in Year 1 and Rp2.25 million every year after that.

On average, each farm in Bali had an expected net annual income of Rp73.3 million (US\$8,100), assuming seven cohorts of birds per year and an average of 4,900 birds per cohort.

Soft audit of slaughterhouses

Biosecurity to prevent disease is not a problem in RPAs as the time between delivery and slaughter is too short for disease transfer. Issues for the RPAs were hygiene and the ability to separate CMC chickens from other chickens entering and exiting the slaughterhouse.

Slaughterhouses involved in the project already held or were working towards NKV certification from *Dinas Pertanian* covering standards of hygiene and food safety. The project worked with the RPAs and the agency to facilitate progress in NKV certification.

In addition, the PBUI conducted a soft audit of the slaughterhouses to ensure the separation of biosecure chickens during transport and processing. This included developing protocols using different coloured boxes to ensure ease of separation and minimise errors during the transport of the chickens to the supermarket. Separation during processing was achieved by processing biosecure chickens first each morning, followed by normal chickens.

Farmer of the Year competition

The Biosecure Farm of the Year competition was run from March to June 2012 in Bali, South Sulawesi and West Java. The objectives of the competition were to:

- select farms in the provinces that best represented the concepts of biosecurity in NICP farms
- publicise biosecurity and expand poultry farmers' knowledge of what their neighbours were doing and, therefore, what they could do

- provide an opportunity for the poultry industry in each of the provinces to continue to develop linkages with government and poultry producers and develop consistent messages about poultry biosecurity and general farm management.

The competition costs were as follows:

- Bali: The competition cost Rp48 million, which included Rp16 million for the award ceremony and Rp10 million for prizes
- South Sulawesi: The competition cost Rp44 million (the award ceremony, which cost Rp27 million, was covered by the Australian Department of Agriculture, Fisheries and Forestry). This ceremony had a much larger audience and included the launch of an important provincial decree. Prizes were valued at Rp22 million and included trips to Bali for the three winners to visit some good examples of biosecure farms in that province.
- West Java: The competition cost Rp34 million, including prizes valued at Rp10 million.

There were 66 entries from Bali, 20 from South Sulawesi and 12 from West Java. In order to encourage participation, it was necessary to contact farmers via their contract companies because it was not possible to use the media to do so.

Several issues limited the number of entries:

- Farmers who were unable to complete the entry form had to rely on the companies' technical services staff to assist them.
- Companies were concerned about advertising their best farms in case they were 'poached' by other companies.
- There were limited incentives for companies to be involved.
- Biosecurity understanding and adoption among farmers and contract company technical services staff was still poor.
- Technical services staff had limited time and many clients, leaving them little scope to distribute entry forms and assist with their completion.
- Many farmers, their contract companies, or both, believed that they did not meet the criteria to enter and that the cost of improving biosecurity was too high.

However, now that the competition has been run successfully and companies realise that the motivation is to improve on-farm biosecurity, the project team believes that there will be more entries in coming years. Support from government, companies and the media will make it easier to encourage participation.

Farm signage, product packaging and video production

The project supplied initial quantities of farm biosecurity signs; egg and meat packaging; brochures describing the characteristics of the Healthy Farm product (Figure 7) for distribution to consumers in supermarkets and other promotional materials, such as T-shirts; and Healthy Farm booths for displaying the products in the supermarkets. The project also supported the supermarkets by providing trained assistants to help promote the products.



Figure 7. Healthy Farm meat chicken logo

Farm signs

A very basic requirement of on-farm biosecurity was the use of signs warning staff not to enter restricted areas and reminding them of their responsibilities. Three types of signs were produced and distributed to participating farmers (Figure 8). The signs were made of aluminium and cost Rp150,000 each. Each sign had the PBUI logo and clear pictorial and text messages about what was required.

Product packaging and consumer information

The project supplied initial packaging materials for both chickens and eggs. Each province received 650 cardboard egg cartons costing Rp3,100 each (Figure 9). After the cartons were used, each egg market chain became responsible for supplying its own cartons. In Bali, the chain continued to source cardboard cartons, while in Makassar that was too difficult and expensive so the chain reverted to plastic cartons. In West Java, the trial did not continue.

Packaging for the meat chickens was also initially supplied by the project. Each province received 10,000 plastic bags with logos (Healthy Farm, PBUI and appropriate provincial government institution) costing Rp900 each. The Bali meat market chain decided that it would use styrofoam with plastic wrapping for the chickens being sold into Carrefour, so the project supplied stickers that could be attached to the plastic.



Figure 8. Farm biosecurity signs: (a) farm office, (b) farm gate, (c) shed door



Figure 9. Healthy Farm egg carton

Video and brochure production

Videos were produced for training and marketing by the PBUI and for advertising the Healthy Farm brand before the product launch at the supermarket. Brochures were also produced to provide information on the product to the consumer (Figure 10). The claims in this material were based on the fact that the product was produced on farms that had implemented agreed biosecurity plans. While there may have been some quality improvements because of improved management systems, no claims could be made about quality or food safety.

Healthy Farm product launch

With farmers and advisers trained, farmers implementing their approved farm biosecurity plans, slaughterhouses implementing improved hygiene and product separation, the scene was set to launch the Healthy Farm products in the three provinces.

The Healthy Farm products were launched in the three supermarkets in June 2011. The launch was accompanied by the provision of specialist sales assistants for 3 days in Bogor and Makassar and 1 month in Bali. At all stores, price discounts were also offered to encourage purchases. In Bogor, the Healthy Farm chickens were sold for Rp15,450 per

bird, a 25% discount on the recommended price. These pricing and marketing decisions were the responsibility of the supermarkets, supported by the project.

There were initial problems in the meat-chicken marketing in Bogor and Makassar. While there was Healthy Farm product available at the Yogya supermarket in Bogor, the supermarket management was not keen to sell a product that was making claims that made their regular product appear to be inferior. While they allowed the project staff to sell the product and distribute the brochures explaining the background to the product, they did not allow the team to use the packaging (Figure 11). Support for the product was provided for 3 days, but it was then decided that there was insufficient support to continue with the trial. Clearly, there had not been adequate buy-in from the supermarket, which soon encouraged the RPA to cease processing the Healthy Farm chickens.

In Makassar, Healthy Farm chickens and eggs were launched in the Alauddin Lotte Mart, which targets mainly commercial consumers (such as small markets and restaurants) rather than household consumers. Both Healthy Farm eggs and chicken-meat products were launched, 3 days of sales support was provided, and the products sold well. In January 2012,

the products were launched at a Lotte Mart that was more focused on household consumers. Difficulties in maintaining continuity of supply to these supermarkets ensured that the Healthy Farm meat-chicken product was available for only a few months in each

store. Healthy Farm eggs have been successfully integrated into the supermarkets' product range.

In the Carrefour supermarket in Bali, Healthy Farm chickens were launched in June and eggs in January 2012. The products continue to sell.



Figure 10. Brochures and the supermarket booth at the Healthy Farm product launch



Figure 11. Healthy Farm product launch in Bogor, June 2011

The results of the Healthy Farm product trial

This section discusses the results from the Healthy Farm product trials in Bali and South Sulawesi. The trial in Bogor, West Java, was discontinued.

Healthy Farm chicken in Bali

This section discusses and summarises the benefits and costs to the producers, slaughterhouse, supermarket and consumers in Denpasar, Bali.

Slaughterhouse

The RPA purchases both regular chickens and Healthy Farm chickens for the same price, but receives a premium from the supermarket for the labelled chickens. Table 9 summarises the trade in broiler chickens between the RPA and the supermarket.

The trial started in June 2011 and experienced high demand during the first month due to aggressive marketing in the supermarket. In July 2011, 46% of the chickens purchased from this RPA were bought as Healthy Farm chickens. This decreased to 28% in September 2011 and has levelled off to 15–20% since then.

The sales results indicate that the RPA is receiving an economic benefit for selling the branded chicken. With an average price increase of 12% for the new product and an average of 546 chickens per month at that premium, the RPA is receiving a benefit of Rp1.73 million (\$US192) per month for minimal

cost. Apart from purchasing cool boxes and some implementation of new transportation protocols, the RPA incurs no extra costs in processing the Healthy Farm chickens.

Supermarket

The RPA delivered directly to a large modern supermarket in Denpasar, which was responsible for the packaging and labelling of the product before it went onto the supermarket shelf. The chicken met the food safety standards required of products being sold in the supermarket. Because the chickens were being sold fresh, there was no need for some of the approvals required for processed products. Even though the government could not ‘certify’ the farms, the provincial government in Bali did provide a ‘permission letter’ (*surat keterangan*) that gave the supermarket permission to sell the product with a provincial government stamp.

For the first month, trained, designated sales assistants distributed information on the product and encouraged consumer purchases. It was important not just to supply information but also to advertise and ensure that the product was placed correctly in the supermarket. Good agricultural marketing can play a role in stimulating demand for products such as chicken meat and eggs (Rouse and Davis 2004).

As can be seen from Tables 9 and 10, there is a price margin between the RPA and the supermarket.

Table 9. Sales of regular and Healthy Farm chickens by the slaughterhouse to the supermarket, July 2011 – July 2012

	Jul	Sep	Nov	Jan	Mar	May	Jul	Average
Regular farm chickens								
No. of days purchased	30	29	30	27	26	30	31	29
Total purchased per month	2,073	2,277	2,136	2,323	2,371	2,395	2,125	2,127
Average price per chicken (Rp)	23,467	23,638	23,433	27,481	24,288	26,413	29,387	25,753
Healthy Farm chickens								
No. of days purchased	21	15	9	9	9	11	7	11
Total purchased per month	1,770	890	390	380	390	418	371	546
Average price per chicken (Rp)	27,143	28,800	28,000	29,333	28,000	28,727	34,143	28,923

Table 10. Sales of Healthy Farm chickens at the supermarket, July 2011 – September 2012

	Jul 11	Sep 11	Nov 11	Jan 12	Mar 12	May 12	Jul 12	Sep 12	Average
Number sold	785	484	250	216	260	262	308	245	345
Average price (Rp)	31,595	33,200	32,900	35,342	36,900	36,901	37,923	40,520	35,892

During the trial, the average price to the consumer was 24% higher than the purchase price from the RPA. Apart from the supermarket's profit, there are two major reasons for this:

- The packaging and labelling costs are being borne by the supermarket. The chickens are packaged in styrofoam and plastic, costing Rp1,630 per chicken (Rp550 for the styrofoam, Rp80 for the plastic and Rp1,000 for the label).
- There is a significant percentage of unsold Healthy Farm chickens at the supermarket. While the supermarket buys on average 546 chickens per month, only 345 (63%) are sold for the premium price. Those that are not sold on the day are discounted or processed into other products.

Demand for broilers was high in the initial period after the launch in June 2011 (Figure 12). This was due to the concerted promotional activity and the employment of trained Healthy Farm sales assistants.

While there was a decline in sales following the launch, sales have since gradually increased and the birds are still selling in the supermarket 2 years after the launch. The meat-market chain for Healthy Farm chickens in Bali is now self-sustaining.

The supermarket sells around 100 regular chickens per day (3,000 per month), so Healthy Farm chickens accounted for approximately 10% of total whole-chicken sales during the study period (June 2011 – September 2012). There is a significant price differential between Healthy Farm chickens and regular chickens sold at this supermarket. The regular chickens sold at an average price of Rp26,000, which is Rp9,892 (US\$1.10) or 38% cheaper than the Healthy Farm chickens. The supermarket's desire to not only continue selling the product but also to expand the production of Healthy Farm chickens to a second slaughterhouse and a new group of farmers indicates that the concept may be viable and sustainable.

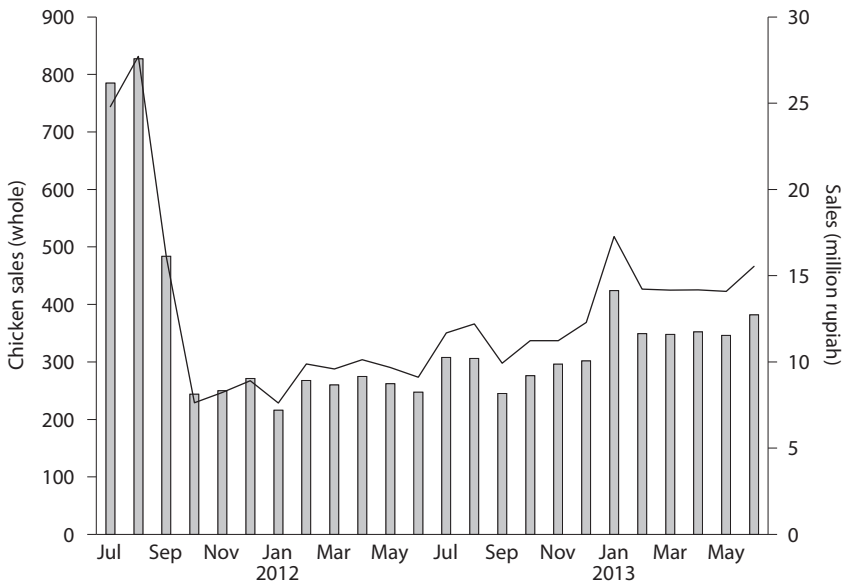


Figure 12. Healthy Farm chicken sales in Carrefour supermarket, Bali. Bars represent whole chicken sales (left axis) and the line is sales in rupiah (right axis).

Healthy Farm eggs in Bali

It took longer to develop the egg market in Bali. Healthy Farm eggs were not available in the Carrefour supermarket until November 2012 (Figure 13). The main reason for the delay was the time needed to get approval from the Carrefour head office, which required more detailed research before it would issue the appropriate bar code. In the end, it was decided that approved egg producers would supply MSJ with their eggs in the morning for grading and weighing in the afternoon. The approved egg supplier would then work with MSJ to select suitably sized and coloured Healthy Farm eggs and, after agreeing on price and terms of payment, MSJ would send the eggs to the supplier's office, where the eggs would be cleaned before packaging, labelling and transport to Carrefour.

Healthy Farm eggs in Makassar

Healthy Farm eggs in Makassar, South Sulawesi, originate from Satria Jaya farm in Lekopacing village. The owner of the farm is a member of the CMC Working Group in South Sulawesi and has been convinced of the need to improve the biosecurity

of his farm since it opened in 2005. He has been the driver of the Healthy Farm egg concept in the province and has encouraged the egg supplier that he works through to also participate.

The eggs are selling in two supermarkets in Makassar:

- At the Alauddin wholesale supermarket, Healthy Farm eggs have been selling in cartons of 10 for Rp13,200, equating to Rp1,320/egg. Regular eggs sell by the kilogram and have been selling for an average of Rp14,900/kg (or Rp930/egg, as there are usually 16 eggs to the kilogram). This provides an extra return per 10 eggs (a carton) of Rp3,900. However, each cardboard carton costs Rp3,100, leaving a profit of only Rp800/egg (US\$0.09) to be divided between the farmer, egg seller and supermarket. This may not be sustainable.
- At the Panakukang consumer supermarket, Healthy Farm eggs have been selling at a higher price of Rp15,000/carton (Rp1,500/egg). Regular eggs have been selling for Rp15,400/kg (about Rp960/egg). This is a price increase of 56% for 10 packaged Healthy Farm eggs over the purchase price of 10 unpacked generic eggs. The price differential per 10-egg carton is therefore Rp5,400. Even with the cost of the carton, this equates to

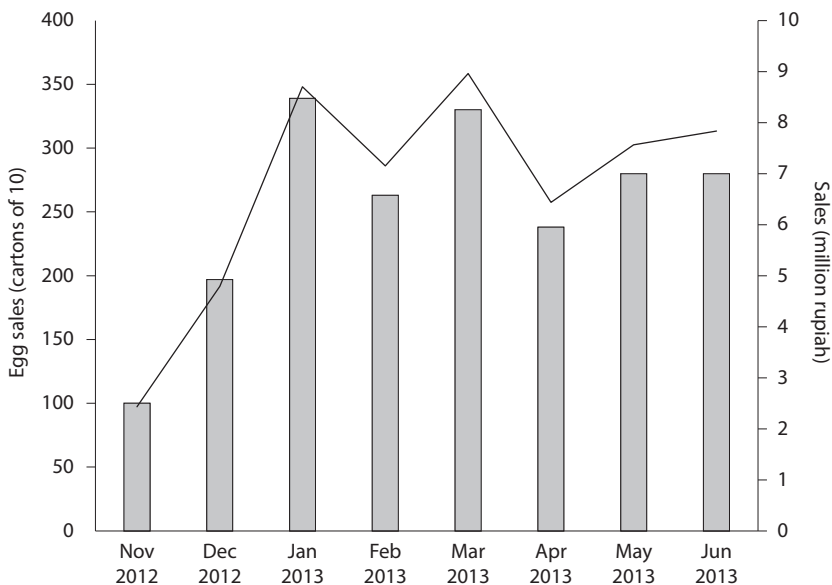


Figure 13. Egg sales in Bali, November 2012 – June 2013. Bars represent whole chicken sales (left axis) and the line is sales in rupiah (right axis)

an extra return of Rp2,300/egg (US\$0.26). With sufficient quantity of sales, the selling of Healthy Farm eggs at Panakukang supermarket may be sustainable. In 2012, the supermarket's egg supplier and the supermarket agreed to market the eggs in cheaper and more readily available plastic cartons costing Rp1,500 each. The cardboard cartons had to be sourced from West Java province and cost Rp3,100 each plus transport.

The system for delivering eggs of a consistent quality is simple compared with that needed for broilers. In Makassar, the trade is driven by a very dynamic farmer through one egg buyer. The producer is large enough to ensure that there are enough Healthy Farm eggs available every day. Currently,

sales are averaging 70 cartons a month at Panakukang and 50 cartons a month at Alauddin. This represents relatively small profits of Rp273,000 (US\$30) and Rp120,000 (US\$13) per month, respectively. This is not highly profitable, but the producer and egg buyer see the potential to develop the market further and work together to achieve that. Also, no significant changes to management processes in the market chain are needed to obtain this profit.

The most important thing in the egg industry is trust between the producer and egg buyer. Even though their profit is small, there is potential for the farmer, egg buyer and supermarket to develop this relationship in the future.

Lessons learned from the trial

The varying degrees of success in the three provinces were due to several often interacting factors. Some problems arose from the nature of the trial (for example, its small scale of operations), but others will provide useful lessons.

The most important factors were the contractual arrangements between stakeholders. These either caused problems for continuity of supply or affected the flow of price premiums down the chain, preventing the financial incentives from getting to farmers, to whom they were intended to flow. Most problems could be said to have arisen from existing arrangements, and changing those arrangements was not viable for a small-scale project. Therefore, structural change to overcome such problems will be needed for sustainable market penetration. Although many of these problems were significant for a small trial, they would be manageable for an ongoing product supply chain.

The trial was intended to prove a concept, and the ongoing and increasing sales in two locations have been a success. It can be expected that some companies will bring their own premium products to market in the near future.

The training program

Many lessons were learned from PBUI training program:

- The training program is an essential and integral part of a newly developed poultry biosecurity accreditation system, which can be part of a Healthy Farm market chain.
- Establishing a new system, which involves changing the behaviour of stakeholders involved in the chain, is not easy. Developing a new model of behaviour and management will take some time.
- ACIAR project AH/2006/169 is a small research project intended to develop a new model or system that can be adopted to different scales within the poultry industry and replicated in other areas of

Indonesia. This model is expected to ‘inoculate’ the industry and spread in other areas outside the project’s participating provinces.

- To support the newly developed system, the training program must involve all stakeholders, including farmers, contractors, transporters, technical services, banks, feed and drug companies, government (local and central), poultry associations, poultry shops and consumers.
- Different stakeholders need different biosecurity training packages. The difference is mainly in the depth, focus and time allocation (from 1–5 days). A field visit is necessary for advisers and auditors and perhaps also for farmers. In this ACIAR project, there was no field visit during farmer training, because of time constraints.
- Many trainees (veterinarians, animal production people and farmers) had previously attended other biosecurity training run by other institutions. However, all of them seemed to gain new knowledge and enjoy the training and had rewarding discussions. Attendance through to the closing sessions was very high, and participants were rewarded with certificates.

Existing contractual arrangements between stakeholders

The smallholder and the contract company

The price premium did not flow back to the smallholders for a number of reasons:

- Smallholder farmers, on average, manage 7 cohorts per year, keeping the birds on the farm for between 28 and 32 days. It is expected that they will sell the entire cohort (averaging 4,900 birds) at the same time (an ‘all-in all-out’ system). This is easier for transporting product and managing the next batch of DOCs and is also important for disease control. The trial is selling an average of only 500 Healthy Farm birds per month, which is

a long way short of the scale required to make the system beneficial for the farmers. Greater demand in supermarkets and traditional markets is needed to provide a market incentive for the smallholder to invest in improved biosecurity.

- The contractor controls the sale of the product, so the smallholder cannot gain direct access to the approved slaughterhouse unless the company organises it.
- This trial expected smallholders to cover the full cost of improving biosecurity and becoming an approved producer. However, under the contract system, while there is the potential for smallholders to receive a bonus from a higher than guaranteed price, the benefit is never fully passed back.
- The contractor is unlikely to subsidise or support the smallholder to improve their biosecurity by entering into a cost-sharing arrangement, as smallholders are on flexible, usually short-term, contracts that allow them to move between companies quickly and easily.
- Some contracts with farmers contain various clauses for premiums associated with increased efficiency and lower mortality, but no payment directly linked to the implementation of biosecurity. Some contract companies argued that farmers would benefit from higher productivity and reduced mortality because of improved biosecurity, and in some cases therefore refused to pass on any premium during the trial.

Contracts between slaughterhouses and contract companies

Contractual arrangements between contract companies and RPAs also affected the trial results, but this was mostly because of the scale of the trial and would not be an issue for implementation at an operational scale. Existing arrangements meant that the RPA in Bali had supply difficulties, as existing contract company customers were given priority. In Bali and Bogor, there were also problems when only small quantities needed for the trial were being collected from biosecure farmers, making transport arrangements inefficient. Payment arrangements were also different for new customers. Payment was needed up front, instead of through short-term credit, creating cash-flow problems. All these problems would not be expected in larger operations in which arrangements become permanent.

Day-old chick scheduling in Bali

In Bali, the farms selected were contracted to two companies willing to cooperate with the project: PT MSJ and PT Ujadi. Of the original 20 farms involved in the CMC, 10 were contracted to PT MSJ and 10 to Ujadi. Neither company had biosecurity incentives for farmers, but they set up a different ordering system for birds from biosecurity farms. The capacity of sheds owned by the farms was between 4,000 and 13,000 birds. Due to similar scheduled dates of DOC check-in, there were only 12 different harvest dates for the 20 farmers.

Both companies had existing schedules for DOC check-in, and it was difficult to change them because that would affect the schedule for all producers in Bali. Therefore, the project farmers were forced to follow the scheduled DOC check-in, resulting in no chicken harvesting for one period of 12 days. To have a farmer harvesting every day and delivering to the RPA would require at least 45 farmers to be involved in the program.

Contractual arrangements between slaughterhouses and supermarkets

The contractual arrangement between the supermarket and the RPA was an important influence. As for the contract companies, the selection of the RPA was based on it being an existing supplier to the supermarket. That was not the case in South Sulawesi, causing difficulties and delays in starting the trial.

In Bogor, a series of issues from the supermarket down to the RPA and farmers contributed to the failure of the trial. However, most of the problems related to the lack of a new cost code for the product. The supermarket head office required the new code before the new product line could be sold (at a higher price than regular chicken), even though the RPA was already a supplier. The provincial project coordinator attempted to facilitate this for the RPA but was unsuccessful. As a result, the Healthy Farm chicken had to be sold at the same price at the launch. This caused a series of other problems.

The RPA was unhappy, as there were extra costs involved in transporting and handling the biosecure chickens, but the price they were receiving from the supermarket was the same as for regular chickens. One cause of the extra cost was the location of the biosecure farms and the low volumes being collected,

resulting in only partially loaded trucks. Of the farms in the project, only some were existing suppliers to the selected RPA, and others were located further away than regular suppliers. The RPA stated that it would be happy to process and on-sell biosecure chicken for the same price if it were cost neutral, but that was not possible due to the distance and volume issues.

The supermarket was not happy, as it was now selling two products from the same supplier for the same price—one that was biosecure and one not. The manager became concerned that customers would not buy non-biosecure chicken or any chicken at all when they saw biosecure and non-biosecure product from the same non-NKV-certified supplier being sold for the same price.

The nature of the market and perceptions of food safety and biosecurity

The traditional markets where most chicken is sold give consumers the opportunity to inspect live birds and therefore be sure that the birds are ASUH (*aman, sehat, utuh, halal*—safe, healthy, pure, permitted). To move to a cleaner marketing system requires greater confidence in the safety of the chilled market chain. For example, at some markets there is increasing use of chilled bins for the storage of leftover birds. This is a positive development, as it reduces the movement of live birds back to farms, but it has an unexpected consequence that consumers perceive leftover birds to be inferior because they were not sold on the previous day.

The overlap of concepts of biosecurity, food safety and healthiness occurred among all stakeholders, from consumers to supermarkets and government officials. The term ‘clean market chain’ suggests a concept covering biosecurity at the farm level, segregated transport, certified slaughterhouse facilities and chilled marketing in supermarkets. The ‘Healthy Farm’ brand name focuses on the farm but also implies that the product has health benefits for the consumer.

Supermarkets and government officials were just as concerned with food safety at the RPA and supermarket as with farm biosecurity. For example, one government official challenged the proposition that food safety was a separate issue from biosecurity. From her perspective, they are closely interrelated.

From the regulator’s perspective, the issues all come under ‘public health’. Supermarkets and food chains generally conducted audits at RPAs but not at farms. One company in Bogor that has contract farmers and an RPA has an internal audit system. It tests for salmonella, *E. coli* and antibiotic levels and provides certification for restaurants. It would be a small step to include biosecurity certification as well if the market demanded it.

Food safety appears to be an issue that is better understood, perhaps because more people have direct experience with it. From an outlet and consumer perspective, and given the risks, this view is logical. Although HPAI is zoonotic, it presents no health risk from consuming properly prepared and cooked meat.

From the supermarket perspective, the Healthy Farm chicken offers another premium product choice for the consumer, which most of the supermarkets were interested in because existing brands lack variety. However, even if a product has superior origins it will be difficult to sell if it is not perceived as a healthy and quality product. One government official offered the view that young people preferred KFC because it was healthier because of the company’s superior food safety and auditing. From an Indonesian consumer perspective, food safety is the most important concern. This is quite understandable, as there have been problems in the past and awareness is high.

Most stakeholders called for a public education campaign about biosecurity, and some certification schemes (*halal*) and consumer demand (for ASUH, probiotic and organic chicken products) provide good models for biosecurity. For example, in the consumer survey, consumers rated *halal* certification as the most important characteristic, and several schemes exist to certify RPAs for *halal* production. Farm biosecurity could adopt a similar system, independently certified by an organisation such as the PBUI. The next strategic step may be to find ways to increase consumer demand, such as through education campaigns about biosecurity.

Product quality

It is unclear whether consumers understand the concepts of biosecurity well. Most stakeholders commented that a public education campaign was needed.

Even if the concepts are well understood, it is unlikely a product that looks inferior will sell, as

was the case in South Sulawesi. The main problem in marketing the chicken in South Sulawesi was the product's appearance and resulted from existing packaging arrangements between the RPA and supermarket. The RPA was supplying normal chicken packaged in polystyrene trays and clear wrap. Therefore, the Healthy Farm chicken was packaged in plastic bags, which created a problem with product presentation as fluid was visible in the bag. This was the only supermarket that packaged normal unbranded chicken in this way. Price seems less important. Supermarket officials gave examples of other premium products (such as organic and probiotic products) that sold out when available at considerably higher prices than the Healthy Farm chicken. The supermarkets were enthusiastic about increasing the range of these products.

Product quality appears to be the main reason for the greater success of egg sales compared to meat sales. Several supermarkets and egg suppliers said that the Healthy Farm eggs were observably superior,

with thicker shells and yellower yolks. In fact, this may be at least partly due to grading and washing rather than the better health of the layers. Eggs were graded on size and washed by suppliers. In Sulawesi, egg sales were decreasing for some time before the review team's visit. The supermarket's fresh produce manager attributed the decline to eggs not being washed and graded (that is, a decline in product quality). The review team found eggs that varied in size and were not washed on display in the supermarket, although when interviewed the egg supplier said she continued to grade and wash eggs.

Part of the problem in Bogor was related to perceptions of biosecurity. The concern of the supermarket manager that awareness of biosecurity could reduce sales of normal chickens or overall chicken sales has some validity. Sales have previously declined catastrophically after outbreaks of disease. This attitude suggests that customers know enough about biosecurity to know that biosecurity failures present a danger to public health.

Smallholder benefits of improved biosecurity

The trial has shown that the slaughterhouses and supermarkets can benefit from processing and selling products from biosecure farms. Even though adequate financial benefits cannot be passed on to the participating farmers, poultry producers are still investing in improved biosecurity for a number of reasons:

- Poultry producers who have undergone training now have a better understanding of how disease enters and moves around their farms, and of how improvements in biosecurity can reduce risk.
- The producers believe that there are production benefits (such as reduced mortality and better feed conversion ratios) that can be gained through the existing contract system.
- Poultry producers often learn from other farmers. If they see others improving fences and gates, installing signs and footbaths and so on, they sometimes follow.

The sections below examine the potential, perceived and actual benefits of improving biosecurity on NICP farms. They describe the contract system, through which all financial benefits flow, and estimate the benefits of reduced risk and improved productivity.

Importance of the contract

Contracts are designed to provide smallholders with access to high-quality and timely inputs and a guaranteed minimum sale price. The benefit to the contractor is that they have some certainty of being able to supply chicken meat to their customers. Generally, there is a mutual benefit to both parties (Patrick 2004).

Through the contract system, smallholders receive two types of payments for their chickens: the agreed contract price and bonuses based on performance and the real sale price. It is through the bonuses that they can receive additional income and be encouraged to improve management and efficiency. There is provision in existing contracts for the smallholders

to benefit not only from higher market prices but also from improved productivity and feed efficiency. The nature of the contract bonuses is an important driver in a smallholder's decision to invest in biosecurity.

Five types of bonus can be included in smallholder contracts:

1. The *market price bonus* is a percentage of the difference between the actual sale price and the agreed contract price. It is often linked to the performance of the cohort. The better the flock performance, the greater the percentage of the higher price that is passed on to the smallholder.
2. The *feed conversion ratio bonus* reflects the smallholder's ability to use feed efficiently. Bonuses are based on the feed conversion ratio attained by the smallholder compared with the standard feed conversion ratio expected by the contractor.
3. The *European efficiency or performance index bonus* is based on a number of factors, including mortality rate, average weight, feed conversion ratio and age at harvest.
4. Each contract has a maximum permitted mortality rate. When the mortality rate is within the standard range, a *mortality bonus* is paid.
5. A *production compensation bonus* accrues to smallholders when they are forced to keep their birds on-farm for longer than is efficient because the company is unable to pick up the birds at the right time.

Modelling smallholder benefits from the sale of Healthy Farm chicken

The Healthy Farm trial was unable to ensure that price premium benefits returned to the farm. However, Tables 11 and 12 compare a basic scenario (using data from six contract companies in Bali) in which there is no disease, no investment in biosecurity and no Healthy Farm price premium with a

scenario in which smallholders invest in biosecurity and receive the price premium (on top of the regular price bonuses) for their product.

In the base scenario, market price bonuses play a vital part in providing income for farmers. In Contracts 3, 4 and 5, farm profit is obtained mainly from those bonuses. Contracts 1 and 2 do not pass on as high a percentage of price improvement as the others. Contract 5 has both the highest gross margin before bonuses and the highest price bonuses. Contract 2 provides the highest non-market price bonus.

An investment in biosecurity costs Rp6.9 million in Year 1 and Rp2.25 million in subsequent years (Scenario 1, Table 12). If there were no financial benefit in making that investment (that is, no price premium, no productivity increases and no disease challenges), that would represent a loss of approximately 20% of profit in Year 1 in four of the six contracts—a significant cost.

The ability of smallholders to supply to a premium market should also lead to financial rewards, and an appropriate proportion of the benefit should return to the farmers. In Scenario 2, there is no disease outbreak, but investing in biosecurity allows the

smallholder to participate in the Healthy Farm value chain and the contract company receives a Rp500/head market price bonus.

The flows of benefits to the smallholder under Contracts 1 and 2 are less than the investment required. These contract types do not encourage smallholders to invest in biosecurity through market price bonuses. Most of the benefits of any investment accrue directly to the company. Contract companies using Contracts 3, 5 and 6 have identical market price bonus systems and farmers cover the costs of their biosecurity investment under those contracts. However, whether or not this is sufficient to encourage improved biosecurity is uncertain.

Reduction in disease risk

The smallholder's perceptions of risk may play a role in their decision to invest in biosecurity. The risk averse may see the investment as a useful form of insurance, while those with less experience of disease or understanding of disease movement might not wish to invest. Table 13 provides a guide to the potential losses from a severe disease outbreak and therefore the risk that smallholders face from diseases such as HPAI and Newcastle disease. The loss

Table 11. Base scenario—no disease outbreak, biosecurity investment or price premium (Rp million)

	Contract 1	Contract 2	Contract 3	Contract 4	Contract 5	Contract 6
Total income	1,003	1,174	1,087	1,110	1,072	1,167
Total costs	1,034	1,144	1,085	1,108	1,023	1,158
Bonuses						
Market price	14.2	10.0	45.9	32.5	50.3	21.9
Other	2.1	14.0	6.2	12.4	6.2	11.2
Total bonuses	16.3	24.0	52.1	44.9	56.5	33.1
Total gross margin	-15.0	54.0	54.0	46.0	105.0	42.0

Table 12. Scenario 1—no disease outbreak, with biosecurity investment and a premium (market price bonus) of Rp500/chicken (Rp million)

	Contract 1	Contract 2	Contract 3	Contract 4	Contract 5	Contract 6
Total income	1,003	1,174	1,087	1,110	1,072	1,167
Total costs	1,034	1,144	1,085	1,108	1,023	1,158
Biosecurity costs	6.9	6.9	6.9	6.9	6.9	6.9
Bonuses						
Healthy Farm market price	2.1	5.0	10.6	8.3	10.6	10.6
Existing market price	14.2	10.0	45.9	32.5	50.3	21.9
Other	2.1	14.0	6.2	12.4	6.2	11.2
Total bonuses	18.4	29.0	62.7	53.2	67.1	43.7
Total gross margin	-22.0	52.0	58.0	48.0	109.0	46.0

of one of the year's 7 cohorts has major implications for on-farm profitability, costing between Rp34 million (Contract 1) and Rp53 million (Contract 6). If a smallholder lost a cohort every 2 years rather than every year, they would lose half that amount.

Improved productivity

Although smallholders received no premium for products from biosecure farms, many were satisfied because they had increased productivity and reduced their personal and commercial risk. Some of these benefits were discussed in farmer groups, which identified significant benefits. In all case study areas, there were perceived decreases in mortality rates. In Makassar the rate was reported to have dropped from 10% to 4%, and in Bogor from 7% to 3.5%. In Bali, farmers reported an expected reduction of 1.5%. There were also perceived reductions in the days required to raise 1.1 kg birds and improvements in performance indexes.

In May 2012, a study of broiler farms in Bali looked at various performance indexes in biosecure and non-biosecure farms using data provided by the contract companies. Of 64 broiler farmers, 32 were biosecure farmers and 32 were non-biosecure. Most farmers (91%) were contracted to MSJ, Ujadi, Cioimas and PKP.

Five indicators were used to assess performance; depletions, feed conversion ratios, the weight of harvested birds, the age of harvested birds and a performance index. The study found that the average depletion rate and feed conversion ratio of biosecure farms were significantly lower than those of non-biosecure farms. The average weight of harvested birds at biosecure farms (1.73 kg) was not significantly different from that of birds from non-biosecure farms (1.75 kg). The harvest age at biosecure farms (33.6 days) was also not significantly different from the age at non-biosecure farms (34.3 days).

The average performance index of birds from biosecure farms (289.3) was significantly higher than the average for birds from non-biosecure farms (265.3). This study found similar results to a study by USAID (2009), which found only small differences in the weight and age of harvested birds after farms implemented biosecurity.

The results indicate that the implementation of biosecurity measures benefited farmers' depletion rates, feed conversion ratios and performance indexes. Birds coming from biosecure farms had lower depletion rates and feed conversion ratios and higher performance indexes than those from non-biosecure farms. The lower depletion rate can lead to an increase in farmers' gross income because more birds can be harvested.

Table 13. Scenario 2—base scenario with a disease outbreak (loss of 1 cohort) (Rp million)

	Contract 1	Contract 2	Contract 3	Contract 4	Contract 5	Contract 6
Total income	860	1,006	932	951	919	1,000
Total costs	922	1,012	973	990	908	1,039
Bonuses						
Market price	12.2	8.5	39.3	27.9	43.1	18.8
Other	1.7	14.3	5.3	10.6	5.3	9.6
Total bonuses	14.0	22.8	44.7	38.5	48.5	28.4
Total gross margin	-49.0	7.0	3.0	-0.5	59.0	-11.0

Policy initiatives to improve biosecurity implementation

The Healthy Farm trial has demonstrated the viability of CMCs driven solely by market factors.

Biosecurity is a relatively new issue for Indonesian governments (for example, the *Livestock and Animal Health Act 2009* contains only scant mention of biosecurity). However, several initiatives are being trialled.

Government officials were not closely involved in the CMC trial, but *Dinas Pertanian* and district officials supported the project and the concept. They are now working through some issues to enable greater success in future. In general, the implementation of regulations during the trial was difficult; for example, many slaughterhouses could not be NKV-certified because of their location in or near villages. There were similar problems in introducing biosecurity measures at some farms. There will be a period of structural adjustment as newer, well-designed farms and slaughterhouses are established. At some point, regulation or incentives may be needed to exclude farms that cannot meet minimum standards from the supply chain.

Because of the role of live-bird markets in the build-up and spread of viruses, the stated aim of government is to work towards a chilled market chain. It hopes to achieve this by building small slaughterhouses to replace wet markets. Some six small slaughterhouses have been built around Jakarta, but this is only a small proportion of the local market. The main problem is the large number of bird collectors who will be put out of work. There have been demonstrations that have delayed any change. Ho Chi Minh City in Vietnam was cited as an example in which restructuring solved the problem by moving collectors into post-processing jobs.

The sale of live birds at markets appears to be intimately connected to product quality and consumer perceptions of food safety. The implementation of a chilled market chain requires consumer confidence in the safety of the chain and changes in several

paradigms. For example, we heard that there has been an increase in the use of freezers at live-bird markets for birds that are not sold live. Regulating against the removal of unsold live birds from markets minimises the return of birds (and disease) from markets to farms. However, this has an unintended consequence, in that frozen or chilled birds are perceived as lower quality, since they are those that are left over at the end of the market because they have failed to sell. Prohibiting the removal of unsold live birds will require substantial infrastructure and consumer education.

The change to a chilled market chain is a major one, and the industry has been lobbying the government for some years to legislate for the introduction of a levy, but without success. A levy could fund many proposed measures, such as education, certification and research. In the face of continued problems, interim measures that work towards the introduction of CMCs at wet markets may be useful.

One major difference among stakeholders was in their perceptions of how change should be driven. Several project members spoke of the need for top-down policies in which supermarkets drive implementation. In contrast, the government has been generally using a bottom-up approach, educating and working with farmers to encourage implementation. Many stakeholders (particularly farmers) spoke of the need for government to regulate, but government has mostly been using incentives rather than regulation. As one government official stated, the enforcement of regulation is very difficult. The only government regulation introduced was in Bali, requiring contract companies to appoint a technical officer to advise farmers and staff on biosecurity. It was not clear how this would be enforced or whether this position had to be in addition to current staff.

In Bogor, small independent farmers make up a significant part of the industry. Incentives in place for them to implement biosecurity, including subsidised

vaccine, education campaigns and the provision of spray equipment, are very effective. Many people interviewed stated that change will take time, but behavioural change has been achieved within 6 months in some closed market chains using auditing and strictly enforced minimum requirements.

Certification for biosecurity has not been developed but could be combined with other existing certification schemes. For example, in Bogor the district government provides HPAI-free certification up to the RPA level. One contract company with an RPA said the company has an internal audit and certification system (provided by a laboratory) for *E. coli*, salmonella and antibiotic levels. The certification is required by some restaurants.

The compulsory introduction of farm biosecurity measures by Ciomas has been a significant development. This was partly motivated by firms such as KFC and McDonald's beginning to require biosecurity measures on the part of their suppliers. The Ciomas RPA in Makassar gave the example of McDonald's supplier audits, which are tabulated and for which worldwide results are published. Ciomas stated that the company was near the bottom of the tables. There are considerable compliance costs for smaller producers. For example, the egg supplier who has been a pioneer in the implementation of biosecurity measures in Makassar said that the paperwork and audit costs of becoming a McDonald's supplier were preventing him from doing so.

Ciomas stated that many of its farmers did not want to stay with the company and moved to other

contract companies when Ciomas began to introduce compulsory biosecurity policies. One main reason was the compulsory 2-week break between batches, which results in one fewer rotation per year. However, Ciomas reported that farmers who had left wanted to return when they saw the benefits of increased productivity.

Public perception and knowledge of biosecurity was a pervasive issue. All stakeholders said that there was a need for education and that price was a critical factor in the decision to implement biosecurity. The question then becomes about the best way to take advantage of perceptions about biosecurity.

While it may be possible to separate biosecurity from food security in the consumer's mind, it might not be practical to do so. Government officials stressed that the relationship of the two under a public health umbrella is valid. The implementation of regulation, certification and the resolution of problems need to be solved separately, but the public perception will remain one of a CMC.

It is possible to market certified products (for example, *halal* certification has been successful). Policy that encourages biosecurity as a minimum requirement alongside food safety and that therefore allows the marketing of certified products that come from a CMC would be the easiest for consumers to understand and support. The difficulty will be in developing a certification system that covers farm biosecurity and NKV certification at both the slaughterhouse and the supermarket.

References

- ABCRC (Australian Biosecurity Cooperative Research Centre for Emerging Infectious Diseases) 2007. The epidemiology, pathogenesis and control of highly pathogenic avian influenza in ducks in Indonesia and Vietnam. ABCRC. Accessible at <<http://www1.abcrc.org.au/pages/project.aspx?projectid=117>>, accessed 11 July 2007.
- Abley J. 2000. Stated preference techniques and consumer decision making: new challenges to old assumptions. Working Papers, SWP:2/00, Cranfield School of Management.
- Ambarawati I.G.A.A., Prasetyo B.K. and Patrick I. 2011. Farmer investment into biosecurity on broiler and layer farms in Bali. Paper presented at 55th Annual Australian Agricultural and Resource Economics Society National Conference, Melbourne, 5–11 February.
- Fanatico A. 2010. Pastured poultry: a Heifer Project International case study booklet. Heifer International and National Centre for Appropriate Technology.
- FAO (Food and Agriculture Organization of the United Nations) 2004. FAO Recommendations on the prevention, control and flock eradication of highly pathogenic avian influenza in Asia. FAO Position Paper, September. FAO: Rome. Accessible at <<ftp://ftp.fao.org/docrep/fao/010/ag035e/ag035e.pdf>>, accessed 6 December 2013.
- FAO (Food and Agriculture Organization of the United Nations) 2012. H5N1 HPAI global overview: January–March. Issue No. 31, EMPRES/FAO-GLEWS. FAO: Rome. Accessible at <<http://www.fao.org/docrep/015/an388e/an388e.pdf>>, accessed 6 December 2013.
- ICASEPS (Indonesian Center for Agricultural Socio Economic and Policy Studies) 2004. Socio-economic impact assessment of the AI crisis on poultry production systems in Indonesia with particular focus on independent smallholders. ICASEPS: Jakarta.
- Iqbal M., Susilowati S.H. and Patrick I. 2010. Consumer willingness to pay for poultry products from biosecure farms in West Java. Paper presented at the ACIAR workshop on towards the adoption of cost-effective biosecurity on NICPS farms in Indonesia. Bogor, Indonesia, 8–9 June 2010.
- Landes M., Persaud S. and Dyck H. 2004. India's poultry sector: development and prospects. Diane Publishing: Darby, Pennsylvania.
- Lee J., Gereffi G. and Beauvais J. 2012. Global value chains and agrifood standards: challenges and possibilities for smallholders in developing countries. Proceedings of the National Academy of Sciences of the United States of America 109(31), 12326–12331.
- Lestari V.S., Natsir A., Ali H., Saadah, Mawardi A., Karim H. and Patrick I. 2011. Consumers' perception and willingness to pay for poultry products from biosecure farms in South Sulawesi. Jurnal Ilmiah Aktualita III(2), 145–152.
- McLeod A., Morgan N., Prakash A. and Hinrichs J. 2005. Economic and social impacts of avian influenza. FAO Emergency Centre for Transboundary Animal Diseases Operations, Food and Agriculture Organization of the United Nations: Rome.
- McMichael A., Powles J., Butler C. and Uauy R. 2007. Food, livestock production, energy, climate change and health. Lancet 370, 1253–1263
- Memedovic O. and Shepherd A. 2009. Agri-food value chains and poverty reduction: overview of the main issues, trends and experiences. United Nations Industrial Development Organization: Vienna.
- Nerlich B., Brown B. and Crawford P. 2009. Health, hygiene and biosecurity: tribal knowledge claims in the UK poultry industry. Health, Risk and Society 11(6), 561–577
- Patrick I. 2004. Contract farming in Indonesia: smallholders and agribusiness working together. ACIAR Technical Report No. 54. Australian Centre for International Agricultural Research: Canberra.
- Reardon T., Timmer P. and Chandron R. 2004. The rapid raise of supermarkets in developing countries: induced organizational, institutional and technological change in agrifood systems. Electronic Journal of Agricultural Development and Economics 1, 168–183.
- Rouse T. and Davis D. 2004. Exploring a vision: integrating knowledge for food and health. Workshop summary, 88. Agriculture and Natural Resources Board, Division of Earth and Life Sciences, National Academy of Sciences, National Academy Press, Washington, DC.
- Shepherd A. 2007. Approaches to linking producers to markets: a review of experiences to date. Agricultural Management, Marketing and Finance Occasional Paper No. 13. Food and Agriculture Organization of the United Nations: Rome.

- Silbergeld E., Graham J. and Price L. 2008. Industrial food animal production, antimicrobial resistance, and human health. *Annual Review of Public Health* 29, 151–169.
- Susilowati S., Patrick I. and Iqbal M. 2012. Measuring and defining the factors affecting adoption of biosecurity on smallholder poultry farms in Indonesia. Paper presented at 56th Annual Australian Agricultural and Resource Economics Society National Conference, Perth, Australia, February 2012.
- USAID (United States Agency for International Development) 2009. Commercial poultry private sector partnership program: year one, development alternatives. USAID: Washington DC.
- Yusuf R. 2011. Consumer willingness to pay for poultry products from biosecure farms in Bali. Paper presented at the 55th National Conference of the Australian Agricultural and Resource Economics Society, Melbourne, Australia, February 2011.



ACIAR

Research that works for developing
countries and Australia

aciarc.gov.au