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CBAIC
Community Based Avian Influenza Control Project

COMMUNITY-BASED AVIAN INFLUENZA CONTROL PROJECT

COMMERCIAL POULTRY PRIVATE SECTOR PARTNERSHIP PROGRAM

Year One

14 October 2009 – *revised 11 November 2009*

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Cover photo credit: Heru Setyoko, CBAIC.

Dr. Agung Haryanto, a member of the CBAIC private sector partnership (PSP) team, checks the litter temperature and relative humidity in a brooding house at a participating broiler farm in Leles subdistrict, Garut, West Java. Following good management practices (GMP), the temperature should be about 30 degrees Celsius, and humidity should be above 50 percent (ideally 60-70 percent) to prevent chick dehydration. The CBAIC PSP biosecurity and GMP training program covers these and many other topics for improving disease control and revenue production.

COMMUNITY-BASED AVIAN INFLUENZA CONTROL PROJECT

COMMERCIAL POULTRY PRIVATE SECTOR PARTNERSHIP PROGRAM

Year One

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EXECUTIVE SUMMARY

A key element of Community-Based Avian Influenza Control Project year three activities included development and implementation of a commercial poultry private sector partnership (PSP) program. This program was a technical assistance activity aimed at helping the Indonesian commercial poultry sector to better use their resources to prevent and control avian influenza (AI) and other poultry diseases. Ultimately, this program will reduce the risk of pandemic flu developing from H5N1 highly pathogenic avian influenza, a main objective of the USAID AI control program.

PSP program activities focused on western Java Island, specifically West Java province and parts of Banten province, where nearly thirty percent of the population of the entire country lives. The area also accounts for nearly seventy percent of all confirmed human and animal bird flu infections in the country.

Year one of the commercial poultry PSP program concluded in September 2009. This document details the initial effects of the interventions on the Indonesian commercial poultry sector, and distills lessons learned and their implications for advancing the program during the upcoming nine-month CBAIC work extension.

Initial program findings and accomplishments include:

Creation of Sector 3 demand for biosecurity services

After training, sector 3 farmers under the CBAIC program are much more cognizant of the importance of biosecurity and desire additional technical support and information. Sector 3 farmers not participating in the CBAIC program requested technical assistance for their farms.

Improved technical knowledge in the commercial poultry sector

Program participants showed improvement in biosecurity and technical knowledge of good management practices (GMP), which was documented through pre- and post-training testing. Improvement was seen in all Sector 1 and 2 technical services staff, as well as Sector 3 farm supervisors.

Improved commercial poultry disease control related practices

Initial evaluation efforts indicate management and biosecurity practices have improved after PSP training. This success is reflected in biosecurity adoption scores recorded during post-training farm monitoring. Monitoring also revealed that regular support visits to sector 3 farms are essential to re-enforce and eventually institutionalize these good practices.

Improved management practices and positive trends towards increased revenue

A review of preliminary data (one flock cycle post-PSP intervention) has shown that, in general, participating commercial farms have been able to reduce depletion (bird deaths

due to disease, accident, and culling). Farm performance monitoring also revealed a general increase in chicken body weight in fewer days (a preliminary increase in production efficiency), which, if the trend holds through time, may increase longer term-revenue.

Analysis of technical services platforms

Sector 1 and 2 businesses have the ability to sustain a technical services platform for contract farmers. Poultry shops may also be able to operate smaller platforms to serve their contract farmers.

Detailed discussion of the above mentioned points is presented in this report. The findings and data presented will need to be validated through continued data collection and analysis during the extension period.

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ACRONYMS AND ABBREVIATIONS

AI	Avian Influenza (In this document, AI refers to H5N1 HPAI.)
AusAID	Australian Agency for International Development
BEP	Break-Even Point
CBAIC	Community-Based Avian Influenza Control Project
DOC	Day Old Chick
DVD	Digital Video Disk
FAO	Food and Agricultural Organization of the United Nations
FCR	Feed Conversion Ratio
GMP	Good Management Practices
GOI	Government of Indonesia
H5N1	HPAI Strain of AI
HPAI	Highly Pathogenic Avian Influenza
IDR	Indonesian Rupiah
IP	Production Index
MOU	Memorandum of Understanding
PSP	Private Sector Partnership
TOT	Training of Trainers
USAID	United States Agency for International Development
USDA	United States Department of Agriculture

I. INTRODUCTION

The Community-Based Avian Influenza Control Project (CBAIC) is part of the United States Agency for International Development | Indonesia strategy for reducing the risk of pandemic flu. Overarching goals include prevention of pandemic flu from the H5N1 strain of avian influenza and establishment of Government of Indonesia capacity for pandemic response; and reduced occurrence of AI infection in poultry and humans. Specifically, CBAIC meets three USAID strategic objectives: Strengthen Government of Indonesia (GOI) planning, preparedness, and coordination among government sectors and levels, and donor agencies; increase effectiveness of H5N1 prevention and control in poultry; and decrease high-risk behavior associated with transmission of H5N1 among poultry and humans. This will reduce the risk of pandemic flu developing from H5N1.

PREMISE

Recent studies[1] in Indonesia indicate that commercial poultry is likely a mechanism for avian influenza (H5N1) virus transmission among poultry and between poultry and humans. This implies that more attention needs to be given to controlling HPAI risk in commercial poultry production systems[2], including Sector 1, 2, and 3 producers. In response to this need, USAID | Indonesia requested CBAIC to design biosecurity business models and provide proof of principle of their viability and efficacy and their contributions toward reducing H5N1 transmission. The underlying premise of the design was that biosecurity services could, if targeted correctly, be internalized, i.e. pay for themselves through increased farm productivity as measured by lower depletion (total mortality), improved feed conversion ratios (FCR) and reduced age to market. This increase in productivity would result in greater profitability and thereby allow for recovery of any additional costs associated with the biosecurity interventions.

OBJECTIVES

CBAIC developed the PSP program to improve profitability and disease control through increased implementation of biosecurity measures and good management practices (GMP). Objectives of the PSP program in year one were to:

- Improve the commercial poultry industry's participation in, support for, and implementation of practices and procedures for H5N1 risk reduction,
- Provide "proof of principle" that the recommended H5N1 risk reduction measures are financially and technically sustainable,
- Develop one or more private sector partnership models for providing specialized biosecurity and GMP technical assistance to a range of producers.

Achievement of these objectives would result in establishing the technical platforms through which CBAIC and its Indonesian partners could extend the technical services initiated to more poultry producers across a wider geographic range.

[1] Evidence and supporting arguments are found in: the National Strategic Work Plan for Progressive Control of HPAI in Indonesia—Phase 2, 2009-2011; Criteria for Selecting Areas for Intensified HPAI Disease Control—FAO, July 2008; Final report on Initial Commercial Poultry Profiling Activities in Western Java—FAO, July 2008; and Cost Effective Biosecurity for non-Industrial commercial Poultry Operations in Indonesia—AusAID, June 2008.

[2] Characteristics of these poultry production systems as described by the FAO appear as APPENDIX A to this report.

II. APPROACH

CBAIC established partnerships with Sector 1 private poultry producers for the delivery of biosecurity services for the prevention and control of HPAI and other poultry diseases. The CBAIC PSP program focused on development and implementation of models for the delivery of biosecurity and good management practices (GMP) training for our partners and their selected contract (Sector 3) farms. Participation in the PSP program also involved commodity support for participating farms to facilitate their implementation of trained biosecurity and management practices. The key elements of the PSP program included:

- Identification of the specific types of technical assistance that the Indonesian poultry industry requires to improve their production and marketing systems in ways that measurably reduce the incidence and spread of H5N1 among poultry and humans;
- Identification of the types of organizations, businesses or associations that would provide the most effective delivery of managerial and technical support for a program addressing these critical H5N1 risks; and,
- Development and testing of models for internalizing biosecurity services to determine which has the greatest chance of long-term success in the Indonesian business context.

PARTNERSHIPS

CBAIC developed partnerships with three Indonesian commercial poultry associations. CBAIC also met with FAO, USDA, AusAID, and the Indonesian-Dutch Partnership to avoid duplication and ensure complementary efforts.

INTERVENTIONS

Technical services models. Based on the structures and operations of poultry producer associations, CBAIC developed and tested three intervention models for broiler producers. Plus, separate small-scale partnerships were developed with five commercial egg producers in order to better understand the technical needs of layer farms and identify their common biosecurity challenges.

Model 1 involved CBAIC partnership with three Sector 1 companies that entailed participation of a selection of their contract broiler farms in the PSP program. Technical services staff were trained in biosecurity and GMP, which they then taught to their selected Sector 3 farm supervisors and workers. A total of 150 contract farms participated.

Model 2 involved CBAIC partnership with independent broiler (80 percent) and layer (20 percent) farms, which are Sector 3 farms that are not contracted with large firms. Therefore, there were no technical services staff to train in this model. Instead, CBAIC trained directly at the farm level, reaching farm supervisors and workers of broiler farms to improve the quality and scope of their technical capabilities with respect to biosecurity and GMP. Twenty-six farms participated.

Model 3 involved CBAIC partnership with several poultry shops, which own numerous independent Sector 3 broiler farms. Poultry shops serve as a commercial intermediary between the Sector 3 farms they own, and the Sector 1 and 2 firms. In this model, CBAIC trained poultry shop technical staff, and farm supervisors and workers to improve the quality and scope of their technical capabilities with respect to biosecurity and GMP. Nineteen farms participated.

III. SCOPE & ACTIVITIES

GEOGRAPHIC COVERAGE

Two-hundred farms took part in the CBAIC PSP program – 195 broiler farms and 5 layer farms. The figure below highlights the thirteen districts in West Java province in which participating farms are located. PSP farms are also located in two districts in Banten province (north and west of Bogor), and one district in Central Java province (east of Ciamis).

PARTNERSHIP DEVELOPMENT

CBAIC held numerous consultative meetings with commercial poultry associations. These meetings served to introduce the PSP program, and better understand the structure, function, and membership of each organization. Detailed discussions with each association identified how best to provide technical services to their respective members. Memoranda of Understanding (MOU) were drafted and signed between CBAIC and each partner firm, representing formal work agreements.

CBAIC partnered with three broiler companies. These Sector 1 producers contract with thousands of medium-sized Sector 3 poultry producers to meet the demand for chicken in Indonesia. Under their CBAIC MOU, the companies were responsible for selecting the farms to participate in the PSP program. Criteria for selection was straightforward – farms of 5000 birds or larger, motivated to participate, agreeable to regular performance monitoring. It was the responsibility of CBAIC, to negotiate with all selected participants for permission to access farms, collect sensitive financial data, and monitor changes in farm practices and productivity, and overall performance.

CURRICULUM DEVELOPMENT

CBAIC developed the biosecurity curriculum to be delivered to program participants. CBAIC drew upon training materials developed by STOP AI, adapted them to the Indonesian context, and added sections on GMP. In addition, two educational biosecurity DVDs (*produced by the United States Department of Agriculture and the California Department of Food and Agriculture, and used with permission*) were shown during training. Also with permission, CBAIC reproduced the DVDs and provided copies to each trainee, accompanied by Indonesian translations of the dialogue that were produced by CBAIC. CBAIC PSP Team Leader Dr. Path Manathan led curriculum development and adaptation efforts. The CBAIC PSP team developed a comprehensive two-day biosecurity training course. The course covered five AI overview modules and eight subject areas. Field exercises gave trainees practical experience in applying new techniques and in monitoring production performance. Classroom topics covered:

- AI disease overview (5 modules)
- Risk assessment
- Biosecurity
- Good farm management practices
- Immunosuppression
- Cleaning and disinfection
- Manure composting
- AI rapid testing
- "Taking the learning home."

The CBAIC PSP biosecurity and best management practices training manual was produced in English (below left) and Indonesian (below right).

TRAINING SESSIONS

CBAIC first conducted training-of-trainers (TOT) for technical services staff of participating firms and associations with background knowledge in veterinary medicine, animal husbandry, poultry management, marketing, and sales. CBAIC trained 207 technical staff (including 49 veterinarians). Once trained, the technical staff took the lead in training their respective participating Sector 3 farm supervisors and employees. Based on the CBAIC curriculum, technical staff taught participants about HPAI and methods for controlling it and other poultry diseases. CBAIC supervised and co-trained as necessary to ensure that trainees would be able to take what was learned in the classroom and implement it in their farms. An additional 216 Sector 3 farm supervisors were trained. Thus, from March through May 2009, CBAIC trained 423 poultry industry technical advisors and Sector 3 farm supervisors and workers in biosecurity and best management practices (Table 1).

Table 1. Summary of PSP biosecurity trainings.

Training session number	Training dates	Number trained
1	20-21 March 2009	**23**
2	24-25 March 2009	36
3	31 March – 1 April 2009	40
4	6-7 April 2009	23
5	14-15 April 2009	21
6	17-28 April 2009	41
7	21-22 April 2009	24
8	24-25 April 2009	36
9	28-29 April 2009	34
10	1-3 May 2009	31
11	7-8 May 2009	42
12	12-13 May 2009	43
13	26-27 May 2009	29

The five AI disease training modules covered information about the HPAI H5N1 virus, how it can be transmitted and interventions against those modes of transmission, risk factors in a farm setting, clinical symptoms of the disease in poultry, post-mortem signs, and, importantly, how H5N1 presents in human cases. In the cleaning and disinfection module, trainees were also shown proper methods of cleaning and disinfection, including how to use specialized equipment, such as high-pressure sprayers.

TRAINING RESULTS

As a means of establishing a baseline for measuring increased knowledge about and capacity to address HPAI risk, CBAIC designed and administered a simple, multiple-choice and fill-in-the-blank test on HPAI H5N1 and good poultry management practices to each of the participant groups. The results of this test provided CBAIC with an idea of the level of understanding of HPAI and poultry husbandry in each training group, and allowed them to adjust the training accordingly. Each training group was administered the test and then re-tested after the training. The post-training examination provided the course instructors with measurable feedback on how well the information they had attempted to transfer had been understood by their audience. Results for each training are summarized in Table 2. Test scores of every training group improved after training. The minimum improvement was 16.7 percent; the maximum improvement was 29.9 percent, with two days of training. Not surprisingly, baseline knowledge was higher for technical services staff and lowest at the Sector 3 farm level.

Table 2. Pre- and post-test scores per PSP training.

	Training session number													Average
	1	2	3	4	5	6	7	8	9	10	11	12	13	
Pre-test	53.4	39.2	44.9	52.9	32.1	43.2	50.4	57.9	46.9	57.5	61.1	48.9	48.3	48.9
Post-test	75.1	61.6	64.2	82.8	53.3	70.5	76.8	74.5	70.9	77.0	90.4	75.3	76.7	62.6
% change	**21.7**	**22.4**	**19.4**	**29.9**	**21.3**	**17.4**	**26.4**	**16.7**	**24.0**	**19.5**	**29.3**	**26.5**	**28.4**	**24.6**

IV. PERFORMANCE MONITORING & RESULTS

Shortly after CBAIC PSP biosecurity training commenced, farm monitoring was initiated to evaluate implementation of trained biosecurity and management practices. CBAIC developed checklists and data intake forms to facilitate data collection. These were for recording data on biosecurity implementation, farm management practices, broiler weight and growth, and broiler flock depletion (APPENDICES B, C, D, and E, respectively). CBAIC staff and PSP partners (CBAIC-trained technical services staff, in particular), as well as trained Sector 3 farm supervisors and employees were taught to use the forms for data collection.

Since the production cycle for broiler birds is generally 35 days, and taking into account a standard disinfection period of up to 10 days, it was determined that it would be possible to collect data from each participating broiler farm over one or two production cycles. Farms were monitored twice during the production cycle to capture critical productivity measurements such as depletion (total mortality due to disease, culling, accident, etc.), body weight, and feed conversion ratio.

It was agreed with partner firms that CBAIC would monitor 65 broiler farms, while partners would monitor the remaining 130. However, CBAIC did conduct spot checks of the partner-monitored farms. CBAIC also monitored the five participating layer farms.

The data collected during preliminary monitoring show that:

1. Biosecurity measures implemented are having a positive effect on reducing avenues for HPAI H5N1 infection,
2. The same measures appear to be having a positive impact on production performance, and
3. Productivity gains witnessed appear to be sufficient to cover the costs of the biosecurity measures implemented.

Overall, trends are moving in the right direction, but additional data collection and analysis during the nine-month work extension are needed to confirm longer term impact.

PROGRESS INDICATORS

CBAIC created an internal performance monitoring plan to track progress of the PSP program, and quantify initial program impact. Table 3 below lists each results area and accompanying indicators. Progress towards each indicator is detailed in the following pages.

Table 3. PSP progress indicators.

Indicator	*Results Area A: HPAI-Risk Reduction Capacity Building*
1	Partnerships developed.
2	Training workshops conducted.
3	Partner technical services staff trained on HPAI biosecurity.
4	Farm supervisors trained on HPAI biosecurity.
	Results Area B: Reduction of HPAI Risk on Farm
5	Percent of participating farms observed to be implementing 80% or more of core biosecurity and good management measures.
	Results Area C: Economic Incentives for Improved Biosecurity
6	Reduce average flock depletion per cycle.
7	Reduce average overall feed conversion ratio (FCR) per cycle.
8	Increase average overall production index (IP) per cycle.
	Results Area D: Promote Sustainable Technical Services
9	Technical services models developed and tested.

IMPLEMENTATION AND CAPACITY BUILDING (Results Area A)

CBAIC outperformed its targets for implementation and capacity building in year one of the PSP program. Successful negotiations with commercial poultry associations and firms resulted in the formation of six key private sector partnerships. This points to strong interest in the Indonesian commercial poultry industry in improving the biosecurity and performance of poultry farms, specifically at the Sector 3 contractor level. In addition, Sector 1 partners were keen to strengthen the capacity of their own technical services staff in the areas of biosecurity and good management practices.

Results Area A: KNOWLEDGE AND UNDERSTANDING OF HPAI RISK REDUCTION
Goals: Increased farmer and technical staff capacity to implement appropriate and effective risk reduction.

#	Indicator	Unit of measure	Target	Achieved
1	Partnerships developed	# of partners (associations and companies)	3	6
2	Trainings conducted	# of trainings	10	13
3	Partner technical services staff trained on HPAI biosecurity	# of technical staff trained	100	207
4	Sector 3 farm supervisors trained on HPAI biosecurity	# trained	200	216

CHANGE IN PRACTICES (Results Area B)

Intensive field monitoring of the 195 participating Sector 3 broiler farms and five layer farms found that 74 percent of them (148 of 200) had implemented eight or more of the ten core biosecurity practices covered by the CBAIC PSP training (Table 4). It is important to note that field monitoring visits were crucial for this accomplishment. Additional regular monitoring visits will be needed to re-enforce and institutionalize these changes.

Table 4. The ten core CBAIC biosecurity and good management practices.

1. A stop sign controls access to the farm.
2. A service room is available and used by those entering the farm.
3. Coveralls are available and used by those entering the farm.
4. Boots are available and worn by those entering the farm.
5. Hand washing with soap and water is practiced.
6. Foot baths are available and used by those entering the farm.
7. Farm facilities and equipment are thoroughly cleaned regularly.
8. Proper disinfection procedures are implemented.
9. Poultry health and growth are monitored regularly.
10. Good brooding practices are implemented.

Results Area B: REDUCTION OF HPAI RISK ON FARM
Goal: Increased on-farm use of HPAI-risk reducing biosecurity measures.

#	Indicator	Unit of measure	Target	Achieved
5	Percent of participating farms observed to be implementing 80% or more of core biosecurity and good management measures	% of participating farms	50	74 (148 of 200 farms)

CHANGE IN PERFORMANCE (Results Area C)

In this section, overall change in performance is illustrated by analysis of production indicators to calculate production indices (IP), as well as a break-even point (BEP) analysis that shows how many cycles would be needed to cover the costs of implementing the ten core biosecurity measures and good management practices in Table 4 above.

Depletion and feed conversion ratio are key to calculating IP and BEP as estimates of performance.

Depletion. The total number of birds in a flock that have died due to illness, disease, accident, and culling. Depletion accounts for bird death due to all causes; mortality normally refers only to loss due to disease. Since the fewer birds that survive directly translates into fewer birds sold, a reduction in depletion is important to increasing revenue.

Feed conversion ratio (FCR). The amount of feed (in kilograms) consumed by a broiler chicken to produce one kilogram of meat. A reduction in FCR translates into a cost savings, which correlates to improved performance. And since the cost of feed is the most significant operating expense for poultry producers in Indonesia (>75 percent of expenses), even a small reduction in FCR may lead to increased revenue.

Results Area C: ECONOMIC INCENTIVES FOR IMPROVED BIOSECURITY
Goal: Reduced costs associated with poultry disease leading to greater productivity at the farm level.

#	Indicator	Unit of measure	Target	Achieved
6	Average flock depletion per cycle	% of bird deaths	<5	3-5
7	Average feed conversion ratio (FCR)	Kilograms of feed to produce one kilogram of meat	1.6-1.7	1.6-1.7
8	Production index (IP)	Index value	>275	275-360

Production index analysis

The production index estimates the overall performance of a broiler farm per flock. It is equivalent to the European Production Efficiency Factor (EPEF) used in western countries. Calculation of the IP value flock cycle takes into account broiler body weight and age to market, depletion, and FCR. In general, the sale of heavier, younger birds, coupled with low flock depletion and FCR, translate into a good IP value. ("Age to market" refers to the number of days required to fatten up a broiler DOC until it is ready to sell, which is generally in the vicinity of 30 days.)

IP value scale:

IP < 235	Poor (loss/break-even)
IP > 275	Good
IP > 300	Very Good
IP > 350	Excellent

The formula for calculating IP is:

$$IP = \frac{\text{Body weight X Livability}}{\text{Age to market X FCR}} \text{ X } 100$$

It should be noted that data analysis is limited and complex because Indonesian broiler growers' pay depends on many factors. These include which company they contract with (or work with as an independent grower), and the fact that each Sector 1 and 2 company has their own criteria regarding how the final payment to a grower is calculated. The criteria used for these calculations vary. Some companies pay growers based on FCR, some on "livability" (100 percent minus percent depletion), some body weight at sales, and some use IP. It should also be noted that these results are preliminary, and are only based on one flock cycle of data, post-intervention.

Analysis of year one monitoring data has shown a reduction in bird losses (depletion) and an increase in bird weight at sale one flock cycle after CBAIC PSP intervention (Table 5). Again, these are *preliminary results* and, ideally, monitoring would continue over multiple flock cycles after intervention to observe the durability of the impact of the intervention on production. Table 6 shows the average IP calculated for each partner using performance values from Table 5.

Table 5. Performance results for each broiler farm partner.

Partner	Age to market (days)		Body weight (Kg)		Depletion (%)		FCR	
	Pre-PSP	Post-PSP	Pre-PSP	Post-PSP	Pre-PSP	Post-PSP	Pre-PSP	Post-PSP
Company A	31	30	1.52	1.53	5.85	5.07	1.61	1.59
Company B	32	29	1.48	1.46	7.00	6.90	1.79	1.80
Company C	32	32	1.53	1.58	6.80	6.11	1.74	1.69
Independent farms	31	30	1.47	1.47	4.22	4.07	1.65	1.61
Poultry shops	28	27	1.30	1.26	3.96	3.94	1.61	1.58

Table 6. Production indices (IP) for each broiler farm partner.

Partner	Production index	
	Pre-PSP	Post-PSP
Company A	287	304
Company B	240	260
Company C	256	274
Independent farms	275	292
Poultry shops	277	284
Overall average	267	283

Break-even point analysis

For the 58% participating poultry farms showing an increase in revenues after CBAIC PSP intervention, the break-even point (BEP) was estimated. The BEP is the number of lots (or flocks) of birds that need to be produced in order to pay for the costs associated with implementation of the biosecurity and management practices introduced during the PSP program.

Since actual revenue fluctuates widely according to variation in the prices of day old chicks, feed and finished broilers, the method used here uses only two parameters: the feed conversion ratio (FCR), that is the amount of feed consumed divided by the gain in body weight; and the depletion, that is the proportion of the birds lost due to disease, accident, and culling. Based on average market values, fixed assumptions are made for the price of day old chicks, the price of feed, the final weight of broilers and the market price of broilers, and these are used to estimate the BEP.

It is important to note also that labor costs are not considered in the analysis, which is based on the observation that the PSP biosecurity interventions recommended do not entail additional labor to implement, just different and more effective ways of doing what labor is already doing.

Then the revenue from sales less the day old chick and feed costs is calculated before and after the intervention based on these assumptions and the actual FCR and depletion figures.

Many assumptions are made regarding expenses. For example, the weight of the day old chicks is not factored into the calculations and all other costs apart from feed and chicks are assumed to be equal before and after the interventions. Because of these assumptions, the calculated value is not the actual profit; it is a marginal analysis looking at changes in net revenue.

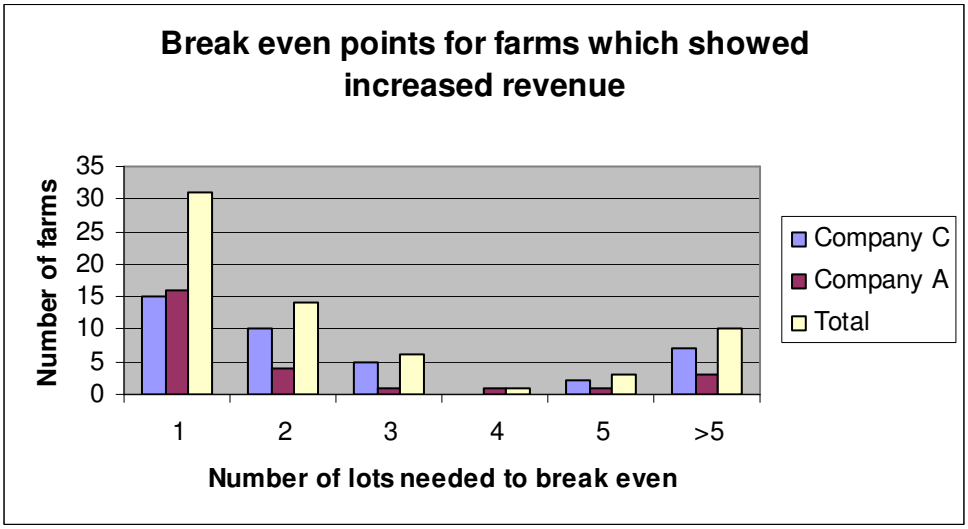
Other assumptions were made, such as the number of birds in the "before" and "after" lots, which were standardized for comparison purposes. Wherever possible, average figures from *two* lots after intervention were used to increase the accuracy of the estimation. Data were available from one lot before the intervention. The calculation assumes that the breed of chicken and the source of feed was the same before and after intervention, as these factors affect the FCR, and differences in revenue. APPENDIX F shows the formulae used to make the calculations, together with an example of the data entered and the result.

Results. The FCR and depletion data, together with the number of birds, were used to calculate the break-even point for individual farms. The result is only meaningful for farms which show increased revenue after the interventions compared to before. Table 7 shows the number and percentage of farms from each group which show a better result after the interventions than before, and then, out of the farms that showed a better result, the average number of lots required to recuperate the investment on the biosecurity interventions. Though some farms did not show improvement, this may have been because data was acquired too soon after the intervention, before the impact became apparent. It is hoped that this can be addressed during the year two of the PSP program.

Table 7. Farms from each group that improved after intervention.

Parent Company	No. of farms analyzed	No. generating additional revenue after interventions	Percentage generating additional revenue after interventions	Average number of lots of birds required to break even for farms making additional revenue
Company A	43	26	60	2
Company B	42	17	40	2
Company C	57	39	68	4
Total	142	82	58	3

The figure on the below shows the BEPs in terms of numbers of lots of birds for the farms which showed increased revenue after the intervention in the two groups, Companies A and C, which showed overall better results after the interventions. The estimations show that the cost of the interventions would be recuperated with the additional revenue after only one lot of birds in forty eight percent of these farms.



Discussion. The results for Company C suggest that the interventions were very successful in generating additional revenue, with nearly 70 percent of farms showing increased revenue. The average number of lots required to pay for the interventions is a function of the size of the farm – the larger the farm, the smaller the number of lots required to pay for the interventions. When promoting the interventions in the future it may be best to target farms with 5000 birds or more. For Company B, the overall results after the intervention did not show improvement. The reasons for this were not clear, and, therefore, a break-even point analysis was not applied here. However, like Company C, the results for Company A also showed that revenues increased for the majority of farms after the interventions.

In interpreting the results, it should be remembered that the improvements are not just a consequence of the material acquisitions, but also of a results of improved management practices which do not necessarily cost anything more to implement.

It may be that the power washer could be available at a significantly reduced price, in the order of IDR 2,000,000. In this case the cost of the investment would be recovered significantly earlier, since this is one of the main costs.

What the analysis does show is that the order of magnitude of the costs is well within what can be recuperated as a result of increased revenue in a broiler farm of 5000 or more birds. It is proved, in principle, that these interventions can pay for themselves, and more. Indeed, the estimated revenue generated in the two successful groups of farms is such that a business selling the services would, in principle, be viable.

Conclusions. Evaluation of the financial viability of biosecurity depends on an assessment of production parameters prior to the intervention. To date this has been based on one lot of birds immediately prior to the interventions. However, many random factors can influence the results from a single lot of birds, and for a sounder comparison it is better to have an average result from more than one lot. To the extent that the time allowed for the project extension permits it, this can be achieved by promising growers who enroll in the program the benefits associated with it on condition of satisfactory record keeping prior to the interventions. This can be done by identifying all the participants at an early stage prior to implementing the training on a batch by batch basis.

In analyzing the results with aim of quantifying the financial benefits and determining whether and how soon these can pay for the biosecurity interventions, one of the greatest confounding factors has been the age the birds are marketed. The market for broilers in Java is volatile, and the decision on when to market the birds is taken more on the market price of the day than on technical considerations of the age at which production is most efficient, and the decision is not planned in advance. However, the age of marketing has an effect both on the profitability of the lot of birds, and on all the parameters that are used to measure the production efficiency: the production index, the FCR, and the depletion. The age of marketing is one of components of the formula used to calculate the production index; the FCR increases (gets worse) if the birds are kept for a long time; and the longer the birds are kept the more are lost. This means that the age of marketing can easily differ before and after the interventions due to market factors unrelated to production efficiency, and hence influence the estimations of changes in profitability or production efficiency, even when fixed assumptions are made for the cost of inputs and the sale price of birds. This bias can be excluded in future by using the FCR and depletion figures at a fixed age, no later than the youngest age at marketing, for comparisons of production efficiency and profitability.

The other two potential confounding factors in estimating changes in revenue are the breed of chicken used and the source of feed used: both have a significant effect on the FCR. However, these are not changed frequently, and the potential bias that could result can be eliminated simply by removing those farms where changes have occurred from the calculations.

SUSTAINABLE TECHNICAL SERVICES (Results Area D)

Last, but not least, CBAIC tracked overall PSP program efforts to promote sustainable technical services for Sector 3 poultry farms. The initial plan was to develop and test two intervention models to assess the viability of sustainable technical service platforms. However, after learning of the potential importance of poultry shops in the West Java poultry value chain, CBAIC developed and implemented a third model. The third model focused on poultry shops as a potential additional platform from which sustainable technical services could be provided to Sector three poultry producers.

Results Area D: PROMOTE SUSTAINABLE TECHNICAL SERVICES
Goal: Establish demand for and the sustainability of private sector biosecurity services.

#	Indicator	Unit of measure	Target	Achieved
9	Technical services models developed and tested	# of models	2	3

In year one of the PSP program, CBAIC strengthened existing technical services platforms in the three Sector 1 firms. Participation in the PSP program improved the abilities of technical field staff to provide better oversight and guidance on biosecurity and good management practices.

During the CBAIC PSP program, CBAIC and partner companies shared the responsibility of monitoring key HPAI-risk and productivity indicators on participating farms. Here, CBAIC technical staff, Dr. Agung Haryanto (standing center) and Mr. Erwan Julianto (recording) collect data from collaborating farm managers. *Photo by CBAIC.*

V. OBSERVATIONS AND LESSONS LEARNED

CBAIC has gained valuable insights regarding the commercial poultry industry in Indonesia, the operations of its Sector 1 partners, and their relationships with their Sector 3 contractors.

GENERAL OBSERVATIONS

1. There are many improvements to be made at Sector 3 farm level. For example, before the training, most of the farms participating in the PSP monitoring activity did not have an understanding of proper cleaning and disinfection procedures. Most are open houses which allow access to wild birds, rodents and other pests. Water sanitation is not commonly practiced on Sector 3 farms, creating another avenue for virus transmission.

2. Enviromental risk was significant (e.g. farms next to rice fields or roads, and houses over fish ponds in Tasikmalaya and Ciamis)

3. Most farm workers admit to raising their own back yard poultry or have pet birds at their homes. Both represent a great danger for HPAI transmission where biosecurity is weak.

4. Humidity in the poultry houses being monitored was over 70% even reaching 85%. HPAI viruses can survive for long periods in such a humid environment.

8. Record keeping on these farms is minimum and different within each of the operations. PSP interventions improved the ability of farms to monitor their depletion, weekly body weight control and production numbers.

OBSERVATIONS FROM LAYER FARMS

1. Selected layer farms were concentrated in West Java (Bogor district) and Banten (Tangerang and Serang districts). All of the farms are family owned operations.

2. These farms purchase the layer DOC and feed from Sectors 1 and 2. There is no routine technical service from these sectors unless requested by the farm owner on specific problems. Technical and veterinary services are provided by the drug companies through routine regular visits.

3. Owners and supervisors of all the five layer farms showed a keen interest in improving their existing biosecurity measures and scored over 80% in adoption of PSP biosecurity measures after the training.

4. All layer farms except one had bird capacity of over 200,000 layers. Most of these farmers are growing ISA Brown breed which has proven to them to be a very good production bird with fewer management issues.

5. About 10% of the layer farms in Indonesia are not vaccinating for AI, but they practice very strict biosecurity measures to control diseases.

6. Production performance monitoring in Indonesian layer farms is based on egg mass or number of kilo eggs per hen production. On an average 20kg of eggs per hen up to 80 weeks of production is a profitable operation. One of our study farms reported producing above this level up to 21kg eggs per hen.

7. Spent hens are sold to one trader and no retailers were allowed at these farms. Birds are transported to a trader site outside the farm premises.

LESSONS LEARNED

Lessons learned during the course of year one of the PSP program include:

Partnerships

1. Sector 1 commercial poultry producers have shown a readiness to form partnerships with PSP. They acknowledge a need to improve levels of biosecurity, particularly on the farms of their contractors.

2. Memoranda of Understanding are not particularly popular with the private sector but necessary to clarify expectations on both sides.

Training

3. Hands-on practical implementation at the farm level had significant impact on the commercial farmers operation and improvement. Classroom training without the hands on farm level approach and monitoring would not have had a substantial impact in changing practices.

4. Sector 3 farmers would like training to be closer to their farm areas as they need to tend to their farms.

Data collection

5. Negotiations to secure access to Sector 3 farms need to start early to be able to collect baseline data and evaluate production data before interventions. Now that relationships have been established it should be easier to collect pre-intervention data.

6. Because age-to-market is a major factor in confounding calculation of profit/revenue, the FCR and depletion data should be recorded at a fixed age – no later than the youngest age at marketing.

Calculating revenue / profitability

7. There is a very thin profit margin, if any, for Sector 3 farmers.

8. Sector 3 contract farms owners rarely calculate their own profit. These profits are calculated by Sector 1 firms and then deposited into Sector 3 farm bank accounts after subtracting costs for inputs (feed, DOCs, medicine, etc.) they have supplied.

9. Each Sector 1 company calculates profits differently. Sector 1 companies provide sector 3 farm owners bonuses that are based on a "mix" of specific data e.g. FCR, IP, mortality rate, body weight, and good record keeping. The "mix" is different for each company, which make profit comparability across companies very difficult.

Deeper focus on select audiences

10. CBAIC reached Sector 3 farm owners and supervisors but not always all the workers. More visuals and simpler tools for use by farm supervisor will be needed to reach this audience effectively.

11. From a business perspective and economies of scale, it is best to focus on Sector 3 farms of more than 5000 chickens.

12. Improved biosecurity at the farm level is dependent on behavior changes by traders and transporters, therefore, these groups should be targeted as well.

Leveraging resources

13. Through year one of the PSP program, CBAIC has been able to leverage USAID | Indonesia funding by accessing private sector human and financial resources. In particular, numerous participating farms have made small infrastructure and commodities investments to implement additional biosecurity measures such as building bamboo fences, screening poultry houses, installing vehicle disinfection baths, creating service rooms, purchasing blowers for ventilation, and installing new water treatment procedures (filters, chlorine). Sector 1 companies were willing to invest executive time and the time of their technical services staff to monitor and collect data, and at least two of the companies are using CBAIC training materials to conduct their own trainings.

APPENDIX A. Commercial poultry sectors

Sectors (FAO/définition	Systems			
	Industrial and integrated	Commercial poultry production		Village or backyard
		Bio-security		
		High	Low	
	Sector 1	Sector 2	Sector 3	Sector 4
Biosecurity	High	Mod-High	Low	Low
Market outputs	Export and urban	Urban/rural	Live urban/rural	Rural/urban
Dependence on market for inputs	High	High	High	Low
Dependence on goods roads	High	High	High	Low
Location	Near capital and major cities	Near capital and major cities	Smaller towns and rural areas	Everywhere. Dominates in remote areas
Birds kept	Indoors	Indoors	Indoors/Part-time outdoors	Out most of the day
Shed	Closed	Closed	Closed/Open	Open
Contact with other chicken	None	None	Yes	Yes
Contact with ducks	None	None	Yes	Yes
Contact with other domestic birds	None	None	Yes	Yes
Contact with wildlife	None	None	Yes	Yes
Veterinary service	Own Veterinarian	Pays for veterinary service	Pays for veterinary service	Irregular, depends on govt vet service
Source of medicine and vaccine	Market	Market	Market	Government and market
Source of technical information	Company and associates	Sellers of inputs	Sellers of inputs	Government extension service
Source of finance				
Breed of poultry	Commercial	Commercial	Commercial	Native
Food security of owner	High	Ok	Ok	From ok to bad

Sector 1: Industrial integrated system with high level biosecurity and birds/products marketed commercially (e.g. farms that are part of an integrated broiler production enterprise with clearly defined and implemented standard operating procedures for biosecurity).

Sector 2: Commercial poultry production system with moderate to high biosecurity and birds/products usually marketed commercially (e.g. farms with birds kept indoors continuously; strictly preventing contact with other poultry or wildlife).

Sector 3: Commercial poultry production system with low to minimal biosecurity and birds/products entering live bird markets (e.g. a caged layer farm with birds in open sheds; a farm with poultry spending time outside the shed; a farm producing chickens and waterfowl).

Sector 4: Village or backyard production with minimal biosecurity and birds/products consumed locally.

APPENDIX B. Biosecurity implementation checklist

CBAIC COMMERCIAL POULTRY
PRIVATE SECTOR PARTNERSHIP PROGRAM
BIOSECURITY MEASURES ADOPTED CHECKLIST

	M&E Initial		M&E Initial		M&E Initial		M&E Initial	
Type Name of Company in here Type Name of Farm or Number in here Type Name of Farm Supervisor in here	Date		Date		Date		Date	
Flock Condition (C&D / DOC / 7days / 21days / 5 weeks)								
BEHAVIOR AND IMPLEMENTATION	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**
1. Access to farm with **STOP SIGN**								
2. SERVICE ROOM organized								
3. COVERALLS available for Visitors, Technical Service, Farm Supervisors & Farm Workers								
4. BOOTS available for Visitors, Technical Service, Farm Supervisors & Farm Workers								
5. HAND WASHING available with soap and Water								
6. FOOT BATHS available								
7. CLEANING procedures have improved with the new power washer.								
8. DISINFECTION procedures improved [disinfectant selection, concentration use etc.]								
9. HEALTH & GROWTH monitored regularly								
10. GOOD BROODING adopted & practiced								
SCORE:								

APPENDIX C. Farm management checklist

BROILER /LAYER FARM VISIT CHECKLIST

FARMER: _____LOCATION: _____ COMPANY: _____

FLOCK ID: _____DATE OF VISIT:_____ AGE OF FLOCK: _

1) Observe Quality of Chicks / Birds

- ☐ Dehydration
- ☐ Navel Infection
- ☐ Chicks Weight
- ☐ Chicks Activity

2) Observe the Chick's Symptoms

- ☐ Respiratory – panting, breathing sounds
- ☐ Digestive – Diarrhea, Blood in faces
- ☐ Nervous – Trembling, head twisting
- ☐ Skeletal – Leg Problems

3) Observe Quality of environmental control

- ☐ Brooder temperature / Room temperature
- ☐ Relative Humidity
- ☐ Ventilation - Air Movement
- ☐ Light Intensity
- ☐ Litter conditions
- ☐ Dust condition inside the barn

4) Observe Quality of management techniques

- ☐ Feed texture & feeding techniques
- ☐ Water Quality, drinker cleanliness – water sanitation (chlorination)
- ☐ Disease control program – vaccination, medications used in water & in feed
- ☐ Biosecurity Practices

Continuous Improvement Comments:

APPENDIX D. Broiler weight and growth form

BROILER WEIGHT CHART & GROWTH PATTERN
[STRAIGHT RUN]

WEEK	DAYS	AVERAGE GAIN PER DAY	WEEKLY GAIN (Approx)	EXPECTED BODY WEIGHT	GROWTH PATTERN
	Day Old Chick [DOC]	----	-----	35 - 40 g - 45 - 50 g	X 4
1	7 days	11 g 23 g	120-135 g	< 120 160 g > 175	X 2.5
1st Check: TO UNDERSTAND BROODING MANAGEMENT ISSUES - IF ANY					
2	14 days	24 g 30 g	240-270 g	400 g >430	X 2.0
3	21 days	32 40 g	400-440 g	< 600 g 800 g >840 g	+ 500 g + 600 g
2nd Check: TO UNDERSTAND IMMUNOSUPPRESSION ISSUES - IF ANY					
4	28 days	42 g 50 g	500-550 g	1300 g > 1400 g	+ 500 g + 600 g
5	35 days	51 g 58 g	500-650 g	1800 g > 2000 g	
Final 3rd Check : FOR PROFITABILITY					

APPENDIX E. Broiler flock depletion form

BROILER RECORD
CBAIC COMMERCIAL POULTRY PSP PROGRAM

CROP #: _____ DATE PLACED:_____

NUMBER PLACED:_____

FARM: _____ COMPANY:_____ DISTRICT:_____ HOUSE#:_____

A	O
Total	
C	M

DOC WEIGHT: 40g

DAY	Weekly Loss	Total Loss	Weight	Vaccination & Medication	Feed Consumption (kg)
WK 1	Max 1%		160 g +		
WK 2	Max 0.5%		400 g +		
WK 3	Max 0.5%		800 g +		
WK 4	Max 0.5%	Recommended	1300 g +		
WK 5	Max 0.5%	3%	1800g-2000 g		
WK 6			2600 g +		

M= Mortality
A= Accident
C= Culling
O= Others

SUMMARY & COMMENTS FOR CONTINUOUS IMPROVEMENT:

TOTAL FEED CONSUMED:_____ Kg

FCR: _____

APPENDIX F. Break-even point calculator

Before intervention

A	Average price / DOC	4000
B	Average feed price / kg	4800
C	Average broiler weight (kg)	1.5
D	Feed conversion ratio	1.64
E	Average broiler sale price / kg	13000
F = C*E	Average broiler sale price / bird	19500
G	Revenue/bird = F - A - (B*C*D)	3692
H	Number of birds	5020
I	Depletion	0.048
J	Number of birds at end = H*I	4779
K	Revenue per lot = J*G - (A*H*I) - (H*I*.4*B)	16680279
L	**Increased revenue per lot = K' - K**	**3736500**

After intervention

A	Average price / DOC	4000
B	Average feed price / kg	4800
C	Average broiler weight (kg)	1.5
D'	Feed conversion ratio	1.56
E	Average broiler sale price / kg	13000
F = C*E	Average broiler sale price / bird	19500
G	Revenue/bird = F - A - (B*C*D')	4268
H	Number of birds	5020
I'	Depletion	0.0243
J'	Number of birds at end = H*I'	4898
K'	Revenue per lot = J*G - (A*H*I') - (H*I'*.4*B)	20416780

M # of lots required to break even = N / L 1.55

Cost of interventions per farm*

	number	unit price	total
Power washer	1	3275000	3275000
Clothes	12	75000	900000
Scale	1	825000	825000
Boots (pairs)	7	51000	357000
Bucket	1	15000	15000
Gloves	2	35000	70000
Footbath	2	29000	58000
Clipboard	2	7500	15000
Stop sign	1	182000	182000
Measuring cup	2	12500	25000
Thermometer	6	12000	72000
N TOTAL			**5794000**

blue = fixed assumptions
red = variable data
* costs are in IDR