

The Economic Impact of Bird Flu Disease on Broiler Prices in Egypt

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ABSTRACT

On 17th February 2006, the bird flu outbreak was announced in Egypt. The outbreak at the beginning emerged in three provinces; El-Menya, Cairo and Giza. Then widely spread to the majority of Egyptian governorates. The outbreak resulted 35 human cases since the virus first surfaced in Egypt. Fifteen have died until 9th June 2007. This paper analyses the impact of avian flu outbreak on broiler's consumer and farm gate prices, in addition to, the marketing margins in pre and post outbreak periods. In general, the most seriously affected being producers with high fixed costs and borrowings. However, the other losers in the protein market are likely to be the poor consumers who would have had to pay higher prices for protein during and after the outbreak. The estimated cost incurred to the broiler industry due to price differential effects on the marketing margin alone was about LE 3 million during the outbreak severity period (17th Feb- 26th March 2006).

Keywords: Bird Flu, Avian Flu, Broiler, Egypt.

1. INTRODUCTION

As argued by (Bloom et al., 2005), the outbreak of SARS in 2003 showed that even a disease with a relatively small health impact can have a major economic effect. Globally, SARS is believed to have infected around 8,000 people, killing 800 (Cooper and Coxe, 2005). The Asian Development Bank estimated that the economic impact of SARS was around \$18 billion in East Asia, around 0.6% of gross domestic product (Fan, 2003), (AsianDevelopmentBank, 2003).

The avian influenza is one of today's biggest threats to the world's socio-economic health. The World Health Organization (WHO) estimates 2–7 million people could die(WHO, 2007a), while other estimates are much higher, exceeding 100 million deaths (Osterholm, 2005). The 20th century saw three major flu pandemics. The largest, the "Spanish flu" (1918–1919)

is believed to have killed between 50–100 million people (Barry, 2005). No other influenza in history has been this deadly and the high virulence may be due to the specific public health conditions that existed during the First World War (Byeryl, 2005). Despite the human cost, the long-run impact of Spanish flu is unclear (Brainerd and Siegler, 2003), (Almond, 2003). The two other flu pandemics (in 1957–1958 and 1968–1969) killed substantially fewer people (around 1–3 million each). All three flu pandemics mutated from forms of avian influenza and at least two of the three originated in Asia (Tauberger, 2005).

Currently, the avian flu virus has been transmitted only from animal-to-animal and animal-to-human, the great danger is that a new strain may evolve that could infect humans and be transmitted within the human population. (WHO, 2004) report that the current situation with avian influenza has satisfied two of the prerequisites of the start of a new human influenza pandemic three times in the last eight years. In other words, the probability increases that the virus will enter a second stage and spread from human-to-human, thus, causing world wide pandemic and greater costs than the current situation.

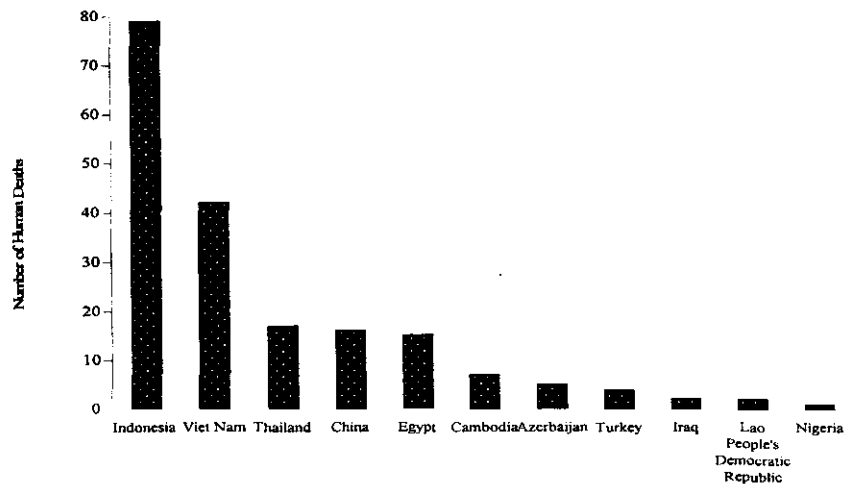
The outbreak began in south-east Asia in mid-2003 and has now spread to a few parts of the world. To date, nine Asian countries have reported outbreaks (listed in order of reporting): the Republic of Korea, Vietnam, Japan, Thailand, Cambodia, the Lao People's Democratic Republic, Indonesia, China, and Malaysia. Of these, Japan, the Republic of Korea, and Malaysia have controlled their outbreaks and are now considered free of the disease.

By the end of July 2005, the virus spread geographically beyond its original focus in Asia to affect poultry and wild birds in the Russian Federation and adjacent parts of Kazakhstan. Almost simultaneously, Mongolia reported detection of the highly pathogenic virus in wild birds. In October 2005, the virus was reported in Turkey, Romania, and Croatia. In early December 2005, Ukraine reported its first outbreak in domestic birds.

In effect, the death toll reported by the WHO (till 6th June 2007) has risen to 190 cases all over the infected countries (WHO, 2007b). Indonesia accounted the highest mortality ratio (42%), followed by Vietnam (22%),

Thailand, China and Egypt (8% on average), Cambodia (4%), Azerbaijan and Turkey (2.5% on average), Iraq and the Lao People's Democratic Republic (1% on average), and finally Nigeria (0.5%).

FIGURE: 1: NUMBERS OF CONFIRMED HUMAN DEATHS OF AVIAN FLU TILL 6TH JUNE 2007



Source: Compiled from WHO online fact sheet report.

The importance of this disease is a combination of: (1) the high levels of its infectious nature and flock mortality rate (often above 50%), that require severe control methods to restrict the outbreak. Such methods are normally costly, such as vaccination strategies and the culling of apparently healthy birds that have been in contact with infected ones. In addition to, the restrictions in tourism and international trade for live birds and poultry meat products, besides the threats to poultry investments, employment and services. Moreover, the infection of other poultry and livestock species, such as ducks, geese, quails and pigs. The importance of these infections is less about morbidity and mortality in these species, and more about maintaining a reservoir of disease, especially in ducks, and

potentially creating influenza strains that threaten human health (Rushton et al., 2005).

On 17th February 2006 bird flu disease (strain H5N1) was confirmed to be present in Egypt. The outbreak started first in El-Menya, Cairo and Giza provinces, and then widely spread to cover the majority of Egyptian governorates. Egypt has the highest known cluster of human bird flu cases outside Asia, with 35 known human cases since the virus first surfaced in Egypt. Fifteen have died until 9th June 2007 (WHO online database).

Even in its early stages, avian flu has already caused significant economic damage. This is primarily due to the damage to the agricultural sector, particularly poultry production (Verbiest and Castillo, 2004).

This paper is organized as follows; Section 2 discusses the aim of the paper and data collection. Section 3 gives an overview on the Egyptian poultry sector. Section 4 offers a brief background on the outbreak and broiler prices. Section 5 examines the impact of the outbreak on broiler price and marketing margin. Section 6 suggests some recommendations. Finally, Section 7 devoted to conclusion.

2. AIM OF THE PAPER AND DATA COLLECTION

The paper attempts to quantify the impact of bird flu disease on broiler prices throughout the pre and post outbreak period (1st May 2005-31st Dec 2006). Data is obtained mainly from poultry stock market, Egyptian Ministry of Agriculture (MOA), Centre of Information and Supporting Decision Making (CISDM) and Food and Agriculture Organization (FAO).

3. THE EGYPTIAN POULTRY SECTOR

The poultry sector is considered one of the core sectors in the Egyptian agricultural economy. It enjoyed high levels of governmental support since the mid 1970s, when the government sought poultry self sufficiency. This support varied from tax exemption (up to ten years) for some poultry integrated industries, and the exclusive permission for poultry firms to be established on agricultural land, to subsidized credit and banning poultry imports from 1986 to 1997 (that replaced with 80% tariff on poultry imports). These incentives escalated the sector's investments and

capital stock that reached about LE 18 billion and LE 5 billion respectively in 2005, employing about one million workers.

Egypt's livestock sector contributed 47% percent of total domestic agricultural production in 2005. Fifty four percent of Egypt's total livestock production (estimated at 721 thousand metric tons) was obtained from poultry meat during the period 2000-2005 (on average), in which, exceeded beef and lamb meats by 42% and 980% respectively. However, broiler meat accounted 77% of total poultry production during the period 2000-2005 (on average), followed by goose and duck meat (11%), rabbit meat (10%) and turkey meat (2%), (see figures 2 and 3).

FIGURE 2: COMPOSITION OF LIVESTOCK PRODUCTION DURING (2000-2005)

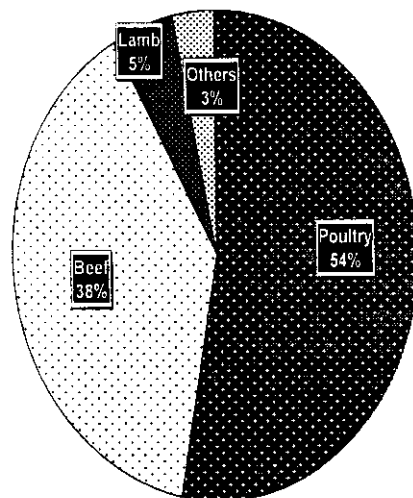
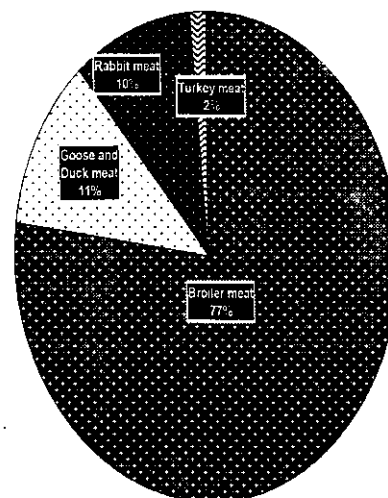


FIGURE 3: COMPOSITION OF POULTRY MEAT PRODUCTION DURING (2000-2005)



Source: Compiled and calculated from FAO online data base.

However, the classification developed by FAO (2004) and noted in (Rushton et al., 2005), defines four poultry production systems according to the level of biosecurity and the marketing of birds and products (see Table 1). Although, this is not the only classification system for poultry, but is probably the most appropriate for macro level analysis of poultry sectors with regard to avian influenza control (Rushton and Ngongi, 1998;

Spradbrow, 1993). With regard to the appropriateness of FAO classification system to the Egyptian poultry sector, three production systems (sectors two, three and four) are believed to be dominating, in which the majority of producers are falling in sectors three and four. While, sector one is relatively insignificant, as a small number of birds are processed through slaughterhouses and the majority are marketed as live birds, being brought into the main centers of consumption by vans and then distributed. This would indicate that few systems could be classified as being in sector one.

TABLE 1: CLASSIFICATION SYSTEM FOR POULTRY PRODUCTION SYSTEMS

	Sector 1	Sector 2	Sector 3	Sector 4
System	Industrial Integrated	Commercial	Commercial	Village or backyard
Biosecurity	High	Moderate to high	Low to Minimal	Minimal
Bird and Product marketing	Commercial	Usually commercial	Birds usually sold in live bird markets	Birds and products consumed locally

Source: Rushton et al, (2005) p.3.

4. THE AVIAN FLU OUTBREAK AND BROILER PRICES

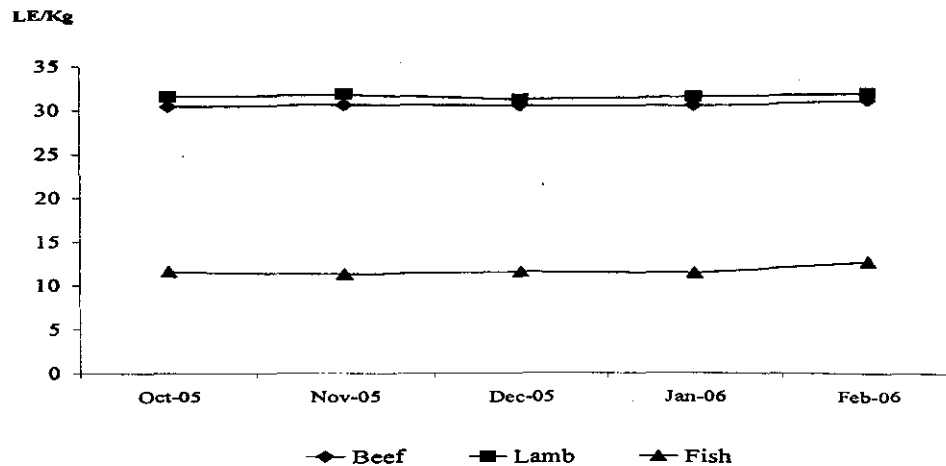
From October 2005 onwards, onset the emergence of avian flu outbreak in China, there were large fluctuations in the Egyptian poultry supply and demand. During this period, demand fell sharply as consumers become increasingly worried about food safety. In addition, the increased supply led to a fall in chicken consumer prices from LE 7.2/Kg in October to LE 6.4/kg in November and further to LE 5.1/kg in December and January 2006.

By the mid of February 2006, the government of Egypt announced the presence of 18 infected birds. In effect, the government decreed a number of precaution rules, for example; (1) banning live poultry movement between provinces for fifteen days that could be extended unless there is a clearance permission issued by the governor higher board. (2) Banning poultry waste and feathers movements. (3) Banning all live poultry selling and marketing. (4) Demolishing unauthorized poultry sheds and backyard systems. (5) Abandoning all live and processed poultry importation, except

for layers and broiler parents (conditional to satisfying all lab and health requirements decreed by the Ministry of Agriculture). (6) Abandoning the importation of all feather powder and poultry wastes that are used in poultry feed. (7) Adopting a limited compensation policy. (8) Vaccination strategy. (9) Increasing awareness.

Moreover, on 4th march the outbreak spread to cover fourteen provinces, in which, there have been 331 infected bird cases. Consequently, poultry demand fell dramatically. However, Figure 4 shows that there was an increase in prices for beef, lamb and fish in February 2006 compared to October 2005 by 2.4%, 1.4% and 10.2% about indicating a clear shift to other protein sources (Anonymous, 2006).

FIGURE 4: POULTRY SUBSTITUTES PRICES DURING OCT 05-FEB 06



Source: Compiled and calculated from (Anonymous, 2006).

It is worth mentioning that, the rise in fish meat prices is nearly fourfold and sevenfold of that for beef and lamb, this is presumably because the demand elasticity for fish meat is more elastic than beef and lamb. In other words, the majority of consumers can afford to pay the 10% increase in fish price (which is initially about LE 13 per Kg) rather to pay the

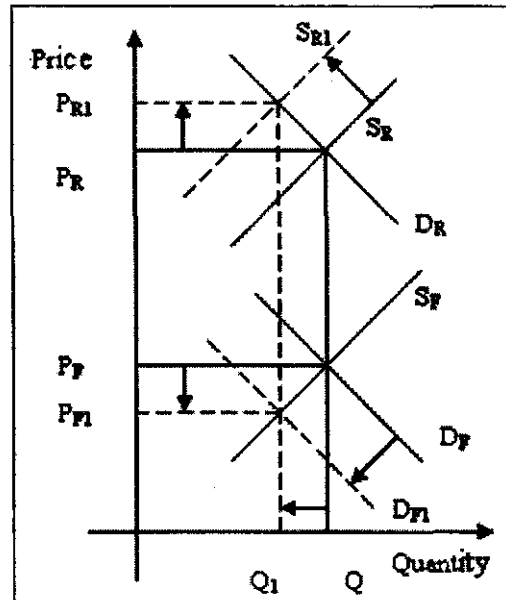
relatively little rise in beef and lamb prices (which is initially about LE 32 per Kg).

During the period 17th Feb-5th March 2006, poultry trade was banned due to movement restrictions. By May 2006, demand was beginning to recover and by July consumer prices had reached nearly LE 9 per kg and increased further to about LE 10 per Kg (on average) during August, September and October. The economic consequences of the bird flu outbreak included changes to the way broilers were marketed.

The change in marketing methods during the bird flu outbreak also led to increased marketing costs as abattoirs were restricted in the broilers that they processed and, in addition, incurred higher processing costs (eg, for increased biosecurity measures).

Owing to (Wilson and Kinsella, 2004), Figure 5 shows how a change in the market as argued above can, simultaneously lead to both an increase in retail price and a fall in farm gate price. In theory, the pre outbreak market is given by supply and demand at the retail level of S_R and D_R respectively, with supply and demand at farm gate level of S_F and D_F respectively. Hence, in the pre outbreak market, Q units of poultry are demanded at both retail and farm gate levels. Retail and farm gate prices are P_R and P_F respectively, and the marketing margin (difference between retail and farm gate prices, i.e. $P_R - P_F$). With the onset of bird flu crisis, the attendant marketing restrictions, processing and marketing costs rose thus increasing the overall retail cost of supplying poultry, as shown by the rise in the retail supply curve to S_{R1} . The consequence of this cost shift is an increase in retail price to P_{C1} , leading to a fall in demand from Q to Q_1 as retailers respond to higher retail prices by reducing purchases. In order for the market to be in equilibrium, derived demand at the farm gate moves from D_F to D_{F1} , Q_1 units of poultry are purchased at farm gate level and the price of poultry falls to P_{F1} . Hence the marketing margin increases to $P_{R1} - P_{F1}$; the consequence of retail price rises and farm gate price falls.

FIGURE 5: RETAIL, FARM GATE PRICES AND CHANGES IN MARKET MARGIN



Source: (Wilson and Kinsella, 2004)

The above analysis does not explore the impact of any potential buying power that may have accrued to abattoirs during the outbreak period due to the geographical marketing restrictions placed upon farmers. However, if market power was exercised, this would be expected to contribute further towards an increase in the marketing margin as farm gate prices would be reduced further.

The overall hypothesis presented above is that during outbreak period, restrictions in marketing activities and increased marketing and processing costs led to changes in both retail and farm gate prices. Moreover, the analysis shows that we should expect prices at retail and farm gate levels to move in opposite directions following such marketing shock, this widening the marketing margin.

5. EXAMINING THE EVIDENCE

Data on broiler consumer (retail) prices and farm gate prices are used to drive changes in marketing margins that occurred following the avian flu outbreak, in comparison to the pre-outbreak period. We then estimated the cost of this price differential to the Egyptian broiler industry over the period investigated.

Figure 6 shows consumer and farm gate weekly prices for broiler during the period from 1st May 2005 to 31st Dec 2006. The difference between the two prices is the marketing margin. Figure 7 shows this weekly marketing margin between the farm gate price for broiler and the consumer price over the same period. Three distinctive points are indicated on the chart, the first point at which broilers demand started to fall (October 2005), whereas the second point illustrate the banning period of broilers movement after the announcing the presence of bird flu outbreak (mid February 2006) and the third after people began buying poultry products again.

Marketing margin results presented in Table 2 indicated that a significant difference in marketing margin occurred after the bird flu outbreak. The avian flu outbreak led to a fall of LE 0.68 per Kg (47%) in broilers marketing margin during the period 2nd Oct 2005-30th April 2006 compared to pre outbreak period. The outbreak further resulted in an average increase in marketing margin of LE 1.18 per Kg (153%) in post outbreak period compared to the period 2nd Oct 2005-30th April 2006. the average percentage share of the consumer value returned to producers decreased from 82.5% to 77.6% over the three time periods examined.

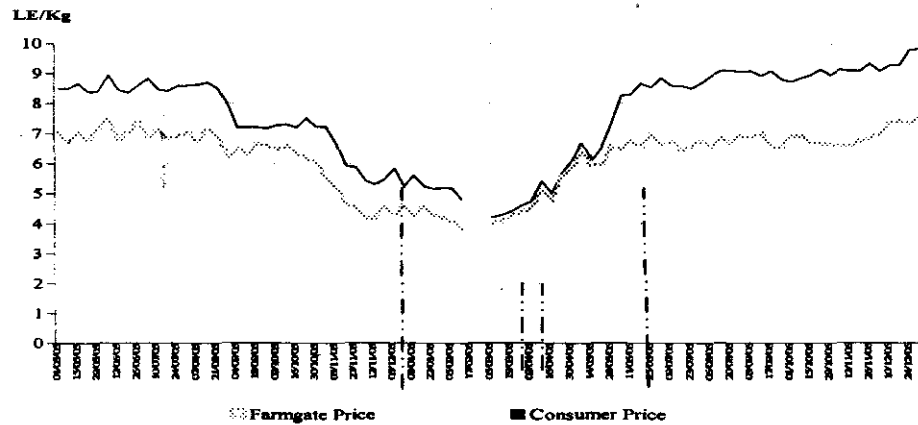
TABLE 2: AVERAGE BROILER PRICES, MARKETING MARGINS AND VALUE RETURNED TO FARM GATE DURING THE PERIOD 1ST MAY 2005-31ST DEC 2006

	Farm Gate Price LE/Kg	Consumer Price LE/Kg	Marketing Margin LE/Kg	Increase in Marketing Margin (per Kg of previous time period)	Increase in Marketing Margin (per Kg from pre outbreak period)	Consumer Value returned to farm Gate
Pre outbreak period 01/05/05 – 25/09/05	6.85	8.30	1.45	na	na	82.5%
During outbreak period 02/10/05 – 30/04/06	4.87	5.70	0.77	-0.68	-0.68	85.4%
Post outbreak severity period 07/05/06 – 31/12/06	6.75	8.70	1.95	1.18	0.50	77.6%

This period covers the early (02/10/05-16/02/06) and severe (17/02-30/04/06) stages of the outbreak.

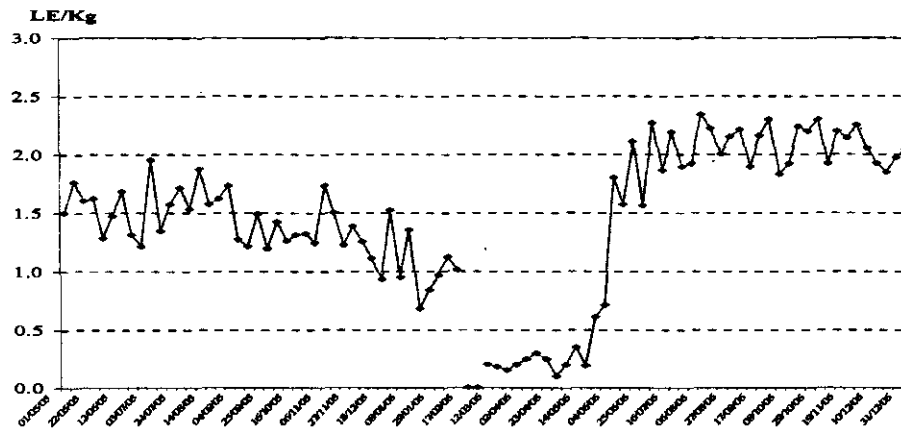
Source: Authors calculations

FIGURE 6: WEEKLY CONSUMER AND FARM GATE PRICES DURING THE PERIOD 01/05/2005-31/12/2006



Source: Compiled from (El-SawalhyH, 2006) and poultry stock market data

FIGURE 7: WEEKLY MARKETING MARGIN DURING THE PERIOD 01/05/2005-31/12/2006



Source: Authors calculation.

The significant increase in market margin of LE 0.50 per Kg following the outbreak announcement is not surprising and can be attributed to the combination of both demand side and supply side effects. There was a huge decline in the consumer demand for broilers leading to reduce demand for broilers at the farm gate. Consumers switched consumption from chicken to substitute meats i.e. beef, lamb and other poultry products. In addition to the demand impacts, the processing sector also incurred supply side effects via the costs of new regulations to reassure consumers of the safety of chickens.

Despite the fact that the avian flu outbreak led to reduced demand for chicken meat coupled with increased costs in the processing sector, the effects of the outbreak were largely restricting to supply side issues; particularly limitations in the market chain that led to increased marketing costs. This resulted from movement restrictions, particularly within infected provinces, as producers and abattoirs in these areas were restricted in their normal activities.

As argued by (Wilson and Kinsella, 2004), the above results show that the consequences of this were increases in the consumer prices and decreases in the farm gate prices during the outbreak, combining to raise the marketing margin (compared to the pre outbreak period).

5.1 COSTS INCURRED TO BROILER INDUSTRY

In order to develop plans of control and future eradication determining micro-level impacts of the disease is critical. There needs to be an understanding of the winners and losers in an outbreak situation in order to set policies and actions that will motivate all actors to become actively involved in a control campaign. In general, the impact of bird flu outbreak is generally felt throughout the poultry chain. Five major sectors could be identified in poultry production chain; supply industry, production, marketing, processing and consumers sectors.

In line with poultry industry classification (presented in Table 1), Table 3 illustrates the expected impacts of bird flu crises across production systems and general economy. Unsurprisingly, there are winners from this dramatic outbreak, such as vaccine producers and retailers, poultry meat

TABLE 3: THE IMPACT OF BIRD FLU OUTBREAK ON POULTRY PRODUCERS, PROCESSORS, CONSUMERS AND GENERAL ECONOMY

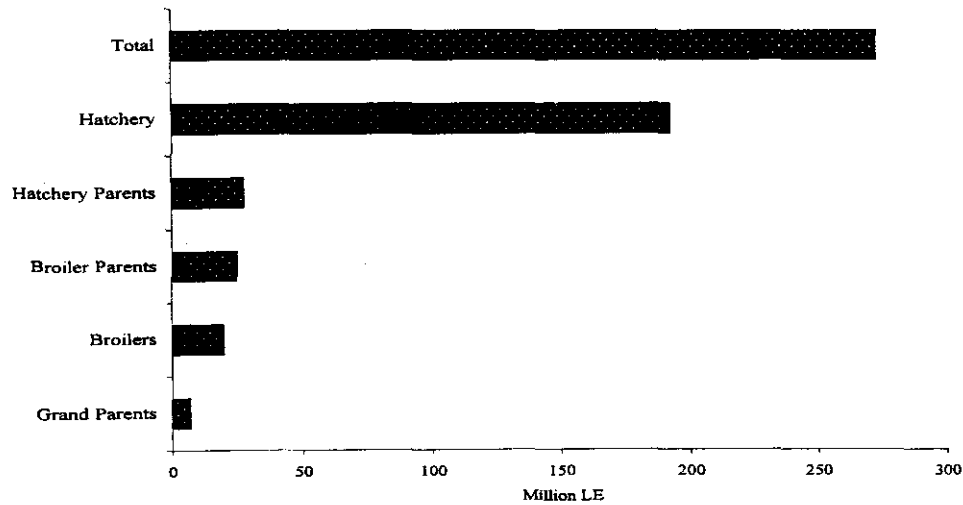
Part of the Industry	Heavy losers	Losers	Neutral	Winners
Supply Industry	• Feed industry	• Day old chick suppliers (assuming demand will be high after an outbreak has ended)	--	• Veterinary profession • Vaccine producers
Production	• Producers with high investments in fixed capital and loans (sectors 1 and 2 and possibly 3)	• Producers who lost poultry either by H5N1 or stamping out (all sectors)	• Producers who were not directly affected by H5N1 (all sectors, but particularly sectors 1 and 2) (assumes that the lack of a market is compensated for by higher prices after an outbreak)	• Beef, sheep and goat producers
Marketing	• Sole traders of poultry in areas badly affected by H5N1	• Sole traders in areas not directly affected by H5N1	• General traders of livestock	• Traders of other livestock
Processing	• Export orientated poultry abattoirs (sector 1)	• National supply poultry abattoirs	• General abattoirs	• Other livestock abattoirs
Consumers	• Urban poor	• Rural poor in areas affected by H5N1	• Rural poor in areas not affected by H5N1 • Urban medium and rich who can afford other protein sources	--
General	• People who have died and their families.	• Workers in poultry export industry (sector 1) • Workers in national poultry industry processing • Tourism industry	--	• Workers in other livestock Processing industries

Source: Rushton et al, (2005) p.3.

substitute (lamb and beef) producers. In contrast, poultry feed industries, producers and poultry traders are expected to be direct losers.

(El-Sawalhy, 2006) estimated the aggregate losses in some poultry sectors from nearly mid February to the end of March 2006, that resulting from destroyed (slaughtered or burnt) flocks by about LE 278 Million. However, the loss varies among different sectors. Figure 8 shows that, hatchery chicken sector have severely suffered (LE 193 Million), whereas grand parents sector burdened the least (LE 7 Million).

FIGURE 8: ESTIMATED POULTRY LOSSES DURING THE PERIOD 17TH FEB- 26TH MARCH 2006



Source: Data obtained from (El-Sawalhy, 2006).

Drawing back to results presented in Table 2, the outbreak marketing margin costs incurred to broiler industry can be proximally estimated during the period 17th Feb- 26th March 2006. The number of

destroyed broilers are converted to a tonnage and aggregated. Table 4 shows that the approximate cost to the broiler industry due to price differential effects on the marketing margin alone was about LE 3 million. However, it is believed that the loss is far higher than this figure, simply because not all the eradicated broilers were officially reported, in particular those for small producers and backyard systems. It worth mentioning that this cost excludes the loss incurred due to reduced demand following the bird flu outbreak.

TABLE 4: THE IMPACT OF BIRD FLU OUTBREAK ON MARKETING MARGINS OF BROILERS DURING THE PERIOD 17TH FEB-26TH MARCH 2006

Numbers destroyed	3,980,000
Average weight (assumed at 1.5 Kg)	5,970,000
Monetary value of difference in marketing margin due to bird flu outbreak	LE 2,985,000

Source: Authors calculations

Assuming the fall in farm gate prices (10 p/Kg) is attributable as a loss to broiler producers, and the rise in consumer prices (40 p/Kg) was incurred by the processing and consumer sector as increased marketing costs, the LE 3 million cost can be disaggregated. This results in an estimated loss of LE 0.6 million to broiler producers and increased costs of LE 2.4 million to the processing and marketing sector, albeit that the latter cost was passed on consumers via higher consumer prices i.e., ultimately a loss in consumer surplus.

6. RECOMMENDATIONS

However, the paper recommends the following: (1) Surveillance of poultry producers, in particular, smallholders, backyard systems and villagers where biosecurity measures are minimal. (2) Using the experience of monitoring and controlling such outbreaks, such as Bovine Spongiform Encephalopathy (BSE) and Foot and Mouth Disease (FMD) in the UK and Newcastle disease in South-East Asia. (3) There should be national database for registering the incoming and outgoing traded birds and poultry products. (4) In general, the poultry processing and marketing system should be restructured terms of encouraging the public and private sectors

in establishing modernized slaughterhouses and replacing poultry live marketing by a biosecured commercial system. (5) Increasing the public awareness of removing affected birds from the environment and encouraging human health campaigns in facing the outbreak

In line with (Rushton et al., 2005), when creating policies concerning strategy, the following should be considered: first, an integrated approach that gathers human and animal health, areas of agriculture and rural development, finance and planning, and economics. This cooperation should be on both the national and global levels. Second, there should be a balance of short and long-term solutions to control the disease at its source in the agricultural setting. Since the Avian flu is becoming epidemic in East Asia; it will need a strong effort to suppress. It is also possible that a human pandemic could still surface from a different strain of flu virus. Therefore, it makes sense to strengthen institutional, regulatory, and technical capacity of human health, animal health and other related topics. Third, even though an individual country or government may have adequate plans in place, it should be backed by global resources. Controlling a pandemic can be overwhelming, so countries experiencing the crisis are in need for help and support in handling the political, social and economic costs of the policy which benefits the global community, not just the people of that particular nation. Forth, using research to complete the knowledge base is essential as well as a way to share information with policymakers, the public, and experts are crucial.

7. CONCLUSION

During the last three decades the Egyptian poultry industry has grown rapidly. The major advances have been achieved through the introduction of tax incentives, governmental regulations and low interest credit. However, the bird flu outbreak in 2006 had considerable effects on the poultry sector and agricultural business industries. These effects include the mass slaughtering and marketing of poultry, temporary ban on poultry imports, establishment of technical task forces for surveillance and diagnosis communication and mass media control, movement control and limited compensation. In general, there have been major changes in the markets for poultry products, and also changes in the prices for other protein products. These changes have affected the marketing margins of

various poultry sectors. The paper estimated the costs incurred (due to bird flu outbreak) to broilers marketing margin during the period 17th Feb- 26th March 2006 at about LE 3 million. Broiler consumers and producers shared this loss (i.e., via increasing consumer prices and reducing producer prices) at the ratio 4:1.

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الأثر الإقتصادي لمرض انفلونزا الطيور على أسعار دجاج التسمين فى

مصر

د. أحمد صلاح الخولى د.حسن نبيه ابراهيم د. أيمن محمد أبوزيد

قسم الاقتصاد الزراعى - كلية الزراعة - جامعة المنوفية

فى السابع عشر من فبراير عام ٢٠٠٦ ظهر مرض انفلونزا الطيور فى كل من المنيا والقاهرة والجيزة، وانتشر بعد ذلك لىغطى معظم محافظات الجمهورية، الأمر الذى أدى إلى إتهيار فى صناعة الدواجن فى مصر، مما كان له الأثر السئ على قطاع الدواجن بشكل خاص والقطاع الزراعى بشكل عام، وعلى ذلك فإن هذا البحث يهتم بتحليل أثر هذه الكارثة على أسعار دجاج التسمين على مستوى المزرعة والمستهلك، وكذلك تحليل الهوامش التسويقية قبل وبعد حدوث الكارثة، وقد اسفرت للدراسة عن بعض من النتائج التى كان من أهمها أن خسائر قطاع دجاج التسمين نتيجة لتخفاض الهوامش التسويقية قدرت بنحو ٣ مليون جنيه خلال الفترة (١٧ فبراير - ٢٦ مارس ٢٠٠٦) أى نحو ٤٠ يوما فقط، وذلك على مستوى البيانات المتاحة. إلا أن هناك اعتقاد من الباحثين أن هذا الرقم أقل بكثير من الرقم الفعلى وذلك لعدم وجود حصر شامل للمزارع التى اصيبت بالمرض وايضا للمزارع التى تخلصت من إنتاجها نتيجة الإصابة بهذا المرض. وقد أوصت الدراسة للتغلب على بعض من مشاكل ظهور هذا المرض بالتوسع فى إنشاء للمجازر الآلية واحكام السيطرة البيطرية عليها مع منع تسويق الدجاج الحى بالاضافة إلى إنشاء شبكة معلوماتية ترصد مصادر إنتاج وتوزيع الدواجن فى مصر.

الكلمات الدالة : انفلونزا الطيور - دجاج لتسمين - مصر