Zoonotic disease risks and socio-economic impacts of industrial poultry production: review of the experience with contract growing in the United States of America

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SUMMARY

The model of food animal production in the United States of America, which is characterized by an industrial scale and organization, is currently expanding globally, particularly in Asia. The practice of contract poultry growing, in which firms contract out the raising of live chickens to independent farmers, is often a key component of this system. The poultry industry in the United States of America is highly vertically coordinated, and contract growing within this coordinated system reduces economic risk and costs to the firm (known as the integrator), and to some extent to the growers as well by providing the growers with market access for their products. However, contract growers assume the burdens of many of the costs as well as the negative health and social externalities of poultry production, including waste management, occupational and community health risks, implementation of farm-level biosecurity and socio-economic decline. The disparity in economic power between integrator and grower allows the integrator to outsource these externalities onto the grower, and exclude these negative by-products from their costs of production. In light of concerns regarding emerging zoonoses, particularly pandemic influenza, the potential consequences of this system for global public health are significant. A full understanding of experience in the United States of America with respect to the implications of the zoonotic disease risks and economic impacts associated with contract growing can inform policies aimed at reducing these risk factors in nations where the private sector is increasingly adopting a contracting model.

Key words: poultry, United States of America, model, contract
1 INTRODUCTION

Methods of food animal production affect consumer food safety, agricultural and national economies, and the environment. Despite growing awareness of the global implications of food animal production in terms of food safety, its effect on the health, economic and social wellbeing of rural communities is less frequently studied. Over the past 70 years, the production of animals for human consumption has undergone dramatic transformations in intensity, scale and geographic concentration. The poultry industry in the United States of America was the first sector in which rapid consolidation and vertical coordination occurred, starting in the 1930s, and this process has altered broiler poultry production from household-level enterprises to a high-throughput agribusiness on an industrial model. Today, this highly integrated and intensive nature characterizes the poultry industry in developed countries. Middle-income countries, particularly Thailand, Brazil and China, have witnessed a rapid industrialization of the production of food animals for domestic consumption and export in recent years, and these trends are expected to continue as demand for poultry increases around the world (OECD-FAO, 2006). These changes have clear public benefits, in that they facilitate the reliable production and delivery of low-cost animal protein to both domestic and global markets, providing improved quality control and the structure for rapid uptake of new technology. Along with these benefits, however, high-throughput animal husbandry has led to increased concerns about food quality, animal welfare, environmental contamination, cohesion of farming communities and the development of antibiotic resistance (Cole et al., 2000; Silbergeld et al., 2008).

Human contact with poultry, both at the household and the industrial level, is a clear risk factor for exposure to avian commensals that can infect humans, including bacteria such as Campylobacter spp., Salmonella spp. and Listeria monocytogenes, as well as viruses such as those causing avian influenza. Epidemiological analyses of human infections with the H5N1 strain demonstrate that close interaction with domesticated live poultry is a risk factor for human infection with the virus (van Boven et al., 2007; Babakir-Mina et al., 2007). Given challenges in animal-disease monitoring in areas with widespread household-level poultry production, coupled with difficulties in active human-health surveillance in most regions of the world, the industrialization of poultry production is viewed by some policy-makers as a way to reduce risk at this critical human–animal interface. Yet, recent H5N1 outbreaks in poultry in the United Kingdom and China, as well as a little-publicized outbreak of low pathogenic avian influenza in the United States of America in 2007, demonstrate how industrialized production poses distinct risks for cross-infectivity between wild birds and poultry, and reinforce how these risks are not prevented by standard biosecurity practices. This is because these large operations, while confined, are not inherently biosecure or bio-contained; the lack of adequate management of animal wastes and the transport of these and other by-product materials over long distances may, in particular, provide a major route of pathogen release and transfer.

The industrial poultry model often includes the practice of contract growing, in which firms contract the raising of chickens to independent farmers, who are responsible for the delivery of chickens of market weight back to the firm. The farmer is paid according to the acceptability and total weight of the finished product; he or she bears the costs of feed, energy, labour, and any loss of chickens over the growing period. Contract growing
is a central component of the industrial poultry model in the United States of America. The practice is being expanded by firms from the United States of America in other countries (e.g. Tyson in Mexico) as well as being adopted by local businesses in middle-income countries (e.g. Sadia in Brazil). Vertical coordination and contract growing in this industry are not driven by evidence that these methods decrease zoonotic disease risk, but by the economics of poultry production on a commercial scale.

The implications of contract growing for zoonotic disease emergence and the socio-economic sustainability of rural communities are not well understood. As industrial-scale contract growing is exported to the middle- and low-income nations, it is critically important to examine the consequences of this model for factors relevant to health, including the autonomy and economic solvency of contract growers, poultry workers and their communities. In this paper, we examine the potential consequences of the transition for zoonotic disease exposure and social decline, focusing on experience in the United States of America in order to highlight potential risks facing the developing world.

2 STRUCTURE OF THE POULTRY INDUSTRY IN THE UNITED STATES OF AMERICA

Industrial food animal production is defined by its high-throughput production methods, in which thousands of animals of a single breed are grown at one site under highly controlled conditions. The animals are typically raised in confined housing, provided with defined feeds rather than access to forage, and managed in order to facilitate the uniform and reliable production of meat, milk or eggs.

The transformation of poultry production in the United States of America over the past half century is characterized by vertical integration, vertical coordination and specialization. Vertical integration occurs when a single firm, known as an integrator, controls all or most aspects of production from “farm to fork”. Vertical coordination is an organizational structure in which the firm ensures that each production process is managed and coordinated, without the firm necessarily controlling all aspects of production. From a precise definitional perspective, the poultry industry in the United States of America is vertically coordinated, rather than integrated, as key functions (notably raising the animals) are contracted out; however, the firm in this structure is commonly referred to as an integrator, and we will use this term in this paper.

In the United States of America, a relatively small number of corporations function as integrators. Tyson Foods, Pilgrim’s Pride, Gold Kist and Perdue, together, produce 75 percent of the broilers sold annually by weight (USPEA, 2005). The poultry industry is highly specialized, with different firms dominating egg, broiler and turkey production. Specialization allows firms to enhance economies of scale by narrowing the range of products produced and streamlining operations. Moreover, a key characteristic in the organization of the integrated industry is that the integrator controls the slaughter and processing of animals into consumer products, thus maintaining economic control at the switch point from agriculture to the food industry. Because of this control, it is difficult for other entities, such as independent farmers, to enter the market.

The poultry industry in the United States of America currently produces nearly 9 billion broiler chickens per year (USDA, 2005). The industry observed staggering increases in pro-
duction and density over the last half century. In 1954, there were no broiler poultry farms in the United States of America with more than 100,000 birds. By 1974, 30 percent of farms had 100,000 birds or more, and by the middle of the 1990s, nearly 100 percent of broiler facilities housed more than 100,000 live birds at a time (Hinrichs and Welsh, 2002). Broilers are the single largest commodity among poultry products, accounting for US$20.9 billion of the US$28.8 billion revenue from poultry in 2005 (USDA, 2005). Poultry production in the United States of America is highly concentrated along the eastern seaboard and in the southeastern states, with nearly 70 percent of total value from poultry generated in the Northeast, Appalachia, Mississippi Delta and the Southeast. Figure 1 depicts dominant regions for poultry and egg production in the United States of America.

The localization of poultry production in the United States of America is independent of major markets or population centres. The ability to absorb costs, including energy, associated with transporting poultry products from these concentrated areas to major market centres speaks to the vast economies of scale derived from consolidation. Consumption of broilers has increased dramatically in the United States of America, coinciding with the coordination of the industry, even as demand for other meat products has remained stable (Figure 2).

FIGURE 1
Value of poultry and eggs as a percentage of total market value of agricultural products sold in the United States of America in 2002

Source: United States Department of Agriculture. (http://www.nass.usda.gov/research/atlas02/).
This transformation in organization and density of production affected the workforce involved in food-animal production and the nature of this work in the United States of America. Grey et al. (2007) estimate that at present there are 54,000 poultry and pig workers in the United States of America, of which 10,500 work in broiler confinement facilities (Gray et al., 2007). This represents a substantial decrease in the numbers of farmers and farm workers, while the numbers of processing plant workers has increased. On the farm, the growers manage and tend to flocks, usually with the help of hired labour and family members. Chicken catchers, who are contracted or employed by the integrator, harvest live chickens from the growers’ facilities at the end of the six-week growing cycle. The remaining workers in the industry work in processing facilities.

3 CONTRACT GROWING: A MODERN “SHARECROPPING” MODEL

Growers play a unique role in the system in that they are responsible for mitigating important health and environmental risks, but are outside the direct employ of the integrator. Contract growing became commonplace in the United States of America soon after mid-century. By 1960, 90 percent of broiler production occurred through contract growing (Welsh, 1997). Integrators breed the parent stock, produce and hatch eggs, provide chicks, feed and veterinary care (including antibiotics and other additives). Growers provide chicken houses, labour, utilities and operating and maintenance costs. Growers are responsible for the disposal of animal wastes and dead birds, as well as cleaning and sanitizing their facilities. Notably, growers are also responsible for many of the costs associated with the implementation of biosecurity measures at the farm level. Growers often, but not always, own the land on which animals are raised, but they do not own the animals. Integrators retain ownership of the animals throughout the growing process and have full access to the

![Figure 2: Per capita consumption of chicken and pig meat in the United States of America, 1990–2005](image)
contract growers’ facilities. In essence, the grower’s product is his or her labour and capital investment, not the animals he or she raises. The system is reminiscent of sharecropping, an agricultural system common in the southern United States of America in the second half of the nineteenth century, in which the farmer sells his or her labour, and works land owned by others, in exchange for a share in the profits determined by the firm to which he or she is contracted. Sharecroppers of this period, like poultry growers, did not sell directly to the consumer market and, therefore, could not adjust directly to market demands.

Integrators set the criteria for raising chickens in the contract, which requires chicken houses to be built to precise specifications, including stipulations for design, construction, ventilation, heating, cooling and lighting systems. Broiler growers typically build at least four houses on their property, each holding between 25,000 and 70,000 birds, and some build as many as 16 (Stull and Broadway, 2003). In fact, one of the incentives to grow poultry rather than other animals or crops is that return per acre of land is relatively high and labour inputs are relatively low for an agricultural investment. However, the costs are considerable, and growers may borrow as much as 110 percent of the cost of construction over 10–15 year loans. A contract with an integrator makes it easier for growers to secure loans (Stull and Broadway, 2003). Start-up costs per growing house average US$170,000, and new growers entering the industry often face costs up to US$600,000 for multiple houses (Cunningham, 2005).

The production contracts also specify payment in terms of weight of acceptable live broiler produced at the end of the growing period. However, this payment is reduced by the cost of feeds required to bring the flock to market weight, and the grower bears the costs of the time taken to reach market weight in terms of energy and labour costs (hiring workers). Specifics of grower contracts differ by integrator, but most are structured using a “tournament scheme” in which a component of payment is based on the relative performance of a given grower. For the tournament component of payment, growers are rewarded or penalized based on their feed conversion rate (the amount of feed required to produce the weight of acceptable broiler at the end of the growing period) in comparison to that of a comparable group of growers contracted with the same integrator during that same harvest period. Contracts also generally include a minimum guaranteed payment per pound of saleable meat (currently about 5 cents/pound). Contract duration varies in length, but most are very short term and only cover a single flock at a time (about six weeks) (Vukina and Leegomonchai, 2006). Contracts generally do not guarantee the number of flocks the grower will receive per year (Vukina and Leegomonchai, 2006). These conditions give considerable power to the integrator.

Growing contracts provide clear benefits to integrators. They allow integrators to maintain control of the stages of production most critical in maintaining the link between demand and supply and safeguard them from a central form of uncertainty in the poultry production process: the actual rearing and survival of marketable chickens. Tournament payments reduce the cost of contracting to the integrator and allow the integrator to pass on some of the market-based uncertainty to the grower. This structure also rewards technical efficiency among growers, to the extent possible given integrator specifications, promoting

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1 1 pound = approximately 0.45 kg.
efficient use of feed, antibiotics, energy and labour inputs (Knoeber, 1989). Contracting also allows integrators to accommodate new technology into production practices without incurring significant costs (Vukina, 2001). Costs associated with waste management are also shifted to the grower, allowing the integrator freedom to increase production density with reduced concern for constraints posed by disposal of animal wastes. Importantly, contracting allows integrators to avoid the costly capital investment of building and maintaining chicken houses. Modern high-density poultry houses are highly specific assets, meaning that the design and financial investment associated with facilities renders use for a different purpose difficult, if not impossible. Growers absorb the risk associated with this specific asset, effectively binding them to poultry production under contract to the integrator that stipulated the specifics of house design and management. The location of the growing facilities in close proximity to a particular processing plant and feed mill may also bind a grower to a specific integrator, as can construction and maintenance specifications that vary among firms, making it difficult for a grower to switch integrators (Vukina and Leegomonchai, 2006). Additionally, the integrator may request frequent upgrades and technological improvements to poultry houses as a condition for contract renewal (Vukina and Leegomonchai, 2006). Due to their substantial personal investment in highly specialized chicken houses and a scarcity of other economic opportunities in the region, contract growing creates an uneven economic dynamic that disadvantages growers (Knoeber, 1989; Vukina and Leegomonchai, 2006).

Contracting also has benefits for growers, and these relationships are entered into voluntarily. Contracting has the central benefit of ensuring the growers a market for their products during contracted periods and alleviating cash-flow problems (Vukina, 2001). As noted above, the intensive methods of broiler production reduce the labour costs for farmers. Additionally, contract growing provides an opportunity for farmers to maintain a rural, agricultural lifestyle despite national declines in the numbers of small farms, especially in the traditionally agricultural regions of the southern United States of America. Despite these benefits, however, many contract growers express significant discontent about relationships with integrators. A 1999 survey of 1 424 contract growers in ten states found the tournament scheme, in particular, to be a source of considerable grievances (Farmers’ Legal Action Group, 2001). Nearly half the growers believed that the tournament scheme provided poor incentives for hard work. Seventy-eight percent of growers responded that their pay depended more on the quality of the inputs provided by the integrator (chicks, feed) than on the quality of their own work. Grower distrust of the integrator’s measurements was also a significant issue in the survey. One-third of respondents expressed confusion regarding their post-harvest settlement sheets, and growers also expressed mistrust about the accuracy of feed weighing, the prompt weighing of birds at the processing facility, and higher than expected condemnation rates at processing. One-third of respondents reported that they are sometimes or often left without birds long enough to cause financial hardship. While 75 percent of growers in the survey believed that broiler growing had been a good decision for them, only 35 percent would encourage others to enter the business.
4 CONTRACTING: SHIFTING THE BURDENS OF POULTRY PRODUCTION

From a financial perspective, as discussed above, contracting allows integrators to maintain equity in the product and control over its production and quantity, while shifting some of the risk involved in the variability of producing live animals to the contractor. From a public-health vantage point, contracting results in a transfer of the health risk associated with intense exposure to live animals and their wastes from integrator to grower, and, in the absence of regulatory controls, ultimately to the public. This phenomenon is the central focus of this paper.

We highlight five negative externalities of contract growing that are relevant to public health: 1) waste management; 2) occupational exposures to, and human infections with, zoonotic pathogens; 3) peri-occupational and community exposures to these pathogens; 4) decline of rural communities; and 5) farm-level biosecurity. High-density animal production is associated with a host of other risks to occupational health (Gray et al., 2007; Donham et al., 2007) and community well-being – from respiratory disease to odour pollution (Cole et al., 2000; Warner et al., 1990; Wing and Wolf, 2000). In this paper, we focus on specific risks for zoonotic disease emergence that arise from the outsourcing of negative by-products of production from integrator to grower.

4.1 Waste management

The United States Department of Agriculture (USDA) estimates that confined food animals produce approximately 303 million tonnes of waste per year, which is more than 40 times the mass of human biosolids generated annually (Agricultural Research Service, 2007). It is estimated that the 9 billion broiler chickens grown annually in the United States of America produce between 12 and 23 billion kg of waste annually (Nachman et al., 2005). The management of animal wastes and the disposal of dead birds is the sole responsibility of the grower.

Unlike human wastes, animal manure is subjected to few regulations regarding treatment and none for disposal. Ninety percent of poultry litter (which includes excreta, spilled food, dead animals, and the layer of sawdust or other material spread on the floor of the poultry house) is applied to land, or stored in heaps until it is applied to land or transported off the farm (Graham, 2007). The lack of regulation regarding the treatment of animal biosolids is surprising, given that animal waste often contains levels of pathogens higher than those found in human faeces. Many enteric organisms can survive for long periods of time, from days to months, in manure and wastewater (Nicholson et al., 2005; Guan and Holley, 2003). Bacterial pathogens such as Campylobacter spp, Salmonella spp, Brucella spp, Clostridium perfringens and Listeria monocytogenes can be present in fresh poultry manure at high levels, and infectious doses are observed even following holding on site (Cole et al., 2000). Additionally, viral persistence in poultry manure poses risks of exposure to zoonotic viruses. Infectious titres of avian influenza virus have been recovered from the manure of infected chickens for up to three weeks (Lu et al., 2003), and methods of storage and transport of manure are hypothesized to be potential sources of spread of zoonotic agents (Gilchrist et al., 2006).
4.2 Consequences for occupational health and illness
Growers, catchers and their families experience exposure to zoonotic pathogens from direct and indirect occupational contact with live birds and poultry manure. Among these populations, exposure to viral and bacterial pathogens may result from working in the confinement house itself, handling live chickens, cleaning the confinement house or transporting animal waste. Potential exposure pathways include inhalation and ingestion of dusts (inside and near to the poultry house), exposure from lacerations, eye exposure and cross-contamination of drinking water on the farm. In the United States of America, the agricultural workforce in food animal production is not unionized (except for processing-plant workers in some cases) and is not provided with clothing or other personal protective equipment when entering the poultry house. There are typically no cleaning and hygiene facilities provided to these workers.

Occupational exposure to broilers has been shown to increase risk of infection with enteric bacteria, including enterococci (van den Bogaard et al., 2002) and *E. coli* (Price et al., 2007) and *Campylobacter jejuni* (Wilson, 2007). Poultry workers on the Delmarva Peninsula were shown to have 32 times the odds of carrying gentamicin-resistant *E. coli* and five times the odds of being infected with a multidrug resistant strain of *E. coli* compared to community referents (Price et al., 2007). In an experimental study, Ojeniyi (1989) inoculated chickens with an introduced strain of *E. coli*; poultry workers in contact with these birds were quickly infected by this strain. The implications of zoonotic bacterial infection are clearly intensified by the presence of antibiotic-resistant strains, which complicate treatment and may prolong illness.

Confinement workers and growers also have elevated exposure to zoonotic viruses, and this is of clear concern in relation to viral re-assortment and the development of human–human transmissible strains of influenza viruses. An analysis of human infection with H5N1 in Hong Kong SAR during the 1997/1998 outbreak found that occupational tasks involving direct contact with live poultry were a statistically significant risk factor for seropositivity (Bridges et al., 2002); in fact, only those occupational tasks which involved handling live poultry were associated with increased risk of infection. A study of the H7N1 outbreak in the Netherlands in 2003 indicated that the highest rates of human seroprevalence were among individuals with occupational contact with poultry, including cullers, veterinarians and farmers (Koopmans et al., 2004). Puzelli et al. (2005) reported serological evidence of avian-to-human transmission of both high- and low-pathogenic strains of H7 in Italy. Together, these observations indicate that occupational exposure to industrial poultry production, through growing and working with live poultry, poses a distinct and significant risk of infection with avian influenza viruses.

4.3 Peri-occupational and community exposure
While growers and poultry workers themselves experience the most direct contact with live poultry and are at highest risk of exposure to zoonotic disease, their families and communities are also at elevated risk of exposure and subsequent infection. More research is needed to fully depict the peri-occupational and community infectious-disease risks from confinement facilities, but recent analyses indicate ample reason for concern, particularly for influenza transmission (Graham et al., 2007; Gray et al., 2007). In an analysis of the H7N1
outbreak in the Netherlands, Fouchier et al. (2004) identified H7 seroprevalence in members of farm workers’ families, indicating that peri-occupational pathways of exposure are viable for influenza viruses (Fouchier et al., 2004). Fey et al. (2002) documented the case of a farm child infected by ceftriaxone-resistant salmonella and Gupta et al. (2003) identified indistinguishable isolates of ceftriaxone-resistant salmonella in cattle and farm communities. Transmission of methicillin-resistant Staphylococcus aureus to families of pig farmers has been reported in the Netherlands, with molecular methods confirming the clonality of human and pig isolates (Huijsdens et al., 2003). These studies imply that farm families and communities are a population at elevated risk of infection with farm-based zoonotic pathogens.

Furthermore, exposure among farm communities to drug-resistant bacteria from confinement houses is of significant concern for public health. The presence of pathogens and drug-resistant pathogens has been documented in air and water near to these facilities. Poor waste-management practices contribute to the spread of antibiotic-resistant bacteria in the environment near food animal production facilities (Chapin et al., 2005; Sapkota et al., 2007; Anderson and Sobsey, 2006), putting community members at increased risk of exposure to drug-resistant strains through air and water pollution. The geographic concentration of industrial food animal production intensifies the impacts of these exposures for farm communities (Silbergeld et al., 2008).

The economic burdens associated with treating zoonotic illnesses, particularly drug-resistant infections, among farmers and their families are also significant. In the absence of national health-care resources in the United States of America, the costs associated with these illnesses (including lost work time and any treatment) are largely borne by the grower or the workers. As contract employees, growers generally receive few, if any, health benefits from integrators, which may result in reduced access to primary care and delayed identification and treatment of disease. Farm-based practices to reduce grower exposure to zoonotic agents, such as the purchase and use of personal protective equipment, are also the sole financial responsibility of the grower. In these ways, the health conditions and health-care costs that result from continuous exposure to a high density of live chickens in a confined environment – an exposure required by the very nature of contract growing for a broiler integrator in the United States of America – remain an externality of production, borne not by the integrator but by the grower and the community.

4.4 Investments for biosecurity

Farm-level biosecurity is critical in reducing opportunities for the transfer of pathogens among birds and between poultry and humans. In a vertically coordinated system, integrators can set company-wide biosecurity standards and guidelines for growers to follow. However, these standards often entail additional costs for the grower – including the purchase of new equipment, disinfectant, or structural adjustments – for which the integrator does not provide financial compensation; this reduces incentives for compliance or maintenance of equipment. In the event of an outbreak, growers may experience significant financial losses from culling or flock loss. Compensation schemes typically exclude direct payment to contract growers (World Bank, 2006), despite the fact that both integrators and growers have invested resources into the flock. In the United States of America, the United States Department of Agriculture (USDA) and states pay integrators up to 75 per-
cent of the appraised value of the flock lost to HPAI. Integrators are encouraged, but not required, to compensate the growers for their losses on the basis of what they would have earned had the flock not been culled (Ott and Bergmeier, 2005). Yet, given the low profit margins in the industry, the established level of compensation is generally not high enough for integrators to cover their own losses as well as those of growers. Costs associated with depopulating and disinfecting growing houses, as well as with waste management, in an outbreak are not included in the compensation scheme, and are borne entirely by the grower. Compensation schemes are intended to provide incentives for the early reporting and culling of infected animals to prevent disease spread. Strategies that fail to acknowledge the full financial investment of growers may have the effect of discouraging the early and complete reporting they were designed to facilitate.

4.5 Economic impacts of contracting: social justice concerns
There are also significant economic impacts of industrial poultry production at the community, and even regional, level. These operations often bring increased investment in the local communities in which the industry is based, including jobs, tax revenue, and road and utility infrastructure. These local benefits can be significant, especially in low-income rural areas, and for this reason are often welcomed by some individuals in local communities. Across the agricultural sector, however, concentration and industrialization is associated with economic and community decline (MacCannell, 1988) as well as decreased tax receipts and local purchases (Foltz et al., 2002; Durrenberger and Thu, 1996). Property values have also been observed to drop after a confinement house locates in a community (Abeles-Allison and Conner, 1990).

Most importantly, individual benefits in terms of profits are relatively low. Poultry growers do not earn significant profits through contract relationships. Growers invest approximately 50 percent of the capital necessary to produce broiler chickens, but earn less than 3 percent of returns on the investment (Morison, 2007). In the 1999 grower survey, 75 percent of growers in the study made less than US$30 000/year from broiler production, and 45 percent made less than US$15 000/year (the federal poverty standard for a two-person household in 1999 was US$17 029/year) (Saenz et al., 2006). According to the survey, the majority of growers earn 50 percent or more of their income from broiler production. Additionally, more than half of survey respondents took on US$100 000 or more to finance the operation, and 52 percent still owed 75 percent or more of the total farm debt (Farmers’ Legal Action Group, 2001).

Growers blame lower than expected income on poor chick quality and higher than expected operating costs. From 1980 to 2002, poultry growers experienced an increase in building and equipment costs of more than 200 percent (Cunningham, 2005). Variable costs associated with fuel, electricity and labour – all the sole responsibility of the grower – have also increased in recent years. Yet, integrator payments to growers have not kept pace with these increasing fixed and operating costs; over a 22 year period, base payments per pound increased by only 54 percent, from 3.3 cents in 1980 to 5.0 cents in 2002 (ibid.). Simply adjusting for inflation, 3.3 cents in 1980 would be worth 7.0 cents in 2002; this calculation highlights that grower payments have actually decreased in value as they have not kept pace with baseline inflation (US Department of Labor, 2007).
Financial challenges are only one of the issues facing poultry-growing communities. In the United States of America, one reason for the geographic location of poultry production is related to community empowerment: the siting of confined animal facilities is disproportionately in non-white, low-income communities, who may not have the political or economic resources to resist the industry or mitigate its health and environmental consequences (Wing et al., 2000). Confinement houses are more likely to be located in communities with high percentiles of African Americans or persons living in poverty (Wilson et al., 2002; Ladd and Edward, 2002), and near low-income and non-white schools (Mirabelli et al., 2006). As a consequence, the presence of confinement houses negatively impacts already tenuous social capital, causing rifts and social gaps between independent and contract farmers, and antagonism and hostility directed towards supporters and opponents of industrial food animal production (Wright et al., 2001). These studies strongly suggest that the practice of contract growing has important negative implications for both equity and community cohesion, which are independent factors in community health.

5 POLICY IMPLICATIONS

Industrial poultry production brings clear benefits to consumers through reduced prices, and greater security and availability of food products. Yet, the negative public-health implications of poultry production are largely externalized from the production costs faced by integrators. The practice of contract growing facilitates the outsourcing of negative externalities onto growers, poultry workers, local communities and the general public. As contract growing becomes more commonplace in the middle- and low-income nations, attention must be paid to these negative externalities. These practices have local impacts on the health and economic survival of farm communities as well as critical implications for global disease emergence. Contract systems require specific policies in order to mitigate these local, national and global risks.

Policies regarding the treatment and use of animal waste, based not just on nutrient balance, but also on pathogen levels, are imperative in reducing the environmental and health risk caused by exposure to animal waste. The geographic concentration of industrial animal production in rural and peri-urban areas in the developing world, which have high population density and limited public-health surveillance and environmental monitoring, intensifies the need for regulations for the treatment of animal waste in these areas. Waste-management strategies must also consider the liability of the integrator for the by-products of production. Liability strategies that fall solely on the resource-constrained grower may contribute to mismanagement of animal waste and limit incentives for innovations in waste-treatment technologies. Strategies that provide financial incentives for the development of inexpensive, on-farm waste-treatment technologies that reduce pathogens below infectious levels should be a central priority of municipal and federal governments.

Improving occupational health among growers and their communities is another area in which policy action is required. At the farm level, growers, farm workers and their families internalize risks to personal health from exposure to zoonotic pathogens, which may be amplified due to the density of animals within a confined facility. In the absence of employer- or state-sponsored health care, this is both a health and a financial risk. Regulatory standards should mandate the use of personal protective equipment (including goggles,
gloves, aprons and boots) to shield growers and poultry workers from zoonotic-disease exposure. Policies that include growers in health-care programmes, through employer- or state-sponsored systems, can mitigate the financial burden on growers and local communities and reduce disease transmission within farm communities.

Health-care services for contract growers and farm communities are also necessary to provide front-line surveillance for emerging zoonotic diseases. However, in the United States of America, these communities are among the least likely to be served by accessible health-care resources. Active surveillance of poultry-worker and community health is a vital component of public-health policy in nations with industrial animal production; the lack of health surveillance among growers, poultry workers and their families represents a critical missing link in plans for preventing pandemic influenza (Gray et al., 2007). Public-health resources should also be devoted to monitoring the health of these workers, even those who are undocumented, so that emerging diseases are identified quickly. Given that both integrators and the public benefit from intensive animal production, community health monitoring provides a potential opportunity for public/private partnerships that can involve private corporations, governments, universities and non-governmental organizations.

Farm-based biosecurity standards, as well as compensation schemes, must be designed to include consideration of the burden on contract growers, to ensure both fairness and effectiveness. One of the most obvious gaps in this respect is the current practice of compensation for flock-loss associated with outbreaks, which does not include direct payment to growers, but, like a bankruptcy claim, considers the grower as a party of last resort. Since growers are the most closely involved with chickens on a daily basis, fair compensation schemes reimbursing growers are vital in setting incentives to report infected birds quickly. When compensation schemes exclude direct payment to contract growers, this provides perverse incentives with respect to halting emerging diseases. Similarly, costs associated with implementing biosecurity plans should be shared between integrators and growers – acknowledging the shared investment in the flock.

Addressing the socioeconomic impacts of contract growing is a challenging issue that requires regulatory, legal and non-governmental approaches. Zoning that limits geographic concentration of industrial food animal facilities, based on human population density, regional infrastructure or environmental carrying capacity could reduce community decline and also impart environmental benefits. Such measures could also reduce the ready movement of pathogens, including viruses, among animal houses. This movement can occur by airborne movement of dusts and aerosols, as well as by vector-transport via insects, small rodents, and wild birds that enter and leave poultry houses that are not completely biosecure. There are also specific suggestions regarding limiting the proximity of poultry and pig houses in order to reduce the possibility of viral mixing of influenza strains (Saenz et al., 2006). Laws to strengthen contractor rights within negotiations and ensure fair payment schemes can protect workers, and non-governmental organizations play an important role in improving contract conditions for growers.

The experience with contract growing in the United States of America provides important insights to developing nations who adopt this practice as a component of industrialized poultry production. Contract growing imposes significant health and economic risks on growers and farm communities, as well as the general public. Public health and agricultural
policies must consider factors specific to the contracting relationship and the externalities of industrial poultry production in order to successfully mitigate these risks.

REFERENCES


