China's Pig Problem

The Need for Increased Sustainability in China's Pork Industry

November 30, 2018
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Introduction to the Chinese Pork Industry

Thanks to massive leaps in its economy and major policy reforms, China has gone from famine stricken to now commanding some of the world's most predominant food markets. From seafood to red wine, the changing culinary landscape of China is shaped by ancient tradition and Western influence. Yet in this time of change, there is one food item that has maintained its reverence with the Chinese palate: pork. In 2016, China consumed 65.6 million tonnes of meat, with 40.8 million tonnes being pork. (Agri-Food Canada, 2018). China is also the world's largest producer and importer of meat, with pork unsurprisingly comprising the lion's share (Agri-Food Canada, 2018). Pork is the meat of choice for Chinese due to the deep historic and cultural significance of the pig. The Chinese were among the first to domesticate wild swine some 10,000 years ago (Bourne, 2016). Over history pigs have been important food and waste disposal systems for households-the Mandarin character for "home" contains a pig (Bourne, 2016). They are part of the zodiac calendar, folk legends, traditional rituals and much more (Bourne, 2016). Pork is so important in China that the country set-up a national pork reserve in 2007, where the government can strategically buy live and frozen pigs from farmers in times of low prices, then release inventory in times of high prices (Kemp, 2013). The reserve stabilizes the market and ensures supply like other reserves for precious commodities like the United States' strategic petroleum reserve (Bourne, 2016). Surprisingly, in recent years pork demand has slightly decreased due to a variety of factors such as a rise in healthier eating habits, but still the Chinese pork industry remains a juggernaut (Huang, 2017). Accompanying the industry however are a range of sustainability issues that threaten China's environment as well as the industry's capacity for sustained production. To protect the environment and ensure the pork supply remains robust, current issues with the industry's sustainability need to be addressed.

Problems

China's agricultural situation is interesting, as it is caught between two worlds: traditional vs. modern, small-scale vs. industrial. More than half of China's nearly 700 million pigs are raised on smaller-scale, family-owned farms that slaughter less than 500 pigs a year (Patton, 2018). The rest of the pork is produced in industrial style pig farms, a system the Chinese government encourages. The industrialization of agriculture is a theme that is pushed on many of China's agricultural fronts in efforts to address food safety issues, environmental problems, and to increase efficiency. However, in doing so China has opened another can of worms, with the well-known issues that accompany industrial livestock farming. Additionally,

as the world's largest pork importer, China's appetite has been taking a toll on the countries it imports from. To feed the beast (quite literally), China also needs to import vast quantities of grain to feed their domestic pigs, resulting in a slew of environmental issues for feed producing countries.

Algae growth from nutrient pollution in Dianchi Lake, water pollution from agriculture is a major problem in China (Chiu, 2018).

Domestic Production Issues

In China, both small-scale and industrial pig rearing systems present a variety of environmental and biological issues that threaten sustainability. Small-farms are particularly vulnerable to sustainability concerns as some adopt unsustainable practices to meet rising demand and increased competition. Additionally, societal marinization and inequalities in rural China often result in small farmers lacking the necessary tools to increase sustainability in their operations.

The environmental issues with pig production in China are widespread but not unique. It's the same tales of water, soil and GHG pollution like in other countries. And while all are serious, let's look closer at the water problems, an issue that has been wildly publicised in China. Cultural eutrophication due to fertilizer runoff and manure are causing lakes in China to experience algae blooms, as algae overrun the nutrient enriched water (Chiu, 2018).

A survey published in *Environmental Research Letters* in 2016 found that in 2000, 30% to 70% of manure was dumped directly into rivers during the

time when the country was expanding the size of farms (Chiu, 2018). Interestingly, before 1970 when most farms where single family owned, only 5% of manure was directly dumped into rivers (Chiu, 2018). This is because traditional farms used far more manure as crop fertilizer, while industrial farms dump large quantities directly into water bodies as waste (Strokal, 2016). Despite the government's claims of improved environmental protection that industrializing pork production would bring, it seems like there are still many issues with the process. Despite more industrialization, agriculture related water pollution persists. In 2013, around 16,000 dead pigs washed up in Shanghai along the Huangpu river with some of the corpses infected with *porcine circovirus* (Chiu, 2018).

Dead pigs being taken away in Shanghai (Keyu, n.d).

Events like this are not only public health risks, but also pose as a serious threat to water security. As according to the China Geological Survey, 90% of underground water already has some degree of contamination, with more than 60% suffering severe contamination (Zhang, 2013).

The Chinese government has been reluctant to impose strict regulations on small farms that can't afford them, and would rather see the farms become absorbed by a large industrial model (Chiu, 2018). Yet even the intensive industrial pig farms that Chinese government have been so keen on, are falling short in their promises of better waste management. Industrial farms do not always manage waste sustainably, even if they have the capacity to. For example, companies may opt out of using their industrial converters that turns manure to fertilizer, as the cost to run the machines is more than the profit from the fertilizer (Chiu, 2018). Pollution from both small and industrial farms can be seen as results of distrust and government corruption, leading to poor compliance and weak enforcement of environmental regulations (Chiu, 2018).

The state of pig farming not only threatens the environment, but also the industry itself due to widespread practices that are increasing disease risks in the pigs. Both small and industrial farms in China have been known to overuse antibiotics in pork production, which increases the risk of disease resistance. In efforts to compete in an increasingly more competitive market, small-scale farmers have turned to antibiotic use for help.

In a study done in Funing County with 654 pigs farms, it was found that 68% admitted to using veterinary antibiotics that violated regulations, 55% overused antibiotic and 24% went so far as to use human antibiotics on their pigs (Chen, 2018). Much of this inappropriate antibiotic use was due to a lack of education among small farmers whom are generally older and don't comprehend the complex consequences

resulting from antibiotic misuse (Chen, 2018). In the study, 59% of the farmers surveyed had an education level at or below primary school, and 28% had a junior high school education level (Chen, 2018). While education problems and the struggle to make ends meat are the reasons for antibiotic overuse with small farmers, antibiotic use is a definitive feature of industrial livestock operations.

Due to the cramped living conditions of industrial farms, which can crowd thousands of animals in enclose areas, antibiotics are practically essential in ensuring growth and survival (Collignon, 2015).

The cramped conditions of factory farms make them a hotbed for disease growth and transmission (Badkar, 2013).

In addition to already being the largest consumer of antibiotics for livestock, recent modelling suggests that between 2010 and 2030, China is set to increase its use of antibiotics by 99% (Collignon, 2015; Van Boeckel, 2015)—a scary statistic considering the negative effects of antibiotics overuse are already present in China.

Overuse of antibiotics can lead to the accelerated development of antibiotic resistant bacteria and 'superbugs'. Colistin is a key antibiotic that is important for human health worldwide. However, it is widely used in Chinese livestock, with China being the world's largest user of the antibiotic (Liu, 2018). In 2013, there was found to be *E. coli* with colistin resistance genes at a Shanghai farm, pointing for the need of better antibiotic practices in China (Liu, 2018). The rise of a superbug can be detrimental to entire industry and threaten China's ability to produce pork. A farm can't be sustainable if all the animals die.

Foreign Production Issues

As the world's largest producer and importer of pork, China has great influence on trading countries. This influence is also not only limited to developing countries who are often the victims of industry outsourcing. Even the U.S. is affected by the Chinese pork industry; the U.S.' largest pork producer Smithfield Foods is now Chinese owned (Clark, 2018). Other countries involved are Argentina and Brazil, as they are important soy suppliers for China's pig feed (Schneider, 2011).

The U.S. has been a key figure in supplying China's pork. The $7.1 billion purchase of Smithfield Foods by Chinese conglomerate WH Group was the largest-ever foreign takeover of its kind (Clark, 2018). There have been concerns about the environmental impacts more pork farming will have in the US, as well as the practices being used. Smithfield Foods has been alleged to have fed illegal chemicals to its pigs and has a record of environmental problems (Clark, 2018).

In the southern states where pork production is greatest in the US, there are already a multitude of environmental

concerns (Clark, 2018). In Duplin County, North Carolina, the country's top hog-producing county, 15,700 tons of waste is generated by the pigs daily (Clark, 2018). To store this waste, open-air lagoons with millions of gallons of waste are kept behind the barns which pose a great threat to the surrounding environment and the sounding population of 160,000 people (Clark, 2018). The region even experiences flooding from the lagoons due to hurricane hits in the area (Clark, 2018). Duplin County is just one example of one of the areas in the U.S. that is directly affected by the Chinese pork industry. While Chinese interest hasn't created these risks or unstainable rearing methods, the demand for more U.S. pork would exacerbate these existing concerns.

Flooding of manure lagoon after Hurricane Matthew in North Carolina (Charles, 2016).

The US, among other pork producing countries like Canada, is a country from which China can outsource all of the dirty and unsustainable parts of pig farming while reaping the benefit of clean, quality pork (Clark, 2018). Ironically, this is what many countries like the U.S. do to China in other industries.

When it comes to producing feed for China's hogs, cash crops such as soybeans from countries like Argentina and Brazil have been key. In fact, 60% of all soybeans grown worldwide are exported to China with an expected annual growth of 5-8% (Nesbit, 2018). To meet this demand, countries have been cutting down their forests to make way for more soybean fields. (Yu, 2015).

Soy field in Mato Grosso, Brazil encroaching on forest (Butler, 2009).

This deforestation not only reduces forest cover, but it subsequently leads to biodiversity loss and contributes to climate change (Yu, 2015). Massive soy fields are not the greenest of pursuits and require large amounts of pesticides and fertilizer. In Brazil it is estimated that 35% of all pesticides used are for soy (Yu, 2015). China's reliance on other countries for feed and for pork itself, is also risky for the country's food supply as it may change resulting from political tensions. Currently the trade war with the U.S. involving soybeans (a third of imported soybeans came for the U.S.)

has even spurred ideas such as changes in pig feed formulas (Elmer, 2018).

Possible Sustainability Solutions

A variety of factors need to be taken into account when trying to make the pork industry and supply more sustainable in China. Probably the easiest step is to eat less pork. Secondly, more sustainable farming methods need to be implemented, with both small and large producers. Finally, while not the most ideal solution environmentally, outsourcing pork production to countries better suited to pork production may be a good option environmentally and economically if we are strictly speaking about Chinese interests.

With the Chinese pork industry already so massive, what can possibly be done? (Rossi, 2018)

Reducing Consumption

While this may seem close to impossible given the size of China's pork industry and pork's cultural significance, there are signs that show that this may not be too far-fetched. As noted, demand for pork in China has surprisingly decreased in recent years. A factor behind this shift is the rise of more health-conscientious consumers in China.

Millennials are a key driver for this change as they explore healthier, more plant-based diets (Neff, 2018). Even the

extreme of veganism where no animal products can be consumed, has seen momentum with the vegan food market expected to rise more than 17% between 2015-2020 (Neff, 2018). While societal trends by millennials may not seem convincing enough to some, the Chinese government has acted to try and influence reduced meat

Photo of a dumpling made with "vegan pork" by Chinese start-up Omnipork shared on Instagram (Castrodale, 2018)

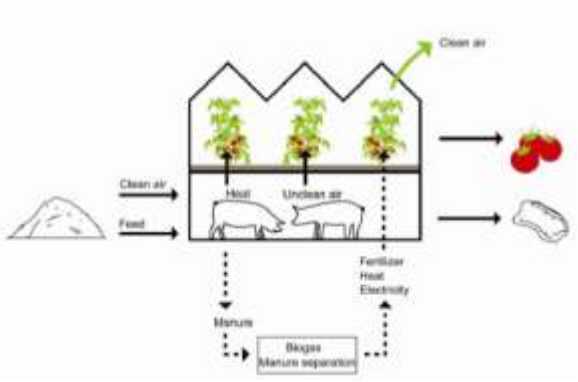
consumption to combat both environmental and public health issues.

In 2017 the Chinese government released a new set of dietary guidelines that if followed, could lead to 50% less meat consumption in the country (Neff, 2018). While this goal seems very optimistic (after all who in Canada even follows our guidelines to a tee?) other arguably more influential measures have been put into place. This year China's Ministry of Education introduced a animal welfare course to its high schools, a first for the country (RSPCA, 2018). This the course is aimed to shift attitudes in the country on animal welfare, farm animals included (RSPCA, 2018). This formalized education about farm animals in unison with shifting social views of meat with millennials, can lead to transformation in the Chinese diet in coming years as the younger generations become more influential.

Changing Production Methods

Unlike the main government focus of increasing pig-only industrial farms, an integrated farm such as a pig-biogas-vegetable greenhouse system (PBVGS) can decrease the environmental impact of pig farming while also improving products/service beyond pork (Qi, 2005). A PBVGS combines pig farming with gas and vegetable production. This system uses a biogas digester to ferment pig waste to produce gas and fertilizer (Qi, 2005). The gas can be used to heat and light greenhouses where the fertilizer is used to grow crops (Qi, 2005).

In a study done in Laiwu, Shandong Province it was found that pig growth, vegetable growth and biogas production all increased in a PBVGS system (Qi, 2005). The average yield of tomatoes and cucumbers increased greatly at 27.8% and 18.45% vs the controls (Chen, 2018). A PBVGS is an example of a more circular system were pig waste that would otherwise pollute the environment, is used in a productive way that helps the environment and can diversify income.



Model of a PBVGS system (Using Pigs to Grow Tomatoes with Biogas, 2010)

The industrial pork model also hasn't been the environmental champion that the Chinese government may have pushed. As such, working with small-farmers can be key in increasing sustainability. The Jinli cooperative setup by Jinzhong Food Co. Ltd. with small pig farmers is an example (Ji, 2016).

By increasing trust with small farmers and providing them with education on antibiotic use, care, specialized feed and discounted vet services among other things, the pig supply from the coop to Jinzhing increased from 10% to 40% from 2005 to 2015 (Ji, 2016). This is significant as proper supply from small scale-farmers can curb the demand for industrial systems. Which are known to have inherent problems like disease proliferation from over crowding.

Strategic Outsourcing

China isn't the best pig producer. Compared to the U.S., China's efficiency in pumping out pork is lack luster. Despite cheaper labour costs in China, lower productivity and higher feed costs make China much less efficient in producing pork than the U.S. (Day, n.d.). Between 2000-2015, feed costs in China were 75% higher than in the U.S; perhaps due to U.S.' ability to produce its own feed crop while China needs to import. (Day, n.d.). The U.S. has better feed conversation ratios as well, which means pigs in the U.S. are more efficient in converting feed to weight than pigs in China (Day, n.d.). This is accredited to better genetics and more efficient industrial farming systems (Day, n.d.).

While China has been making investments to achieve the U.S.' level of pork efficiency, perhaps for China's environment it's better that these farms take place off Chinese soil. While industrial farming is not the ideal scenario for many, at least doing it in a place that has the most bang for your buck is better than doing it at home. Ideally the best of both worlds could happen if China and foreign countries/companies work together to implement more sustainable farming methods in countries best suited for pork production.

Strategic pork production in better suited countries like the U.S. can alleviate environmental stresses at home (CNBC, 2018).

In Closing

China's pig problem is big and complex, but without large reductions in consumption perhaps it will never be truly sustainable. But really, which meat eating country is? Many Chinese have just in the last few decades been able to begin to enjoy the food choices the West has had for generations. The Great famine is still a not too distant past for many, and food security for some is still daily a concern. Yet China greatly needs more sustainably in its pork industry for many reasons. It is likely the path to sustainably will involve many elements including diet changes, farming practices and international partnerships, but if and when China figures it out, it can be a crucial model to help other countries with their own meat problems.

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