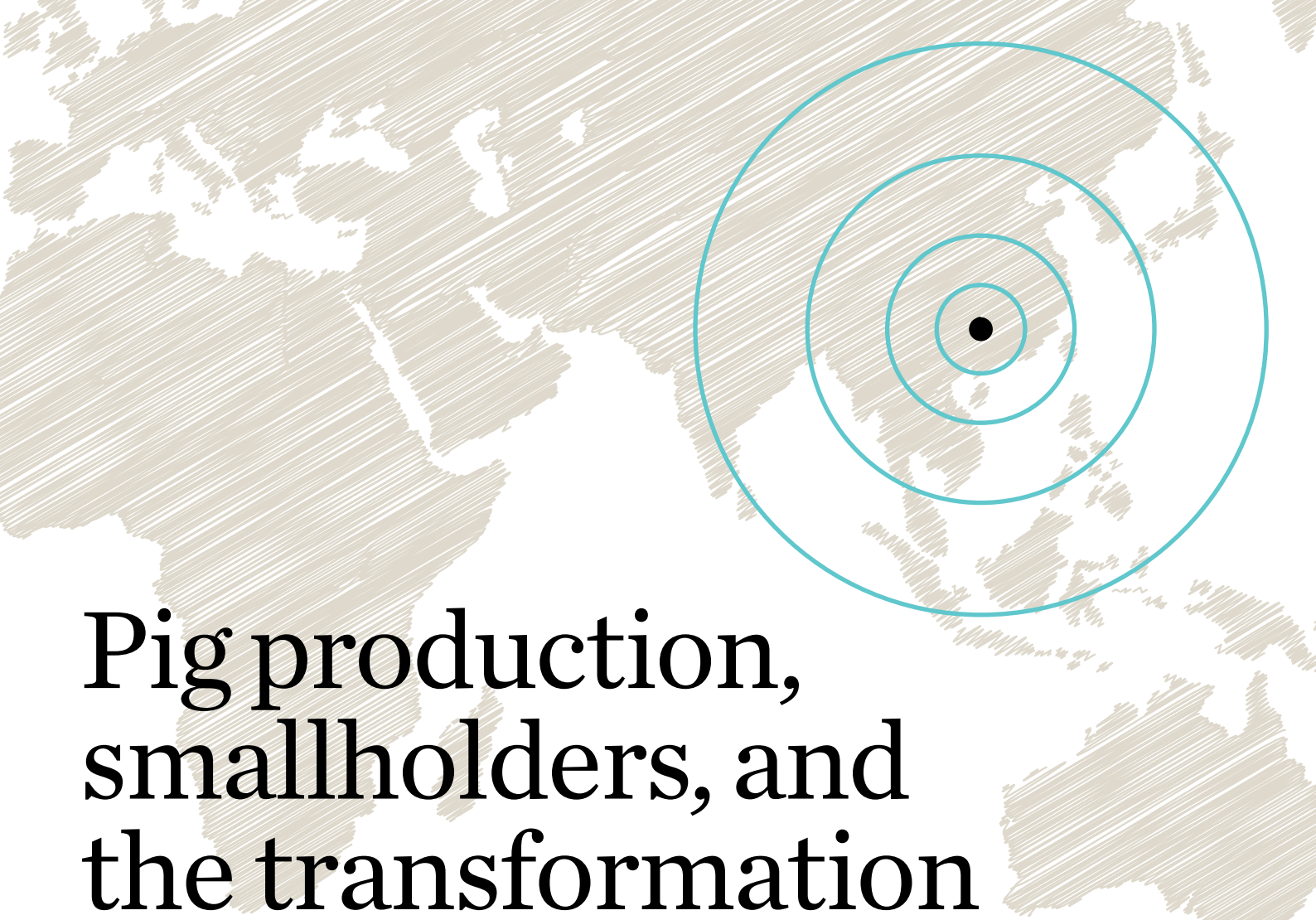

Pig production, smallholders, and the transformation of value chains in China

Xiangping Jia, Jikun Huang, Dan Wang, Huaiju Liu and Yuxi Cheng

Country Report
March 2014

Sustainable Markets

Keywords:
Sustainable markets; small-scale farmers

iied

About the authors

Xiangping Jia is Associate Professor at the Center for Chinese Agricultural Policy, Chinese Academy of Sciences (jiaxp.ccap@igsnrr.ac.cn)

Jikun Huang is Director and Professor at the Center for Chinese Agricultural Policy, Chinese Academy of Sciences.

Dan Wang, is a Post-doctoral Researcher at the Center for Chinese Agricultural Policy, Chinese Academy of Sciences.

Huaiju Liu is a Research Assistant at the Center for Chinese Agricultural Policy, Chinese Academy of Sciences.

Yuxi Cheng is a Research Assistant at the Center for Chinese Agricultural Policy, Chinese Academy of Sciences.

Acknowledgements

This research was funded by UK aid from the UK Government. However, the views expressed do not necessarily reflect the views of the UK Government.

About The Center for Chinese Agricultural Policy (CCAP)

The mission of the Center for Chinese Agricultural Policy (CCAP) is to analyse policies related to agricultural research and development, natural resource and environmental issues, and integrated rural urban development. It provides policy support and helps formulate practical and feasible policies for sustainable development and modernisation of rural China. CCAP endeavours to use research to provide policy-relevant information, and collaborate with various academic, government, NGO, and private sector bodies worldwide.

Produced by IIED's Sustainable Markets group

The Sustainable Markets Group drives IIED's efforts to ensure that markets contribute to positive social, environmental and economic outcomes. The group brings together IIED's workon market governance, business models, market failure, consumption, investment and the economics of climate change.

Published by IIED, 2014

Xiangping Jia, Jikun Huang, Dan Wang, Huaiju Liu, Yuxi Cheng. *2014. Pig Production, smallholders, and the transformation of value chains in China.* IIED Issue Paper. IIED, London.

http://www.iied.org/group/sustainable-markets

ISBN 978-1-78431-009-7

Printed on recycled paper with vegetable-based inks.

International Institute for Environment and Development
80-86 Gray's Inn Road, London WC1X 8NH, UK
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055
email: info@iied.org
www.iied.org

@iied
www.facebook.com/theIIED

This study examines the transformation of the pig industry in China from a smallholder system to an industrialised, large-scale system. Through sampling and data collection at county, township, village and household levels, the authors analyse the implications of this transformation, and compare their data to national statistics. The dynamics of pig production are examined in a context of environmental and social sustainability, focusing on marketing arrangements, food safety and the waste management of pig farms with different herd sizes. The paper explores the governance structures of the transformed value chains, with vertical coordination between large producers and mid-stream processors. This transformation brings new opportunities for the pig industry in China, as well as challenges in environmental sustainability, with the large operations becoming a major source of pollution.

Contents

Introduction

Over the past 20 years, China's rapid economic growth has resulted in an increased demand for livestock products. China's total meat production in 2001 increased to 19 million tons, three times the volume produced in 1985 (Chengguo Liu 2003-2009). These changes in consumption patterns have been driven by rising incomes and urbanisation (Huang and Rozelle 1997).

Although the share of poultry production increased as a share of China's meat production to 21 per cent in 2001 (from 8 per cent in 1985), the pig industry plays an important role in China's livestock sector. Pork production accounted for 66 per cent of China's total meat output in 2001, and pork remains the most popular meat for Chinese consumers (Chengguo Liu 2003-2009). Between 1985 and 2001, pork consumption increased by 148 per cent. Meat consumption is high among both rural (43 per cent) and urban residents (57 per cent).

Pig production in China is mainly carried out by smallholder farmers in backyards. It is traditional in China's rural society for farmers to raise pigs, chickens and other animals, as well as grow crops. Being a small scale operation (2-3 heads per household per year), most pigs are sold in local wet markets as a means of cash income. According to a ministerial survey conducted by the Research Centre for Rural Economy (RCRE) in 1999, smallholder farmers with fewer than five pigs accounted for 93 per cent of total farms, but only produced 60 per cent of the total number of slaughtered animals (Somwaru *et al.* 2003).

Ensuring food safety and sustainability based on a production system dominated by small scale farmers is challenging. Huang *et al.* (2013) found that vertical coordination in the upstream dairy chain was mainly governed by personal ties and mutual trust between farmers and buyers, which gave rise to concerns about food safety. Somwaru *et al.* (2003) also observed that the small pig operations were less profitable than the large ones.

The Chinese government has initiated various national and local programmes of subsidies and investments in order to transform pig production into a more industrialised system. In 2007, China's pig market experienced an unexpected price rise, causing panic among consumers and concern for the government. To support the pig industry, the Ministry of Finance announced policy support for consolidated pig production and subsidies for pig farms, especially large-scale farms. The provincial governments also implemented a range of supporting policies for pig production.

In the meantime, off-farm employment has been expanding in China. The exact numbers vary depending on the exact definition of off-farm labour. However, during the 1980s and 1990s, approximately 200 million of the rural labour force found jobs off the farm, totalling more than 6 million per year (NBS 2010). Estimates of the rise in the share of the rural labour force employed in off-farm sectors range from 35 per cent to 40 per cent during that period. By the mid-2000s, 265 million (more than 50 per cent) of China's 500 million-strong rural labour force had off-farm employment (Zhang *et al.* 2008).

A backyard pig farm (CCAP)

The transformation of China's pig industry has huge implications not only for food safety, but also for the environment and for equity. Huang *et al.* (2007) found that the agrifood market in China was competitive in every area, which helped shield upstream farmers from rent extraction by downstream industries. A large volume of empirical evidence shows that vertically coordinated agrifood chains exclude the poor and raise concerns about equity (Swinnen 2007). It is difficult to know whether the ongoing transformation in China's pig production still excludes the poor. Meanwhile, pig waste management has been a hot topic in China in recent years. Nitrogen and phosphorus are significant pollutants of rivers, lakes and coastal marine ecosystems, which result in the impairment of water quality (Tan and Li 2010; Liu *et al.* 2005).

As the economy developed, livestock production experienced an accompanying structural change (Skoufias 1994; Taniguchi 1997). The pig industry plays a dominant role in China's food system, and the way in which the sector is being transformed is important not only to policy makers, but also to practitioners, such as non-governmental organisations and private industries.

However, there is insufficient research and evidence supported by rigorous survey data on China's pig production. The published statistics on pig production were conducted by the National Bureau of Statistics in 1996 and the Research Centre for Rural Economy (RCRE) in the Ministry of Agriculture (MOA) in 1999. While the RCRE dataset captures dynamic changes in pig production and structural changes, the dataset has not been updated since the 2000s, and thus does not reflect the most recent transformations in China's pig and pork systems. Meanwhile, neither of the datasets reflects the characteristics at the micro and community levels, which constrains our understanding of the determinants and the heterogeneous nature of the livestock industry. More importantly, policy makers need to know what kind of policy could work, and where and how it would work. Practitioners want to know the implications of structural changes in the sector. Agricultural and development researchers are interested in how such a transformation affects efficiency, labour allocation and distribution.

The objective of this study is to examine the transformation of the pig industry and its implications for food safety and sustainability. In Chapter 2 we introduce the methods of sample and data collection to show the unique value of the data. In Chapter 3, we examine the dynamics of pig production. In Chapter 4, we investigate marketing arrangements and the waste management of pig farms with different herd sizes. In Chapter 5 we present some conclusions.

Sampling and data collection

1

Overview of concentrated hog production (CCAP)

The dataset was based on two rounds of nationally representative surveys conducted in 2011 and 2013. In 2011, five provinces were randomly selected to represent five of China's major agro-ecological zones: Shandong represents the eastern coastal provinces (Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi and Shandong) and the northern provinces (Beijing, Tianjin, Hebei, Shanxi and Inner Mongolia); Sichuan represents the southwestern provinces (Chongqing, Sichuan, Guizhou, Yunnan and Guangxi); Guangdong represents the southern provinces (Guangdong, Guangxi and Hainan); Hubei represents the central provinces (Henan and Hubei) and northwest provinces (Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang); and Jilin represents the northeastern provinces (Jilin, Liaoning and Heilongjiang).

After the provinces were selected, we chose the counties, townships and villages. Within each selected province, all the counties were listed in descending order according to the total number of pigs produced in 2010. Three counties were randomly selected from each province, each representing the top, middle and bottom of the stratum. Following the same procedure as the county selection, we randomly selected three townships in each county and three villages in each township.

Government surveys were conducted at both county and township levels. At the county level, government officials at the Bureau of Animal Husbandry were interviewed about pig production by herd size. Similar questions were asked at township stations about animal husbandry and veterinary medicine. In addition, we inquired about the policy instructions received from the county and higher government during 2004 and 2010; followed by more in-depth questions on the objectives. At both county and township level, local socio-economic information (such as the number of pigs and feed processors, infrastructure, etc.) was collected.

The third step was to choose the sample households. In each village, village leaders were interviewed about backyard pig producers, medium-scale pig producers, and large-scale pig enterprises. If there were medium-scale and large-scale producers, we selected one backyard, one medium-scale and one large-scale producer. If only medium-scale and large-scale producers were available, we selected one factory-style producer and two backyard producers. If only backyard pig producers were available, we randomly chose three backyard producers. In addition, we also randomly selected three non-pig producers in the village.

In each of the sample villages an enumeration team led by the authors carried out a community survey. As with the county and township surveys, we asked about the total number of pig producers, as well as the number of different producers by size (i.e. small-scale backyard producers, medium-scale specialised producers, and large-scale industrial enterprises). Additional information on local characteristics (such as cropping areas, distance to the nearest township road and availability of feed suppliers) was also collected for different years.

A large farm complex (CCAP

Finally, the team collected more detailed information from each pig producer. In addition to survey blocks enumerating the basic characteristics of households (family size, labour endowments, farm size, total consumption value, etc.), demographic information about each individual in the household was recorded. Information such as gender, age, education and marital status, was gathered. The survey included a long section to record the working experience of each member in the labour force. Specifically, enumerators asked questions about whether each member of the household had an off-farm job and, if so, the type, the working hours and the income from the job (both monetary and non-monetary).

Non-pig farmers were also asked about their history of pig farming. For each non-pig farmer, the team asked whether he/she had engaged in pig farming during 2004 and 2010. If yes, they were asked when they began and when they left the industry. In addition, we asked them the same questions about household characteristics (such as the family size and total asset value) and individual demographics (such as age, education, and labour endowments).

The second survey round was conducted in 2013. To the greatest extent possible we asked the same respondents the same questions (complemented with questions specific to various policies). The survey was repeated at all levels (county, township, village and household). A section was added at the township level about the policy instructions they had received in order to scale-up backyard smallholder production. Based on the two rounds of the surveys, we were able to create a panel of townships, villages, and households during 2004 and 2012 which represented the pig industry in China. In total we had 371 pig farmers from 135 villages and 45 townships by 2012.

Transforming pig production in China

2

2.1 Farm structure of pig production: national statistics

The national statistics show a decline in smallholder pig farms in China. As shown in Table 1, the percentage of farms with fewer than 50 pigs was almost 99 per cent in 2003, and these farms accounted for 73 per cent of national pig production, showing the dominance of smallholder farms. The percentage of pig farms with small herds steadily decreased to 95 per cent in 2010; however, pig production from smallholder farms accounted for only 29 per cent of national production. Pig production in smallholder farms has decreased dramatically in just seven years.

Both medium and large farms have increased over this timescale, but large farms have increased faster. The percentage of pig farms of medium scale (smaller than 100 but larger than 50 head) increased to 2.7 per cent, but production of this group seems to be stable (only 1 per cent increase from 2003 to 2010, see Table 2). Large farms (more than 100 but smaller than 500 head) accounted for a very small percentage in 2003 – only 0.2 per cent in terms of participation and 8 per cent in terms of pig production. However, the share of production increased to 14 per cent in 2010. Large pig farms developed fast.

Notably, the number of large farms that slaughtered more than 500 pigs increased sharply and became the major suppliers. There had been no farms slaughtering more than 500 pigs annually before 2004. Even in 2010, these farms only represented 0.5 per cent. Nevertheless, production on these farms increased to 47 per cent, almost half of the national figure. Most of these large farms are factory-style with intensive use of capital.

The national statistics are fragmented and incomplete. There are many missing values across years and the data are not consistent in definition. Small farms are not disaggregated, so the dynamics of backyard farms with fewer than ten pigs could not be examined. This feature of the national data constrains policy makers and practitioners in designing and evaluating their policies. According to RCRE data, smallholder farmers with less than five pigs accounted for 60 per cent of production in the 1990s (Somwaru *et al.* 2003).

Table 1. Percentage of pig farms by herd size in China, 2003-2010

Year	1-49	50-99	100-499	500+
2003	99.0	0.8	0.2	0.0
2004	–	73.3	22.8	3.9
2005	–	75.3	21.3	3.7
2006	–	75.1	21.7	3.5
2007	97.2	1.9	0.7	0.2
2008	96.6	2.2	0.9	0.3
2009	96.1	2.5	1.0	0.4
2010	95.6	2.7	1.2	0.5

Source: China Livestock Yearbook 2004-2011, NBSC.

Table 2. Percentage of pigs slaughtered by farms of different size, 2003-2010

Year	1-49	50-99	100-499	500+
2003	73	9	8	10
2004	62	12	12	14
2005	–	34	31	35
2006	–	33	33	34
2007	45	11	12	32
2008	37	11	13	39
2009	32	11	14	44
2010	29	10	14	47

Source: China Livestock Yearbook 2004-2011, NBSC.

2.2 Farm structure of pig production: our own survey data

The survey data were valuable as a complement to the national statistics as they examined the dynamics of pig production and the farm structure. In this section, we present the inventory and distribution of production by various farm structures from 2004 to 2012.

Concentrated hog production (CCAP)

Table 3. Pig production and participation in sample villages in China, 2005-2012

Year	0-9	10-49	50-99	100-499	500+
Number of pig farms (per cent)					
2005	57	29	6	7	2
2010	48	27	10	11	4
2012	46	26	11	11	5
Number of pigs slaughtered (per cent)					
2005	49	24	11	10	7
2010	36	24	12	17	12
2012	35	24	11	17	14

Source: Authors' survey
Note: The number of villages is 135.

Table 4. Percentage of pig farms in villages and emerging large farms of pig production in the sample area, 2005 and 2012

	2005	2012
Percentage of pig farms among village residences[a]	34	24
Number of large complexes for pig production in townships[b]	4.4	8.8
Herd stock of large complexes for pig production in the townships (1000 herd) b	16	27

Source: Authors' survey
[a] The number of sample village is 135.
[b] The number of sample township is 45.

The community survey showed a steady rise of large-scale farms and a decline in backyard smallholders involved in China's pig production. The number of backyard pig farms decreased by almost 2 per cent annually (from 57 per cent in 2005 to 48 per cent in 2010). Pig production in backyard farms decreased from 49 per cent in 2005 to 35 per cent in 2012. For pig farms of medium size (more than 50 but less than 100 slaughtered), production remained stable (column 2, Table 3). Production in medium to large farms with more than 100 pigs, but less than 500, increased from 10 per cent to 17 per cent; this is consistent with the national statistics and with existing studies.

Large farms that annually slaughter more than 500 pigs have increased over this time period, but production figures are lower than the national statistics. As shown in Table 3, the percentage of production for large farms increased to 12 per cent in 2010, which is lower than the national statistics (47 per cent, see Table 2). The major reason for the difference is the sampling scheme. The survey conducted in 2011 and 2013 by the Center for Chinese Agricultural Policy (CCAP) did not include pig companies and focused on pig production in rural villages. Interestingly, the difference explains the percentage of pig production by companies; the figure increases from 28 per cent (35-7, last column in Table 2 and Table 3) to 35 percent (47-12).

The number of emerging large farms became apparent through the township survey. As shown in Table 4, large pig farms and companies doubled in number in townships from 2005 to 2012. For these large pig companies, more than 3,000 pigs are slaughtered annually (16000/4.4, Table 4).

The household surveys show that our sampling scheme at the household level is consistent with the village data. The participation of backyard smallholders decreased steadily by 14 per cent (from 28 per cent in 2004 to 14 per cent in 2011). The percentage of medium and large farms increased dramatically over the period (see Table 5).

Pig farmers are distinct from non-pig farmers in terms of demographic characteristics. Pig farmers are relatively young with little off-farm employment. As shown in Table 6, pig farmers spend only 19 per cent of their time in off-farm employment. The figure was much higher for other farmers. One interesting finding was that farmers who left pig farming were the poorest (1,500 Yuan per capita, column 2, Table 6).

Table 5. Participation and pig production by herd size for sample households, 2004-2011

Year	Number of pig farms	Percentage to household sample	Total herds (1000 heads)	Percentage of farm by herd size					Percentage of slaughtering herds by size				
				0-9	10-49	50-99	100-499	500+	0-9	10-49	50-99	100-499	500+
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2004	256	66	41	28	29	14	23	7	0.6	4.3	6.1	28.3	60.6
2005	267	69	44	25	31	13	23	8	0.6	4.6	5.7	30.0	59.1
2006	281	72	50	24	30	14	23	9	0.5	4.1	5.6	29.2	60.7
2007	307	79	61	22	29	13	25	12	0.5	3.8	4.5	25.8	65.5
2008	337	86	87	19	29	13	28	12	0.3	2.8	3.4	22.0	71.5
2009	356	91	135	18	26	15	27	15	0.2	1.7	2.5	14.1	81.5
2010	370	98	147	15	24	17	27	17	0.1	1.6	3.0	14.7	80.6
2011	371	100	135	14	24	17	29	17	0.1	1.6	3.2	18.0	77.0

Source: Authors' survey

Table 6. Household characteristics for pig and non-pig farmers

	Pig farmers in 2010	Non-pig farmers in 2010	
		Had pigs before	Never had pigs
Percentage of off-farm workers in 2004	18	23	32
Percentage of migrant off-farm workers in 2004	9.5	13.5	13.9
Assets value per capita (1000 Yuan) in 2004	8.1	1.5	7.3
Age of household head	42	47	44
Education attainments of household head	7.9	7.8	7.8

Source: Authors' survey

Transformed pig production, agrifood markets and environmental sustainability

3

3.1 Upstream marketing

Although the upstream agrifood market in China includes the poor, the lack of vertical coordination in the agrifood chain poses tremendous challenges for complying with food safety standards. In their large-scale farm survey, Huang *et al.* (2009) found that no farmers had their fruits tested for pesticide residue. After selling their output on the spot market, farmers in China's horticulture economy are free from all accountability. The same situation is also observed in China's dairy market. Milk stations even accepted `bad' milk when raw milk at the farm gate was found to be unsafe (Huang *et al.* 2008). Given the increasing concerns over food safety, smallholder farmers in China find it difficult to gain access to high-value markets that have stringent food safety and quality standards (World Bank 2006).

Small brokers still dominate the pork chain upstream. As shown in Table 7, nearly 45 per cent of pig production was sold (by 53 per cent of pig farmers) through mobile brokers in 2012 in the sample area. The number is 12 per cent for processors, suggesting a vertical purchase from the meat industry. Pigs slaughtered directly at slaughterhouses numbered only 34 per cent.

As mentioned previously, the transformation of pig production in China has had significant implications for marketing and food safety. As shown in Table 8, vertical marketing with processors was often organised by large pig farms who slaughtered more than 500 pigs per year. The comparable figure was zero for backyard farms (column 3, Table 8). It is worth noting that large farms also sold pigs to mobile brokers who did not require such high standards or traceability.

Existing studies found that agro-industrial enterprises promote vertical coordination between individual farmers, and the midstream and downstream segments through contract farming (Guo *et al.* 2007). Our surveys suggest that there were few written contracts at the farm gate. This is similar to a horticultural study that showed that in only 6 per cent of tomato-producing villages and 9 per cent of cucumber-producing villages, the villagers believed that there was any commitment from buyers to purchase the farmers' output. Commitment to purchase was not written down, but was mainly maintained through longstanding business relationships. Informal contracting at the farm gate is preferred to formal contracting in China's pig and horticultural markets.

Table 7. Percentage of pig farmers and pigs sold through various marketing channels in 2012, China

	Broker	Slaughterhouse	Processor	Others *
Percentage of households	53	35	7	5
Percentage of pigs	45	34	12	10

Source: Authors' survey
Note: *"Others" include own consumption and pigs sold to other pig farms

Table 8. Marketing channel of pig farms by slaughtering size in 2012, China

	Broker	Slaughter	Processor	Other
	(N=187)	(N=125)	(N=26)	(N=18)
Backyard (1-9)	34	41	0	25
Medium and medium-large (10-500)	56	34	7	2
Large (>500)	50	35	13	2

Source: Authors' survey

3.2 Waste management

Waste management of the pig industry is a major problem in many countries. In the United States, previous studies showed that the growth and concentration of pig production has been associated with negative social and environmental impacts on the air, arable land, waterways, environmental justice and human health (Wing *et al.* 2008; Ribaudo et al. 2003; Mohamed 1998; Skinner *et al.* 1997).

Pig waste management has been a hot topic in China in recent years. Empirical studies suggested that livestock waste, especially pig waste, has been the main source of pollution in rural China (Wang *et al.*, 2012). Nitrogen and phosphorus are significant pollutants of rivers and lakes, resulting in the impairment of water quality (Tan and Li 2010; Liu et al. 2005). Moreover, there was also evidence of degradation and eutrophication of local drinking water and the reduction of aquatic plant diversity due to untreated disposal of organic wastes (e.g. pig waste) in rural China (Zhang *et al.* 2006; Mosier and Zhu 2000).

Pig producers in China dispose of waste in a variety of ways, but the most common is production on their own land, with 50% of farmers applying the manure to their own plots (175/348=50 per cent, Table 9). Meanwhile, 24 per cent of them use the waste for clean energy biogas production, and 10 per cent of pig farms use the waste in aquaculture. A few pig producers, mainly smallholder farms, sell waste.

Marketing of pig waste is more prevalent among large producers. As shown in Table 9, no backyard farms sold any waste; the majority of waste was self-consumed in cropping production and biogas. Large farms (32 per cent) tended to sell their pig waste to manure processors in 2010, although it is not known why the proportion decreases to 17 per cent in 2012.

It is worrying that large pig producers are the major source of discarded waste, causing concerns about environmental pollution. For example, in 2010, only 2 per cent of large pig farms discarded their waste, whereas the figure increased to 11 per cent in 2012.

Unlike backyard pig producers, large producers do not have enough land for pig waste. Hence, pig urine and faeces, which are considered to be valuable fertilisers by backyard pig producers, become waste for factory-style pig producers. Rather than raising these pigs in the backyard, these large pig producers raise pigs in a factory style. A large number of pigs are kept in a barn, usually in a closed environment. If pig urine and faeces cannot be removed in time, they have a negative impact on animal health.

Table 9. Households' primary waste management by herd size in 2010 and 2012

Self-consumption					
	Fertilisers	Biogas	Feed	Sale	Discard
	(N=175)	(N=84)	(N=39)	(N=35)	(N=15)
	(1)	(2)	(3)	(4)	(5)
2010					
Backyard (1-9)	53	43	2	0	2
Medium and medium large (10-500)	55	23	10	7	5
Large (>500)	28	12	26	32	2
2012					
Backyard (1-9)	60	40	0	0	0
Medium and medium large (10-500)	59	19	12	7	4
Large (>500)	26	25	21	17	11

Conclusion

4

Based on a nationally representative survey in China, this study reveals a dramatic transformation in China's pig production. Smallholder farms in backyards were the major pig producers in the 1990s. However, as the economy grew, leading to an increase in income and off-farm work opportunities, a large number of these small-scale backyard pig producers moved to off-farm employment. Meanwhile, under the national campaign, `The New Countryside Construction' (*xin nong cun jian she*), both national and local governments took a bold course of action to promote consolidated pig production by encouraging the establishment of large farms. All these factors have led to a dramatic structural change in the pig industry.

This transformation in pig production has a significant impact on the agrifood market and on environmental sustainability. This study reveals that vertical coordination started to emerge between consolidated pig producers and mid-stream processors. However, the governance of the pig chain is still loose; there is little contract commitment and corresponding vertical investments. Meanwhile, although waste management is being gradually introduced into the market by pig producers, especially the large-scale ones, a vast number of pig producers have become the major source of pollution relating to waste management. Thus, China is facing huge challenges in food safety and environmental pollution due to this transformation.

The commercialisation of China's agrifood system has triggered a gradual transformation of the country's smallholder farms. While smallholder farmers recognise the opportunities brought by the commercialised agrifood market, big challenges remain in the country's vast farm sector. The government-driven agro-industrialisation, achieved by promoting large farms, may strengthen the vertical coordination of the agrifood chain and farmers' access to market and technology. However, the challenge is to maintain this system of production in an efficient, safe, and sustainable manner.

References

Chengguo Liu (editor) (2003-2009) Chinese Statistical Yearbooks (2003-2009) , China Agricultural Publisher, Beijing.

Guo, H., Jolly, R.W. and Zhu, J. (2007) `Contract Farming in China: Perspectives of Farm Households and Agribusiness Firms' in Comparative Economic Studies 49:285-312

Huang, J., Wu, Y., Yang, Z., Rozelle, S., Fabiosa, J., and Dong, F. (2013) Marketing China's milk: A case study of the sales activity of dairy farmers in greater Beijing' China Economic Review 23(3): 675-689 doi:10.1016/j.chieco.2010.09.006

Huang, J., Zhi, H., Huang, Z, Jia, X. and S. Rozelle, S. (2009) Smallholder Incomes, Vegetable Marketing and Food Safety: Evidence from China. Paper presented at the International Association of Agricultural Economists Conference (29th), August 16-22. Beijing

Huang, J., Wu, Y., Yang, Z., Rozelle, S., Fabiosa, J. and Dong, F. (2008) Marketing China's Milk: A case study of the sales activity of dairy farmers in Greater Beijing. Working paper. Center for Chinese Agricultural Policy, Chinese Academy of Sciences

Huang, J., Rozelle, S., Dong, X., Wu, Y., Zhi, H., Niu, X. and Huang, Z. (2007) Agrifood Sector Studies China: Restructuring agrifood markets in China - The horticulture sector. Part A - meso-level study. Regoverning Markets Programme, IIED

Huang, J. and Rozelle, S. (1997) `Market development and food demand in rural China' in China Economic Review 8(1):25-45

Liu, Y., He, P., Shao, L., and Yang, G. (2005) `Production and feature of rural solid wastes in Tailake region of China' in Journal of Agro-Environment Science 24(3):533-537

Mohamed, S. (1998) `Nutrient balance patterns in African livestock systems' in Agriculture, Ecosystems and Environment, 71(1-3): 241-254

Mosier, A. R. and Zhu, Z.L. (2000) `Changes in patterns of fertilizer nitrogen use in Asia and its consequences for N2O emissions from agricultural systems' in Nutrient Cycling in Agroecosystems 57: 107-117

Ribaudo, M., Gollehon, N., Aillery, M., Kaplan, J., Joahnson, R., Agapoff, J., and Christensen, V. (2003) Manure management for water quality: cost to animal feeding operations of applying manure nutrients to land. USDA Economic Research Service, Report AER-824. Washington, DC, USA

Skinner, J.A., Lewis, K.A., Bardon, K.S.,

Tucker, P., Catt, P., J.A., and Chambers, B.J. (1997) `An Overview of the Environmental Impact of Agriculture in the UK' in Journal of Environmental Management, 50(2): 111-128

Skoufias, E. (1994) `Using shadow wages to estimate labour supply of agricultural households' in American Journal of Agricultural Economics 76(2):215-227

Somwaru, A., Xiaohui, Z., and Tuan, F. (2003) China's Pig Production Structure and Efficiency. Paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Montreal, Canada, July 27-30, 2003

Swinnen, J.F.M., ed. (2007) Global supply chains, standards and the poor. CABI, Wallingford, UK

Tan, Y., and Li, D. (2010) Pig Farming in Large Scale and Environmental Conservation: Dilemma and Choice - based on America's Experience. Chinese Agricultural Science Bulletin, 26(13):20-22.

Taniguchi, N. (1997) `The Conditions of Japanese Agricultural Production' in Agriculture and Agricultural Policy in Japan, edited by the Committee for the Japanese Agriculture Session, XXI, IAAE Conference

Wang, J., Lin, C., Chen, Y., and Liu, A. (2012) Cultivated land pollution at township level in China: situation, factors and measures, China Land Sciences, 26(2):25-30,43

Wing, S., Horton, R., Marshall, S., Thu, K., Tajik, M., Schinasi, L., and Schiffman, S. (2008) Air Pollution and Odour in Communities Near Industrial Swine Operations. Environmental Health Perspectives, 116(10): 1362–1368

World Bank (2006) China's compliance with food safety requirements for fruits and vegetables: Promoting food safety, competitiveness, and poverty reduction. Report 39766. The World Bank, Washington DC

Zhang, L., Huang, J., Li, X., and Rozelle, S. (2008) China's labour transition and the future of China's employment and wages. Working Paper. Center for Chinese Agricultural Policy, Chinese Academy of Sciences

Zhang, W., Shi, M., and Huang, Z. (2006) Controlling non-point-source pollution by rural resource recycling. Nitrogen runoff in Tai Lake valley, China, as an example. Sustainability Science 1: 83-89

This study examines the transformation of the pig industry in China from a smallholder system to an industrialised, large-scale system. Through sampling and data collection at county, township, village and household levels, the authors analyse the implications of this transformation, and compare their data to national statistics. The dynamics of pig production are examined in a context of environmental and social sustainability, focusing on marketing arrangements, food safety and the waste management of pig farms with different herd sizes. The paper explores the governance structures of the transformed value chains, with vertical coordination between large producers and mid-stream processors. This transformation brings new opportunities for the pig industry in China, as well as challenges in environmental sustainability, with the large operations becoming a major source of pollution.

iied

International Institute for Environment and Development
80-86 Gray's Inn Road, London WC1X 8NH, UK
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055
email: info@iied.org
www.iied.org

Knowledge Products