

China's Agricultural Pollution Changes in a Decade Findings from the Second National Census on Pollution Sources

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On 10 June 2020, the Ministry of Ecology and Environment (MEE), Ministry of Agriculture and Rural Affairs (MARA) and the National Bureau of Statistics Bureau jointly released the Bulletin on the Second National Census on Pollution Sources. The Census was conducted by 15 ministerial departments over three years and aimed at identifying pollution threats throughout the country. The census standard time was 31st December 2017.

China's first national census on pollution sources was conducted in 2007-2010, with census standard time of 31st December 2007, the results were released in February 2010.

This issue of SAIN Information Sheet summarizes the findings on pollutants emission from agriculture and highlights the changes between the first and the second censuses.

1. The key findings of the second census

- The second census collected data from more than 3.58 million sources of pollution, which covered industry, agriculture, domestic, centralized pollution control facilities and mobile sources
- The amount of major pollutants from agriculture – chemical oxygen demand (COD), total nitrogen and total phosphorus - dropped by 19.4%, 47.7% and 25.5% respectively from ten years earlier
- Agriculture remains the major source of water pollutants – COD, ammonia nitrogen, total nitrogen and total phosphorus account 49.8%, 22.4%, 46.5% and 67.2% of the national total
- Within agriculture, livestock is the major source of all the water pollutants, which contributed 93.8% of COD, 51.3% of ammonia nitrogen, 42.1% of total nitrogen and 56.5% of total phosphorus of total agricultural pollutant emission
- The air pollutant from agriculture machinery, categorized as mobile source, contributed 10.6% of nitrogen oxides, 0.6% of particulate matter, and 2.2 % of volatile organic compounds (VOCs) of the national total
- Agricultural machinery contributed 17.8% of nitrogen oxides, 26.8% particulate matter, and 9.4% VOCs to total emission from mobile sources
- The residues of plastic mulch film accumulated in the soil reached 1.18 million tonnes in 2017, increased by 1.06 million tonnes from 2007

2. The data

2.1. Pollutants emission from all sectors

In 2017, China's major pollutants emission from all sources:

Water pollutants (thousand tonnes)

- COD 21439.8
- Ammonia nitrogen 963.4
- Total nitrogen 3041.4
- Total phosphorus 315.4

Air Pollutants (thousand tonnes)

- Sulfur dioxide 6963.2
- Nitrogen oxides 17852.2
- Particulate matter 16840.5
- Volatile Organic Compounds (VOCs) 10174.5

2.2. Pollutants emission from agriculture

Water pollutants (thousand tonnes)

- COD 10671.3
- Ammonia nitrogen 216.2
- Total nitrogen 1414.9
- Total phosphorus 212.0

The breakdown of water pollutants from agriculture in 2017 are as following:

Crop production (thousand tonnes)

- Ammonia nitrogen 83.0
- Total nitrogen 719.5
- Total phosphorus 76.2

Livestock (thousand tonnes)

- COD 10005.3
- Ammonia nitrogen 110.9
- Total nitrogen 596.3
- Total phosphorus 119.7

Aquaculture (thousand tonnes)

- COD 666.0
- Ammonia nitrogen 22.3
- Total nitrogen 99.1
- Total phosphorus 16.1

Air pollutants

The second census added the emission of air pollutant from agriculture machinery, categorized as part of mobile source.

In 2017, the amount of air pollutant emission from agricultural machinery were:

	(thousand tonnes)
• Nitrous oxides	1893.0
• Particulate matter	93.7
• VOCs	224.5

Residues of plastic mulch film

Over 10 years' time, China's plastic film residues accumulated in soil has increased from 0.12 million tonnes in 2007 to 1.18 million tonnes in 2017.

3. Contribution of agricultural source pollutants to the national total (%)

Water pollutants

• COD	49.8
• Ammonia Nitrogen	22.4
• Total Nitrogen	46.5
• Total Phosphorus	67.2

Air pollutants

• Nitrogen oxides	10.6
• Particulate matter	0.6
• VOCs	2.2

4. Changes in a decade

China has made big achievement in reducing pollutants emission from agriculture since the first national pollution sources census. Comparing with 2007, the total nitrogen emission from agricultural source dropped by 48%, by 55% and 42% respectively from crop and livestock production (see Table 1 for details).

Meanwhile, China also achieved continued increase in agricultural output in the same period. As shown in Table 2, from 2007 to 2017, China's grain output increased by 31.2%, meat output by 25%, and aquatic products by 36%. This may partly indicate that China's agricultural industry is moving to a greener direction.

However, huge challenges remain in the future.

- Fertilizer and pesticides use still much higher than should be. Although China has realized its goal of zero growth in fertilizer and pesticides use by 2020, to further reduce fertilizer and pesticides and increase the use efficiency requires more innovative approaches
- China has launched various initiatives to increase the efficiency and reduce the environmental pressure from livestock production. However, under the pressure of recovery from the attack by African Swine Fever since 2018 and the COVID-19, continue to applying strict environmental control becomes more difficult

- Agriculture is not only the major source of water pollution, but also the atmospheric pollutants such as ammonia (NH₃) which is associated to the formation of particulate matter, nitrous oxide (N₂O) and methane (CH₄) which are powerful greenhouse gases. Currently these pollutants are not included in the census but greeter efforts are needed to reduce these emissions because their local and global significance
- China is the world largest consumer of agricultural plastic film. In 2017, China used 1.4 million tonnes of plastic mulch film, and mulched 18.7 million ha farm field. Plastic residues not only pollute the soil, but also the whole food chain and wide ecosyssem
- China is speeding up the mechanization in agriculture. From 2007 to 2017, China's total agricultural machinery power increased from 766 million KW in 2007 to 988 million KW in 2017, a 29% increase. Air pollution from agriculture machinery is therefore becoming a major environmental challenge.

Table 1. Changes in China's agricultural pollution 2007-2017




















Source and Pollutants (thousand tonnes)		2017	Comparing with 2007 (%)
Water pollutants			
Agriculture	COD	10671.3	19.4 
	Ammonia Nitrogen	216.2	
	Total Nitrogen	1414.9	47.7 
	Total Phosphorus	212.0	25.5 
In which			
Crop Production	COD		
	Ammonia Nitrogen	83.0	
	Total Nitrogen	719.5	55.0 
	Total Phosphorus	76.2	29.9 
Livestock	COD	10005.3	21.1 
	Ammonia Nitrogen	110.9	
	Total Nitrogen	596.3	41.8 
	Total Phosphorus	119.7	25.4 
Aquaculture	COD	666.0	19.3 
	Ammonia Nitrogen	22.3	
	Total Nitrogen	99.1	20.7 
	Total Phosphorus	16.1	3.2 
Air pollutants			
Agricultural machinery	Nitrous oxides	1893.0	No data available in 2007 census
	Particulate matter	93.7	
	VOCs	224.5	
Other pollutants			
Crop	Accumulated plastic film residues in soil	1184.8	Increased from 121.0 in 2007

Table 2. Changes in China's agricultural outputs 2007-2017

Agricultural outputs (million tonnes)				Changes 2007-2017 (%)
		2017	2007	
Crop	Grain	661.6	504.1	31.2 
	Oil seeds	34.8	27.9	24.7 
	Vegetable	691.9	575.4	20.3 
	Fruit	252.4	176.6	42.9 
Livestock	Meat	86.5	69.2	25.1 
	Milk	30.4	29.5	3.1 
	Egg	31.0	25.5	21.6 
Aquaculture	Aquatic products	64.5	47.5	35.8 

(data source: National Bureau of Statistics)

5. China's efforts in tackling agricultural pollution

The most remarkable change in China's agricultural production in the last decade is shifting from quantity to quality. Chinese government has initiated a number of policies and actions in order to achieve such transformation. The following are some of the key policies and actions underpinning China's efforts¹:

→ No 1 Central Document (2011) - Accelerating Water Conservancy Reform and Development

Establish a system of controlling pollutant discharge to water function areas

→ MARA (2011) - Suggestions on Agricultural and Rural Energy Saving and Emission Reduction

By 2015, compare with 2010, total agricultural COD emission reduced by 8%, ammonia nitrogen emission reduced by 10%

→ State Council (2013) - Action Plan for Prevention and Control of Air Pollution

By 2017, PM 10 concentration in cities above prefecture level should decrease by over 10% of 2012; PM 2.5 concentration in Jingjinji Area, Yangtze River Delta, Pearl River Delta should decrease by 25%, 20% and 15% respectively; actively develop new products of slow release fertilizers, reduce the ammonia emission in fertilizer application

→ MARA (2015) – The Action Plan for Zero Growth in Fertilizer Use by 2020

Establish a management and technology system for scientific fertilizer application, and achieve zero growth in fertilize use

→ MARA (2015) – The Action Plan for Zero Growth in Fertilizer Use by 2020

Establish a resource-saving, environmentally friendly pest and disease prevention and control technology system, and to strive to realize zero growth in pesticides use.

→ State Council (2016) - 13th Five-Year Plan for Ecological & Environmental Protection
Strengthen control of pollution sources, launch special projects for emission reduction

→ State Council (2018) - Three-year Action Plan for Winning the Blue Sky War (2018-2020)

15% reduction of sulphur dioxide and nitrogen oxide by 2020 compared to 2015 levels; 18% reduction of PM2.5 density

→ State Council (2016) - Action Plan for Prevention and Control of Soil Pollution

¹ For more details, see: SAIN Information Sheet [No 6](#), [No 9](#) and [No 21](#)

Ten actions include survey on soil pollution, legislation on soil pollution control, managing agriculture land, protect non-polluted soil, regulation on pollution sources, pollution treatment and remediation, research and development

→ State Council (2017) - The Guideline on Innovating Institutional Mechanism and Promoting Agricultural Green Development

Realise more efficient use of land and water resources, cleaner production environment, innovation-driven and incentive mechanisms

→ MARA (2017) - Five Actions to advance Agriculture Green Development

Livestock and poultry wastes recycling and utilization, substituting chemical fertilizers with organic fertilizers in fruit, vegetables and tea plantations, crop straws treatment, plastic film collection and recycling, aquatic biota protection

→ MARA (2019) - Technology Guidelines for Agriculture Green Development (2018-2030)

The Guidelines outlined the priority technology systems which need research and development, integration and demonstration, dissemination and application

→ National People's Congress (2018) - Soil Pollution Control and Prevention Law

MEE will be primarily responsible for supervising and administering soil pollution work, other authorities, such as the Ministry of Natural Resources and the Ministry of Agriculture and Rural Affairs will also play a role.

→ MARA et al (2019) - Guideline on Preventing and Control the Pollution from Plastic Mulching Film

By 2020, the working mechanism and recycling systems should be established, with 80% of film recycled, and zero growth in film mulched farmland areas; by 2025, all agricultural mulch film should be recycled with negative growth in film residues, and white pollution significantly controlled

→ MARA (2019) - Guideline for Speeding up Aquaculture Green Development

Boost the fishery industry through quality development, adopting the green development approach in the aquaculture development, promoting the healthy aquaculture system

→ NDRC (2020) - Opinions on Accelerating the Establishment of Green Production and Consumption Laws and Policy System

Annex - SAIN Information Sheet List

No. 1

China's Agriculture and Food Policies

No. 2

Policies on Agricultural Production System and Food Safety Supervision System Reform

No. 3

英国农业技术战略简介 UK Strategy for Agricultural Technologies – Summary

No. 4

China's 13th Five Year Plan on Science and Innovation

No. 5

China's Innovation Driven Development Strategy

No. 6

China's Agricultural Modernization - Policy Framework

No. 7

China's Agricultural Production and Trade in 2016

No. 8

China's Agricultural Production and Trade in 2017

No. 9

China's Agricultural Transition in 2017 - Policies, Actions and Progress

No. 10

绿色未来: 环境改善 25 年规划 (A Green Future: Our 25 Year Plan to Improve the Environment)

No. 11

China's Agricultural Plans in 2018

No. 12

健康与和谐: 绿色脱欧的未来食品、农业和环境 (Health and Harmony: the future for food, farming and the environment in a Green Brexit)

No. 13

英国部署清洁空气战略, 严格控制农业氨排放 (Clean Air Strategy)

No. 14

China's Agricultural Products Trade in the First Three Quarters 2018

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China's Agricultural Production and Trade in 2018

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China's Agricultural Products Trade in the First Quarter 2019

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China's Agricultural Products Trade in the First Half 2019

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China's Rural Virilisation and Agriculture Green Development – Policy Framework and Action Plans

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Status of China's Cultivated Land Quality in 2019

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