

- b) In 2018, Ministry of agriculture revised the system, the classification standard of large and medium sized tractors and small tractors is changed from engine power 14.7 kW to 22.1 kW; the coverage of large and medium sized tractor towing farm machinery is changed to “matching with 58.8 kW and above tractors”. At the same time the small tractors towing farm machinery was cancelled. The same applies to the tables following.

Around 2 million specialized farmer's cooperatives were registered in China by the end of November, 76 times the number a decade ago, according to the ministry. Currently, the cooperatives have over 100 million rural households participating, which account for 46.8 percent of the country's total. Through specialized cooperatives, farmers engaged in the same kind of agricultural production are able to pool resources and increase productivity. “The development of farmers' cooperatives in China will accelerate its land circulation, heralding greater demands for agricultural machinery and fierce competition among equipment manufacturers home and abroad,” said Liu Xiaoran, an expert with the China National Association of Grain Sector.¹³⁴⁴

8.7.2 Aquaculture and fishing

8.7.2.1 13th Five-Year Plan

Excerpts of the 13th Five-Year Plan for Economic and Social Development of the People's Republic of China (2016–2020) on Aquaculture and Fishing:

Part IX Development Coordinated Between Regions, Chapter 41, Widen Space for the Blue Economy.

Section 1 Strengthening the Marine Economy

We will improve the marine industry structure, develop high seas fishing, promote the scaled-up use of desalinated sea water, support the development of industries such as marine biological medicine and marine equipment manufacturing, and accelerate the development of marine service industries. We will develop marine science and technology, focusing on achieving breakthroughs in advanced marine technology which allows deep- sea operations and is eco-friendly and secure. We will move ahead with development of smart marine projects. We will make innovations in market- based allocation methods for ocean and island resources. We will develop national marine economic development experimental zones in Shandong, Zhejiang, Guangdong, Fujian, and Tianjin, support Hainan in using South China Sea resources to develop a distinctive marine economy, and develop Qingdao's Blue Silicon Valley as well as other marine economic development demonstration zones.

Section 2 Strengthening Protection of Marine Resources and Environments

We will deepen comprehensive management of marine ecosystems, promote the development of marine functional areas, improve the spatial layout of offshore areas, and ensure that development intensity is appropriate. We will strictly control the scale of land

¹³⁴⁴ Xinhua News Item dated March 21, 2018 titled “Technology reshaping agriculture in China”, available online at URL: http://www.xinhuanet.com/english/2018-03/21/c_137054369.htm

reclamation from the sea, strengthen the protection and restoration of coastal zones, and ensure that the natural shoreline does not fall below 35%. We will also strictly control the intensity of fishing and enforce a fishing prohibition period. We will strengthen the prospecting and development of marine resources and expand scientific expeditions to marine Polar Regions. We will ensure that pollutants originating from land can be discharged into the sea only if they meet standards, control the total amount of pollutants discharged, and establish an early warning mechanism for the carrying capacity of marine resources and its environment. We will enforce marine ecological red lines, implement a project to restore wetlands by developing mangrove forests in the south and Chinese tamarisk forests in the north, carry out projects to develop islands and reefs in an ecologically sustainable way, and strengthen the protection of rare marine species. We will strengthen research on marine climate change, increase marine disaster monitoring, risk evaluation, and disaster prevention and mitigation capabilities, strengthen strategic preparedness for conducting maritime disaster relief, and improve response capabilities in regards to environmental emergencies occurring at sea. We will put in place a maritime supervision system and conventionalize maritime supervision.¹³⁴⁵

Xinhua News Item dated February 15, 2019 captioned “China's 2018 aquaculture output tops 50 million tonnes” reported that China’s aquaculture output exceeded 50 million tonnes in 2018, accounting for over 78 percent of the country's total aquatic products output, official data showed. China is the world's only country that raises more aquatic products than what it fishes, according to the Ministry of Agriculture and Rural Affairs. Exports totaled 23.3 billion U.S. dollars, with a trade surplus of 7.5 billion dollars registered last year, narrowing down from the previous year. The Belt and Road Initiative offers huge potential for international cooperation in aquaculture, and China will use its advantage in technology, talent and finance to help developing countries develop their aquaculture industry, said Zhang Xianliang, a senior official with the ministry.¹³⁴⁶

As per Xinhua News Item dated March 10, 2019 captioned “China to accelerate green development of aquaculture industry”, China will promote the green development of its aquaculture industry and produce more eco-friendly aquatic products, according to the agricultural ministry. More than 98 percent of the aquatic products will meet market standards by 2022, while ecological demonstrative zones are expected to account for 65 percent of the total aquaculture areas, said the Ministry of Agriculture and Rural Affairs. To achieve such targets, 10 governmental departments including the agricultural ministry have unveiled a guideline on the green development of the industry, vowing to build more demonstrative zones and advance ecological prevention of aquatic animal diseases. While strengthening the planning of waters and shoals for aquaculture, China will make efforts to optimize the industrial structure and encourage deep-sea aquaculture, according to the guideline. The guideline also stressed the country will

¹³⁴⁵ Excerpts from Part IX Development Coordinated Between Regions, Chapter 41 Widen Space for the Blue Economy, Section 1 Strengthening the Marine Economy and Section 2 Strengthening Protection of Marine Resources and Environments of The 13th Five-Year Plan for Economic and Social Development Of The People’s Republic Of China (2016–2020) Pg 116, available online at URL: https://en.ndrc.gov.cn/policyrelease_8233/201612/P020191101482242850325.pdf

¹³⁴⁶ Xinhua News Item dated February 15, 2019 captioned “China's 2018 aquaculture output tops 50 mln tonnes”, available online at URL: http://www.xinhuanet.com/english/2019-02/15/c_137824585.htm

improve the management of aquaculture waste and maximize the industry's role in ecological restoration.¹³⁴⁷

As per **China Daily Report dated April 24, 2019 titled “China extends helping hand in aquaculture”** China claimed of more contributions to the sustainable development of the global fishing industry under the Belt and Road Initiative, according to the Ministry of Agriculture and Rural Affairs. China is the world's largest aquaculture producer and it can give full play to its technological and talent advantages in the field while cooperating with other developing countries, the ministry said. "We hope to work with others involved in the BRI to develop the fishing industry and make breakthroughs in aquaculture," it said. "Through cooperation we can provide technology, talent and financial support for developing aquaculture, including the cultivation and processing of aquatic products." The initiative has provided new opportunities for China's international cooperation in the fishing industry because of the great market potential in those countries, the ministry said. Many countries involved, especially the coastal countries, boast rich fishing resources and are traditional consumers of aquatic products. China's total aquaculture output exceeded 50 million metric tons last year, accounting for more than 78 percent of the country's output of aquatic products, according to the ministry. China is the only country in the world that raises more aquatic products than it catches by fishing, according to the ministry. China exported aquacultural products worth \$23.3 billion last year, an increase of 10 percent over the previous year. The trade surplus in such products was \$7.5 billion last year, a decrease of around 23 percent from the previous year.¹³⁴⁸

In 1985, China's fishing industry began cooperating with some developed countries, which provided aquatic products and employment opportunities for locals, said Zhang Xianliang, chief for fishing administration and supervision at the ministry. The rapid development of aquaculture in China has kept up with demand for protein and has reduced fishing in natural waters, he said, adding that aquaculture still has great potential in China, as daily consumption of aquatic products in the country is only about half the global average.

Cui Lifeng, former president of Chinese Academy of Fishery Sciences, said fishing cooperation between China and other countries, including those involved in the BRI, has great potential. Some developing African and Southeast Asian countries, for example, have relatively backward fishing industries, and food security remains a problem. But they have favorable natural resources and waters, he said. "China can help these countries develop aquaculture to improve food security and the incomes of fishermen through investment, training talent or sending fishing experts to provide technical guidance," he said. "International cooperation in fishing can benefit both China and other countries." The academy has been providing training in aquaculture for developing countries over the past three decades, including fish reproductive technologies, feed

¹³⁴⁷ Xinhua News Item dated March 10, 2019 captioned “China to accelerate green development of aquaculture industry”, available online at URL: http://www.xinhuanet.com/english/2019-03/10/c_137884172.htm

¹³⁴⁸ China Daily Report dated April 24, 2019 titled “China extends helping hand in aquaculture” written by Wang Xiaodong, Pg 1, available online at URL: http://www.chinadaily.com.cn/a/201904/24/WS5cbfbc91a3104842260b7f5b_1.html

manufacturing, prevention and control of aquatic diseases and the operation of small fish farms, Cui said.¹³⁴⁹

Xinhua News Item dated July 4, 2019 captioned “China develops semi-submersible aquaculture platform” reported that China has developed a semi-submersible aquaculture platform that harnesses ocean wave energy, according to its developer. Developed by the Guangzhou Institute of Energy Conversion under the Chinese Academy of Sciences, the platform integrates multiple functions including power generation, deep-sea aquaculture and tourism. Some traditional aquaculture cages have problems including poor resistance to wind and waves, insufficient energy supply and inability to carry modern aquaculture facilities. Based on decades of experience in ocean wave energy development, researchers developed the semi-submersible platform that can harness ocean wave energy and received patents from China, Japan and the European Union. The prototype of the platform has been delivered, and the institute will cooperate with companies to test it in a marine environment and further improve it. The platform shows China's growing capacity in offshore aquaculture equipment and engineering, and is expected to promote the development of marine economy, according to the institute.¹³⁵⁰

Another **Xinhua News Item dated September 5, 2019 captioned “China sees rapid expansion of coastal aquaculture ponds”** reported that China has experienced a rapid expansion of coastal aquaculture ponds since 1984, according to a recent study paper published in the International Journal of Applied Earth Observation and Geo-information. Monitoring and mapping of aquaculture ponds are of utmost importance for the sustainable management of coastal ecosystems, said the paper. Researchers generated maps of coastal aquaculture ponds in China from 1984 to 2016 at 30 meters spatial resolution. In addition, the spatial-temporal dynamics of coastal aquaculture ponds were examined. The results showed that the country's total area of coastal aquaculture ponds expanded by 10,463 square kilometers, with the largest gain occurring from 1990 to 2000. The provinces of Guangdong, Shandong, Jiangsu, Liaoning and Hebei had significant increases of aquaculture ponds areas, said the paper, accounting for 83 percent of the total number of expanded ponds. Rapid expansion of coastal aquaculture ponds was observed within the 10 kilometers inshore buffer areas. And the loss of wetlands and arable land contributed more than half of the expansion. The research is expected to study China's coastal artificial wetland ecosystem and provide support to figure out solutions for wetland sustainable utilization, scientific protection and land resources planning.¹³⁵¹

Further **Xinhua News Item dated September 27, 2019 titled “China launches project to foster fish gene research”** has mentioned that China has launched a project to construct a high-quality fish genome database and foster fish gene research, according to the Chinese Academy of Science (CAS). The project, Fish 10,000 Genomes Project, is

¹³⁴⁹ Ibid Pg 2, available online at URL:

http://www.chinadaily.com.cn/a/201904/24/WS5cbfbc91a3104842260b7f5b_2.html

¹³⁵⁰ Xinhua News Item dated July 4, 2019 captioned “China develops semi-submersible aquaculture platform”, edited by Liangyu, available online at URL:

http://www.xinhuanet.com/english/2019-07/04/c_138198347.htm

¹³⁵¹ Xinhua News Item dated September 5, 2019 captioned “China sees rapid expansion of coastal aquaculture ponds” edited by Lu Hui, available online at URL:

http://www.xinhuanet.com/english/2019-09/05/c_138367949.htm

coordinated by the Institute of Hydrobiology under the CAS, BGI Genomics Institute's Qingdao branch, Northwest Poly-technical University as well as other institutions. It aims to conduct the genome mapping of 10,000 species of fish living around the world and establish a large-scale, high-quality fish genome database. Researchers have collected samples of 324 species of fish, completed genome sequencing of 105 species and published the genomic map of 10 species. The project will last 10 years. It will help provide a molecular basis for fish breeding, offering a reference for aquaculture and marine ecological conservation, according to the CAS.¹³⁵²

8.7.2.2 FAO United Nations: Fishery and Aquaculture of PRC

Food and Agriculture Organization of United Nations: Fisheries and Aquatic Department

Fishery and Aquaculture Country Profiles of PRC: Country brief

China has been the world's top fish producer for many years. In 2015, China (mainland only) produced 65.2 million tonnes of food fish, with 47.6 million tonnes (73 percent) from aquaculture and 17.6 million tonnes (27 percent) from capture. Chinese aquaculture enjoyed double-digit growth rates in the 1980s and 1990s, but in the new millennium (2001–2015) the average annual growth was relaxed to 5.4 percent, lower than that of the rest of Asia. Chinese aquaculture is much more diverse than all other countries in terms of farmed species (over 200) and farming systems/methods. Chinese fish farmers contributed 62 percent to the world's farmed food fish production in 2015. China harvested 13.9 million tonnes of seaweeds from aquaculture in 2015.

Since 2007, when catch data were substantially revised on the basis of the Second National Agriculture Census, total capture production has been growing at an annual average rate of 2 percent thanks to increased marine catches which reached 15.3 million tonnes in 2015, whereas inland water catches have remained mostly stable around 2.3 million tonnes per year. Catches reported for Chinese vessels operating in distant waters (areas outside fishing area "61-Northwest Pacific") grew significantly reaching almost 1 million tonnes in 2015, but it is thought that catch data by distant fleets may still be underreported. In 2015, there were about 370 000 non-powered fishing vessels and another 672 000 were motor-powered. China implemented a fishing fleet reduction plan and a substantial marine fleet reduction was achieved by 2008 but that the fleet size has been on the rise since then.

The fishery sector provided jobs for over 14 million people in 2015 in all sectors. More than half of the employment was full-time. Aquaculture accounted for 5.1 million jobs. The sector also provides jobs in associated services, e.g. in the input supply, processing and marketing chains and this was reported as a further 15.9 million people in 2015. Since 2002, China is the world's largest exporter of fish and fishery products, with exports reaching USD 19.7 billion in 2015. In the last few years, China has significantly increased its imports of fish and fishery products, and became the world's third largest fish importer since 2012, with imports worth USD 8.5 billion in 2014. FAO methodology

¹³⁵² Xinhua News Item dated September 27, 2019 titled "China launches project to foster fish gene research" edited by Xuxin available online at URL: http://www.xinhuanet.com/english/2019-09/27/c_138428461.htm

estimated an apparent *per caput* consumption of about 37.9 kg/year in 2013, up from 31.9 kg in 2009. China became Party to the 1982 UN Convention on the Law of the Sea (UNCLOS) in 1996 and the 1995 UN Fish Stocks Agreement in 2000 with a statement expressing the understanding of the Chinese Government with respect to specific provisions of the Agreement concerning the inspection of vessels. China is a founding member of the Network of Aquaculture Centres in Asia and the Pacific (NACA).

8.7.2.3 Membership in Regional Fishery Bodies

- Asia-Pacific Fishery Commission (APFIC)
- Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)
- Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea (CCBSP)
- Indian Ocean Tuna Commission (IOTC)
- Inter-American Tropical Tuna Commission (IATTC)
- International Commission for the Conservation of Atlantic Tunas (ICCAT)
- International Whaling Commission (IWC)
- Network of Aquaculture Centers in Asia-Pacific (NACA)
- North Pacific Fisheries Commission (NPFC)
- South Pacific Regional Fisheries Management Organization (SPRFMO)
- The North Pacific Marine Science Organization (PICES)
- Western and Central Pacific Fisheries Commission (WCPFC)

China: FAO Fishery Statistics

		1980	1990	2000	2010	2013	2014	2015
EMPLOYMENT		4175.024	11173.463	12935.689	13992.142	14430.576	15030.522	14587.632
	(thousands)							
	Aquaculture	...	1740.999	3722.349	4978.969	5191.739	5124.211	5103.175
	Capture	4175.024	9432.464	9213.34	9013.173	9238.837	9906.311	9484.457
	Inland	...	...	...	5903.336	5761.665	6344.593	...
	Marine	4175.024	9432.464	9213.34	3109.837	3477.172	3561.718	9484.457
	FLEET(thousands vessels)	...	...	974.873	1065.645	1071.664	1065.319	1042.489

Source: FAO Fishery Statistics

URL: <http://www.fao.org/fishery/facp/CHN/en#pageSection1>

Following topic related Charts and figures are available at Food and Agriculture Organization of United Nations: Fisheries and Aquatic Department, Fishery and Aquaculture Country Profiles of PRC at URL:

<http://www.fao.org/fishery/facp/CHN/en#pageSection1>

- Total capture and aquaculture production for PRC (tones)
- Capture and aquaculture production of aquatic plants for PRC (tones)
- Aquaculture production by culture environment of PRC (tones)
- Capture production by inland and marine waters for the PRC (tones)
- Major species groups in capture production for the PRC (tones)
- Total imports and exports of fish and fisheries products for the PRC (USD 1000)
- Per capita supply of fish and fisheries products for the PRC (Kg)
- Composition of per capita fish supply for the PRC-2013 (Kg)
- Aquaculture sub-sector
- Legal Framework, Regional and International legal Framework.

China: Output of Fishery from 2013-2018¹³⁵³

Item (10,000 tons)	2013	2014	2015	2016	2017	2018
Total Aquatic Products	5744.2	6001.9	6211.0	6379.5	6445.3	6457.7
Seawater Aquatic Products	2992.4	3136.3	3232.3	3301.3	3321.7	3301.4
Freshwater Aquatic Products	2751.9	2865.7	2978.7	3078.2	3123.6	3156.2

Source: 12-2, Output of Agriculture, Animal Husbandry and Fishery, China Statistical Yearbook 2019

URL: <http://www.stats.gov.cn/tjsj/ndsj/2019/indexeh.htm>

China: Gross Output Value of Fishery and Related Indices

Year	Gross Output Value (100 million Yuan) Fishery	Indices of Gross Output (Preceding Year = 100) Fishery
1978	22.1	---
1980	32.9	107.7
1985	126.1	118.9
1990	410.6	110.0
1995	1701.3	119.4
2000	2712.6	106.5
2005	4016.1	106.5
2006	3970.5	106.0
2007	4427.9	104.0
2008	5137.5	105.8
2009	5514.7	105.6
2010	6263.4	105.4
2011	7337.4	104.1
2012	8403.9	105.0
2013	9254.5	105.1
2014	9877.5	104.0

¹³⁵³ Source: 12-2, Output of Agriculture, Animal Husbandry and Fishery, China Statistical Yearbook 2019

URL: <http://www.stats.gov.cn/tjsj/ndsj/2019/indexeh.htm>

2015	10339.1	104.3
2016	10892.9	102.9
2017	11577.1	102.8
2018	12131.5	102.7

Source: 12-3, Gross Output Value of Agriculture, Animal Husbandry and Fishery and Related Indices, China Statistical Yearbook 2019

URL: <http://www.stats.gov.cn/tjsj/ndsj/2019/indexeh.htm>

China: Output of Aquatic Products from 1978-2018

Year Region	Total Aquatic Products	Seawater Aquatic Products								(10 000 tons)						
			Naturally Grown	Artificially Cultured	Fish	Shrimps, Prawns and Crabs	Shellfish	Algae	Others	Freshwater Aquatic Products	Naturally Grown	Artificially Cultured	Fish	Shrimps, Prawns and Crabs	Shellfish	Others
1978	465.4	369.5	314.5	45.0	256.1	50.6	26.8	26.0	105.9	29.6	76.2	99.7	3.8	2.4		
1980	449.7	325.7	281.3	44.4	234.1	42.1	23.4	26.2	124.0	33.9	90.2	116.3	5.2	2.5		
1985	705.2	419.7	348.5	71.2	274.5	70.6	47.3	27.3	285.4	47.6	237.8	276.5	5.5	3.4		
1990	1237.0	713.3	550.9	162.4	423.1	107.0	147.3	27.5	8.2	523.7	78.3	445.4	504.9	9.5	7.6	1.8
1995	2517.2	1439.1	1026.8	412.3	758.1	184.8	392.3	74.9	29.0	1078.1	137.3	940.8	1018.6	27.3	20.5	11.6
2000	3706.2	2203.9	1275.9	928.0	896.7	257.9	901.7	106.1	41.5	1502.3	193.4	1308.9	1358.4	76.3	40.0	27.7
2005	4419.9	2465.9	1255.1	1210.8	913.9	281.3	1008.1	133.9	128.6	1954.0	221.0	1733.0	1737.2	140.3	46.3	30.2
2006	4583.6	2509.6	1245.4	1264.2	892.1	299.4	1046.7	137.6	133.8	2074.0	220.4	1853.6	1822.5	167.8	50.9	32.8
2007	4747.5	2550.9	1243.6	1307.3	891.3	298.9	1068.2	138.8	153.7	2196.6	225.6	1971.0	1908.5	202.1	50.5	35.5
2008	4895.6	2598.3	1258.0	1340.3	864.3	288.8	1072.5	142.3	122.1	2297.3	224.8	2072.5	1998.5	210.1	50.1	38.7
2009	5116.4	2681.6	1276.3	1405.2	880.8	303.6	1120.0	148.4	131.0	2434.8	218.4	2216.5	2109.9	228.8	52.0	44.2
2010	5373.0	2797.5	1315.2	1482.3	906.3	310.4	1170.4	156.6	142.1	2575.5	228.9	2346.5	2225.6	248.1	53.8	47.9
2011	5603.2	2908.0	1356.7	1551.3	1075.2	321.8	1212.8	162.9	135.3	2695.2	223.2	2471.9	2343.7	248.8	53.9	48.8
2012	5502.1	2889.6	1314.4	1575.2	957.3	345.7	1264.8	179.0	142.8	2612.5	204.0	2408.5	2235.9	268.7	54.0	54.0
2013	5744.2	2992.4	1327.7	1664.7	972.8	362.6	1327.6	188.5	140.9	2751.9	204.2	2547.7	2366.5	277.0	52.8	55.5
2014	6001.9	3136.3	1403.9	1732.4	1042.5	382.9	1371.7	202.9	136.2	2865.7	202.5	2663.2	2470.7	288.7	51.4	54.8
2015	6211.0	3232.3	1435.7	1796.6	1078.0	386.3	1414.0	211.5	142.5	2978.7	199.3	2779.3	2571.9	300.2	51.6	54.9
2016	6379.5	3301.3	1386.0	1915.3	1063.1	396.1	1476.9	219.3	145.8	3078.2	200.3	2877.9	2653.8	316.1	52.5	55.8
2017	6445.3	3321.7	1321.0	2000.7	1115.8	370.7	1481.4	224.8	129.0	3123.6	218.3	2905.3	2702.6	320.8	46.7	53.6
2018	6457.7	3301.4	1270.2	2031.2	1091.5	368.2	1487.0	236.2	118.5	3156.2	196.4	2959.8	2691.4	369.7	40.8	54.4

Source: 12-15 , Output of Aquatic Products from China Statistical Yearbook 2019

URL: <http://www.stats.gov.cn/tjsj/ndsj/2019/indexeh.htm>

8.7.3 Chemistry, Materials Science and Nanotechnology

8.7.3.1 Chemistry

8.7.3.1.1 UNESCO Science Report 2015: China

“China in UNESCO Science Report: Towards 2030” covering China’s Section (Pg 621-641) authored by Cong Cao published in 2015, Paris UNESCO, excerpts from the report are mentioned below:

According to the Institute of Scientific and Technical Information of China, which is affiliated with the **Ministry of Science and Technology (MoST)**, China contributed about one-quarter of all articles published in materials science and chemistry and 17% of those published in physics between 2004 and 2014 but just 8.7% of those in molecular