China's Agricultural Modernization Strategy towards 2035

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Abstract: *China's agricultural modernization drive has made steady progress with great achievements. After six decades of development, China has reached the mid-stage of agricultural modernization. By the average pace of recent years, China is poised to attain agricultural and rural modernization by 2035, but progress will vary considerably across regions and sectors. A transition towards an agricultural powerhouse is the only path towards agricultural modernization. Being a large agricultural producer, China has yet to qualify as an agricultural powerhouse in terms of agricultural sufficiency, competitiveness, innovation, and sustainability. From the mid- and long-term perspective, our agricultural modernization should proceed in light of China's rural reform experience, focusing on food security, agricultural industry, green transition, and agri-tech. With a regionally differentiated approach, China should aim to basically achieve agricultural and rural modernization in about 15 years and complete the transition towards an agricultural powerhouse in 20 years from 2020.*

Keywords: *agricultural modernization, agricultural powerhouse, implementation strategy*
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Agricultural modernization is a strategic priority concerning the rejuvenation of the Chinese nation and China's development towards a great modern socialist country. Adopted at the Fifth Plenum of the 19th CPC Central Committee, the *Proposals for Formulating the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and the Long-Range Objectives Through the Year 2035* identifies agricultural modernization as a long-term goal. After reviewing China's progress in agricultural development, this paper puts forth strategic recommendations for China to enhance agricultural competitiveness and achieve basic agricultural modernization by 2035.

1. Key Achievements of China's Agricultural Modernization

As early as in the 1950s, the Chinese government vowed to achieve the goal of agricultural modernization. Before the reform and opening up in 1978, the concept of agricultural modernization had been construed in the narrow sense as a combination of agricultural mechanization, water conservancy, the application of chemical fertilizers, electrification, and the improvement of crop species. In the early stage of reform and opening up, the nation started to realize the importance of science and technology in agricultural modernization. With the establishment of the socialist market economic system in the 1990s, agricultural modernization took on the connotations of commercialization and market-oriented

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面向2035年的中国农业现代化战略

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摘 要： 中国特色农业现代化持续推进，成就举世瞩目。经过60多年的持续推进，目前中国农业现代化进程已处于中期阶段。按照近年来的平均推进速度，到2035年中国总体可以基本实现农业农村现代化，但各地区、各领域的进程差别较大。加快由农业大国向农业强国转变是实现农业现代化的必由之路。现代农业强国的标志大体可归纳为“四强一高”，即农业供给保障能力强、农业竞争力强、农业科技创新能力强、农业可持续发展能力强和农业发展水平高。面向中长期发展，要将农业现代化一般规律与中国农村改革经验紧密结合，围绕粮食安全、现代农业产业体系、农业绿色化转型、科教兴农等重点领域，实施分地区、分阶段、分重点的梯次推进战略，力争用15年左右的时间基本实现农业农村现代化，用20年左右的时间完成由农业大国向农业强国的转变。

关键词： 农业现代化；农业强国；推进战略

JEL 分类号：Q10

加快推进农业现代化，是事关中华民族伟大复兴和建设社会主义现代化强国的重大战略任务。党的十九届五中全会通过的《中共中央关于制定国民经济和社会发展第十四个五年规划和二〇三五年远景目标的建议》将基本实现农业现代化作为到2035年基本实现社会主义现代化远景目标之一。对此，系统总结中国农业现代化取得的成就，科学把握当前农业农村现代化的实现程度，从中国农业发展特征与国际农业发展经验出发，提出中国从农业大国向农业强国转变以及到2035年基本实现农业现代化的战略选择，具有重要理论价值和决策意义。

一、中国农业现代化取得的主要成就

早在20世纪50年代，中国就提出了实现农业现代化的目标任务。在改革开放之前，农业现代化一直被狭义理解为农业的机械化、水利化、化学化、电气化和良种化等。改革开放初期，人们对农业现代化的理解开始突出科技化，强调把农业的生产和管理逐步建立在科学技术的基础上。20世纪90年代，随着社会主义市场经济体制的建立，农业现代化又被赋予商品化、市场化、产业化的内涵。2017年，党的十九大报告将农业现代化

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development. In 2017, the *Report to the 17th CPC National Congress* called for "expediting agricultural and rural modernization." The concept of agricultural and rural modernization encompasses broader aspects, including progress in rural industries, environment, culture, governance, and living standards (Wei, 2019).

Since the founding of the People's Republic of China in 1949 and especially reform and opening up in 1978, China has made remarkable progress towards agricultural modernization. The output of grain and other staple agricultural products steadily increased. Agriculture became more profitable, competitive, and sustainable. Farmers saw a steep rise in their income and welfare levels. With these achievements, China has made great contributions to world agricultural development.

(i) Food security: From 1949 to 1966, China's grain output increased from some 100 million tons to 200 million tons. In the subsequent four decades, China's total grain output leaped from 200 million tons to over 600 million tons. In 2012, China's total grain output exceeded 600 million tons for the first time. In 2015, it exceeded 650 million tons and remained so afterward. From 1950 to 2019, China's total grain output grew by 2.56% on an annual average basis. Since 2005, China's grain self-sufficiency has surpassed 95% (Wei and Du, 2020). With less than 1/10 of the world's arable land, China feeds 1/5 of the world population - a remarkable contribution to global food security.

According to data from the World Bank and the United Nations Food and Agriculture Organization (UNFAO), China's grain output reached 6,029 kilograms/hectare in 2017, which was on a par with the level of high-income countries. China's per capita grain possession stood at 470 kilograms (the State Council Information Office, 2019), which was above the world average. In the same year, China ranked first in the world for cereal, wheat, paddy rice, peanut, tea and meat output. China's grain (paddy rice, wheat and corn), peanut and tea output accounted for over 20%, 30% and 40% of the world's total, respectively. China has steadily advanced agricultural cooperation with countries and regions involved in the Belt and Road Initiative (BRI) with a total agricultural trade volume reaching 230 billion US dollars in 2019 (Han, 2020). A diverse and open pattern of agricultural cooperation is taking shape apace, enhancing China's domestic agricultural supply.

(ii) China's agriculture operated with improving quality and efficiency. China's farming, forestry, livestock and fishery sector has been growing rapidly over the past six decades. From 1953 to 2019, the total output value of China's farming, forestry, livestock and fishery sector grew by 4.5% on an annual average basis, and this growth rate averaged 5.5% over the period 1979-2019 (Wei, 2020a). Few countries in the world could maintain such a high growth rate for their agricultural economy for such a long period. Meanwhile, a structural change took hold. In 2019, crop farming accounted for 53.3% of China's agricultural economy, down 32.6 percentage points from 1952, and the shares of forestry, livestock and fishery increased by 3.1, 15.5 and 8.8 percentage points, respectively. With the structural improvement, China has established a modern agricultural system, steadily increased grain output, and optimized the regional layout of cash-crop farming.

Amid deepening supply-side structural reforms, a modern agricultural operation system took shape. Rural contract land transfers accounted for 35.9% of the total farming area (Han, 2020), giving rise to agricultural economies of scale. New agricultural entities such as farmers' cooperatives have mushroomed. In 2018, there were 87,000 agricultural enterprises, 2.17 million registered farmers' cooperatives, 600,000 family farms, and 7.8 million innovators and entrepreneurs who returned to the countryside. New business entities and professional farmers have become driving forces of agricultural modernization (Ning, 2020). The quality, efficiency and competitiveness of agriculture have improved continuously. China's agricultural value-added per labor force exceeded the level of middle-income countries since 2012. By 2019, China's agricultural value-added per labor force has increased fourfold over 1995 (Figure 1).

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扩展到农业农村现代化，提出了“加快推进农业农村现代化”的任务。很明显，农业农村现代化具有更加丰富的内涵，它是包括农业现代化在内的农村产业现代化、农村生态现代化、农村文化现代化、乡村治理现代化和农民生活现代化“五位一体”的有机整体（魏后凯，2019）。

新中国成立以来尤其是改革开放以来，中国农业现代化进程持续推进，农业发展取得了举世瞩目的成就，粮食和主要农产品生产能力稳步提高，农业经济效益和竞争力显著增强，农民收入水平和福祉大幅提升，农业可持续发展能力不断强化，逐步走上了具有中国特色的农业现代化道路，为促进世界农业发展作出了巨大贡献。中国农业现代化的成就主要体现在以下几个方面：

一是粮食和主要农产品供给得到充分保障。新中国成立初的粮食总产量为1亿多吨，到1966年达到2亿吨，40多年后，中国粮食总产量从2亿吨跃升至6亿多吨。2012年粮食总产量首次突破6亿吨，2015年突破6.5亿吨，随后始终稳定在6.5亿吨以上，1950~2019年中国粮食总产量年均增长2.56%。2005年以来中国谷物自给率均超过95%（魏后凯和杜志雄，2020），连续多年实现口粮完全自给，用不足世界1/10的耕地养活了约占全世界1/5的人口，为世界粮食安全做出举世瞩目的贡献。

根据世界银行与联合国粮农组织的数据，2017年中国谷物单产达6029千克/公顷，与高收入国家相当。中国人均粮食占有量达到470千克左右（中华人民共和国国务院新闻办公室，2019），高于世界人均粮食占有量。此外，中国谷物、小麦、稻谷、花生、茶叶和肉类产量等多项指标均位列世界第一，谷物、小麦和玉米产量占世界的20%以上，花生产量占世界的30%以上，茶叶产量占世界的40%以上。中国与“一带一路”沿线国家和地区积极推进农业合作，2019年农产品贸易总额达到2300亿美元（韩长赋，2020），多元开放的农业对外合作格局加快形成，不断保障和优化国内农产品供应。

二是农业生产经营的质量和效益稳步增强。中国农林牧渔业总产值保持了60多年的高速增长，按可比价格计算，1953~2019年中国农林牧渔业总产值年均增长率为4.5%，其中，1979~2019年为5.5%（魏后凯，2020a），在世界范围内农业经济能够长期保持如此高增速的国家并不多见。在这个过程中，我国的农业实现了从单一以种植业为主的传统农业向农林牧渔业全面发展的现代农业的转变，农业发展由增产导向转向提质导向。2019年，我国农业产值占农林牧渔业总产值53.3%，相较于1952年减少了32.6个百分点；林业、畜牧业和渔业占比分别提高3.1个百分点、15.5个百分点和8.8个百分点，农林牧渔结构日益合理的现代农业产业体系初步建立，粮食主产区稳产增产能力增强，经济作物进一步向优势产区集中，农业生产区域布局日趋优化。

随着中国农业供给侧结构性改革深入推进，现代农业经营体系也加快构建，农村承包地流转面积比例达到35.9%（韩长赋，2020），多种形式适度规模经营实现新发展，新型经营主体大量涌现。农民合作社等新型农业经营主体数量增长迅猛，2018年我国农业领域产业化龙头企业数量高达8.7万家，登记注册的农民合作社数量多达217万个，家庭农场数量为60万个，各类返乡下乡创新创业人员累计达780万人。新型经营主体和新型职业农民正成为引领农业现代化的主力（宁吉喆，2020），农业发展质量、效益和竞争力不断提高。中国劳均农业增加值自2012年起超过中等收入国家水平，到2019年中国劳均农业增加值已是1995年的4倍之多（见图1）。

三是现代农业装备条件大幅改善，科技含量不断提升。新中国成立初期中国农业产业基础薄弱，1952年中国农业机械总动力仅18.4万千瓦，1978年为1.2亿千瓦，当年全国农业综合机械化率仅有19.7%（魏后凯，

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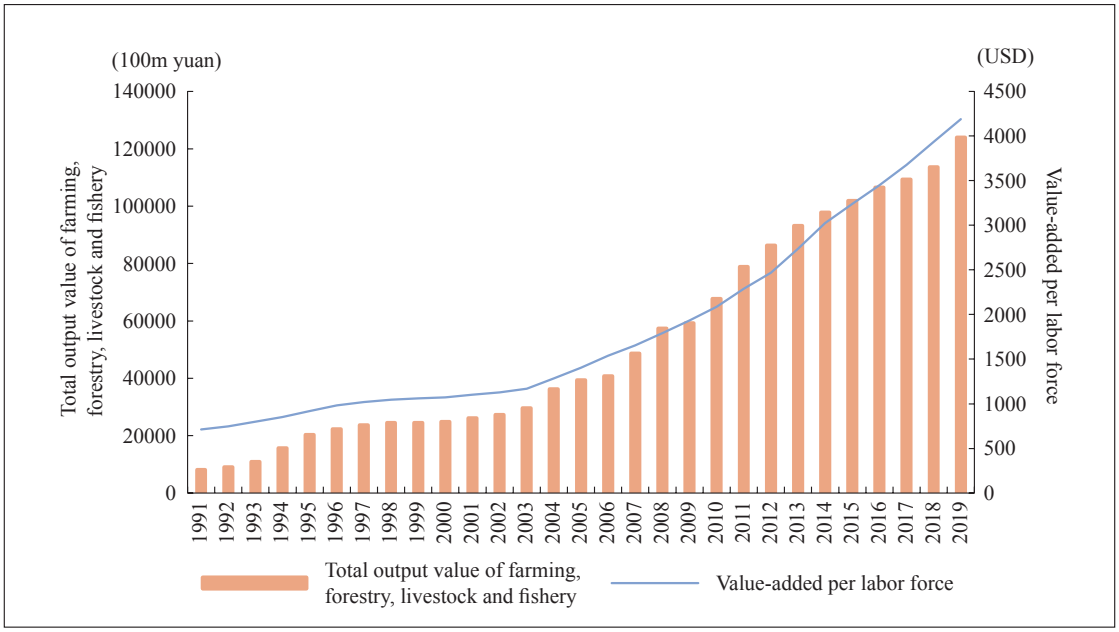

Figure 1: Change in the Total Output Value of China's Farming, Forestry, Livestock and Fishery Sector and Agricultural Value-Added per Labor Force

Source: Aggregate output data of farming, forestry, livestock and fishery is from the National Bureau of Statistics (NBS); the aggregate output index for farming, forestry, livestock and fishery is calculated at the 1990 constant price for the pre-2003 period and calculated at the comparable price for the post-2003 period since it includes the output value from services. Agricultural value-added per labor force data is from the World Bank at 2010 constant US dollar.

(iii) Mechanization and agri-tech have boosted productivity. From 1952 to 1978, the total power of China's agricultural machinery increased from a mere 184MW to 120GW; in 1978, China's agricultural mechanization rate was only 19.7% (Wei, 2020a). Since the reform and opening up in 1978, mechanical power has replaced manpower and animal power in China's agriculture. In 2019, the total power of China's agricultural machinery reached 1.03TW, and the overall mechanization rate of crop farming exceeded 70%. Specifically, the mechanization rate of grain farming was above 80%. Water conservancy infrastructure kept improving. In 2018, China's farmland irrigation area reached 68 million hectares, up 2.4 times from 1952, or 1.9% on an annual average basis (Ning, 2020). By 2020, China is expected to have 53.33 million hectares of high-standard farmland, which ensures the country's agricultural self-sufficiency.

Progress in agri-tech has injected vital forces into China's agricultural modernization, bringing the country to the world frontier in some areas. In 1949, progress in science and technology contributed less than 20.0% to China's agricultural output growth. This ratio rose to 27.0% early in the early reform era. By 2019, however, progress in science and technology contributed 59.2% to China's agricultural output growth, covering most staple crop species (Wei, 2020a), and independently selected species have covered 95% of the sown area. China leads the world in terms of genome research and applications for paddy rice, cabbage, tomato and cucumber, and has made breakthroughs in super rice, GM corn and new species of soybean. New modes of agricultural production, such as facility agriculture, soilless culture, sightseeing agriculture and precision farming, have developed rapidly. Crop farming, livestock and fishery have widely applied ICT technologies, including big data, driving forward agricultural digitalization, rural e-commerce, and smart farming.

(iv) Agricultural sustainability steadily increased. For a long time, China's agriculture depended heavily on chemical fertilizers and pesticides. This traditional approach is unsustainable. Less chemical

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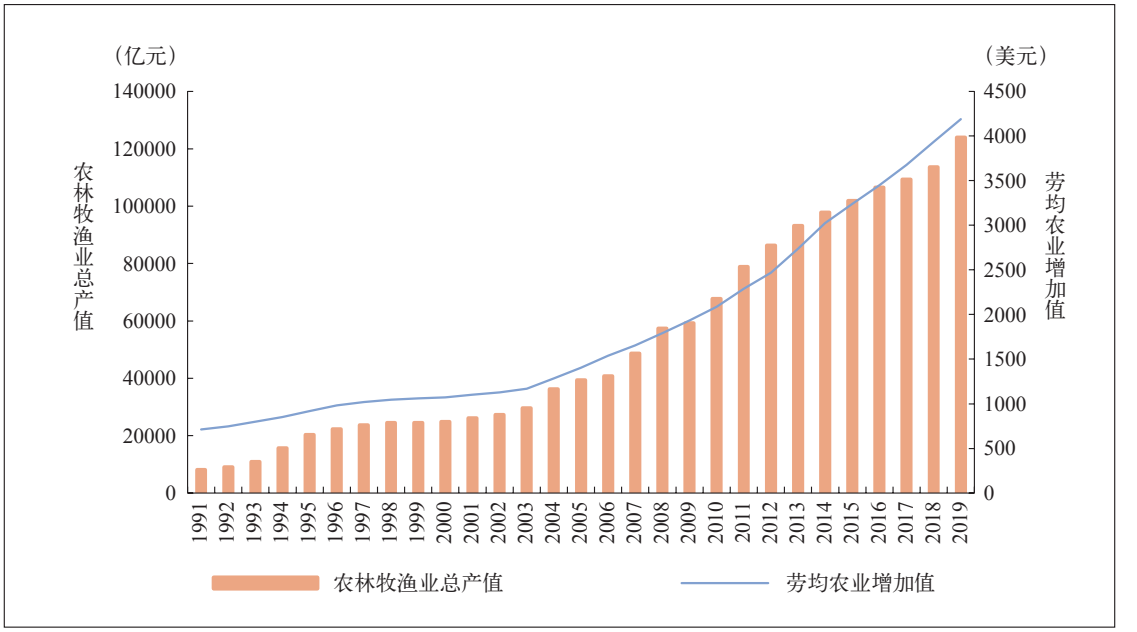

图1 中国农林牧渔业总产值与劳均农业增加值变化

数据来源：农林牧渔业总产值来源为国家统计局，2003年以前农林牧渔业总产值指数按1990年不变价格计算，2003年以后，农林牧渔业总产值包括农林牧渔服务业产值，按可比价计算。劳均农业增加值数据来源于世界银行，按2010年不变价美元。

2020a）。改革开放以来，中国农业生产方式实现了从主要依靠人力、畜力到主要依靠机械动力的历史性转变，2019年中国农业机械总动力达到10.3亿千瓦，农作物耕种收综合机械化率已超过70.0%，其中主要粮食作物耕种收综合机械化率超过80%。同时，我国农田水利基础设施条件持续提高。2018年我国耕地灌溉面积高达10.2亿亩，相较于1952年增长2.4倍，年均增长1.9%（宁吉喆，2020），2020年中国预计将累计建成8亿亩高标准农田，有力保障了国家农产品供给。

农业科技进步为农业现代化注入了强大动力，部分研发领域已处于世界前沿。1949年，我国农业科技进步贡献率不到20.0%，改革开放初期也仅27.0%，而到2019年，我国农业科技进步贡献率已经达到59.2%，主要农作物良种基本实现全覆盖（魏后凯，2020a），自主选育品种面积超过95%。水稻、白菜、番茄、黄瓜等作物基因组学研究及应用国际领先，超级稻选育推广、转基因玉米和大豆新品种研发等都取得突破，设施农业、无土栽培、观光农业、精准农业等新型农业生产模式快速发展。特别是当前种植业、畜牧业、渔业等信息化建设进展顺利，农业农村大数据和基础数据资源建设初见成效，农机装备和作业数字化步伐加快，农村电子商务蓬勃发展，农业数字化、智慧化转型正在深入推进。

四是农业可持续发展能力持续增强，彰显绿色发展理念。长期以来中国农业过度依赖化肥、农药等化学品大量投入，这种传统生产方式已难以为继，推进化肥、农药等减量增效，实现农业高质量绿色发展，成为农业供给侧结构性改革的重要内容，近年来成效明显。2015年以来中国化肥、农药使用量连续实现负增长（见图2），2019年中国化肥施用量为5403.6万吨，相较于2015年少施用619万吨，降低了10.3%；农药使用量为145.6万吨，相较于2015年少使用32.7万吨，降低了18.3%。同年中国三大主粮化肥利用率达到39.2%，农药利用率

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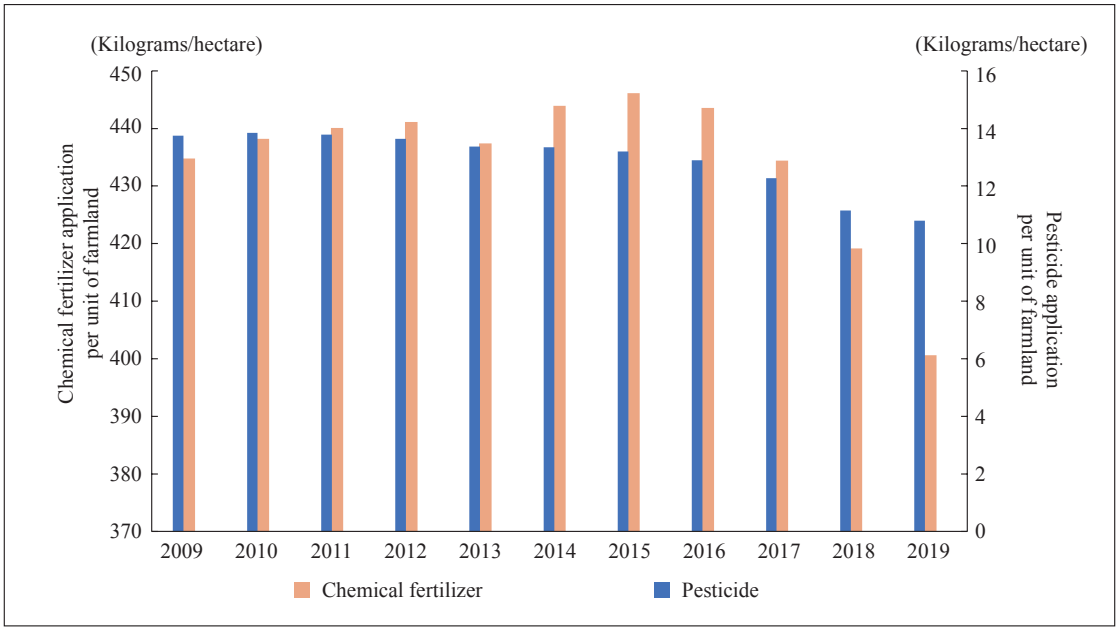

Figure 2: China's Chemical Fertilizer and Pesticide Application Intensity, 2009-2019

Source: Calculated based on data from the *China Statistical Yearbook 2020* and the National Bureau of Statistics (NBS).

fertilizer and pesticide consumption and greener farming practices have become key elements of China's agricultural supply-side structural reforms and achieved great results in recent years. Since 2015, China's chemical fertilizer and pesticide have recorded negative growth rates (Figure 2). In 2019, China's chemical fertilizer consumption stood at 54.036 million tons, down 6.19 million tons from 2015, which is a 10.3% decrease. Pesticide consumption decreased by 327,000 tons, or 18.3%, from 2015 to reach 1.456 million tons. In the same year, China's fertilizer application rate for paddy rice, corn and wheat was 39.2%, and pesticide application rate reached 39.8%, up 4.0 and 3.2 percentage points over 2015, respectively. Currently, China's livestock and poultry manure utilization rate has reached 75%, and stalk utilization and farm membrane recovery rates have reached 86% and 80%, respectively.

In 2019, China's arable land quality improved by 0.35 grades from 2014 (Ministry of Agriculture and Rural Affairs, 2020), and the effective utilization factor of farmland irrigation reached 0.559. Chemical inputs have been used more sparingly and efficiently. By the end of 2018, China had certified 122,000 pollution-free agricultural products, green food products, organic agricultural products, and geographically labeled agricultural products (Ning, 2020). Well-known agribusiness brands keep emerging. Currently, more than 97% of agricultural products have passed safety inspections (Han, 2020). China plans to enhance green agriculture, promote the quality of agricultural produce, and maintain and restore agricultural ecosystems. In 585 livestock counties, livestock and poultry manure is recycled into resources. Rotational farming and fallowing pilot programs have been expanded to two million hectares. As of 2021, key regions of the Yangtze River Basin will be subject to a 10-year fishing moratorium. Regular fishing moratorium schemes have covered the seven major river basins and key rivers, lakes, and sea areas.

2. China's Agricultural Modernization Process and Outlook

Despite the great achievements since 1949, China still has a long way to go before achieving

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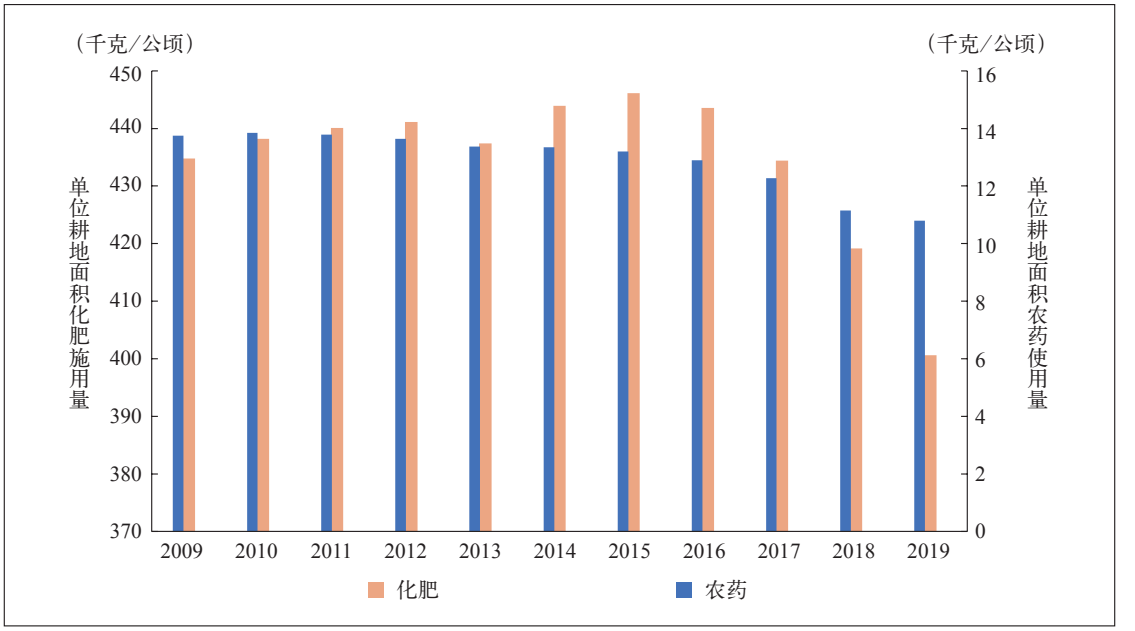

图2 2009~2019年中国化肥和农药使用强度

资料来源：根据《中国统计年鉴2020》和国家统计局发布的相关数据计算。

达到39.8%，分别比2015年提高4个百分点和3.2个百分点。目前中国畜禽粪污综合利用率已经达到75%，秸秆综合利用率、农膜回收率分别达到86%和80%。

2019年中国耕地质量较2014年提高0.35个等级（农业农村部，2020），农田灌溉水有效利用系数达到0.559。得益于化学投入品总量得到控制以及资源利用率的提升，中国农业绿色化、优质化、特色化、品牌化水平不断提升。截至2018年底，中国“三品一标”产品总数12.2万个（宁吉喆，2020），目前农产品质量安全监测合格率稳定在97%以上（韩长赋，2020）。未来中国还将持续深入推进质量兴农、绿色兴农战略，提升农业生态系统养护与修复水平。中国已整建制推进585个畜牧大县畜禽粪污资源化利用，耕地轮作休耕试点面积扩大到3000万亩。长江流域重点水域自2021年起将实施为期10年的禁捕，内陆七大重点流域和主要江河湖海休禁渔制度实现全覆盖。

二、中国农业现代化的进程与展望

农业现代化是变传统农业为现代农业的动态过程。新中国成立以来，虽然中国农业现代化取得了巨大成就，农业生产面貌发生了翻天覆地的变化，但由于原有基础较差，加上中国的大国小农特征，在新型工业化、城镇化、信息化、农业现代化新“四化”同步中，农业现代化至今仍然是明显的短板。因此，全面加快农业现代化进程，加快实现由农业大国向农业强国转变，将是未来中国建设社会主义现代化强国的核心任务之一。按照现有进程和推进速度，到2035年中国总体上可以基本实现农业农村现代化，但分区域、分领域的进程差别

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agricultural modernization, which started from a very low basis. Smallholders with inefficient farming practices still dominate. Among China's "new four modernizations," i.e. new-type industrialization, urbanization, ICT application and agricultural modernization, agriculture has been the weakest link. In building a great modern socialist country, China must prioritize agricultural development. At the current pace, China is poised to basically achieve agricultural and rural modernization by 2035, but the progress will vary considerably across regions and sectors.

2.1 Overall Progress of China's Agricultural Modernization

Like other countries in their agricultural modernization drive, China has seen steady decreases in agricultural value-added as a share of GDP and agricultural labor force as a share of the total workforce. Amid rising productivity and economic development levels, rural populations have migrated to cities, and rural labor productivity and farmers' incomes keep on the rise. In 1952, the primary industry generated 50.5% of total value-added in China. In 2019, this ratio fell to 7.1%. By 2035, agricultural value-added is expected to account for less than 5% (Research Group of the Rural Development Institute, the Chinese Academy of Social Sciences, 2020a). As can be seen from Figure 3, the share of China's agricultural value-added has fallen below the level of middle-income countries and is edging closer to the level of upper-middle-income countries. From 1952 to 2019, the share of the workforce in China's primary industry fell from 83.5% to 25.1%, down over one percentage point on an annual average basis. The labor force will continue to migrate from agriculture to industry and services, and the agricultural labor participation rate will further decrease. By 2035, China's agriculture will employ around 10% of the total workforce (Research Group of the Rural Development Institute, the Chinese Academy of Social

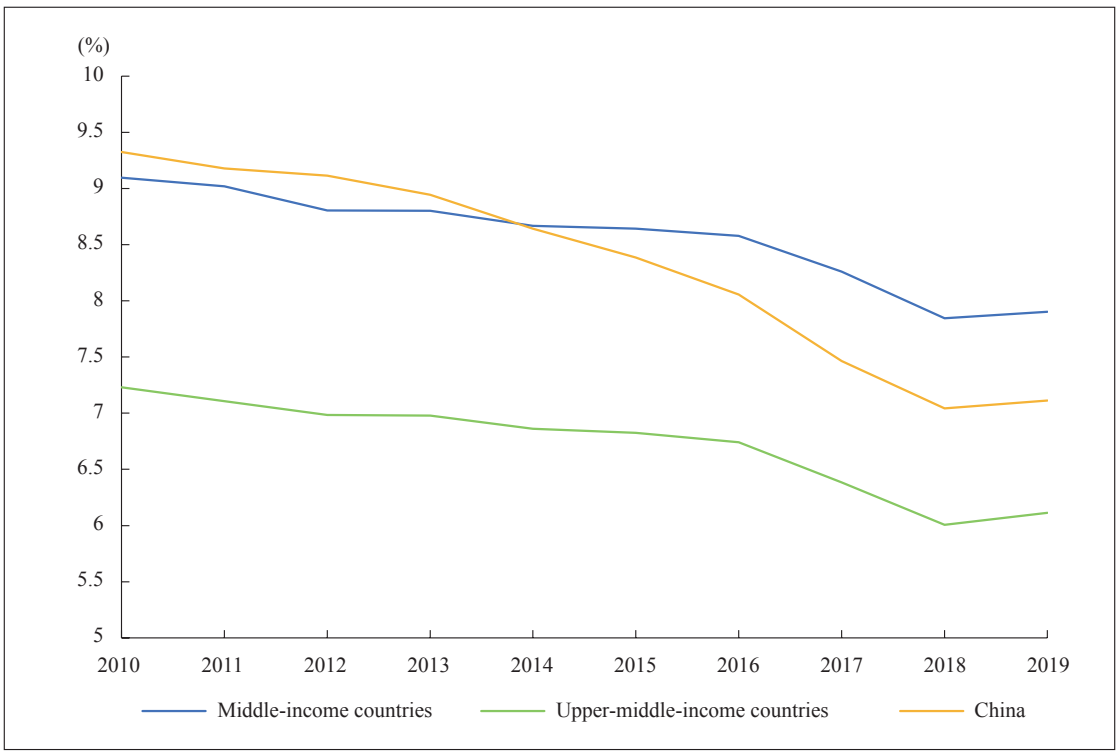

Figure 3: International Comparison of Agricultural Value-Added as a Share of GDP
Source: World Bank database.

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较大，实现由农业大国向农业强国转变的任务依然十分艰巨。

（一）中国农业现代化的总体进程

总体上看，中国的农业现代化进程符合世界农业现代化一般规律，即随着生产力和经济发展水平的提高，农业增加值占国内生产总值的比重逐渐减少，农业就业人员占就业人员比重逐渐降低，农村人口稳步向城镇转移，农业劳动生产率和农民收入持续增加。从增加值比重来看，中国第一产业增加值占比由1952年的50.5%下降至2019年的7.1%，预计2035年农业增加值占比将下降至5%以下（中国社会科学院农村发展研究所课题组，2020a）。从图3中可以看出，近年来中国农业增加值比重已经降至中等收入国家水平之下，并在逐步接近中等偏上收入国家水平。再从就业比重来看，从1952年到2019年，中国第一产业就业人员占比从83.5%下降至25.1%，年均下降幅度超过1个百分点。未来农业劳动力向工业、服务业部门转移的总体趋势大体不变，农业劳动参与率将进一步减少。预计到2035年，中国农业劳动力占就业人员比重将下降至10%左右（中国社会科学院农村发展研究所课题组，2020a），考虑到中国兼业化农户占大多数，参与农业劳动的实际劳动力比例可能更低。

农业现代化是农业农村现代化的核心内容。中国社会科学院农村发展研究所课题组结合乡村振兴战略的阶段性目标，通过构建评价指标体系，提出了2035年基本实现农业农村现代化和2050年全面实现农业农村

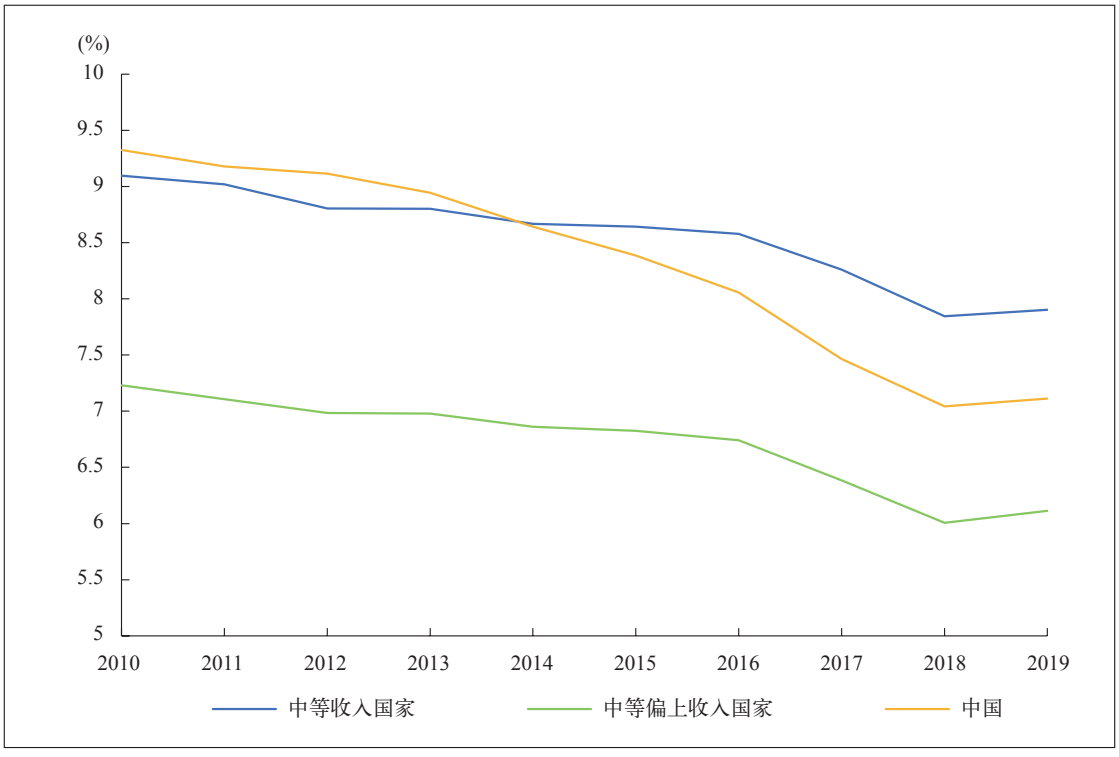

图3 农业增加值占国内生产总值比重的国际比较

资料来源：世界银行数据库。

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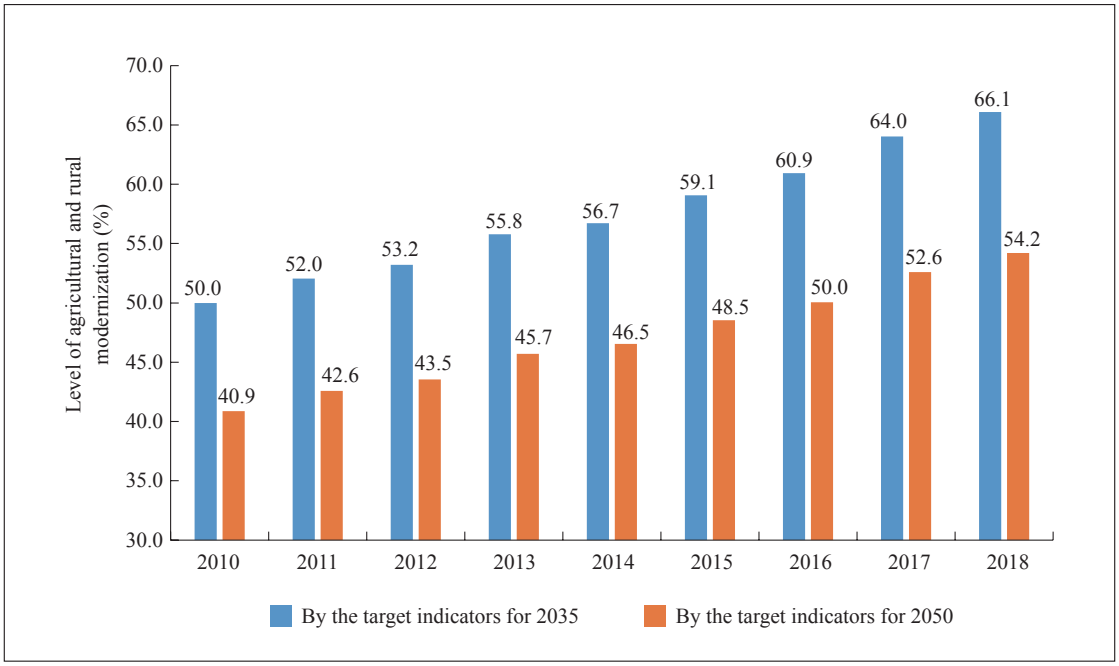

Figure 4: China's Agricultural and Rural Modernization Progress
Source: Estimated by authors with data from official sources.

Sciences, 2020a). Considering that most farmers take part-time non-farming jobs, the actual ratio could be even smaller.

Based on the goals for countryside vitalization, the Research Group of the Rural Development Institute (RDI) of the Chinese Academy of Social Sciences (CASS) has identified target indicators for basic agricultural and rural modernization by 2035 and in all respects by 2050. By the target indicators for 2035, the level of China's agricultural and rural modernization was 66.1% in 2018; by the target indicators for 2050, the level of achievement was 54.2% (Figure 4). By the average growth rate of 2010-2018, China would be able to achieve the composite target index for agricultural and rural modernization by 2035 (Research Group of the Rural Development Institute, CASS, 2020b).

Regionally, however, the level of agricultural and rural development varies considerably. From the late 14th Five-Year Plan (FYP) period (2021-2025) to the early 15th FYP period (2026-2030), China's prosperous coastal regions and suburbs of large cities such as Beijing, Tianjin, Zhejiang, Shanghai and Jiangsu would basically achieve agricultural and rural modernization (Tier-1 Regions). Less developed provincial-level regions in the western part of China, including Tibet, Yunnan, Gansu and Guizhou, face a daunting task in achieving basic agricultural and rural modernization by 2035 (Tier-3 Regions). The rest are Tier-2 Regions (Figure 5).

Sector-wise, rural industries will attain the highest level of modernization, and rural living standards and the environment will come last. At the current pace, China's agricultural and rural modernization drive will follow a sequential path of agricultural development, rural prosperity, and environmental sustainability (Research Group of the Rural Development Institute, CASS, 2020c).

Notably, agricultural productivity is the weakest spot. By the World Bank's World Development Index (WDI), in 2018, China's agricultural value-added per labor force was slightly above the world average but 22.2% below the level of upper-middle-income countries and only 12.1% the level of high-income countries. In China, agriculture continues to employ an outsize share of the workforce. Most

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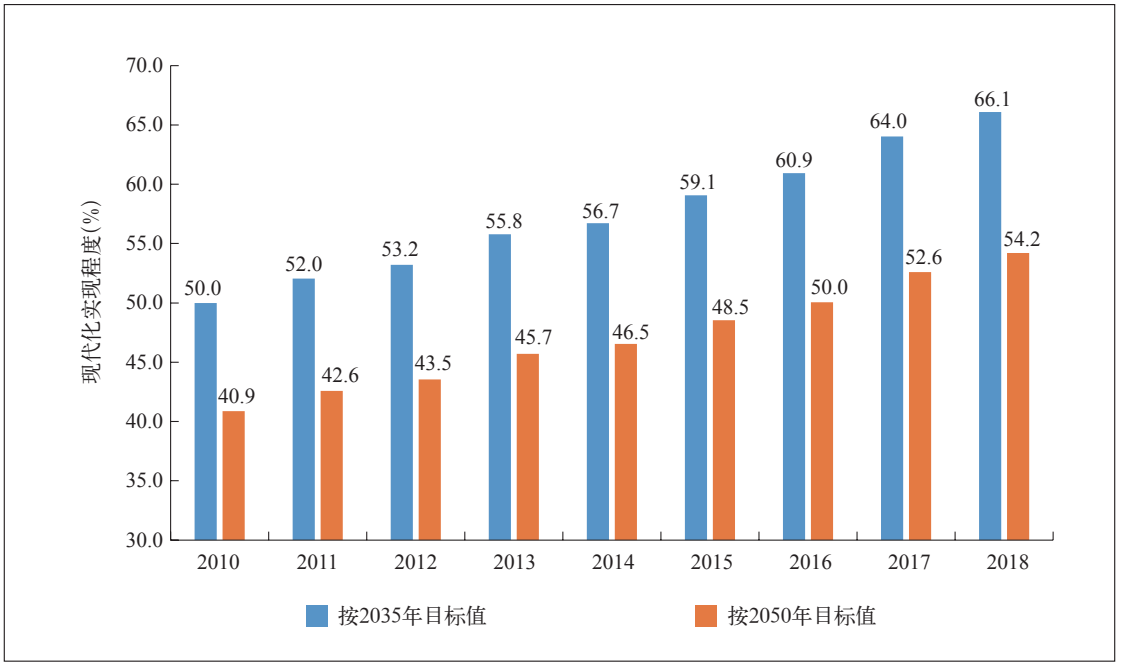

图4 中国农业农村现代化实现程度的变化

资料来源:根据有关数据测算。

现代化目标值,据此对中国农业农村现代化实现程度进行了综合评价。结果表明,按2035年目标值测算,2018年中国农业农村现代化的实现程度为66.1%;按2050年目标值测算,实现程度为54.2%,均处于中期阶段(见图4)。如果按照2010~2018年平均增速推进,从总体上看,到2035年中国基本实现农业农村现代化目标值是可以的(中国社会科学院农村发展研究所课题组,2020b)。当然,这只是就平均的综合指数而言。

然而,分区域和分领域来看,各方面的进程差别较大。分区域看,各地基本实现农业农村现代化程度大体分为三个阶梯。"十四五"期末到"十五五"初期,北京、天津、浙江、上海、江苏等部分沿海发达地区和大城市郊区有条件率先基本实现农业农村现代化,这些地区属于第一梯队。西藏、云南、甘肃、贵州等省份属于第三梯队,这些地区到2035年如期基本实现农业农村现代化尚需进行不懈努力。其他地区介于中间水平,属于第二梯队(见图5)。分领域来看,农村产业现代化的实现程度最高,农民生活现代化和农村生态现代化实现程度相对偏低。按照现有推进速度推测,中国农业农村现代化推进将呈现从"农业强"到"农民富"再到"农村美"的阶段性演进特征(中国社会科学院农村发展研究所课题组,2020c)。需要指出的是,在农业现代化领域,目前最突出的短板是农业劳动生产率。按照世界银行世界发展指标,2018年中国劳均农业增加值虽略高于世界平均水平,比中等偏上收入国家低22.2%,仅相当于高收入国家的12.1%。很明显,中国农业劳动生产率较低是与其农业就业比重较高、农民普遍兼业以及小规模分散经营等紧密联系在一起的。根据世界银行,2019年中国农业就业人员占就业总人数的比重为25.4%,同年中等偏上收入国家为21.6%,高收入国家仅为3.1%。相比之下,中国人均国民总收入已越过中等偏上收入国家的门槛,预计在"十四五"期间有望进入高收入国家的行列。

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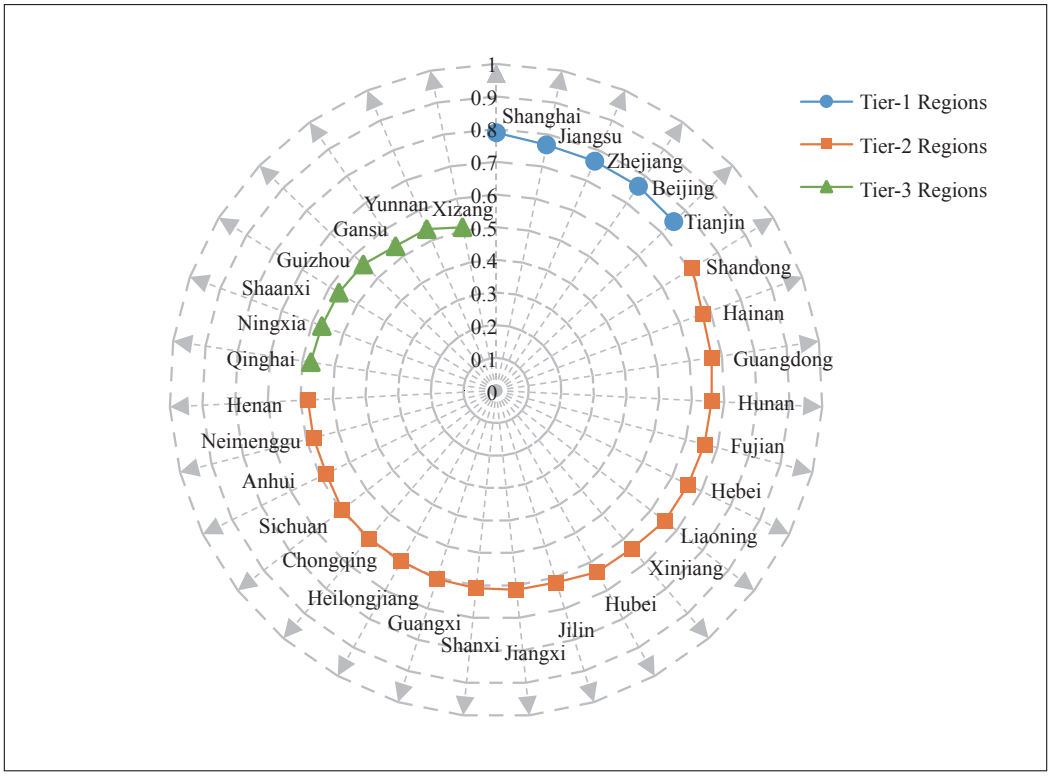

Figure 5: Attainment of Basic Agricultural and Rural Modernization by Region

Note: Base period is 2018. Values closer to 1 denote a higher level of attainment, and vice versa.

Source: Estimated with official data.

farmers are smallholders, who are also employed in non-farming sectors on a part-time basis. According to the World Bank, in 2019, agriculture employed 25.4% of China's total workforce. In the same year, this percentage was 21.6% for upper-middle-income countries and a mere 3.1% for high-income countries. In comparison, China's per capita gross national income had already crossed the threshold for upper-middle-income countries, making the country poised to join the rank of high-income countries during the 14th FYP period.

2.2 March towards an Agricultural Powerhouse

China is a large but not competitive agricultural producer. The *Report to the 19th CPC National Congress* calls for turning China into a prosperous, democratic, civilized, harmonious and beautiful socialist country by the middle of this century. Agricultural modernization is an essential element in achieving this vision. In 2018, the CPC Central Committee and the State Council enacted the *Opinions on the Implementation of the Rural Vitalization Strategy*, which calls for China's transition from a large agricultural producer to a competitive one. As China's development enters into a new phase, agriculture takes on great importance to countryside vitalization and socialist modernization. China will become an agricultural powerhouse as long as it strives to enhance the quality, efficiency and competitiveness of agricultural development. In the coming three decades, China is most likely to join the rank of agricultural powerhouses in the world around 2040, paving the way for its ascent into a great socialist modern country.

Academics have yet to agree on the criteria for an "agricultural powerhouse." Only a few countries in the developed world have managed to achieve agricultural modernization. They include the United

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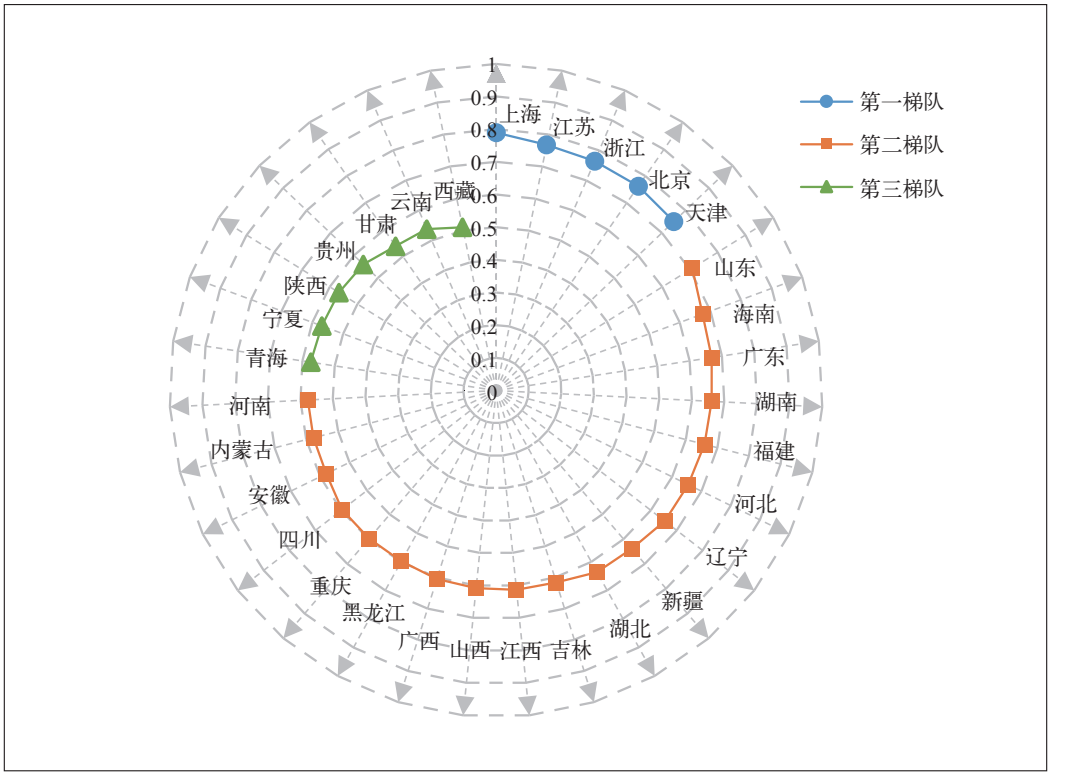

图5 按基本实现农业农村现代化目标的分省份实现程度与推进次序

注：评价以2018年为基期。其值越接近1表示实现程度越高，反之亦然。
资料来源：根据有关数据测算。

（二）迈向农业强国的趋势展望

中国是一个农业大国，但至今仍不是现代化的农业强国。党的十九大报告明确提出到21世纪中叶把中国建成富强民主文明和谐美丽的社会主义现代化强国。很明显，加快推进农业现代化，实现由农业大国向农业强国转变，是全面建成社会主义现代化强国的应有之义。2018年，《中共中央国务院关于实施乡村振兴战略的意见》已经明确提出“加快实现由农业大国向农业强国转变”，这就为中国农业的长远发展指明了方向，也提出了新的要求。在新发展阶段，加快实现由农业大国向农业强国转变，既顺应了中国农业现代化的基本趋势，也是全面推进乡村振兴和社会主义现代化强国建设的重要途径。总体上看，目前中国已经具备建成农业强国的良好基础，关键在于全面提高农业发展质量、效益和竞争力。在未来30年，中国最有可能在2040年前后跨入现代农业强国行列，这将为全面建成社会主义现代化强国奠定坚实基础。

目前学术界对农业强国的标准尚无统一定义。农业与国民经济发展高度关联，世界上已经实现农业现代化的国家集中在少数发达国家，如美国、加拿大、澳大利亚、法国、德国、荷兰、丹麦、以色列、日本等，这些国家劳均农业增加值大都在3万美元以上，也常被认为是农业强国。通过国际比较发现，事实上农业强国的特征已经体现在农业现代化的许多关键指标中。概括地讲，现代化的农业强国以“四强一高”即农业供给保障能力强、农业竞争力强、农业科技创新能力强、农业可持续发展能力强和农业发展水平高为标志。

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States, Canada, Australia, France, Germany, the Netherlands, Denmark, Israel, and Japan. In these countries, agricultural value-added per labor force is all above 30,000 US dollars. They demonstrate superior agricultural sufficiency, competitiveness, innovation and sustainability, which are considered as key dimensions of agricultural modernization.

Agricultural sufficiency: As a populous developing country, China has to feed a population of 1.4 billion - a burden which no country in the developed world has ever experienced. In this sense, agricultural sufficiency is a crucial metric of China's agricultural modernization. With a grain output above 650 million tons, China can feed its population of 1.4 billion in the mid- and long-term perspective. Even with a population growth of 100 million during 2020-2050, China will still be able to meet the international food security standard of 400 kilograms per person. What matters is to secure the effective supply of key agricultural products such as grains and hogs and address diverse market needs.

Agricultural competitiveness: Despite different resource endowments, all countries are committed to enhancing agricultural competitiveness. Either for capital-intensive path in North America or labor-intensive one in East Asia towards agricultural modernization, their agricultural competitiveness is reflected in such key indicators as value-added, yield per unit area, and cost of production. Competitiveness is a key aspect of an agricultural powerhouse. In terms of agricultural value-added per labor force, China's agricultural labor productivity is way below the level of leading nations. With a labor force 90 times the US level, China only generates six times more value-added from agriculture than does the United States. That is to say, for each unit of agricultural value-added, China inputs 14 more units of the labor force than does the United States. From 2000 to 2018, China's gaps with leading nations for agricultural value-added per labor force narrowed, but remain significant (Table 1).

Table 1: China's Gaps with Leading Nations for Agricultural Value-added per Labor Force

(In USD at 2010 current-year price)

Country	Agricultural value-added per labor force		Relative gap			
			Multiple with China as 1		Coefficient of relative gap (%)	
	2000	2018	2000	2018	2000	2018
China	1,076	3,830	1.0	1.0	0.0	0.0
US	67,151	79,055*	62.4	20.6*	-98.4	-95.2*
Canada	—	95,687	—	25.0	—	-96.0
Australia	47,767	82,838	44.4	21.6	-97.7	-95.4
France	39,089	62,855	36.3	16.4	-97.2	-93.9
Germany	25,213	46,326	23.4	12.1	-95.7	-91.7
The Netherlands	50,662	80,779	47.1	21.1	-97.9	-95.3
Denmark	38,296	51,470	35.6	13.4	-97.2	-92.6
Israel	49,523	91,547	46.0	23.9	-97.8	-95.8
Japan	24,937	24,169	23.2	6.3	-95.7	-84.2
World	1,876	3,192	1.7	0.8	-42.7	20.0
Upper-middle-income countries	1,746	4,926	1.6	1.3	-38.4	-22.2
High-income countries	25,140	31,541	23.4	8.2	-95.7	-87.9

Note: Relative gap coefficient = (China/other economies) × 100 - 100.* represents the value at the price level of the year 2017.
Source: Calculated with data from the World Bank's WDI database.

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一是农业供给保障能力强，这是走中国特色农业强国道路的基础。中国是一个人口众多的发展中大国，世界上没有任何一个发达国家像中国一样需要满足14亿人口的国内供给保障。就此而言，农业供给保障能力既是衡量中国能否成为现代农业强国的前提，也是体现中国特色农业现代化水平的重要指标。按照当前中国粮食6.5亿吨以上的生产能力，实施藏粮于地、藏粮于技战略，中长期完全可以保障14亿多人的口粮问题，即使在2020~2050年期间人口增长1亿的高增长预期下，也完全可以满足人均400千克的国际粮食安全标准，因此就目前农业生产能力而言，中国已经具备农业强国的较好基础和实力，关键是确保粮食、生猪等重要农产品的有效供应，并适应多样化的市场需求。

二是农业竞争力强，这是农业强国的直接体现。就国际发展经验看，虽然各国农业发展的资源禀赋不同，但在推进农业现代化过程中对更高农业竞争力的追求是一致的。无论是北美资本集约型还是东亚劳动集约型的农业现代化道路，农业竞争力最终都反映在增加值、单产水平、生产成本等关键指标所具备的比较优势上。农业竞争力的强弱决定了农业发展水平的高低，是中国迈入农业强国需要突破的重点方面，涉及农业竞争力的关键指标需要重点关注。特别是从劳均农业增加值来看，中国农业劳动力投入与产出结构严重失衡，农业劳动生产率远低于主要农业强国的水平。例如，与美国相比，中国农业就业人员是美国的90倍，农业增加值仅为美国的6倍左右，相当于每单位农业增加值中国较美国多投入14个单位的劳动力。从2000年到2018年，中国与主要农业强国之间劳均农业增加值差距尽管在逐步缩小，但至今差距依然十分明显（见表1）。

表1 中国与主要农业强国劳均农业增加值差距比较

单位：美元（2010年当年价）

国家	劳均农业增加值		相对差距			
			以中国为1的倍数		相对差距系数（%）	
	2000	2018	2000	2018	2000	2018
中国	1076	3830	1.0	1.0	0.0	0.0
美国	67151	79055*	62.4	20.6*	−98.4	−95.2*
加拿大	—	95687	—	25.0	—	−96.0
澳大利亚	47767	82838	44.4	21.6	−97.7	−95.4
法国	39089	62855	36.3	16.4	−97.2	−93.9
德国	25213	46326	23.4	12.1	−95.7	−91.7
荷兰	50662	80779	47.1	21.1	−97.9	−95.3
丹麦	38296	51470	35.6	13.4	−97.2	−92.6
以色列	49523	91547	46.0	23.9	−97.8	−95.8
日本	24937	24169	23.2	6.3	−95.7	−84.2
世界	1876	3192	1.7	0.8	−42.7	20.0
中等偏上收入国家	1746	4926	1.6	1.3	−38.4	−22.2
高收入国家	25140	31541	23.4	8.2	−95.7	−87.9

注：相对差距系数=（中国÷其他经济体）×100−100。标有*的数据是以2017年价格水平表示。
资料来源：根据世界银行世界发展指标数据库计算。

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Innovation: Agricultural powerhouses derive their fundamental impetus from progress and innovations in science and technology. In the agricultural modernization drive of countries, each big step of progress in agri-tech never failed to transform agriculture in significant ways, giving rise to diverse forms of agri-business such as energy agriculture, bio-agriculture, green agriculture, and smart agriculture. Innovation is essential to raising total factor productivity (TFP), transforming traditional agriculture, and facilitating China's transition towards an agricultural powerhouse. Judging by the trends of the 13th FYP period, agri-tech and equipment will continue to play a more supportive role going forward. According to the Research Group of the Rural Development Institute, CASS (2020c), agri-tech is expected to contribute more than 70% to China's agricultural growth, and the overall crop farming mechanization rate will exceed 85% when China basically achieves agricultural and rural modernization by 2035, which is close to the overall level of developed countries.[1] Released by the CPC Central Committee and the State Council, the *Outline of Innovation-Driven National Development Strategy* calls for China to join the rank of the most innovative countries by 2030. If breakthroughs can be achieved in biotechnology, seed resources, agricultural machinery and information technology, China will boast a strong prowess in agricultural innovation.

Agricultural sustainability: All developed countries have attached great importance to protecting the agricultural environment while striving to boost agricultural productivity. Green farming practices and multi-functional agriculture are effective ways to realize agricultural sustainability. For East Asian countries where labor is abundant and the land is scarce, a balance must be struck between chemical inputs and soil and water protection and ecological restoration. In recent years, China has seen negative growth in chemical fertilizer and pesticide consumptions. Following the trend since 2017, China is expected to reduce chemical fertilizer consumption below the international safety limit of 225 kg/hectare by 2035 - a key metric for agricultural sustainability.

Among these metrics of agricultural modernization, China is well-positioned to achieve agricultural sufficiency and innovation - both are within reach by 2035 when the country expects to achieve the goal of agricultural and rural modernization. Potentials for agricultural sustainability are also robust. Yet competitiveness is the most difficult and challenging aspect of China's efforts to become an agricultural powerhouse.

In discussing China's potentials to become an agricultural powerhouse, it is necessary to forecast agricultural labor productivity, which best reflects agricultural competitiveness. Based on the studies of Bai and Zhang (2017) and the Research Group of the Center for Macroeconomic Research, CASS (2020) and in light of the global economic recession under the COVID-19 pandemic, China's agricultural value-added is expected to reach some 10 trillion yuan by a conservative estimate, up over 40% from 2019.[2] Based on an estimate of China's agricultural labor force as a share of the total workforce, China's agricultural labor productivity is expected to reach 80,000 yuan/person by 2035, which is more than double the level of 2018. Most academics believed that the developed world had achieved agricultural modernization in the 1990s or so, when high-income countries recorded an agricultural value-added per labor force of about 15,000 US dollars. In East Asia of the same period, the same figure was some 20,000 US dollars and 10,000 US dollars for Japan and South Korea, respectively.[3] Considering the exchange rate and price index changes, China's agricultural labor productivity is expected to exceed 15,000 US dollars by 2040 under the most likely scenario, crossing the threshold as an agricultural powerhouse.

It takes at least two stages for China to develop into an agricultural powerhouse. As China attains a basic level of agricultural and rural modernization by 2035, it should achieve a fairly strong position

[1] It is generally believed that in developed countries, progress in science and technology contributes some 80% of agricultural growth, and agricultural mechanization rate is above 90%.

[2] Calculated at the 2019 price.

[3] Calculated at the 2010 constant price. Data are from the World Bank.

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三是农业科技创新能力强，农业强国的基础动力是科学技术的进步和不断创新。从各国农业现代化历程看，每一次重大科技进步都能导致农业大变革，推动农业升级和结构调整，先后出现能源农业、生物农业、绿色农业、智慧农业等多种形态。加大农业科技创新，提高全要素生产率，不断对传统农业进行改造升级，是实现由农业大国向农业强国转变的根本途径。结合“十三五”时期的发展态势，农业科技和物质装备的支撑能力还将稳步提升，根据中国社会科学院农村发展研究所课题组（2020c），到2035年基本实现农业农村现代化时，中国农业科技进步贡献率将达70%以上，农作物耕种收综合机械化率达85%以上，这已经逐步接近发达国家的整体水平[1]。对标中共中央、国务院印发的《国家创新驱动发展战略纲要》中2030年中国跻身创新型国家前列的目标，如果生物技术、种质资源、农机装备制造、信息化技术等领域的“卡脖子”技术能够取得突破，预计到2035年中国在农业科技创新领域也将具备较强实力。

四是农业可持续发展能力强，发达国家实现农业现代化的共同点，是在重视对农业投入、保障农业生产力的同时，始终没有放松对生态环境的保护。许多国家采取鼓励绿色生产行为、调整农业生产方式、开发农业多种功能等方式，都能有效实现农业可持续发展。特别是对于人多地少的东亚国家而言，在化学品投入中，必须兼顾土壤、水等资源保护和生态修复，这是建成农业强国的必要保障。近年来中国化肥、农药使用量已经实现负增长，目前又在全国推进化肥、农药减量增效行动试点，从近几年的减量趋势和治理力度来看，未来化肥、农药使用量还将进一步减少，同时化肥、农药利用率不断提高。按照2017年来的化肥减量化趋势，预计到2035年中国有可能实现化肥施用量低于225千克/公顷的国际公认安全上限目标，从而为增强农业可持续发展能力提供关键支撑。

五是农业发展水平高，这实质上是农业全面进步的体现，是农业供给保障能力强、农业竞争力强、农业科技创新能力强和农业可持续发展能力强这“四强”的综合维度，即“四强”决定了“一高”，而“一高”又代表了“四强”。因此，这“四强一高”与农业现代化相辅相成，是农业现代化水平整体提升的表征。

综上所述，“四强一高”中的农业供给保障能力强和农业科技创新能力强这两项具备较好的实现基础，预计在2035年基本实现农业农村现代化时均可以实现，而农业可持续发展能力强这项也有可预期的发展前景。就当前和今后一段时期农业现代化进程看，“四强一高”中增强农业竞争力是中国实现农业强国过程中难度最大、最具挑战性的部分。

讨论农业强国的实现可能，就有必要对最能体现农业竞争力强弱的农业劳动生产率进行预测。结合白重恩和张琼（2017）以及中国社会科学院宏观经济研究中心课题组（2020）等研究结果，考虑到世界范围内新冠肺炎疫情持续背景下全球经济的总体衰退态势，保守估计2035年中国农业增加值在10万亿元左右，较2019年提高40%以上[2]。同时结合上文对中国农业劳动力占就业人员比重的预计，可大体推断到2035年农业劳动生产率将接近8万元/人，较2018年翻一番以上。考虑到人民币对美元汇率的长期看涨趋势，2035年前后农业劳动生产率有可能接近1.5万美元。目前，学界普遍认为大部分发达国家在20世纪90年代左右就已实现农业现代化，高收入国家整体在20世纪90年代中期劳均农业增加值在1.5万美元左右，如同期东亚国家，日本在2万美

[1] 普遍认为发达国家科技对农业的贡献在80%左右，农业机械化水平在90%以上。
[2] 按2019年价格计算。

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in agricultural sufficiency and innovation. Around 2040, China is expected to achieve agricultural competitiveness and join the rank of agricultural powerhouses. This conclusion coincides with the stages of China's agricultural and rural modernization mentioned earlier, proving the consistency between agricultural modernization and rural modernization.

Notably, the above criteria for an agricultural powerhouse are based on the agricultural development journeys of most countries. China should explore its unique path of agricultural modernization and follow its own pace. Given the uncertainties in technology progress, global trade, policy change and the pandemic, China is likely to become an agricultural powerhouse earlier or later than expected. Whichever the case, the status of an agricultural powerhouse will be a key facet of China's achievement of the goal of socialist modernization in all respects by 2050. The vision towards an agricultural powerhouse in the coming three decades will not change.

3. Strategic Pathway towards Agricultural Modernization by 2035

In our path towards socialist agricultural modernization by 2035, we must follow our national conditions and historical experiences, safeguard the fundamental interests of farmers, and steer agricultural and rural reforms towards the right directions. Agricultural modernization strategy must prioritize food security, agricultural industry, green transition, technology, and education. After achieving the goal of building a moderately prosperous society in all respects by 2020, we should strive to achieve a basic level of agricultural and rural modernization in another 15 years and complete the transition towards an agricultural powerhouse in 20 years.

3.1 Safeguarding the Bottom Line of National Food Security

Amid urbanization and consumption upgrade, food security comes under strain. To ensure food security, we must protect arable land, build farmland with high standards, improve agricultural infrastructure, apply advanced technology, optimize product mix, and increase crop yield. We should leverage food quota and tariff and nontariff trade measures to regulate grain import to balance the structure of grain supply and demand under the premise of basic grain self-sufficiency. Last but not least, we should prohibit food waste and step up R&D on the reduction of food losses during harvesting, transportation, storage and processing. We should foster a public culture of rational food consumption and prevent waste at the dinner table.

3.2 Create a Modern Agricultural Industry

We should adjust the agricultural structure and create regional clusters. We should derive value addition from agricultural processing and integrate various links of the agricultural industry, including distribution, storage, transportation, and processing. We should foster competitive agricultural operations and service entities that share interests with farmers. We should engage private actors to offer a wide range of agricultural services efficiently for the benefit of all stakeholders (Wei, 2020b). We should optimize the geographical layout of the agricultural industry by forming regional clusters specialized in agricultural processing, recreational agriculture, rural e-commerce, and other functions.

3.3 Transition towards Green Agriculture

We should promote green and efficient agriculture. As the minimum standard, agricultural products should be pollution-free. There should be more supply of green, organic and wholesome agricultural products made by well-known brands. We should increase agricultural waste recycling and the efficient use of resources like water and soil. We should develop green and circular agriculture based on local environmental capacity, restore agricultural ecosystems, and improve market-based ecological

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元左右，韩国为1万美元左右[3]。以特定历史时期作为农业强国的参照，同时考虑汇率、价格指数变化的影响，预计在2040年前后中国农业劳动生产率最有可能超过1.5万美元，达到农业强国的门槛。

总之，农业强国的实现是分阶段的。到2035年基本实现农业农村现代化时，中国预计可以实现农业供给保障能力强、农业科技创新能力强这“两强”；而到2040年前后，可实现农业竞争力强，届时农业发展水平接近部分发达国家，中国整体进入农业强国行列。该结论与上文农业农村现代化阶段进程的研判相一致，证实了农业现代化与农业农村现代化在进程上是统一的。

需要指出的是，以上对实现农业强国的判断只是以大多数国家农业发展历程作为参考而得出的，中国农业发展有自身特点，要遵循农业现代化演进的规律性，走有中国特色的农业强国之路，不能一味进行指标攀比或搞跃进式发展。同时，未来农业发展受到科技进步、全球贸易、政策变化、疫情灾害等诸多因素影响，仍存在诸多不确定性，因此中国迈入农业强国的具体年份有可能提前或错后。但无论如何，农业强国都是2050年中国全面建成社会主义现代化强国的重要表征，未来30年内中国进入农业强国的远景不会改变。

三、面向2035年的农业现代化战略选择

面向2035年的中长期发展，走有中国特色社会主义农业现代化道路，要立足农情国情和历史经验，以农民根本利益作为农业现代化的出发点和落脚点，正确认识和引导农业农村改革，围绕粮食安全、现代农业产业体系、农业绿色化转型、科教兴农等重点领域，将若干阶段性战略统一纳入农业现代化推进战略之中，通过分地区、分阶段、分重点的梯次推进，做好政策续接和渐进改革。在2020年完成全面建成小康社会任务后，力争用15年左右时间基本实现农业农村现代化，用20年左右的时间完成由农业大国向农业强国的转变。

（一）坚守国家粮食安全底线

推进农业现代化需要在粮食安全的战略框架下进行，伴随人口城镇化和消费结构升级，粮食与农产品供给压力逐年加大。要继续贯彻国家粮食安全战略，一是保障粮食有效供给。切实加强耕地保护工作，加快高标准农田建设，以改善农业基础设施和推进科技进步为重点，注重优化品种结构，推广科学合理的生产模式，着力提高农作物单产，保障国家粮食安全和农产品有效供给。二是利用好国际市场。在口粮完全自给、谷物基本自给前提下，以保持粮食供需结构平衡为主，利用好粮食配额和关税与非关税等贸易措施，合理调控粮食进口。三是将减少粮食浪费纳入制度建设，加大针对粮食收割、运输、储存、加工等环节的节粮减损技术研发投入。坚决遏止餐桌上的浪费，形成全社会科学合理的粮食消费观。

（二）全面构建现代农业产业体系

要以价值提升为导向，以利益共享为基础，以市场主体为抓手，大力推进农业结构调整，优化产业布局，打造区域特色农业集群。一是推动农业向价值链中高端跃升。重点是增强农产品加工业引领带动能力，加快

[3] 按2010年不变价美元计算，数据来源于世界银行。

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compensation mechanisms involving various stakeholders.

3.4 Agri-tech and Education

Technology and education inspire innovation and entrepreneurship in the countryside. We should seek diverse forms of home-grown innovation, and expedite the commercialization of R&D results for agriculture and the countryside. We should prioritize the research of fundamental and frontier technologies, increase the synergy among the industry, universities and research institutes, and draw innovation factors to business entities. We should foster a conducive innovation ecosystem by protecting intellectual properties and patents and drafting technology standards. We should enhance organizational assurance for agricultural and rural innovation by coordinating stakeholders at various levels and across regions.

3.5 Diversification Strategy for Agricultural Development

We should offer classified policy guidance for regions in light of their comparative advantages, encouraging some regions to take the lead in achieving agricultural modernization. At the provincial level, we have identified three types of regions, including Shanghai, Jiangsu, Zhejiang, Beijing and Tianjin (Tier-1 Regions), Shandong, Fujian, Guangdong, Hunan, Hubei, Liaoning and Hebei (Tier-2 Regions), and the rest (Tier-3 Regions) (Wei *et al.*, 2020). By 2035, all regions should basically achieve agricultural and rural modernization. We should follow a differentiated regional policy. The eastern region should serve as a forerunner and benchmark for agricultural modernization by international standards. The central region should increase grain output while raising farmers' income, and keep its level of agricultural development above the national average. The western region should develop agriculture with local features, keep up with more advanced regions, and achieve the targets for agricultural and rural modernization in time. We should launch, improve and integrate pilot programs such as demonstration zones for agricultural modernization in representative regions with central-local resources coordination. We should try to develop these demonstration zones in tandem with state-level new development areas and economic and technological development zones as vanguards of reform programs.

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市场流通体系与储运加工布局的有机衔接。二是以提高竞争力为重点培育各类市场主体。要试点培育一批竞争力强、带动力强的新型农业经营主体和服务主体，创新各类市场主体与农户有效联结的利益分配机制。三是完善农业社会化服务体系。充分发挥多元主体作用，完善社会化服务网络，探索多样化服务模式，推动形成政府引导、市场主导，主体多元、形式多样，便捷高效、全链受益的多元共享型农业社会化服务新格局（魏后凯，2020b）。四是优化农业产业布局。以主体功能区划为依据，进一步引导特色农产品向优势区集聚，充分发挥农产品加工业、休闲农业、农村电商等新产业的集聚功能，加快农业产业集群发展，促进现代农业生产布局的调整优化。

（三）加快推进农业绿色化转型

尊重农业发展规律，积极转变农业发展方式，强化农业的生态服务等功能和承载力，提高资源利用率，形成绿色生产方式，构建以绿色、生态为导向的农业发展格局。一是推动农业发展方式的绿色化转型。将无公害作为食品安全的最低标准，以扩大绿色、有机农产品供给为重点优化农业生产体系，增加品牌、优质、健康的功能性农产品供给。二是提高农业资源利用率。加强农业废弃物的回收利用，提高水、土等资源的利用效率。三是增强农业多功能性和承载力。开展农业生产潜力和资源环境承载力评估，构建与资源承载力相匹配的绿色农业、循环农业等农业产业体系。兼顾农业开发与环境保护，修复农业生态系统，加快建立生态产品价值实现机制，进一步完善市场化、多元化的生态保护补偿机制。

（四）深入实施科教兴农战略

面向国家重大战略需求，面向“三农”的实际问题和切实需要，面向世界与未来的科技前沿，全面推进实施科教兴农战略，激发农业农村创新创业动力，为农业农村现代化提供强有力的科技支撑。一是增强自主创新能力。实施多元化的自主创新路径，把原始创新能力提升摆在更加突出的位置。加快集成创新和应用示范，促进农业农村科技成果转化。二是完善农业农村科技创新体系。优先部署重大基础和前沿性技术研究，整合高校、科研院所的科研资源，推动创新要素向生产经营主体集聚，促进产学研深度融合。三是营造良好的农业农村科技创新生态。强化知识产权制度对农业农村科技创新的保障作用，完善科技创新、专利保护与标准制定的互动机制。健全农业农村科技创新的组织保障，构建各级协同、区域协作、多方参与的农业农村科技创新生态。

（五）实施梯次推进的多元化战略

一是实行梯次推进。按照“因地制宜、分类指导、突出重点”的原则，发挥不同地区的比较优势，允许和鼓励有条件的地区率先基本实现农业农村现代化。从省级层面看，可分三个梯次推进：上海、江苏、浙江、北京、天津等为第一梯次，山东、福建、广东、湖南、湖北、辽宁、河北等为第二梯次，其他地区为第三梯次（魏后凯等，2020），确保在2035年前全部如期基本实现农业农村现代化。二是探索多元化发展模式。通过改革创新实施差异化发展政策。东部地区要向国际看齐，发挥先行、示范和标杆作用，引领全国农业现代化。中部地区以巩固

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提升为主，处理好粮食生产与农民增收的关系，确保农业现代化实现程度始终高于全国。西部地区要突出特色农业发展，尽快缩小地区差距，保证如期基本实现农业农村现代化的既定目标。三是通过试点引领来优化实施路径。加快推进农业现代化示范区试点建设，可以考虑选择一些代表性地区，统筹中央和地方资源，对发展较好、运作较成熟的各类试点项目进行整合提升。探索示范区与国家级新区、经济技术开发区等共同推进的实现路径，发挥改革排头兵和示范引领的先导作用。

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