Low-carbon agriculture

1. Background

- Climate change affects agriculture:

27% China GHG (2019) https://rhg.com/research/chinas-emissions-surpass-developed-countries/

Changes in temperature and rainfall patterns and water management system issue

will seriously affect the quality and efficiency of crop production, including hindering crop pollination and (https://www.mdpi.com/2071-1050/10/6/1776/pdf) affect quality and quantity-------indicate that elevated CO2 levels may cause a decrease in the quality of bread wheat due to generally lowered protein content. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1569568/) also proven by some experts

as well as various natural disasters such as drought that lead to Mouse plague in Australia https://www.reuters.com/business/environment/australian-farmer-counts-cost-mouse-plague-after-drought-2021-05-31/)

https://www.sciencedirect.com/science/article/abs/pii/S1043951X18301688 - beside low production, market can give negative response to such problem due to rising price. E.g. wheat production loss under RCP8.5 reduces to only 4.3% due to market response.

Rcp 8.5 explanation – (https://climatenexus.org/climate-change-news/rcp-8-5-business-as-usual-or-a-worst-case-scenario/)

Therefore, adverse effects of climate change on crop yields far outweigh the beneficial effects.

- Agriculture affects the climate:

https://www.climatewatchdata.org/ghg-emissions?breakBy=gas&chartType=line&end_year=2018&gases=ch4%2Cco2%2Cn2o&regions=CHN&sectors=agriculture&source=PIK&start_year=2008 remake data

38.2% methane emission from agriculture where 22% from rice cultivation in 2018. 2017 agriculture become lead emitter in for N2O in China cover almost 73.7% of total emission (https://chinapower.csis.org/china-greenhouse-gas-emissions/)

Agriculture is one of the main sources of greenhouse gas emissions (especially methane from livestock breeding and nitric oxide from chemical fertilizers)

Deforestation and degradation will also lead to an increase in carbon dioxide emissions

Chemical pesticide production fell almost 30% from 2014 to 2019 (https://www-statista-com.eu1.proxy.openathens.net/statistics/275859/chemical-pesticide-production-for-chinas-agriculture/)

- Due to this China set some goals and regulation

2-degree 2015 paris agreement

China's 30·60 double carbon target,

Roadmap to Zero Carbon in Agriculture (Roadmap)

Allow agriculture to achieve low-carbon or even zero-carbon transformation while maintaining or even increasing productivity

The 14th Five-Year Plan (Agricultural Goals and Plans)

2. **Sustainable Agriculture systematic**
   - One important goal of sustainable agriculture is the low carbon agriculture, to reach the low carbon agriculture there are 2 factors we need to consider which are efficiency issue and greenhouse gas issue.
   - One way to reach more sustainable in agriculture sector, it is important to reduce inputs and increase the output efficiency.
     Low input: Solagro (2007) (i.e., on-farm resources) and to minimise the use of production inputs (i.e., off-farm resources), such as purchased fertilisers and pesticides, wherever and whenever feasible and practicable, to lower production costs, to avoid pollution of surface and groundwater, to reduce pesticide residues in food, to reduce a farmer's overall risk, and to increase both short- and long- term farm profitability" (http://www.fao.org/family-farming/detail/en/c/1115210/) ,
     Increase output efficiency: deceased father of grain, Yuan Long Ping hybrid rice increase production rate. 1970, he developed hybrid strains that yielded 20% more rice than conventional grains. Not only for China, these hybrid strains have influence to the world rice production which accounted about 15% in 2021. Credit for deceased Yuan Long Ping for his dedication and innovation to feed the growing planet with fewer resources. (https://www.washingtonpost.com/local/obituaries/yuan-longping-dead/2021/05/25/e23a377e-bd5a-11eb-b26e-53663e6be6ff_story.html)
   - Another way is reducing the greenhouse gasses, it is believed that Methane (CH4) and Nitride Oxide (N2O) are two major gasses that emit from the agricultural sector, yet small portion of CO2 also produced by the agricultural

sector. (Like stated before). This is concerning as these gases will lead to more severe climate change. To prevent this there are several ways one is by

1 Use renewable clean energy/bio-energy (example: [Goldwind] new energy photovoltaic power generation system, solar-driven automatic photoelectric machinery)
https://irena.org/-/media/Files/IRENA/Agency/Publication/2019/Nov/IRENA_Future_of_Solar_PV_2019.pdf agrophotovoltaic
http://www.goldwindglobal.com/business/ green agriculture park
Promote low-carbon agricultural production technology: soilless cultivation and three-dimensional planting technology to increase yield, less-tillage technology, cultivated land rotation and fallow system (Example in China if available) http://www.goldwind.com.cn/

2 Reduce use of fertilizer and pesticide, https://stories.pinduoduo-global.com/articles/how-china-can-cut-emissions-from-its-farms fertilizer less emission , low carbon agriculture

3 Carbon sink: to achieve sustainable agriculture could apply Carbon sequestration or increasing carbon sinks
Carbin sequestration - https://chinadialogue.net/en/food/how-can-china-cut-emissions-from-its-farms/
Forestry carbon sink: planting trees, protecting and restoring the soil, enhancing the carbon absorption capacity and storage of farmland
Carbon sink trading (Example in China if available)
Afforestation https://www.nature.com/articles/s41586-020-2849-9

3. **Future of Low carbon agriculture in China**
   - With previous subsidy and goals for 2030 carbon peak and 2060 carbon neutrality. Moreover, (the regulation for agriculture sector) provide selective financial subsidies to agriculture and forestry to reward public welfare services including carbon management. It is very certain that the low carbon agriculture will be achieved eventually, also can be seen from the data amount of methane and N2O reduced by each years. This indicate how China is very serious handling this