Scenarios of Climate Change and its potential impact on agriculture, food security and nutrition in Uzbekistan and the region using the IMPACT Model

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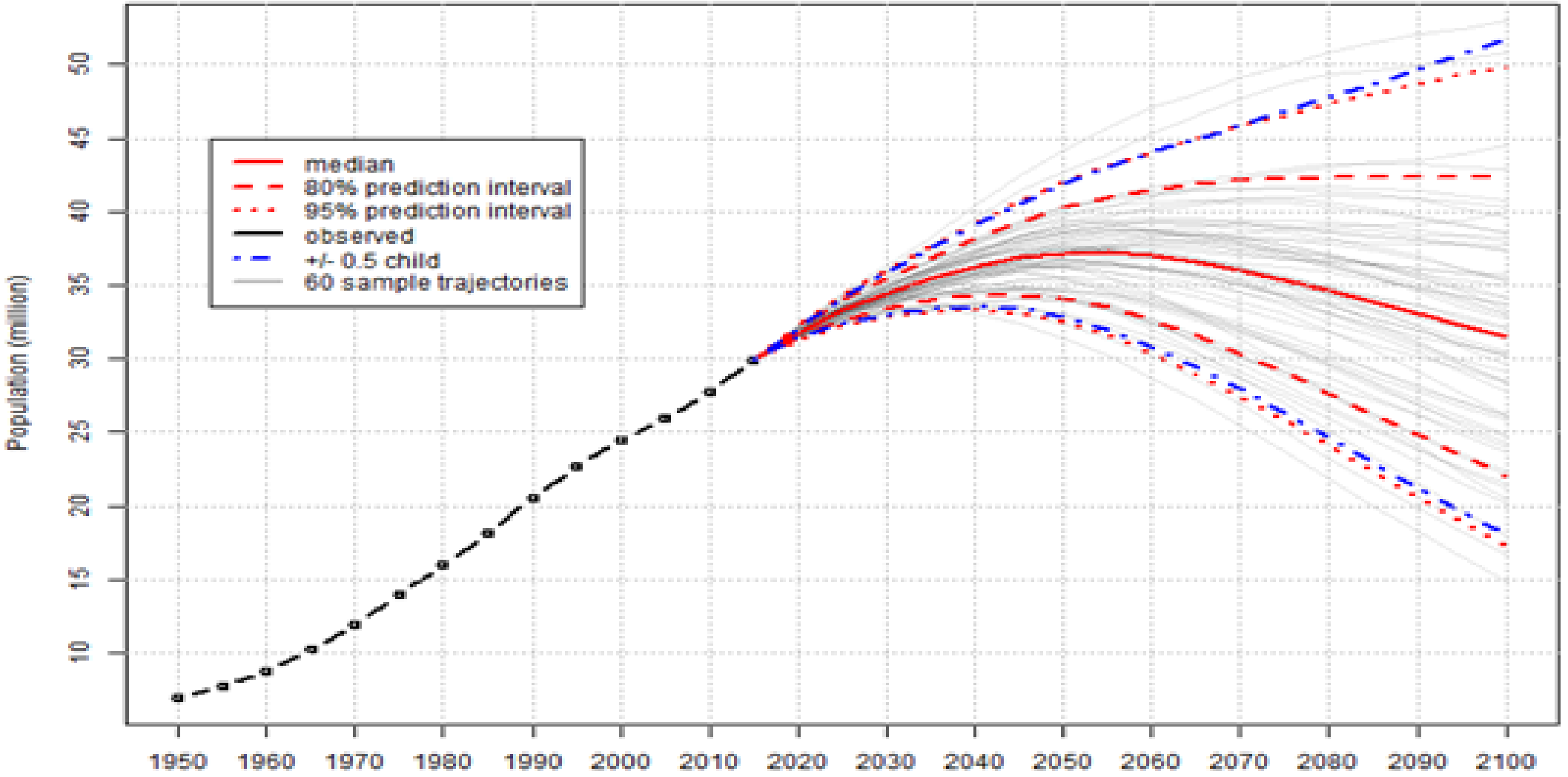
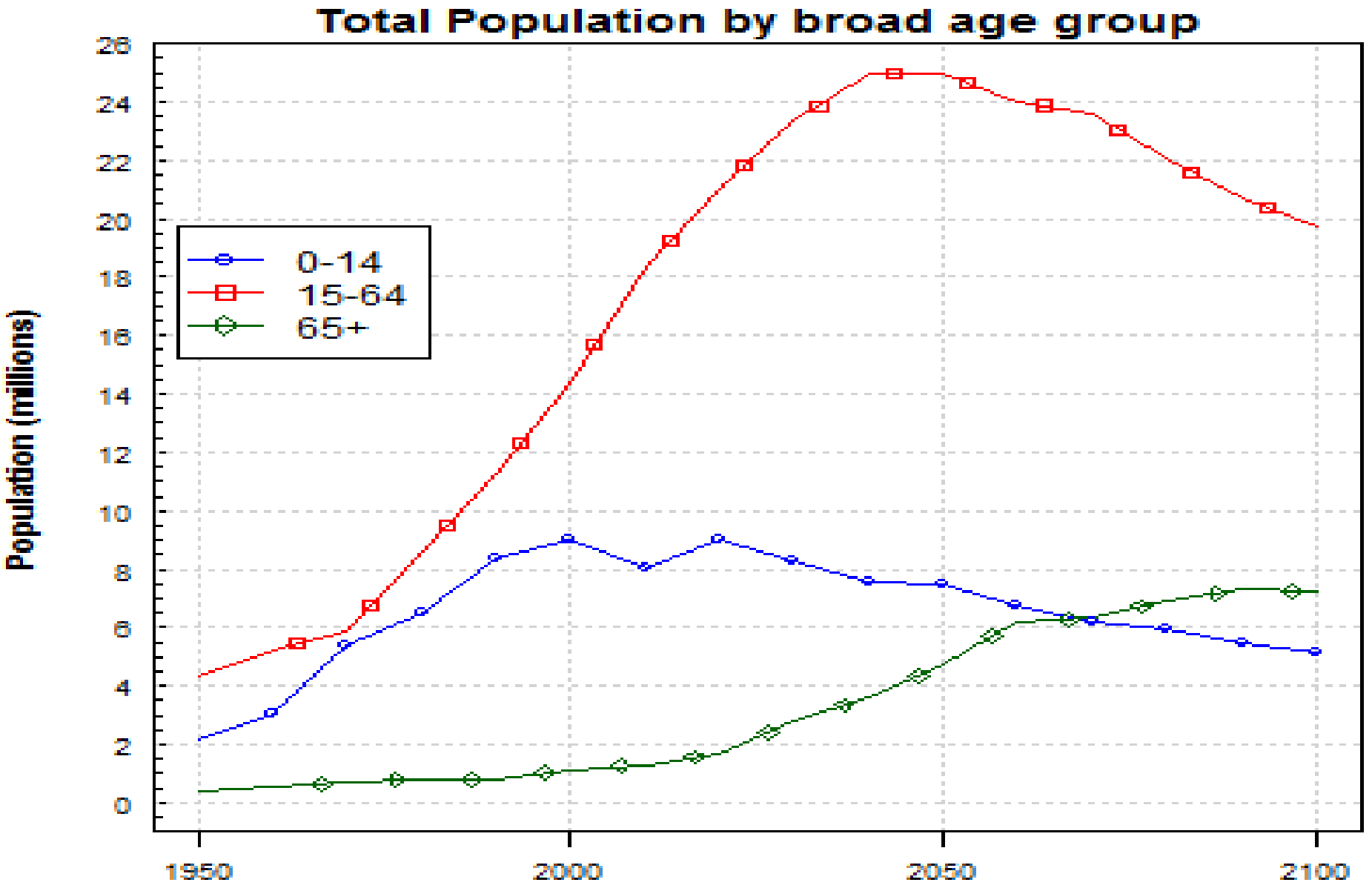
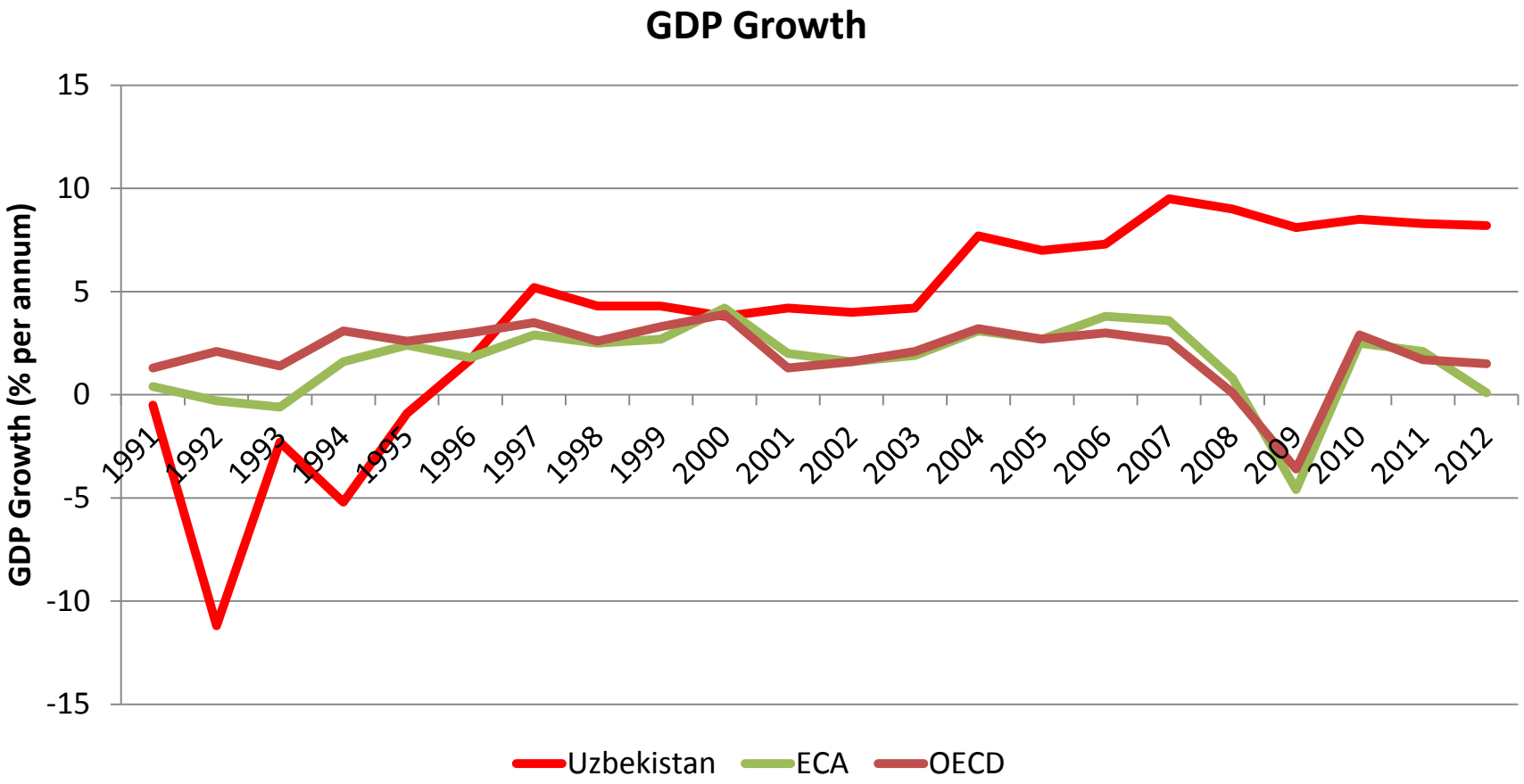
UN population projections for Uzbekistan




Total Population by broad age group
Population (millions)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
1950
2000
2050
2100
0-14
15-64
65+

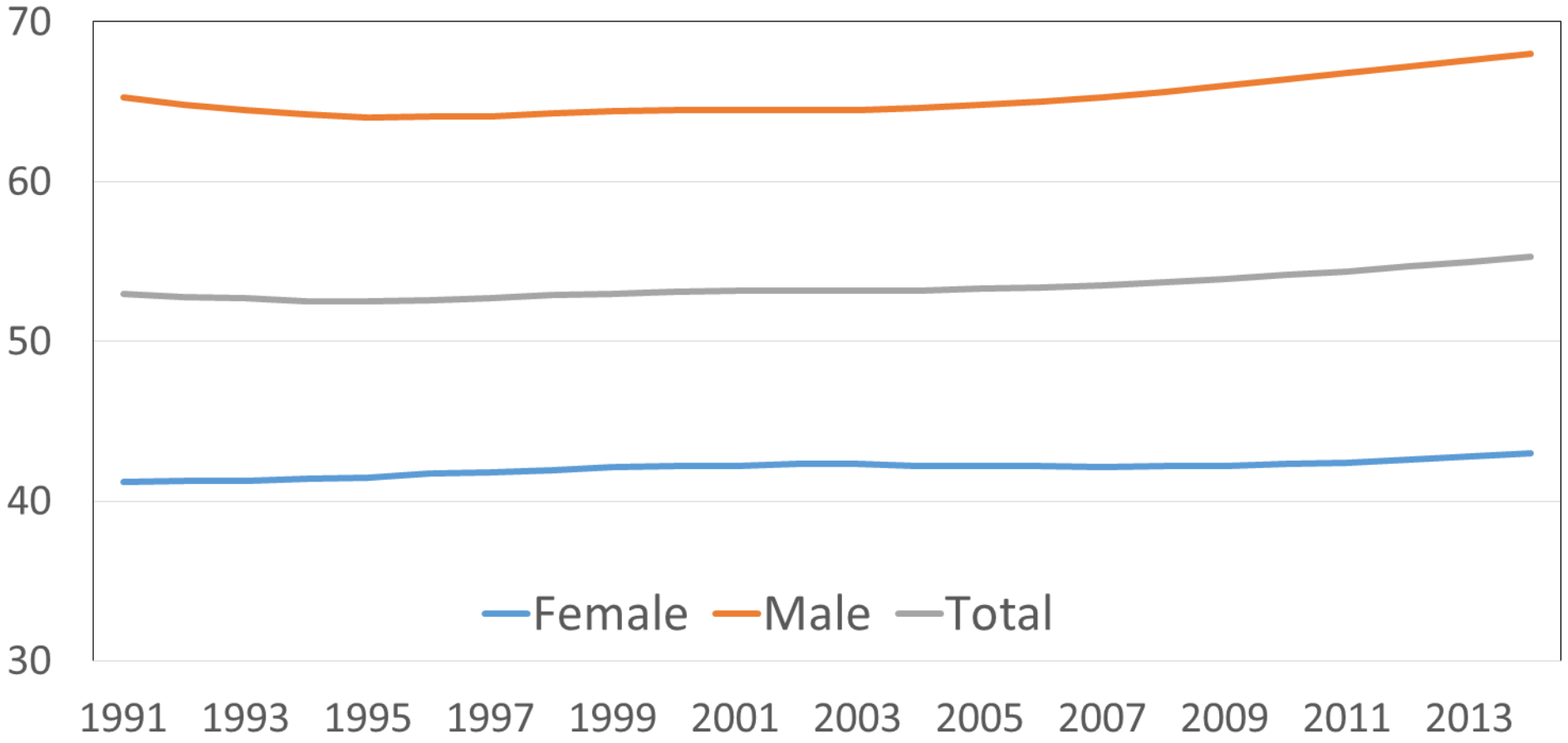
Economic growth in Uzbekistan has been among the highest in the world in the last decade



Source: World Bank, World Development Indicators 2015

However, employment rates have not caught up with economic growth

Employment rate



Source: World Bank, World Development Indicators 2015

Industlialization policy and agriculture

- Starting from the middle of the 1990s Uzbekistan pursues the industrialization policy mainly at the expense of mining and agriculture
- Self-sufficiency in wheat has become an integral part of the policy
- The share of agricultural sector in GDP has reduced from 24% in 2006 to 17% in 2015
- Value added of agricultural sector has been also falling during the last decade. Nevertheless, Uzbekistan is still an agrarian society with the agricultural sector providing 27% of the country's employment (Ajwad, M.I. et al, 2014).

Features of agricultural sector

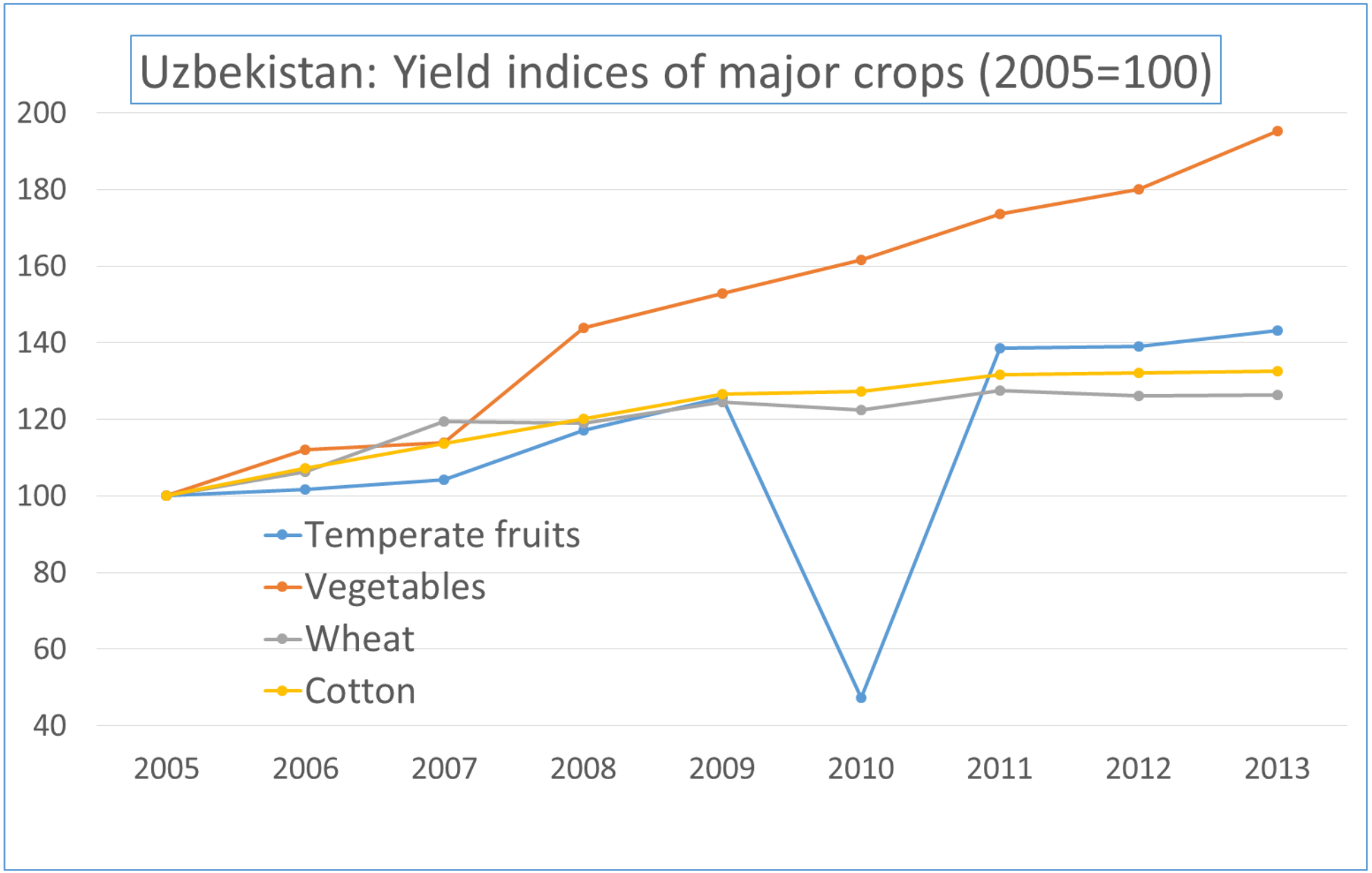
- Agricultural land is owned by state. Agriculture provides 17% of GDP and 27% of employment, but it has experienced chronic underinvestment (less than 5% of overall investments in 2014).
- After the trade sector, agriculture is arguably most regulated industry
- State also imposes plan for wheat and cotton cultivation and production within state procurement system. The government sets the procurement price for wheat and cotton, usually at below market prices.
- Heavy reliance on irrigated agriculture, and water availability in Syrdarya and Amudarya basins
- 75% of irrigated land was allocated either to cotton or wheat in 2014, down from 82% in 2005

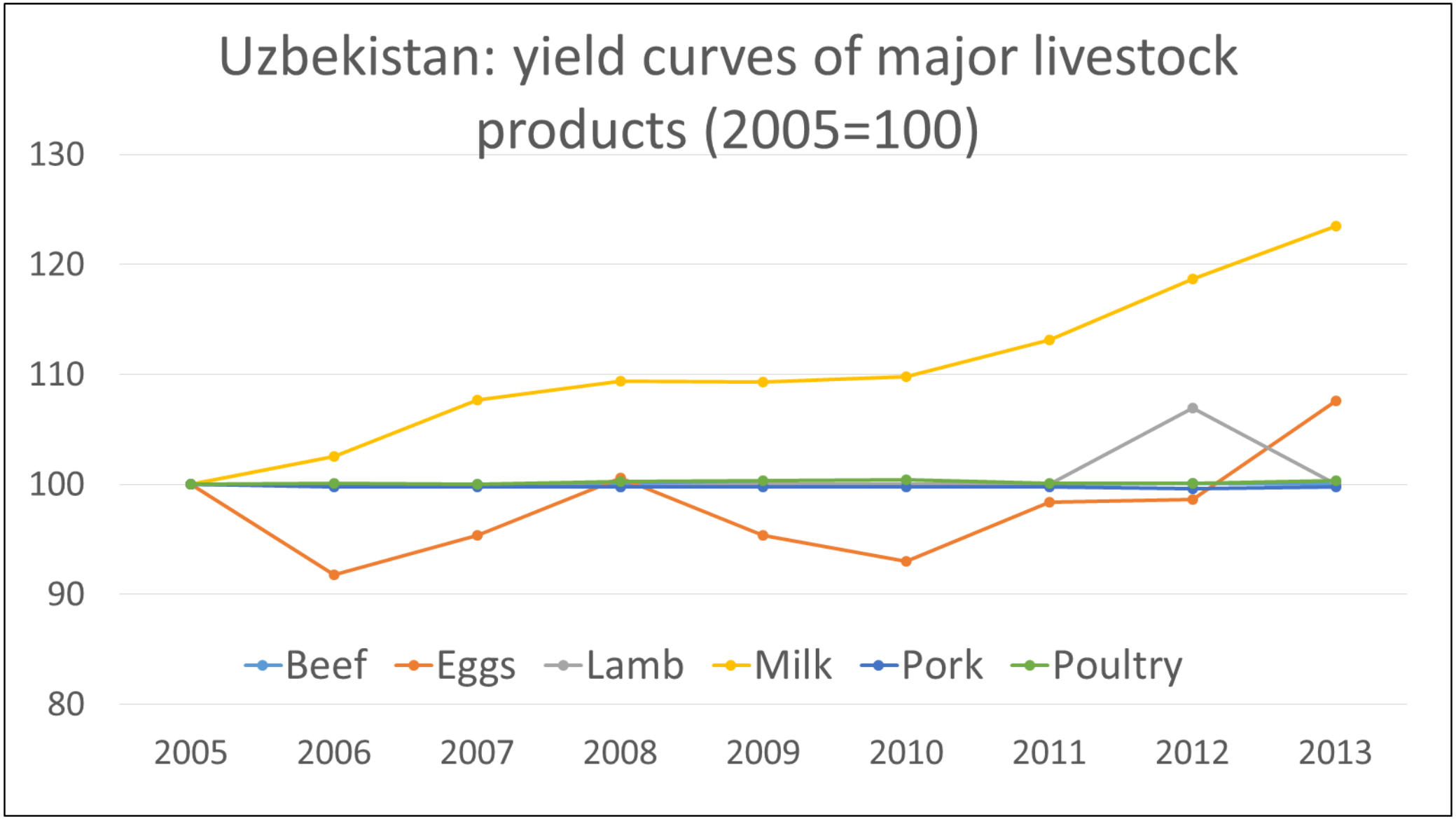
State Food Programme for 2015-2019

- The Programme envisages:
- Further reforms in agriculture
- Introduction of more advanced technologies
- Mechanization, especially of cotton cultivation
- Increased processing of agricultural produce
- The Programme also envisages optimization of crop land, namely, further decrease in the amount of land allocated to cotton and increase in land allocated to fruit and vegetables

Uzbekistan: Harvested area by major crops

	1990	**2000**	**2010**	**2013**
Total harvested area,‘000/ha	4,194.2	3,778.3	3,708.4	3,658.6
In percentages				
Cereals, mainly wheat	12.1	42.7	45.3	44.9
Cotton	51.3	38.2	36.2	35.8
Potatoes	1.2	1.4	1.9	2.1
Vegetables	3.9	3.4	4.7	5.2
Melons	2.2	1.0	1.3	1.4
Fodder crops	29.2	11.3	8.6	8.7


Uzbekistan: Yield indices of major crops (2005=100)
200
180
160
140
120
100
80
60
40
2005
2006
2007
2008
2009
2010
2011
2012
2013
Temperate fruits
Vegetables
Wheat
Cotton

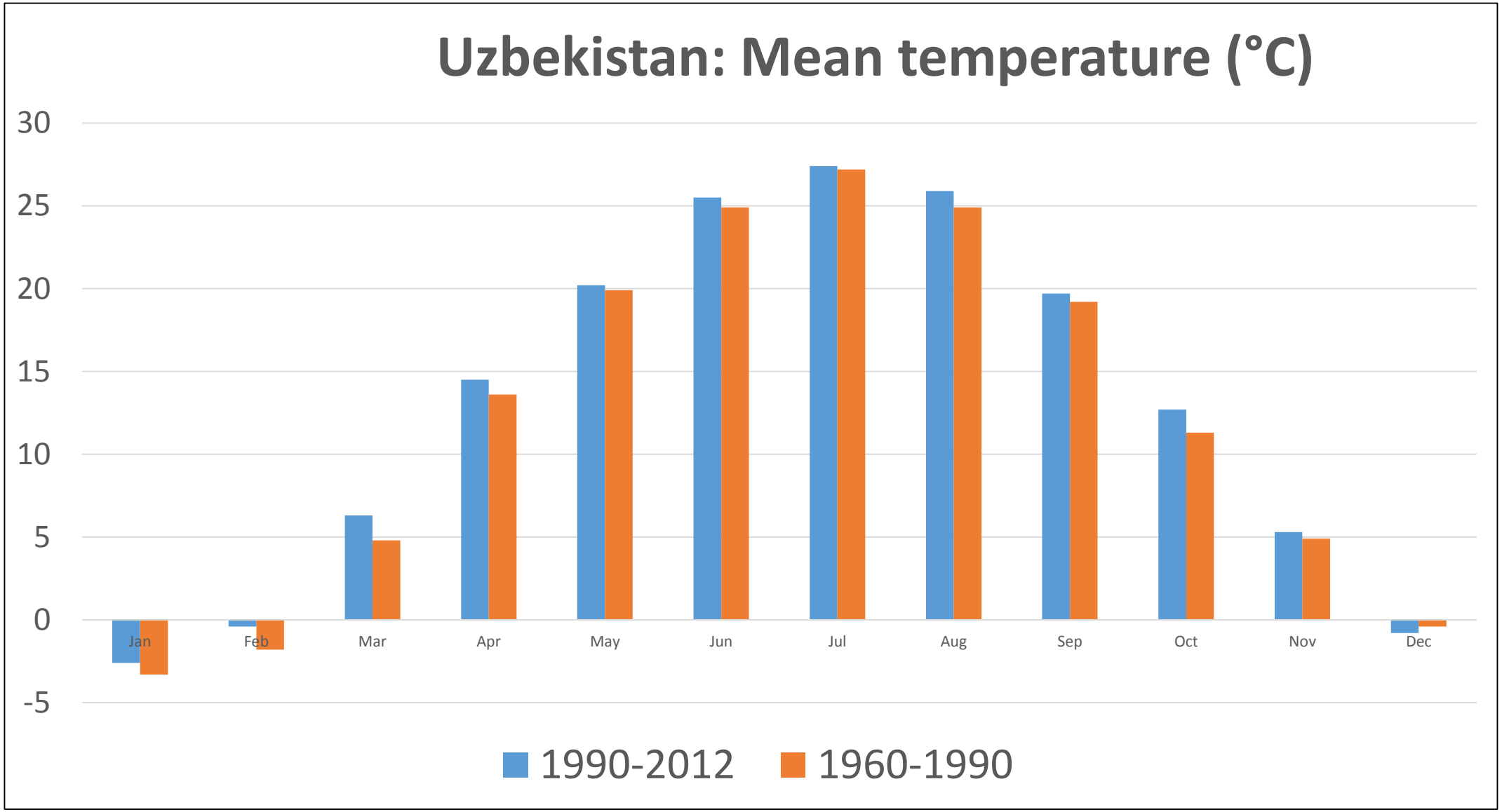

Uzbekistan: yield curves of major livestock products (2005=100)
130
120
110
100
90
80
2005
2006
2007
2008
2009
2010
2011
2012
2013
Beef
Eggs
Lamb
Milk
Pork
Poultry

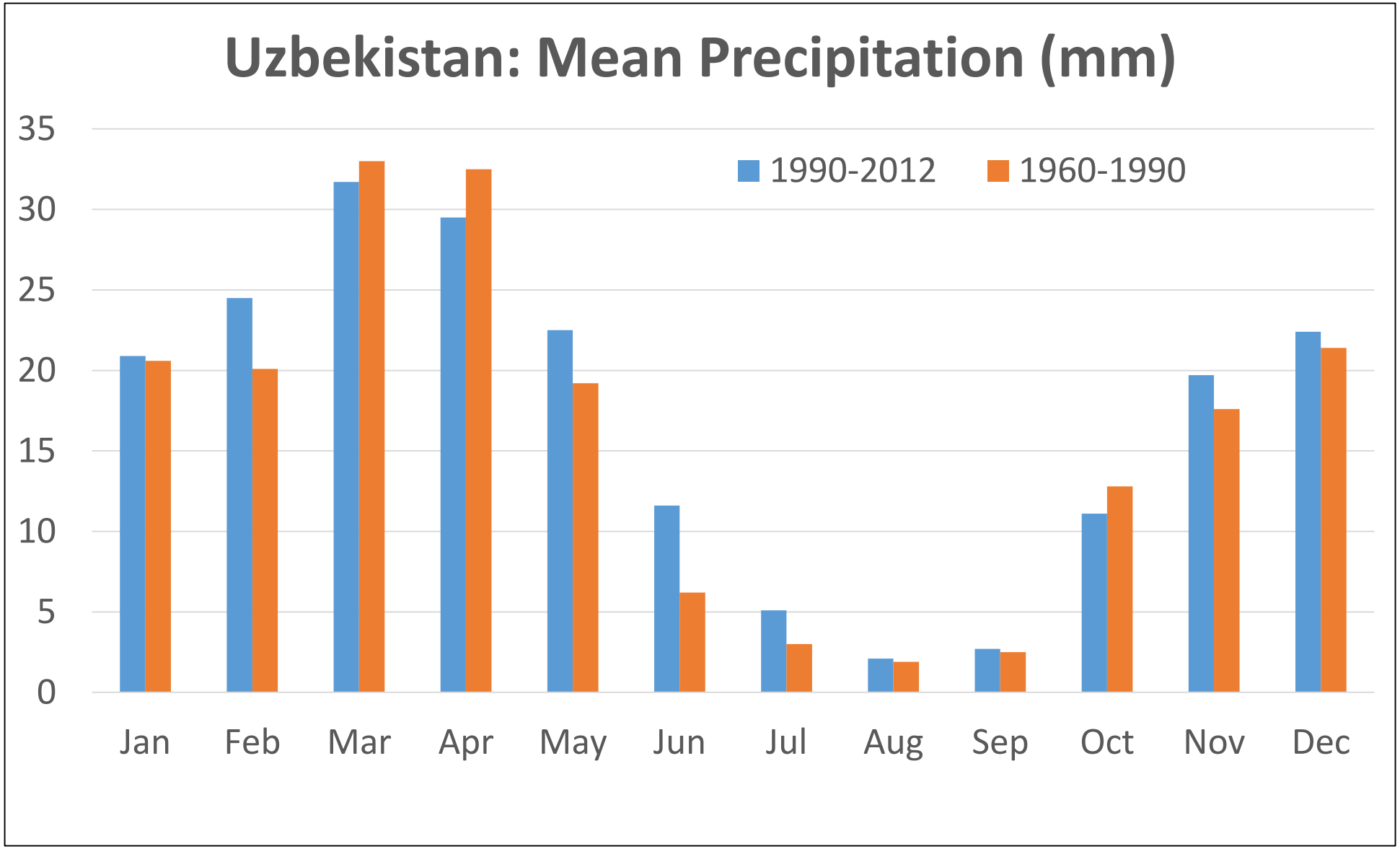
Climate change and its impact on Uzbekistan

- Since the mid-20th century, average temperature rose by 0.5°C in the south to 1.6°C in the north of Central Asia
- In Central Asia, water resources depend on glaciers and snow pack.
- Glaciers in upland areas have lost one-third of their volume since the 1900s. Glaciers, which account today for 10 percent of the annual stream flow in the Amu Darya and Syr Darya basins, are projected to lose up to 50 percent in volume in a 2°C warmer world, and potentially up to 75 percent in a 4°C warmer world.
- As a result, water flow has increasingly shifted towards early spring, bringing with it frequent droughts in lowlands and severe floods in highlands
- World Bank (2015) estimates that weather-related disasters cause economic losses from 0.4 to 1.3 percent of Gross Domestic Product per year for Tajikistan, Turkmenistan, and Kyrgyzstan

Climate change and its impact on Uzbekistan

- For Uzbekistan, World Bank (2010) predicts that mean annual temperature will increase from 1.9°C to 2.4°C by 2050, with the greatest warming projected to occur in winter and spring
- It also predicts an increase of 15-18% in mean annual precipitation by 2050, with the greatest seasonal increase in summer
- Projected water deficit increases from 2 km3 in 2005 to 11-13 km3 in 2050
- A riskier agricultural production environment, as increasing temperatures result in greater crop evapotranspiration, offsetting projected increases in precipitation and resulting in a more arid production environment
- Increased exposure to new pests and diseases for agricultural crops and livestock due to changes in the temperature and precipitation regime
- An increased length of growing seasons, especially in northern areas, providing opportunities for new crops, increased productivity and changes to cropping patterns


Uzbekistan: Mean temperature (°C)
30
25
20
15
10
5
0
-5
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
1990-2012
1960-1990


Uzbekistan: Mean Precipitation (mm)
1990-2012
1960-1990
35
30
25
20
15
10
5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Assumptions for scenario building: socioeconomic developments

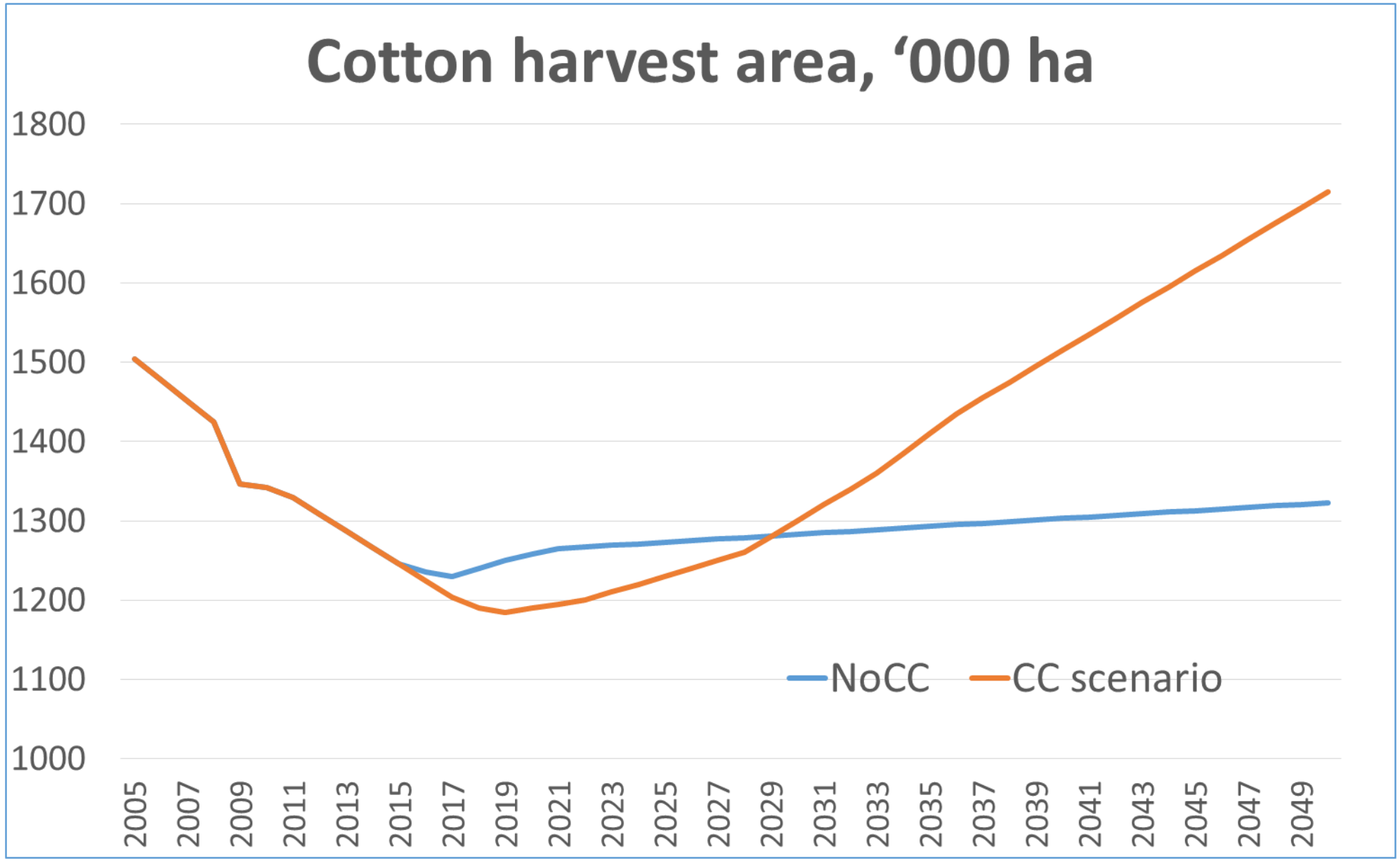
- Population growth will correspond to the UN projections
- GDP will continue to increase in the long run, albeit at lower rate
- State procurement for wheat and cotton will continue to have significant impact on crop allocation and yield (incentive issue) between 2015 and 2030, but its impact will wane afterwards
- International prices for food crops will exert more influence in the longer run

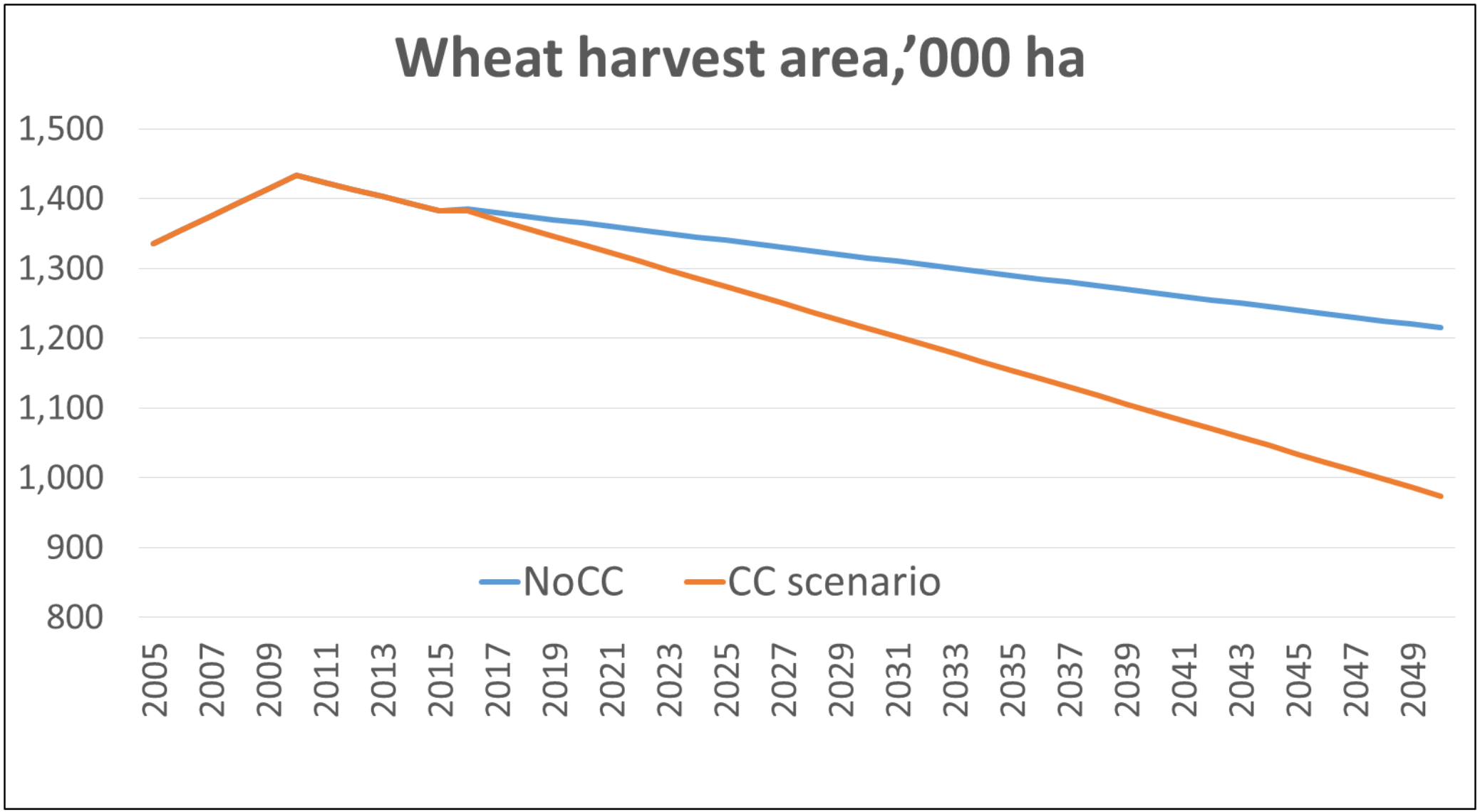
Assumptions for scenario building: climate change

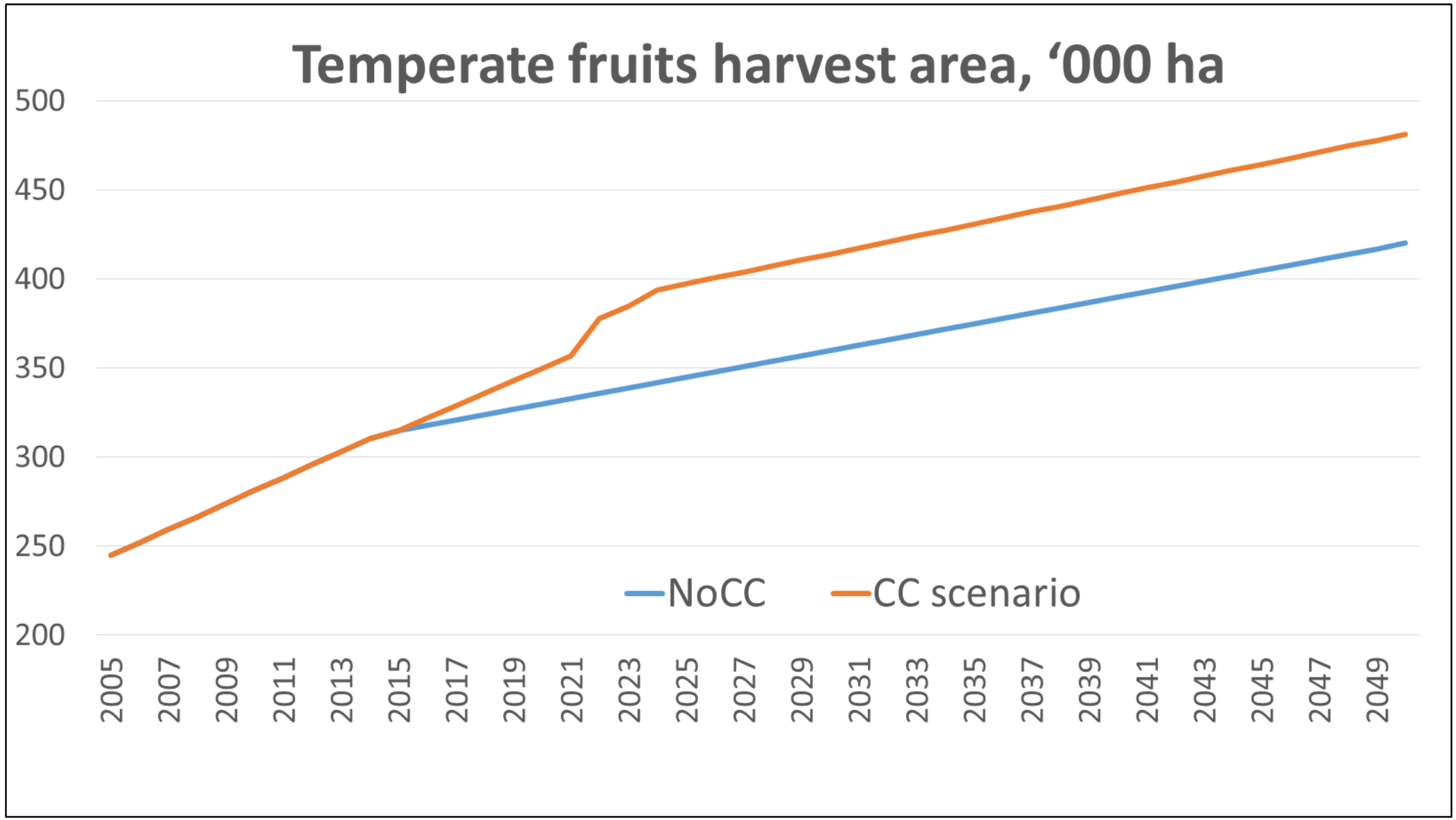
- No climate change (NoCC) is a baseline
- GFDL, HadGEM, IPSL, MIROC RCP4.5 are basis for moderate climate change scenario
- GFDL, HadGEM, IPSL, MIROC RCP8.5 are basis for severe climate change scenario
- Temperature will increase more in winter and early spring months
- Precipitation will be more or less the same, but timing will shift towards spring and winter from summer

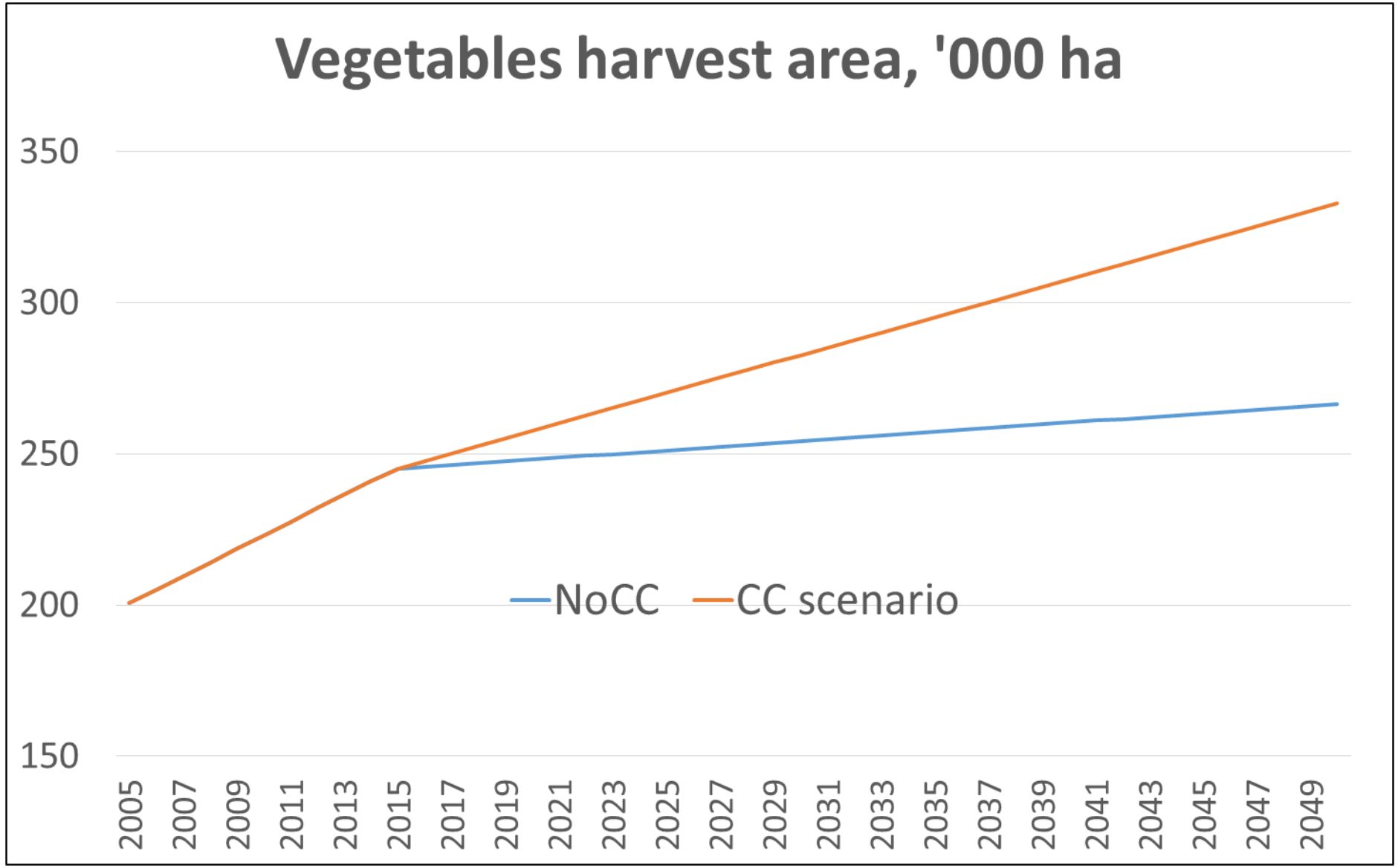
Assumptions for scenario building: water

- Surface water withdrawal decreases by 10% between 2015 and 2030, and by 20% between 2030 and 2050
- Water shortage in the Syrdarya river basin will be more severe than in the Amudarya river basin
- Water saving technologies will allow to increase basin efficiency by 10% between 2015 and 2030, and by 5% between 2030 and 2050
- Water storage capacity will increase by 30% between 2015 and 2030, and by 10% between 2030 and 2050


Cotton harvest area, ‘000 ha
1800
1700
1600
1500
1400
1300
1200
1100
1000
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
2027
2029
2031
2033
2035
2037
2039
2041
2043
2045
2047
2049
NoCC
CC scenario


Wheat harvest area,'000 ha
1,500
1,400
1,300
1,200
1,100
1,000
900
800
NoCC
CC scenario
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
2027
2029
2031
2033
2035
2037
2039
2041
2043
2045
2047
2049


Temperate fruits harvest area, ‘000 ha
500
450
400
350
300
250
200
NoCC
CC scenario
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
2027
2029
2031
2033
2035
2037
2039
2041
2043
2045
2047
2049


Vegetables harvest area, '000 ha
350
300
250
200
150
NoCC
CC scenario
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
2027
2029
2031
2033
2035
2037
2039
2041
2043
2045
2047
2049

Price predictions of IMPACT

- No climate change: Cotton prices will increase by 37%
- Severe climate change (MIROC 8.5): Cotton prices will increase by 83%

- NoCC: Price for wheat will increase by 28%
- MIROC 8.5: Price for wheat will increase by 36%

- NoCC: Price for temperate fruits will increase by 38%
- MIROC 8.5: Price for temperate fruits will increase by 45%

Preliminary conclusions

- Climate change will affect Uzbekistan's agriculture through mainly change in precipitation level and regime, as well demand shifts
- Through its impact on demand, climate change will have long-lasting effect on harvested area, as well as crop yields
- Active adaptation policies, including introduction of water-saving technologies, development of new climate-resistant varieties, are needed
- Pressure to modify/change state procurement system will increase