

The Impact of Dietary Patterns on Environmental Sustainability - *the Case of China*

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Introduction

- Dietary pattern has been changed due to economic development (Fuller, Beghin and Rozelle 2007; Curtis and McCluskey 2007; Zheng and Henneberry 2009; Popkin 2014; Zhai et al 2014)
- Dietary pattern changes induce
 - Health: obesity and diet-related chronic diseases (Du et al. 2014; Xu et al. 2015)
 - Environment: burdens in air, soil and water (Alexandratos and Bruinsma 2012)
- Health outcomes tend to be more emphasized but the environmental ones, when promoting and adopting a healthy dietary pattern (Stookey et al. 2000; Harnack et al. 2002; Diethelm et al. 2012)

This Presentation Will...

- 1. Illustrates the deviations of actual diets from the Chinese Dietary Guidelines (CDG)'s recommended diets
- 2. Explores how reducing the deviations can influence environmental sustainability
 - GHG emission
 - Energy use
 - Bluewater footprint
- 3. Analyzes the current production and consumption situation of major food groups

The Chinese Dietary Guidelines (CDG)

- FAO/WHO World Declaration on Nutrition – to improve the food consumption patterns and nutritional well-being of individuals and populations
- The Chinese one – based on national food consumption pattern and survey of nutrition and chronic diseases



Dietary Recommendations in the 2007 CDG for General Population (Healthy Adults Aged 18 – 59 Years Old)

Source: the Chinese Dietary Guidelines 2007

	Energy Levels per person per day						
	6700kJ 1600kcal	7550kJ 1800kcal	8350kJ 2000kcal	9200kJ 2200kcal	10050kJ 2400kcal	10900kJ 2600kcal	11700kJ 2800kcal
Cereals (g / day)	225	250	300	300	350	400	450
Soybeans (g / day)	30	30	40	40	40	50	50
Vegetables (g / day)	300	300	350	400	450	500	500
Fruits (g / day)	200	200	300	300	400	400	500
Meat (g / day)	50	50	50	75	75	75	75
Dairy (g / day)	300	300	300	300	300	300	300
Eggs (g / day)	25	25	25	50	50	50	50
Seafood (g / day)	50	50	75	75	75	100	100
Cooking Oil (g / day)	20	25	25	25	30	30	30
Salt (g / day)	6	6	6	6	6	6	6

Data –China Health and Nutrition Survey (CHNS)

- Eight waves of individual-level panel data from the CHNS (1991-2011) (1989-2007)
- Focuses on the general population defined in 2007 CDG – healthy adults aged from 18 to 59 years old (1600, 2800kcal)



Proportions of People Whose Consumption Level is Under, Within, and Over the CDG's Recommended Range for 5 Problematic Food Groups

	All Year				All Year				
	1991	2000	2011		1991	2000	2011		
<i>Vegetables</i>				<i>Dairy</i>					
Under	50.5%	49.6%	37.9%	63.5%	Under	99.6%	99.9%	99.5%	99.6%
Within	35.3%	35.1%	41.8%	28.3%					
Over	14.2%	15.3%	20.3%	8.3%	Over	0.4%	0.1%	0.5%	0.4%
<i>Fruits</i>				<i>Egg</i>					
Under	88.8%	97.4%	93.7%	71.5%	Under	46.9%	65.3%	47.2%	30.4%
Within	7.6%	2.1%	4.5%	18.5%	Within	14.3%	13.9%	16.5%	14.1%
Over	3.6%	0.5%	1.7%	10.1%	Over	38.8%	20.8%	36.3%	55.4%
<i>Meat</i>									
Under	27.4%	38.7%	26.8%	14.4%					
Within	8.5%	6.6%	9.0%	10.7%					
Over	64.1%	54.7%	64.2%	74.9%					

Figure 1: Average Meat Consumption per person (gram/day) with CDG Recommended Range

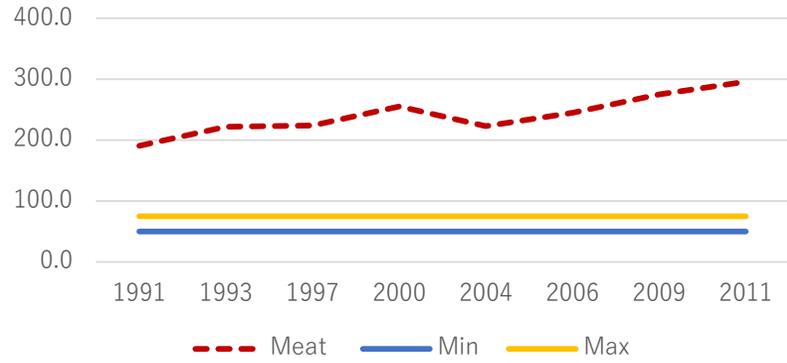


Figure 2: Average Eggs Consumption per person (gram/day) with CDG Recommended Range

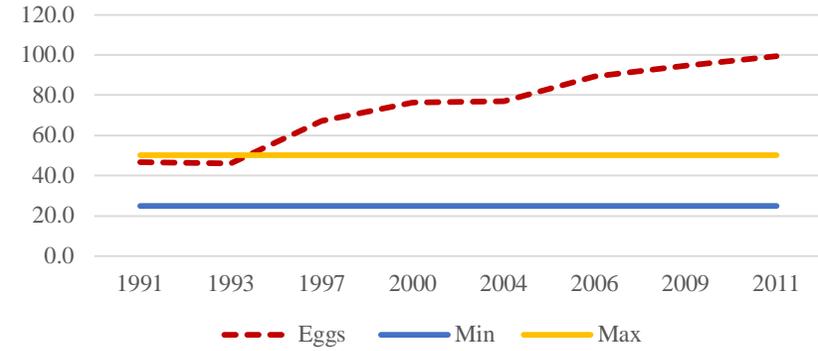


Figure 3: Average Fruit Consumption per person (gram/day) with CDG Recommended Range

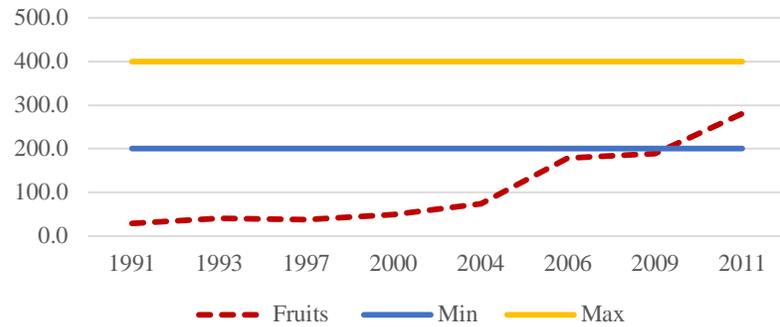
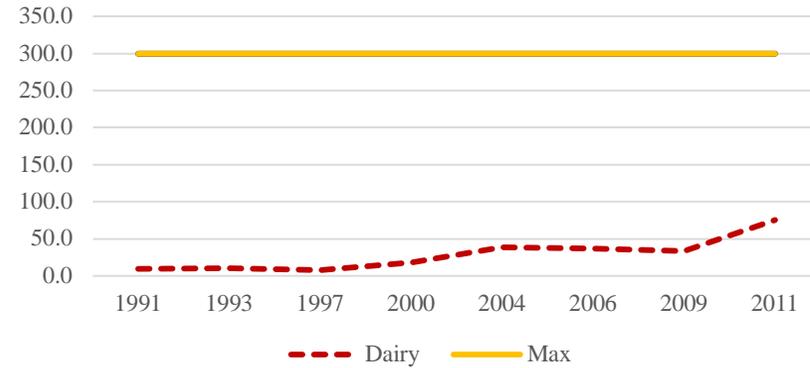


Figure 4: Average Dairy Consumption per person (gram/day) with CDG Recommended Range



Environmental Influences of Promoting the CDG's recommended Diets

- GHG emission, energy use, and blue water footprint
- Tom, Fischbeck and Hendrickson (2016) and Keoleian (2014)
 - Per-calorie index of the environmental influence for each major food group
 - Lower bound of the per-calorie environmental burdens for China

Individual-level Environmental burdens by following the CDG in 2011 (per person per day)

	Meat	Egg	Dairy	Fruits	Vegetable
GHG Emission (g)	-4.99	-0.06	1.61	0.05	0.02
Energy Use (kJ)	-7.96	-0.06	2.11	1.13	0.78
Blue Water Footprint (liters)	-91.89	-3.04	27.85	8	4.25

Nation-level Environmental burdens by following the CDG in 2011 (per year)

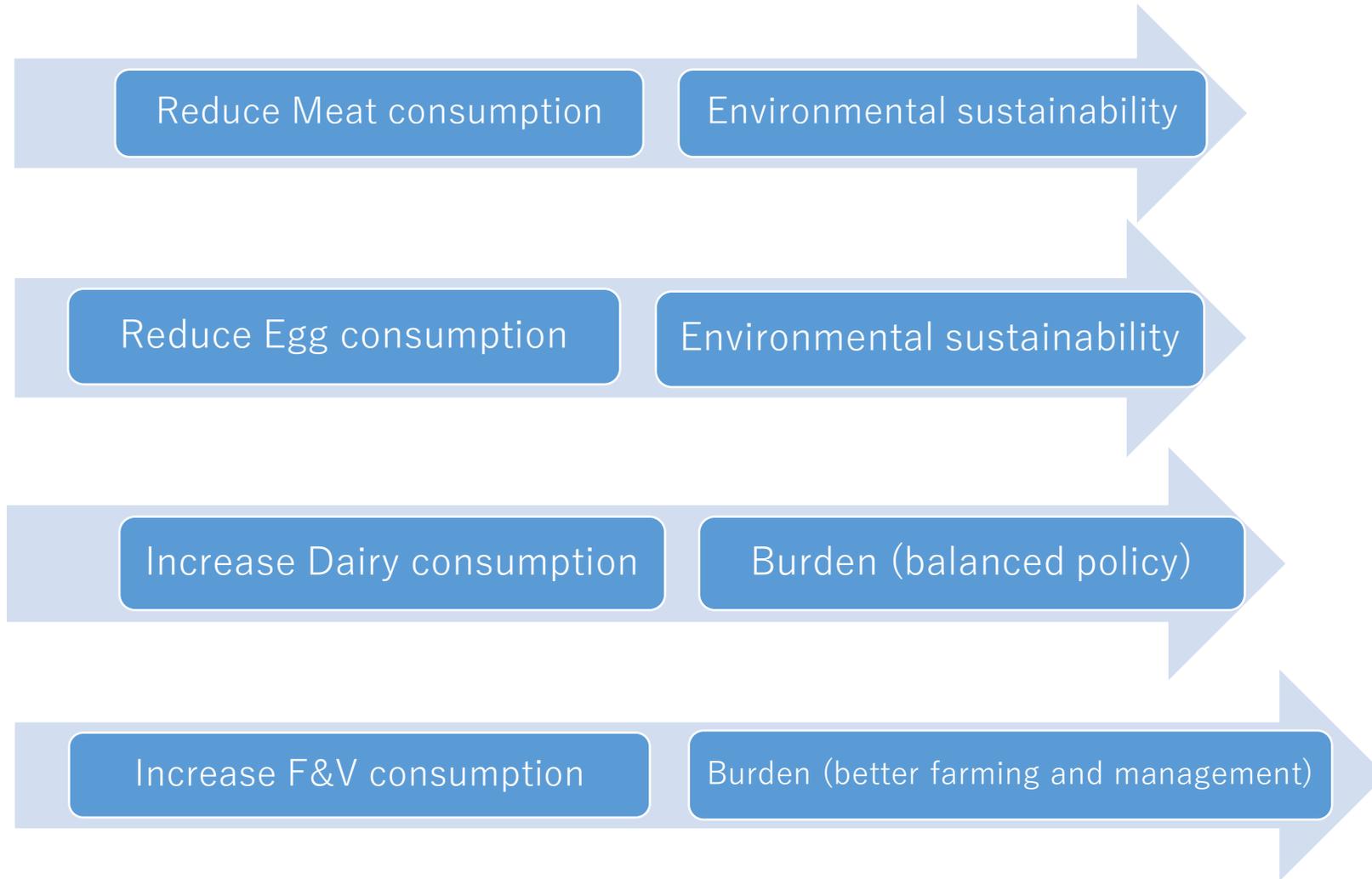
	Meat	Egg	Dairy	Fruits	Vegetable
GHG Emission (Gg)	-2447.9	-31.4	790.1	24.9	11.0
Energy Use (tJ)	-3907.1	-29.1	1036	551.9	382.1
Blue Water Footprint (tliters)	-45.1	-1.5	13.7	3.9	2.1

Nation-level Total Environmental Burdens of All Food Groups in 2011(per year)

GHG Emission (Gg)	-1653.4	<u>15%</u> of China's total GHG emission in 2011
Energy Use (tJ)	-1966.1	<u>2%</u> of China's total Energy Use of Agriculture sector in 2011
Blue Water Footprint (tliters)	-26.9	<u>17%</u> of China's annual average total Blue Water Footprint

(Other data source: CAIT, FAOSTAT, Water footprint network)

A healthier Diet, following the CDG...



China's Meat Production and Consumption

- China is the largest meat consuming country, 74 million tonnes of pork, beef and poultry in 2017, around twice as much as the United States (USDA 2017)
- China is the top pork producing and a leading importing country, a leading feed importing country (Gale 2017) – *heavy domestic environmental burden & shifting out the environmental burden?*
- Now the pork demand hit the ceiling (Patton 2017)

China's Dairy Production and Consumption

- Low prices depress Chinese production (over 50% dairy farms operate at a loss in 2016)
- Ability to produce more milk is limited (though recent imports of breeder cattle to improve genetic stock and increase herd numbers)
- Low international prices boost Chinese importing dairy products (97% of fluid milk from EU and New Zealand) – *shifting out?*
- Consumption remains stagnant (1-2% increase due to population and urbanization) but has great growth potential which has been dragged slow by food safety concerns

China's Egg Production and Consumption

- World's largest grower of egg laying hens (number increasing) and has been the largest producer of eggs since 1996
- Exports mainly to neighboring countries at an increasing rate due to increasing international price since 2014 – *bears burden for exporting destinations?*
- Imports of shell eggs and liquid egg from the United States and Singapore – *shifting out?*

Livestock Sector - Most Environment Damaging

- Animal wastes, antibiotics and hormones, chemicals from tanneries, fertilizers and pesticides used to spray feed crops
- Specific to GHG emission (**80% of the agriculture sector, 18% of total global GHG**) from enteric fermentation and manure management (FAO 2013)
- Land degradation, compaction, and erosion from overgrazing

China's F&V Production and Consumption

- World's top F&V producer (half of vegetables and 30% of fruit)
- Mainly for domestic consumption, very few for exports to nearby countries (though still world's 4th and 7th by value)
- Imports mainly from Southern Hemisphere countries for regional specific products and the United States

Conclusion

- What we eat really matters for
 - Health
 - **Environmental sustainability**
- Balanced policy for dietary guidelines
- Improve agricultural production and farm management
- Shorten the agri-food supply chain??

Thank you very much!