

Food Fortification in China: A Brief Review

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CONTENTS

01

Development of Food Fortification
in China

02

Salt Iodization

03

Major Food Fortification Projects
Advanced through Government
Led Partnership Model

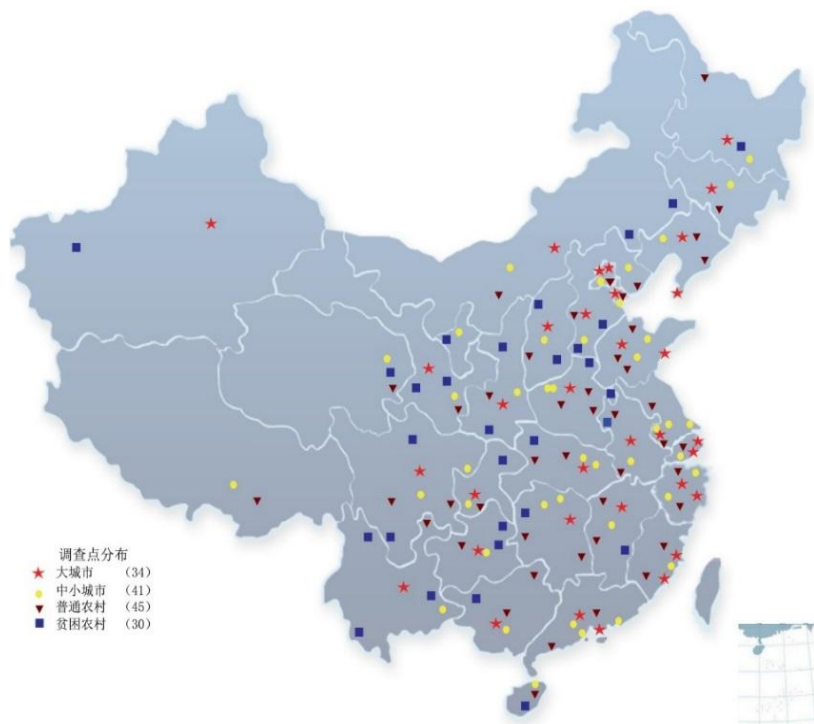
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Summary

01

Development of Food Fortification in China

Micronutrient malnutrition demand food fortification in China



Monitoring Report of national nutrition and health report (2020)

Sentinel sites of National Nutrition and Health Monitoring

Deficiency of micronutrient

Age (yrs)		
Vitamin A	Def, %	MD, %
6-17	1	14.7
>18	0.5	4.1
Vitamin D	Def, %	Inad, %
6-17	18.6	43.3
>18	21.4	38.8
Zinc	Def, %	
6-17	3.8	
>18	6.0	
Anemia	Prevalence, %	
0.5-5	21.2%	
6-11	4.4%	
12-17	6.6%	
>18	8.3%	

Def: deficiency;
MD: marginal deficiency;
Inad: inadequacy.

Dietary micronutrient intakes

Micronutrient		Percent, %
Calcium	<EAR	96.6
	EAR-RNI	2.0
	≥RNI	1.4
Zinc	<EAR	35.6
	EAR-RNI	18.0
	≥RNI	46.5
Iron	<EAR	11.5
	EAR-RNI	16.5
	≥RNI	72.0
Vitamin A	<EAR	77.0
	EAR-RNI	11.0
	≥RNI	12.0
Vitamin B ₁	<EAR	77.8
	EAR-RNI	10.0
	≥RNI	12.2
Vitamin B ₂	<EAR	90.2
	EAR-RNI	5.1
	≥RNI	4.8
Vitamin C	<EAR	67.7
	EAR-RNI	9.2
	≥RNI	23.1

EAR: Average nutrient intake. <EAR: inadequacy.
RNI: recommended nutrient intake. >RNI: adequacy.
EAR-RNI: acceptable for groups.

Food fortification in China

Government mandatory fortification project

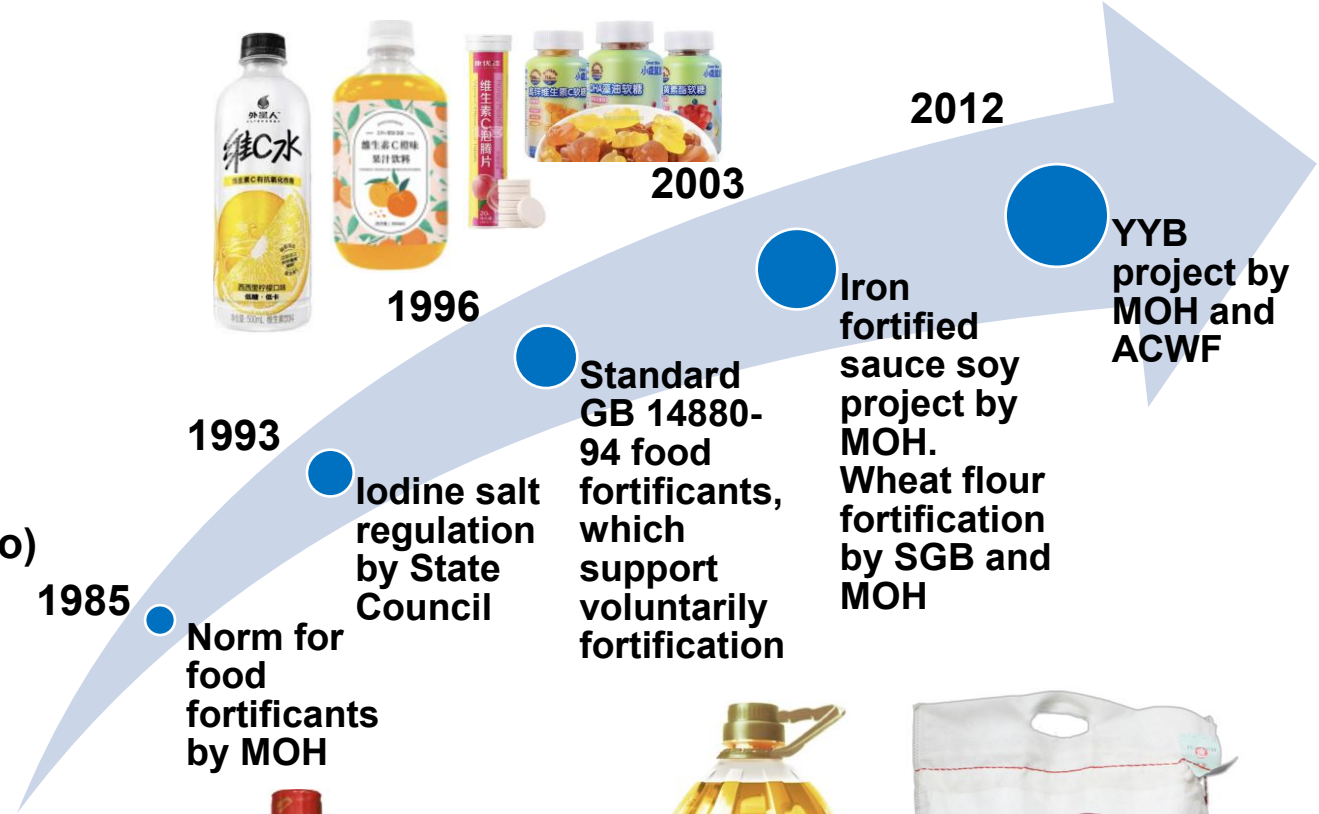
1. Iodine fortified salt

Government oriented voluntary fortification projects

1. Iron fortified soy sauce
2. Flour and rice fortification
3. VA fortified cooking oil
4. Complementary food supplements (Ying Yang Bao)

Voluntary fortification

1. Wheat , rice and their processed products
2. Milk, modified milk and dairy products
3. Drinks in different types
4. Cooking oils
5. Juices of fruits and vegetables
6. Meat floss
7. Egg powders
8. Jelly and gummy
9. others





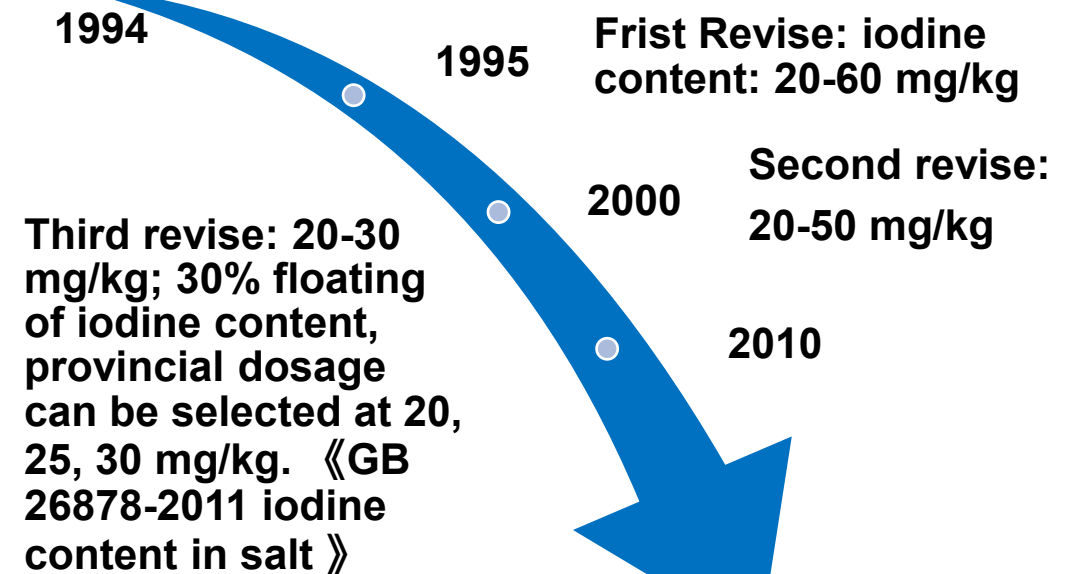
Salt Iodization

Salt Iodization in China

- Government commitment on iodine deficiency disorder (IDD) elimination by the year 2000 in 1993. A mandatory salt iodization regulation was launched in 1994.
- In 2000, MOH declared that China had achieved the periodical goal at national level. Iodine status in China was evaluated as adequate in 2003 by WHO.

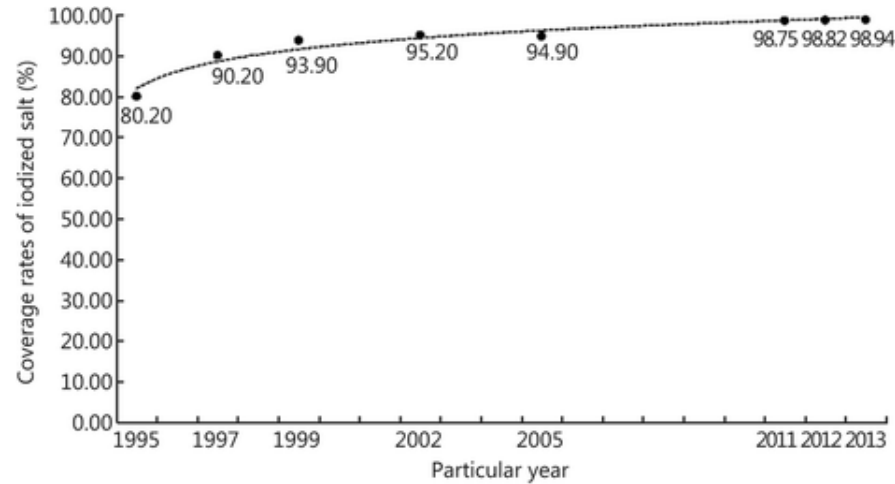
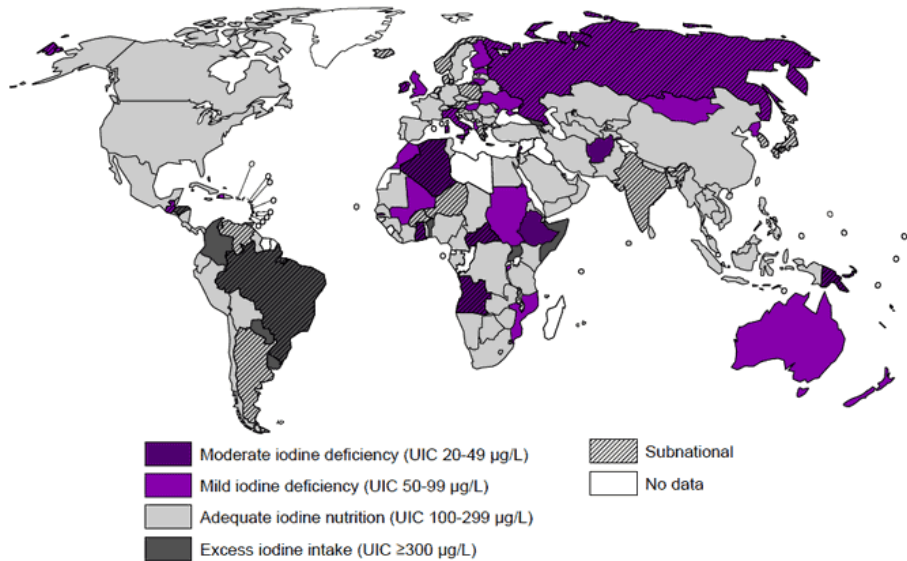


Original: mandatory regulation. Iodine dosage: 20 mg/kg, recommended by international organization.



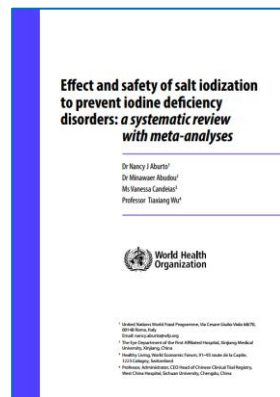
All types of salt are permitted to market

Iodine nutrition is evaluated as adequate in China



Conclusion
Iodine intake is generally adequate in China, but there are deficiency risk in pregnant women and excessive risk in high iodine water regions.

Globally, 2 billion population are at risk of IDD. 140 countries has mandatory regulations or laws to implement universal salt iodization; iodine salt has covered 75% household of developing countries.



Chinese former Premier Li Peng signed the “World Declaration for the Survival, Protection and Development of Children” and the Plan for Action in 1993

技术报告 No. 2010-002

中国食盐加碘和居民碘营养状况的风险评估

Salt Iodization and Risk Assessment of Iodine Status in Chinese Population

国家食品安全风险评估专家委员会
2010年5月14日

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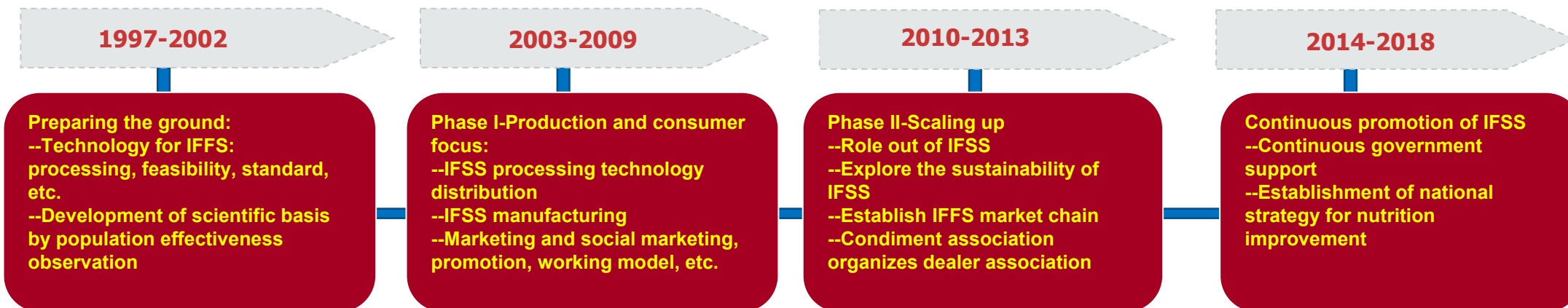
Major Food Fortification Projects Advanced through Government Led Partnership Model

Iron Fortified Soy Sauce (IFSS) Project

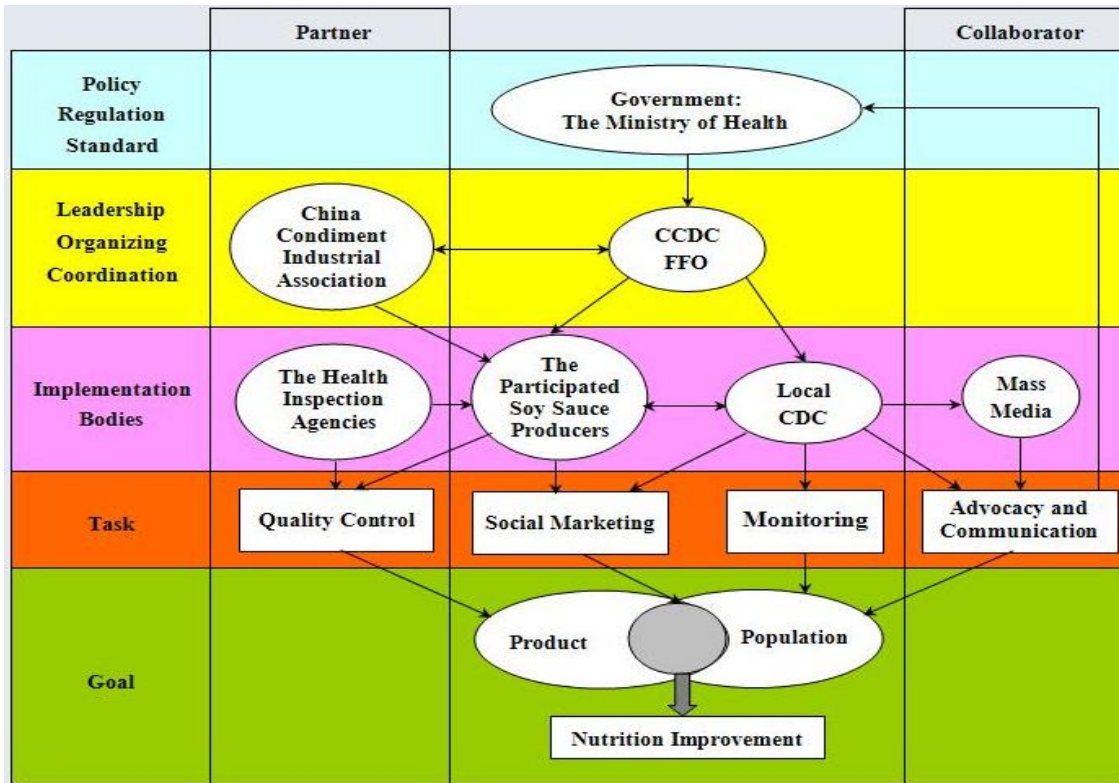
1. Soy sauce is a traditional fermented condiment with near-universal consumption among China's population.
2. Soy sauce, with its naturally dark color and pronounced saltiness, serves as an appropriate food vehicle for iron fortification.
3. Chinese food fortificants standard permit the use of iron in soy sauce.



Use of Iron Fortified Soy Sauce in ID and IDA Control and Prevention in China is a project led by the Ministry of Health, supported by GAIN. It is usually referred to as GAIN Project.



Working model of the IFSS project: two wheels turn simultaneously



This case was coordinated by Michael Jarvis (World Bank Institute) and Béatrice Magarinos (Global Alliance for Improved Nutrition). We would like to express our gratitude to the staff of Shijiazhuang Zhenji Brew Group Company, Ltd, the Center for Disease Control and Prevention (CDC) in China and their partner organizations for their invaluable contributions to the case's development.

This case was commissioned by the World Bank Institute with the support of the Global Alliance for Improved Nutrition.

Business Innovation to Combat Malnutrition | Case Study Series

Two Wheels Turning: Partnership in China's Soy Sauce Fortification Program

Case A



IN NOVEMBER 2003, Chen Junshi was preparing to launch the initial stage of what he hoped would become a nationwide program to combat iron deficiency and iron deficiency anemia in China. As a nutritionist and director of the Food Fortification Office (FFO) at China's Center for Disease Control and Prevention (CDC), Chen headed a team of...

explained the various reasons why his Zhenji colleagues now objected to participating in the CDC iron fortification program. If Zhang could not persuade his colleagues at Zhenji to participate, Chen knew it would be an uphill struggle to win and sustain the backing of other manufacturers.

IRON-FORTIFIED SOY SAUCE PROJECT IN CHINA: A NEW PARADIGM IN PUBLIC HEALTHCARE DELIVERY – REFLECTIONS AND CHALLENGES

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We are grateful for the help of many officials from China Centre for Disease Control and Prevention and staff of Global

1May 2014. After ten years and an investment of US\$4.6 million, the Global Alliance for Improved Nutrition (GAIN), reviewed the Project Update for the the Iron Fortified Soy Sauce (IFSS) project in China. The update contained news of overall progress and some on-going challenges as Phase II of the project came to a completion which has a US\$1.5 million funding. Being the world's first and largest iron fortified soy project, GAIN wanted to better understand the IFSS experience in order to extract major lessons that GAIN could share with others. Dr. Regina Moench-Pfanner, Director, GAIN – Singapore, brought together Professor Ho Yew Kee, Head of Department of Accounting, and Dr Yap Chee Meng, Associate Dean, Faculty of Engineering at the National University of Singapore to study the

Advocacy and Awareness Improvement Activities



IFSS Promotion in Rural Boarding Schools

1. The project was funded 1.4 million USD by MOH.
2. Goal: IFSS should cover all the local boarding schools in rural area in one county in all provinces.
3. Previous case study: IFFS was applied to all 29 boarding schools in Huairou county and Yanqing county in Beijing.

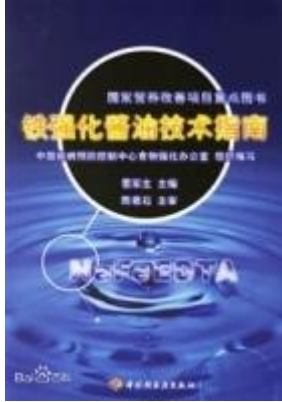


Collaboration with supermarket chain

Collaborated with Carrefour (China), Suguo and other chain supermarkets i.e. to hold “Balance of Nutrition, Health of Family”, food fortification advocacy week in 163 Carrefour stores in 45 cities in China.



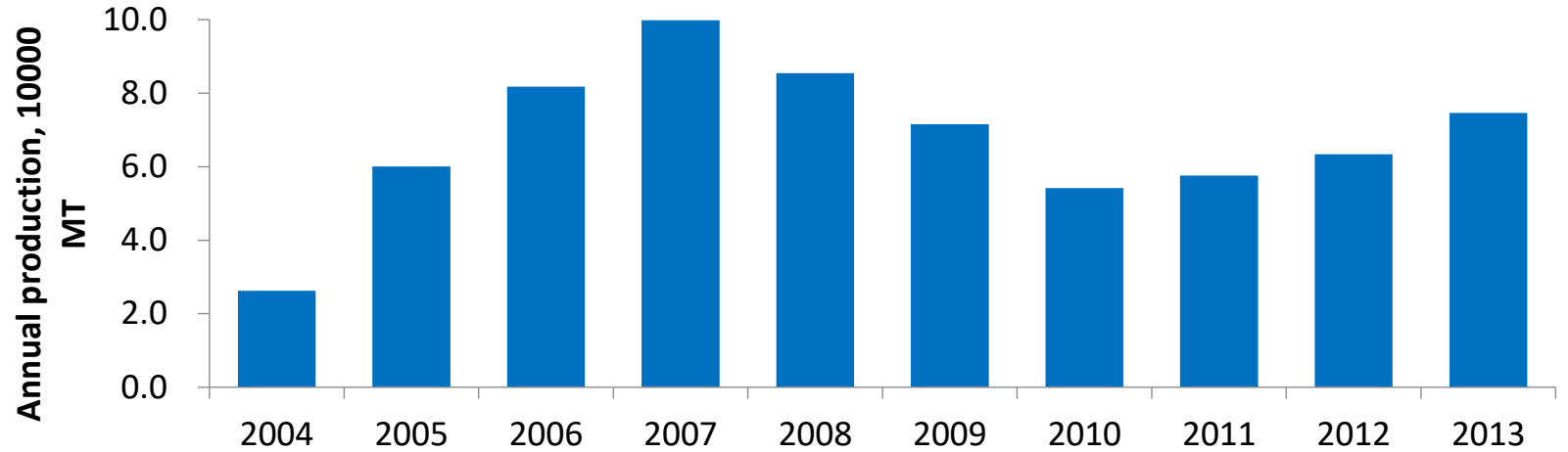
Impact of IFSS



Data of the Fifth National Nutrition and Health Survey (2013) showed the national average anemia rate was declined from 20.1% in 2002 to 9.7% in 2013. An evaluation study suggested iron fortified soy sauce project contributes approximately 21% of the decrease.

The cost-benefit of IFSS was estimated over 1:40 by the health economic study.

《Prevention of iron deficiency and anemia: evaluation of iron fortification of soy sauce》, People's Medical Publishing House. 2023



The production of IFSS was 75,000 MT in 2013 – this represented 4.5% of the soy sauce market and covered 55 millions population.

	Accelerate provinces	project provinces	Other provinces
Covered population (million)	280	150	110
Covered at risk (million)	25	17	8
Market rate, %	14.2%	3.3%	0.7%

FFO survey data, 2013

Technology of Rice Fortification

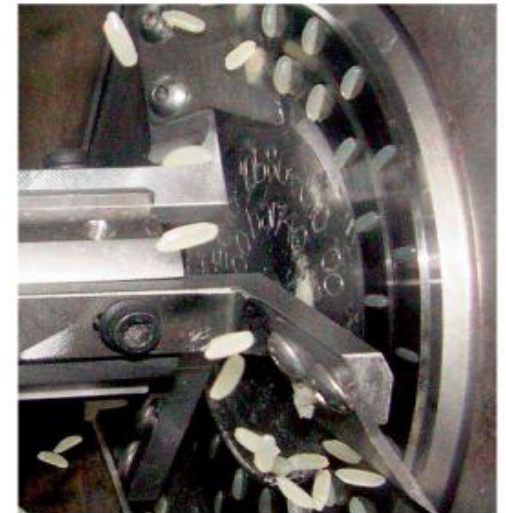
Cold-extrusion fortified rice technology was established between 2004 and 2007 through the efforts of COFCO and UltraRice, and has since been further developed domestically.

COFCO artificial nutrient rice is produced exclusively for exporting.

Fortified rice has not yet widely commercialized in China due to various reasons including high cost.

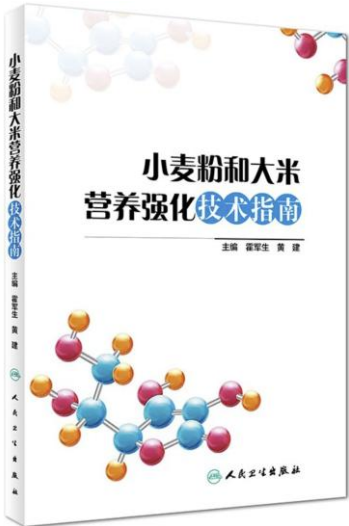


The Buhler extruder used in the NutriRice process. Photos courtesy of Buhler.



Buhler's expertise in extrusion technology helped create the NutriRice process.

Rice fortification has been shown to be effective among high-risk students in migrant boarding school



Formula of rice fortification

Iron	Ferric pyrophosphate	24 mg/kg
VB ₁	Thiamine hydrochloride	3.5 mg/kg
VB ₂	Riboflavin	3.5 mg/kg
Zinc	Zinc dioxide	25 mg/kg
Folic acid	Folic acid	2 mg/kg
Nicotinic acid	Nicotinamide	40 mg/kg
β-carotene	β-carotene	3 mg/kg

Huo J et al., J Food Nutr Disord 2014, 3:2
<http://dx.doi.org/10.4172/2324-9323.1000133>



Journal of Food & Nutritional Disorders

Research Article

A SCITECHNOL JOURNAL

School Food Fortification Improves Nutrition Status of Students from Poor Migrant

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Rec date: May 26, 2013, Acc date: Feb 27, 2014, Pub date: Mar 03, 2014

Abstract

To observe the effect of food fortification including multivitamin fortified rice, iron fortified soy sauce and VA fortified cooking oil on school children of rural-urban migratory families. The school children in a boarding school for children of migrated families in suburb Beijing city were selected as volunteer subjects and the school cafeteria were supplied with iron fortified soy sauce, multivitamin fortified rice and VA fortified cooking oil for 10 month. Dietary survey and nutrition measurement were conducted before and after 10-month intervention with fortified foods. Hb, SF, SI, sTIR, serum Zinc and serum VA were measured with blood samples. VB1 and VB2 were measured with urine samples. The results showed that the daily intakes of the fortified micronutrients reached the requirements of Chinese AI or RNI through the application of fortified foods. Haemoglobin, serum zinc, VA, urine VB1 and urine VB2 levels were significantly increased in 10 months intervention compared with the baseline while sTIR level was significantly lower than that of the baseline. Anemia prevalence was decreased from 14.1% to 2.5% and the rates of deficiencies and inadequacies of iron, zinc, VA, VB1 and VB2 were

reported that students in schools of CPMF showed lower health and nutrition status compared with students in public school [1]. The prevalence of micronutrient deficiency and anemia were even higher in schools of CPMF compared with those who are still in rural, but the problem has been somehow neglected [2]. Food fortification is a cost-benefit approach for prevention of micronutrient deficiency and sufficient experiences have been accumulated from both developed and developing countries. There have been some reports for food fortification projects showed the health effects in both students and other groups of population in China and the related fortified foods including multimicronutrients enriched wheat flour and rice, VA enriched cooking oil and iron enriched soy sauce [3]. Food fortification is considered a feasible and sustainable method in promoting student nutrition status in CPMF schools, but there still lack of practices and evidences. This study was designed to observe the change on micronutrients status of students intervened for 10 months by iron fortified soy sauce, multivitamin fortified rice and VA fortified cooking oil in a CPMF school.

Method

Subjects and sampling

A CPMF school named Dandelion School located in Daxing county, a region in suburb of Beijing, where was one of gregation region of the migrant population. Dandelion is the only school within the region that recruits only CPMF as students and the students are not charged for any tuition fees, in addition, the school receives 600 RMB (approximately 95 USD) for a year to supply meals and dorms, but it is also free to the extremely poor students. There were about 640 students in the school aged from 11 to 16 years old and 56% percent of the students boarded in the school from Monday morning to Friday evening. Those who lived nearby would go home every day accounted for 44% percent of the total, but they have their breakfast and lunch in the school. The school cafeteria supplies three meal every day except weekend and the cost of meal for one day is less than 6.3 RMB or 1 USD because both the school donors and lower income of floating



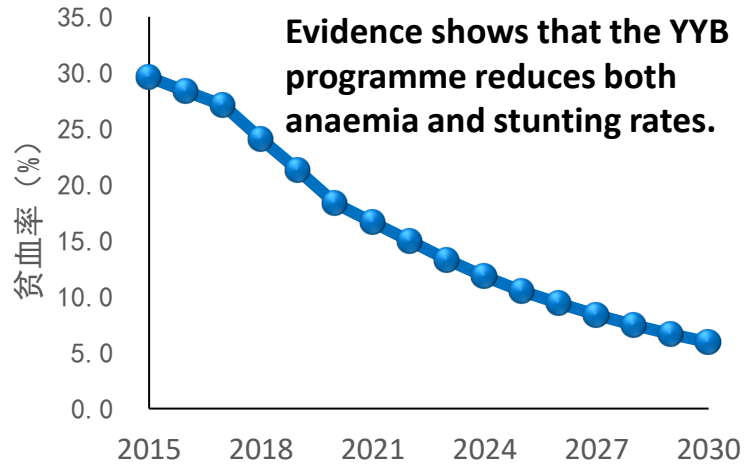
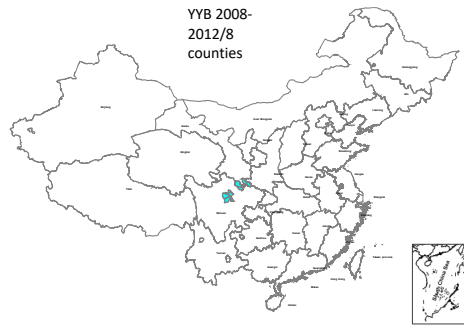
YYB Project

The government provides YYB and delivers nutrition and infant-feeding education for caregivers of children aged 6–24 months in rural areas. YYB is a home-fortification intervention consisting of a multi-nutrient soybean-based complementary food supplement.



加温开水2-3勺 (20-30ml) 倒入营养包 搅拌 调至糊状

YYB project has been integrated into the national basic public health service system.

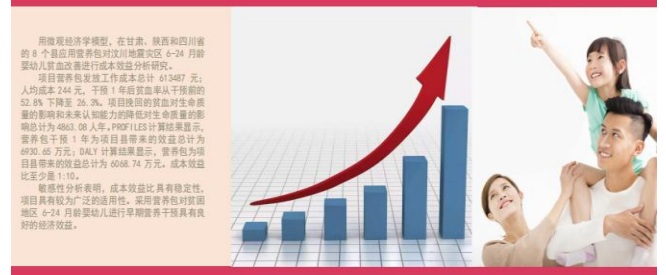


YYB项目地区6~23月龄婴幼儿贫血率(%)趋势变化

Evaluations show that the YYB project is a low-cost, high-return intervention, demonstrating strong economic sustainability.

1:10

营养包成本效益分析



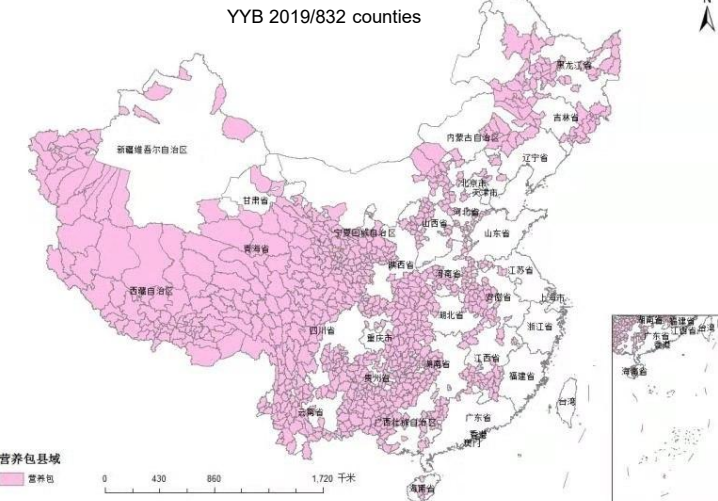
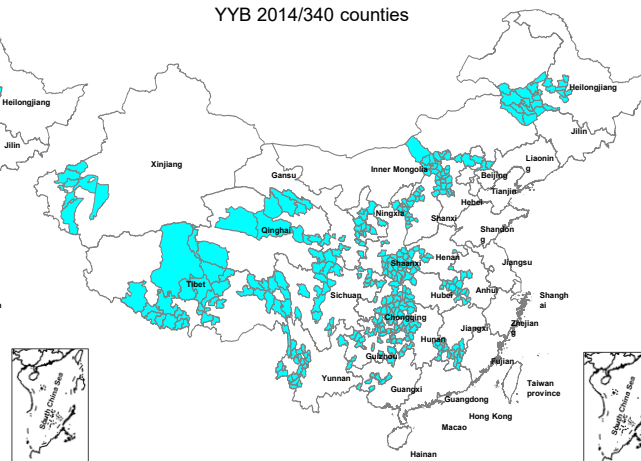
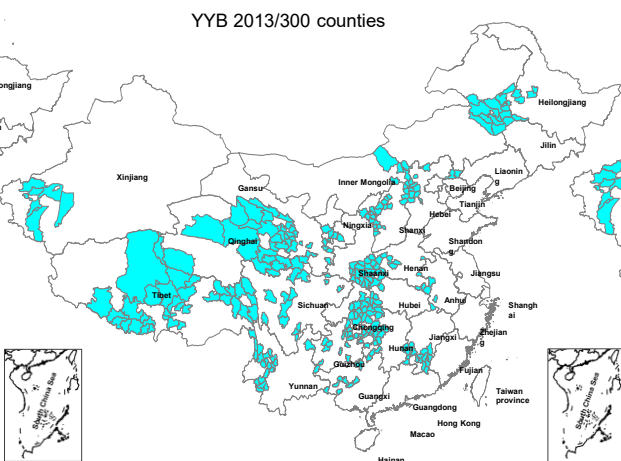
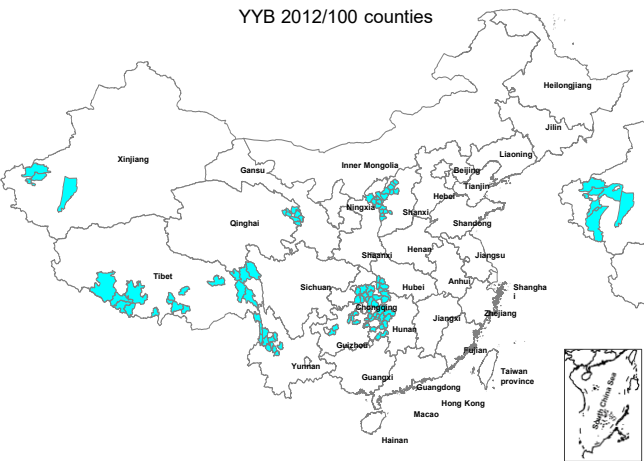
数据来源：霍军生，孙静，黄美英，等。营养包改善贫困地区婴幼儿贫血状况的成本效益研究，2016，47（5）。

YYB 2012/100 counties

YYB 2013/300 counties

YYB 2014/340 counties

YYB 2019/832 counties



Since 2012, the YYB project has reached 22 provinces and benefited more than 19 million infants aged 6–24 months in rural areas.

Biofortification in China

HarvestPlus in China, led by the Institute of Biotechnology of the Chinese Academy of Agricultural Sciences, was initiated in 2004. It has developed over 20 biofortified varieties covering five major crops, with core fortifications of iron, zinc, beta-carotene (pro-vitamin A), and folic acid.



- 关于HPC
- 目标和优势
- 顾问委员会
- 办公室
- 合作伙伴



关于HPC
中国作物营养强化 (HarvestPlus-China, HPC) 是国际HarvestPlus (HP) 的姊妹组织, 在HP和国家有关部门的资金支持下, 于2004年正式启动, 致力于筛选、培育、评价和推广富含微量营养素的营养强化作物, 改善我国贫困人群中普遍存在的微量营养素缺乏(隐性饥饿)问题, 提高全民营养健康水平。

Iron and zinc biofortified rice, wheat and potato
B-carotene fortified sweet potato
Folic acid fortified corn

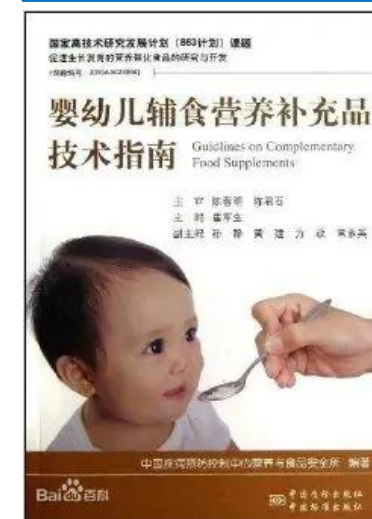
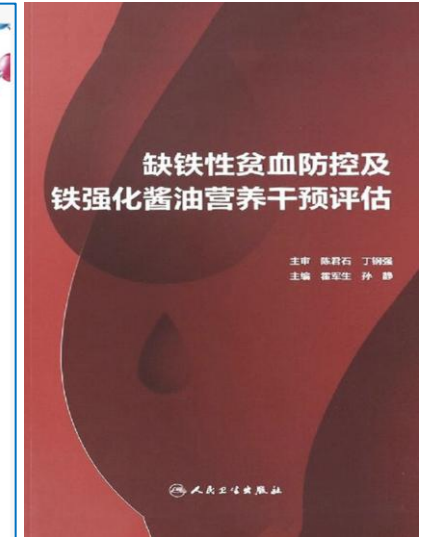


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Summary

Summary

1. **Mandatory salt iodization and government-funded Yingyangbao (YYB) programmes are widely recognized as two of China's most successful large-scale fortification initiatives.**
2. **Pilot efforts on iron-fortified soy sauce and wheat-flour fortification have generated valuable experience for scaling up mass-fortification through government-led partnership model.**
3. **Voluntary fortification, including biofortification, has expanded rapidly over the past decades as the food industry and agriculture sectors increasingly prioritize nutrition.**
4. **Substantial evidence now demonstrates that food-fortification interventions have significantly reduced micronutrient deficiencies in China.**





Thank You