

Mandatory Fortification With Folic Acid

Presented by Scott J. Montgomery
Food Fortification Initiative Director
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**Food
Fortification
Initiative**

Enhancing Grains for Healthier Lives



What is fortification?

Adding
vitamins and
minerals



during the
milling process



to produce
more nutritious
foods



Photo from Mühlenchemie



Photo by David Snyder / CDC Foundation



Istockphoto



FFI focuses on industrially milled wheat flour, maize flour, and rice

Industrial mill



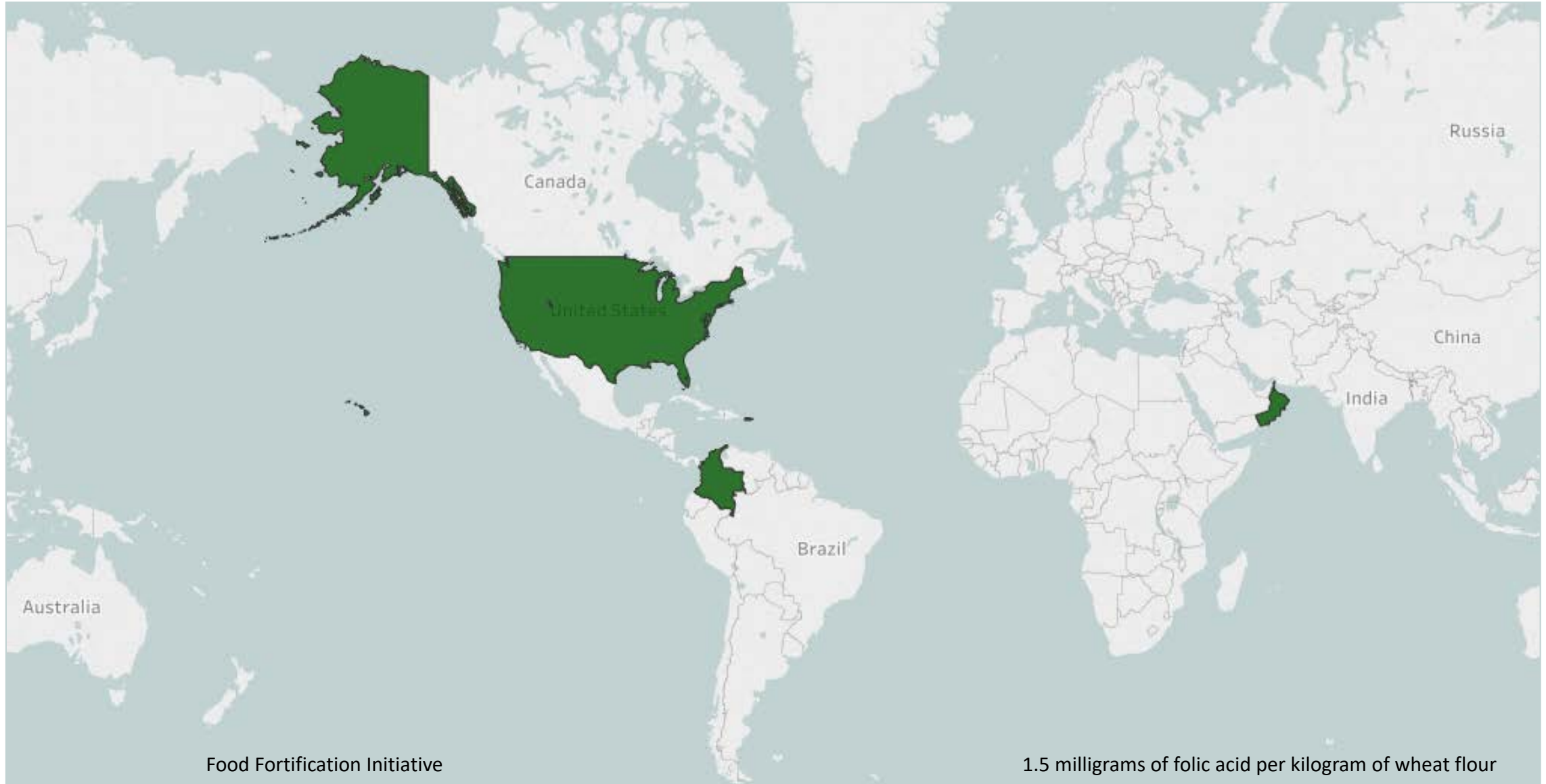
Bühler photo

Village-type chakki mill



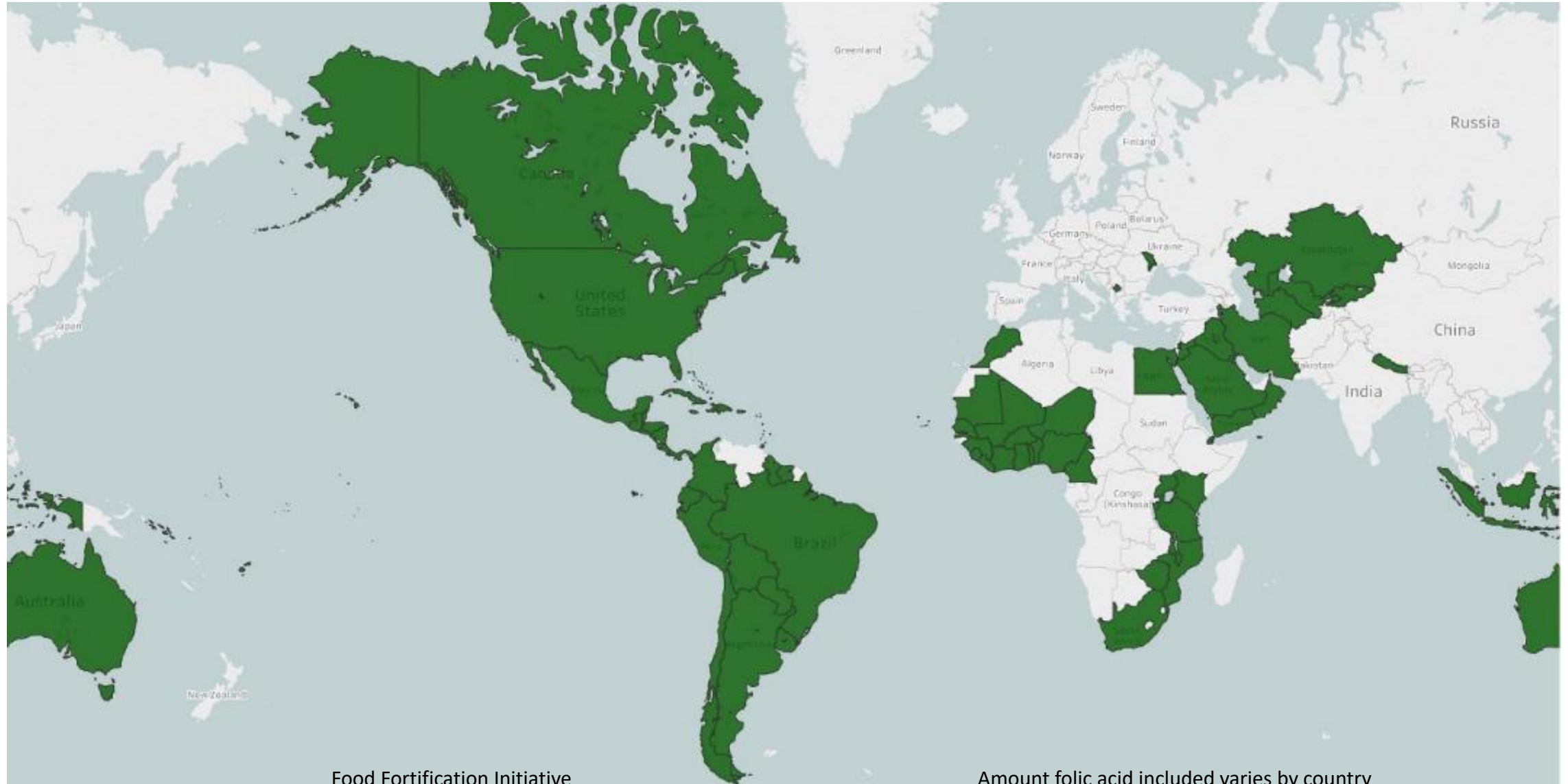
India photo by David McKee

1996–1998: U.S. and Colombia mandate adding folic acid to grains; Oman reaches national coverage





2017: 81 countries require folic acid in industrially milled wheat flour, maize flour and/or rice





Benefits of Mandatory Fortification



Legislation leads to high coverage

82%

Average percent of industrially milled wheat flour that is fortified in countries with legislation

15%

Average percent of industrially milled wheat flour that is fortified in countries without legislation



Nutrient levels increasing in Cameroon

Among Women in Urban Areas N = ~ 300 households	2 years before fortification	1 year after fortification	Percent Increase
Plasma folate* (nmol/L)	15	47	213%
Plasma B12 (pmol/L)	461	671	46%
Plasma zinc (µg/dL)	55	65	18%
Ferritin (µg/L)	37	47	27%



Cameroon photo from Flickr Creative Commons

*Plasma/serum folate is a short-term measure and RBC folate concentration is a long-term measure of folate status and is the biomarker used for NTD risk. Correlation between plasma/serum folate concentration and RBC folate concentration is unknown.

Iron, Zinc, Folate, and Vitamin B-12 Status Increased among Women and Children in Yaoundé and Douala, Cameroon, 1 Year after Introducing Fortified Wheat Flour
Engle-Stone R, Nankap M, Ndjebayi AO, et. al. J Nutr. 2017 Jul;147(7):1426-1436.. Epub 2017 Jun 7 <http://jn.nutrition.org/content/early/2017/06/07/jn.116.245076>



Folate and other nutrient deficiencies decreasing in Fiji

Percent of Women Age 15–45 Deficient Before and After Flour Fortification, Fiji, N=869

Measurement	Percent Deficient Before, 2004	Percent Deficient After, 2010	Cut offs used for deficiency in women ¹
Serum folate	8	1	Serum folate <10 nmol/L
Iron	23	8	Serum ferritin <15 mg/L
Zinc	39	0	Serum zinc <10.1 mmol/L

In addition, anemia prevalence among this group dropped from 40% to 28%.

Anemia defined as hemoglobin <12g/dL

Only 16.1% of the women had taken nutrient supplements in the six months prior to the survey

National Food and Nutrition Centre 2010 ffinetwork.org/monitor/Documents/Fiji.pdf

¹ World Health Organization apps.who.int/iris/bitstream/10665/161988/1/9789241549042_eng.pdf



Legislation equalizes costs for millers



One metric ton of wheat flour is about 2,200 pounds or 1,000 kilograms, as pictured here. FFI photo.

Premix cost to fortify 1 metric ton

Wheat Flour:

Average of US\$ 3 to fortify with iron, folic acid, and other B vitamins

Maize Flour:

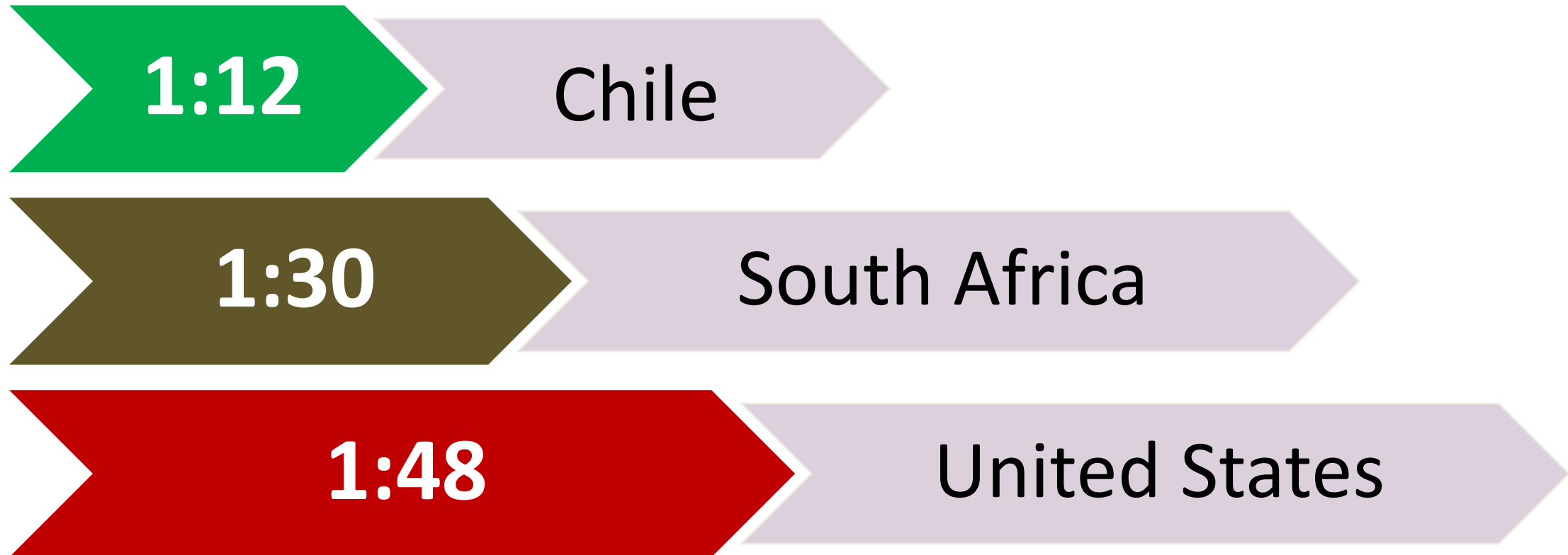
Average of US\$ 4 to fortify with iron, zinc, vitamin A, folic acid, and other B vitamins

Rice:

US\$ 6 to US\$ 20 to fortify with iron, zinc, vitamin A, folic acid, and other B vitamins



Fortifying with folic acid leads to healthcare savings from preventing spina bifida





Legislation establishes appropriate standards

- Which nutrients
- Type of iron
- Level of nutrients

Nutrients Added Through Fortification (parts per million)

	Minerals			B Vitamins				
	Iron	Type of Iron	Zinc	Folic Acid	B12	Niacin	Riboflavin	Thiamin
Wheat	44	Multiple Compounds Allowed		1.54		55	4	6



Legislation enables monitoring

Food Control

- Internal
- External
- Commercial

Program

- Intake
- Impact



Comisión Nacional para la Fortificación,
Enriquecimiento y/o Equiparación de Alimentos
REPÚBLICA DE GUATEMALA

In summary

Fortification is most effective when it is mandatory because legislation:

- Helps ensure high coverage
- Equalizes costs for millers
- Establishes appropriate standards
- Enables monitoring

For more information:

E-mail sjmontgom@gmail.com

Also see:

FFInetwork.org

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