

# Identifying Appropriate Delivery Options for Fortified Rice

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## Key Messages

- To identify the optimal delivery option for fortified rice, decision-makers should assess the public health need, the rice supply chain, the feasibility of rice fortification, and the extent and scale to which social safety nets reach groups that can most benefit from rice fortification.
- Mandatory rice fortification offers the best opportunity to maximize the public health benefit.
- When the rice milling landscape is fragmented and mandatory fortification is not feasible, the fortification of rice distributed through social safety nets is an alternative to achieve public health impact in targeted populations.

## Introduction

Where rice is an important staple food, rice fortification has the potential to significantly contribute to the reduction of micronutrient deficiencies in a population. Fortified rice can reach consumers through three different delivery options. First, governments can mandate that all rice on the market be fortified. Alternatively, rice millers can voluntarily fortify rice in response to market demand. Third, fortified rice can be distributed through social safety net programs. The distribution of fortified rice through social safety net systems can occur alongside either mandatory or voluntary rice fortification. Selecting the most appropriate delivery option depends on public health need, context, and the intended objective and purpose of rice fortification.

This article provides an overview of the three potential delivery channels for fortified rice, lessons learned from implementing countries and current status of rice fortification.

“Selecting the most appropriate delivery option depends on public health need, context, and the intended objective and purpose of rice fortification”

## Delivery Option 1:

### Mandatory fortification

Mandatory fortification requires food producers, both of domestic and of imported food, to fortify the particular staple food or condiment with specified micronutrients. In comparison with other delivery options, experience shows that mandatory fortification has the greatest potential for public health impact. This results from the consumption of the fortified food by all segments of the population, without requiring behavior change. Governments tend to institute mandatory fortification when micronutrient deficiencies, or the risk of micronutrient deficiencies, are widespread, and when a suitable food vehicle that is consumed by the majority of population can be effectively fortified.<sup>1</sup> Mandatory fortification requires considerable government will, advocacy, and leadership to create the necessary legislation and monitoring system.

### Current status of mandatory fortification

Five low- and middle-income countries have mandatory rice fortification, but only three countries have successfully implemented programs so far, as rice fortification is still rather new (**Table 1**). Costa Rica has the most successful mandatory rice fortification program, with 100% of rice fortified. The country also mandates fortification of other staple foods, such as wheat and maize flours, milk, and oil, so the population's improvements in nutrient status are difficult to attribute specifically to rice fortification. Papua New Guinea has also been successful

**TABLE 1:** Status of rice mandatory fortification, by country.

Country	Legislation year	Rice source, fortified kernel source & milling industry	75–149 g/d
Costa Rica	2001	40% imported; 2 domestic fortified kernel producers; 11 mills	100% fortified
Nicaragua	2009	80% rice domestically grown; 40+ mills, many small	Limited implementation
Panama	2009	40% rice imported; initial plan for government to pay for kernels	Not being implemented yet
Papua New Guinea	2007	All rice imported; fortified with imported kernels or in country of origin	At least 80% fortified (market share of largest importer)
Philippines	2001	13% imported; ~11,000 mills. Fortified kernels imported plus 3 domestic producers. SSN rice	1–2% total rice fortified 2006–2013. Currently <1%

in implementing a mandatory rice fortification program. The country's success is facilitated by the fact that almost all rice is imported rather than domestically grown. Moreover, the rice is imported by a small number of rice importers, the largest of which (with an estimated 80% market share) fortifies all its rice. Other importers in the country are believed to be fortifying at least some of their rice. The United States is the third country with mandatory rice fortification legislation. Federal legislation requires that rice must be fortified if it is produced in, goes to, or passes through, a state with mandatory legislation. Six of the US's 50 states have mandatory legislation, and have effectively leveraged their legislation so that an estimated 70% of the US rice supply is fortified.

The other three countries with mandatory fortification have struggled to operationalize and enforce rice fortification. The Philippines passed mandatory legislation in 2001 and has undertaken significant planning and investment for rice fortification, yet less than 1% of total rice is currently fortified. Initially the government put in place a work plan that projected implementation in phases, with the largest mills fortifying first. The National Food Authority (NFA), which implements a large social safety net program of subsidized rice, then conducted efficacy, effectiveness and acceptability trials of fortified rice, and purchased blenders and fortified kernels to fortify their rice at NFA warehouses. Multiple sub-national governments passed local ordinances requiring all rice to be fortified. However, despite these efforts, the private sector never started rice fortification on a large scale, primarily due to a fragmented milling industry landscape and the low fortification capacity of the thousands of small millers. There are also additional problems of technology constraints, the complexity of the supply chain for fortified kernels, and geographic logistical challenges. At this time, even the NFA rice is not being fortified, due to problems with logistics, finances and consumer uptake. As a result of these challenges, the government has not actively tried to enforce universal rice fortification.

Similarly, the governments of Nicaragua and Panama are not actively enforcing their rice fortification legislation. Again, these

countries are also hampered by the high fragmentation of the rice milling industry and low industry capacity for fortification.

#### **Lessons learned from mandatory fortification** Mandatory fortification provides the greatest opportunity for large-scale, sustainable public health impact

Although there are few mandatory rice fortification programs being implemented today, extrapolating from rice fortification efficacy studies and lessons learned from other staple food fortification (e.g., wheat flour) and condiments (e.g., salt) there is every reason to believe mandatory rice fortification would be an effective and cost-effective strategy to improve micronutrient intake. For more information, please refer to the case study on Costa Rica, in the contribution by Tacsan et al (p. 212).

#### **Political will is necessary to establish mandatory fortification**

Political will and commitment are required to pass national legislation requiring the addition of specific micronutrients to the identified food, and to set national standards. Thereafter, continued political will and government capacity are necessary to implement regulatory monitoring systems for effective enforcement of the legislation and standards.

#### **As with all mandatory food fortification programs, mandatory rice fortification programs are only effective when enforcement is in place**

Comprehensive legislation and strong enforcement create an enabling environment to ensure a sustainable and cost-effective supply of fortified rice. Legislation, once passed, must be enforced. However, generating sufficient political will, manpower, and resources to effectively enforce the legislation has been challenging in half of the countries with mandatory rice fortification legislation. Enforcement and regulation function to level the playing field and provide the private sector with the assurance that their competitors will incur the same costs. These measures also ensure the fortification of the entire rice supply.

### **Mandatory fortification, including mandatory rice fortification, has minimal impact on consumer pricing**

When fortified rice is mandated, consumers do not need to choose between fortified and non-fortified rice, as all the rice on the market will be fortified. Therefore, consumers do not have to change their buying habits and will not have to pay a premium price for fortified brands. In this scenario, rice millers will most probably pass on the additional costs of fortification to consumers. These costs are likely to be minimal, and will be shared across all the rice available in the market. In fact the average consumer may not notice the increased cost. In some contexts the government may choose to pay for the cost of fortification, or millers may choose to not pass on fortification costs to consumers.

### **The degree of industry consolidation, size, and modernization contributes to the success of rice fortification**

In many rice-producing countries, rice milling has traditionally been done on a very small scale, such as one mill per village. Today, the global industry is slowly modernizing and consolidating. As demonstrated by Costa Rica, a consolidated manufacturing base facilitates the achievement of universal rice fortification. In the Philippines, the fragmented milling structure has been a significant constraint to the implementation of mandatory rice fortification legislation.

### **Industry investment is necessary to develop domestic capacity for fortified kernel production**

The volume of fortified kernels required to fortify a country's rice supply is considerable. Therefore, the associated transport costs of importing fortified kernels can be prohibitive. Private companies will only invest in the manufacturing facilities for fortified kernels if they are confident that national governments will enforce the legislation and that millers will comply with it. Alternatively, fortified kernel producers outside the country will only significantly increase their production capacity and be in a position to sell their products at rates that compensate for transport costs if they believe that there will be a sustained market for their fortified kernels. Millers also need to make investments in feeder and blending equipment and to purchase fortified kernels. Prior to developing domestic capacity for kernel production, players in the supply chain will need to evaluate the government's political will, manpower, and resources before committing their own resources.

### **Marketing, including communication for behavior change, is not necessary to influence purchasing decisions when rice fortification is mandatory**

When mandatory legislation is in place and enforced, marketing and communication costs are minimal. It remains impor-

tant to inform consumers that their rice is now fortified and to provide labelling that indicates the type and level of the additional nutrient content. There is no need, however, for either rice producers or the government to undertake costly marketing or other communication activities to encourage people to purchase fortified rice.

### **Delivery Option 2: Voluntary fortification**

Fortification is voluntary when the private food industry has an option whether or not to fortify products. Voluntary fortification is a business-oriented approach, with fortified food products marketed as "value-added" products, often targeted at higher-income consumers. If millers perceive a current, potential or emerging demand for fortified rice, they may choose to develop a fortified brand to increase sales or profits. The potential for influencing a population's micronutrient health through voluntary rice fortification will be low. This is due to the uncertainty of industry uptake and consumer demand. Impact will also be limited as lower socioeconomic groups, who are most in need of fortification, are the most unlikely to purchase fortified brands due to their higher cost. Consumer aversion to changing rice preparation, cooking and eating habits, and product unavailability in typical channels, such as bulk sales, also limits the potential impact of voluntary fortification. Additionally, there is no evidence that voluntary fortification leads to mandatory fortification.

### **Status of voluntary fortification**

Four countries have large-scale voluntary rice fortification programs, in addition to numerous other small-scale fortification efforts throughout the world. Columbia has a relatively consolidated rice industry; seven millers fortify rice and produce about 50% of the market supply. Unfortunately, Columbian millers use a coating fortification technology that is vulnerable to nutrient loss after preparation and cooking. This reduces the public health benefit. This ineffectual fortification method demonstrates that the lack of national standards is the key weakness of voluntary fortification. In Brazil and South Africa, where implementation has not been achieved at large scale (only an estimated 1–4% of rice is fortified), the rice millers are fragmented, and consumer awareness and motivation to purchase the premium-priced rice brands is low. The current status of implementation in the Dominican Republic is not known.

### **Lessons learned regarding voluntary rice fortification**

#### **Difficult to achieve broad public health impact**

Voluntary rice fortification has not achieved high and sustained coverage of the total rice supply, except in unique situations, such as in Columbia, where industry consolidation facilitated agree-

ment between millers to fortify. Without much coverage of the fortified product, in particular among the most poor and vulnerable populations, the health benefits will be limited.

#### **Standards are necessary, even in voluntary fortification**

Voluntary rice fortification also requires appropriate standards for rice fortification. As evidence from Columbia demonstrates, the benefits of convincing millers to voluntarily fortify were offset by ineffective fortification standards. The lack of effective voluntary standards in Colombia has enabled rice producers to market fortified rice that is unlikely to provide nutritional benefit.

#### **Government regulations and enforcement are still necessary in a voluntary system**

Although the private sector determines whether to fortify, governments still have a significant role to play in setting standards and regulations for fortification. In the context of voluntary fortification, governments also have to undertake compliance monitoring and enforcement so as to ensure that fortified products meet national standards, that they are safe and correctly labeled, and that unsubstantiated health claims are not made.

#### **Fortified rice brands are likely to be more expensive**

Millers will typically raise retail prices to cover the increased costs of manufacturing and marketing fortified brands. If the fortified rice brands are being sold as value-added products, the price increase may be in excess of production and marketing costs, as producers will often position the fortified rice as a luxury product.

#### **Increased marketing (i.e., advertising, promotion, and packaging) is needed to promote the benefits of the fortification and the premium pricing**

Contrary to popular belief, marketing and social mobilization campaigns aimed at encouraging consumers to purchase fortified foods, including fortified rice, have failed to convince large segments of the population to choose fortified products. However, with voluntary fortification, consumers are offered a choice of value-added, higher-priced fortified rice or lower-priced, unfortified rice at the point of sale. Therefore, in order to increase sales of fortified products, there is no other choice than for rice producers or governments to undertake and maintain marketing and social mobilization campaigns.

### **Delivery Option 3:**

#### **Fortification of rice distributed through social safety nets**

Targeted rice fortification can be achieved by fortifying rice distributed through social safety nets, such as school feeding

programs, distributions to the poor or to vulnerable groups, food for work programs, and food aid during emergency situations. Fortifying rice distributed in social safety net programs reaches the most vulnerable populations, and thus has the potential to make a significant impact on public health. The fortification of rice distributed through social safety nets can be implemented in parallel with mandatory or voluntary fortification. It can also function as a catalyst for mandatory fortification.

#### **Status of fortification of social safety net rice**

Five countries currently distribute fortified rice through social safety net programs, which are primarily implemented by governments with funding from governments or donors. The most successful of these is the inclusion of fortified rice in the Bangladesh Government's Vulnerable Group Feeding/Development program.

On a smaller scale, in Odisha state in India, the UN World Food Programme (WFP) is supporting the distribution of fortified rice with Indian-made fortified kernels blended into the non-fortified rice at the district level through the platform of the government's school feeding program. Based on the findings of the ongoing evaluation, the State government will explore expansion through the entire state's school feeding program.

In Indonesia, the RASKIN subsidized rice program for the poor implemented a pilot program to fortify rice distributed in a limited area. Efficacy and effectiveness studies of the impact of the distributed fortified rice have been commissioned. Depending on the results, fortification may be scaled up to all RASKIN distributed rice. Ultimately, the potential impact of fortification of RASKIN rice will depend on how well the social safety net itself is functioning. It has been reported that both suboptimal beneficiary targeting and social stigmatization resulting from the use of low-quality rice has limited effectiveness of the RASKIN program. In addition, before the pilot can be expanded, logistical challenges – such as the development of sufficient domestic capacity to produce fortified kernels and cost-effective opportunities to blend the fortified kernels with the non-fortified rice – require resolution.

In the Philippines, the National Food Authority (NFA) has enjoyed only limited success at fortifying subsidized rice. Budget constraints have limited production quantities and beneficiary coverage. In addition, the NFA purchased colored fortified kernels in order to differentiate the subsidized rice from private-market rice. As a result of this differentiation, the colored kernels have reduced the acceptability of the fortified rice among some consumers. NFA is now considering resuming fortification with non-colored kernels, assuming that funding can be secured.

### **Lessons learned from fortification of rice distributed through social safety nets**

**Social safety net programs that include rice distribution offer a good opportunity to target fortified rice to those most in need**

In situations where mandatory fortification is not possible, social safety nets may be the only delivery option for fortified rice that will achieve a public health impact. However, the public health impact will be limited to the beneficiaries of the social safety net.

### **Fortification of rice distributed through social safety nets can act as a catalyst for mandatory fortification**

Fortification of rice in social safety nets establishes supply chains for fortified kernels and capacity for the production of fortified rice. It also provides opportunities to establish the effectiveness and acceptability of fortified rice among domestic consumers. Information on rice fortification and experience obtained through social safety net programs can increase government commitment to mandatory rice fortification.

### **Enforcement and regulation**

The fortification of rice distributed through social safety net programs is unlikely to require national legislation, but it will require the social safety net implementer to make a policy decision and to establish or adopt a standard for fortified rice supplied in the social safety nets.

### **The social safety net implementer typically bears the cost of fortification**

Social safety nets are often funded and implemented by the government, philanthropic organizations, or the private sector as part of their Corporate Social Responsibility activities. Rice millers and manufacturers will be invited to bid to supply the program. These private sector agents will have a guaranteed market with low risk, at a price that usually covers their increased manufacturing costs for a defined period of time. As the social safety net implementer is bearing the cost of fortification, the consumer will not be subject to a price increase.

### **Fortification costs may be substantial**

Although the fortification manufacturing cost will be a small percentage of the price of the program, compared to the costs of procurement and distribution, the initial capital costs and reoccurring costs may still be considerable. For example, the Philippines' NFA spent over US\$1.5 million on blenders and imported fortified kernels but was only able to fortify an average of 15% of the rice distributed by the program between 2006 and 2013 (an average of 160,000 metric tons per year). By contrast, in mandatory fortification programs the cost of fortification is

shared by all consumers and possibly millers, in social safety net programs the cost of fortification is often borne by the program funder.

### **Logistical issues may impede implementation**

Several of the social safety net programs have experienced logistical difficulties, such as sourcing the rice for distribution, contracting millers to blend, and sourcing fortified kernels. Challenges also exist in the implementation of the social safety net program itself, such as poor management and corruption, and ineffective and inefficient targeting. Finally, there may be consumer stigmatization as a result of participation in the program, which may be exacerbated by the use of poor-quality rice.

### **No marketing is needed for fortified rice in a social safety net**

The fortified rice is provided to the targeted population for free or at a subsidized price; the group targeted does not have a choice regarding the brand or type of rice supplied. However, as in all fortification programs, consumers should be informed that the rice is fortified so that they understand its benefits.

### **Considerations for choosing the optimal delivery option**

With the reliance on rice as a staple food throughout Asia and the high prevalence of micronutrient deficiencies in the region, rice should be considered as a major fortification vehicle. The impact will be maximized if high coverage of fortified rice can be achieved in those population groups with nutrient deficiencies. The choice of delivery option should be based on an analysis of the rice supply chain, an assessment of the feasibility of implementation in the given context, and identification of the target group.

Mandatory rice fortification offers the best opportunity to reach the majority of people in a cost-effective and sustainable way. However, mandatory fortification is only possible under certain conditions. Mapping the rice supply chain helps to assess the feasibility of mandatory rice fortification and should include an assessment of the proportion of rice that is milled in mills with fortification capacity, the extent of milling consolidation, the availability of warehouses where it might be fortified, and the most sustainable and cost-effective sources of fortified kernels. If the analysis suggests mandatory rice fortification is feasible, information on the rice supply chain should be used to plan implementation.

Depending on the manufacturing and regulatory landscapes, voluntary fortification rarely achieves high population coverage, and is unlikely to achieve a public health impact for the most vulnerable. Therefore, in places where mandatory rice fortification is not feasible, social safety nets that distribute rice



A child eating his lunch at school, Colombia

offer a good opportunity for reaching the most vulnerable. Planners must analyze the feasibility of integrating fortification into the rice procurement, processing, and distribution process of the social safety net program and estimate funding and quality assurance monitoring requirements. The efficacy and effectiveness of the fortified rice is dependent on how well the social safety net functions.

### Conclusions

Mandatory rice fortification offers the best means of achieving high coverage of a population, and hence a public health benefit. Past experience shows that voluntary rice fortification has only achieved high coverage in unique circumstances, such as in Colombia, where industry consolidation facilitated agreement between millers. Social safety net programs that distribute rice are an excellent way of reaching vulnerable groups with fortified rice, and they provide valuable manufacturing and distribution experience. Importantly, assessment of the feasibility of implementation is necessary for both mandatory and social safety net delivery options. A rice landscape analysis will provide essential information to assess feasibility.

### References

1. Allen L, de Benoist B, Dary O et al, eds. Guidelines on food fortification with micronutrients. Geneva: World Health Organization/Food and Agriculture Organization, 2006.