

# Food Availability and Consumption

## Africa Integrated Rice Fortification

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### Introduction

Effective and sustained food fortification programs contribute to improving micronutrient status of vulnerable populations when the fortified foods are consumed regularly and the levels of micronutrients added to those foods are based on the estimated average daily per capita intakes of the foods. The adequately fortified food must be consumed consistently by the vast proportion (est. >80%) of the population. Therefore, up-to-date data on intakes of the target foods to be fortified are essential for setting national fortification standards. In sub-Saharan Africa the diets of vulnerable populations are usually monotonous. Most cereal milling processes remove much of the intrinsic micronutrients. These should be restored and increased proportionately; the addition of extra vitamins and minerals will help to improve micronutrient intakes and status.

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It is important to enhance the micronutrient value of widely consumed cereal-based staple foods such as wheat and maize

flours and rice to sustainably address micronutrient deficiencies in Africa. This paper seeks to provide an estimate of the availability and consumption of diverse food vehicles in Africa. There is a particular focus on rice as one of the key food vehicles for fortification with vitamins and minerals. The paper looks at subregional disparities in the availability and consumption of food as well as variations in per capita consumption in order to assist in aligning recommendations on rice fortification in Africa with recent WHO guidelines.<sup>1</sup>

### Outlook for internally- and externally-sourced rice for consumption as a staple

The consumption of rice has been increasing significantly in Africa and has overtaken the consumption of major local cereals such as maize, sorghum and millet. In 2017 estimates from the Food and Agriculture Organization of the UN (FAO) for rice production in Africa exceeded the previous 2016 all-time high by 1% to reach 31.1 million tons (20.3 million tons milled basis).<sup>2</sup> This level was estimated to be sufficient to keep global per capita consumption largely steady at an estimated 54.3 kg per person per year. The FAO forecast for world rice inventories at the end of the 2017 and 2018 marketing seasons points to global reserves modestly increasing by half a percentage point year on year to reach 170.8 million metric tons.<sup>3</sup> In terms of imports, Africa witnessed an estimated 16 million tons of rice delivered in 2017, with the forecast easing slightly in 2018 to 15.6 million tons.<sup>4</sup> The increasing growth in demand for rice would continue to imply imports are outstripping local production gains. Burkina Faso, Cameroon, Guinea-Bissau, Mauritania, Niger and South Africa will all increase rice imports in 2018.<sup>5</sup> However, the rice sector in West Africa remains at the center of expansion through government and private-sector-supported initiatives. For West Africa, a yield turnover of 16 million tons (10.2 million tons milled basis) was projected in 2017, an increase of more than 4% over 2016 figures. Nigeria remains the lead producer and also importer of rice in West Africa, with 3.2 million tons estimated milled basis for 2017 – 6% over the yield for 2016. Marketing year estimates for 2018–2019 total imports for some key countries in the region – Burkina Faso, Guinea, Mali, and

Senegal – are expected to increase by approximately 14.5% to reach 3.375 million tons. Overall imports for 2017 stood at 14.5 million tons for the region – a 4% increase over 2016 estimates. Côte d'Ivoire, The Gambia, Liberia, Mauritania, Senegal and Togo all increased imports of rice to meet consumption needs.<sup>6</sup>

### Potential effect of fortified rice consumption in Africa, in particular West Africa, relative to other foods

The following steps are recommended to implement an effective and sustainable mass food fortification program:

1. Define the target population(s)
2. Assess the intake and status of critical micronutrients and intake of potential food vehicles in the target population
3. Select the food vehicle(s)
4. Select the fortification compound
5. Determine the level of fortification
6. Establish the regulatory parameters
7. Estimate costs and establish financial/technical support
8. Develop a monitoring and evaluation plan

One of the key tools for measuring the frequency and adequacy of consumption as well as the feasibility of fortifying a potential food vehicle is the fortification rapid assessment tool (FRAT).<sup>7</sup> Dietary intake should be estimated as closely as possible for potential per capita consumption.<sup>8</sup>

FRAT serves as a pragmatic tool for confirming that the food vehicle is being consumed and to estimate the amounts and likely population coverage, and for determining the levels of micronutrient to be provided through fortification of the food.<sup>9</sup> Rice has not been a key food vehicle included in most FRAT surveys conducted in Africa, so this study used estimated per capita data from FAO statistics.<sup>10</sup> The present analysis only tracked the potential

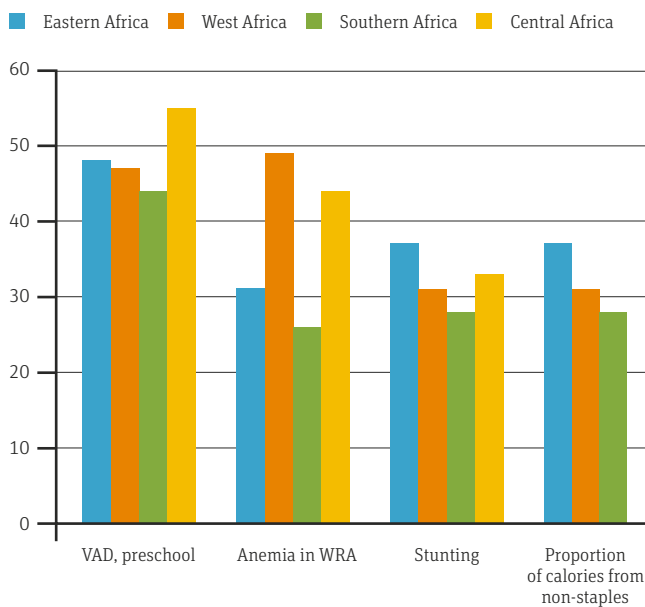
annual per capita consumption profile for rice and other foods using data from FAO. It made comparisons among different sub-regions and the potential contribution of rice fortification to improving micronutrient nutrition. However, future FRAT surveys should include rice and assist with establishing more refined per capita consumption profiles for planning rice fortification initiatives within specific contexts. This would complement previous FRAT surveys reviewed by Hess et al (2013) for 11 countries in Africa.<sup>11</sup> The median amount of wheat flour consumed, for example, ranged from 49 to 108 g/d among consumers in eight countries. The lowest amounts were reported in rural strata in Burkina Faso (21–53 g/d).<sup>11</sup> The data on wheat flour consumption correlated positively with data from FAO food balance sheets which enabled the establishment of adequate consumption ranges based on WHO guidelines and recommendations<sup>12</sup> for developing harmonized standards on wheat flour fortification for West Africa. Similar comparative analysis could therefore guide the development of fortification standards for rice fortification in the West Africa region. The Global Alliance for Improved Nutrition (GAIN) and the Food Fortification Initiative (FFI) in 2016 identified 12 countries, largely in West Africa, with the highest opportunity for their populations to benefit from rice fortification in Africa. Seven of these countries could have their urban populations benefiting more than their rural counterparts. This is largely due to high imports of rice to these countries compared to largely subsistent local production and consumption in rural areas.<sup>13</sup>

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**TABLE 1:** Rice consumption per person per day (g) and the proportion (%) of industrially milled local rice produced in West African countries<sup>17,18</sup>

Country	Rice consumption per person per day (grams)	Percentage of industrially milled local rice produced
Benin	146	< 20
Cape Verde	134	0 (all imported)
Côte d'Ivoire	175	< 20
The Gambia	169	0
Ghana	88	30
Guinea	266	0
Guinea-Bissau	269	0
Liberia	94.8	1
Mali	156	40
Nigeria	77	40
Senegal	144	40
Sierra Leone	283	7

**FIGURE 1:** The prevalence of vitamin A deficiency and stunting in children under five, anemia in women of reproductive age, and proportion of calories from non-staples by subregion in sub-Saharan Africa (GNR 2017)<sup>20</sup>



The data from FAOSTAT, when graphically plotted for various subregions of sub-Saharan Africa, indicate that the per capita food supply of milled rice equivalent was highest for West Africa and increased from an estimated 30 kg/capita/year to close to 40 kg/capita/year from 1998 to 2012, while for all other regions of Africa (Southern, Central and Eastern Africa) the increase narrowly moved from about 10 kg/capita/year to about 15 kg/capita/year. A similar trend was observed for the share of kilocalories from rice in the per capita food supply. West Africa registered significantly higher values than the other subregions, at 300 kcal/capita/day in 1998, which rose to nearly 400 kcal/capita/day in 2012. In the other subregions, the per capita daily calorie intake of available rice is estimated to be between 100 and 150 kcal/capita/day over the same time frame (Table 1). Rice fortification could therefore be more promising in addressing micronutrient deficiencies in West Africa than in any other subregion of sub-Saharan Africa.<sup>14,15</sup> However, significant barriers to rice fortification in West Africa include “protective national rice self-sufficiency policies and unofficial trade across porous land borders, which counterbalance these opportunities. Moving forward with rice fortification in West Africa will depend on successful navigation of politically sensitive policies, and opportunities to use food distribution programs as part of social protection programs, supported by effective regulatory monitoring.”<sup>16</sup>

### Consumption of other foods and relative proportions of calories from non-staples

The 2017 Global Nutrition Report estimates that among the four

subregions of sub-Saharan Africa, Southern Africa has the highest proportion of calorie consumption from non-staple foods and apparently has the lowest prevalence of micronutrient deficiencies as well as the lowest prevalence of vitamin A deficiency in preschool children and of anemia in women of reproductive age. Southern Africa also has the lowest prevalence of stunting and has been registering higher levels of overweight, obesity and diet-related noncommunicable diseases due to the effects of changing diets and lifestyles, particularly in the growing middle-income class. West Africa relative to Eastern Africa also has lower stunting prevalence. However, all subregions have vitamin A deficiency prevalence above 40% in preschool children, with Central Africa having over 50% prevalence. Anemia in women of reproductive age remains a public health concern, in particular for Eastern, Central and West Africa.<sup>19</sup>

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Looking at Figure 1, Southern Africa, which has the highest proportion of calorie from non-staples, has the lowest rates of vitamin A deficiency, anemia and stunting. Dietary diversification is therefore key for improving micronutrient and overall nutrition outcomes even where food fortification exists. There is evidence of positive correlation between the level of diversity of food groups in a diet and the increase in the micronutrient profile of that diet. Data from FAOSTAT indicate that the food supply per capita for meat is highest in Southern Africa (40 to 50 kg/capita/year from 1998 to 2012), followed by Central Africa and the rest, which are all below 25 kg/capita/year as of 2012.<sup>21</sup> Eastern and West Africa, however, lead in the consumption of fish and seafood as food supply per capita, with all subregions consuming below 15 kg/capita/year of fish and seafood.<sup>22</sup> Africa also consumes relatively low quantities of pulses and other products – less than 12 kg/capita/year over the past decade.<sup>23</sup> The consumption of fruit excluding wine remains relatively low, with Central Africa leading other subregions at an estimated annual per capita consumption level of around 80 kg. Actual fruit consumption is, however, highest in West Africa and is declining to below 15 kg/capita/year, and is lowest in Central Africa.<sup>24,25</sup> The consumption of vegetables (prepared, in preservatives, dehydrated, canned, fresh or dried) is relatively high in Eastern and West Africa at 45 kg/capita/year and around 38 kg/capita/year respectively in the last decade.<sup>26</sup> West Africa also consumes higher amounts of wheat products compared to

other subregions, with an estimated 58 kg/capita/year – almost double those of other subregions which are estimated at below 30 kg/capita/year.<sup>27</sup> In comparison, Southern Africa consumes more maize products, as much as 100 kg/capita/year, followed by Eastern Africa, estimated at around 60 kg/capita/year.<sup>28</sup> Maize flour fortification could therefore have a more significant impact in Southern and Eastern Africa compared to West Africa, where rice remains the predominant cereal consumed by the populace. The annual per capita consumption of vegetable oils, one of the key food vehicles fortified under mandatory regulations in West Africa, remains quite low in all regions, with West and Southern Africa leading at above 10 kg while the other two sub-regions – Central and Eastern Africa – consume below this estimated figure.<sup>29</sup>

Five Fortification Assessment Coverage Toolkit (FACT) surveys have been conducted in West Africa. The results of the FACT surveys varied widely from country to country. Overall, the results showed that improvements are required for each national fortification program to increase coverage and quality. Only Senegal achieved ≥50% coverage for the consumption of fortified wheat flour nationwide, at 51.2%.<sup>30</sup> For edible oil, only Côte d'Ivoire has achieved ≥50% for consumption of fortified oil.<sup>31</sup> In addition, the FACT surveys in Burkina Faso and Ebonyi and Sokoto, Nigeria, revealed that there is scope to expand fortification to new vehicles including rice. In Burkina Faso, the results revealed that rice, tomato paste and bouillon cubes are widely available across all regions of the country, although over 90% of the available brands are imported.

### Conclusion and recommendation

Unlike maize and other cereals, rice remains a very important food commodity consumed largely in West Africa with close to 400 kcal per capita per day consumed by the population in the subregion and an annual per capita food supply as milled rice equivalent of 40 kg/capita/year. Rice fortification coupled with nutrition education and other complementary micronutrient interventions could significantly contribute to addressing deficiencies in essential vitamins and minerals in West Africa and other subregions of sub-Saharan Africa. Sound food consumption data and estimates on per capita consumption are essential for planning the addition of micronutrients to fortified food vehicles.

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The estimates provided in this article are equivalent available quantities. However, actual levels should be estimated through food frequency surveys for various geographic regions, socioeconomic and demographic groupings within specific contexts prior to embarking on rice fortification programs. Rice is consumed in various forms, with multiple accompaniments, including soups and stews. West Africa has mandatory fortification of wheat flour and vegetable oil across 15 countries. Countries have the capacity to increase local rice production and processing prior to fortification, but currently Mali is the only country that has piloted fortifying rice in West Africa, and is the first in Africa. Rice is an ideal food vehicle for fortification due to its wide consumption, reach, coverage, acceptability and palatability. Rice fortification should therefore be advanced in West Africa with access and availability for consumption by all segments of the population irrespective of geographic, cultural, or socioeconomic situation. The coordinated and integrated implementation of rice fortification along with other food vehicles, as well as complementary nutrition interventions, will significantly contribute to improving nutrition outcomes and help address micronutrient deficiencies in Africa. Governments and policymakers should therefore be assisted in forging public-private partnerships to scale up rice fortification in Africa.

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