

Golden Rice for Public Health

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Global mortality (millions)	2010 ^a	2014 ^a	2016/2017
Vitamin A deficiency	1.9–2.8	1.4–2.1	1.3–1.9 (2016) ^b
HIV/AIDS	1.8	1.2	0.94 (2017) ^c
Tuberculosis (TB)	1.4	1.1	1.6 (2017) ^d
Malaria	0.7	0.6	0.45 (2016) ^e

Ebola: 2,287 (<https://www.who.int/emergencies/diseases/ebola/drc-2019>)

Covid-19: 555,000 (https://en.wikipedia.org/wiki/Template:COVID-19_pandemic_data)

Annual mortality from different public health diseases (VAD deaths exclude significant maternal mortality).

VAD is the most significant killer, and it is preventable.

Vitamin A deficiency (VAD) is caused by insufficient dietary diversity; often driven by poverty.

VAD is the leading cause of childhood blindness.

A source of vitamin A reduces child mortality by 23 – 34%: up to 76% for measles.

The carotenoids in Golden Rice are a source of vitamin A.

Amount of β -carotene in Golden Rice $\mu\text{g/g}$	Rice consumption per day (g of dry rice before cooking)	Percentage of EAR provided
β-carotene to circulating retinol bioconversion rate: 2.1:1 (e.g. children)		To a child^a
4.0	40	36%
4.0	100	91%
6.0	40	54%
6.0	100	136%
11.2	40	102%
11.2	100	254%
β-carotene to circulating retinol bioconversion rate: 3.8:1 (e.g. adults)		To an adult
4.0	40	20%
4.0	100	50%
6.0	40	30%
6.0	100	75%
11.2	40	56%
11.2	100	140%

^aFor 1- to 3-year-old child, 100% of EAR is 210 μg RAE/day. An EAR that does not ensure adequate stores but is enough for normal dark adaptation is set at 112 μg ~50% EAR [46]



Table 2.

The potential for Golden Rice to deliver the estimate average requirement of β -carotene, as a source of vitamin A, to 1–3-year-old children and adults.

EAR = Estimated Average Requirement
RAE = Retinol Activity Units

As a Genetically Engineered ('GE') crop Golden Rice has to meet many regulatory requirements re safety to humans, animals and the environment.

(GE because 2 genes of interest added once in ~2004)

Golden Rice was approved for feed and/or food use in Australia, Canada, New Zealand, and the US in 2018, and in the Philippines in December 2019

Philippine Rice Research Institute completed, in September 2019, the final field trials needed to make an application for commercial propagation

Next steps:

- Securing the certificate of completion from the Dept. of Agriculture, Bureau of Plant Industry (BPPI) (in process)
- Submission and review of the **application for commercial propagation**

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The Bangladesh Rice Research Institute (BRRI) submitted its application for cultivation approval, including food use, at the end of November 2017

- Since then, the National Committee on Biosafety (NCB) under the Ministry of Environment, Forest, and Climate Change, and its technical core committee, have only met very infrequently
- BRRI has fully responded to any and all questions raised to date
- The lack of a truly operational regulatory system and the absence of a predictable process for NCB meetings is a major impediment to progress