"Golden Rice" – GM Vitamin A Rice

Golden Rice is the name of a rice that has been genetically engineered (genetically modified or GM) to produce beta-carotene, which the body can convert into vitamin A. This beta-carotene gives the rice grains the yellowish colour that inspired its name. Golden Rice is being developed by the International Rice Research Institute (IRRI), a research and educational organization based in the Philippines, along with various national partners in other countries.

IRRI and other proponents of Golden Rice claim that it will be an important intervention to address vitamin A deficiency, or VAD, which is a serious problem in communities facing **malnutrition and food insecurity**. Its impacts are particularly severe for children and, if not dealt with, can lead to blindness, and in severe cases, death. However, VAD can be better addressed through long-term approaches that ensure people have access to diverse diets, along with immediate measures such as food fortification and supplementation.

Golden Rice is unnecessary and does not address the real problem.

Golden Rice is not the solution. Vitamin A deficiency is a symptom of hunger and malnutrition, which is caused by poverty and inequality. The real solution lies in approaches that give people access to diverse and healthy diets with vitamin-A rich foods, and the means to grow them.

Golden Rice is not ready. Golden Rice does not yet work as promised. It is not ready for farmers to grow or for people to eat; its beta-carotene levels are not as high as in several other foods and degrade significantly during storage and cooking; and we still do not know whether it helps fight VAD.

Golden Rice is designed for use in the Philippines and Bangladesh. The Government of the Philippines approved Golden Rice as safe to eat in December 2019, following similar approvals in four countries that will not be producing or consuming it: Canada, the US, Australia and New Zealand. **No country has yet assessed its potential to combat VAD**, or approved the rice for cultivation. There is no GM rice on the market anywhere in the world.

1. GOLDEN RICE HAS LOW AND VARIABLE LEVELS OF BETA-CAROTENE

The levels of beta-carotene documented in Golden Rice are still low and variable. Based on the beta-carotene levels of Golden Rice that IRRI reported in their regulatory submissions, and considering the current high rates of beta-carotene lost during cooking and storage as well as the highly variable conversion rate of beta-carotene to vitamin A, an adult woman would need to eat several kilograms of Golden Rice a day in order to get her required daily amount of vitamin A – likely anywhere from 2 kilograms to over 20 kilograms, depending on how long the rice has been stored. In contrast, **half a cup of most green leafy vegetables is enough to meet the required daily amount of vitamin A for adults and children**.

2. GOLDEN RICE HAS NOT BEEN ADEQUATELY TESTED FOR BIOAVAILABILITY

We do not know if Golden Rice improves the vitamin A status of people suffering from VAD. **Vitamin A can only be absorbed by the body when it is consumed along with fat**. However, children and adults suffering from VAD often do not have access to fat in their diets. IRRI says: "After obtaining the necessary permits and approvals, an independent community nutrition study will be conducted to evaluate the efficacy of Golden Rice; in other words, whether or not it improves vitamin A status."

3. BETA-CAROTENE IN GOLDEN RICE DEGRADES RAPIDLY DURING STORAGE AND COOKING

When Golden Rice is stored and cooked, it could lose all, or almost all, of its beta-carotene. A 2019 study found that the beta-carotene in Golden Rice degrades over time. This is especially important because rice is commonly stored for long periods before it is consumed. Degradation levels were lower in rice stored at cooler temperatures and not exposed to air (vacuum packed). **After six months of being stored in common conditions and temperatures, the beta-carotene in Golden Rice degraded by 80-84%**. In addition, cooking degraded the beta-carotene by 17-24%.

4. GOLDEN RICE IS NOT YET READY FOR FARMERS TO GROW

Golden Rice has to be crossed with local rice varieties in order to be ready to grow. **Researchers are still working to develop Golden Rice varieties that have yield and other qualities that make them suitable for farmers in Asia**. A 2017 study by Indian researchers found that when the Golden Rice event GR2-R1 was crossed with a widely grown local variety, unintended yield loss and stunted growth resulted: the Golden Rice DNA disrupted genes in native rice, leading to the defects.

5. GOLDEN RICE HAS NOT BEEN ADEQUATELY TESTED FOR SAFETY

Health Canada, as well as regulators in the US and in Australia and New Zealand, have approved Golden Rice as safe to eat. However, the German non-profit organization Testbiotech says that there are insufficient grounds to conclude safety. **IRRI did not conduct any animal feeding studies** and, in fact, argues that there is no justification for conducting such studies to demonstrate safety. Testbiotech says that, "In the light of the humanitarian claims made in the context of the Golden Rice project, it is surprising that this application is not based on a full set of data to establish high safety standards and evidence of the actual benefits."

6. GOLDEN RICE POSES ENVIRONMENTAL RISKS

Proponents argue that because rice is largely self-pollinating, and its pollen does not remain viable for long, Golden Rice will not contaminate other rice varieties. However, studies in China have shown that gene flow can occur from GM rice to wild and weedy rice. This contamination could affect both wild rice populations and the rice seed supply, and **it would be very difficult – or impossible – to reverse such contamination**.

7. GOLDEN RICE IS EXPENSIVE AND UNNECESSARY

Millions, or perhaps billions, of dollars have been spent developing and promoting Golden Rice and yet it is not an effective solution to VAD and is not proven to work. IRRI says that "Golden Rice is intended to be used in combination with existing approaches to overcome VAD, including eating foods that are naturally high in vitamin A or beta-carotene, eating foods fortified with vitamin A, taking vitamin A supplements, and optimal breastfeeding practices." **However, these other solutions are proven, are already being used, and are much less costly to implement**.

"Promoting readily available, diverse and safe Vitamin A food sources from sustainable and ecological farming is the long term solution to combat malnutrition, ensure food security and health, not genetically modified crops like Golden Rice."

— Cris Panerio, MASIPAG, a farmers network in the Philippines that is also part of a pan-Asian network of more than 30 groups called the *Stop Golden Rice! Network*.

For references and further discussion, please see **www.cban.ca/GoldenRiceReport2019**

For more information and details: **www.cban.ca/goldenrice**

cban Canadian Biotechnology Action Network | cban.ca

The Canadian Biotechnology Action Network (CBAN) brings together 16 organizations to research, monitor and raise awareness about issues relating to genetic engineering in food and farming. CBAN members include farmer associations, environmental and social justice organizations, and regional coalitions of grassroots groups. CBAN is a project on Tides Canada's shared platform. **www.cban.ca**