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Indonesia, Malnutrition

## **Vitamin A Deficiencies in Indonesia**

Indonesia is a country that has a population of over 250 million people situated in Southeast Asia, and is made up of many islands. (“United Arab Emirates”). The current government of Indonesia is a democracy headed by president Joko Widodo. Thirty-one percent of the total land mass of Indonesia is cultivated, but farm sizes are about one one-hundredth of an average American farm (“Agricultural Land” ; “FAO.org”). Indonesia’s main crops include rice, corn, cassava, soybeans, peanuts, rubber, copra, palm kernels, palm oil, coffee, cocoa, and various spices (“International Rice”). They export coal briquettes, palm oil, petroleum gas, rubber, and crude petroleum. Their main imports are refined petroleum, crude petroleum, telephones, vehicle parts, and petroleum gas (“Indonesia”).

Indonesians typically live four people to a house, and housing varies depending on where you live (“Household Size and Comparison Around the World 2017). In rural parts of Indonesia, peoples’ homes have floors of either compacted dirt, raised wood, or concrete. Their walls are made of wooden frames surrounded by woven bamboo mats, and their roofs are dried palm leaves, tiles, or wood (Adam, Asvi Warman and Oliver W. Wolters). Urban area homes use more man-made materials than rural area homes; their floors are either tile or cement with walls of teak, brick, or plaster, and they have roofs of tile or shingles (Adam, asvi Warman and Oliver W. Wolters).

When it comes to jobs in Indonesia, about two-thirds of people are employed, which is about 122 million people. This number takes into account the 15.6 million people getting an education, and the 8 million people doing odd jobs. 62.9 million people are unemployed, while about 56 million people are of working age but are unemployed (Investments, Indonesia).

Education structure in Indonesia is similar to what the United States offers. Indonesia has Kindergartens, grade schools, and middle schools. The similarities stop there though, as high school is split up into university-bound and work-bound. The work-bound students begin attending a vocational school ([www.scholaro.com/pro/Countries/Indonesia/Education-System](http://www.scholaro.com/pro/Countries/Indonesia/Education-System)). The main problem with vocational school is that they are only located in urban areas, meaning that if you wanted to attend one you would have to relocate to an urban area that has one. Vocational schools are meant to get students ready for the workforce and are primarily funded by donations from countries and private training colleges. Tertiary school is for university-bound students who want to continue their education, and is split into four branches: polytechnics, academies, institutes, and universities ([www.scholaro.com/pro/Countries/Indonesia/Education-System](http://www.scholaro.com/pro/Countries/Indonesia/Education-System)).

Indonesia, while being a developing country, has a large and complex malnutrition problem when it comes to micronutrients. A few things factor into Indonesia’s malnutrition problems; one being their volatile and unpredictable climate, and the other is the lack of growable crops due to that climate. Indonesia can have varying rainfall and has an average relative humidity of seventy to ninety percent during their rainy season ([www.weatheronline.co.uk/reports/climate/Indonesia.htm](http://www.weatheronline.co.uk/reports/climate/Indonesia.htm)). This rainy season runs from April to November while the dry season runs from December to March. The western and northern parts of Indonesia see the most rain, and are directly affected by El Niño and La Niña ([www.weatheronline.co.uk/reports/climate/Indonesia.htm](http://www.weatheronline.co.uk/reports/climate/Indonesia.htm)).

The warm currents from El Niño drift back towards South America, causing the once-prevalent rains to stop. This causes forest fires and droughts; one forest fire in particular caused a heavy smog that surrounded Indonesia and was harmful to breath. One good thing about El Niño, despite all of the negatives surrounding it, is that it seems to happen only every two to seven years and comes around Christmas time, hence the name El Niño, which means Christ Child in Spanish (“El Niño and Indonesia”).

As a result of this unpredictable climate, the people of Indonesia are only able to grow and harvest certain crops. Their main food crop is white rice; the farmers then eat whatever they raise in terms of cattle and other crops alongside the rice. Rice is considered the main dish, and is served with a side of whatever meat or soup they have. The rice and side dishes are cooked by frying, with any spices being ground with pestle and mortar([www.vtaide.com/ASEAN/Indonesia/food.htm](http://www.vtaide.com/ASEAN/Indonesia/food.htm)). Where this becomes a problem is the fact that white rice typically is carbohydrate-dense and holds almost no other nutritional value, save for some minerals and a few vitamins. Another problem with white rice is that it promotes arthritis due to the high carbohydrate level. One of the minerals in white rice is iron, which helps decrease and prevent the anemia that is prevalent in women and children (Dubois, Sirah ; [apps.who.int/nutrition/landscape/report.aspx?iso=idn](http://apps.who.int/nutrition/landscape/report.aspx?iso=idn)).

Indonesian people currently grow only white rice, but brown rice has all of the same qualities of white rice and more. It has more magnesium and fiber, meaning that the rice will sustain people longer and help supplement the workers’ muscles. The main downfalls of brown rice is that it takes longer to cook, due to the fiber, and is chewier ([apps.who.int/nutrition/landscape/report.aspx?iso=idn](http://apps.who.int/nutrition/landscape/report.aspx?iso=idn)). Another option is wild rice, which is the only kind of rice that contains vitamin A and does not promote arthritis. In addition to this, wild rice also has the following benefits: more fiber, folic acid and omega-3 fatty acids. Again, like the brown rice, wild rice takes longer to cook, and has less minerals than the brown or white rice ([apps.who.int/nutrition/landscape/report.aspx?iso=idn](http://apps.who.int/nutrition/landscape/report.aspx?iso=idn)).

Due to the lack of diversity in their diets, Indonesians are at higher risks for micronutrient deficiency, particularly vitamin A. Vitamin A deficiency is a terrible disease that affects the eyes, especially in small children and pregnant women, and can lead to permanent blindness. It is caused by an issue with the GI tract in which the body cannot absorb enough, or a lack of it in someone’s diet. Either way, this disease causes structural and biophysical changes in the eye (Medico, Indian). Eighty-four percent of children ages five months to twenty-nine months require supplementation of vitamin A. Depending on their lack of the micronutrient, the child may require either does one or does two of the vitamin supplements. Dose one is for treating the beginning stages of vitamin A deficiency, while dose two is for the more progressed cases ([apps.who.int/nutrition/landscape/report.aspx?iso=idn](http://apps.who.int/nutrition/landscape/report.aspx?iso=idn)).

The first symptom of vitamin A deficiency is night blindness and dark ridges that appear on the white part of the eye. These ridges are visible when looking at the person’s eye, and are black or brown in color. As the disease progresses, the eyes can become dry and inflamed until the disease reaches its most devastating state (Medico, Indian). The eye then develops ulcers and Bitot’s spots that could cause the eye to become infected and result in removal. Bitot’s spots are hard white spots that are foamy and are filled with bacteria. The bacteria are what causes the foam, which is a byproduct of their metabolism and energy creation, and can proliferate uncontrollably to infect the eye completely (Medico, Indian).

The treatments for this disease include a variety of things depending on what stage a person is in. For the dry eyes, a doctor would prescribe artificial tears, whereas if you had the Bitot’s spots, you would be prescribed a round of antibiotics (Medico, Indian). The ultimate way to stop this disease is to stop the underlying condition. With both of these cases, supplementation would be necessary either in the form of altering the diet or prescribing a Vitamin A supplement. In Indonesia people are given the supplement more often than not due to the lack of variety in their diet (Medico, Indian).

Another part of this issue is the fact that people in Indonesia don't have the money to afford health care, let alone to get treated for their vitamin A deficiency. Per capita, the average person spends about three hundred dollars on healthcare in their entire lives, which amounts to about three percent of the country's total income ([www.who.int/countries/idn/en/](http://www.who.int/countries/idn/en/)). If more people had access to these supplements, it could reduce the prevalence of this disease by anywhere from twenty to thirty percent (Dijkhuizen, M.A. and Wieringa, Frank).

Along with their reduced income, healthcare is not readily available or reliable unless you are wealthy. Public healthcare hospitals do not have government-funded ambulances and are not equipped to take patients who need major surgeries or are in bad accidents (Allianz). Even the better-equipped private healthcare hospitals do not have government-funded ambulances, but are forced to buy and maintenance their own instead. If your wound is too serious, you may be brought to a different neighboring country entirely to get treated. On top of that, if you live in a rural community, chances are the medicine you will need will be the next rural town over or in an urban community (Allianz).

The fact that Indonesian health care is unevenly distributed is all the more reason to have people take care of themselves before these diseases can develop in an effort to save time and money. A solution is needed that would help prevent Vitamin A deficiency before it started, while also giving people an alternative income so that if something else occurred they can get treated. A way to help remedy this issue is to use aquaponics to provide people with a steady source of vitamins and minerals that are otherwise absent in their diets.

Aquaponics is the water and energy-conscious way of growing food, animals, and crops ([www.nal.usda.gov/afsic/aquaponics](http://www.nal.usda.gov/afsic/aquaponics)). In this method of farming, one would raise plants in a kind of mesh suspended over a tank of water that a school of fish live in. The fish would eat the tips of the roots of the plants, and the waste from the fish would supply the water with nutrients for the plants to take in along with the water. In addition to the fish, vampire crabs could be introduced and take the aquaponics tank to the next level. The crabs are extremely low maintenance and would even eat the bugs that tried to eat the plants, as well as add another layer of income to the people of the community (Biotopel). The Indonesian aquaponics tank would grow white, brown, and wild rice. These three types of rice give the people a variety of vitamins and minerals in their diet without having people to adjust their tastes or pallet to something new and foreign ([apps.who.int/nutrition/landscape/report.aspx?iso=idn](http://apps.who.int/nutrition/landscape/report.aspx?iso=idn)).

For the species of fish, I chose goldsilk seabreams. These fish are indigenous, ensuring that if the fish escape they will not be an invasive species and wipe out other native species (James, Nicola C et. al). These fish have many other benefits including: being good for recreational fishing, meat, "...marketplace acceptance...", economic value, are very resistant to disease, and are fast growing. Goldsilk seabreams are a good choice for captivity because they are adaptive to changes in water salinity, captivity, and temperature (Thompson, Shilts M et. al).

The Indonesians who raise these fish would need to do very little maintenance to grow the fish to raise them to sexual maturity. Once they get there, they can grow the next generation and raise them to maturity, and the people could then cull fish as the population grows so that there is not crowding in the tank (James, Nicola C et. al). With the following suggested tank size and ratios in mind, the tank could only hold about eleven fish at a time. After the fish are culled, they can be used as food or be sold to a local fish market for profits ([uponics.com/aquaponics-aquarium/](http://uponics.com/aquaponics-aquarium/)).

The following materials would be needed for the aquaponics tank: an oval stock tank that can hold 110 gallons, a plastic kiddie pool with a slide, some sand and mud, some coontail plants, coconut fibers, 11 baby goldsilk seabreams, a plastic liner for the tank, and a building for it to be placed in. The tank would

be set up with the liner in it and about half the sand placed in the bottom ([uponics.com/aquaponics-aquarium](http://uponics.com/aquaponics-aquarium) ; [aquaponics.com/aquaponics-information/build-a-mini-aquaponics-aquarium/](http://aquaponics.com/aquaponics-information/build-a-mini-aquaponics-aquarium/)). The kiddie pool would be cut in half, and the half with the slide on it would get the rest of the sand.

Once the pool had been filled with water, the coontails would be nestled into the bottom sand and the fish and crabs released. The coconut fiber would go on top and the rice seeds planted ([uponics.com/aquaponics-aquarium](http://uponics.com/aquaponics-aquarium) ; [aquaponics.com/aquaponics-information/build-a-mini-aquaponics-aquarium/](http://aquaponics.com/aquaponics-information/build-a-mini-aquaponics-aquarium/)). The kiddie pool would give the older crabs something to live on and hide in, while the coontails would oxygenate the water and give another food source for both fish and crabs ([aquaplant.tamu.edu/plant-identification/alphabet-index/coontail/](http://aquaplant.tamu.edu/plant-identification/alphabet-index/coontail/)). The crabs, although being on the pet trade market for a decade, had only just been discovered by science in the past two years, which means that in terms of scientific research, not a lot has been discovered ([news.nationalgeographic.com/2015/03/150316-vampire-crabs-animals-new-species-science-pets/](http://news.nationalgeographic.com/2015/03/150316-vampire-crabs-animals-new-species-science-pets/)). This could also secure funding by enticing scientists into the villages for a small fee in order to research the crabs.

The crabs would be raised with the intention of selling, not eating. The crabs are only a few inches in length and are very desirable in the pet trade because they are only found in Indonesian river valleys. The crabs would help benefit the aquaponics mini-ecosystem by: cleaning the tank, eating any leftover produce, and becoming a natural pesticide by eating any plant-harming insects (JamesPNgo et. al ; Biotope1).

To fund this project, the CDC has a program called the International Micronutrient Malnutrition Prevention and Control (IMMPaCt). This program helps eradicate deficiencies of iron, vitamin A, folate, and zinc in impoverished countries. They help by giving governments and people monitoring systems to track the progress of the malnutrition and treatments, as well as helping with food security and supplementation ([www.cdc.gov/nutrition/micronutrient-malnutrition/about/index.html](http://www.cdc.gov/nutrition/micronutrient-malnutrition/about/index.html)). IMMPaCt also changes policies and uses grains for home fortification to ensure the stability of the region in terms of vitamin A. Annually, they provide over 3 million dollars of funding and assistance in collaboration with the United Nations Children's Fund (UNICEF), World Health Organization (WHO), Food Fortification Initiative (FFI), U.S. Agency for International Development (USAID), and the Micronutrient Initiative (MI) to name a few ([www.cdc.gov/nutrition/micronutrient-malnutrition/about/index.html](http://www.cdc.gov/nutrition/micronutrient-malnutrition/about/index.html)).

In conclusion, Indonesia is a developing country that has some work to do. Its healthcare insurance and hospitals are dependent on income level, making it hard to receive necessary and adequate care. That being said, vitamin A deficiency is a serious disease that affects many people in Indonesia and is currently being treated by supplements alone. In an effort to conserve resources and money, aquaponics should be implemented as an alternative to supplementation, which would stop the disease at its dietary source. The aquaponic system would provide a variety of nutrients in the form of native fish and rice, as well as making farmers money in the long run. A combination of golden sebreams and different varieties of rice would provide the necessary vitamin A that could stop hundreds of micronutrient-deficient deaths each year in Indonesia.

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