

# Global Challenge: Duckweed in Tanzania

## *Introduction*

In Tanzania, a large part of the population suffers from malnutrition. Which is caused by, among other things, too little consumption of vegetable proteins. Due to uneducated farmers, water and land are not optimally used for the production of crops. Through educating farmers, repurposing agricultural land and growing the nutritional plant duckweed the huge malnourishment issue in Tanzania could be improved.

## *Country and family*

Tanzania, officially the United Republic of Tanzania, is an independent country in East-Africa endowed with important land and water resources that has a high agricultural potential. The capital of Tanzania is Dodoma, but the largest city is Dar es Salaam. Within the republic, Zanzibar has a semi-autonomous status. The average number of children in a Tanzanian family is five. In many rural areas of Tanzania, tribal customs advocate a gender division of labor in these families: women and girls take care of the household chores, small children, and livestock, and plant and weed the agricultural fields. Men prepare land for cultivation, care for large livestock, market produce, and make the important financial and political decisions for the family. As girls and women throughout the country have gained access to more formal education, however, they are challenging the customary division of labor. Tanzania's yearly minimum wage is \$1,593.00 in International Currency. International Currency is a measure of currency based on the value of the United States dollar in 2009 ("Tanzania Minimum Wage - World Minimum Wage Rates 2021", z.d.).

The Tanzanian economy is heavily based on agriculture, which in 2013 provided 85% of exports. The agricultural sector grew 4.3% in 2012, less than half of the Millennium Development Goal target of 10.8%. 16.4% of the land is arable, with 2.4% of the land planted with permanent crops. Tanzania's economy relies on farming, but climate change has impacted their farming. According to the 2002 National Irrigation Master Plan, 29.4 million hectares in Tanzania are suitable for irrigation farming; however, only 310,745 hectares were actually being irrigated in June 2011.

The typical Tanzanian diet is based on cereals, starchy roots and pulses. Consumption of micronutrient dense foods such as animal products and fruits and vegetables is low and subsequently micronutrient deficiencies are widespread. At national level, the dietary energy supply does not fulfill average energy requirements of the population. The Dietary diversification index is very low, as starchy foods provide almost three quarters of the total energy supply, despite the wide variety of food produced in the country.

### *Challenge and impact*

Undernutrition is highly prevalent in Tanzania. More than a third of children under five years are affected by chronic malnutrition. In the Southern zone prevalence surpasses 50%. This is caused by a combination of factors including maternal malnutrition, inadequate infant feeding practices, low quality of health care and poor hygiene. Breastfeeding is widely practiced but exclusive breastfeeding is not widespread and complementary feeding practices are inadequate. At the same time, the country is undergoing a nutrition transition due to changes in dietary habits, especially among middle and high income groups living in urban areas who consume energy dense and processed foods. The prevalence of overweight and obesity is noticeable among women (almost one woman out of five). A diet based on consuming more vegetable proteins instead would be helpful in preventing obesity.

More vegetable proteins would also help improve the issue of low dietary diversity. Most households in Tanzania lack diversity because the intake of meat, poultry, fish, and vegetables and fruits is low. According to the article 'Determinants of dietary diversity and the potential role of men in improving household nutrition in Tanzania' most consumed foods within the Tanzanian household are cereals, vegetables, oils and fats, spices, condiments and beverages. Children and women in female-headed households have low dietary diversity compared to those in male-headed households. Women and children access less diverse diets since 46% and 26%, achieved minimum dietary diversity respectively. Production of vegetables play an important role in improving the dietary diversity of women. Gender and education of the household head, food preparation and nutrition training are important factors influencing dietary diversity of the members of a household. Results suggest that there is a need to support community-based programs to provide information on food and the importance of vegetables, their preparation, consumption and utilization to address food and nutrition challenges (Ochieng, Afari-Sefa, Lukumay, & Dubois, 2017, p. 1).

Not all suitable farmland in Tanzania is currently being used for growing crops. Irrigation is a key strategy for food security and poverty alleviation among small farmers in Tanzania. However, the potential of irrigation to improve food security is limited by multiple barriers, such as by poor irrigation infrastructure and management. There is increasing concern over the ability of water resources to meet the expected increase in demand, and existing irrigation schemes will have to become more efficient by removing barriers to improving water management (Mdemu, Mziray, Bjornlund, & Kashaigili, 2016).

### *Solution and recommendations*

The current diet diversity in Tanzania can be improved by consuming more vegetable proteins. A suitable source of protein is duckweed. Duckweed is filled with minerals and vitamins, such as vitamin B1, B2, B6, C and E, antioxidants and all essential amino acids (One World, 2020). Protein from duckweed scores significantly better on essential amino acids in terms of nutritional value than soy and grain protein (Rubisco Foods). Because it contains a lot of protein, it could be a good meat substitute. Within two weeks, a single duckweed plant turns into a colony of 17,500 plants (One World, 2019). Duckweed plants, also called Lemnoideae, can double every 30 hours under ideal circumstances during the

growing season, resulting in approximately 10 times more protein per hectare per year than, for example, soy (Dr IM van der Meer, WUR). In addition, the environmental impact of the plant is also many times lower, because it grows almost everywhere in the world in stagnant pools and ponds, so there is little transport involved and therefore there will be low CO<sub>2</sub> emissions (Rubisco food). In addition, duckweed has a purifying effect on water. It extracts nitrogen and phosphorus from the water and uses it to grow (TU Delft Delta, 2001).

The rate at which duckweed grows can have a positive effect on the current malnutrition situation in Tanzania. Duckweed would also be a great addition to citizens' diets to improve their diet diversity, especially for women and children. Duckweed can be consumed in salads, pastas and a great variety of different dishes, it is similar to cooking with spinach.

In order for duckweed to be successful in Tanzania changes in the current distribution of agriculture and arable farming by farmers would be desired. Repurpose of agricultural land, to a more efficient and duckweed friendly environment would be useful for healthier diets and structured farming. Such a process of re-organizing is not easy, but it can be facilitated by, for example, government subsidies or the assistance of NGOs, such as One Acre Fund or World Concern International. Information can also be given to local farmers about the use and usefulness of duckweed. Educating farmers is beneficial for enriching general knowledge about efficient farming. Duckweed is currently a fairly unknown source of protein, through information, farmers can decide to repurpose their waters to a place where they can grow duckweed. Educating farmers about irrigation and water management is also necessary, as duckweed grows in water. Educating and informing is incredibly important, especially for the Tanzanian farmers of the future.

### *Conclusion*

Duckweed is very nutritional and grows rapidly. Repurposing land in Tanzania to a more duckweed friendly environment would be recommended, this can be achieved through educating and with the assistance of governmental institutions or NGO's. The versatility, accessibility and nutritional value of duckweed makes it a great solution for current dietary issues in Tanzania. *If you ask us, what do we need? We will say, Duckweed!*

## Sources

- Mdemu, M.V., Mziray, N., Bjornlund, H., & Kashaigili, J.J. (2016, 6 June). *Barriers to and opportunities for improving productivity and profitability of the Kiwere and Magozi irrigation schemes in Tanzania*.  
Found on  
<https://www.tandfonline.com/doi/full/10.1080/07900627.2016.1188267>
- Ochieng, J., Afari-Sefa, V., Lukumay, P. J., & Dubois, T. (2017). *Determinants of dietary diversity and the potential role of men in improving household nutrition in Tanzania* PLOS ONE, 12(12)
- Tanzania Minimum Wage - *World Minimum Wage Rates 2021*.  
Found on  
<https://www.minimum-wage.org/international/tanzania>
- Vithlani, M. (2020 October). *Veganism in Tanzania: Is a plant-based diet rooted in its traditional cuisine?*  
Found on  
<https://theveganreview.com/veganism-in-tanzania-is-a-plant-based-diet-rooted-in-its-traditional-cuisine/>
- Countries and their cultures. (z.d.). *Cultures of Tanzania - history, people, clothing, traditions, women, beliefs, food, customs, family*.  
Found on  
<https://www.everyculture.com/Sa-Th/Tanzania.html>
- Zoetbrood, N. (2020, 21 August). *Dit wonderplantje levert tien keer zoveel eiwit als soja*.  
Found on  
<https://www.oneworld.nl/lezen/klimaat/dit-wonderplantje-levert-tien-keer-zoveel-eiwit-als-soja>
- Energiefonds Overijssel. (2002, 24 Februari). *Eendenkroos als alternatief voor dierlijk eiwit*.  
Found on  
<https://www.energiefondsoverijssel.nl/nieuws/interview-rubisco-foods-eendenkroos-als-alternatief-voor-dierlijk-eiwit/>
- Hadden, B. (2020, 8 November). *Eendenkroos moet voedselprobleem oplossen 'boordevoleiwit, groeit en is lekker'*.  
Found on  
<https://www.ad.nl/koken-en-eten/eendenkroos-moet-voedselprobleem-oplossen-boordevol-eiwit-groeit-snel-en-is-lekker~afa668ef/>
- Voor de wereld van morgen. (2016, 21 September). *Van eendenkroos tot voedselbron*.  
Found on  
<https://www.voordewereldvanmorgen.nl/artikelen/van-eendenkroos-tot-voedselbron>
- NOS. (2018, 5 March). *Hoe slecht is vlees echt voor het milieu?*  
Found on  
<https://nos.nl/artikel/2220696-hoe-slecht-is-vlees-echt-voor-het-milieu.html>

- RIVM. (2020, 29 October). *Voedselconsumptiepeiling*.  
Found on  
<https://www.rivm.nl/voedselconsumptiepeiling>
- Voedingscentrum. (N.b.). *Naar een plantaardig voedingspatroon*.  
Found on  
<https://mobiel.voedingscentrum.nl/Assets/Uploads/voedingscentrum/Documents/Consumenten/Encyclopedie/Brondocument%20-%20Naar%20een%20meer%20plantaardig%20voedingspatroon%20-%20Voedingscentrum.pdf>
- Redactie. (2014, 28 August). *80% landbouwgrond gebruikt voor dierlijke productie*.  
Found on  
<https://www.foodlog.nl/artikel/80-landbouwgronden-gebruikt-voor-dierlijke-productie>
- Dinther, M., (N.b.). *Zó voeden we die 10 miljard monden in 2050 (met behoud van de aarde!)*  
Found on  
<https://www.volkskrant.nl/kijkverder/2018/voedselzaak/artikelen/zo-voeden-we-die-10-miljard-monden-in-2050-met-behoud-van-de-aarde/>
- Resource WUR. (1998, 12 Februari). *Eendenkroos*.  
Found on  
<https://resource.wur.nl/nl/show/-Eendenkroos.htm>
- Bouhuijzen, L. (2020, 24 Februari) *Rubisco Foods ziet grote toekomst voor plantaardig eiwit uit waterlinzen: Opening nieuwe kroosfabriek op The Green East in Raalte*  
Found on  
<https://www.vee-en-gewas.nl/artikel/238351-opening-nieuwe-kroosfabriek-op-the-green-east-in-raalte/>
- McMullin, D. (2001, 18 Januari). *Water zuiveren met eendenkroos*.  
Found on  
<https://www.delta.tudelft.nl/article/water-zuiveren-met-eendekroos>
- Verbeek, W. (2021, 1 Januari) *Gaan we eendenkroos eten in 2021?*  
Found on  
<https://www.nouveau.nl/artikel/lifestyle/health/gaan-we-eendenkroos-eten-2021#:~:text=Een%20ander%20superfood%20dat%20steeds,goed%20alternatief%20voor%20vlees!>