



Christine Buerki

Education for a Sustainable Development

Complementary Material and Hints for the UN SDG no 02



SDG no 02: Zero Hunger

End hunger, achieve food security and improved nutrition and promote sustainable agriculture

1. Introduction to the topic

As I have, since my childhood, being a passionate photographer, I remember all those striking pictures from photographers, documenting famine in the early 70ties in the Sahel region. So, what is the story about hunger? I would like to point out one specific book, published in 2009, which explains the mechanisms behind this tragedy that has already lasted for decades: „So wird Hunger gemacht“ from Petra Ramsauer ([1](#))

How is hunger defined?

Hunger is defined as a short-term physical discomfort as a result of chronic food shortage, or in severe cases, a life-threatening lack of food. (National Research Council, 2006)

World hunger refers to hunger aggregated to the global level. Related terms include food insecurity and malnutrition. Food insecurity refers to limited or unreliable access to foods that are safe and nutritionally adequate (National Research Council, 2006). Malnutrition is a condition resulting from insufficient intake of biologically necessary nutrients (National Research Council, 2006). Although malnutrition includes both-nutrition and under-nutrition, the focus for global hunger is under-nutrition.

Understanding „hunger“ with its background and reasons is - as mentioned - very complex. Therefore, this SDG should, like all other SDGs, not be addressed in isolation, but should always be taught and explored in a multidisciplinary way. Therefore STEM-teachers are asked to reach out to their colleagues of different fields to work together:

For this SDG no 01, one can connect with colleagues in subjects like:

History	Politics	Sociology	Economics
Ethics	Religion	Geography	Biology
Philosophy	Psychology		

(The order of the topics is random and has no implication of a ranking!)

If you click on one of the [hyperlinked words](#), it will lead you to ideas for a multidisciplinary teaching in the text. With such a precious potpourri of fields and competences, you can introduce your students to the very much multifactorial aspects of hunger.

They should be able to understand, that hunger is not just happening, but has its reasons; and they should be taught about the relationship between food security and healthy soils, about the relationship of hunger and land grabbing of rich countries, about the stock market speculating on food, about the impact of big companies on the issue of seed patents and the impact of the ongoing worldwide deforestation and its relation to increasingly frequent droughts worldwide.

SOURCE:

So wird Hunger gemacht, Petra Ramsauer, Buch (ISBN13: 9783800074006)

<http://www.sandammer.at/rez10/hunger-ramsauer.htm> , last accessed: 2021/05/12

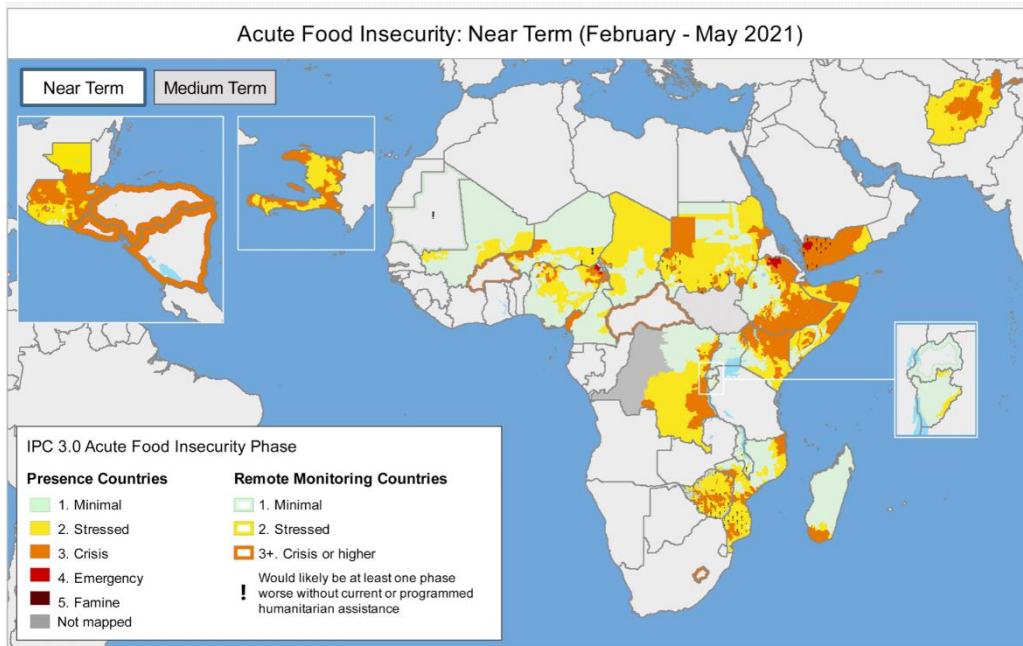
2. How to implement SDG 1 with STEM education?

a. Science

You could start with some statistics and graphs, to launch a first discussion with your students about this topic. There are many sites available, I just cite a few:

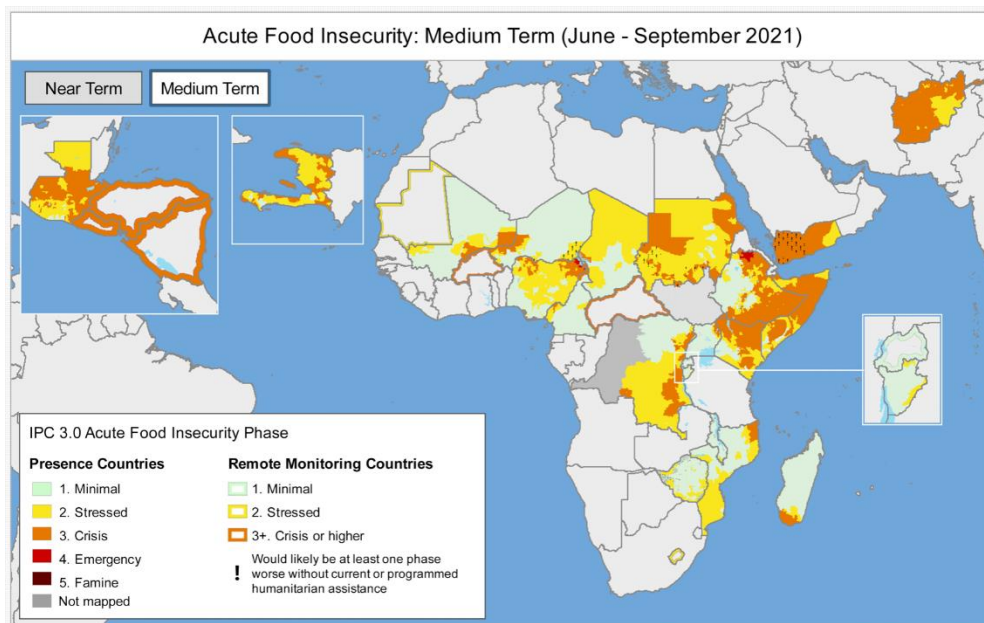
- <https://fews.nethttps://www.worldhunger.org/world-hunger-and-poverty-facts-and-statistics/>
- <https://www.worldhunger.org/education-links/>
- <https://twomillionhands.wordpress.com/2014/05/05/10-zahlen-und-fakten-zu-hunger-und-welternahrung/>
- <https://www.who.int/news-room/fact-sheets/detail/food-safety>
- <https://sedac.ciesin.columbia.edu/downloads/maps/food/food-food-insecurity-hotspots/food-food-insecurity-hotspots-average-phase-class-global-2009-2019.jpg>

Acute Food Insecurity **Near Term** (February 2021 - May 2021)



Source: <https://fews.net>

Medium Term (June 20201 - September 20201) —> see the difference for Afghanistan!



Source: <https://fews.net>

In **Biology (Genetics) classes**, you could explore the relations of hunger and health:

- During the last decades, mostly not perceived by most people, in many countries there was a significant loss of original seed varieties to grow Rice, Corn, Wheat, Oat, Millet, ...

For example, in India, some decades ago there were existing 10,000 different types/varieties of Rice. Each one, perfectly adapted to the local soil conditions and microclimate. Then, multinational seed breeders came and offered their „standard-rice-breed“ to local farmers with the promise, they would gain more harvest out of it. Well, for some this might have been true - for many not at all, as this standard is not fitting in all of these diverse conditions on this continent. In addition, the farmers couldn't anymore breed the Rice by themselves, what made them dependent from multinational seed breeders.

Similarly, this happened to many other staple / basic foods.

(Further aspects with [Biology](#))

- Explore with your students how new breeds or varieties can be produced in the lab. You can address the whole curriculum for genetics with this issue.

Methodological hint

Collect different types of soil from your surroundings. Test with the help of the Vernier Sensors the different characteristics of these soils.

Take easy sprouting seeds- for example radish or cress and sow the seeds on the different soil samples. What can you observe? Put some samples under water stress, too (for this experiment, you've got to have 2 or more soil samples for each soil-type!)

- What is the impact of malnutrition on a child's body in relation to their growth, or to their development of the hormone system?
- Discuss the impact of eating too much animal proteins. How is this discussion related to the worldwide hunger?
- Discuss the food-chains and the loss of energy at each level! (—> you only bring 1/10 of the energy invested before, into the next level of a food chain!

Methodological hint

Let students visualize different food chains.

Poverty and the regional distribution:

Together with **Geography**:

- What kind of regions are most affected by famine?
- What do these landscapes look like?
- How did they change over the last 10,000 to 100,000 years?
- Or did they change only recently? What was/is the impact of humans on this landscape?
- What types of soils and microclimate exist in vulnerable regions and
- **Biologists'** point of view: what plants fit best into such conditions? (next Link to [Biology](#))
- What is the reality? For example corn is cultivated in many regions not at all suitable for this grass. Cotton is cultivated in desert-like regions but is native to tropical and sub-tropical regions ([2](#))...

b. Technology

Diving into modern agriculture industry which is automating trekkers and using drones. The ,modern' farmer does not anymore need to leave his house to work on his fields. He can awaken the machines with his tablet from the coach. Together with the **Psychologist, Ethicist** explore, what impact this will have on the farmers' mindset, health-set and soul-set as he is no longer in touch with the ground, the cattle etc.

—> Look for conclusive studies about a significant benefit for such investments.

—> Very important: Discuss this in relation with the SDG 12, too! ([3](#), [4](#))

c. Engineering

Discuss (together with a colleague from the **Biology**) the different techniques of modern hors-soil-farming with a whole-cycle approach named Aquaponic. ([5](#))

Methodological hint

Try to build such a system with your students! (—> not too small though! It is the same like with a fish aquarium: the bigger it is, the easier it is to run! :-)

In many cases, lack of water is the cause of a bad harvest. Develop and discuss an intelligent irrigating system like the idea published on the T³-Europe content portal ([6](#))

Together with **Philosophy**: How do engineers' new inventions help if the natural resources are not abundant anymore? —> Take the example happening in the US, in the Great Plains, where the ground water is disappearing rapidly due to many years of over-abstraction of this source. From the huge „Ogallala Aquifer“, dating back to the ice age, many generations pumped out water from this source . The Great Plains are a plateau on many locations, reaching up to 1000m above sea level, and the settlement of this region goes back to the 1860ties.

Although this region was never really meant to be suitable to grow crops / grains in an intensive way, it developed to be the most important place for the crop supply in the USA. The following resources give you an overview: ([7](#), [8](#), [9](#), [10](#))

d. Math

- Using big data! Introduction in statistics or some parameters of data about hunger. Introduction to the topic of extrapolation. —> in this context: extrapolate the continuous use of water for irrigation on critical sites like the Great Plains (—> see above)
- Mathematical modeling on ecological and environmental topics ([11](#))
- Together with a colleague from the Biology department, you could work on given data sets; for example on anthropogenic biomes and inventing new views on these data ([12](#))

SOURCES:

2. EARTH observatory, NASA: (<https://earthobservatory.nasa.gov/world-of-change/AralSea>), last accessed: 2021/05/12
3. Farming & Agriculture Robots: <https://builtin.com/robotics/farming-agricultural-robots> , last accessed: 2021/05/12
4. Future Farming, Robots: <https://www.futurefarming.com/Machinery/Articles/2021/5/Claas-and-AgXeed-collaborate-on-field-robots-746174E/> , last accessed: 2021/05/12
5. TheAquaponicSource: <https://www.theaquaponicsource.com/what-is-aquaponics/>. last accessed: 2021/05/12
6. T³-Europe Resources: https://resources.t3europe.eu/t3europe-home?resource_id=1802&cHash=cad6f97e7a4a35694879f9a9dd3a2fbb , last accessed: 2021/05/12
7. The Great Plains' invisible water crisis: <https://www.mcclatchydc.com/news/nation-world/national/article28505764.html> , last accessed: 2021/05/12
8. The disappearing Ogallala Aquifer: https://theindependent.com/news/the-disappearing-ogallala-aquifer/article_1b19a9ea-142e-11e4-98a5-0019bb2963f4.html , last accessed: 2021/05/12
9. Widespread Drought On The Great Plains Could Impact 2021 Growing Season <https://www.hppr.org/post/widespread-drought-great-plains-could-impact-2021-growing-season>, last accessed: 2021/05/12
0. Ogallala Aquifer: https://en.wikipedia.org/wiki/Ogallala_Aquifer , last accessed: 2021/05/12
11. Mathematical Modelling Approach in Mathematics Education, Ayla Arseven, Faculty of Education, Cumhuriyet University, Turkey (2015): <https://files.eric.ed.gov/fulltext/EJ1083314.pdf> , last accessed: 2021/05/12
12. EARTHDATA, Anthropogenic Biomes: <https://sedac.ciesin.columbia.edu/data/collection/anthromes/sets/browse>, last accessed: 2021/05/12

3. Connecting this SDG with other SDGs

Methodological hint

Encourage your students, to present the different links and dependencies in a *Concept Map*. This is a powerful tool, not only to show how things are linked together, but it shows you, if the student can make the links and name the dependencies. (13)

Some ideas:

- SDG 1: Poverty leads often to famine
- SDG 3: Hunger threatens the health
- SDG 4: With hunger you cannot concentrate and learn at school.
- SDG 6: With no water no food can be produced
- SDG 8: With hunger you won't be able to work
- SDG 10: Hunger causes inequalities
- SDG 15: The causes of hunger are in many cases due to a violation of our land
- SDG 16: Famine causes wars and migration- which- itself is causing conflicts

Trying to reduce the negative impact of humans on our planet with the help of the 17 SDG's, can be a really good idea to make positive impacts.

There is though there is a stumbling block to overcome:

If enterprises, governments and individuals in their pursuit of following the SDG's are just focusing on one single - or may be two SDG's, there will be a huge rebound effect to other goals. So the crucial point really is, to have always all SDG's in mind, if a new project or idea is launched.

*How the SDG 2 is affected, if one is **only focusing** on one of the following goals:*

- **SDG 8:** Economic growth: is mostly realized on the shoulders of already poor and hungry people. Non-domestic companies are exploiting big indigenous communities (since decades) taking their land- so they cannot grow their own food or taking their water resources
- **SDG 9:** Industry innovations and infrastructures have to be built somehow. The MIPS (see SDG 12) is very high and the resources are taken from places where people are most vulnerable.
- **SDG 11:** With the Western thinking we are building „sustainable cities“, which have the same flip side as mentioned above!
- **SDG 12:** Modern societies are defining their wealth through consumption and richness. Again, here is the measure of MIPS the central focus one should put on! Discuss with your colleagues from the **Sociology / Psychology**, why possession can't make men sustainable happy —> enroll projects with your students on minimalism, on sharing economy, and discuss about renunciation and modesty.
- **SDG 16:** The mindset of the modern economy and the pursuit of more and more makes this goal unreachable. Look up the complementary material for SDG 08. There, the exponential function will be discussed.

Methodological hint

Let the students do *scribbles* about this subject. Where do they see the negative influence of only focusing on for example SDG 12 ([14](#))

SOURCES:

13. 6. Creately.com, The Ultimate Guide to Concept Maps: From Its Origin to Concept Map Best Practices, <https://creately.com/blog/diagrams/ultimate-concept-map-tutorial/>, last accessed 2021/04/08
14. Art by Ro, Scribbling Drawing Tutorial for Beginners, <https://artbyro.com/scribble-drawing-basics-for-beginners/>, last accessed 2021/04/08