# What price should nature pay because of our desire for increased yields?

Photo credit BillsExplorations

For decades humans' efforts have been dedicated towards increasing agricultural yields, ignoring the fact that with every 20 percent of raised yield comes the high and intangible cost of 9 percent loss of species, according to the Helmholtz Centre for Environmental Research. To raise yields farmland is being intensively exploited, the consequence of which is not focused upon enough by recent research. In Europe, where 80 percent of land is dedicated to agriculture and related services, different practices have been followed to increase crop yields. Consolidation of farmlands, in which smaller fields are joined together to form large fields, is used to facilitate agricultural mechanization and an increased use of fertilisers and pesticides. A group of scientists at the Helmholtz Centre for Environmental Research – UFZ, conducted a global meta-analysis synthesising 115 studies to investigate the relationship between yield and biodiversity and evaluate the situation. In the research article, the UFZ biologist Dr. Michael Beckmann and co-authors elucidate how measures followed to increase yields impacts negatively on biodiversity. According to the authors, the bidimensional relationship between raised yield and decreased biodiversity is hitherto an under-researched area.

The scientific group conducted a systematic review of the Web of Science, finding almost 10,000 studies. By use of selection criteria they reduced the number of studies to 1,371; from which 115 studies were considered to have sufficient data for their study. The 115 studies yielded 449 cases: 292 for species richness and 157 for yield. The team further developed a mathematical model in order to overcome the differences among the studies related to climate zone, area and time. They classified the agricultural areas by intensity of land-use: low, medium and high. After analysing the data, they found that conventional intensification in areas of medium land-use intensity have the highest yield increases – 85 percent, but that these same areas show the largest loss in species richness – almost 25 percent. On the other hand, the high intensity systems showed no significant loss of species and yet substantial yield gains – 15 percent. Though this may sound good, the research team warns that it is most likely related to the fact that these areas already lost their biodiversity due to the earlier increase in intensity. The study also demonstrates how intensification measures, in cases like timber, may lead to high yields without a corresponding loss in biodiversity. The study highlights the importance of focusing on the relationship between yield and biodiversity, and opens the door for more research to understand the most optimal ways in which intensive land-use could be developed without a loss of biodiversity.

**Reference**

Beckmann, M., Gerstner, K., Akin-Fajiye, M., Ceauşu, S., Kambach, S., Kinlock, N. L., Phillips, H. R. P., Verhagen, W., Gurevitch, J., Klotz, S., Newbold, T., Verburg, P. H., Winter, M., & Seppelt, R. (2019). Conventional land-use intensification reduces species richness and increases production: A global meta-analysis. Global Change Biology, 1-16. Doi:10.1111/gcb.14606



ISSN-Internet 2197-411x OLCL 862804632

UniKassel & VDW, Germany- June 2019

## Summer School "Future of Food — Sustainable Food Systems" 24th-31st August 2019 at the Academy of Schloss Kirchberg

Photo credit: www.schloss-kirchberg-jagst.de

**Schloss Kirchberg**

The summer school is intended for all young people, including farmers, food artisans, trainees, students and young professionals, who are interested in sustainable food and agriculture and seek to play a role in shaping our sustainable diet in the future.
We will together investigate the burning questions on (animal) food production. Each day we will get to know a different stage of the value chain through lectures, interesting field trips and intensive discussions about:

- What enlightened consumers want today
- Current nutrition trends
- Existing and future trade and marketing concepts
- The role the food trade plays in sustainable food supply
- Animal welfare and meat consumption
- How we (should) imagine ecologically and ethically sustainable agriculture

These questions in addition to other important issues and concepts will be discussed with experts and pioneers and, of course, one another.

We look forward to your applications until June 30, 2019.
The application form and further information can be found on our website
*www.schloss-kirchberg-jagst.de/sommerschule*

For all questions we are also available at *bildung@besh.de* and 07954 9211880.

## Salty? Well, no worries, this comes with less sodium chloride!

A research team at Washington State University has discovered a way to produce a salty taste with less sodium chloride content. According to the United States of America Office of Disease Prevention and Health Promotion, daily sodium intake should not exceed 2,300 mg. Yet, US Americans usually consume more salt than they need, which is unhealthy. Data shows that US American females consume a daily average of 2,980 mg, while males' average consumption is over 4,000 mg per day.

The negative health impacts of sodium chloride are well-known, including calcium excretion which can lead to a

negative calcium balance. Calcium chloride and potassium chloride, however, have no such ill-effects. Rather, potassium has a positive effect on blood pressure, but it comes with a bitter taste which people do not really accept. The research team succeeded to make a blend of calcium chloride and potassium chloride, but with less sodium chloride. The team conducted sensory tests using sensory analysis with consumers and the University's potentiometric electronic tongue to investigate the acceptability of the new blend and to calculate the optimal proportions of each salt in the new combination. The sensory tests included a variety of combinations including salt solution, salt in water and salt in tomato soup.

The ideal combination was found to comprise 96.4 percent sodium chloride, 1.6 percent potassium chloride and 2 percent calcium chloride. The researchers suggest that additional salt blends could be created that increase the proportion of the other two salts while reducing sodium chloride further. Recent studies confirm that the best way to reduce salt consumption is to do so gradually. Thus, the use of new blends may help people in their transition to lower salt diets. "It's a stealth approach, not like buying the 'reduced salt' option, which people generally don't like," said Carolyn Ross, a Food Science professor at the Washington State University.

**Reference**

Barnett, S. M., Diako, C., & Ross, C. F. (2019). Identification of a salt blend: Application of the electronic tongue, consumer evaluation, and mixture design methodology. *Journal of Food Science*, 84(2), 327-338. Doi:10.1111/1750-3841.14440

## Our tongue can also smell!

People usually associate flavour with their taste sense. In fact, flavour has been proven to come more from the smell sense than the taste sense. Anyway, our brain uses information from different senses including taste and smell to reach its final perception on flavour. It was previously understood that recognition of a flavour is the result of a combination of smell and taste information, that were considered to interact only when reaching the brain. Thus, and up till now, the perception of a flavour was thought to begin in the brain itself. However, a new discovery by the Monell Center, Philadelphia, USA may have proven the earlier understanding to be wrong.

The Monell Center claims to be the world's only independent, non-profit scientific institute dedicated to interdisciplinary basic research on the senses of taste and smell. Its new scientific study reveals that the body sensors responsible for detecting odours in the nose, the so called functional olfactory receptors, exist in the taste cells too. This research may explain how scent molecules can influence the taste perception. The practical importance of these findings relate to the future possibilities of using "odour-based taste modifiers" to overcome excessive use of salt or sugar, especially for people who are fighting obesity and diabetes.

The inspiration for the main research idea came from the 12-year old son of Mehmet Hakan Ozdener, the lead author of the study and a cell biologist at Monell. The son had asked his father if snakes' protrude their tongues to smell, which prompted Ozdener to investigate further. Several experiments conducted by the Monell Center prove that some taste cells contain both taste and olfactory receptors. The experiments demonstrate how human taste receptors may respond to odours in a similar manner to olfactory receptors. The results suggest that olfactory receptors interact with the taste receptors on the tongue to provide the flavour perception. "The presence of olfactory receptors and taste receptors in the same cell will provide us with exciting opportunities to study interactions between odour and taste stimuli on the tongue" said Ozdener. The question that remains is whether the olfactory receptors are located in a specific taste cell type or not. Scientists will continue to explore the mechanism by which odour molecules modify the taste cell responses that lead to the final taste perception.

Reference:

Malik, B., Elkaddi, N., Turkistani, J., Spielman, A. I., & Ozdener, M. H. (2019). Mammalian taste cells express functional olfactory receptors. *Chemical Senses*, XX, 1-13; doi:10.1093/chemse/bjz019


ISSN-Internet 2197-411x OLCL 862804632