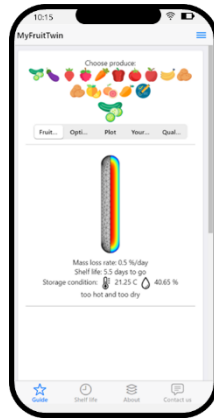
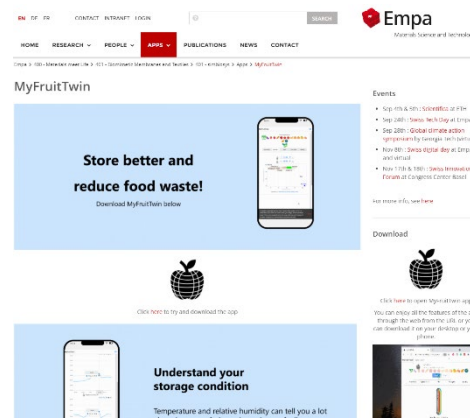


**SCIENTIFIC REPORT - SNSF project CRARP2\_198564**

(a) MyFruitTwin



(b) Website

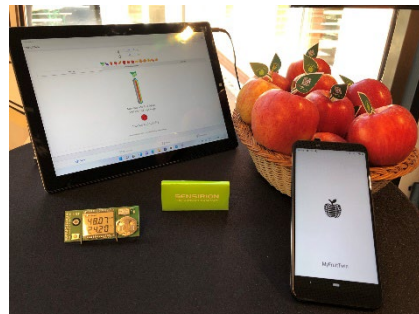


**Figure 1: Interface of the app, MyFruitTwin (a) and its website (b)**

(a) Our booth at Scientifica



(b) Table set up at Tag der Technik



(c) Flyer from Global Climate Action Symposium



(d) Screenshot of Schweizer Digitaltag



(e) Photo from Swiss Innovation Forum



**Figure 2: Insights of the outreach events; (a)Scientifica, (b)Tag der Technik, (c)Global Climate Action Symposium, (d)Schweizer Digitaltag, and (e)Swiss Innovation Forum**

## 1. Summary of the project and its results

### Project purpose

In Switzerland, up to one-third of fresh produce is lost or wasted on the way from farm to fork. This post-harvest loss must be reduced to minimize resource waste and greenhouse gas emissions. If we look closer at where these losses and waste occur, households, retail and gastronomy cover more than half of the portion. The main reasons for the food loss among these groups are identified as lack of knowledge and awareness. The consumers, retail employees, and restaurant staff often have little insight into processes during storage or what could be done to extend shelf life. The project aimed to help consumers, retail employees, and restaurant staff learn how to store their fruits and vegetables, monitor their conditions, and eventually reduce food waste.

### Project results

We created an easy-to-use app to explore what happens inside fruits and vegetables during storage at home or work. This app was inspired by the physics-based digital twin. The digital twin is a virtual representation of fruits and vegetables that captures the relevant physical, biochemical, physiological, and microbiological processes that affect quality during its lifecycle. We provided sensors to our app users to understand the temperature and humidity of their storage conditions. These sensor values were fed into the app to get insights into how their fruits and vegetables behave under input storage conditions. We showcased this app through five different outreach events and via the website. According to several discussions with our app users through the events, the insights provided by the application raised the awareness of the correct storage of fresh produce. The app encouraged them to store their fruits and vegetables better.

## 2. Project output and its impacts:

### Deliverables:

- ❖ **App** MyFruitTwin: <https://simbiosys.shinyapps.io/Agora/>
  - MyFruitTwin is a Progressive web app (PWA) (Fig.1a). The app utilizes the tools and knowledge of physics-based digital twins. This app was developed using R. The users can easily use the app and download it via URL. The app had 256 active hours from September 2021 to January 2022.
- ❖ **Website:** <https://www.empa.ch/web/simbiosys/apps/myfruittwin>
  - The website is hosted within the research group (Fig. 1b). This page features MyFruitTwin and outreach events where the app was featured. The website also includes the video created to illustrate how the app works. We had 488 page views and 371 unique page views between the second week of September 2021 and the third week of January 2022.

### Outreach events and impacts:

- ❖ **Scientifica** (Sep 4<sup>th</sup> and 5<sup>th</sup>, 2021) at ETH Zurich (Fig. 2a), <https://scientifica.ch/en/ausstellungen/innovation-fuer-nachhaltige-entwicklung/>:
  - Scientifica is a weekend event hosted by ETH Zurich and the University of Zurich every 2 years to invite the public to experience science. Our booth was part of the exhibit "Innovation for sustainable development," a collaboration of the ETH for Development (ETH4D) initiative and the World Food System Center of ETH Zurich that highlighted research from the fields of agricultural, food, and water supply research. Over the two days of the event, we had interactions with small kids, students, professors, family, and scientists. We had provided 100 apples with QR codes to the website and the app and gave away approximately 150 sensors. More than 300 people have visited our booth.
  - Social Media Posts:
    - [https://www.linkedin.com/posts/empa\\_reduce-food-waste-save-food-what-you-need-activity-6844222704283865088-Uhpr](https://www.linkedin.com/posts/empa_reduce-food-waste-save-food-what-you-need-activity-6844222704283865088-Uhpr)

- Likes: 20
  - <https://www.linkedin.com/feed/update/urn:li:activity:6844557990083735552>  
Impressions: 587 Likes: 10
  - <https://www.linkedin.com/feed/update/urn:li:activity:6839475424876081152>  
Impressions: 723 Likes:10
- News: [Innovation for sustainable development](#)
  - <https://worldfoodsystem.ethz.ch/news/wfsc-news/2021/09/scientifica-2021.html>  
Views: 99
- ❖ **Tag der Technik** 2021 (Sep 23<sup>rd</sup>, 2021) at Empa Dubendorf (Fig. 2b), <https://www.tage-der-technik.ch/>:
  - Tag der Technik was half a day event and consisted of laboratory tours, presentations, and panel discussions addressing various aspects of food engineering. At our booth, we have interacted with experts in the food industry and people from academia in food-related research. Roughly 50 people stopped by our booth. We gave away 30 apples with QR codes to the website and the app, as well as 10 sensors.
- ❖ **Global Climate Action Symposium** (Sep 27<sup>th</sup>, 2021) online, hosted by Georgia Institute of Technology (Fig. 2c), <https://globalchange.gatech.edu/global-climate-action-symposium-2021/>:
  - The symposium was a 3-day event. More than 800 individuals attended joined from 39 countries across these 3 days. Empa presented MyFruitTwin on the first day of the symposium in the "Changing the food system" section, supported by the World Food System Center at ETH Zurich.
  - Social Media Posts:
    - <https://www.linkedin.com/feed/update/urn:li:activity:6839191210142265344>  
Impressions: 2997 Likes: 60
    - <https://www.linkedin.com/feed/update/urn:li:activity:6847128062627192832>  
Impressions: 2195 Likes: 32
    - <https://twitter.com/ethzWFSC/status/1433428138541735937?s=20>  
Impressions: 1161 Likes: 6
    - <https://twitter.com/ethzWFSC/status/1453675742437548036?s=20>  
Impressions: 823 Likes: 2
    - <https://twitter.com/ethzWFSC/status/1440920111708266497?s=20>  
Impressions: 400 Likes: 4
    - <https://twitter.com/SwissCGAtlanta/status/1442528169597173769?s=20>
    - <https://twitter.com/SwissCGAtlanta/status/1442512212464214019?s=20>
  - Video: <https://www.youtube.com/watch?v=05JuiQpoAoc>
- ❖ **Schweizer Digitaltag** (Nov 8<sup>th</sup>, 2021) online, live streaming from the Innovation room at Empa St Gallen (Fig. 2d), <https://youtu.be/nFF6Z4BIN-U> (edited version), <https://www.youtube.com/watch?v=p5iU9Vt2ZJE> (live-streamed version):
  - During the streaming, the issue of food waste was discussed, and MyFruitTwin was featured as a solution. Twelve apprenticeship cooks joined the live steaming with their teacher. Ca. 60 people have joined online during the streaming, and the video has 376 views as of Jan 28<sup>th</sup>, 2022 (282 on the live-streamed version + 94 on the edited version).
  - News: <https://www.digitaltage.swiss/>
- ❖ **Swiss Innovation Forum** (Nov 18<sup>th</sup>, 2021) at Congress Center Basel, (Fig. 2e), <https://www.swiss-innovation.com/en/>:
  - We had many interactions with entrepreneurs with various backgrounds, including retailers, industrial design, medical, urban farming, and startups. We gave away 20 apples with QR codes to the website and the app.