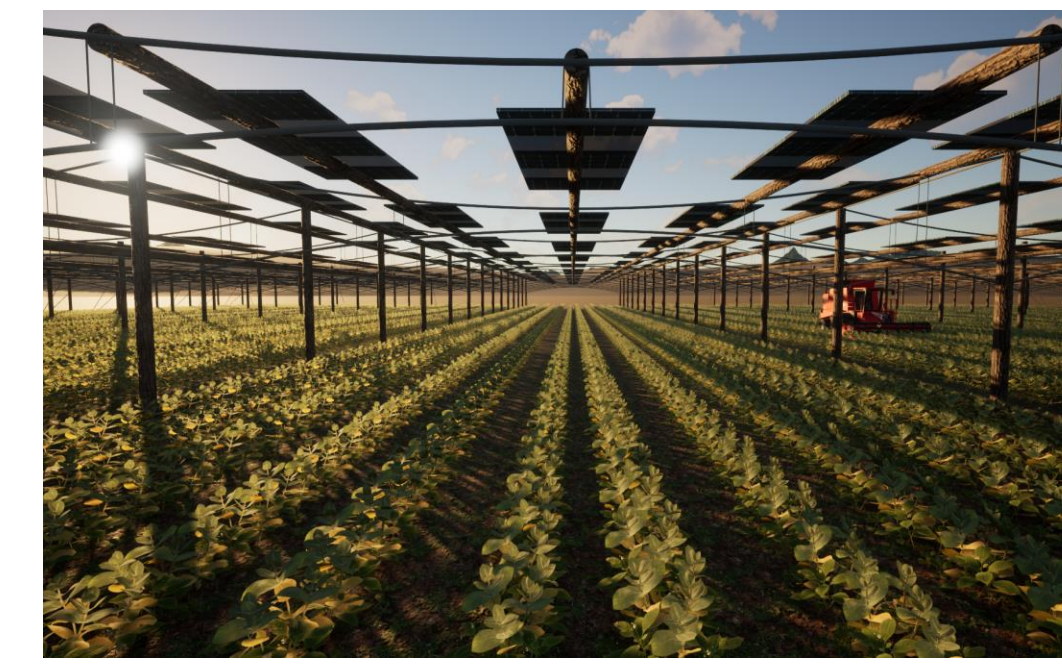


Timber PV canopy for soybean production

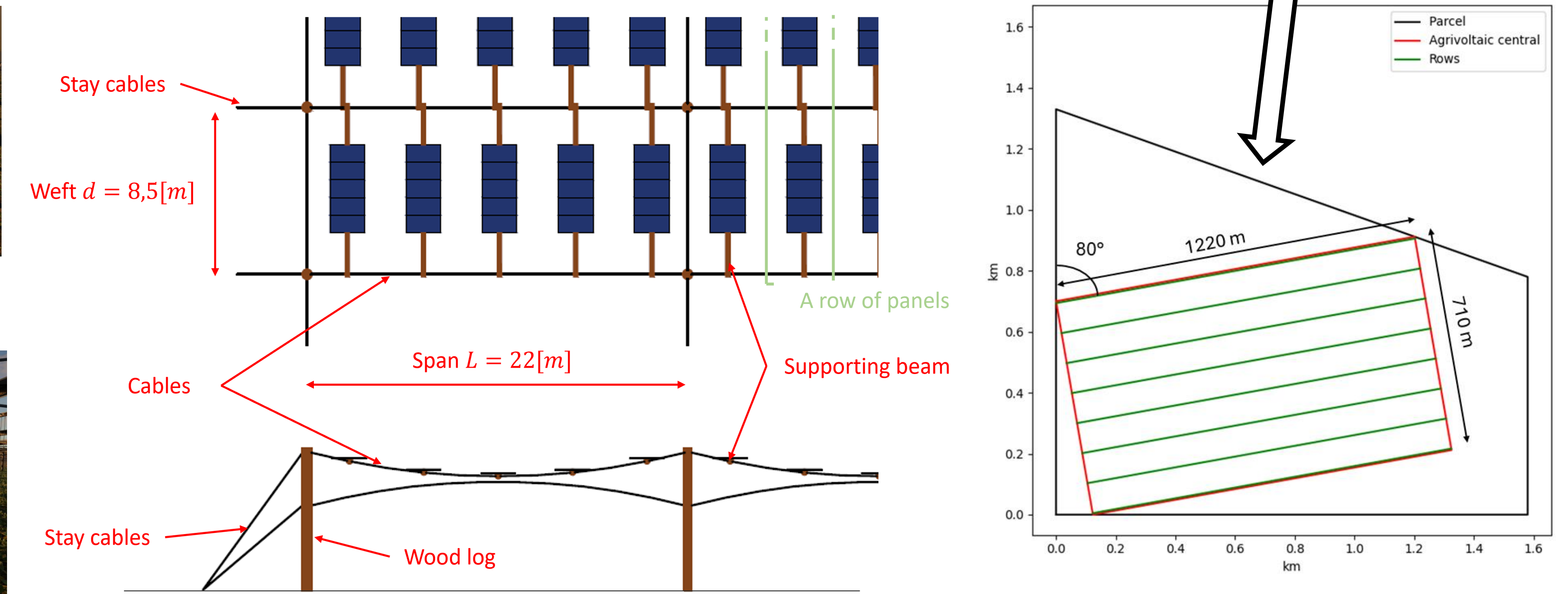
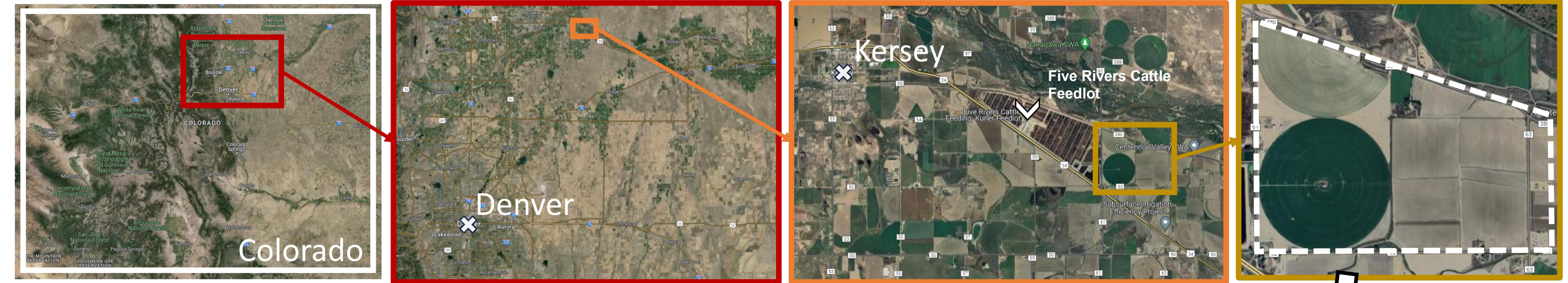
AgriVoltaics 2024 Student Design Competition

Dartevelle Joran, Bouvry Arnaud, Bruhwyler Roxane, Dardenne Benjamin

joran.dartevelle@student.uliege.be, abouvry@uliege.be, roxane.bruhwyler@uliege.be, benjamin.dardenne@uclouvain.be



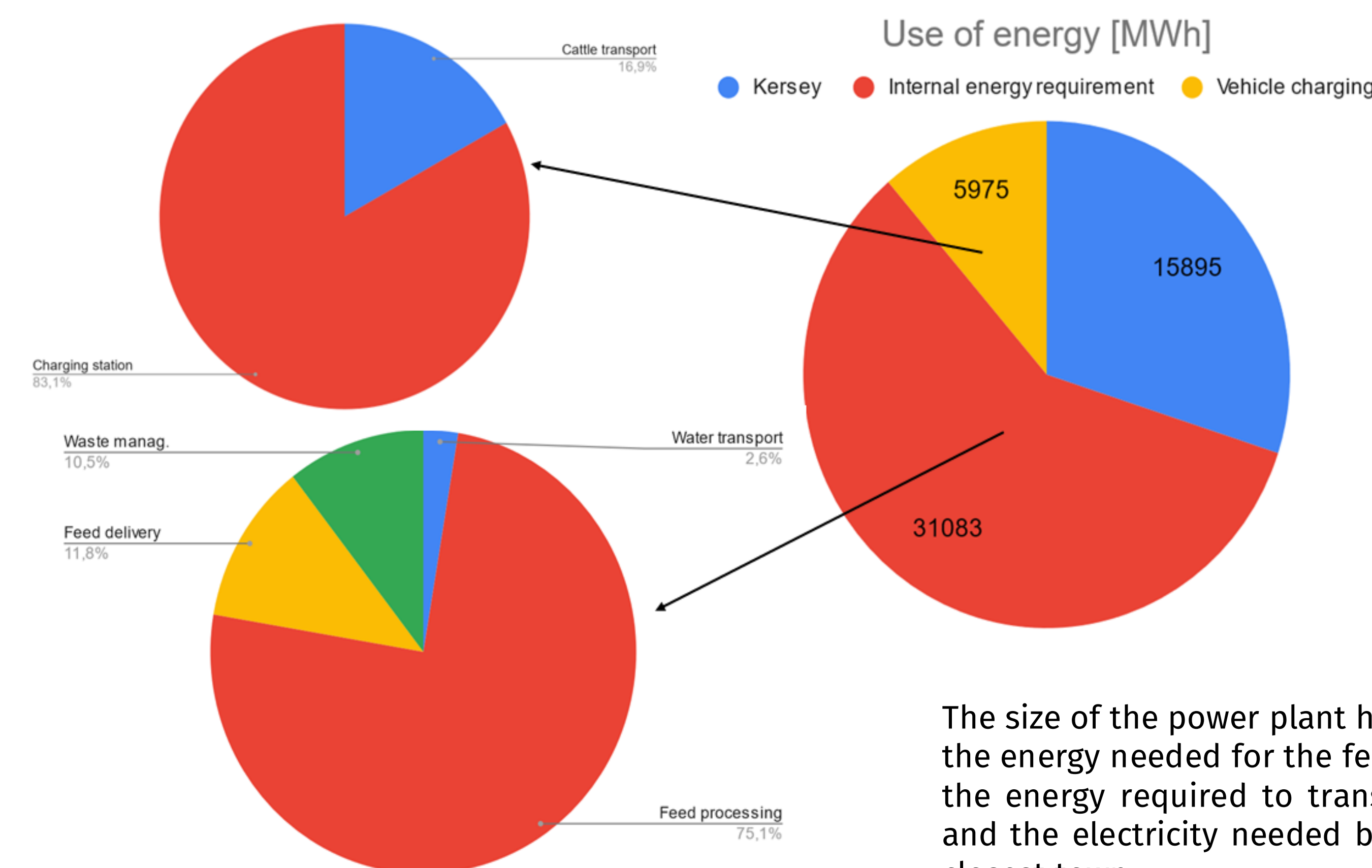
PV plant layout in Colorado Landscape



Five Rivers Cattle Feeding in Weld County, Colorado, is committed to corporate social responsibility in the communities in which it operates. It is also committed to ensuring the sustainability of its operations by limiting its impact on the environment. Five Rivers Cattle Feeding's Kuner Feedlot has 525 acres of farmland adjacent to its industrial operation (Feeding). With the aim of becoming a driver of change, the board decided to use this land as a demonstration site for the environmental and economic viability of innovative solutions developed and promoted by local initiatives. The high energy requirements of the production site, combined with the large amount of transport involved in its activities, seemed to offer an opportunity for local energy recovery.

An agrivoltaic project would therefore be of great added value to this feedlot, for which the supply of both food and electricity is essential. The project consists of a photovoltaic canopy using cables to support the PV panels and wood log columns to raise the whole installation above an agricultural parcel. With an azimuth of 80° , the installation can produce 53,000 MWh per year, with the shades spaced to achieve a coverage rate of 15%. In addition, to mitigate the impact of the photovoltaic system on incident radiation and plant growth, lenticular light diffusers are placed between the panels to distribute the radiation more evenly and reduce the influence of alternating light and shade.

Energy needs



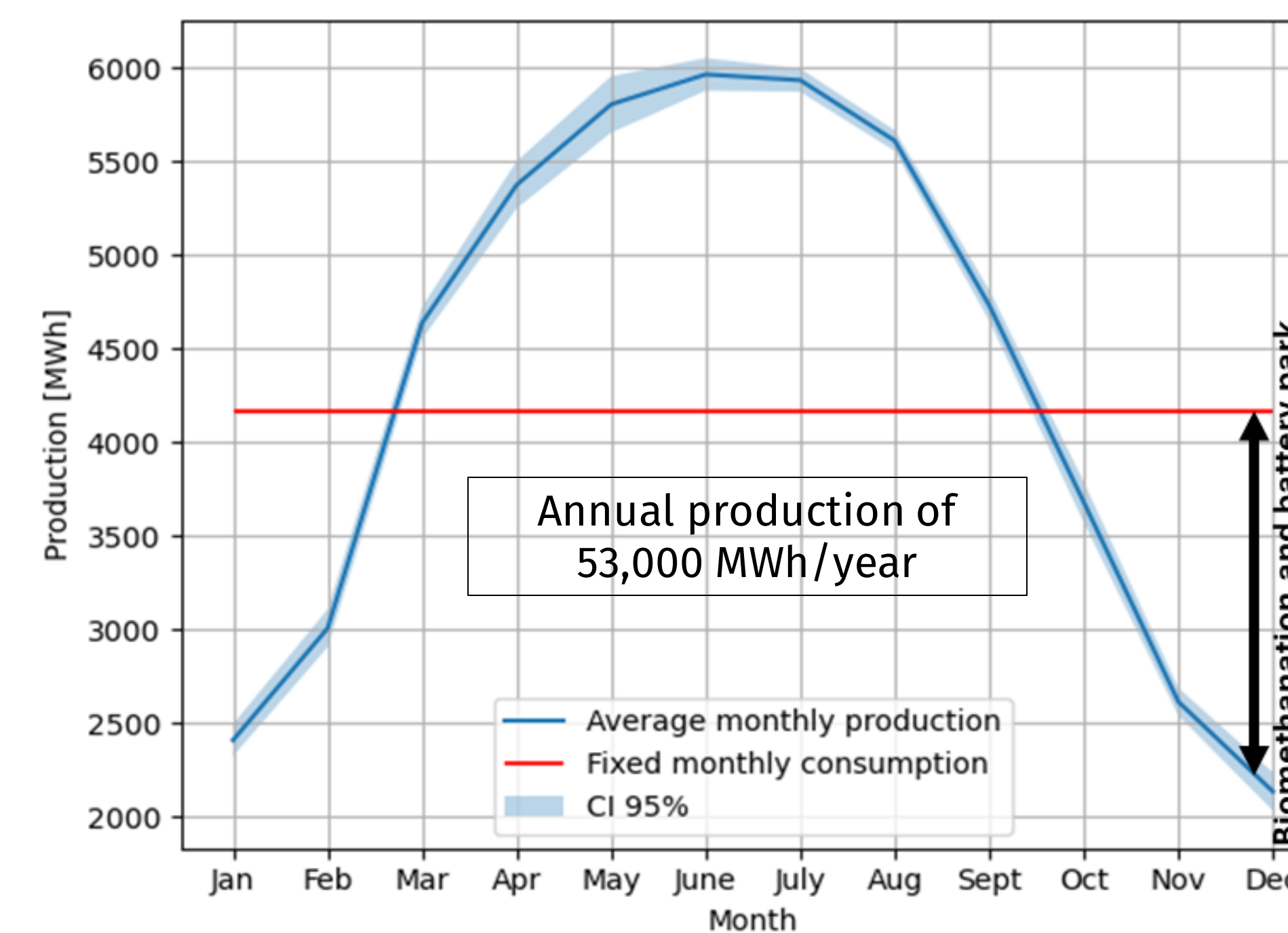
The size of the power plant has been chosen considering the energy needed for the feedlot to operate on its own, the energy required to transport cattle to the abattoir and the electricity needed by the people of Kersey, the closest town.

Take Home Messages

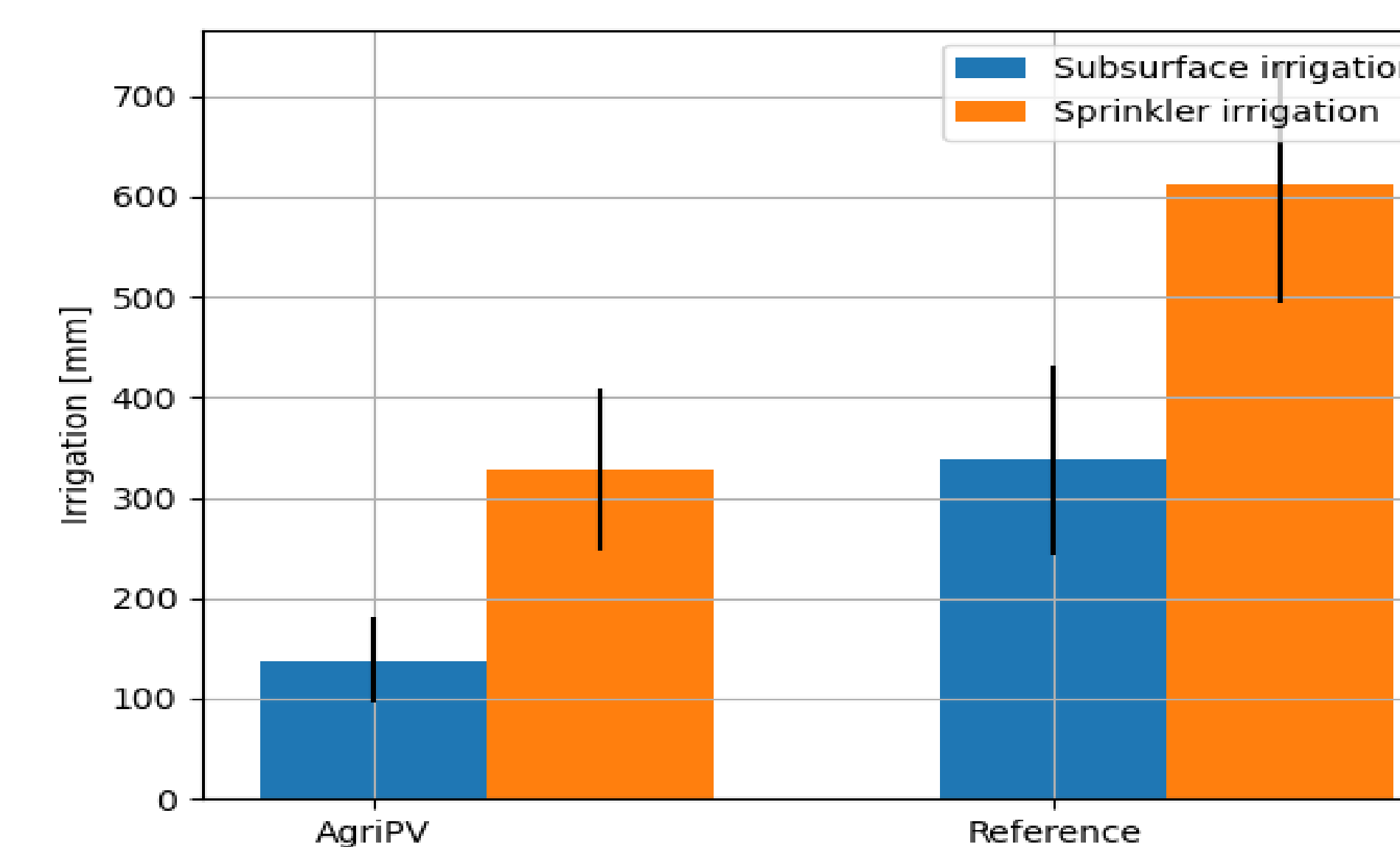
- Optimization study valid for several projects
- AgriPV reduces watering needs by 50%
- Crop yield reduced by 30%. Solution: lenticular diffusers
- Green electricity production: 53,000 MWh/year
- Timber logs are relevant for PV structures

Studies and results

PV generation



Watering needs



Agricultural production

It shows a reduction in crop yield of around 30% on average. However, this reduction is overestimated as we were unable to take into account the influence of lenticular diffusers (Even-Lighting) in the STICS crop model. It has been shown that diffusers significantly help to avoid too much crop yield reduction.

Optimal dimensions

