

Agrovoltaik - Landwirtschaft unter Photovoltaikanlagen

Masterthesis in the Department of Regenerative Energien & Energieeffizienz
and in the Department of Agricultural Engineering

1. examiner: Prof. Dr.-Ing. habil. Peter Zacharias
2. examiner: Prof. Dr. Oliver Hensel

presented by: Obergfell, Tabea

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abstract

The need for more renewable energy sources causes serious conflicts with agricultural practice, particularly with regard to photovoltaic plants which compete in many places for the same land units. This conflict can be alleviated by combining production of electricity and food on the same unit. The present study investigates the concept of agrovoltaic, which uses a special system-technology to enable intensive agricultural land use and photovoltaic electricity generation simultaneously. This study focuses on the question of the feasibility of the agrovoltaic concept in Germany regarding the technical and economical constraints. The first section deals with the impacts of a PV power plant on the microclimatic conditions and the identification of promising food crops. Subsequently, the required system configurations from an agricultural perspective are being elaborated and models of the overall productivity of an agrovoltaic system are being developed. As a result, compared to the conventional separated generation of PV electricity and food, land productivity increases by 55 to 75 %. However, a microeconomic analysis clarifies that agrovoltaic can be financially profitable and compete with low levelized costs of electricity of PV or off-shore wind energy. Nevertheless, at given appropriate suitable political and economical framework conditions, with a technical potential of 50GWp agrovoltaic could make an important contribution to the future energy supply. This work aims to lay the foundation for the practical implementation of a pilot project and opens the perspective on application options in arid zones of the tropics and subtropics.

Keywords: Agrovoltaik, Landwirtschaft, Photovoltaik, Flächennutzung, Machbarkeitsstudie, Doppelernte