

IZTECH ME401 Project Proposal

Advisor: Prof. Dr. Gökhan Kiper

Project title: Design of olive tree shaker with a deployable umbrella

Number of groups: 1

Number of students in each group: 5

Is the project within the scope of Co-Op Extended?: May be (Mecalac)

Project Background: Türkiye is among top olive producers in the world. In recent years olive farmers have a hard time in finding the necessary labor for harvesting. Machines of various types and sizes are used in olive harvesting. The aim of this project is to design a compact and capable harvesting machine that can work on narrow paths. The tree shaker should comprise an attachment that is connected to a vehicle such as a loader, that has an arm should with pitch and roll dof and a deployable umbrella.

Project Objective:

- To design a compact olive harvester attachment that can operate in narrow paths

Project Design Criteria:

- Shaking frequency: ≥ 1200 strokes/min
- Should be able to travel between trees with ≥ 5 m apart
- Umbrella diameter: ≥ 6 m
- Load (olive) capacity: at least 500 kg
- Maximum mass (w.o. umbrella): 600 kg
- Harvesting speed: ≤ 2.5 min per tree

Expected Outcomes:

- Detailed design of a full-scale tree shaker verified via simulations
- A full-scale prototype (if the financial sponsor approves the design)

Sustainable Development Goals: 5

The project aims to increase olive harvesting efficiency. The project is related to SDG2 (Zero hunger) via target 2.4 (By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality) and 2a (Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries)

Literature Survey Subjects:

- Conditions of olive farms in Türkiye (tree types, capacity, terrain info, planting distance, etc.)
- How to prepare an olive farm for machinery harvesting (pruning, ground, etc.)
- Oil harvesting machines (types, properties, operations, etc.)
- Ideal properties of olive tree shakers (vibration frequency, acceleration, duration, etc.)
- Deployable umbrellas used in tree shakers

Please write your notes below, which you find useful for students to know about the project.

The students should have a good background (grade CC or higher) of theory of machines.