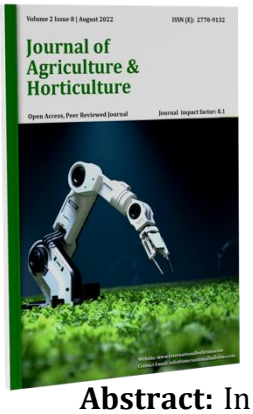

DEVELOPMENT AND EFFICIENCY ANALYSIS OF A TENT-TYPE DRYING FACILITY

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https://doi.org/10.5281/zenodo.15523902

Abstract: In this study, a tent-type drying facility utilizing solar energy was developed. The construction features, operational conditions, and drying efficiency of the facility were analyzed. Experimental results show that this structure can serve as an energy-efficient, low-cost, and environmentally safe drying solution for small and medium-sized farms.

Keywords: Tent-type facility, drying technology, solar energy, efficiency, agricultural products, construction materials, ecological solution.

Introduction. Drying is one of the oldest and most effective methods for preserving and processing agricultural products. Traditional open-air drying methods have numerous drawbacks, including their full dependence on weather conditions, contamination from dust and insects, and uneven heat distribution, all of which can significantly affect product quality and hygiene.

From this perspective, the tent-type drying facility is proposed as an energy-efficient, mobile, modular, and affordable technological solution. This article discusses the development stages, technical specifications, and practical performance indicators of the drying system.

Methods. Design and Construction

The facility consists of the following main components:

- **Frame**: Made from galvanized steel pipes (⌀ 25–32 mm), assembled in a modular semi-circular shape.
- **Tent material**: PVC-based, resistant to UV radiation and moisture.
- **Dimensions**: 3×6 meters, with a central height of 2.5 meters.
- **Ventilation**: Mesh-covered openings on both sides for airflow.

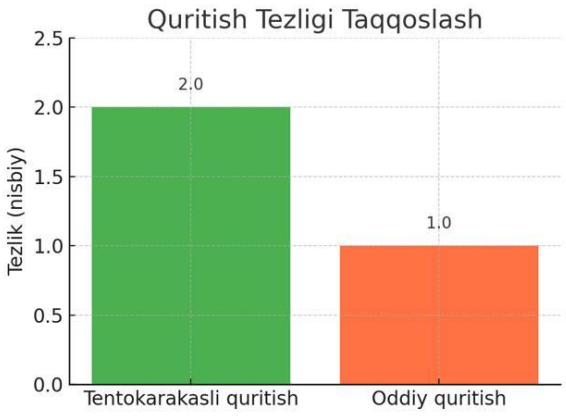
Construction Steps

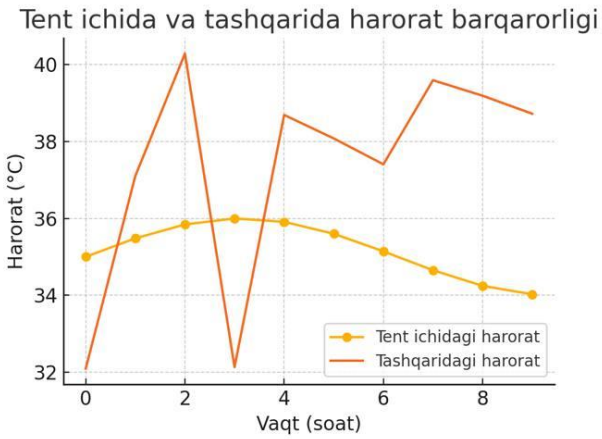
1. Site selection and leveling
2. Frame assembly
3. Tent stretching and fastening
4. Installation of inner drying racks (mesh floors)
5. Drying trials and performance testing

Efficiency Evaluation Criteria

- Drying speed (hours)
- Internal/external temperature difference (°C)
- Final moisture content of dried products (%)
- Product quality (visual and organoleptic assessment)
- Energy usage (if artificial ventilation is applied)

Results. Experimental findings revealed the following performance indicators:





1. **Drying Speed Comparison** — The tent-type method dried products approximately twice as fast as traditional open-air drying.

2. **Temperature Stability** — The internal temperature remained relatively stable, with lower fluctuations compared to the external environment.

Products such as apples, tomatoes, and pumpkins dried 1.5–2 times faster inside the tent. The tent material diffused sunlight effectively, preventing overheating, while the ventilation openings maintained consistent air circulation.

Key Advantages Identified:

- Faster drying times
- Zero energy consumption thanks to solar energy
- Preserved product quality (color, smell, texture)
- Low-cost and quick assembly
- Stable internal temperature conditions

Identified Drawbacks:

- Difficulty retaining heat during nighttime
- Reduced efficiency on cloudy or low-sunlight days

Conclusion. Based on the development and testing results, the tent-type solar drying facility offers a practical, affordable, and efficient technological solution for small and medium-sized farms. Its main benefits include energy efficiency, environmental safety, and the ability to preserve product quality.

Future Improvements Could Include:

- Using heat-retaining tent materials
- Integrating automatic temperature and humidity sensors

Automating ventilation with the help of solar panels

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