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Green Economy in Eastern Partner Countries

GTI ARTICLE 3 – "Geo-Organic"

Greening the Industry – Georgian enterprise "Geo-Organic" LTD benefits from taking part in the EU4Environment company assessment

Since the early days of history, dried fruits and nuts have been part of the human diet. The drying process provides considerable advantages for the preservation of fruits whilst maintaining nearly the same qualities as their fresh counterparts, with dried fruits being popular both as stand-alone products as well as additives used in pastries and baked products.

They are straightforward to produce, easy to store and consume, and a good means to deliver the bioactive compounds essential in promoting good health and preventing diseases.[1] The low pH of fruits, the low moisture content, and the presence of natural antimicrobial compounds in the finished products, together with the hygienization process supported by the drying temperatures, have all turned dried fruits into a safe and long-lasting supply of vitamins and nutrients.[2]

Since around 1500 BC, Mesopotamians, ancient Greeks, and the inhabitants of the Caucasus, alongside many other people, have used drying as an effective means to preserve and store food. Today, dried fruits are produced in many regions of the world, and are readily available in many varieties across different countries and markets. The world produces approximately 3 million tonnes of dried fruits per year, with grapes and dates being the most prevalent choices, estimated at around 1.33 and 1.11 million tonnes, respectively.[3] Apart from these two, other fruit varieties, such as figs, apricots, or plumbs have become popular options over the years.

In the past, dried fruits were made by removing most of the humidity from fresh fruits through methods like sun drying or air drying. More recently, machines such as dehydrators or microwave drying are being used. Sun drying remains particularly widespread, as it was the dominant method of drying fruits for over millennia, for which the hot Middle Eastern sun provides an excellent

[1] Alasalvar, C., Salvadó, J.S. and Ros, E., 2020. Bioactives and health benefits of nuts and dried fruits. *Food Chemistry*, *314*, p.126192.
[2] Shah A. S, Bhat S. V, Muzaffar K, Ibrahim S. A, Dar B. N. Processing Technology, Chemical Composition, Microbial Quality and Health Benefits of Dried Fruits. Curr Res Nutr Food Sci 2021; 10(1). doi : http://dx.doi.org/10.12944/CRNFSJ.10.1.06
[3] https://www.statista.com/statistics/959950/dried-fruits-global-production-by-type/

medium. Depending on the region and the raining season, this method is also cost-effective and straightforward.

The drying process begins with the reception of the chosen types of fruits. Then, the fruits are cleaned, sorted (with the unsuitable products being discarded), sliced, and stored on a special site. Here, the products rest for up to 18 hours. Depending on the contents, types of fruits, and their general characteristics (water content, the size of slices, and so on), the drying time varies from fruit to fruit. The drying process is also highly dependent on the type of dryer used. They can be conventional sun driers, or heated by electricity or natural gas. In this part of the production process, the aim is to maintain a constant temperature of around 60-70°C to reduce the water content of the fruits to 15% of the initial amount.[4]

Once the necessary qualities of the dried fruits are met, the fruits are removed from the drying area, packaged, and distributed for retail.

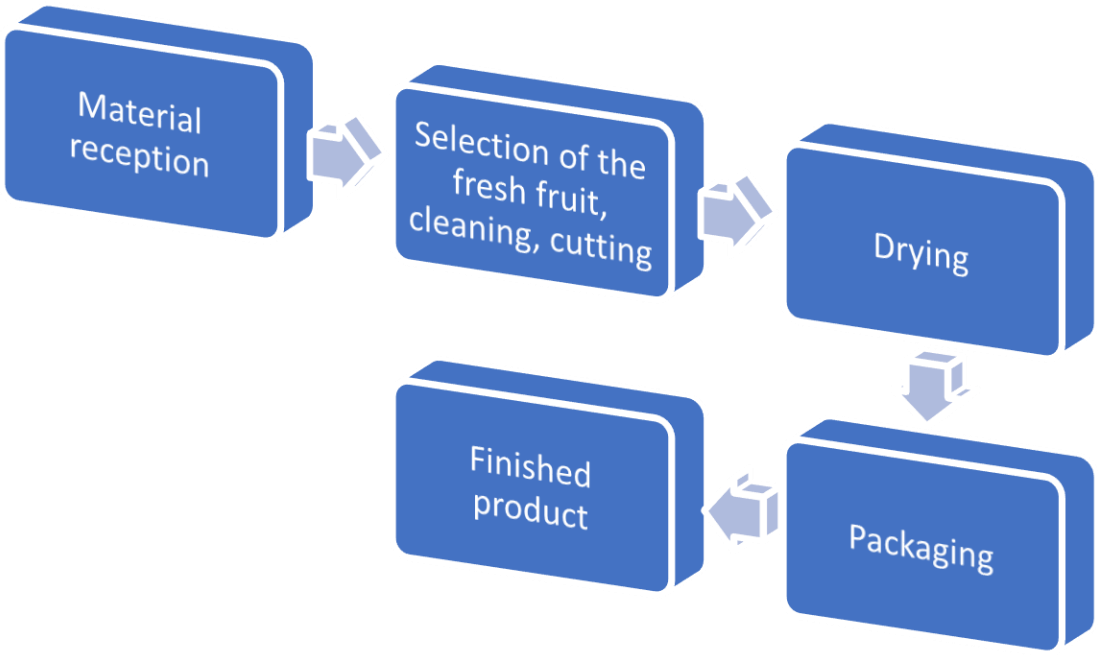

Figure 1. The process flow chart for drying fruits

Geo-Organic and its' endeavour to improve its resource efficiency

"Geo-Organic" Ltd. is a mid-sized company located in Sagarejo, which employs around 100 local workers for the industrial-scale production of dried fruits and jams. For this purpose, the company uses both commercially available steam dryers as well as sun-based dryers. The company started its operation in 2019, however, as a result of partially inefficient utilization of the existing equipment and machinery, in 2020, it produced only 22 tonnes of dried fruits and derivates (instead of the 120 tonnes design capacity). This prompted the company representatives to join the UNIDO Resource Efficient and Cleaner Production (RECP) Demonstration Project under EU4Environment Action funded by the European Union. Between

[4] https://www.fao.org/3/au111e/au111e.pdf

2021-2022, RECP experts evaluated the main site of the enterprise and identified key gaps and resource inefficiencies. The RECP team was then able to identify key inefficiencies in terms of thermal energy consumption, the design of the energy systems, and the optimization of the available machinery. To improve the observed inefficiencies, two major measures were identified to increase energy efficiency and production output, and reduce waste and CO_2 emissions. As potential solutions, the installation of a heat recovery system was proposed (to use the thermal energy from the exhaust air). This would result in annual energy savings of around 22,590 kWh of thermal energy or 3,000 m^3 of natural gas. The investment cost for the implementation of this recommended measure is estimated at €5,000[5] (14,000 GEL), with annual energy savings of €1,441 (4,146 GEL), and a simple payback period of 3.7 years. According to the data collected by the RECP experts, the annual CO_2 emissions would also be reduced by 4.6 tonnes, each year.

To increase the existing production capacity and the usage of solar dryers, a second recommendation was to improve the ventilation through the dryer and install a buffer tank to support the drying process at night.

To maintain the necessary temperature and humidity in the dryer at night, an additional heating capacity of 50kW should be provided. This would raise the estimated annual natural gas consumption for one solar dryer room to 19,947 m^3 per year (150,000 kWh per year). Nevertheless, the introduction (including the vacuum tubular panels and the thermally insulated hot water tank) with an estimated operational time of eight hours would partially decrease the annual natural gas consumption up to 8,000 m^3 per year (60,000 kWh per year), bringing the company financial savings worth €3,929 (11,000 GEL) every year. The total investment cost for the implementation of this measure is calculated at around €14,393 (40,300 GEL), and, based on the estimated monetary savings and investment, the payback period of this measure would be around 3.7 years with a reduction of CO_2 emissions of 12 tonnes each year.

[5] Exchange rate for EURO is taken at 1 EUR = 2.8 GEL