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## Routes to recycle food byproducts into food value chains

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The bioeconomy approach calls for a transition of food production processes from linear systems to circular systems, that mimic natural cycles and have the capacity to utilize by-products as resources. The present report aims to illustrate three strategies to use food by-products as raw materials for food value chains. Winemaking by-products are considered as a case-study. These latter mainly consist of grape marc (skins and seeds). According to the FAO, ~80 Mt of grapes are produced throughout the world annually, most of which were used in winemaking, generating approximately 3.4 Mt of grape marc. In the first recycling route, grape marc are processed to obtain health-promoting food ingredients to be used in functional cereal-based, dairy, and fruit-based products that can be applied as a dietary intervention to prevent major chronic diseases, such as cardiovascular disease and diabetes. A second route is to process grape marc into clean label food additives with multifunctional properties such as antioxidant, colorant or thickening agents that replace the synthetic ones in meat-, fish- and fruit-based products. The third route aims at a sustainable production of proteins and vitamins, thus addressing the needs of populations with endemic nutritional deficiencies. Grape marc are therefore used as a growth substrate for the basidiomycetes fungi belonging to the genus *Pleurotus*, which possesses a complex enzymatic system that converts lignocellulosic materials into a fungal biomass that is rich in proteins, with a valuable essential amino acid scoring pattern, as well as in D and B-group vitamins.

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