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The support of local farming communities and crop production resilience to climate change through the cultivation of giant reed (Arundo donax sp.). An Italian case study.

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In literature on climate change, the bioenergy crops are well known for their ability to reduce greenhouse gases emission and increase the soil carbon stock. Nevertheless, in several countries they are considered in competition with food crops, representing a problem for facing the current and future "Food Security" issue related to climate change and population increase.
At same time, in order to sustain local farming communities and crop production, mitigation actions at farm scale are identified to face climate change. However, in some cases the specific actions required by the pedo-climatic conditions, are not always economically sustainable by farmers.
In this contest, the energy crops with high environmental adaptability and high productive performances, as the giant reed (Arundo donax spp.), cultivated in the areas not suitable for food crop (marginal areas) may represent an opportunity to increase the farmers' incomes, through the direct sale of above ground biomass (AGB) (as raw material for energy or green chemistry) or by means of the obtained biofuel or biogas. Moreover, the bioenergy crops, with low-input cropping systems (i.e. without irrigation and fertilized with compost from organic residues) are considered the most efficient crops for Greenhouse Gases reduction. In fact, they have a direct effect on processes affecting the CC at global scale: i) preserving and improving the soil carbon stock, ii) reducing the soil tillage and preserving the soil erosion, iii) allowing the conservation of fossil fuel resources with a reduction of CO_2 emission in the atmosphere. Finally, their high environmental adaptability allows a riparian vegetation use (in the soils near water drains or rivers) with an important effect on the interception of nutrients as nitrogen and phosphorus that, if leached, have a high environmental impact on watercourses (e.g. eutrophication). Thus the correct use of this crops allows to respond to 3 of 17 Sustainable Development Goals (SDG) of United Nations: (i) SDG 2 on food security and sustainable agriculture, (ii) SDG 7 on reliable, sustainable and modern energy and (iii) SDG 13 on action to combat climate change and its impacts.
Therefore, in order to support the resilience of local farming communities and food production, a mitigation action to face climate change can be bases on the assessment of the possible increase of farmers' incomes derived by the cultivation of bioenergy crops in their marginal areas.
On these premises, we have evaluated the giant reed responses in the marginal areas of an agricultural district of southern Italy (Destra Sele) and evaluated the expected farmers' income in a near future (2021-2050) through a simulation model application.
In order to realize this applicative and pro-active approach to farmer support, the normalized water productivity index of giant reed has been determined, through the use of agro-hydrological model SWAP, calibrated and validated on two years of long term field experiment on giant reed, realized within of study area.

Keywords: Climate Change; SWAP; giant reed;water productivity (WP); Sustainable Development Goals (SDG)