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Bound Topic of Research: "Climate change mitigation and adaptation: risks, impacts and resilience"

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TITLE OF THE PROJECT : Economics of Agroforestry Systems as Climate Change Mitigation Strategy in Mediterranean Region	
THEME:	INNOVAZIONE GREEN ✓
RESEARCH PROPOSAL	
<p>Introduction:</p> <p>Globally, the humans and their environment are facing alarming situation due to increased disturbance of nature's balance. The disturbance caused to the environment has resulted in extreme climatic events, occurring frequently in terms of droughts, sea level rise, floods and heat waves. These extremes will have impact on different dimensions of life, but the most precarious of them will be through deterioration in quality and productivity of food grains. Several research studies around the world have proven the deleterious effect of climate change on agriculture.</p> <p>Agriculture sector is a significant contributor to global warming because of greenhouse gas (GHG) emissions such as carbon dioxide (CO₂), nitrous oxide (N₂O), and methane (CH₄). A report by Mediterranean Experts on Climate and Environmental Change (MEDECC) in 2019 highlighted about risks in the Mediterranean region associated to climate change. The rise in temperature in the region is higher than the current global warming trends (+1.1° C). The impacts will apply additional pressure on already exhausted ecosystems and on vulnerable societies and economies.</p> <p>Agricultural systems are complex and it is necessary to work on a holistic way in order to sustain biodiversity in agriculture. In this regard, it is important to work with citizens and farmers. Deressa et al. (2009) identified major climate change adaptation methods, including use of different crop varieties, tree planting, soil conservation, early and late planting, and irrigation. Results of their study, based on discrete choice model indicated that farmers' choices were influenced by the level of education, gender, age, and wealth of the head of household, access to extension and credit etc. Precision agriculture and smart farming can also play a crucial role in sustainable agriculture.</p>	

A farming organization name as Linking environment and Farming (LEAF) has prominently supported the integrated farming system. LEAF (2017) stated that the integrated farm management consists of the use of traditional methods and modern technologies, and incorporate the continuous improvement across whole farm. The basic objective of integrated farming (IF) is to effectively recycle the farm residue within system and to ensure optimal utilization of available resources without damaging the resources base environment, in other words, to achieve the agro-ecological equilibrium. The crucial factors in IF systems are the collaborative transfer of resources among enterprises, inter-dependence within the system among enterprises, and flexibility in the system for long-run sustainability (Vereijken, 1989; Hendrickson et al., 2008).

The motivation of the proposed study is towards the huge potential of Agro-Forestry (AF) for increasing the resilience of agro-ecosystem in light of climate change. Agro-forestry is a farming system to increase production of land resources. An integration of forestry component with crops can contribute for mitigation and adaptation to climate change (Hernandez-Morcillo et al., 2018). AF is considered to support and sustain multiple environmental and socio-economic benefits through the integration of trees in agricultural landscapes. Usually, the communities organize themselves for collective action in order to manage resources that are salient for the community (Gibson & Becker, 1999).

The literature on agro-forestry innovations can be broadly divided into three categories. Firstly, in context of innovation such as adoption of innovations holding characteristics preferred by the diversity of households and environmental friendly (Ajay et al., 2011). The attributes of innovations determine its adoption. The improvement in appropriateness of Agro-Forestry (AF) innovations according to farmers' needs increased their uptake (Rogers, 2003). However, higher profitability, better retail prices and increased income facilitate the innovation adoption whereas lack of noticeable revenues impedes the adoption (Conteh et al., 2016). Secondly, household context, that refers to common determinants of AF adoption such as local environment, individual farm-household characteristics and social networks (community meetings), is considered as important in AF adoption decisions (Ndayambaje et al., 2012; Abiyu et al., 2016; Amare et al., 2019). Besides, the third category is about the factors that influence the AF adoption decision of farm households but are not in the immediate reach such as institutional circumstances. Similarly, market features, access to credit, and provision of subsidies enhance the farmers' willingness to adopt AF innovations (Gyau et al., 2012).

A most common method employed in the studies for data collection is a formal household survey. Some studies are based on experimental data and aerial imagery (Bucagu et al., 2013; Amare et al., 2019). However, there are still lack of studies with econometric models and a more robust panel data analysis.

Objective:

The specific objective of the proposed study is:

- i. To assess the nature and extent of agroforestry systems adopted in Mediterranean
- ii. To investigate the factors affecting farmer's decision and willingness to adapt agroforestry as sustainable agricultural practices
- iii. To identify the factors that ensures the sustainability of collective action.

Methodology:

For sustainable agro-forestry development, formulation of management plans for the

implementation of agro-forestry programs and participatory planning is essential. For the objective proposed under the study, the recommended agro-forestry innovative farming practices will be enlisted for assessing their extent of adoption. This will be done through literature review and in consultation with agricultural scientists.

Data for the proposed study will be collected from cross-section of farm households, through stratified random sampling. Farm specific indicators such as area & age of a specific farm, farming experience, cost of production & revenue generation will be considered. Additionally, five agronomists, environmental and business advisors will also be the part of semi-structured interviews. The extent of adoption of concerned farming system and factors affecting their decision and willingness of adoption will be analyzed using Logit / Probit model. The economics of adopting innovative farm practices will be estimated using standard economic framework, including returns over a period of time.

The theoretical idea for the proposed study will be Utility framework (theory of utility maximization) for the farmer's willingness to adopt. Suitable statistical tools will be employed for testing of research hypothesis, which mainly include positive impact of the proposed farming systems on food and climate.

Significance & Expected Results:

The climate smart sustainable agro-ecosystem is the need of the hour and policy makers all over the world are suggesting the large scale adoption of practices. There is a requirement to highlight the willingness of farmers, the limitations and constraints in adopting sustainable agro-ecosystems so that effective measures can be implemented for maximizing social benefits.

Therefore the proposed study is expected to generate the following outcomes:

- The study will help in understanding the current level of adoption of agro-forestry, its role in mitigating climate change effects
- The study will also help in generating data regarding farmer's willingness about the adoption of agro-forestry farming systems for strengthening policy planning.
- The results will be helpful for encompassing the risks related to sustainable agro-ecosystems.

Relevance:

Agroforestry system produces energy in a sustainable manner to ensure sustainability. Besides, it is an important source of raw material for the industries. It is the necessity of the time to study the systems adopted in agro-forestry and the existing limitations to the adoption. So the present study will be in coherence with the previous research theme of SNSI (i.e. industrial sustainability & prevention of risk events). As the proposed system will provide cushion against risk and uncertainties towards climate change.

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