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EXTENDED ABSTRACT
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# Promoting Climate-Smart Agroforestry Practices: A Case of Maryland, USA

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Agriculture in the U.S. accounted for 9.4% of the total greenhouse gas (GHG) emissions in 2022, primarily due to agricultural soil management, rice cultivation, urea fertilization, liming, burning of agricultural residues, enteric fermentation, and manure management. However, agriculture also has significant potential to combat climate change through the adoption of Climate-Smart agricultural and forestry (CSAF) practices, which aim to reduce GHG emissions and enhance carbon sequestration. U.S. croplands can store approximately 140–347 million metric tons of carbon equivalent per year. The expected annual soil carbon sequestration potential for no-till and reduced-till practices is 0.77 tons and 0.49 tons of $CO_2$ equivalents per hectare (t $CO_2e$ $ha^{-1}$ $yr^{-1}$), respectively. Similarly, agroforestry systems can increase soil organic carbon stock by 2.71 (0.84 – 4.23) t $CO_2e$ $ha^{-1}$ $yr^{-1}$. Despite such significant potential and opportunity, the adoption of these CSAF practices among small-scale and minority producers is nonexistent or minimal due to challenges such as lack of education, awareness, technical knowledge, funding, and motivation to change traditional agricultural practices. Promoting CSAF practices among small-scale and minority producers is crucial to mitigate climate change and minimize its negative externalities in agricultural production and productivity. Therefore, the study objectives were to (i) promote the adoption of CSAF practices among small-scale and minority farmers, and (ii) identify and assess the factors determining the adoption of CSAF practices among these producers.

To achieve these objectives, an outreach study cum demonstration project was conducted by the University of Maryland Eastern Shore (UMES) Extension. Participants, including beginning, socially disadvantaged, veteran, and limited-resource producers, were recruited, and five demonstration sites were established in Maryland (Princess Anne, Crisfield, Glen Arm, Germantown, and Mardela Springs). At these sites, CSAF practices were implemented by planting climate-resilient, high carbon sequestration potential fruit trees such as fig (*Ficus carica*), persimmon (*Diospyros kaki*), pawpaw (*Asimina triloba*), apple (*Malus domestica*), and peach (*Prunus persica*) in rows spaced 25-30 feet apart (Fig. 1). In the alleys between these rows, fruit shrubs like blueberry (*Vaccinium corymbosum*), and vegetables such as pumpkin (*Cucurbita pepo*), watermelon (*Citrullus lanatus*), eggplant (*Solanum melongena*), sweet potato (*Ipomoea batatas*), bell pepper (*Capsicum annuum*), cantaloupe (*Cucumis melo*), and tomato (*Solanum lycopersicum*) were planted, using minimum tillage practice. Moreover, natural hardwood mulch and weed-barrier fabrics were applied to control weeds and manage water efficiently. In addition to establishing demonstration sites, the demonstration project offered need-based training, workshops, field days, interactive meetings, and mentor/specialist consultations to educate the participants about CSAF practices. Furthermore, some production inputs such as manure/fertilizers, seeds, saplings, weed-suppressing ground fabrics, and garden tools were provided to the participants to encourage active participation.

For the study, 36 project participants from Glen Arm and Rosedale, Maryland, were selected through a purposive sampling method. A semi-structured questionnaire was used to collect both qualitative and quantitative data from the participants. Data were analyzed using Excel and SPSS 25.

The descriptive results revealed that approximately 61% of respondents ($n = 36$) acknowledged the role of trees in CSAF practices for mitigating greenhouse gas emissions. Additionally, 78% of respondents expressed a willingness to participate in capacity-building activities related to CSAF practices. Furthermore, individuals who recognized the benefits of trees in CSAF practices were more likely to engage in capacity-building activities (e.g., training, workshops, field days, and specialist consultation) ($\phi = 0.396$, $p < 0.05$). The high willingness of respondents (78%) to participate in capacity-building activities highlights participants' growing awareness about the importance of adopting CSAF practices to address the issues of climate change. Overall, the findings suggest that promoting and increasing awareness of the benefits of CSAF practices, such as reducing GHG emissions and increasing carbon sequestration, can lead to greater participation in capacity-building activities, thus enhancing broader adoption among small-scale and minority producers. These results provide valuable insights for extension personnel and policymakers in developing effective strategies to strengthen the capacity of small-scale and minority producers and promote the adoption of CSAF practices.

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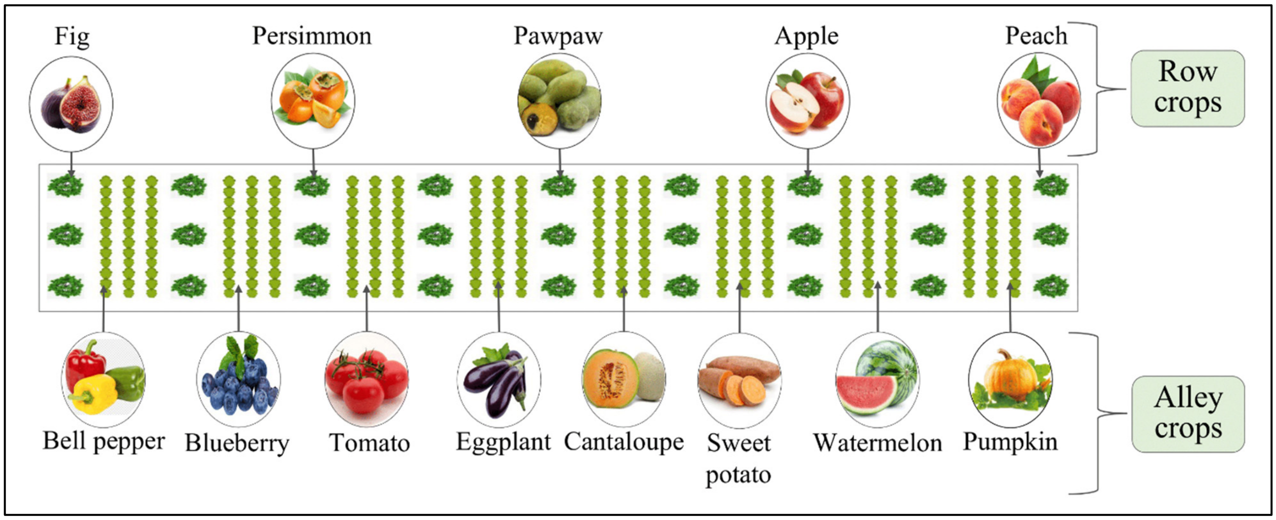


**Figure 1.** UMES Extension's alley cropping model and its CSAF commodities. Note: The model depicts only the commodities used; the number and layout of the row and alley crops varied across demonstration sites.

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