Moringa yield benefits from innovative pollination intervention

Planting attractant crops as inter and border crops in the Moringa ecosystem can improve insect pollinator diversity and its abundance

No. of fruit sets increased by 15 %

Tagetes erecta

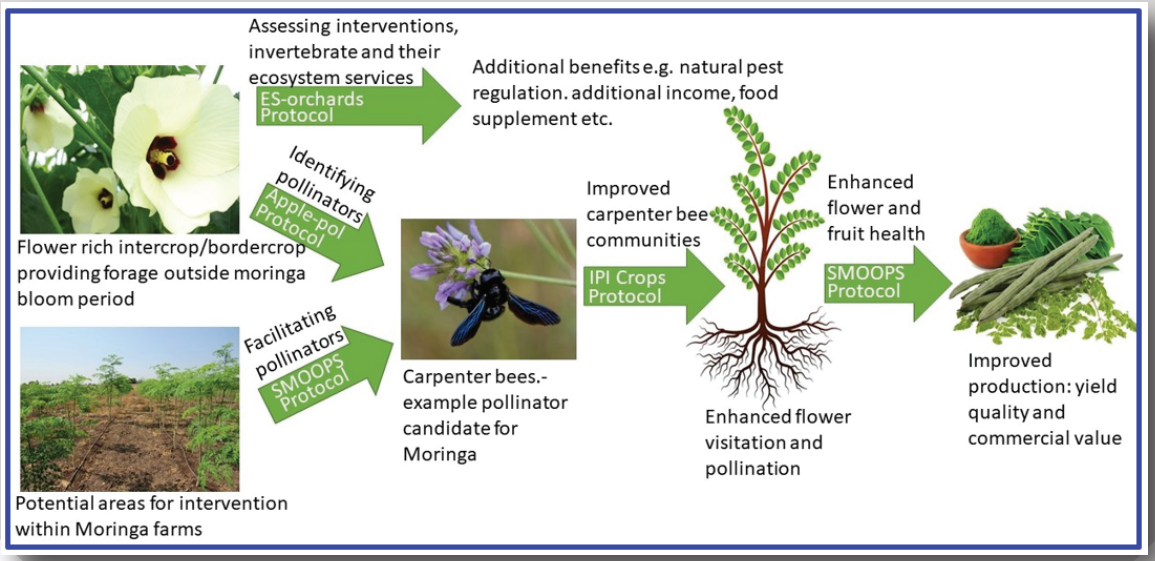
Context

Moringa (Moringa oleifera) popularly known as Drumstick, is less water requiring and economically important crop, which is increasingly being cultivated by smallholders. In Tamil Nadu, Moringa is widely cultivated in Dindigul, Karur and Coimbatore districts. The crop is cross-pollinated, and insects are essential for pollination. On average, Moringa flowers bloom for 45-60 days in February-May season, and 55-70 days in September-November. Insect pollinators are crucial during the flowering period for higher Moringa pod production. However, they are declining due to crop intensification and Moringa mono-cropping, landscape simplification and transformation, also declining natural habitat spaces for pollinators. Besides, insect pests of Moringa are mostly managed by the chemical pesticides, and this further limits the insects visiting the flowers having a direct consequence on pod yield and quality.

Intervention

Floral diversity in the agricultural ecosystem directly influences pollinator abundance, diversity and corresponding activities in the crop-fields, by attracting various group of insect pollinators. Planting such attractant crops as co-crops within the Moringa ecosystem has potential to increase pollinator diversity and also conserve pollinators when pesticides are sprayed. Marigold (Tagetes erecta) and Redgram (Cajanus cajan) were selected as inter and border crops during consultation with farmers. The effect of floral intervention on flower visitors and pollination services in Moringa were assessed in 12 paired-fields. Each pair contained one intervention site with floral enhancement crops in the form of inter- and border-cropping, and the other was the control site without any floral intervention. Two rows of red gram were planted as border crops and two rows of marigold as intercrops.

Stationary observation was made for both Moringa and attractant crops to record the insect pollinators visiting the crops. To assess the increased benefits from insect pollinators because of attractant crops, pollination service was measured by open pollination, pollination exclusion / closed pollination and supplementary / hand pollination



Cajanus cajan

techniques. Numbers of fruits were counted initially at the fruit-set stage, and then again just before harvesting to calculate percentage fruit set. Crop quality parameters were also recorded including number of seeds per pod (seed set), length, diameter and weight at the time of harvest. Technical manuals and calendars were prepared with high resolution images of Moringa insect pollinators in vernacular language, and their benefits were explained to farmers.

Additional cost involved in the interventions were Rs 354 per acre. This include seed and seedling costs of both co-crops, labour charges, and investment in drip irrigation pipes for intercrop. This initial investment is compensated from the income of flower and grain yield of Marigold and Redgram respectively at the time of harvest. Income ranges from Rs 400-440 per acre. Hence the floral intervention is cost-effective for farmers to adopt.

Outcomes

- Suitability of inter and border crops for different seasons were identified. Both crops were suitable for Rabi season, but only the border crop was successful in Kharif season. Additional irrigation is needed to maintain Marigold, and not suitable for Moringa growth.

- Number of fruit sets increased by 15 percent and quality of the fruits in Moringa such as fruit length, fruit girth and number of seeds viz., 15, 10 and 10 percent were more in the intervention field

- Major insect pollinators (total of 30 species) recorded were nine species of bees, five species of wasps, seven species of flies, and nine species of butterflies and moths as important pollinators for moringa fields. Floral visits were dominated by bees constituting 1410 observations in control sites, and 2035 observations in intervention sites. Regarding all floral visitor species, the number of flower visits were significantly greater in the intervention sites (64.42 ±22.94) than in the control sites (43.08 ±16.29).

- Results were shared with farmers to raise awareness on insect pollinators. Before interventions, most farmers were unaware about role of insect pollinators in moringa yield. After interventions, farmers considered pollinators and planned pest management schedules without affecting insect pollinators. After the interventions, more than 100 farmers replicated the model with both inter and border crops or one of the crops.

- Acceptance of the technology was higher among farmers due to its simplicity, economic viability and environmental benefits. It is one of the Nature Positive Solutions in agriculture to improve ecological services (pollination) and increase biodiversity in farmers field to bring additional agro-ecological benefits.

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