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Assessment of farmer-adopted agroforestry systems in Panagar block of Jabalpur district, M.P.

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Abstract
To chronicle the agroforestry system used by farmers in their field area, a study was carried out in the Jabalpur district's Panagar block. During 2024–2025, farmers were surveyed using questionnaires to gather information on topics such as tree species selection, horticultural and agricultural crops, animal husbandry and planting patterns (on bunds, blocks or scattered in the field). The findings showed that the six agroforestry system types that the farmers of the Panagar Block liked were the agri-silvi-horti system, the agri-silvi-pasture system, the hori-agri system, the silvi-agri system, the agri-horti-pasture system and the silvi-agri-horti-pasture system. Compared to other systems, the productivity for the Horti-agri system adoption rate (29%) was higher. Additionally, it was reported that the majority of farmers preferred the following fruit-based systems: Agri-silvi-horti, Horti-agri, Agri-horti-pasture and Silvi-agri-horti-pasture: Mango (33.59%), Ber (26.72%), Guava (16.79%), Papaya (12.21%), Amla (6.87%) and Bel (3.82%). In contrast, the tree-based systems were preferred by Teak (26.53%), Mahua (20.41%), Neem (14.29%), Tendu (13.27%), Eucalyptus (10.20%), Palas (9.18%) and Acacia (6.12%). The majority of farmers raise livestock. In their fields, the majority of farmers favor bund and scattered planting.

Keywords: Panagar block, agroforestry system, farmers, productivity, tree-based system, fruit-based system, livestock, planting

Introduction
Following the green revolution, India's economy has grown quickly. However, the nation is also dealing with the effects of a rapidly expanding human population (Gupta *et al*., 2017) [7]. It has an impact on household socioeconomic circumstances, land holdings, land use patterns and cropping patterns (Sarvade and Singh, 2014) [13] (Sarvade *et al*., 2020) [11]. According to the National Agroforestry Policy (NAP, 2014), agroforestry systems are the sole way to enhance tree cover. According to the Sub-Mission of Agroforestry (SMAF) Operational Guideline (2016), trees cultivated outside of forests provide almost 65% of the nation's timber needs. Agroforestry currently covers 13.7 million hectares (FSI, 2013) and growing trees outside the forest (TOF) on farmlands can be a practical way to increase the designated forest cover by 33%. In order to produce extra sporadic revenue, it is crucial to raise farmers' awareness of the benefits of implementing promising agroforestry systems in their fields.
Promoting a variety of agroforestry models appropriate for varied agro-ecological zones and land use circumstances is the aim of the Sub-Mission of Agroforestry. There are several promising agroforestry systems, such as the Gmelina + Bach+ Paddy system (Sah *et al*., 2002) [12], the Babul + Paddy, Sagon + Musli (Berry *et al*., 2005) [3], the Bamboo based agroforestry system (Berry *et al*., 2008) [6], the Flemingia based silvi-agri-lac system (Berry *et al*., 2018a) [5], the Gmelina + Pan (Berry *et al*., 2018b) [5], and the Gmelina + Adarak (Berry *et al*., 2021) [10] for Madhya Pradesh. Farming communities must consider the ramifications and adopt integrated farming methods. Agriculture productivity and output could be increased with integrated farming (Yadav *et al*., 2019) [19]. Farmers should pursue income crops to a certain degree in addition to integrated farming, since this will enhance their standard of living and ensure they have access to nutrient-dense food (Arora, 2013) [1]. One of the finest options for sustainable agriculture may be to implement agroforestry systems. Field crops, fodder crops, horticultural crops, fruit trees and forest MPTs (Multipurpose Tree Species) can all be grown in agroforestry.

In order to lower production risk and uncertainty in economic advantages, agroforestry systems may provide a variety of products (Sarvade and Singh, 2014; Sarvade *et al*., 2014; Singh *et al*., 2015; Sarvade *et al*., 2019; Sarvade and Upadhyay, 2019) [13, 15, 18, 14, 16].

According to earlier research, farmers had moderate to low preferences for medicine, cottage industries, handicrafts, fibre or flosses, oilseeds, animals, birds, insects etc. while they preferred species that provided fuel wood, fodder, vegetables, fruit and timber (Gupta *et al*., 2017; Islam *et al*., 2015 and Banyal *et al*. 2011) [7, 8, 2]. Mulukh *et al*., 2017 [9] and Sarvade *et al*., 2020) [11] examined the adoption of agroforestry systems in certain regions of Maharashtra and Madhya Pradesh states, respectively, while Sharma *et al*. (2011) [2] examined the adoption behaviors of farmers engaged in agroforestry in Jabalpur district, Madhya Pradesh (Sarvade *et al*., 2020) [11]. In order to determine if farmers were adopting agroforestry systems, the study was conducted in three chosen villages in 2024–2025.

Methodology

The study was carried out purposively in three selected villages in the Panagar block of Jabalpur district during the FWE programme based on the farmers' acceptance of the agroforestry method. Thirty farmers were selected from each village allotted to the FWE student. The aforementioned data was gathered in 2024–2025 and a survey of 90 farmers and three villages in the Panagar Block was conducted.

Result and Discussion

Six agroforestry system were adopted by farmers, according to the data: agri-silvi-horti, agri-silvi-pasture, hori-agri, silvi-agri, agri-horti-pasture and silvi-agri-horti-pasture. The data are graphically represented in Figure 1. The majority of farmers (29%) used the hori-agri system, which was followed by the agri-silvi-pasture system (24%), agri-horti-pasture system (17%), silvi-agri-horti-pasture system (15%), agri-silvi-horti system (11%), and silvi-agri system (4%).

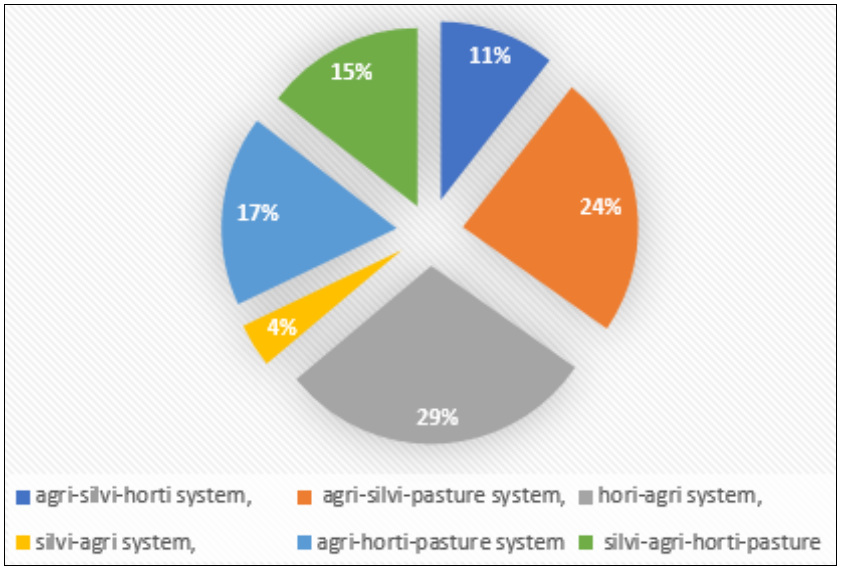

Fig 1: Dominent agroforestry system in panagar block of Jabalpur district, M.P.

According to the data in Table 1, farmers typically grow a variety of crops, including soybeans, rice, wheat, urad, moong, maize, peas and eucalyptus (*Eucalyptus spp*.), neem (*Azadirachta indica*), mahua (*Madhuca indica*), teak (*Tectona grandis*), palas (*Butea monosperma*), tendu (*Diospyros melanoxylon*), and babul (*Acacia spp*.). Additionally, farmers repurposed their fields by planting horticulture crops, such as mango (*Mangifera indica*), guava (*Psidium Guajava*), papaya (*Carica papaya*), bel (*Aegle marmelos*) and amla (*Phyllanthus emblica*). The majority of farmers keep livestock and the population of these animals is made up of milch animals like cows and buffalo. On the other hand, some farmers grew barseem for fodder and others fed paddy and wheat straw as dry fodder. The land holding and land uses are the primary determinants of the tree planting pattern. Block planting comes after bund and scattered planting, which is what most farmers choose on their fields. Farmers are knowledgeable in tree farming; they have kept trees on their field bunds for a variety of purposes, including fuel wood for burning, food for fruits and animal feed.

Table 1: Details on the combination of trees, horticulture crops, agriculture crops and livestock on a farmer's field

Village	Agroforestry system	Tree species	Agriculture crops	Horticulture crops	Livestock	Planting pattern
Saraswa	Agri-Silvi-Horti system	Eucalyptus (*Eucalyptus spp*.), Neem (*Azadirachta indica*)	Soyabean, Rice, Wheat, Urad, Moong	Mango (*Mangifera indica*), Guava (*Psidium Guajava*), Amla (*Phyllanthus emblica*)		Scattered in field, on bund
	Agri-Silvi-pasture system	Neem (*Azadirachta indica*), Palas (*Butea monosperma*)	Rice, Maize, Wheat		Cow	Scattered in field
	Horti-Agri		Paddy, Wheat	Mango (*Mangifera indica*), Ber (*Ziziphus mauritiana*), Bel (*Aegle marmelos*)		On bund
	Silvi-Agri system	Mahua (*Madhuca indica*), Palas (*Butea monosperma*)	Rice			On block
Jatwa	Horti-Agri system		Paddy, Pea, Urad, Moong,	Ber (*Ziziphus mauritiana*), Mango (*Mangifera indica*), Guava (*Psidium*		On bund and scattered in field

			Pulses	*Guajava*)		
	Agri-Horti-Pasture system		Paddy, Maize	Mango (*Mangifera indica*), Amla (*Phyllanthus emblica*)	Cow	Scattered in field
	Agri-Silvi-Pasture system	Teak (*Tectona grandis*), Mahua (*Madhuca indica*), Eucalyptus (*Eucalyptus spp.*),	Paddy, Maize		Fodder crop – Barseem	On bund, on block and scattered in field
	Silvi-Agri-Horti-Pasture system	Teak (*Tectona grandis*), Tendu (*Diospyros melanoxylon*)	Wheat	Mango (*Mangifera indica*), Guava (*Psidium Guajava*)	Cow	On bund, on block and scattered in field
Keolari	Agri-Horti-Pasture system		Rice, Wheat	Mango (*Mangifera indica*), Papaya (*Carica papaya*)	Cow, Buffalo	Scattered in field and on bund
	Silvi-Agri-Pasture system	Neem (*Azadirachta indica*), Babul (*Acacia spp.*)	Rice		Cow, Buffalo	On bund
	Horti-Agri system		Rice, Wheat, Pulses	Mango (*Mangifera indica*), Ber (*Ziziphus mauritiana*)		Scattered
	Silvi-Agri-Horti-Pasture system	Eucalyptus (*Eucalyptus spp.*), Tendu (*Diospyros melanoxylon*)	Rice	Mango (*Mangifera indica*), Papaya (*Carica papaya*)	Cow	On bund, Scattered in field

Under fruit-based farming system it was reported that maximum farmers preferred Mango (33.59%) followed by %), Ber (26.72%), Guava (16.79%), papaya (12.21%) while Amla (6.87%) and Bel (3.82) represents the less preferred among the fruit yielding species in fruit-based system *viz*. Agri-silvi-horti, Horti-agri, Agri-horti-pasture and Silvi-agri-horti-pasture. The data are shown in figure 2.

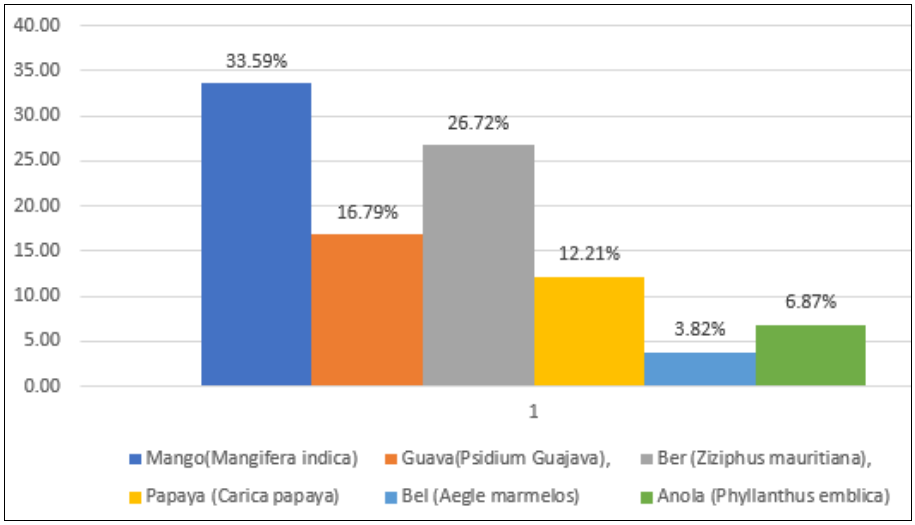

Fig 2: Fruit yielding species prefered by farmers in panagar block of Jabalpur district, M.P.

Additionally, it was reported that the most popular tree-based system among farmers was Teak (26.53%), followed by Mahua (20.41%), Neem (14.29%), Tendu (13.27%), Eucalyptus (10.20%) and Palas (9.18%). Acacia (6.12%) was the least popular tree-based system, such as Agri-silvi-horti, Agri-silvi-pasture, silvi-agri, and Silvi-agri-horti-pasture system (Figure 3).

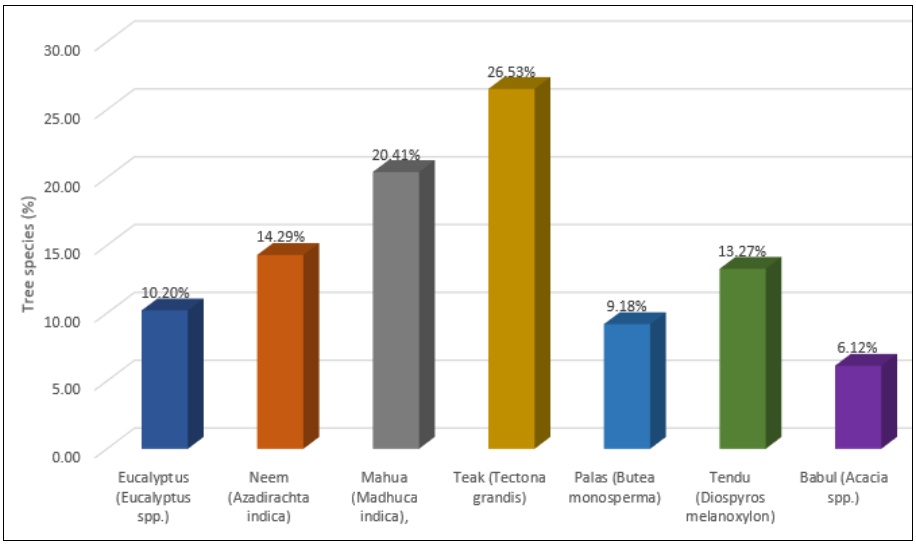

Fig 3: Tree species prefered by farmers in panagar block of Jabalpur district, M.P.

Conclusion

Rice, wheat, maize, soybeans, urad, moong, peas and other crops are the main crops grown in the Jabalpur district of Panagar block. Fruit-bearing species include mango, ber, guava, papaya, amla and bel, while tree species include teak, mahua, neem, tendu, eucalyptus, palas and acacia. All of these trees are kept on the fields of farmers in the district, indicating that the farmers there are aware of agroforestry practices. The farmers' awareness of the advantages of the agroforestry system was also noted by the study. Traditional agroforestry systems are used by the majority of farmers. In order to increase their income, farmers are eager to implement economically feasible agroforestry systems.

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