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Opinion

Vegetable Pea (*Pisum Sativum*) under Agroforestry could be a Viable Agroforestry Model in Hilly Region of Uttarakhand

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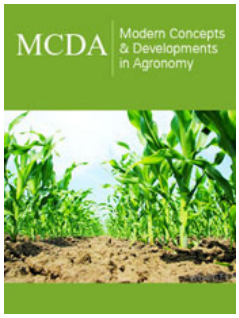

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Introduction

Vegetable pea (*Pisum sativum*) is one of the most important vegetable crops belonging to the family Leguminaceae. The green and dry foliage are used as feed for livestock and green pods being highly nutritious are preferred for culinary purposes [1]. It is a good source of protein (25%), amino acids, sugars (12%), phosphorus, vitamins A and C and carbohydrate apart from having a minute quantity of iron [2].

Pea has long been accepted as a restorer of soil fertility due to their unique ability of symbiotic nitrogen fixation [3]. This ability has made the crop one of the most important and useful components of existing cropping system in the present context of soil fertility degradation. Pea is a quick growing, an annual herbaceous vine that requires the lattice to support growth. Uttarakhand is a one of the hilly states of India, situated in the North-Western Himalayas, blessed with naturally suitable agro-climatic condition for cultivation of an off-season vegetables production and temperate fruits under various agroforestry system (agrisilviculture system, agrihorticulture system and agrisilvihorticulture system). Vegetable production under agroforestry system is the main occupation of farmers of the hilly region of Uttarakhand and great potential for significant income generation.

In Garhwal Himalayan region, mainly area above 1800m asl are the suitable for off season vegetable cultivation i.e. Garden pea, Cabbage, Cauliflower, Bottle gourd, Cucumber, Radish, Coriander, Spinach, Snake guard and Sponge gourd with fruits trees like Apple, Pear, Peach, Plum, Apricot, Kiwi fruit, and Walnut etc are produced in mid to high altitude and forest trees like Bhimal, Kharik, Wild cherry, Ficus and Oak are common in farmer field.

The region has the unique advantage of climate for producing off-season vegetables in hilly areas, which fetch a good price in the market and improve livelihood of local people. Retaining of tree component in farmer field is a very old tradition for obtaining fruit, fuel, fodder, fiber and for crop protection purposes. Vegetable pea is the short duration (4 months) crop cultivated by the farmers of hilly region of Garhwal Himalaya during the August-November. In Uttarakhand it is mainly grown in U.S. Nagar, Tehri, Dehradun in area viz., 3710ha, 2246.20ha and 1786ha with a production of 30648.30MT, 21319.05MT and 10226MT respectively [2]. Among the 7 hilly districts of Uttarakhand Tehri Garhwal has maximum area under pea cultivation and among the vegetable crops most growing crop is also vegetable pea (Directorate of Horticulture, Uttarakhand). The major varieties such as Ageta, Arkel, Early Badger, VL-7, VL-13, VL-14 and VL-15 are grown by farmers, but Arkel variety is used widely by farmers of Garhwal (Table 1).

Table 1: Vegetable pea and agroforestry tree combination in Garhwal Himalaya.

S.no.	Combination	Nature of Tree	Common use of Tree
1	*Pisum stivum + Grewia optiva*	Silviculture tree	Fuel, Fodder, Fibre
2	*Pisum stivum + Celtis australis*	Silviculture tree	Fuel, Fodder
3	*Pisum stivum + Prunus cerasoides*	Silviculture tree	Ritual, Fuel, Fodder
4	*Pisum stivum + Quercus leucotrichophora*	Silviculture tree	Fuel, Fodder, Timber
5	*Pisum stivum + Malus domestica*	Horticulture tree	Fruit
6	*Pisum stivum + Pyrus communis*	Horticulture tree	Fruit
7	*Pisum stivum + Prunus persica*	Horticulture tree	Fruit
8	*Pisum stivum + Prunus salicina*	Horticulture tree	Fruit
9	*Pisum stivum + Juglans regia*	Horticulture tree	Nut, Agriculture implements and Butt of gun
10	*Pisum stivum + Prunus armeniaca*	Horticulture tree	Fruit, Medicinal oil

In rain fed lands, sowing of pea is done during the rainy season, in the month of mid-July and starting of August. The crops are harvested after two to three months with an average of 3 pickings. This is primarily because vegetables cultivation is water-intensive and hence in absence of irrigation they can be grown only during the rainy season. Cultivation of off-season vegetable pea under different agroforestry system gives lesser pod yield as compared to sole pea cropping. However, yield reduction due to tree components is compensated by additional output i.e., fuel, fodder, fiber and timber provided by agroforestry trees and after harvesting of all green pods straw of pea is utilized as fodder in lean period (Winter). It is also observed that most of the temperate fruit trees are deciduous and fall their leaves during winter season and reduce competition for light, water and nutrient between agriculture crops and trees. Under the agroforestry system only pea crops give 2 to 3 times more income from the total cost of cultivation and associated agroforestry trees give separate additional income like fruit, fuel and fodder to the farmers.

Problem Faced by Farmers in Hills of Uttarakhand

One of the major problems faced by those farmers who are growing vegetables peas is uncertain weather events and crop damage by wild animals especially by wild boar, monkeys, rabbit and barking deer. Some of the area also facing transportation, storage facility, Shortage of packing material and market intelligence related problems.

Recommendations

Subsidies for fencing (live fencing) could help farmers and reduce yield loss through wildlife. Early variety of Vegetable pea under agroforestry system should show in First week of August because early sowing gives early harvest and farmers may obtain good economic return from market due to less availability of off-season vegetable pea. Identification of varieties with superior quality and yield under agroforestry system. Improving storage facilities and transportation in remote hilly areas is another track where government intervention would be helpful. Information, communication related to market intelligence should be made more effective through various media like television, radio, newspapers and even internet can be used more effectively to achieve this. Awareness for crop insurance should be made by extension agencies to promote farming in hilly areas.

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