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ABSTRACT

Findings and Conclusions

The present research has been carried out to explore the possibilities of development and spread of the cultivation of medicinal and aromatic plants (MAPs) in Haryana in the wake of low agriculture profitability, loss of biodiversity especially of cultivated plants, health problems and economic exclusion of a big section of rural population. Haryana is one of the states where the green revolution was first realised and diffused in other parts of the country. However, findings of this research indicate a highly specialised agricultural system dominated by rice-wheat cropping system in the most part of the state. It is also important to point out the finding that farming community in the heydays of the green revolution not only pushed the frontiers of unlikely crops in ecologically unlikely areas but also destroyed ecologically desirable land cover including forests, scattered patches of woodland, scrubland, grassland etc. The brunt of this loss was borne by biodiversity, both plant including MAPs and wildlife. The impact of green revolution which had brought tremendous increase in agricultural production is also over, and now agricultural output is more dependent on good weather rather than inputs. The situation is alarming as the use of chemicals has not only jeopardised local ecology, contaminated food and groundwater but also rendered agroecosystems highly vulnerable to pests and diseases. Almost stagnant crop yields and higher input costs of fertilisers, chemicals and water have also driven a big section of farmers into deep debt.

This state of affairs requires drastic shift in cropping systems with emphasis on diversification by introducing unconventional crops or plants which could ensure higher return and protect environment. Some socioeconomic facts like increasing consumption of herbal medicines and other preparations, health awareness and high demand of the MAPs raw material in domestic and international markets have also necessitated the cultivation of these plants. A large section of the society especially in rural areas still depends upon herbal medicines and other natural preparations. These natural resources are increasingly becoming precarious. Therefore, there is an urgent need of conserving these resources for sustainable agroecosystem, human health and economic security of rural people. To make this study more focussed and useful only eight MAPs (*amla*, *brahmi*, *ashwagandha*, *mulethi*, citronella, lemongrass, mint, palmarosa) have been selected for study.

As is found out in this work, each of the selected MAPs in the present analysis has the potential to accrue much more commercial profit with the minimum use of monetised inputs compared to conventional crops if cultivated/planted in fields. In addition to commercial profit, they will have more positive environmental impacts in comparison to conventional cropping system. Cultivation of the MAPs is generally carried out organically which is not harmful to any environmental or soil site. Their cultivation may also be done in association with agroforestry. Hence, ex situ conservation of MAPs i.e. their cultivation/plantation is not

only ecologically desirable for agroecosystems themselves, but also an economically feasible solution as has been found in many parts of the world. One may argue that this will jeopardise food security of a developing and populous country like India. But one cannot go too far in this line of argument as food security not only depends upon the local food production but purchasing power also. In this study it has also been argued that sustainable supply of the MAPs is possible by their incorporation into conventional cropping systems, which may also go a long way to undo harm caused by the green revolution.

The first step in developing and spreading the cultivation of MAPs is to demonstrate economic viability of the MAPs to convince and motivate the farming community. Both, the Government of Haryana and Government of India have taken many initiatives in this direction. Several plants have been introduced in different parts of the state. Initial results are encouraging as their reported yields are quite high. For this purpose proper selection of commercially profitable MAPs and environmentally favourable areas is necessary where each of them could establish and bring in high profits with least or no stress on or harm to the environment. In the present work delineation of the state of Haryana has been done into areas or zones where these plants could express their full genetic and phenotypic potential to generate maximum possible commercial profits. This exercise has been carried out by employing a new methodology of agroecological zoning. It is expected that demarcated zones present a spatial plan for development and spread of the cultivation of selected MAPs. The zones of first and second order suitability are expected to be the cores of diffusion of their cultivation.

However, the demarcation of zones of suitability for MAPs is not a solution in itself for the development and spread of MAPs as their adoption has certain constraints and also opportunities other than environmental and ecological which are also to be addressed in Haryana. In some cases cost effective and easy to handle technology and farming techniques are yet to be perfected and demonstrated. It has also been found that most farmers are also not much aware about the cultivation of these plants and there are some economic/financial, commercial, environmental and training problems which have been constraining the development and spread of MAPs cultivation in the state. It is expected that in near future these problems may be largely addressed as there exists an extensive network of governments' institutions and departments to promote the cultivation of MAPs and to disseminate information about them. Loan/credit facilities are available at governments' banks and institutions. Market infrastructure is also being strengthened to facilitate marketing of the MAPs produce.

However, one of the most important problems to be resolved is to integrate the disadvantaged sections of rural society into MAPs cultivation so that benefits of this new opportunity are not grabbed by big farmers only. It is, therefore, suggested that sodic, salt affected lands, cultivable waste and fallow land other than current fallow be given to the cooperatives of the unprivileged sections to carry out MAPs cultivation and of course, with the financial and technical support by the State Government. Thus, the course of the development and spread of the MAPs is being largely determined by the economic, agricultural and environmental changes. Opportunities provided by trade and commerce, scientific and technological developments and social awareness of economic and ecological importance of MAPs cultivation will be very helpful in furthering their development and spread in the state. Present research is just an attempt to develop a spatial framework to make the cultivation of the MAPs a success in the state of Haryana highlighting potential and constraints that exist there.