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Economic potentials of medicinal and aromatic plants in dryland and rainfed areas of India

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Abstract
Drought stress is especially important in countries like India where crop agriculture is essentially rain-fed. Indian farmers have been looking for some better alternative to diversify from traditional agriculture due to gradual reduction in profitability owing to decline in productivity, increased incidence of disease and pest attack in traditional crops, contingent upon their hardy nature and higher returns, medicinal plant cultivation is a better option. India needs to take up a systematic approach towards cultivation of medicinal plants to provide a consistent supply of medicinal and aromatic plant produce of international quality.

Keywords: medicinal and aromatic plants

Introduction
Today's healthcare systems mainly rely on drugs derived from plant materials. Most of the world's populations depend on traditional medicine to meet daily health requirements, especially in developing countries, where plants are the main source of medicine. China uses about 5000 species, while India uses 7000 species of medicinal plants. The WHO has estimated that over 80 per cent of the world population meets its primary health care needs through traditional medicine (Singh, 2005) [3]. The rainfed and dryland regions are characterized by erratic and ill distribution of rainfall, low fertility, high temperature, fast blowing dry winds, rapid percolation of water and higher transpiration rate as a result the vegetation is very poor and this causes soil erosion (Rock storm *et al* 2003) [2]. Moreover the population explosion has extended arable farming to the marginal lands, which has led to their further degradation and farming on such lands is leading to falling factor productivity and profitability of dryland crops and this has widened the socio-economic gap between rainfed and irrigated systems. Hence to increase the productivity and profitability of the farmers there is an urgent need to improve the rain water productivity by utilizing the dwindling water resources efficiently this can be achieved by including some drought resistant, efficient water utilizing high value crops like medicinal aromatic and dye crops in to the drylands production systems. Diversification with high value crops like medicinal and aromatic plants (MAPs), which do not have critical stages, or reproductive stages help in increasing the water productivity and provide stability to rainfed agriculture. Moreover the water stress may have positive reactions in improving the quality of the crops through biosynthesis of secondary metabolites and these secondary metabolites may improve the drought resistance to plants. Therefore the quality of these crops is enriched under dryland conditions. About 47.2 per cent of the surface of the earth can be classified as dry land wherein 600 m.ha of land is devoted to dry land agriculture worldwide and more than 700 million people live in these regions. Medicinal plants are the corner stones of both human and veterinary medical systems worldwide. Developing countries produce most of the world food grain including rice, wheat, sorghum, barley, pearl millet, chick pea, pigeon pea, cowpea and groundnut. They get only minimal yield due to poor resource availability in dry lands and wastelands. Now traditional crops are no more economical to the farmers, thus medicinal plants gain its importance. Medicinal plants have higher demand in the market and are quite suitable to our soils and weather conditions. Thus as an alternate cropping system medicinal plants could be included

In the cropping system and as well cultivated as sole crop.

Benefits of growing medicinal and aromatic plants in Rainfed and dry land regions

The curative properties of medicinal plants are due to the presence of complex chemical substances such as alkaloids, glycosides, steroids, essential oils, etc. which are present as secondary plant metabolites. The concentration of these secondary metabolites was reported to be higher under water stress conditions probably providing drought resistance to the plants (Singh, 2005) [3]. A survey done by LINESCO in 1960 showed that the arid zones of the old world are rich sources of number of medicinal plants (Singh, 2005) [3]. The medicinal plants are in great demand since many pharmaceuticals industries needs medicinal plant products as raw materials. Plants can be grown successfully in rainfed and dryland conditions and are suitable for wide range of soils. Medicinal herbs have wider adaptability to drought and other adverse climatic conditions. Some crops are best suited to the mixed, relay and sole crop. Medicinal plants comprise a large number of trees, shrubs, climbers, herbs, grasses, etc. which grow wild in different agro-climatic conditions including arid, semiarid and sub-humid area.

Economic Potentials of MAPs

The global market for herbal products is continuously expanding and it is expected to touch the mark of US$ 5 trillion by the year 2050, from the US$ 62 billion in 2004 (Purohit and Vyas, 2004) [1]. Despite being a major player, the share of India in global trade of MAPs is merely 0.5 per cent, whereas the countries, like China exports plants and raw drugs, therapeutics and other MAPs worth Rs 18,000 crores annually (Singh, 2005) [3]. India has one of the richest sources of many kinds of MAPs but it has achieved only a limited success in tapping the potentials of these plants because of low level of awareness among the farmers about the economic potential and returns (Purohit and Vyas 2004) [1] from these plants. Estimates show that that the potential returns to farmer from cultivation of medicinal plants are quite high. The cultivation of certain rainfed herbs could fetch products price anywhere between Rs. 7,150 to 35,000 per hectare. Although it is not clear that at which stage of the marketing chain these prices are paid but it is obvious that despite varying returns production of medicinal plants could raise the income of rainfed and dryland farmers to a great extent. Low altitude MAPs assume significant economic importance and can be judiciously cultivated to bridge the current gap between demand (40 thousand tons) and supply (20 thousand tons) is estimated to be 40,000 to 200,000 tons, which is expected to rise to 152,000 to 400,000 tons by 2005 (Planning Commission, 2000) [5] to improve the income and status of the rural farm household. The demand for medicinal plants in India, to meet both domestic and export market, comprising of 162 species, is expected to increase at about 15 to 16% between 2002 and 2005. Evidence shows that the total domestic potential for crude drugs and oil extracts in India is worth Rs 3 billion, of which the requirements of over-the-counter products (Planning Commission, 2000) [5].

Table 1: Improved varieties of medicinal and aromatic plants released by Directorate of Medicinal & Aromatic Plants Research centre for rainfed and dryland region

Sl No	Crop	Variety	Developed At	Year Of Release
Medicinal plants				
1	*Chlorophytum borivilianum (Safed musli)*	JS405	Mandsaur	2004
2	*Cassia angustifolia (Senna)*	Anand Late Selection	Anand	1989
3	*Diascoria floribunda*	FB(C)-1	Bangalore	1974
4	*Diascoria floribunda*	Arka Upakar	Bangalore	1980
5	*Glycyrrhiza glabra (Liquorice)*	Haryana Mulhatti-1	Hisar	1989
6	*Hyoscyamus muticus (Egyptian Henbane)*	HMI-80-1	Indore	-
7	*Lepidium sativum (Cress)*	GA-1	Anand	1998
8	*Rauvolfia serpentina (Sarpagandha)*	RI-1	Indore	-
9	*Papaver somniferum (Opium poppy)*	Jawahar Aphim 16	Mandsaur	1984
10	*Papaver somniferum (Opium poppy)*	Kirtiman	Faizabad	1990
11	*papaver somniferum (Opium poppy)*	Jawahar Aphim 16	Mandsaur	1997
12	*Papaver somniferum (Opium poppy)*	Jawahar Aphim 16	Mandsaur	1998
13	*Papaver somniferum (Opium poppy)*	Chetak Aphim	Udaipur	1994
14	*papaver somniferum (Opium poppy)*	Trisna	Delhi	-
15	*Plantago ovata (Isabgol)*	Gujarat Isabgol- 1	Anand	1976
16	*Plantago ovata (Isabgol)*	Gujarat Isabgol- 2	Anand	1983
17	*plantago ovata (Isabgol)*	Haryana Isabgol-5	Hisar	1989
18	*Plantago ovata (Isabgol)*	Jawahar Isabgol-4	Mandsaur	1996
19	*Solanum viarum (Khasi Kateri)*	Arka Sanjeevani	Bangalore	1989
20	*Solanum viarum (Khasi Kateri)*	Arka Mahima	Bangalore	1992
21	*Withania somnifera (Aswagandha)*	Jawahar Asgand-20	Mandsaur	1989
22	*withania somnifera (Aswagandha)*	Jawahar Asgand-134	Mandsaur	1998
Aromatic plants				
1	*ymbopogon flexuosus (Lemon Grass)*	NLG-84	Faizabad	1994
2	*C. martinii Var. Motia (Palmarosa)*	Rosha Grass-49	Hisar	1989
3	*C. martinii Var. Motia (Palmarosa)*	CI-80-68	Indore	-
4	*asminum grandiflorum (Jasmine)*	Arka Surabhi	Bangalore	1993
5	*Vetiveria zizanioides (Vetiver)*	Hyb-8	Mandsaur	-

Table 2: Economics of some of the medicinal and aromatic plants that are grown in dryland and rainfed regions

Sl. no.	Crops	Cost of cultivation (Rs/ha)	Gross income (Rs/ha)	Net income Rs/ha/ year
1	Lemon grass	22500	42000	19500
2	Java citronella	19500	33750	14250
3	Mentha	20500	36000	15500
4	Palma rosa	22500	40500	18000
5	Tulsi (basil)	11500	20000	8500
6	Jama rosa/CN	25000	50375	25375
7	Safed musli (*Chlorophytum borivillinum*)	65000	102000	37000
8	Kalmegh (*Andrographis penniculata)*	58000	65000	7000
9	Sarpgandha (*Rauwolfia serpentina*)	30000	64000	34000
10	Shatawar (*Asparagus racemosus*)	25000	50000	25000

Source: Authors calculation

Conclusion

The paper reviewed the importance of drought stress in reducing the growth of medicinal and aromatic plants. Therefore, water management can persist less damaging of drought stress in medicinal and aromatic plants farming. In addition, this may also be considerable situation in the agricultural activities in dry regions to enhancing the medicinal and aromatic plants drought resistance. The waste lands and problematic soils could be also made cultivable lands with selection of suitable remunerative herbal plants.

Future line of work and Strategies

Though commercial cultivation of some of the species of MAPs are picking up in India but still a lot of efforts are required to observe the real impacts of their cultivation (Singh, et al. 2007, Singh, 2009) [4]. Impetus in terms of planning, funding, production, processing, and strong market linkage is essential to harness the potentials of commercial production of MAPs. Formal bio-partnerships between certified farmers and Ayurvedic pharmaceutical companies needs to be explored. The arrangement should ensure farmers with a guaranteed market and a fixed fair price for their harvest, in exchange for exclusive rights to the produce as the sole buyer. The other agencies like departments of Forest, Agriculture, Horticulture, Health and Family Welfare can come together to offer technical, market related and other input supply services to the various stake holders so that sector as a whole can grow and dependence on outside sources for primary health care is minimized. Use of farmer Interest Groups for dissemination of technology and market information can also be explored in the country.

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