

Coriander the Taste of Vegetables: Present and Future Prospectus for Coriander Seed Production in Southeast Rajasthan

R. P. Sharma✉, R. S. Singh, T. P. Verma, B. L. Tailor, S. S. Sharma and S. K. Singh

National Bureau of Soil Survey and Land Use Planning, Regional Centre, Bohara Ganeshji Road, University Campus, Udaipur-313001, Rajasthan, India.

National Bureau of Soil Survey and Land Use Planning, Amravati Road, Nagpur-440033, Maharashtra, India.

✉Corresponding author: rpsharma64@yahoo.com

Paper No. 144

Received: 28th April, 2014

Accepted: 24 September, 2014

Abstract

Approximately 80% of the world total coriander seed is produced in India. This country is the largest producer, consumer and exporter of the spices. Among these coriander seed is one of the most important spices. Of which, more than 80% is produced in southeast Rajasthan. Even after introduction of advance production technologies for coriander still it is controlled by soil factors. The study was conducted in southeast Rajasthan for evaluation of soil capability to support coriander seed. The limitations considered for assessment of soil are climatic, topographic, wetness, salinity and alkalinity, soil fertility and physical limitation. The criteria of soil slope, erosion, depth, texture, available water content and length of growing period (LGP) were used for final assessment of soil suitability. Keeping these criteria, it was recorded that agroecological environment of this region and soil system environment of Baran, Bundi, Jhalawar and Kota is most suitable for cultivation of coriander seeds. The total geographical area of above four districts of Rajasthan is 2435 thousand hectares. Out of this 49 per cent is the net sown area. Considering the soil texture as one of the limiting factors, 453 thousand hectare area is suitable for coriander cultivation whereas considering the soil slope as second limiting factor 1322 thousand hectare area is suitable for coriander cultivation in above four districts of Rajasthan. The data from year the 2006-07 to 2010-11 indicated that about 200 (± 50) thousand hectare area is being kept under coriander seed cultivation in Rajasthan out of this 99 per cent area is situated in southeast Rajasthan i.e. Baran, Bundi, Jhalawar and Kota. The study

also indicated that the area under coriander cultivation in Chittorgarh district has increased by 160% over 2006-07 (1959 ha) and at present it crossed to 3000 hectares. If efforts are made to bring about 400 (\pm 50) thousand hectare area under coriander seed cultivation of southeast Rajasthan with the existing productivity level of 1100kg/ha than these four districts can produce 440 thousand metric tons of coriander seeds. The present domestic consumption of coriander seed in India is below 200 thousand metric tons. If rest, 240 thousand metric tons of the produce are exported than India can earn foreign money equivalent to 12000 million considering the existing grocery store price of 50/- per kg.

Keywords: Land use planning, Southeast Rajasthan, Coriander seed.

Introduction



India is the world's largest producer, consumer and exporter of the spices and among all spices, coriander (*Coriandrum sativum*) seed is one of the most important spices. Approx. 80% of the world total coriander seed is produced in our country. Coriander seeds and leaves are used as common food flavoring agents. Coriander seeds have medicinal properties too and therefore used as a carminative, and diuretic. Coriander is a commonly used domestic remedy, valued especially for its effect on the digestive system, treating flatulence, diarrhea and colic. In India, coriander is mainly cultivated in Rajasthan, Madhya Pradesh, Uttar Pradesh and Southern States like Andhra Pradesh, Karnataka and Tamil Nadu. The spice is an important item of international trade.

A systematic and scientific appraisal of natural resources developed by Shyampura and Sehgal (1995), especially soils and climate, and their database are important prerequisites for augmenting coriander production on a sustainable basis. Soil resource inventory is, therefore, basic for ascertaining the potential and problems of an area, and for rationalizing the use of

soils according to their capability. Since no two soils are alike and have their own potential and/or problems and behave differently to manage inputs, their use, as per their capability (Sharma *et al.* 2010). Physico-chemical characteristics of soils of southeastern Rajasthan were studied by various workers (Saxena and Singh 1982) but a very little emphasis was given for scope of coriander seed production. Aishwath *et al.* (2011) studied to the soils of four districts comprising Ajmer, Bhilwara, Pali and Rajsmand using a GIS approach for potential soil suitability for cumin, coriander, fennel and fenugreek and found that most of the soils were marginally suitable whereas only two per cent area was moderately suitable for coriander production. The National Bureau of Soil Survey and Land Use Planning (NBSS&LUP), Nagpur in cooperation with the Department of Watershed Development, Govt. of Rajasthan and Central Arid Zone Research Institute (ICAR) took up resource mapping of the state in 1:250 000 scale using the latest technology in order to generate a soil map and database. Keeping this in view the soil resources of southeast Rajasthan was assessed for future scope of coriander seed production. Cultivation of coriander crop needs very specific soil and climatic conditions of its better quality seed production. Both soil and climatic suitability have not been assessed in Indian continent in general and Rajasthan in particular. Therefore, this study was planned to evaluate the agro-ecological environment of Rajasthan for coriander production.

World Production and Consumption

The key to making sense of the coriander market is to realize the capacity of specific producer countries to market. India is a significant producer of coriander, but early sixties almost all the production was staying in the country for domestic consumption. Later, the India started the export of coriander seeds and exported about 21000 metric tons of coriander seeds all over the world. Pakistan produces the coriander seeds up to its domestic demand and sometimes imports from India to meet out the deficit. Production in Eastern Europe is also known to be substantial, but very little information is available. Major producers are India, Morocco, Canada, Pakistan, Romania and the former Soviet Union whereas Iran, Turkey, Egypt and Israel China, Burma and Thailand are minor producer of the coriander seeds. The United States, Canada, Argentina and Mexico are producers in the Americas. The large-seeded coriander is mainly produced in Canada. It takes approximately 100 days for maturity whereas the smaller-seeded coriander takes a longer growing period. Producers thinking about growing coriander should investigate the current pricing of the crop as prices can vary. Due to global competition, the Canadian coriander is uniform in size with good seed quality and reported more competent for export market.

Production scenario of coriander in India and Rajasthan

The data on area, production and productivity (Table 1) indicate that the productivity of coriander seed has showed an increasing trend since last five years. The productivity was increased from 626 kg/ha in year 2007-08 to 908 kg/ha in the year 2010-11. It was reported that

in India, the area under coriander is increasing as per our domestic demand. The increase in overall production of coriander seeds in India is mainly due to the advancement of production technology through the National Agriculture Research System and educating the farmers through various training programmes. Introduction of high yielding varieties, new production techniques, integrated nutrient management and sowing of crops as per soil/land suitability are the major production factor for the higher productivity.

Table 1. Statistical data on area (ha), production (metric tons) and productivity (kg/ha) of coriander seed in India.

	2007 – 08			2008 – 09			2009 – 10*			2010 – 11 (advance estimate)		
	Area	Prodn.	Prty.	Area	Prodn.	Prty.	Area	Prodn.	Prty.	Area	Prodn.	Prty.
Coriander	457605	286414	626	537327	471515	878	530789	501485	945	530860	482230	908

*2009-10 (provisional), Prodn.= production, Prty.= productivity

Coriander is believed to be a native of Egypt, Turkey, and East Mediterranean region. As indicated in Figure 1 it is mainly grown in India, Morocco, Bulgaria, Romania, Canada, China and Syria. India has a share of more than 80% of total world production of coriander seeds

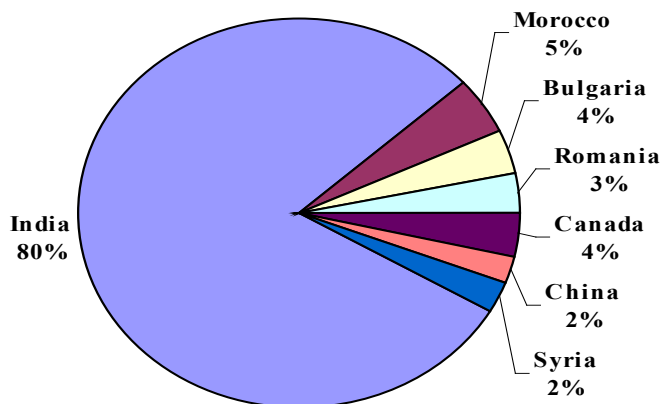


Fig. 1. Major producer countries of coriander and its share in year 2008

In India, it is mainly cultivated in Rajasthan, some parts of Madhya Pradesh, Gujarat and Uttar Pradesh as Rabi crop. Rajasthan holds prime position and contribute more than 80% in total area and production (Table 2).

Table 2. Estimated area (000 ha) and production (000 tons) of major Coriander producing states in India (2003-2004 to 2007-2008)

States	Area (000 Hectare)					Production (000 Tonne)				
	2003-04	2004-05	2005-06	2006-07	2007-08	2003-04	2004-05	2005-06	2006-07	2007-08
Andhra Pradesh	49.00	24.00	28.00	25.00	24.00	16.00	9.00	13.00	10.00	10.00
Bihar	2.20	2.10	2.30	2.30	2.20	1.50	1.40	1.70	1.70	1.60
Chhattisgarh	4.00	4.00	3.90	3.70	3.60	1.20	1.00	0.10	1.0	1.00
Haryana	1.70	1.70	1.70	2.23	2.18	2.20	2.20	2.90	2.63	2.90
Karnataka	7.80	9.60	9.20	6.00	6.00	1.20	1.50	1.40	1.00	1.0
Madhya Pradesh	125.10	115.90	112.80	108.40	94.70	47.00	45.00	42.00	43.60	30.20
Meghalaya	0.10	0.10	0.10	0.10	0.10	0.30	0.30	0.30	0.30	0.30
Orissa	19.00	19.10	19.10	19.10	19.10	9.00	9.10	9.00	9.00	9.00
Rajasthan	241.40	148.40	136.70	131.10	212.84	300.10	169.80	142.40	155.10	245.40
Tamil Nadu	27.70	18.50	21.10	17.40	13.30	8.10	5.50	6.40	5.70	5.10
Uttar Pradesh	5.50	5.50	5.50	5.50	6.00	3.20	3.20	3.20	3.20	3.00
India	483.50	348.90	340.40	320.83	384.22	389.80	223.40	223.40	233.23	309.60

Source: Ministry of Agriculture, Govt. of India.

Rajasthan state is the major producer of coriander seeds in India. In Rajasthan, the district wise data for last five years from 2006-07 to 2010-11 were analyzed for determining the area under coriander seed cultivation. The highest area for coriander production is reported in district Jhalawar (42%) followed by Baran (35%) and Kota (20%). The productivity is higher in Kota (1067 kg/ha) followed by Baran (980 kg/ha) and Chittorgarh (913 kg/ha). District wise area and production scenario is presented in Table 3.

Suitable Agro-climatic Conditions

Coriander is suited to growing in a wide range of soils, but it performs best on well-drained loam, moderately fertile and fine textured soils. It can be grown best in soils having pH range from 4.5 to 8.0, with a most suitable/optimum of 6.3. It requires 18° C temperature for optimum growth, development and good fruit settings. During flowering (anthesis), hot and dry winds may lead to the dropping of flowers, resulting in substantial yield reduction. Many researchers have been noted that volatile oil content increases during cool, moist summers. The use of honey bees as pollinators can improve coriander seed yield.

The coriander plant is well adapted to the tropical and sub-tropical climatic conditions. Coriander requires a cool climate during the growth stage and warm dry climate at maturity. It is observed that the quality of the seed is superior and essential oil content is more when

Table 3. District wise area/production of coriander in Rajasthan in last five years (2006-07 to 2010-11)

District	2006-07	2007-08	2008-09	2009-10	2010-11
	-----Area (hectares)-----				
Baran	42961	82808	90683	77423	59979
Bundi	1390	1407	4267	3271	2223
Chittorgarh	1959	2451	3203	2172	3156
Jhalawar	61963	85762	96940	97940	85795
Kota	22314	39657	49135	50589	45452
Others	550	876	970	875	1447
Rajasthan	131137	212961	245198	232270	198052
	-----Production (metric tons)-----				
Baran	54045	81152	110647	100236	86179
Bundi	1549	1147	3536	3641	2253
Chittorgarh	2606	2238	3184	1262	2054
Jhalawar	68159	38593	92187	107542	69683
Kota	28093	42314	63055	67495	57307
Others	649	683	1084	1059	1601
Rajasthan	155101	166127	273693	281235	219077

the crop is grown in cool climatic conditions. The crop matures in 110-140 days, hence under optimum conditions it requires 120-150 days LGP (Length of Growing Period). The production of coriander seeds is regulated by most limiting factor (s). The limitations (Table 4) considered for assessment of soils are climatic, topographic, wetness, salinity and alkalinity, soil fertility and physical limitation. The criteria (Table 4) of soil depth, slope, texture, erosion, available water content (AWC) and length of growing period (LGP) are very important for assessment of soil suitability.

Physico-chemical properties of soils

Coriander can be cultivated in all most all types of soils but well drained loam or fine textured soil suits well. The crop is also grown well in clay loam soils due to their higher AWC (available water content). Higher surface area, more water and nutrient storage capacity of Vertic soils in the Kota region, best support the coriander production. The scientist of National Bureau of Soil Survey and Land Use Planning, Regional Centre, Udaipur reported that soil quality and climatic suitability for coriander in Kota, Jhalawar, Baran and Chittorgarh districts of Rajasthan might be one of the reasons for involvement of the coriander crop in cropping systems. Fertile soils with adequate organic matter and sunshine, free from flooding/waterlogging conditions are best suited for its growth. Generally, 2-6 irrigations are mandatory for coriander crop,

Table 4. Soil site suitability criteria (crop requirement) for coriander (Sys et al. 1991 and Sys et al. 1993)

Characteristics	S1, highly suitable	S2 moderately suitable	S3 Marginally suitable	N, Not suitable
Climate:				
LGP (days)	120-150	105-120	105-120	<105
Precipitation (mm)	500-600	400-500	300-400	<300
Mean temp. of growing cycle (°C)	13-22	10-13	05-10	<5
Topography:				
Slope (%): Irrigated	<1	1-3	3-8	>8
Un-irrigated	<3	3-8	8-15	>15
Erosion	Slight	Moderate	Severe	Very severe
Coarse fragments (%)	<15	15-35	35-55	>55
Wetness:				
Drainage	Well drained	Well drained	Moderately well drained	Permeable
Flooding	No flooding	No flooding	<5 cm water for 2-3 days	<5 cm water for 3-7 days
Physical conditions of soils:				
Depth (cm)	50-75	25-50	25-50	<25
Texture	Loam, silt clay loam, clay loam, clay	Fine sand	Sandy	Massive clay, coarse sand
AWC (mm)	>100	50-100	50-100	<50
Fertility of soils:				
pH	6.5-7.5	7.5-8.0	8.0-8.5	>8.5
O.C. (%)	>0.6	0.4-0.6	<0.4	<0.4
CaCO ₃ (%)	<10	<10	10-20	>20
Salinity: EC (dSm ⁻¹)	<2	2-4	2-4	>4
Alkalinity (ESP)	<5	<5	5-10	>10

depending on the type of soils and average annual rainfall. Under normal agro-climatic conditions the first irrigation should be made within 30-35 days from the date of sowing followed by second at 50-60 days, third at 70-80 days, fourth at 90-100 days and fifth after 105-110 days and last irrigation may be required at 10-15 days before final harvest. In the clay loam/clay soils of Kota two irrigations are sufficient to produce good yields (AICRP, water management, Kota).

Soil fertility and coriander

The crop can be grown well in soils having pH in the range of 6.5 to 8.5. However, for higher productivity of the crop and quality seed production, it is suggested that pH should be in the range of 6.5-7.5 with more than 0.6 percent organic carbon and less than 10 percent calcium carbonate content. The essential plant nutrients should be applied through fertilizers and organic manures as per the prescription for agro-ecological/agro-climatic zones of India.

Salinity and alkalinity for coriander:

Plants can tolerate even moderate salinity. Coriander can be grown up to 6 EC (dSm^{-1}) and 10 ESP (exchangeable sodium percentage). However, for ideal conditions soils should have EC and ESP less than 2 dSm^{-1} and 5, respectively.

Export scenario of Coriander:

India has become a major exporter of agricultural produce in the world, said by the Minister of Agriculture. Now, there is a plan of Government for a long term export-import policy for agricultural produce. India's agriculture exports increased in last few years and reached to a mark of ₹1.87 lakh crore in 2011-12. It has been registered a tremendous growth of more than 50 percent during the last few years. India exported the coriander seeds to Malaysia, UAE, UK, Saudi Arabia, South Africa etc. of ₹ 720 million in 2003-04 which increased to ₹ 1102 million in year 2007-08. The demand of coriander seeds in International market is increasing in recent years and it is very remunerative to Indian farmers. Therefore, the mind setup of the farmers of southeast Rajasthan especially in four districts viz. Baran, Bundi, Jhalawar and Kota should be intensified by transferring the latest agro-technology in relation to coriander seed production. Such interventions not only increase area under this crop but also augment productivity and seed quality for International export purpose.

The production of coriander seeds is regulated by many agro-climatic conditions. A study was conducted to examine the potentials and constraints for coriander production in southeast Rajasthan. The limitations observed in this region are climatic, topographic, wetness, salinity and alkalinity, soil fertility and physical qualities of soils. The suitability criteria are erosion, slope, water retention, soil depth, texture and length of growing period (LGP) were used to fix the crop requirement and scope of coriander production. On the basis of the above factors it was recorded that the soils of southeast Rajasthan is most suitable for cultivation of coriander seeds.

A study area of four districts of Rajasthan is 2435 thousand hectares. Out of this 49 percent is the net sown area. Considering the soil textural limitation 453 thousand hectare area is suitable for coriander cultivation. Approximately 1322 thousand hectares land is suitable for coriander keeping the slope as one of the limitations. On the basis of soil textural limitations Bundi occupied highest area (228 thousand ha) followed by Kota, Jhalawar and Baran on

the basis of soil suitability assessment for coriander crop. In the present condition farmers of Bundi cultivate coriander only in two thousand hectare land whereas farmers of Baran cultivate more than 59 thousand hectare land. The study suggested that there is still a lot of scope to acquire the area in Bundi and Kota district for coriander crop.

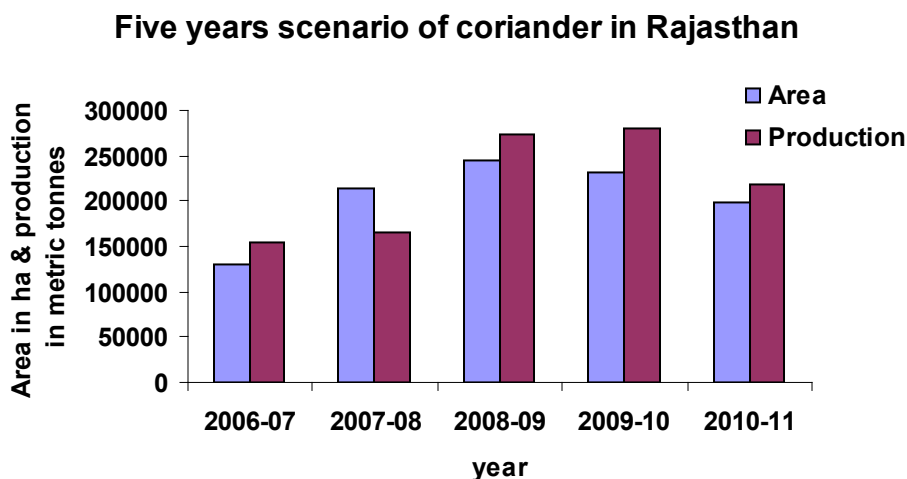


Fig. 2. Area and production of coriander seed in Rajasthan in last five years (2006-07 to 2010-11). Per hectare productivity has not gone below one metric tone except the year 2007-08.

The data from the year 2006-07 to 2010-11 indicated (Table 3 and Figure 2) that about 200 (± 50) thousand hectare area is being kept under coriander seed cultivation out of this 99 per cent area is situated in southeast Rajasthan i.e. Baran, Bundi, Jhalawar and Kota. The study also indicated that coriander cultivation was initiated in Chittorgarh district in recent years and it spread about 2000 hectare area in year 2006-07 and crossed to 3000 hectares at present. Agricultural extension agencies like KVKs, SAUs and national research centers should made efforts through field demonstrations, introduction of improved varieties with quality characters to bring about 400 (± 50) thousand hectare area under coriander seed cultivation of southeast Rajasthan which is highly suitable for coriander crop. With the existing productivity level of coriander seed in Rajasthan (1100kg/ha), these four districts can produce 440 thousand metric tons of coriander seeds. The present domestic consumption/demand of coriander seed in India is around 200 thousand metric tons. If rest, 240 thousand metric tons of the produce are exported than India can earn foreign money equivalent to ₹ 12000 million considering the existing market price of ₹ 50/- per kilogram.

Conclusion

- ❑ Agro-ecological condition and soil suitability assessment of southeast Rajasthan clearly suggested a wide acceptability for expanding the area under coriander seed production. This area has been evaluated as highly suitable for this crop.
- ❑ Policy makers, regional planners, extension workers along with line departments in combination with the research institutions of this region contribute in triggering the existing productivity and international export of coriander seed.

References

- Aishwath O.P., Singh H.R., Velmurugan A. and Anwer M.M. (2011). Analysis of soil suitability evaluation for major seed spices in semi-arid regions of Rajasthan using geographic information system, *International Journal of Seed Spices*, **1**(1): 29-37.
- <http://www.indiastat.com/agriculture/2/stats.aspx>
- Saxena, S.C. and Singh, K.S. (1982). Pedo-chemical characterization of soils of Rajasthan (semi-arid to humid agroclimatic region). *Journal of Indian Society of Soil Science*, **30**: 515-522.
- Sharma, R.P., Rathore, M. S., Singh, R. S. and Qureshi, F. M. (2010) Mineralogical Framework of Alluvial Soils Developed on the Aravalli Sediments. *Journal of Indian Society of Soil Science*, **58**: 70-75.
- Shyampura R.L. and Sehgal J. (1995). "Soils of Rajasthan for Optimizing Land Use", NBSS Publ. (Soils of India Series). National Bureau of Soil Survey and Land Use Planning, Nagpur, India: 76 + 6 sheet soil map (1:500,000 scale).
- Sys, I.C., Vanranst, B. and Debaveye, J. (1991). Land evaluation part II, Methods in land evaluation Agric. Publ. General administration for development co-operation, place, de, camp de Mars, 5btc. 57-1050, Brussels, Belgium.
- Sys, I.C., Vanranst, B. and Debaveye, J. (1993). Land evaluation part III, Methods in land evaluation Agric. Publ. 7 General administration for development co-operation, place, de, camp de Mars, 5btc. 57-1050, Brussels, Belgium.