

Arid Vegetable Production Potential and Income Generation

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ABSTRACT

The present study was conducted in Bikaner district of western Rajasthan. A total of 81 (total sample size) farmers selected for the study using purposive-cum-random methods of sampling. The results of the present study revealed that 37.75 per cent farmers grew different kind of vegetables in hot arid eco-system of Bikaner district during Kharif and Rabi season. Sixty to seventy per cent farmers of the district grew mateera, kachari and snap melon during Kharif season as rainfed crops. At present, the major arid vegetables being grown by the farmers on small scale (0.10 ha) to large scale (2.50 ha) in different cropping systems during Karif and Rabi seasons are mateera (*Citrullus lanatus*), snapmelon, kachari (*cucumis callosus*), brinjal, bottle gourd, ridge gourds, clusterbean, round melon, Indian aloe, okra, tomato, chilli, cauliflowers, cabbage, spinach, fenugreek (leaves), coriander (green), carrot, radish, pea, green onion, mustard leaves, sangari (pods) of khejri (*Prosopis cineraria*), moringa pods, etc. The major vegetable cropping system practiced by the vegetable growers (farmers) in Bikaner district are sole, inter, mixed cropping system and perennial plantation. Mixed cropping is the most prominent system of vegetable growing in arid environment which is practiced by majority (58.25 % of the farmers covering highest area (0.6-2.5 ha). During Rabi season and irrigated conditions, brinjal, cauliflower/cabbage, spinach, fenugreek (leaves), coriander (leaves), carrot, radish, pea, green onion, etc are grown by 33.45 per cent farmers (out of total vegetable growers) on a small scale (0.2-0.3 ha) as sole crops during Rabi season and bottle gourds, mustard leaves, cauliflowers/ cabbage, chilli, fenugreek, etc. are grown as inter-crops in ber, aonla, citrus/kinnow orchards by only 15.20 per cent farmers on a small scale (0.1-0.2 ha). During the Kharif season, the farmers grow Mateera, snapmelon Kachari bottlegourd, cluster bean, brinjal and Indian aloe on their fields and earn net income from them ranging Rs. 26162 to 41117, per hectare. In case of Rabi season's arid vegetables, the farmers are getting net income ranging Rs.33302 to 47380 per hectare.

Keywords: Hot arid eco-system;

Hot arid regions of the country is spread over nearly 31.7 million hectare land area of which 41.5 per cent is arable and 19 per cent is cultural wasteland. The hot arid regions are found mainly in North – West and Southern part of the country. The major parts of the country under hot arid conditions are Western Rajasthan (19.62 Million ha), North-western Gujarat (6..2 M. ha), South-western Punjab (1.45 M. ha), South-western Haryana (1.28 M. ha), Andhra Pradesh (2.16 M. ha), Karnataka (0.86 M. ha), and Maharastra (0.13 M. ha). The hot arid regions of the country are characterized by hostile agro-climate and fragile eco-system. The hot arid zones are characterized by an annual rainfall between 100 – 500 mm with a coefficient of variation (CV) varying from 40 – 70 per cent low and erratic rainfall combined with extremes of temperature (450-500 cal/cm²/day); low relative humidity; high potential evapo-transpiration value ranging from 1600 mm in eastern part and 1800 mm in western part of the region (Yadava and Soni). Despite the various bio-physical constraints, the hot arid areas like Bikaner district of western Rajasthan offers

very good opportunities for cultivation of arid vegetables like, mateera, snapmelon, kachari, brinjal, bottle gourds, round melon, Indian aloe, Khejri sangari (green pods of (*prosodic cineraria*) and others to a considerable extent. The authentic data about present situation, production potential/ problems are not available or vague. To know the production and yield potential, income generation / profits, etc. of arid vegetables grown during Kharif and Rabi season is essential to make the suitable plan and strategies to encourage the production of the same in hot / hostile arid environment. Keeping the above facts and importance in mind, the present study was conducted.

METHODOLOGY

The present study was conducted in Bikaner district of western Rajasthan. The Bikaner district consists of eight revenue Tehsils. Out of these, three Tehsils namely Bikaner, Lunkarnsar and Dungargarh Tehsil were selected purposively for the study. The villages of each Tehsils were listed in descending order on the basis of population size (with the help of secondary information

available at each Tehsil headquarter). After that, 9 villages (including 3 big, 3 medium and 3 small villages) were selected randomly from each Tehsil. Thus, a total of 27 villages (including 9 big, 9 medium and 9 small village) were selected from the above three Tehsils studied. Further, one big, one medium and one small farmer was selected randomly from each village so selected. Thus, a total of 81 (total sample size) farmers selected for the study amongst all three selected Tehsils of the district using purposive-cum-random methods of sampling. The selected farmers were personally contacted, interviewed and their response was recorded on semi-structured interview schedule. The statistical means like, percentage, area in hectare, price and income in Rupees, etc., were used for statistical analysis of data and drawing the conclusion and inferences of the study.

RESULTS AND DISCUSSION

For the clarity and better understanding point of view, the results and discussion of the present study are narrated under the following sub-heads.

Major arid vegetables grown during kharif and rabi season : The results of the present study reveals that over all 37.75 per cent farmers grew different kind of vegetables in arid eco-system of Bikaner district during Kharif and Rabi season of the year. However, 60 – 75% farmers of the district grew mateera, kachari and snap melon during Kharif season as rainfed crops. At present, the vegetables grown by the arid farmers on small scale (0.10 ha) to large scale (2.50 ha) in different cropping systems under different seasons and combinations are : mateera (*Citrullus lanatus*), snapmelon, kachari (*cucumis*

callosus), brinjal, bottle gourd, ridge gourds, clusterbean, round melon, Indian aloe, okra, tomato, chilli, cauliflowers, cabbage, spinach, fenugreek (leaves), coriander (green), carrot, radish, pea, green onion, mustard leaves, sangari (pods) of khejri (*Prosopis cineraria*), moringa pods, etc. The major vegetable cropping system practiced by the vegetable growers (farmers) in Bikaner district are sole , inter-cropping , mixed cropping system and perennial plantation. *Mishra et. al.* (2003) also reported more or less similar finding in their study.

The data/information in Table-1, reveals that out of 37.75 per cent vegetable growers, 28.70% grew mateera, snapmelon and kachari as sole crops on area ranging from 0.2-1.3 ha during Kharif season and in irrigated conditions. In same conditions, out of total vegetable growers, 26.0 per cent vegetable growers grew brinjal, bottle gourd, ridge gourd, round melon, Indian aloe, tomato, okra, chilli etc. as sole crops, area ranging from 0.1-0.3 ha and 24.50 per cent vegetable growers grew clusterbean (vegetable) /mateera/ snapmelon/ kachari/ roundmelon /ridge gourd/ Indian aloe etc. as an inter-crop in ber, aonla, citrus/ kinnow orchards, area ranging from 0.3-0.4 ha.

In rainfed conditions (kharif), farmers adopt mixed cropping system in which mateera, snapmelon, kachari, roundmelons, etc., are grown with pearl millet, groundnut, sesamum, mothbean, clusterbean cowpea, etc. in various combinations. Such type of cropping systems are is practiced by 58.25 per cent vegetable growers, area ranging from 0.6-2.5 ha. Mixed cropping system is the most prominent system of vegetable growing in arid environment of the Bikaner district which is practiced by majority of the farmers covering highest area (0.6-2.5 ha).

Table 1. Major arid vegetable crops grown during kharif and rabi season.

Season	Condition	Cropping systems	Vegetable crops grown	Area (ha.)	Grower's % out of total vegetable growers (37.75%)
Kharif	Irrigated	Sole cropping	Mateera, snapmelon, kachari	0.2-1.3	28.70
		Sole cropping	Brinjal, bottle gourd, round melon, ridge gourds, India aloe, tomato, Okra, chilli	0.1-0.3	26.00
	Rainfed	Inter cropping	Cluster bean (veg.)/ mateera/ snapmelon/ kachari/ round melon/ ridge gourd/ Indian aloe in ber, aonla, citrus/ kinnow orchards	0.3-0.4	24.50
		Mixed cropping	Mateera, snapmelon/ kachari/ round melon with pearl millet, ground nut, sesamum, moth bean, cluster bean and cowpea in various combinations	0.6-2.5	58.25
		Perennial	Sangari (pods) of khejri (<i>Prosopis cineraria</i>) plant/ ha	15-25	70.74
Rabi	Irrigated	Sole cropping	Brinjal, cauliflower/ cabbage, spinach, fenugreek (leaves), coriander (leaves) carrot/ radish/ pea/ green onion	0.2-0.3	33.45
		Inter cropping	cauliflower/ cabbage, chilli fenugreek, etc. in ber/aonla, citrus/ kinnow orchards	0.1-0.2	15.20

Under rainfed condition, plantation of perennial khejri (*Prosopis cineraria*) plant is a very important source of vegetable in arid regions. The khejri tree produces the sangari (pods) for vegetable and loom (leaves) as a nutritious fodder for the farm animals. During the study it was observed that there were 16-25 perennial plants of khejri per ha on 70.74 per cent vegetable growing farmer's field which were used as a major source of vegetable and fodder for farm animals. These khejri plants are either grown naturally or grown by the farmers and looked after and protected. Same kind of results were reported by *Meena, et. al. (2007)* in their study.

During rabi season and irrigated conditions, the farmers grow the vegetable crops as sole crop and inter-crops in orchards. The brinjal, cauliflower/cabbage, spinach, fenugreek (leaves), coriander (leaves), carrot, radish, pea, green onion, etc are grown by 33.45 per cent farmers (out of total vegetable growers) on a small scale (0.2-0.3 ha) as sole crops during Rabi season. In case of inter-cropping system, bottle gourds, mustard leaves, cauliflowers/ cabbage, chilli, fenugreek, etc. are grown in ber, aonla, citrus/kinnow orchards by only 15.20 per cent farmers on a small scale (0.1-0.2 ha). Similar kinds of findings were reported by *Sharma and Khurana (2000)*, that majority of the farmer grew pulses (moong, mash, and cowpea), vegetables, and oilseeds as intercrops in mango orchards in Gurdaspur district of Punjab.

It was also observed that the majority of the farmers of locale of the study grew local/Deshi varieties of the above all mentioned vegetables. However, a few farmers grew hybrid/improved varieties of mateera (AHW-19, AHW-65), snapmelon (AHS-10, AHS-82) and kachari (AHK-119, AHK-200). These findings are in confirmation of *Meena, et. al. (2006)* and *Yadava, et. al. (2008)*.

Average yield potential and income generation from kharif arid vegetables : The hot arid regions of western Rajasthan has very tough/harsh climatic condition and limited resources, even then, some of the arid vegetable mentioned in Table 2 give very good yield and profit to the farmers of the zone. Mateera (*Citrullus lanatus*) is a very potential, tremendous drought tolerant hardy vegetable crop of the hot arid zone. Table 2 reveals that mateera gives very good yield (309 quintals per hectare) and farmers get high net income (Rs.39594 per ha) using their limited resources, man and money. The other important potential vegetable crops of the zone are snapmelon, Kachari, Bottlegourd, Cluster bean, Brinjal and Indian Aloe. These vegetable crops are very drought hardy and give good yield, even during harsh climatic

conditions and limited water / low rainfall and other resources. During the Kharif season, the farmers grow snapmelon Kachari, Bottlegourd, Cluster bean, Brinjal and Indian Aloe on their fields and earn net income from them viz., Rs. 36158, 26162, 39566, 23380, 41117 and 33026, per hectare, respectively.

Table 2. An average yield and net income earned by farmers from kharif arid vegetables.

1	Vegetable crop	Average Yield (q/ha.)	Average selling price (Rs./kg.)	Average net income per ha. (in Rs.)
2	Mateera (Loha)	309	1.66	39594
3	Snapmelon	216	2.54	36158
4	Kachari	110	2.88	26162
5	Bottlegourd	218	2.55	39566
6	Ridgegourd	118	3.74	29320
7	Roundmelon	97	4.05	32254
8	Indian Aloe	239	1.82	33026
9	Brinjal	230	2.44	41117
10	Chilli	127	4.16	38504
11	Cluster bean (Vegetable type.)	98	2.60	23380

Other vegetables like ridgegourd, roundmelon, chilli are also grown by farmers at small scale with good yield and income from them. The highest net income is earned by farmers by growing the thorny brinjal crop. The adoption and area under brinjal crop is very low due to its high irrigation water requirement, unsuitable ground water and other climatic conditions. The most suitable arid vegetable preferred by the farmers of the hot arid environment are mateera, snapmelon, kachari and cluster bean as these vegetables are most drought hardy and give good yield and income with low rainfall /limited water, low investment, and less labour. The demand of these cucurbitaceous vegetables is also high in local areas in comparison to others.

Average yield potential and income generation from rabi arid vegetables : Table 3 reveals that the yield potential of cabbage, carrot, radish, cauliflower is highest viz., 318, 227, 216, 212 quintals per hectare, respectively. However, the net income per hectare is highest of pea and cauliflower followed by cabbage, carrot and spinach i.e. the farmers get net income of Rs. 47380, 43288, 40209, 38336, 33302 per hectare from pea and cauliflower followed by cabbage, carrot and spinach crops, respectively. But in comparison to others, the area under pea and cabbage is very limited and farmers avoid them to grow due to the unsuitable ground water and other climatic conditions.

Table 3. An average yield and net income earned by farmers from rabi arid vegetables.

1	Vegetable crop	Average Yield (q/ha.)	Average selling price (Rs./kg.)	Average net income per ha. (in Rs.)
1	Cauliflower	212	3.09	43288
2	Cabbage	318	2.26	40209
3	Radish	216	2.44	32704
4	Carrot	227	2.70	38336
5	Pea (greed pods)	122	5.65	47380
6	Spinach	131	3.33	33302
7	Fenugreek (leaves)	94	2.88	26193
8	Onion (green)	168	2.95	35272

The important leafy vegetables grown by the farmers of hot arid region is fenugreek which is grown at large scale for seed as well as green leaves. It is fairly suitable in the arid conditions but the production is comparatively low. Some of the farmers grow as green leafy vegetable and for the bulb production. It gives a good production and income under fair climatic conditions and good management practices. The spinach is other important leafy vegetable which is preferred by farmers of the hot arid environment being in demand. The yield potential of the spinach is also good and it provides rational price to the farmers in the market.

CONCLUSION

The hot arid regions of the country like western part of the Rajasthan has high potential to produce the vegetables, particularly cucurbitaceous, solanaceous vegetables and spice crops. This region may work as a huge basket to produce several kind of vegetables in mass to meet the increasing demand of fast increasing population of the country. This dream and targets may be achieved by developing and providing reliable scientific approaches, technologies and knowledge to the farmers to protect / survive their vegetable crops in harsh and hot climatic conditions of the region. There is urgent need to develop such kind of vegetable production technologies which may be potential by grown in limited water, salty ground water treatments, soil fertility management, improved varieties of vegetables, management of extremes of temperature, etc. If we want to achieve the desirable targets of the vegetable production, we have to reach to arid farmer's field to understand their problems and to provide the suitable technical support to nullify the same. Moreover, there is urgent need to develop value added production and a local market to sell the farmer's horticultural produces.

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