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Motivational Factors and Constraint Analysis Regarding Commercial Production of Mateera (*Citrulus lanatus*) in Hot Arid Ecosystem

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ABSTRACT

The present study was conducted in Bikaner district of western Rajasthan and motivational factors and constraints being faced by the farmers in growing Mateera (Citrulus lanatus) crop in hot arid ecosystem of Rajasthan were analyzed. The major motivational factors of farmers behind mateera production at commercial scale as observed during the survey were: substantial income from mateera seeds, good earning from fresh mateerafruits, very low water requirement of the crop, high seed germination capacity, high consumption of mature mateera as a dessert fruits, immature Mateera fruits (Loiya) a very good source of vegetable, long storage life of the mateerafruit, high demand of mateeraeds in the markets, mateera juice protects the body from hot winds (Loo) during summer season, mateera juice helps in removing kidney stones, mateera is a very important component of traditional mixed cropping system of the arid regions, mateera is most suited crop in arid environment, etc. Amongst the major constraints being faced by the farmers in mateera production at large scale were: scarcity of water, very low and erratic rainfall and occurrence of drought very frequently, lack of viable schemes and support system for Mateera growers, no standardized technique is available for value addition of mateera fruits, very deep and salty ground water, inadequate supply of electricity, poor marketing system and market intelligence, lack of knowledge and awareness amongst the farmers about improved technologies of mateera cultivation, etc.

Mateera *(Citrulus lanatus)* is one of the most important and drought hardy cucurbitaceous vegetable crop of hot arid regions. It is grown at large scale in hot arid environment of western Rajasthan during both rainy and summer season. It is very important component of mixed cropping system of this region. Almost, all the farmers of western Rajasthan grow it on their fields as a sole crop or intercrop or mixed crop during Kharif and summer season of the year. It is one of the most important vegetables being liked by majority of people of hot arid regions. The immature fruits (80 - 100 g weight) locally called Loiya, are used as vegetable and its matured (ripened) fruits are predominantly used as dessert fruit. It is one of the most ancient vegetable crops of the Indian desert and is being grown under extremely harsh climatic conditions of western Rajasthan at commercial scale. It can give good production even under very low rainfall / limited irrigation, poor soil and other hostile climatic conditions. The Central Institute for Arid Horticulture, Bikaner, (Rajasthan) is working from long back to develop improved technologies to encourage the production of mateera crop in hard and hostile hot climatic conditions. Recently, the Institute has developed three improved varieties (AHW -10, AHW - 19 and Thar Manak) and other agro-techniques of mateera production which become the boon for the farmers of the hot arid zones.

The farmers of Bikaner district of Western Rajasthan produce mateera at large scale during *kharif* and summer season and earn a lot of money from it. It is one of the major component crop of their cropping system, particularly of their mixed cropping system. However, the actual reasons which motivate the farmers to produce mateera at large scale in hot arid ecosystem of Bikaner district are not yet crystal-clear. Keeping these facts in mind, this study was conducted in Bikaner district of western Rajasthan with the objective "to assess the motivational factors encouraging the farmers to produce mateera at commercial scale and constraints being faced by them in producing the same".

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METHODOLOGY

The present study was conducted in Bikaner district of Western Rajasthan. The district consist of eight revenue Tehsils. Out of these, two Tehsils namely - Bikaner and Lunkarnsar Tehsils were selected purposively. With the help of secondary data available at each selected Tehsils headquarter, a list of the total number of villages falling under these two Tehsils were prepared separately. On the basis of population size, all villages of these Tehsils were categorised in three groups i.e. small, medium and large villages.

Further, four villages were selected randomly from each category of above villages of selected each Tehsils. Thus, a total of 24 villages were chosen from the so selected above two Tehsils for the study. All mateera growing farmers of these selected villages were listed one by one and divided in three groups i.e. small, medium and big farmers (mateera growers). Two farmers from each group of above farmers (of all selected 24 villages) were selected randomly. Out of these two farmers, one farmer was who applying at least life saving irrigation to mateera crop and another was who growing mateera in rainfed condition only. In this way, 6 respondents (mateera growers) were chosen from each category of above selected villages by using purposive-cum-random method of sampling. Thus, a total of 144 respondents (mateera growers) were selected amongst the above groups of the farmers of 24 villages of the selected two Tehsils. Further, so selected mateera growers were personally contacted and interviewed one by one to assess their motivations behind growing mateera crop at large scale on their fields and the constraint being faced by them in growing the same. To find out the rank order of different motivational factors, each motivational factor was assigned with specific score as per response of individual farmer interviewed. The first motivational factor was assigned with highest score and last one assigned with lowest score under different groups of motivational factors. For example, under group of 'economic motivational factors' there were 8 motivational factors in total. Therefore, the first motivational factor was assigned with score 8 (highest) and the motivational factor which was responded by farmer as s" economic motivational factor was assigned with score 1 (lowest). The final rankings of these factors were work out on the basis of total score obtained by each such factor. To measure the constraints, the five-point continuum viz; strongly disagree, disagree, undecided, agree, strongly agree, was used. The score 1, 2, 3, 4, and 5 was allotted in response of strongly disagree, disagree, undecided, agree, strongly agree, respectively. The all responses of the farmers during the survey were recorded on semi-structured interview schedule. The statistical tools like frequencies, scoring, ranking, percentage, etc. were used for analysis and drawing inferences of the study.

RESULTS AND DISCUSSION

The farmers of the hot arid regions of western Rajasthan produce mateera at commercial scale. During the survey, there were observed several motivational factors which encourage the farmers to grow mateera crop extensively. These motivational factors were grouped as economic, production and technological, socio-religious motivational factors and motivational factors related to storage and marketing, health and medicinal value, agro-ecological aspects, etc. The major such motivational factors as reported by the farmers (Mateera growers) during the survey are described here.

1. Economic motivational factor

Data in Table 1, reveals that amongst the economical motivational factors "high income from the mateera seeds, good earning from the fresh mateera fruits, satisfactory price of immature mateera fruits (Loiya) and low cultivation cost of mateera" were the major economical motivational factors behind large commercial production of mateera which were ranked as first, second, third and fourth important economical motivational factors with score 826, 804, 787, and 694, respectively.

The other economic motive which leads to large production of mateera crop in hot arid environment of Bikaner district of Western Rajasthan were, employment generation, substantial income from mateera oil, availability of plenty of land resources and man power, etc.

Table 1: Economic motivational factors.

S.No	Motivational factors	Score (PMS* =1152)	Rank
1	Substantial income from mateera seeds	826	I
2	Good earning from fresh mateera fruits	804	II
3	Satisfactory price of immature fruits(Loiya)	787	III
4	Employment generation	605	V

5	Low cultivation cost of mateera	694	IV
6	High income from mateera oil	487	VI
7	Availability of plenty of land resource.	376	VII
8	Availability of surplus family labour / manpower.	292	VIII

* PMS = possible Maximum scores

2. Production and technological motivational factors

Table 2, reveals that the major production and technological motivational factors which encourage/ motivate the farmers for commercial production of Mateera in hot arid ecosystem were, " very low water requirement of the crop, high seed germination capacity of the crop, accessibility of drought hardy local varieties, high productivity of the crop, minimal land preparation requirement, and comparatively short duration crops" which were ranked as first, second, third, fourth, fifth and sixth important production and technological motivational factors which were scored as 1167, 1067, 1053,943,898 and 821, respectively. Singh and Singh (2005) reported that the farmers grow vegetables because the vegetables provide regular income to fulfil the needs of food and fodder, create regular employment for family labour and utilize agro- resources efficiently. Swarup et.al (1987) also reported that compelling reasons of growing horticultural crops by farmers other than nutritional advantages were favourable climatic features, higher income from per unit area from Horticultural crops, profitability and employment generation.

Table 2: Production and technological motivational factors.

S.No	Motivational factors	Score (PMS* =1140)	Rank
1	High productivity of the crop	943	IV
2	Easiness in sowing & harvesting	775	VII
3	Minimal land preparation requirement	898	V
4	Minimal requirement of intercultural operation	602	VIII
5	Minimal agro-chemicals/pesticides requirement of the crop.	404	IX
6	Accessibility of drought hardy local varieties	1053	III
7	Comparatively short duration crop	821	VI
8	Very low water requirement of the crop.	1127	I
9	High seed germination capacity	1067	II
10	Advancement in productional technologies	311	X

* PMS = Possible Maximum Scores

The other production and technological motivational factors behind commercial production of mateera in hot arid ecosystem were easiness in sowing and harvesting of the crop, minimal requirement of intercultural operation and agro-chemicals and advancement in production technologies of the Mateera crop. There is well known fact that the water scarcity and occurrence of frequent drought are the major problem of hot arid regions. In such conditions, the Mateera crop can be grown with limited irrigation water/rainfall. Its seed germination capacity is very high and it is highly drought resistant crop, it requires minimum land preparation. It is very short duration crop and does not require any special management. Hence, the farmers of hot arid ecosystem of Western Rajasthan like Bikaner district produce Mateera at commercial scale.

3. Socio-religious motivational factors

There were observed several socio-religious motivational factors (Table 3) which motivate the farmers of arid regions to produce Mateera on large scale on their fields. The major socio-religious motivational factors as reported by the farmers were, "high consumption of matured Mateera fruits in direct eating, immature mateera fruits (Loiya) are a very good source of vegetable, high value of nutritious Mateera seeds, good source of life saving food for animals and human being, use of Mateera seeds in various sweets and cold drinks," which were ranked as 1st 2nd, 3 rd, 4th, 5th and 6th with score 1082, 1057, 1039,881, 708 and 598 respectively. Maini (1997) also reported that the socio-economic reasons of growing

common vegetables were to make value added products. They cited that people in dessert areas of Rajasthan grow vegetables (beans) and fruits like cluster bean, kachari, ker, khejri, lasoda etc. to make their value added products and as the main source of vegetables during chronic shortage of common vegetables. Thus, they were motivated to grow these vegetables to meet out their vegetable needs in adverse climatic conditions.

Moreover, the Mateera fruits and seeds have very high place in socio-religions life of the farmers like in worshiping activities during various festival and ceremonial functions and preparation of soft drinks. A farmer who produces higher quantity of Mateera fruits on his field was viewed as a person having high social status.

Table 3 : Socio-religious motivational factors.

S.No.	Motivational factors	Score (PMS* =1296)	Rank
1.	High consumption of mature mateera fruits in direct eating	1082	I
2.	Immature mateera fruits (Loiya) a very good source of vegetable	1057	II
3.	good source of preserved pure water	708	V
4.	good source of life saving food for animals and human being	881	IV
5.	High place of mateera seeds and fruit in worshiping	412	VIII
6.	High value of nutritious mateera seeds	1039	III
7.	Preparation of soft drinks from mateera juice	524	VII
8.	Appreciated use of mateera seeds in various sweets and cold drinks	598	VI
9.	Higher production of mateera fruit is viewed as high social status	344	IX

* PMS = Possible Maximum Scores

4. Motivational factors related to Storage and marketing

Table 4, reveals that motivational factors related to storage and marketing suitability of mateera were," long storage life of mateera fruits, high demand of mateera seeds in the markets/villages, high demand of mateera fruits in localities / villages / local markets, mateera fruits are within the reach of purchasing capacity of all common people and easy in loading - transportation -unloading" which were ranked as 1st 2nd, 3 rd, 4th and 5th with cores 618, 592, 567, 413 and 388, respectively. During the survey, it was also reported by the farmers that the mateera crop was grown not only due to its drought hardiness, high consumption and high productivity but it can be stored at farmer's level and sold upto a long period at different consumption centres / local markets without degradation in its quality and weight. The farmers further told that Mateera crop is a easiest crop with reference to its harvesting, loading, transportation and unloading.

Everybody like to eat Mateera fruits and poorest amongst poor can also purchase it due to its low cost. Moreover, the mateera seeds have high nutritional value and multipurpose use. Hence, its demand is very high in localities/local markets that is why farmers grow Mateera crop at large scale to produce the Mateera seeds in large quantity to earn money. Zelleke et.al (1991) revealed that horticultural crop production can be promoted increased by developing effective and cheap pest control measures, irrigation, storage facilities, efficient transportation facilities, processing, marketing system, etc.

Table 4: Motivational factors related to Storage and marketing

S.No.	Motivational factors	Score (PMS* = 864)	Rank
1	High demand of mateera fruits in localities/ local Markets/villages.	567	III
2	Easy in loading-transportation-unloading	388	V
3	Mateera fruits are within reach of purchasing capacity common people	413	IV
4	Long storage life of the mateera fruit.	618	I
5	High demand of mateera seeds in the markets	592	II

* PMS = Possible Maximum Scores

5. Motivational factors related to health and medicinal value

During the survey, the farmers reported the importance/value of Mateera water (Juice) and its seeds for health and medicinal point of view which compel and motivate the farmers to grow Mateera crop abundantly. The motivational factors related to health and medicinal use of Mateera fruits as enumerated by the farmers were 11 Mateera juice (water) protect the body from hot winds (Loo) during summer, Mateera juice helps in removing kidney stones, it protect the body from dehydration, high medicinal use of Mateera oil and Mateera seeds provide high calories and nutrition, which were ranked as first, second, third, fourth and fifth important factor, respectively (Table 5). These findings are supported by Adeyemi (1987) that the Horticultural crops are very important because they provide industrial materials and contribute a lot to the nutritional balance of the population. They have high dietary and nutritional potential for health point of view and contribute directly to staple food requirement.

Thus, it can be said that mate era crop is grown not only to earn money and simple eating purpose but also it has high value with respect to medicinal and health point of view. Hence, the farmers of hot arid ecosystem prefer to grow mate era crop at large scale on their fields.

Table 5: Motivational factors related to health and medicinal value

S.No.	Motivational factors	Score (PMS* =1008)	Rank
1.	Mateera juice protects the body from hot winds (Loo) during summer season.	748	1
2	Mateera juice helps in removing kidney stones	721	2
3	Mateera juice protects the body from dehydration	714	3
4	Mateera seeds provide high calories and nutrition	404	5
5	Mateera seeds increase fertility in animals	228	7
6	It provides life saving solution / juice	380	6
7	High medicinal value of mateera oil.	622	4

* PMS = Possible Maximum Scores

6. Agro - ecological motivational factors

The farmers disclosed several agro - ecological motivational factors behind production of mateera at commercial scale in hot arid environment of Bikaner district of Western Rajasthan (Table 6). They reported that the mateera crop has some special agro-ecological beneficial peculiarities which make suitable this crop to grow at large scale in hot arid conditions. The major agro -ecological factors which motivate the farmers to grow mateera crop extensively were "mateera is very important component of traditional mixed cropping system of arid regions., mateera is most suited crop in hot arid environment, it has high growth capacity even during low rainfall/drought, mateera crop helps in soil and moisture: conservation and it has high water absorbing capacity", which were ranked as 1st,2nd, 3rd, 4th and 5th" important agro - ecological motivational factors with scores 803, 777, 728, 710 and 633, respectively. The other agro - ecological motives encouraging the farmers to grow mateera crop at large scale on their fields were, " mateera crop adds organic matter into the soil and increases soil fertility, it generates suitable micro-climate in the crop field and help in productivity of other fellow crop or succeeding crops." Samadia (2006) also stated that arid region of Rajasthan are best suitable for production of some cucurbits like water melon, (Mateera), musk melon, snap melon, kachari, round melon etc. during both summer and rainy season. He mentioned that the best quality of these cucurbits are produced in these regions due to high temperature, low humidity and plenty of sunshine at the time of fruit maturity and ripening. In arid region the above cucurbits are grown in almost all kind of locations. The mixed cropping system is prominent cropping system of arid regions in which cucurbits are considered as major components of the above cropping system.

Table 6. Agro - ecological motivational factors.

S.No.	Motivational factors	Score (PMS * =1008)	Rank
1	Mateera is most suited crop in arid environment.	777	II
2	It has high growth capacity even during low rainfall/drought	728	III
3	Mateera crop helps in soil and soil moisture conservation	710	IV
4	Mateera is a very important component of traditional mixed cropping system of the arid regions	803	I
5	It adds organic matter into the soil and increases soil fertility	512	VI
6	It generates suitable micro-climate in crop fields	417	VII
7	It has high water absorbing capacity.	633	V

* PMS = Possible Maximum Scores

7. Major constraints in commercial Mateera productions.

It is a well-known fact that the mateera crop is a tremendous crop grown in hot arid ecosystem of western Rajasthan. It is grown at large scale in western Rajasthan. However, the farmers face various constraints in successful mateera production at commercial scale. During the survey of present study, the farmers reported various constraints (Table 7) which hinder the large/ commercial mate era production on their fields. The major such constraints as reported by the farmers were; scarcity of water, very low and erratic rainfall and occurrence of drought very frequently, lack of viable scheme and support system for mateera growers, no standardized technique is available for value addition mate era fruits, very deep and salty ground water, inadequate supply of electricity, poor marketing system and market intelligence and lack of knowledge and awareness amongst the farmer about improved technologies of mateera cultivation," which were considered as 1st, 2nd, 3rd, 4th, 5th, 6th 7th and 8th important constraints hindering the large adoption and production of mateera crop in hot arid ecosystem of western Rajasthan like Bikaner district.

Table 7: Major constraints in Mateera crop productions at large scale.

S.No.	Constraints	Score (PMS*=720)	Rank
1	Scarcity of water	655	I
2	Very deep and salty ground water	541	V
3	Very low and erratic rainfall and occurrence of drought very frequently	606	II
4 :	No standardized technique IS available for value addition of mate era fruits.	555	IV
5	Per hectare income/return from mate era crop is poor	335	II
6	Lack of improved production technologies	421	IX
7	Poor extension system	388	X
8	Lack of viable schemes and support system for mate era growers	581	III
9	Poor transportation, communication and information network.	277	XII
10	Inadequate supply of electricity	516	VI
11	Lack of knowledge and awareness amongst the farmers about improved technologies of mateera cultivation.	477	VIII
12	Poor marketing system and market intelligence	502	VII

* PMS = Possible Maximum Scores

Singh et.al (2005) reported that there were several socio-economic, production and marketing constraints in vegetable production in Almora and Nainital districts of Uttaranchal. Singh (1997) also revealed that lack of adequate hybrid seed production, lack of full package of practices, absence of practical training facilities and adequate incentives, lack of publicity and frontline demonstrations of the improved technologies etc. hindered the adoption of improved technologies /hybrid.

The other constraints which leads to lower adoption and production of mateera crop in arid regions of the western Rajasthan were, lack of, improved production technologies of mateera cultivation, poor extension system, per hectare income/return from mateera crop is poor, poor transportation - communication and information net work, etc. The farmers wanted to grow mateera crop at large scale not only during Kharif season but in summer season also. However, the above constraints create the problem in large production of mateera in hot arid regions of the western Rajasthan. Anon. (2002) also reported that low income, high cost of input, lack of farmers training, lack of location specific technologies, poor and erratic rainfall, water scarcity, occurrence of frequent drought, safety ground water etc. are the major constraints which hinder the horticultural development in arid region.

CONCLUSION

The present study revealed that there were several economical, production and technological socio-religious, storage and marketing, health and medicinal and agro-ecological motivational factors These factors encourage the farmers to produce the mateera crop at commercial scale in hot arid ecosystem of western Rajasthan. These factors should keep in mind while preparing any developmental program for large production of mateera crop in arid regions. However, the farmers face various constraints in large commercial production of mate era in arid eco-system. Therefore, the suitable strategies and action plan should be prepared to combat this constraint so that farmers can able to produce mateera at large scale to sustain their livelihood in such harsh climatic conditions.

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