

Economic analysis of Nagauri pan methi cultivation in Rajasthan

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Abstract

Trigonella corniculata L. commonly known as Nagauri pan methi is mainly grown in the Nagaur district of Rajasthan in the country. It is grown on large scale for its dried leaves. Present study analyzed the cost, returns and major constraints faced by the farmers in cultivation of pan methi in Nagaur. The average cost of cultivation (Cost C₂) was calculated at ₹ 1,47,366 ha⁻¹. The gross value of dried leaves and seed harvested was ₹ 4,06,645 ha⁻¹. Farmers could earned net returns of ₹ 2,73,555 and 2,59,279 ha⁻¹ over variable and total cost respectively, indicates a very good returns in this crop. The major constraints highlighted by pan methi farmers in Nagaur district of Rajasthan are lack of competitive price due to non availability of notified markets and very few traders and commission agents. Farmers asked for improved quality seed, advance technology in drying and grading of pan methi on large scale production and better price assurance.

Introduction

Fenugreek is an annual herb belonging to the family *Fabaceae* and genus *Trigonella*. The genus *Trigonella* consists of more than 50 species, out of which eleven different species are cultivated in India (Kakani and Anwar, 2012). *Trigonella foenum-graceum* and *Trigonella corniculata* are commercially cultivated oldest spice crops in the country (Singhania DL *et al.*, 2006). *Trigonella corniculata* L., is commonly known as 'kasuri methi' because its origin of cultivation in Kasur district of Punjab province currently lies in Pakistan (Erum *et al.*, 2011). It is a small annual herb with leaflets 1-4 cm long, 8-35 mm broad, oblong-wedge-shaped and tips being notched. The flowers are 6-7 mm long, yellow and wings are shorter than the keel having elliptical shaped seeds with dimensions 1.5×1.0×0.15 length, breadth and thickness; (Pasricha and Gupta, 2014; Kour *et al.*, 2018). *Kasuri methi* is mainly grown for its dried leaves which are used as spice and condiments in cooking as flavoring agents due to their characteristic pleasant aroma. Its leaves are rich source of folic acid, thiamine, Vitamins A, B₆, C, riboflavin and niacin and minerals like potassium, iron, phosphorus and calcium (Singh and Garg, 2006). Its seeds also possess numerous pharmacological properties viz., expectorant, aphrodisiac, carminative, hepatoprotective, anti-microbial, anti-cancer, anti-inflammatory and anti-lithogenic (Jain *et al.*, 1996; Mehrafarin *et al.*, 2011; Yadav *et al.*, 2014; Skaltsa *et al.*, 2010). Seeds of *T. corniculata* have also been reported to exhibit better antioxidant efficacy as compared to *T. foenum-graceum* (Semalty *et al.*, 2009). This crop is being grown in the country on

significant area but there are not any systematic studies highlighting economic analysis of this crop. Therefore present study tries to analyze the economic feasibility of the crop in its main cultivating area *i.e.* Nagaur district of Rajasthan.

Methodology

The cultivation of Nagauri pan methi is mostly concentrated in Nagaur district of Rajasthan. Farmers in the district are growing pan methi with tradition age old practices without introducing much technical knowhow. To introduce scientific good agriculture practices (GAP) in cultivation of this crop, ICAR-NRCSS conducted field level demonstrations on Nagauri pan methi under a DBT sponsored project on "Good Agriculture Practices (GAP) in selected seed spices in Western dry land region under Biotech kisan programme". Farmer selection was made with the help Ambuja Cement Foundation, Marwar Mundwa Nagaur (Rajasthan) in Bhero Nada, Bharani Nadi and Solyana villages of Marawar Mundwa block in Nagaur district due to highest area under this crop in this district. Ten farmers were provided with the input for one acre (0.4 ha) area comprising of improved seed of Pusa Kasuri variety, Fertilizer (DAP, Urea, MOP and Zinc Sulphate), *Trichoderma viride* for seed treatment, Neem oil for biological control of pests, *Beauveria bassiana* and *Lecanicilium lecani* for biological disease control in the month of October, 2020. The beneficiaries were given training on scientific cultivation of Nagauri pan methi and post harvest management practices. Team of scientists from ICAR-NRCSS, Ajmer and South Asia Biotechnology Centre, Jodhpur regularly visited the demonstration sites during cropping season for

monitoring the demonstration and guiding the farmers. After crop harvest & marketing of the produce data were recorded from the beneficiaries by personnel interview methods and analyzed.

Results and Discussion

Cultivation of fenugreek

Fenugreek is believed to be native to the Mediterranean region, now grown across all the continents of the world. It is mainly cultivated in India, Nepal, Pakistan, Bangladesh, Argentina, Egypt, France, Spain, Turkey, Morocco and China. It is also reported as a cultivated crop in parts of Europe, Northern Africa, West and South Asia, Argentina, Canada, United States of America (USA) and Australia (Petropoulos, 2002). India is the largest fenugreek producer in the World. Earlier in India, Kasuri methi was growing as wild forage in Punjab and Kashmir regions of the country. As per discussion with the farmers in Nagaur district during a Brainstorming session on “Nagouri pan methi: Origin, Domestication, Crop improvement and Production system” organized on 3rd Dec, 2020 by ICAR-National Research Centre on Seed spices, Ajmer (ICAR-NRCSS) in collaboration with South Asia Biotechnology Centre, Jodhpur and State Agriculture Department, Nagaur, Rajasthan, pan methi was introduced to Tausar village of Nagaur district from

Kashmir more than one and half century back as forage crop by a businessman visited over there. Over the period, the importance of crop has enhanced from forage to spice and condiments purpose because of its pleasing fragrance and aroma. Now, the crop has become very popular as Nagauri pan methi not only in the country but also abroad. The economic importance of the crop has grown because of increasing demand in domestic as well as international markets over the period. Recently, pan methi business in domestic and international market has crossed an economic turnover of billion rupees business every year (Bhaskar.com, 2020).

As per advance estimate 2019-20, seed spices namely, cumin, coriander, fenugreek, fennel, Ajwain, Dill, Poppy and Celery occupies 17.38 lakh ha area in the country, producing 16.80 lakh ton of seed spices. Fenugreek is grown under 1.20 lakh ha, with production of 1.88 ton seeds at an average productivity of 1566 kg ha⁻¹. It is the seventh largest spice and third largest seed spices grown in the country. It is having 7 and 11 percent share to seed spice acreage and production, respectively and 3.15 and 2.00 percent share to national spice area and production, respectively (Table 1).

Table 1. Area, production and productivity of major seed spices with per cent share to total spices in India (2019-20)

Crops	Area ('000 ha)	Production ('000 ton)	Yield (Kg/ha ⁻¹)	Area Share (%)	Production Share (%)
Cumin	841.94	546.75	649.39	22.02	5.80
Coriander	628.55	755.75	1202.37	16.44	8.02
Fenugreek	120.34	188.48	1566.23	3.15	2.00
Fennel	75.26	127.79	1697.98	1.97	1.36
Ajwain	37.81	27.92	738.43	0.99	0.30
Dill/Poppy/Celery	33.71	32.85	974.49	0.88	0.35
Seed spice	1737.61	1679.54	966.58	45.44	17.83
Total Spices	3824.26	9419.43	2463.07	100.00	100.00

Source: DASD, Kozhikode, 2021.

In India, Fenugreek cultivation is mainly concentrated in the states of Rajasthan, Madhya Pradesh, Gujarat, Haryana, West Bengal and Uttaranchal. During 2019-20, Rajasthan is the largest fenugreek growing state in the country having maximum area (45,310 ha) and second largest in production (62,890 ton) next only to Madhya Pradesh (82,750 tonnes). State is contributing more than 37 and 33 percent share to national fenugreek area and

production, respectively (Table 2). *T. foenum graceum* (L.) is the largest grown species in above states. Whereas, Nagauri Pan methi (*T. corniculata*) is grown in the Northern parts of the country, mainly in Rajasthan and some part of Uttar Pradesh. Further in Rajasthan, its cultivation is mainly concentrated in Nagaur, Mundwa and Khinvsar tehsils of Nagaur district on large scale.

Table 2. Major fenugreek growing states in India (2019-20).

State	Area (Hectare)	Production (Ton)	Yield (Kg/ha ⁻¹)	Area share to total (%)	Production share to total (%)
Madhya Pradesh	44858	82750	1844.71	37.28	43.90
Rajasthan	45310	62890	1387.99	37.65	33.37
Gujarat	9536	18370	1926.38	7.92	9.75
Haryana	3563	8610	2416.50	2.96	4.57
West Bengal	2437	2700	1107.92	2.03	1.43
Uttaranchal	487	2970	6098.56	0.40	1.58
India total	120340	188480	1566.23	100.00	100.00

Source: DASD Kozhikode, 2021.

In Rajasthan, Bikaner, Sikar, Jodhpur, Churu, Pratapgarh are the leading fenugreek producing districts (Table 3). The fenugreek (*Trigonella foenum-graecum*) is mainly grown in above district for seed purpose. Whereas Nagauri pan methi (*Trigonella corniculata* L.) for its dried leaf is mostly grown for in Nagaur and to some extent in Jodhpur district ((Lal *et al.*, 2014). During 2019-20, Nagauri Pan Methi is cultivated on an area of

more than 5000 ha in Tausar, Khajwana, Kuchera, Rune, Janaana, Indokali, Gwalu, Bhatnokha, Siradhana villages of Nagaur district (Dainik Bhasker Newspaper). Pan methi harvested in the Nagaur is very famous for its distinct aroma and flavor not only in the country but also abroad. From this region it is also exported to USA, Japan, Qatar, Tanzania, UAE, Nigeria, China, Australia and Nepal (Pawriya, 2020).

Table 3. Major fenugreek growing districts in Rajasthan (2018-19).

District Name	Area (Hectare)	Production (Ton)	Yield (Kg/ha)
Bikaner	7046	7760	1101
Sikar	5711	7968	1395
Jodhpur	5184	6769	1306
Churu	4985	5633	1130
Pratapgarh	4542	7210	1587
Rajasthan	45306	59161	1306

Source: Source: Government of Rajasthan, 2021.

About respondents

The primary survey of the beneficiaries was conducted to assess their socio-economic profile. Information on age, education, family size, total land holding, area under study crop with experience in pan methi cultivation was collected by personal interview method. The age of the farmers ranged from 24 to 55 years, with an average age of 42 years. All the selected farmers are educated having school education of 3 years to college degree with average formal education of 10 years (Table 4). There are 5 to 6 family members in selected families. Average land holding of respondents is 3.4 hectare. The pan methi is an importance cash crop for the selected farmers. On average 26 percent of total holding is diverted to pan methi cultivation in rabi season shows the higher degree of specialisation towards this crop other than wheat and gram.

Table 4. Demographic profile of respondents.

Particulars	Value
Age (in years)	42
Education (in years)	9
Family size (in no.)	5
Land holding (in ha)	3.41
Area under pan methi cultivation (in ha)	0.89
Experience in spice cultivation (in years)	16

Economic analysis of Nagauri pan methi cultivation

Nagauri pan methi is the major rabi season crop in study area, takes 170-180 days to harvest. It is sown in the second fortnight of October and harvested in first fortnight of April. Farmers take seven to eight cutting of green leaves in whole cropping season (up to ten in some cases) followed by harvesting for seed purpose. First harvesting starts 30-35 days after sowing followed

by regular subsequent cuttings at interval of 10-15 days till crop attains age of 140 to 145 days. Later leaves yield decreases and quality of leaves also degrades which fetches lower price to the farmers. Hence farmers left the crop in field for seed formation to meet out seed requirement in next cropping season. Pan methi green leaves are perishable in nature and loses quality i.e. color and aroma with time, needs to be marketed in time. Farmer takes their produce to Mundwa or Nagaur markets within a week after drying in general. The price they received for dried leaves varies from 70-80 (for early and late cuttings) to 140-150 (for mid season cuttings) rupees per kg dried leaves.

Table 5 and figure 2 depicts the costs in details and cost structure, respectively of Nagauri Pan methi in study area. Farmer follows four to five land preparation operation with tractor drawn implements like deep plough, disc harrow, rotavator and cultivators, costing about ten thousand rupees per hectare. The seeds of this crop are small in size and maximum leaves yield is the main concern of the farmers hence they use higher seed rate up to 250 kg ha⁻¹. The average market prices for seeds of this crop prevail in the study area varies from 150 to 200 rupees kg⁻¹. Higher seed rate coupled with higher seed price leads to 35-40 thousand seed cost ha⁻¹. Seed including sowing cost forms the largest cost component in pan methi cultivation covering more than one fourth of total cost of cultivation (27%). Sowing is manually done by broadcasting method followed by bed preparation and covering of seed under soil followed by irrigation application. For higher leaves yield farmers apply higher doses of chemical fertilizer (Urea, DAP, Potash) along with FYM (>5ton) and micro nutrients like Sulphur, Zinc and Gypsum etc. Manure, fertilizer and micro-nutrients cost 24 to 25 thousand rupees ha⁻¹. The plant protection cost on demonstration plots was calculated 5 to 6 thousand rupees ha⁻¹ (4% share in total cost), was comparatively half of conventional cultivation practices followed by farmers in same locality. The disease and pest control expenditure reduced to half at demonstration plots because of in time application of low cost biochemical control measure (Tricoderma, Bavariea Basina and Neem Oil costing only ₹ 2750 ha⁻¹) provided by ICAR-NRCSS. Pan methi is high water demanding crop, needs optimum moisture in field for quality leaves. In general farmers apply 15 to 18 irrigation from sowing to harvesting using sprinkler system, costs nearly eight thousand rupees ha⁻¹ (6% share in total cost). Cutting green leaves followed by sun drying is the most crucial, skilled and laborious operation in pan methi cultivation. It is high labor intensive operation, starts from 30 to 35 days after showing and continues till 140-145

days after sowing (Table 6). This is the next costly operation in this crop after seed cost. Farmers incurred more than 25 thousand rupees ha⁻¹ costing for leaves cutting, i.e. 17 percent of total cost of cultivation. On general, after eight cuttings, the crop is left for almost a month in the field for seed formation. On complete seed maturity it is harvest manually or mechanically with ripper, followed by threshing, costs more than six thousand rupees ha⁻¹. On average total variable cost comes to ₹ 133090 ha⁻¹ including interest on working capital. Including fixed cost, total cost of cultivation per hectare is arrived at ₹ 147366 ha⁻¹.

Harvesting of leaf cutting starts at the age of one month crop and continues till crop attains four and half month age. During this period farmers take seven to ten cutting varying from farm to farm and crop condition. Currently most of the farmers are using motor drawn leaf cutter in place of manual hand picking. Mechanized cutting reduced the labour demand appreciably, as a result cutting cost reduced to less than half. The yield in first cutting is comparatively less, which shows increasing trend till upto sixth- seventh cutting then starts decreasing (Table 6 and Figure 2). After harvesting leaves are kept for 2 to 3 days for open sun drying on drying yard, prepared by the farmers before harvesting season by leveling and cleaning the available open grounds in the vicinity. Harvested leaves kept for drying must be safeguarded against rains and stray animals. On complete drying leaves are packed in the poly coated plastic bags (to maintain the aroma) and taken to Mundwa or Nagaur city for sale. The first lot fetched relatively less price (70 to 80 ₹ Kg⁻¹) goes on increasing till fifth sixth cutting later it decreases for next harvest produce.

In total average farmers harvested 34 quintal dried leaves from one ha area. The average price received by farmers was 105 rupee per kg of dried leaves. Total value of dried leaves from one ha was arrived at ₹ 357945 ha⁻¹ at the demonstration plots. Other than dried leaves, farmers also harvested 2.44 quintals of pan methi seeds. Farmers keeps the harvested seed for sowing in next coming season at own farm or sale to local farmers if surplus is available. Harvested seed valued at ₹ 48700 ha⁻¹ at prevailed market price of ₹ 20000 quintal⁻¹ during study period. The gross value of produce, combining value of dried leaves and seed arrived at ₹ 406645 ha⁻¹. Over variable and total cost, farmers could earned a profit of ₹ 273555 and ₹ 259279 ha⁻¹, respectively which is relatively higher than other crops cultivated in this region. The returns for rupees of variable cost was calculated at 3.06 rupee and over total cost farmers could earned 2.76 rupees unit cost (Table 7).

Table 5. Cost of cultivation (₹ha⁻¹) of and input application in Nagauri pan methi at demonstration plots during 2020-21

Particulars	Average physical Unit	Cost (₹ ha ⁻¹)
Land preparation	4 to 5 operations	10039
Seed cost	210-250 Kg ^{ha} ⁻¹	
Broadcasting & leveling cost	4 Mondays	1450
FYM	5112 Kg ^{ha} ⁻¹	13780
Urea	112 Kg ^{ha} ⁻¹	736
DAP	110 Kg ^{ha} ⁻¹	2662
Sulphur	18 Kg ^{ha} ⁻¹	1888
Zinc	18 Kg ^{ha} ⁻¹	864
Gypsum	3000 Kg ^{ha} ⁻¹	3568
Bio Fertilizers (<i>Tricoderma, Bavariea Basina</i>)	12.5 Kg ^{ha} ⁻¹	1250
Neem Oil	5 Ltr ha ⁻¹	1500
Plant protection measures	1 to 3 spray	5750
Intercultural operations	1 to 3 operation	6250
Irrigation	15-18 irrigations	7795
Leaves cutting and drying cost	7-10 machine cutting	25500
Harvesting	15 Man days ha ⁻¹	3860
Threshing	1.5 Hrs ha ⁻¹	2572
Marketing cost	Lump sum	1500
Interest on WC	@ 7% per annum	3876.42
Variable cost	₹ ha ⁻¹	133090.4
Fixed cost	₹ ha ⁻¹	14276
Total cost	₹ ha ⁻¹	147366.4

Table 6. Cutting wise yield harvested of dried leaves (kg^{ha}⁻¹) at demonstrations plots

Cutting	Days after sowing	Average yield of dry leaves (Kg ^{ha} ⁻¹)
First	30 to 35	236.00
Second	40 to 45	282.50
Third	55 to 65	393.50
Fourth	70 to 75	440.75
Fifth	85 to 95	492.50
Sixth	100 to 110	565.25
Seventh	120 to 125	562.50
Eight	140 to 145	435.00
Total		3409.00

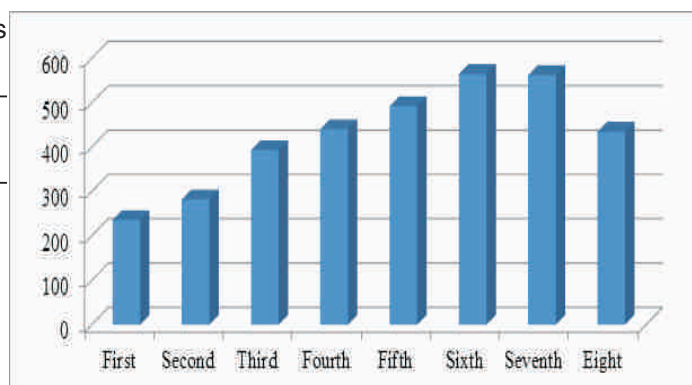


Fig 2. Yield trend of dried leaves (Kg cutting⁻¹) at demonstration plots

Table 7. Returns and yield in Nagauri pan methi cultivation (Rsha⁻¹) at demonstration plots during 2020-21

Particulars	Physical Unit	Cost (₹ ha ⁻¹)
Dried leaves Yield	Kgha ⁻¹	3409
Avg. price received by farmer	₹Kg ⁻¹	105
Dried leaves value	₹ha ⁻¹	357945
Seed Yield	Kgha ⁻¹	244
Prevailed market price	₹Kg ⁻¹	200
Seed value	₹ha ⁻¹	48700
Gross Value of Produce (GVP)	₹ha ⁻¹	406645
GVP minus variable cost	₹ha ⁻¹	273555
GVP minus total cost	₹ha ⁻¹	259279
Return per rupee of variable cost	Ratio	3.06
Return per rupee of total cost	Ratio	2.76
Cost of leaves production	(₹kg ⁻¹)	43.23

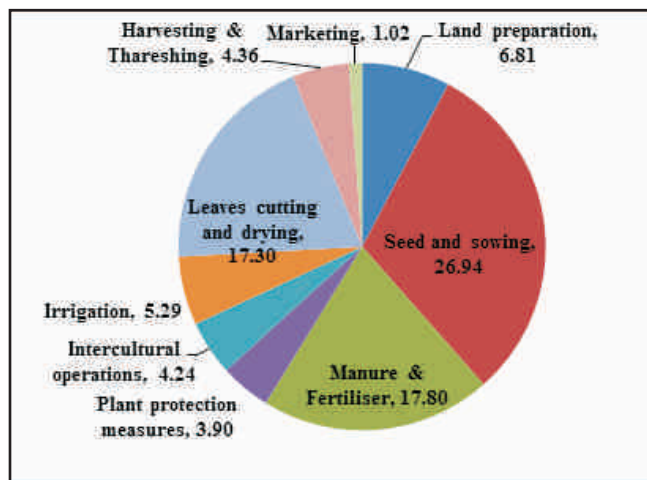


Fig 1. Cost structure of Nagauri pan methi cultivation with percent share

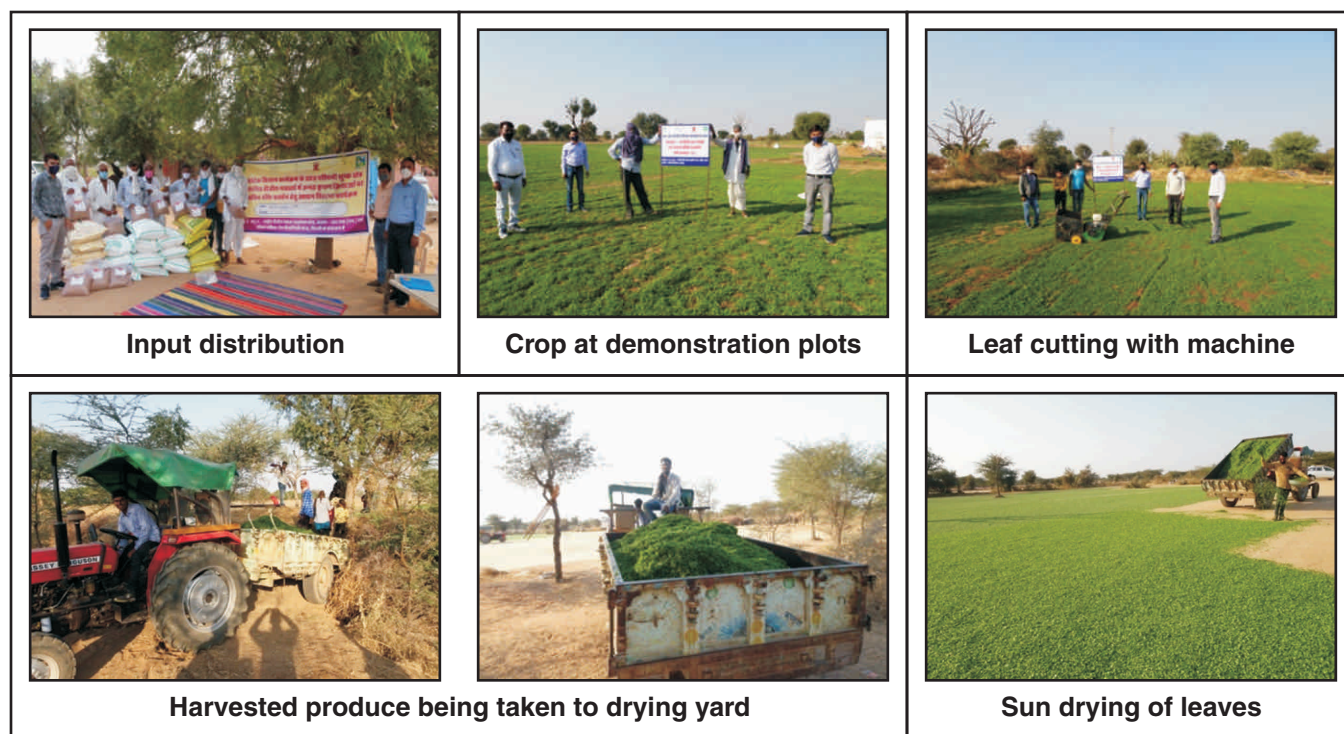


Fig 3. Photos showing activity from input distribution to sun drying at demonstration plots

Constraints faced by farmers in Nagauri pan methi cultivation:

The Nagauri pan methi is highly commercial cash crop cultivated in the study area. But there are several production, processing and marketing problems associated with cultivation of this crop which hurdles its cultivation in the study area. The major constraints are unavailability and high price of quality seeds for sowing. There are only local varieties available from previous year's crop harvest with low leaves quality. Beneficiary

farmers responded that the Pusa Kasuri variety provided by ICAR-NRCSS for the demonstration produced better quality leaves with best appearance and aroma. Incidence of mimicry weed (*Melilotus indicus*) in the field of Nagauri pan methi is big challenge for farmers now a days, is very difficult to control by different means. The mixing of weed leaves with pan methi lowers the quality of produce and reduces its economic value, results in lower market price to the growers. In marketing of dries leaves, farmers encounters with several problems in

selling their produce due to lack of concrete sales arrangements for the farmers. There is not any notified market for this crop. Farmers take their produce to nearby very few commission agents sitting in Mundwa and Nagaur markets, where they do not get fair prices for their produce. There are not any set standards and grading systems. Agents charges unjustified levy on name of excess moisture. Trader's deals with the farmers arbitrarily, lead to dispute among farmers and commission agents very often. The respondent narrated that pan methi was included in the list of notify commodity by the government in May 2017 but the dreams of farmers selling in the market and getting a fair price have not been realized yet (Table 8). Similar problems were also highlighted by Pawariya and Dagar (2020) in this crop. Study calls need for uniform quality standards in this crop. The specified market can be notified so that administrative control over traders can be strengthened for safeguard of pan methi growers and more income generation to the nation by more export from this region.

Table 8. Major problems identified by pan methi farmers

Constraints	Garrett's Rank	Mean Score
Non availability of improved seed	45.32	VII
Incidence of mimicry weed	38.63	IX
Losses by stray and wild animals	43.25	VIII
Labour scarcity	47.62	VI
Lack of appropriate market	69.71	II
Lack of competitive price	76.21	I
Lack of standard/grades	56.42	V
Packaging and Transportation	31.25	X
Intermediaries exploitation	62.34	III
Lack of mechanised drying techniques	59.23	IV

Conclusion

The result shows high economic returns from cultivation of Nagauri pan methi in the study area. The crop is having great potential to enhance the farmer's income due to distinct characteristics of pan methi grown in Nagaur district. Farmers in ths study area face many marketing and production constraints e.g. quality seed, labor problem, competitive prices and quality standard etc. Farmers could not expand its cultivation to larger area due to higher labour, irrigation and drying yard requirements. Advancement in drying technologies and government market intervention can take this crop to

new height. Pan methi has potential to increase the income of the pan methi growers due to high national and international demand and the country can also earn more foreign exchange through its export.

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