Constraints faced by Farmers of Rajasthan State in the Adoption of Improved Kinnow Production Technology

ABSTRACT

The present study highlights the various barriers to the adoption of the improved kinnow production technology under National Horticulture Mission (NHM) by the farmers. Analysis of the constraints, including technical constraints, environmental constraints, financial constraints, marketing constraints and socio-personal & psychological constraints as experienced by the kinnow growers was the main objective of the investigation. Sri Ganganagar district of Rajasthan state was purposely selected as the district had highest numbers of registered farmers under NHM compared to other districts in the state. Findings of the study revealed that the major constraints faced by the kinnow growers in the adoption of improved kinnow production technology under NHM were "unsuitable land for kinnow orchard", "scarcity of water for irrigation", "inadequate subsidy", "no timely sale of produce" and "traditional nature of farmers". This might be due to the lack of awareness and training on the part of the kinnow growers regarding improved practices of kinnow cultivation. So, in order to mitigate these constraints more periodical training on various aspects of improved kinnow production technology should be organized and imparted to the kinnow growers at the grass root level to acquire more knowledge about the new techniques/improved practices of kinnow cultivation.

Keywords: Constraints, Farmers, Adoption, Improved Kinnow Production Technology, NHM

Introduction

Horticulture is one of the most growing sectors in agriculture. It also provide nutrition food along with help and supply of raw material for construction, good wages for workers, ample job opportunities and create income source for the farmers family (Choudhary, 2013). Due to rapid increase in the cultivation and production of horticultural crops, it is known as "Golden Revolution". According to financial year 2021 as per the first advance estimates production of horticulture crops in India was estimated at a record 326.6 million. It is also worth noting that with only 2.4 percent of the land area, India can support about 17 per cent of the world's population. Globally, it appears that we are slowly moving towards the global food crisis (Neeraj *et al.*, 2017).

In this regard, the attention was paid to the development of the horticulture sector in the country through the National Horticulture Mission (NHM) inaugurated by the Department of Agriculture and Cooperation, Ministry of Agriculture and Farmers Welfare, Government of India in the year 2005-06. In which Government of India contributes 85% of the total outlay for

development programmes in all the states and 15% share by the State Governments. India has a wide range of climate and soil on which a large number of horticultural crops are grown such as fruits, vegetables, ornamental, medicinal & aromatic plants, plantation crops, spices, cashew and cocoa (Jain, 2019). In terms of total fruits in India, citrus ranks second after mango in terms of area and third in production after mango & banana. The total horticulture crop production in India is 295164 MT from an area of 24926 thousand hectares (Kumar, 2019)and the total fruit production is 98579 MT from an area of 6648 hectares and the production of that citrus crop is 13200 MT from an area of 1034 hectares.The area under kinnow has been increased from 618.5 mha in 2001-02 to 846.6 mha in 2010-11 and has also been increased to 1034 mha in 2018-19 (Anonymous, 2018-19). According to third advance estimate, the area of kinnow in India is 4.79 lakh hectares and the production is 63.97 lakh tons (Anonymous, 2020_a).

Kinnow is successfully cultivated in Punjab, Haryana, Himanchal Pradesh, Western Rajasthan and Uttar Pradesh. Kinnow (hybrid mandarin) is ranked first among all citrus fruits in area and production in the state of Rajasthan. It is an important fruit crop that thrives in all climatic conditions of Rajasthan. Sri Ganganagar district of Rajasthan is favorable for Kinnow cultivation as compared to other regions of Rajasthan state and is well coveredby NHM. Sri Ganganagar district covers an area of 9009 hectares under kinnow cultivation and the production is 215308 MT (Anonymous, 2020_b). The kinnow, a hybrid mandarin is cross between Citrus Nobilis Lour and Citrus Deliciosa Tan. Kinnow has successfully replaced the traditional citrus fruits such as sweet orange and local mandarin (Gora *et al.*,2011). After achieving highest area and production of kinnow crop in Sri Ganganagar district farmers facing many problems in kinnow cultivation like poor management of kinnow orchards, heavy insect-pest & disease infestation during crop growth period, fruit drop & relatively higher cost of mechanization, less availability of required planting material and limited availability of FYM at the time of planting. The reasons behind these problems are lack of knowledge of the farmers about improved kinnow production technology and their less contact with the extension personnels' or agencies. In this context, there is a dire need to increase the scope for higher production and quality improvement in kinnow cultivation in the region. The National Horticulture Mission has been successfully creating more possibilities for kinnow cultivation, so that the income and production of kinnow growers can be increased.Therefore, realizing the importance of kinnow cultivation under NHM, the present study was conducted with the objective to delineate the constraints being faced by the kinnow growers in the adoption of improved kinnow production technology.

Materials and Methods

The present study was conducted in Sri Ganganagar region of Rajasthan state which was selected purposely on the basis of highest area and production of kinnow cultivation. Sri Ganganagar region comprises two districts namely Sri Ganganagar and Hanumangarh districts.Three *Panchayat Samitis* namely Sri Ganganagar, Sri Karanpur and Padampur were purposely selected for the present study on the basis of highest area and production of kinnow. For selection of respondents, a comprehensive *Panchayat Samiti*-wise list of Kinnow growers who were benefitted under NHM was procured from the Department of Horticulture, Sriganganagar, Rajasthan for current study. With the help of proportionate random sampling method, the respondents who were benefitted under NHM were selected and they were called as beneficiary respondents. To constitute the other half of the sample size, same number of kinnow growers who were not benefitted under NHM were also selected randomly from the same *Panchayat Samitis* and they were designated as non-beneficiary respondents. Thus, total 180 respondent's *i.e.* 90 beneficiary as well as 90 non-beneficiary respondents were selected from the selected three *Panchayat Samitis* for present study. Here, the total sample size from selected *PanchayatSamitis* was 180 respondents. An interview schedule was designed for collection of data from the respondents. The pre-testing of the interview schedule was conducted with the help of 25 non-sampled respondents who were not included in the study. The personal interview method was used for the collection of the data. The data were analysed with the help of different statistical tools like mean percent score, rank correlation and t-test etc.

Results and Discussion

Constraint refers to a reduction on the degrees of freedom of the elements of a system exerted by some collection of elements, or alimitationorbiasonthevariabilityorpossibilitiesofchangeinthekind ofsuchelements(UmerezandMossio,2013).Constraintsareprojectionsofcollectivesentimentsrather thansimplemirrorofobjectiveconditions(Bora,1990).Inthepresentinvestigation,theconstraintswer e operationalizedastheobstaclesandhurdlesconfronted by the kinnow growers in the adoption of improved kinnowproductiontechnology. Tomeasuretheconstraintsresponsibleforhindering the adoption of improved kinnow production technologybythekinnowgrowers, asuitableschedulewasdeveloped.Allthe possible constraints being faced by the beneficiary and non-beneficiary kinnow growers were grouped into five major categoriesnamelytechnical,environmental,financial,marketingandsocio-personal &

psychological constraints. In order to study various types ofconstraints, the kinnow growers were asked to give the response onthreepointcontinuum.Afterthatonthebasisofscoresineachcategory of constraints Mean Percent Score (MPS) was calculated foreach dimension.

TechnicalConstraints

The data inTable 1 shows that technical constraints *viz.*'unsuitableland for kinnow orchard' wasranked first by beneficiarykinnow growers with 69.62 MPS, followed by 'general carelessness ofprivateandgovt.agenciesinthearea'(60.37MPS),'inadequateknowledge about kinnow production' (36.66 MPS), 'lack of knowledgeabout machinery' (35.92 MPS), 'problem of intercropping & interculturaloperations' (34.81 MPS) and 'lack of technical guidance' (32.96 MPS)were rankedsecond,third,fourth,fifth andsixth,respectively.Whereas,in case of non-beneficiary kinnow growers the firstrank was assigned for'lack of knowledge about machinery' with 87.40MPS, followed by 'unsuitable land for kinnow orchard' (85.92 MPS),'general carelessness of private and govt. agencies in the area' (54.44MPS),'lackoftechnicalguidance'(53.33MPS),'inadequateknowledgeaboutkinnowproduction'(50.40MPS)and'problemofintercropping&interculturaloperations(50.37MPS)whichwererankedsecond, third, fourth,fifth andsixth,respectively.

Table 1: Ranking of Items under Technical Constraints

S. No.	TechnicalConstraints	Respondents					
		BeneficiaryRespondents(n=90)		Non-beneficiary Respondents(n=90)		OverallRespondents(N=180)	
		MPS	Rank	MPS	Rank	MPS	Rank
1.	Inadequate KnowledgeaboutKinnow Production	36.66	III	50.40	V	43.53	IV
2.	Lack of TechnicalGuidance	32.96	VI	53.33	IV	43.14	V
3.	Lack of KnowledgeaboutMachinery	35.92	IV	87.40	I	61.66	II
4.	ProblemofIntercropping&InterculturalOperations	34.81	V	50.37	VI	42.59	VI
5.	Unsuitable Land forKinnowOrchard	69.62	I	85.92	II	77.77	I
6.	General CarelessnessofPrivateand Govt. Agenciesinthe Area	60.37	II	54.44	III	57.40	III

	Pooled	45.05		63.64		54.34	

r_s=rankcorrelation r_s=0.43

MPS=MeanPercentScore $t = 0.95^{NS}$

NS= Non Significant

Further, the data in Table 1 also illustrates that 'unsuitableland forkinnow orchard' (77.77MPS) was ranked firstby majority oftheoverallkinnowgrowers,followedby'lackofknowledgeaboutmachinery'(61.66MPS)rankedsecond,'generalcarelessnessofprivateandgovt.agenciesinthearea'(57.40MPS)rankedthird, 'inadequate knowledge about kinnow production' (43.53 MPS) rankedfourth,'lackoftechnicalguidance'(43.14MPS)rankedfifthand'problem of intercropping & intercultural operations (42.59 MPS) wasranked sixth under technical constraints category. Here, the value ofcalculatedrankcorrelation(r_s)was0.43whichwasfoundnon-significant, leading to conclusion that there was a similarity found in therankassignmentpatternoftechnicalconstraintsfacedbythebeneficiaryandnon-beneficiarykinnowgrowersintheadoptionofimproved kinnow production technology, though there was a differencein the magnitude of MPS of beneficiary and non-beneficiary kinnowgrowers. Thus, from the above findings it may be concluded that majority of the kinnow growers reported that unsuitable land for kinnow orchard, lack of knowledge about machinery, general carelessness of private and govt. agencies in the area and problem of intercropping & intercultural operations is very high and as the major constraints. No uses of organic mannure, compost and cow dung are the reason behind for being a problematic and barren land.The findings are in line with the findings of Rai *et al.* (2012)and Bhat *et al.* (2015) who reported that careless nature of agricultureofficerandlackoftechnicalknowledgewerethemajorconstraintsfaced by the farmers in the adoption of orange production technologyand citrus cultivation. The findings are contradictory with findings ofSingh (2019) and Sharma &Upadhayaya (2020) who observed thatproblem of intercropping & intercultural operations and lack of technicalknow-how were the major constraints faced by the farmers in the citruscultivation.

EnvironmentalConstraints

ThedatainTable2showsthatmajorenvironmentalconstraints faced by the beneficiary

kinnow growers were 'scarcity ofwater for irrigation' (70.37 MPS) which was ranked first, followed by'overexploitationofnutrients'(65.92MPS),'unfavorableweatherconditions like frost, drought, erratic rainfall etc.' (58.89 MPS), 'moreinsect, pest attack during crop growth period' (58.80 MPS), 'improperdrainage facility' (56.66 MPS) and 'higher incidence of weed' (48.51)which were ranked second, third, fourth, fifth and sixth, respectively.FurtherexaminationoftheTable2revealsthatthemajorconstraintsperceivedbythenon-beneficiarykinnowgrowerswere'unfavorableweatherconditionslikefrost,drought,erraticrainfall etc. (88.88 MPS) which was ranked first, followed by 'scarcity of water forirrigation'(79.25MPS)rankedsecond,'higherincidenceofweed'(77.40MPS)rankedthird,'improperdrainagefacility'(76.29MPS)rankedfourth,'moreinsectpestattackduringcropgrowth period'(75.18 MPS) ranked fifth and 'over exploitation of nutrients' (70.40 MPS)was ranked sixth, respectively. If we look at the data in Table 2irrespectiveof

Table 2: Ranking of Items under Environmental Constraints

S. No.	Environmental Constraints	Respondents					
		BeneficiaryRespondents (n=90)		Non-beneficiaryRespondents (n=90)		OverallRespondents (N=180)	
		MPS	Rank	MPS	Rank	MPS	Rank
1.	OverExploitationofNutrients	65.92	II	70.40	VI	68.16	III
2.	Scarcity of Water for Irrigation	70.37	I	79.25	II	74.81	I
3.	More Insect,PestAttack during CropGrowthPeriod	58.80	IV	75.18	V	66.99	IV
4.	Improper Drainagefacility	56.66	V	76.29	IV	66.47	V
5.	Higher Incidence ofWeed	48.51	VI	77.40	III	62.95	VI
6.	Unfavorable WeatherConditions(Frost,Drought,ErraticRainfall)etc.	58.89	III	88.88	I	73.88	II
	Pooled	59.85		77.90		68.87	

r_s=rankcorrelation
MPS=MeanPercentScore r_s=0.08
NS= NonSignificant $t=0.53^{NS}$

beneficiaryandnon-beneficiarykinnowgrowers,thedatadepictsthat‘scarcityofwaterforirrigation’(74.81MPS)wasrankedfirstbytheoverallrespondents,followedby‘unfavourableweather conditions like frost, drought, erratic rainfall etc.’ (73.88 MPS)ranked second, ‘over exploitation of nutrients’ (68.16 MPS) ranked third,‘more insect pest attack during crop growth period’ (66.99 MPS) rankedfourth, ‘improper drainage facility’ (66.47 MPS) ranked fifth an ‘higherincidence of weed’ (62.95 MPS) was ranked sixth, respectively.This might be due to that canal water is not sufficient for irrigation because of irregular and sporadic supply of water. The findings are in line with the findings of Tulsiram (2012) andSaryam&Jiril (2020) who reported that shortage of irrigation water wasthe major constraint faced by the farmers in the adoption of orangecultivationtechnology.Thefindingsarecontradictorywiththefindingsof Rana*etal.*(2019)whoconcludedthatproblemofinsectanddiseaseswasthemainconstraintfacedbythefarmersinKhasi mandarincultivation. The value of calculated rank correlation (r_s) was 0.08 which was foundnon-significant, leading to conclusion that there was a similarity in rankassignmentpatternofenvironmentalconstraintsfacedbythebeneficiaryandnon-beneficiarykinnowgrowersintheadoptionofimproved kinnow production technology, though there was a differencein the magnitude of MPS of beneficiary and non-beneficiary kinnowgrowers.

FinancialConstraints

The data in Table 3 shows that financial constraints faced bythe beneficiary farmers in the adoption of improved kinnow productiontechnology were ‘high cost of pesticides and fertilizers’ (66.31 MPS)which was ranked first, followed by ‘inadequate subsidy’ (66.29 MPS),‘lack of credit facility’ (57.40 MPS), ‘high initial cost in establishingkinnoworchard’(55.92MPS),‘labourwagesarehigh’(42.96MPS)andhighcostoftransportation’(39.62MPS)wererankedsecond, third, fourth, fifth and sixth, respectively. Further examination of theTable3depictsthatthemajorconstraintsperceivedbythenon-beneficiary kinnow growers were ‘lack of credit facility’ (78.51 MPS)which was ranked first, ‘high initial cost in establishing kinnow orchard’(77.77MPS)rankedsecond,‘inadequatesubsidy’(77.40MPS)rankedthird,‘highcostofpes

ticidesandfertilizers'(75.18MPS)ranked fourth,'highcostoftransportation' (74.81MPS)ranked fifth and'labourwagesarehigh'(70.74MPS)wasrankedsixth,respectively. If we look at the data in Table 3 irrespective of beneficiaryandnon-beneficiarykinnowgrowers,datarevealsthatmajorconstraints perceived by the overall kinnow growers in the adoption ofimprovedkinnowproductiontechnologyunderNationalHorticultureMission were 'inadequate subsidy' (71.84 MPS), followed by 'high costofpesticidesandfertilizers'(70.74MPS)whichwererankedfirstand second, respectively. While, 'lack of credit facility' (67.95 MPS) wasranked third, 'high initial cost in establishing kinnow orchard' (66.84MPS) ranked fourth, 'high cost of transportation' (57.21 MPS) rankedfifthand'labourwagesarehigh'(56.85MPS)wasrankedsixth,respectively. It might be due to reason that government plays less role in motivating the farmers and storage&infrastructure facilities are not available at subsidized rates. Thevalueofcalculatedrankcorrelation(r_s)was0.21which was found non-significant, leading to conclusion that there was asimilarity in rank assignment pattern offinancial constraints faced bythe beneficiary and non-beneficiary kinnow growers,though there wasadifferenceinthemagnitudeofMPSofbeneficiaryandnon-beneficiary kinnow growers.

Table 3: Ranking of Items under Financial Constraints

S. No.	FinancialConstraints	Respondents					
		BeneficiaryRespondents(n=90)		Non-beneficiaryRespondents (n=90)		OverallRespondents (N=180)	
		MPS	Rank	MPS	Rank	MPS	Rank
1.	Lack of CreditFacility	57.40	III	78.51	I	67.95	III
2.	InadequateSubsidy	66.29	II	77.40	III	71.84	I
3.	Labour Wages areHigh	42.96	V	70.74	VI	56.85	VI
4.	HighCostofTransportation	39.62	VI	74.81	V	57.21	V
5.	HighInitialCostinEstablishingKinnowOrchard	55.92	IV	77.77	II	66.84	IV

6.	HighCostofPesticides andFertilizers	66.31	I	75.18	IV	70.74	II
	Pooled	54.75		45.73		56.57	

r_s=rankcorrelation
MPS=MeanPercentScore
NS= Non Significant

r_s=0.21
$t=0.43^{NS}$

The findings are in line with the findings ofLaxman (2011) and Deshmukh *et al.* (2021) who found that high labourwages and high cost of fertilizers were the major constraints faced byfarmers in orange cultivation technology. The findings are contradictorywith the findings of H.S. *et al.* (2019) who observed that credit facilitywasthemajorconstraint faced bythefarmersinkinnowcultivation.

MarketingConstraints

ThedatainTable4indicatesthatmajormarketingconstraintsperceivedbythebeneficiarykinnowgrowerswere'notimelysaleofproduce'(84.07MPS)whichwasrankedfirst,followedby'lackofstoragefacilityinarea'(69.25MPS)rankedsecond,'existenceofmiddleman'(63.70MPS)rankedthird,'lowpriceofproduce'(54.07MPS)rankedfourthand'non-availabilityoflocalmarket'(49.25MPS)wasrankedfifth,respectively.ThedatainTable 4 also shows that major marketing constraints faced by the non-beneficiary kinnow growers were **'**no timely sale of produce' (90.37MPS) which was ranked first, followed by 'lack of storage facility inarea' (75.55 MPS) ranked second, 'low price of produce' (65.55 MPS)ranked third, 'existence of middleman' (62.96 MPS) ranked fourth and'non-availabilityoflocalmarket'(58.51MPS)wasrankedfifth,respectively.

Further,Table4alsodepictsthatmajormarketingconstraints faced by overall kinnow growers were 'no timely sale ofproduce'(87.22MPS)whichwasrankedfirst,followedby'lackofstoragefacilityinarea'(72.40 MPS)rankedsecond,'existenceofmiddleman' (63.33 MPS) ranked third, 'low price of produce' (59.81MPS) ranked fourth and 'non-availability of local market' (53.88 MPS)wasrankedfifth,respectively.Further,Table4alsoillustrates thatmajormarketingconstraints faced by overall kinnow growers were 'no timely sale ofproduce'(87.22MPS)whichwasrankedfirst,followedby'lackofstoragefacilityinarea'(72.40 MPS)rankedsecond,'existenceofmiddleman' (63.33 MPS) ranked third, 'low price of produce' (59.81MPS) ranked fourth and 'non-availability of local market' (53.88 MPS)

wasrankedfifth,respectively. This might be due to that the government does not take active participation with the farmers in creating local markets, cooperatives, and online marketing platforms; hence the produce is not sold on time.Here,thevalueofcalculatedrankcorrelation (r_s) was 0.9whichwas found significantat one per centlevel of significance, leading to conclusion that there was a similarity inrankassignmentpatternofmarketingconstraintsfacedbythebeneficiaryandnon-beneficiarykinnowgrowersintheadoptionofimproved kinnow production technology, though there was a differencein the magnitude of MPS of beneficiary and non-beneficiary kinnowgrowers.

Table 4: Ranking of Items under Marketing Constraints

S. NO.	Marketing Constraints	Respondents					
		Beneficiary Respondents (n=90)		Non-beneficiary Respondents (n=90)		Overall Respondents (N=180)	
		MPS	Rank	MPS	Rank	MPS	Rank
1.	Lackof StorageFacilityin Area	69.25	II	75.55	II	72.40	II
2.	Existence ofMiddleM an	63.70	III	62.96	IV	63.33	III
3.	Non-AvailabilityofLocalMarket	49.25	V	58.51	V	53.88	V
4.	Low Price ofProduce	54.07	IV	65.55	III	59.81	IV
5.	NoTimelySaleofProduce	84.07	I	90.37	I	87.22	I
	Pooled	64.06		70.58		67.33	

r_s=rankcorrelation
MPS=MeanPercentScore
**=significantat0.01 levelof probability

r_s=0.9
t=3.56**

ThefindingsaresupportedbythefindingsofChoudhary&Bangarva (2013), Kaur & Singla (2016), Wankede*et al.* (2017), Sohi &Mathura (2018) and Regmi *et al.* (2020) who reported that existence ofmiddleman,lowpriceofkinnowfruitandlackofstoragefacilitywerethe major constraints faced by the farmers in the adoption of kinnowproductiontechnology and orangecultivation.

Socio-personalandPsychologicalConstraints

The data in Table 5 reveals that major socio-personal andpsychological constraints perceived by the beneficiary kinnow growersintheadoptionofimprovedkinnowproductiontechnologywere'traditional nature offarmers' (81.11MPS) whichwasrankedfirst,followed by 'low consumption of kinnow in local area' (67.41 MPS)rankedsecond,'generalunawarenessaboutkinnowby-product'(66.67 MPS) ranked third, 'small land holding' (62.96 MPS) rankedfourth and 'low literacy rate of farmers' (60.37 MPS) was ranked fifth,respectively. The data in Table 5 also indicates that major socio-personalandpsychologicalconstraintsencounteredbythenon-beneficiary kinnow growers were 'traditional nature of farmers' (83.33MPS) which was ranked first, followed by 'general unawareness aboutkinnow by-product' (77.03 MPS) ranked second, 'low consumption ofkinnow in local area' (76.66 MPS) ranked third, 'low literacy rate offarmers' (65.55 MPS) ranked fourth and 'small land holding' (63.70MPS)wasrankedfifth,respectively.

Further, Table 5 also depicts that major socio-personal &psychologicalconstraintsfacedbytheoverallkinnowgrowerswere 'traditional nature of farmers' (82.22 MPS) and 'low consumption ofkinnow in local area' (72.03 MPS) which were ranked first and second,respectively. 'General unawareness about kinnow by-product' (71.85MPS) was ranked third, 'small land holding' (63.33 MPS) ranked fourthand 'low literacy rate of farmers' (62.96 MPS) was ranked fifth. The reason behind non-adoption of modern approach to kinnow cultivation was ignorance of success stories of successful farmers and lack of information about incentives received in National Horticulture Mission regarding improved kinnow production technology.Here,the value of calculated rank correlation (r_s) was 0.8 which was foundsignificant at five per cent level of significance, leading to conclusionthat there was a similarity in rank assignment pattern of socio-personalandpsychologicalconstraintsfacedbythebeneficiaryandnon-beneficiarykinnowgrowersintheadoptionofimprovedkinnow production technology, though there was a differencein the magnitudeof MPS of beneficiary and non-beneficiary farmers.

Table 5: Ranking of Items under Socio-personal and Psychological Constraints

		Respondents

S. No.	Socio-personal And PsychologicalConstraints	BeneficiaryRespondents (n=90)		Non-beneficiary Respondents (n=90)		OverallRespondents (N=180)	
		MPS	Rank	MPS	Rank	MPS	Rank
1.	TraditionalNatureofFarmers	81.11	I	83.33	I	82.22	I
2.	Low Literacy Rate ofFarmers	60.37	V	65.55	IV	62.96	V
3.	SmallLandHolding	62.96	IV	63.70	V	63.33	IV
4.	GeneralUnawarenessaboutKinnowBy-Product	66.67	III	77.03	II	71.85	III
5.	LowConsumptionofkinnowin LocalArea	67.41	II	76.66	III	72.03	II
	Pooled	67.70		3.25		70.48	

r_s= rankcorrelation
MPS=MeanPercentScore
*=significantat0.05levelofprobability

r_s=0.8
t=2.26*

The findings aresupported by the findings of Roy *et al.* (2018) and Passah& Tripathi(2020) who reported that small land holding was the major problemfaced by the farmers in the adoption of mandarin cultivation. Cheemaand Jamali (2020) also concluded that low literacy rate was the majorconstraintfaced bythefarmersintheadoptionofcitruscultivation

Conclusion

From the above findings, it is concluded that the main constraints faced by the kinnow growers in the adoption of improved kinnow production technology under National Horticulture Mission were “unsuitable land for kinnow orchard”, “scarcity of water for irrigation”, “inadequate subsidy”, “no timely sale of produce” and “traditional nature of farmers”.So, in order to mitigate these constraints, farmers should use soil amendments as well as organic manure, compost, cow dung, inorganic supplement like zinc, lime can also be added for the reclamation of problematic soil as barren land was one of the inhibiting factors in the production of kinnow fruits in the study area. The only source of water for irrigation in the locale of study was Indira Gandhi Water Canal which was not sufficient for these farmers due to irregular and sporadic supply of water. To cope with the paucity of irrigation water, government should motivate farmers and create suitable infrastructure for rain water harvesting and other water storage facilities at subsidized

rates. The government should actively participate in creating local markets, cooperatives, online marketing platforms to ensure timely sale of farmers' produce. Suitable facilities should also be created to ensure smooth transportation of produce to distant markets, if necessary. Success stories of successful farmers should be publicized so as to bring about a change in the present attitude of the farmers and attract them towards modern approaches of production technology to handle their produce efficiently. There should also be a provision of incentives to encourage better performing farmers and other farmers as well.

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