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Analysis of area, production, productivity and economic returns of Rabi onion to different states of India

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Abstract

A comparison analysis were carried out in twelve states of India during 2021-22; the data were elicited through annual report of National Horticultural Research and Development Foundation (NHRDF)-New Delhi and personal interview of scientist. Problems of onion crop production and their productivity solutions at state farming situations were analysis. In this regard, demonstrations on integrated crop management in onion varieties, farmer's trainings and seminars were conducted in 2021-22 during Rabi season by NHRDF under National Horticulture Mission, in different states locations of India and data were collected and centrally compiled in annual report. The highest average yield of state was obtained in Madhya Pradesh state 320 quintal per hectare with cost of production Rs 223290.00 per hectare and lowest in Tamil Nadu state (175 quintal per hectare) against maximum cost of production Rs 222133.00 per hectare and it was highest production cost Rs 1269.00 per quintal. The maximum technology gap was recorded in Tamil Nadu state 175.00 quintal per hectare and minimum in Madhya Pradesh 30 quintal per hectare. The technology index shows the feasibility of the technology at farmer's field and adoption sincerity of the farmers in state. The lower value of technology index more is the feasibility. The technology index was minimum in Madhya Pradesh 8.57% and maximum in Tamil Nadu 50%. Higher net monetary returns of Rs 461018.00 in Odisha due to adopt best practices with optimum cost of production (Rs/ha) and lowest in Tamil Nadu Rs 127867.00 and it was due to maximum expenses incurred on cost of production. Similarly highest B: C ratio was observed in Odisha 4.31 and lowest in Tamil Nadu 1.57. Production and productivity of onion yield between state yield were varied and differences from state yield, project yield with potential yield can be make up by more emphasis on disseminate to awareness regarding technologies and improved cultivation practices to states, where more gap of yield were observed. Planning of crop demonstrations as well as trainings is an effective extension mean to disseminate the proven technology at farmers level and to bridge the yield gap that increase the crop yield, monetary returns and livelihood status of the farming community.

Keywords: Onion, economics, analysis, production, productivity, technology gap

Introduction

Onion (*Allium cepa* L.) is one of the most important commercial vegetables that form of the daily diet. In India, onion crop is widely grown in different part of the country. Based on FAOSTAT data for 2022, the worldwide onion (including shallots) production are was approximately 5.9 million hectares. Onions produced by India are famous for their pungency and available round the year. Onion is an indispensable item in every kitchen as continent and vegetable. It is used either in raw form and dehydrated form to add favour and taste to Indian cousins. Since onion has medicinal value, it is used in some pharmaceutical preparation also. China ranks first in area and second in onion production in the world. During 2021-22, the state wise area under onion in India has presented in table 1. The productivity of onion is much low in India than the world average (Lawande, 2005) [7]. The production and productivity of onion is varying in state to state specially in Uttarakhand are low in compared to Jammu & Kashmir, Gujarat, Madhya Pradesh and other onion growing states. That is due to lack of knowledge to farmers regarding suitable seasons, unavailability of high yielding varieties, varieties for different seasons, climate, Soil and improved cultivation techniques are the main reasons. Unawareness of the characteristic of the varieties, seasonality's and adoption of proper package of practices are also the reasons

responsible for limiting the production and productivity of onion directly or indirectly (Pandey and Bhondey, 2002) [8]. In the study made to compile production level of onion crop at state wise, it comes to know that, among all the production state contribute a major share in the onion crop production. Hence, a large number of crop demonstrations on integrated crop management in onion with new high yielding variety were conducted in 2021-22 during rabi season by National Horticultural Research and Development Foundation, in different locations of Twelve states through TDTD (Technology Dissemination through Demonstration) under National Horticulture Mission at selected farmers' fields, but adoption level was highly varied. Any

technological improvement or productivity enhance in agriculture, not only contributes to overall economic growth but it also provides immediate microeconomic benefits for a large number of rural households. Onion production was found much higher in Rabi season compared to the kharif and late kharif season. Market price of input that was prevailing at the time of their use was considered for working out of cost of cultivation. The gross return was calculated on the basis of market price of the produce at the time when the produce is ready for sale. Net return Rupees per hectare was calculated by deducting the cost of production from the gross income. pple (CA) leaves of various sizes were gathered.

Table 1: Area, Production and Productivity of Onion in different status during 2021-2022

States/UTs	Area		Production Productivity		
	('000 ha)	Share%	('000 MT)	Share%	(Tonnes/ha)
Assam	8.32	0.43	92.32	0.29	11.10
Gujarat	99.56	5.13	2554.70	8.06	25.66
Maharashtra	945.57	48.71	13668.71	43.14	14.46
Madhya Pradesh	196.67	10.13	4740.60	14.96	24.10
Chhattisgarh	23.50	1.21	388.02	1.22	16.51
Tamil Nadu	56.72	2.92	608.08	1.92	10.72
Punjab	10.37	0.53	245.17	0.77	23.64
Karnataka	231.84	11.94	2779.50	8.77	11.99
Haryana	24.12	1.24	514.00	1.62	21.31
Himachal Pradesh	3.41	0.18	74.83	0.24	21.94
Uttar Pradesh	29.97	1.54	508.85	1.61	16.98
Uttarakhand	4.49	0.23	45.74	0.14	10.19(low)
Bihar	58.00	2.99	1375.00	4.34	23.71
Jharkhand	15.60	0.80	277.96	0.88	17.82
Rajasthan	91.85	4.73	1447.88	4.57	15.76
Andhra Pradesh	44.57	2.30	722.85	2.28	16.22
Telangana	9.30	0.48	176.57	0.56	18.99
Odisha	31.77	1.64	368.91	1.16	11.61
Jammu & Kashmir	5.85	0.30	163.56	0.52	27.96(High)
West Bengal	46.29	2.38	896.14	2.83	19.36
Others	3.34	0.17	37.81	0.12	11.32
Total	1941.11	100.00	31687.20	100.00	16.32

Source: Division of Horticulture Statistics, Ministry of Agriculture and Farmer Welfare, Government of India

Materials and Methods

The present analysis was carried out during Rabi season on the 12 states of India where NHRDF were implemented MIDH (Mission for Integrated Development of Horticulture) under National Horticulture Mission project funded by Govt. of India through TDTD (Technology Dissemination through Demonstration) during 2021-22. In this study basic data were collected and compiled & published in 44th annual report 2021-22 by National Horticultural Research and Development Foundation-New Delhi and others are calculated by using following formula. The study was done the gaps between the potential yield, state average yield and project yield with technology gap and technology index. The data on production cost input used, monetary return and gap in yield were collected and analysed for the economic feasibility of the recommended technology. In this study in which state obtained lowest crop

yield treated as control.

Technology gap = Potential yield-State Average yield

Technology index = Potential yield-Average yield/Potential yield X 100

Cost benefit ratio = Total Gross Return/Total Cost of Production

The farmers involved in demonstration/trainings were facilitated by NHRDF experts/scientist in performing field operations like nursery sowing, transplanting, irrigation, spraying, weeding, harvesting etc. during the course of training and visit. The cost of production collected from concern state NHRDF centre by the farmer's perception with other methods by experts and compiled and published by NHRDF, New Delhi.

Table 2: Cost of production of Rabi onion bulb during 2021-22

Operation/Item	Gujarat	MH ALR	MH NHRDF Red-3	MP	Tamil Nadu	West Bengal	K.N CO-ON-5	K.N A.Rose	Haryana	UP	Bihar	Rajasthan	AP	Odisha
Land rent (6 month)	15000	12000	12000	20000	37500	20000	18000	30000	55000	15000	20000	25000	30000	10000
Seed cost (Rs)	26000	12000	13600	26000	15000	20000	12000	3000	26000	20000	21000	26000	9000	9000
Land preparation	11700	18300	18300	11500	20000	8900	18000	12800	12000	10700	8700	10800	10400	5300
Nursery raising	10680	14600	14350	13000	3000	9000	1200	4000	3290	6200	9000	6000	5000	22400
Manures & Fertilizers	25354	37985	37984	31460	32173	25450	22234	17200	13806	12020	26700	15217	21100	17664
Transplanting	11450	24290	24290	20000	14700	18000	4500	14000	22400	14000	18000	12600	16000	0
Weeding & hoeing	15200	17060	17060	12800	26800	20750	10000	6000	20600	14000	20750	9000	9750	19600
Plant protection	8200	21060	21060	11190	14000	11575	8800	12500	3000	14350	13575	5155	9165	1800
Irrigation	20000	11160	11160	9000	8400	15000	6000	5000	3000	13140	15000	8500	11000	6000
Harvesting, curing, sorting, grading & packing	11750	39750	38500	28750	27195	24500	12000	22100	14000	21100	26250	31100	32700	40600
Transportation	2500	14000	14000	18750	8760	8400	6000	5000	600	15000	7500	10000	6000	0
Overhead charges	2000	-	-	5000	3285	3000	-	1500	2000	-	3000	4000	2000	-
Supervisory charges	4200	4850	4850	12000	7500	3000	-	4500	2000	-	3000	5000	5000	-
Total	164034	227055	227154	219450	218313	187575	118734	137600	177696	155510	192475	168372	167115	132364
Bank interest @ 3.5% (6 months)	2871	5676	5679	3840	3820	9379	5937	4128	3110	3110	9624	8419	5849	6618
Grand Total of production cost (Rs)	166904	232731	232833	223290	222133	196954	124671	141728	180805	158620	202099	176790	172964	138982
Average yield @ (q/ha)	275	275	235	320	175	300	180	180	235	250	300	225	270	300
Final production cost (Rs/q)	607	846	991	698	1269	657	693	787	769	634	674	786	641	463

Source: Data based on 44th Annual report 2021-22, published by National Horticultural Research and Development Foundation-New Delhi.

Results and Discussion

In this analysis, identified onion crop yield & productivity gap between different states of India which influences the productivity of the country. The yield data regarding bulb yield of onion crop, technology gap, technology index, net return and cost benefit ratio of onion crop during 2021-22 were presented in Table 3 & 4 and cost of production in table 2. The data regarding crop yield of onion crop presented in table 2 & 4, it was revealed that, the highest average yield of state was observed in Madhya Pradesh state 320 q/ha followed by West Bengal, Bihar & Odisha (300 q/ha), Gujarat & Maharashtra Agrifound Light Red (275 q/ha), Andhra Pradesh & Uttar Pradesh (250 q/ha) and in Haryana & Maharashtra NHRDF Red-3 (235 q/ha) and lowest yield was observed in Tamil Nadu state (175 q/ha) against maximum cost of production Rs 222133.00 per ha against maximum production cost Rs 1269.00 per quintal followed by Rajasthan state (225 (q/ha). Maximum cost of production was recorded in Maharashtra NHRDF Red-3 Rs 232833.00 per ha followed by Maharashtra Agrifound Light Red Rs 232731.00, Madhya Pradesh Rs 223290.00 and Tamil Nadu Rs 222133.00 per ha, whereas lowest in Karnataka CO-ON-5 Rs 124671.00, Odisha Rs 138982.00, Karnataka A.Rose Rs 141728.00 and Uttar Pradesh Rs 158620.00 per ha. It was also revealed that the production of one quintal onion maximum expenditure occurred on cultivation in Tamil Nadu Rs 1269.00 per quintal followed by Maharashtra NHRDF Red-3 Rs 991.00, Maharashtra Agrifound Light Red Rs 846.00 and Karnataka A.Rose Rs 787.00 per quintal of onion, whereas minimum expenses occurred in Odisha Rs 463.00 followed by Gujarat Rs 607.00 Uttar Pradesh Rs 634.00 and AP Rs 641.00 per

quintal. The variation in technology gap between states may be due to varied soil fertility, climatic condition of the area and management practices implemented by the farmers, knowledge of farmers regarding improved varieties/practices. Hence more location specific recommendations and precise use of technology in the field are necessary to bridge the technology gap as supported by Gupta and Singh (2010) [2]. Maximum technology gap was recorded in Tamil Nadu state in 175.00 q/ha, followed by Karnataka CO-ON-5 & A.Rose 170 q/ha and Rajasthan 125 q/ha, whereas minimum in Madhya Pradesh 30 q/ha followed by Odisha, Bihar & West Bengal 50.00, Gujarat & Maharashtra Agrifound Light Red 75.00, Uttar Pradesh & Andhra Pradesh 100 q/ha and Haryana & Maharashtra NHRDF Red-3 115 q/ha. The results are in conformity with the findings of Tiwari and Divya (2025) [9]. The technology index shows the feasibility of the technology at farmer's field and adoption sincerity of the farmers in state. The lower value of technology index more is the feasibility. Table 3 revealed that the technology index was minimum in Madhya Pradesh 8.57% followed by Odisha, Bihar & West Bengal 14.28%, Gujarat & Maharashtra Agrifound Light Red 21.42%, Uttar Pradesh & Andhra Pradesh 28.57% and Maharashtra NHRDF Red-3 & Haryana 32.85%, whereas maximum in Tamil Nadu 50% followed by Karnataka 48.57% and Rajasthan 35.71%. It was also observed from table no-1 that obtained state average yield was higher than the state productivity that is due to awareness in practices/programme, which was running during period. The data obtained regarding cost benefit ratio all the 12 states of India were presented in Table 4. It is revealed that monetary returns were directly influenced by the market price of

onion bulbs and cost of production during the year and production as well as productivity of the state. It is revealed that the higher net monetary returns of Rs 461018.00 in Odisha followed by Madhya Pradesh Rs 416710.00, West Bengal Rs 403046.00, Bihar Rs 397901.00 and Gujarat Rs 383096.00, whereas lowest in Tamil Nadu Rs 127867.00 followed by Karnataka A. Rose Rs 218272.00, Karnataka CO-ON-5 Rs 235329.00 and Rajasthan Rs 273210.00 and it was due to maximum expenses incurred on cost of production and use of un balance agri inputs, it can be increase by reduces the unnecessary & over expanses on un balances use of chemicals & fertilizers with pesticides. Similarly highest B: C ratio was observed in Odisha 4.31 followed by Gujarat 3.29, Uttar Pradesh 3.15, West Bengal 3.04 and Bihar 2.96, whereas lowest cost benefit ratio was observed in Tamil Nadu 1.57 followed by Maharashtra Agrifound Light Red 2.36, Rajasthan & Karnataka A. rose

2.54 and Haryana 2.59. Means adoption lack of technologies as well as use of un balance chemicals, fertilizers and pesticides. These findings are confirmation with the findings of Heremath and Nagraju (2010) [3], Heremath and Hilli, (2012) [3]. It was concluded that gap of yield between state and differences from potential can be make up by more emphasis on disseminate to awareness regarding technologies and improved cultivation practices to states where more gap of yield was observed with avoid to unnecessary expenses incurred by farmers. Planning of crop demonstrations as well as trainings is an effective extension mean to disseminate the proven technology at farmers level and to bridge the yield gap that increase the crop yield, monetary returns and livelihood status of the farming community. These finding are also benefited to planners for making the plans at a planning time.

Table 3: Yield gap, technology gap, and technology index of onion crop in different states of India during 2021-22

States	Potential yield (Q/ha)	Av. Yield of state (Q/ha)	Production cost Rs/Q	Technology gap (Q/ha)	Technology Index (%)
Gujarat	350	275	607.00	75	21.42
Maharashtra	350	ALR (275) & NHRDF Red-3 (235)	846.00 & 991.00	75 & 115	21.42 & 32.85
Madhya Pradesh	350	320	698.00	30	8.57
Tamil Nadu	350	175	1269.00	175	50
West Bengal	350	300	657.00	50	14.28
Karnataka	350	180	693.00 & 787.00	170	48.57
Haryana	350	235	769.00	115	32.85
Uttar Pradesh	350	250	634.00	100	28.57
Bihar	350	300	674.00	50	14.28
Rajasthan	350	225	786.00	125	35.71
Andhra Pradesh	350	250	720.00	100	28.57
Odisha	350	300	463.00	50	14.28

Table 4: Comparison of economic returns of onion production with cost benefit ratio obtained from different states of India during 2021-22

States	Cost of Production (Rs/ha)	State average Yield Q/ha	Gross return (Rs/ha)	Net return (Rs/ha)	C: B ratio
Gujarat	166904.00	275	550000.00	383096.00	3.29
Maharashtra ALR	232731.00	275	550000.00	317269.00 &	2.36
MH NHRDF Red-3	232833.00	235	470000.00	237167.00	2.36
Madhya Pradesh	223290.00	320	640000.00	416710.00	2.86
Tamil Nadu	222133.00	175	350000.00	127867.00	1.57
West Bengal	196954.00	300	600000.00	403046.00	3.04
Karnataka CO-ON-5	124671.00	180	360000.00	235329.00	2.88
Karnataka A.Rose	141728.00	180	360000.00	218272.00	2.54
Haryana	180805.00	235	470000.00	289195.00	2.59
Uttar Pradesh	158620.00	250	500000.00	341380.00	3.15
Bihar	202099.00	300	600000.00	397901.00	2.96
Rajasthan	176790.00	225	450000.00	273210.00	2.54
Andhra Pradesh	172964.00	250	500000.00	327036.00	2.90
Odisha	138982.00	300	600000.00	461018.00	4.31

* @ Rs 2000/-per quintal sorted/graded onion bulb & Rs 900/-per quintal Un sorted/graded onion bulb market rate.

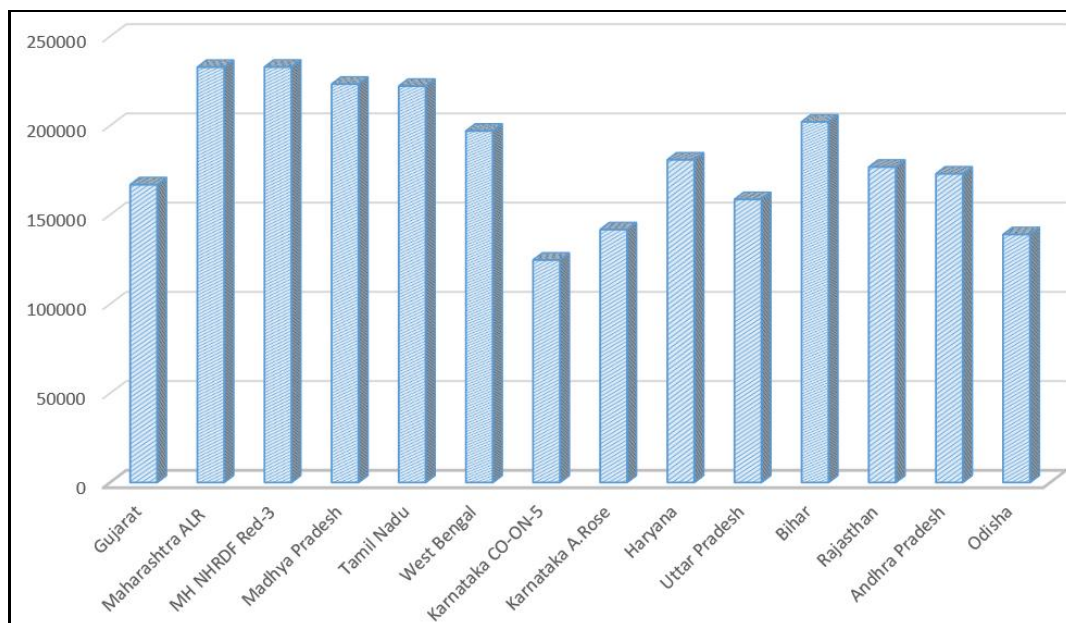


Fig 1: Comparison of returns onion cultivation for all 12 states during 2021-22

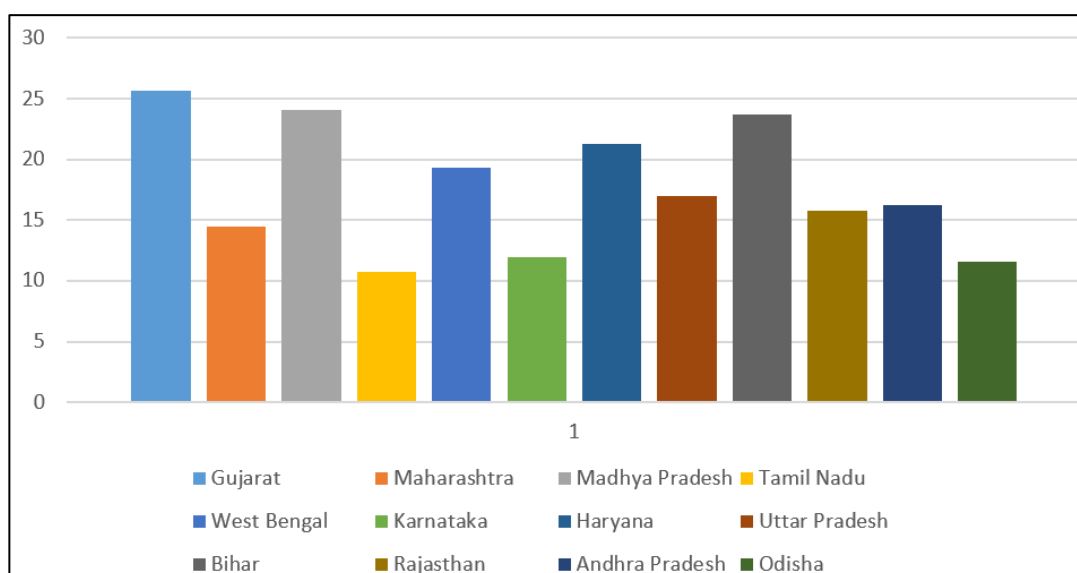


Fig 2: Comparisons of average onion production of different states on productivity of the India during 2021-22

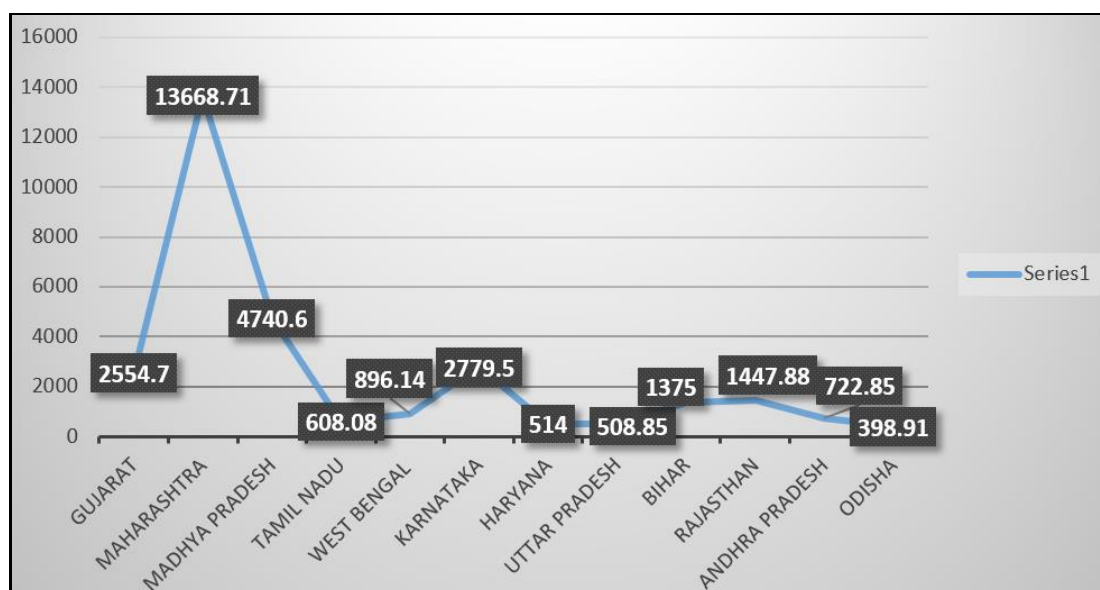


Fig 3: Onion production of different states of India during 2018-19

Conclusion

The study highlighted significant variations in onion productivity, cost of cultivation, and technology adoption across twelve Indian states during 2021-22. Madhya Pradesh achieved the highest yield with minimal technology gap and index, indicating strong feasibility and farmer adoption. In contrast, Tamil Nadu reported the lowest yield and highest production costs, reflecting limited technology assimilation. Demonstrations and farmer trainings under the National Horticulture Mission effectively promoted integrated crop management. Bridging yield gaps through targeted extension, awareness, and technology dissemination is crucial. Strategic planning of demonstrations and capacity building programs can enhance productivity, improve returns, and uplift the livelihood of onion growers nationwide.

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