Production Trend, Marketing Constraints, and Future Strategies of Onion in Western Undulating Agroclimatic Zone of Odisha

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ABSTRACT: India produces onions, one of the agricultural products that is closely monitored. This crop has several personalities; it makes traders happy, farmers fear, and customer's tear. Onion, a vital vegetable in India, is grown by small and marginal farmers and is used in salads, spices, and meals. Despite being the ninth-largest state, Odisha ranks 12th in production and productivity, producing 365.43 thousand metric tonnes from 31.14 thousand hectares. In 2015-16, onions were grown on 2,36000 acres in Kalahandi region. Angul district had the highest onion production (65934 MT) in 2019-20, while Puri had the lowest (2610.5 MT). India's compound growth rates were positive but statistically insignificant, while the production and productivity growth rates of Odisha were positive but found to be insignificant statistically. The growth rate of area in Odisha was found to be negative but statistically significant at 1% level of significance. The study area faced significant constraints, including fluctuating onion market prices, inadequate storage facilities, high transport costs, and the lack of timely market knowledge for onion growers. Future government policies should focus on developing disease resistant onion varieties in Odisha.

Keywords: Marketing Constraints, Production Trend, Garrett's ranking.

INTRODUCTION

One of the agricultural items that is widely watched is onions, which are produced in India. This crop has many personalities; it makes farmers fearful, traders joyful, and consumers cry. The USSR has the greatest kinds of onions, with over 500 species found in the northern hemisphere (Wright, 1992). Onions are richer in calcium and riboflavin, have an intermediate protein content, and have a greater nutritional value (Purse glove *et al.*, 2000). They yield 104.5 million tonnes annually and are cultivated on 5.4 million hectares worldwide (FAO, 2020). India produces more onions than any other country (26.7 MT) (FAO, 2020), yet its productivity is lower. Onions are a staple food in India (Premi & Premi 2017). After Spain and the Netherlands, India is the world's third-largest exporter of onions. The nation produces 21.0% of the world's onion crop, making it the world leader in this area (Horticulture Statistics, 2021). In addition to being a common spice in Indian cuisine, onions are also utilised medicinally (Bose and Som 1990). 2,525,258.35 MT of fresh onions worth Rs. 4,522.79 crores were exported by India in 2022–2023 (Horticulture Statistics, 2021). Economic evaluations; technical efficiency margin (Mahmood, 1995; Shaha, 1999; Hasan, 2010; Haque *et al.,* 2011; Miah and Rashid 2015; Bapari *et al.,* 2016; Grema and Gashua 2014); technical efficiency measurement (Baree, 2012; Haile, 2015; Mari and

Lohano, 2007; Banani *et al.*, 2013); production and marketing constraints (Ali *et al.,* 2015); and onion adoption practices (Anik and Salam 2015) have all received little research. In addition to looking at problems and areas for improvement, this research assesses the economic, financial, and comparative advantages of onion cultivation in India. Gross revenue is greatly impacted by manures, cakes, irrigation fees, and plant protection agents. Costs can be decreased by educating farmers about disease- and pest-resistant cultivars. Yield realisation may be enhanced by raising knowledge of effective resource use (Kantariya *et al.,* 2018). The results will assist academics and policymakers in developing suitable recommendations and strategies for India's onion production.

Objectives

1. To work out the growth rate in area, production and productivity of onion in the sample district state and nation
2. To identify specific marketing constraints of onion crop in the sample district

METHODOLOGY

This study used primary and secondary data sources to investigate onion cultivation in Kalahandi and Nuapada districts of Odisha. Ninety farmers were randomly selected and interviewed using a structured questionnaire. Data on inputs and outputs on onion production was analysed using tabular, log-linear

multiple regression, frequency, and percentage methods.

GROWTH ANALYSIS

The period of analysis is 1984 to 2020.

To analyze the onion cultivation in Odisha and in Kalahandi district, it is proposed to estimate the growth and instability in area, production and yield of onion. There are two types of growth rates *viz.,* linear and compound growth rates. In present study both linear and compound growth rates of onion were estimated to determine the LGR, the linear function of the form

$$Y = A + Bt \qquad (1)$$

$$LGR = \frac{B}{\bar{Y}} \times 100 \qquad (2)$$

To determine the CGR, the exponential function of form is

$$Y = A.B^t \qquad (3)$$

Where, Y = Area/production/yield

t = time

A, B are the constants to be determined

The % of CGR is CGR = (B-1) × 100 (4)

The coefficient of time $\hat{B}$ was tested by t-test statistic

$$t = \frac{\hat{B}}{SE\ of\ B}$$

$$\text{S.E of B} = \sqrt{\frac{\Sigma(Y-\hat{Y})^2}{N}}$$

Garrett's ranking technique. Garrett's ranking technique was used to analyze the problems faced by the Onion cultivators in production. Its production and marketing with the firm. The Onion cultivators will be asked to rank the factors that they will be facing. The ranking of the factors assigned by the farmers will be converted in to percentage terms by using the following formula:

$$\text{Percent position} = \frac{100 \times (R_i - 0.5)}{N_J}$$

Where, R_{ij} =

Ranking given for i^{th} item by j^{th} individual farmer

N_j

= Number of items ranked by j^{th} individual farmer

The percentage position of each rank thus obtained was converted into scores by referring to the tables given by Garrett's and Woodworth (1969). Then for each problem, the scores of individual farmers were added together and divided by the total number of farmers for whom scores will be added. The mean scores for all the problems were ranked by arranging then in descending order.

RESULTS AND DISCUSSION

In 2018, worldwide onion was produced in 4.96 million ha and the production and productivity were 93.17 million tons and 18.8 tons/ha respectively (Table 1). China is the highest producer of onion in world amounting 23.91 million tons and India has the highest area cultivated under onion in world (1.2 million ha). Similarly, USA has the highest productivity in world onion production (56.4 tons/ha).

Table 1: Area, Production and Yield of Onion in the World (2018).

Country	Area (million ha)	Production (million tons)	Productivity (Tons/ha)
Brazil	0.06	1.66	28.84
India	1.20	19.42	16.18
China	1.09	23.91	22.00
Egypt	0.08	3.12	36.71
Pakistan	0.14	1.74	12.80
Iran	0.06	2.35	37.95
Turkey	0.07	2.12	32.32
Russia	0.09	2.02	22.85
USA	0.05	3.03	56.40
Algeria	0.05	1.53	30.58
World	4.96	93.17	18.80

Source: Directorate of Economics & Statistics, Ministry of Agriculture, Agril. Statistical Division

The production of onion in India during 2020 has shown a rise of 18% in area and 17% in production in comparison to those in 2019 (Table 2). The area under onion cultivation in 2020 was 1434 thousand ha as against 1220 thousand ha in 2019. Similarly, the onion production in India in 2020 was recorded as 26378 thousand tonnes in comparison with 22819 thousand tonnes in 2019.

Onion Production in India. Among the states, Maharashtra has the highest position in both acreage and production with an acreage of 196.70 thousand ha and production of 13301.70 thousand MT (Table 3). Gujarat is leading in case of productivity with productivity of 25.65 MT/ha. The other states which prominently produce onion are as following as per production: Madhya Pradesh (4740.6 thousand tonnes), Karnataka (2779.5 thousand tonnes), Gujarat (2554.7 thousand tonnes), Rajasthan (1447.9 thousand tonnes) and Bihar (1375 thousand tonnes).

Table 2: Area, Production and Yield of Onion in India.

Year	Area (million ha)	Production (million tons)	Productivity (million tons /ha)
1981	250.70	2647.90	10.56
1982	234.90	2426.60	10.33
1983	270.40	2699.10	9.98
1984	278.20	3098.90	11.14
1985	280.60	2862.70	10.20
1986	262.20	2532.60	9.66
1987	274.00	2700.70	9.86
1988	315.20	3347.30	10.62
1989	301.20	3065.10	10.18
1990	301.90	3226.20	10.69
1991	323.30	3584.70	11.09
1992	323.50	3490.00	10.79
1993	367.50	4010.00	10.91
1994	378.60	4040.00	10.67
1995	384.60	4080.00	10.61
1996	404.00	4180.00	10.35
1997	355.00	3200.00	9.01
1998	468.10	5331.90	11.39
1999	493.30	4899.50	9.93
2000	450.00	4721.10	10.49
2001	495.80	5252.10	10.59
2002	424.70	4209.50	9.91
2003	553.80	6267.60	11.32
2004	613.80	7760.60	12.64
2005	703.60	9432.50	13.41
2006	768.00	10847.00	14.12
2007	821.00	13900.00	16.93
2008	834.00	13565.00	16.26
2009	756.20	12158.80	16.08
2010	1064.00	15118.00	14.21
2011	1087.20	17511.09	16.11
2012	1052.00	16813.00	15.98
2013	1217.00	19299.00	15.86
2014	1203.60	19401.68	16.12
2015	1173.00	18927.00	16.14
2016	1320.00	20931.00	15.86
2017	1306.00	22427.00	17.17
2018	1285.00	23262.00	18.10
2019	1220.00	22819.00	18.70
2020	1434.00	26738.00	18.65
Source: FAOSTAT 2022			

Table 3: Area, Production and Yield of Major Onion Producing States of India during 2020-21.

Sr. No.	States	Area (million ha)	Production (million tons)	Productivity (million tons /ha)
1.	Andhra Pradesh	44.60	722.90	16.21
2.	Assam	8.32	92.32	11.10
3.	Bihar	58.00	1375.00	23.71
4.	Chhattisgarh	23.31	365.74	15.69
5.	Gujarat	99.60	2554.70	25.65
6.	Haryana	24.10	514.00	21.33
7.	Himachal Pradesh	3.41	74.83	21.94
8.	Jammu & Kashmir	4.32	77.84	18.03
9.	Jharkhand	18.61	295.04	15.86
10.	Karnataka	231.80	2779.50	11.99
11.	Kerala	0.00	0.04	10.79
12.	Madhya Pradesh	196.70	4740.60	24.10
13.	Maharashtra	925.20	13301.70	14.38
14.	Manipur	0.54	5.19	9.63
15.	Meghalaya	0.57	5.12	9.00
16.	Mizoram	0.27	1.80	6.67
17.	Nagaland	0.60	5.61	9.34
18.	Odisha	30.78	359.46	11.68
19.	Punjab	10.35	246.52	23.83
20.	Rajasthan	91.90	1447.90	15.76
21.	Sikkim	0.27	1.67	6.14
22.	Tamil Nadu	52.80	555.70	10.52
23.	Telangana	9.10	172.00	18.90
24.	Tripura	0.17	1.11	6.43
25.	Uttar Pradesh	30.00	508.90	16.96
26.	Uttarakhand	4.49	45.74	10.19
27.	West Bengal	43.55	861.35	19.78
28.	Others	0.88	16.62	

Source: FAOSTAT 2022

Onion Production in Orissa. The state of Odisha could produce onion with total production of 359.46 thousand tonnes from an area of 30.78 thousand ha (Table 4). The productivity of Odisha was 11.68 MT/ha in the year 2020-21. This implies that there is a high scope of increasing onion production in Odisha.

Table 4: Area, production and yield rate of onion in Orissa.

Year	Area ('000 ha)	Production ('000 tons)	Productivity (tons /ha)
1980-81	43.20	6764.00	156.57
1981-82	45.08	6681.00	148.20
1982-83	37.58	8868.00	235.98
1983-84	41.79	8031.00	192.18
1984-85	41.25	7100.00	172.12
1985-86	45.22	7718.00	170.68
1986-87	44.78	7042.00	157.26
1987-88	40.70	7150.00	175.68
1988-89	43.73	7077.00	161.83
1989-90	45.57	6634.00	145.58
1990-91	45.76	7148.00	156.21
1991-92	45.21	7409.00	163.88
1992-93	44.54	7301.00	163.92
1993-94	43.76	7330.00	167.50
1994-95	47.81	7563.00	158.19
1995-96	50.03	7593.00	151.77
1996-97	37.54	7869.00	209.62
1997-98	45.00	3674.00	81.64
1998-99	45.75	7868.00	171.98
1999-00	46.40	7939.00	171.10
2000-01	26.77	8570.00	320.13
2001-02	19.41	8889.00	457.96
2002-03	26.41	9042.00	342.37
2003-04	26.55	9052.00	340.94
2004-05	26.78	9030.00	337.19
2005-06	26.81	9096.00	339.28
2006-07	28.51	9120.00	319.89
2007-08	28.77	9120.00	317.00
2008-09	31.64	8814.00	278.57
2009-10	32.08	9260.00	288.65
2010-11	34.75	11105.00	319.57
2011-12	35.15	11920.00	339.12
2012-13	34.92	12001.00	343.67
2013-14	35.81	12066.00	336.94
2014-15	33.19	11930.00	359.45
2015-16	33.45	11948.00	357.19
2016-17	33.44	11323.00	338.61
2017-18	33.47	11334.00	338.63
2018-19	33.09	11279.00	340.86
2019-20	27.47	10613.00	386.35

Source: 5 Decades of Odisha Agriculture Statistics – 2020

Between these years the onion cultivation area increased from 43.2 thousand ha in 1980-81 to a maximum of 50.03 thousand ha in 1995-96. After that there is seen a declining trend in area of production in onion in Odisha till 2001-02 (19.41 thousand ha). After this year there is an increase in area of production till 2013-14 (35.81 thousand ha). Later there is decrease seen in cultivation of onion till date in 2019-20(27.47 thousand ha). Despite this declining state of area of onion cultivation in Odisha, there is mostly increasing trend in production over these years from 6764 thousand tonnes in 1980-81 till 12066 thousand tonnes in 2013-14. After this until recent year there is seen a dip in production of onion till 2019-20(10613 thousand tonnes). The overall productivity during this period has increased but not so promising as we can see from the table below. The highest productivity was recorded in 2013-14(432.1 MT/ha) and the least was recorded in 1997-98(165.34 MT/ha).

Onion Production of major district in Orissa during 2019-20. Table 5 indicates that onion production was highest in Angul district with a production of 65934 MT followed by Bolangir (42780 MT) and Kalahandi (38848 MT). Puri district recorded the lowest yield of 2610.5 MT in the year 2019-20. In 2019-20, Rayagada district showed the lowest productivity of 10.23 MT/ha and the highest productivity was recorded in Bargarh district (14.53 MT/ha). Kalahandi stood at second in case of area and third in case of production in Odisha.

Table 5: Onion Production of major district in Orissa during 2019-20.

Sr. No.	District	Area (in ha)	Production (in tons)	Productivity (tons /ha)
1.	Angul	4950.00	65934.00	13.32
2.	Balasore	980.00	11005.40	11.23
3.	Baragarh	514.00	7468.42	14.53
4.	Bhadrak	442.00	4689.62	10.61
5.	Bolangir	3000.00	42780.00	14.26
6.	Boudha	1200.00	13200.00	11.00
7.	Cuttack	1130.00	15311.50	13.55
8.	Deogarh	1152.00	12902.40	11.20
9.	Dhenkanal	1520.00	20778.40	13.67
10.	Gajapati	2024.00	20746.00	10.25
11.	Ganjam	963.00	11151.54	11.58
12.	Jagatsinghpur	572.00	6995.56	12.23
13.	Jajpur	-	-	-
14.	Jharsuguda	1025.00	11736.25	11.45
15.	Kalahandi	3200.00	38848.00	12.14
16.	Kandhamal	870.00	11953.80	13.74
17.	Kendrapara	658.00	8119.72	12.34
18.	Keonjhar	1133.00	16281.21	14.37
19.	Khurda	376.00	5192.56	13.81
20.	Koraput	1154.00	15267.42	13.23
21.	Malkanagiri	430.00	5258.90	12.23
22.	Mayurbhanj	590.10	7063.50	11.97
23.	Nabarangpur	291.90	3310.15	11.34
24.	Nayagarh	647.00	7434.03	11.49
25.	Nuapara	880.00	9891.20	11.24
26.	Puri	230.00	2610.50	11.35
27.	Rayagada	840.00	8593.20	10.23
28.	Sambalpur	1162.00	12131.28	10.44
29.	Subarnapur	1302.00	16405.20	12.60
30.	Sundargarh	1886.00	24084.22	12.77

Source: Odisha Agriculture Statistics

Descriptive Statistics. According to Table 6, there were 880.70 and 608.47 thousand ha of onion cultivated during period 1980-00 and 2001-20 respectively in Odisha. In a similar vein, the mean total areas of onion cultivated during same period were 44.04 and 30.42 thousand ha respectively. The total onion production was 144759.00 and 205512.00 thousand tons with mean production 205512.00 & 10275.60 respectively during also same periods in Odisha. In terms of mean productivity, during same period was 318.04 and 316.98 tons/ha respectively. This leads us to conclude that trend of mean area of onion has decreased in second half of study period, but production & productivity has increased significantly during same period. This increase may be due to more emphasis given by farmers to onion than other crops and strong extension service both Private and Govt. sector.

Table 6: Descriptive statistics of Onion Crop in Odisha.

| Sr. No.	Category	Period Odisha	Total	Mean	Range	SE	Variance	SD
1.	Area ('000 ha))	1980-81 to 1999-00	880.70	44.04	12.49	0.69	18.11	3.06
		2000-01 to 2019-20	608.47	30.42	16.40	0.95	18.11	4.26
2.	Production ('000 tons))	1980-81 to 1999-00	144759.00	7237.95	5194.00	222.29	988263.00	994.11
		2000-01 to 2019-20	205512.00	10275.60	3496.00	303.83	1846240.78	1358.76
3.	Productivity (tons /ha)	1980-81 to 1999-00	3311.88	165.59	154.33	6.51	847.29	29.11
		2000-01 to 2019-20	6802.37	340.12	179.39	8.10	1312.36	36.23

Confidence Level (95.0%)
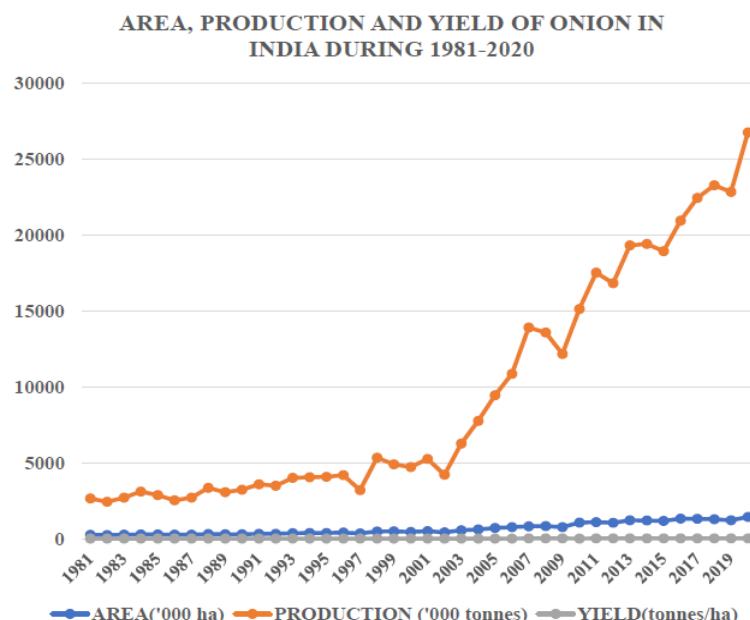
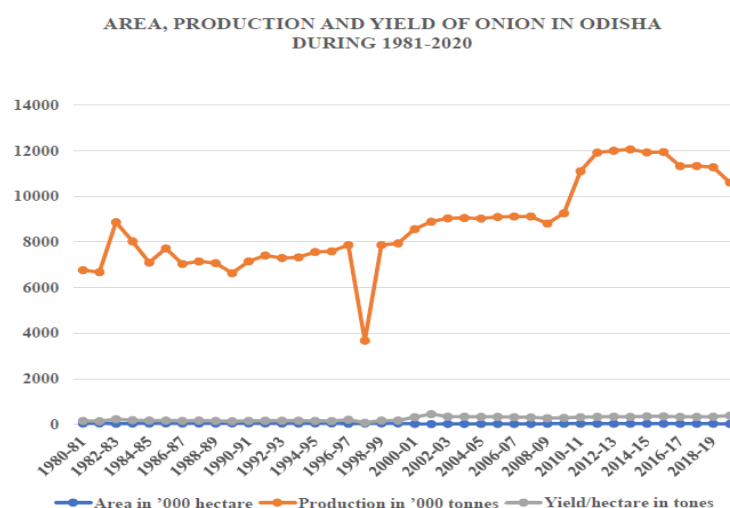**Fig. 1.** Area, production and Yield of Onion in Odisha During 1981-2020.

Fig. 2. Area, production and Yield of Onion in Odisha During 1981-2020.

Table 7: Compound Growth Rate for Onion crop in India and Odisha during period of 1981-2020

Sr. No.	Periods (1981-2020)	CGR		
		Area	Production	Productivity
1.	India	5.115 (3.0362)	6.920 (6.1869)	1.716274 (1.2103)
2.	Odisha	-1.135** (0.00005)	1.507 (3.3903)	2.672886 (7.8068)

*#Parenthesis indicates the P value; NS indicates non-significance at 5%, *** indicates significance at 1%*

Compound Growth Rate. As stated above, regression analysis was used to estimate the compound growth rate of onion area, production and yield of India and Odisha (Table 7). The analysis was done for the years from 1981 to 2020. The data from the above table shows that the growth rate of onion cultivation in terms of area, production and productivity was all positive for India during the year 1981-2020. All the CGR values were found to be non-significant for the data of area, production and productivity of onion in India. The CGR value for area of cultivation of onion in Odisha was found to be negative for the year 1981-2020 but found to be significant at 1% level of significance. The CGR

value for both production and yield of onion in Odisha were found to be positive but non-significant.

Marketing constraints associated to onion marketing in study area. The entire situation of onion farmers' marketing challenges suggests that fluctuation in market price of the onion was a big marketing concern (Table 8). This had an impact on the supply and demand for the produce. The farmer's problem of a lack of appropriate storage facilities in the mandi was placed second. Because the farmers were unable to return the food to their community owing to high transportation costs, they were forced to sell the goods at whatever price was available at the time. Thus, high

transport cost came at third place in the ranking of problems of onion farmers. Farmers have also complained about delay on payment by traders; this is the third significant issue in the research region. It resulted in late sowing of the next crop and lead to unavailability of capital for next season gradually. Fifth rank difficulty mentioned by farmers in marketing is non-availability of market information at proper time. Farmers couldn't get the supply and demand rate of onion in market and thus couldn't sell their produce for a better and deserving price. The sixth key marketing concern in the research region was open auction sale of the produce which led to low prices of onion in market, due to which the profit earned by the farmers were lower. The seventh issue raised by farmers was the existence of high number of intermediaries in marketing process which results in no contact of farmers with the wholesalers and also reduction in selling price of produces. Lack of appropriate credit facilities was the eighth problem described by the farmers in the area. It was mainly caused due to lower literacy level of onion growers and also higher time taking process of credit granting facilities. According to farmers, low pricing of onion during the peak season was the ninth and last problem for the onion farmers in Kalahandi. Although the price of onion was less during peak season, but it was still profitable for farmers.

Table 8: Marketing constraints associated to onion marketing in study area.

Sr. No.	Problems reported by the farmers	Total no. of Respondent	Total Score	Total Mean	Rank
1.	High transportation cost	90	4691	52.12	III
2.	Low price of onion during peak season	90	4275	47.50	IX
3.	Lack of good storage Facilities	90	4718	52.42	II
4.	Fluctuations in market price	90	4821	53.57	I
5.	Delaying on payment by traders	90	4686	52.07	IV
6.	Non availability of market information	90	4654	51.71	V
7.	Lack of appropriate credit facilities	90	4518	50.20	VIII
8.	Open auction sale fetches low price for onion produce	90	4569	50.77	VI
9.	Existence of large number of intermediaries in marketing process	90	4566	50.73	VII

CONCLUSIONS AND POLICY IMPLICATIONS

India's compound growth rates were positive but statistically insignificant, while the production and productivity growth rates of Odisha were positive but found to be insignificant statistically. The growth rate of area in Odisha was found to be negative but statistically significant at 1% level of significance. Odisha has a comparative advantage in onion production, but yield gaps are due to factors like physical, biological, socio-economic, and institutional issues. To improve, participatory research, contract farming, government attention, e-NAM, digital literacy, and market regulation are needed. Policymakers and government should focus on direct procurement from farmers and promote modern techniques like intercropping onion with sugarcane.

FUTURE SCOPE

— Market Demand: Odisha is a net importer of onions, especially during off-seasons. Local production can reduce dependence on onions from Maharashtra, Karnataka, and Andhra Pradesh.

— Employment and Income Potential: Onion cultivation has a high labour absorption rate, supporting rural employment. Provides better price realization compared to many other traditional crops in the region.

— Storage & Processing Opportunities: Government support for onion storage structures (cold rooms, ventilated sheds) could drastically reduce post-harvest losses. Potential for small-scale processing (e.g., onion flakes, powder) adds value.

— Government Schemes & Support: Schemes like MIDH (Mission for Integrated Development of Horticulture) and state horticulture programs provide subsidies for inputs, storage, and training. Farmer Producer Organizations (FPOs) in western Odisha are beginning to explore onion as a collective crop.

—Research & Extension Support: Odisha University of Agriculture and Technology (OUAT) and Krishi Vigyan Kendras (KVKs) provide improved varieties, package of practices, and pest/disease management training.

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