

Analysis of problems faced by exporters of Cucumber and gherkins in India using TOPSIS

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Introduction

Worldwide sales for cucumbers and gherkins exports by country totalled US\$2.7 billion in 2019. Overall, the value of exported cucumbers rose by an average 17.8% for all exporting countries since 2015 when total international shipments of cucumbers were valued at \$2.2 billion. Year after year, the value of globally exported cucumbers decreased by -7.2% from 2018 to 2019. Cucumbers often serve an important culinary support role as crunchy ingredients for many food dishes, from garden salads to sweet pickles. From a continental perspective, Europe sold the highest dollar worth of exported cucumbers during 2019 with shipments valued at \$1.5 billion or 57.3% of the global total. In second place were North American exporters at 34.6% while 6.9% of international cucumbers sales originated from Asia. Smaller percentages came from Latin America (0.9%) excluding Mexico but including the Caribbean, Africa (0.3%) and Oceania (0.02%) mainly Australia and New Zealand.

Below are the 15 countries that exported the highest dollar value worth of cucumbers and gherkins during 2019.

1. Spain: US\$689.4 million (26.9% of total exported cucumbers)
2. Mexico: \$541.9 million (21.1%)
3. Netherlands: \$521 million (20.3%)
4. Canada: \$281.3 million (11%)
5. United States: \$64.3 million (2.5%)
6. China: \$63.3 million (2.5%)
7. Belgium: \$43.1 million (1.7%)
8. Turkey: \$36.8 million (1.4%)
9. Greece: \$29.4 million (1.1%)
10. Iran: \$28.3 million (1.1%)
11. Germany: \$26.2 million (1%)
12. Poland: \$17.5 million (0.7%)
13. France: \$14.5 million (0.6%)
14. Belarus: \$14.1 million (0.5%)
15. Honduras: \$11.5 million (0.4%)

By value, the listed 15 countries shipped 92.9% of global cucumbers and gherkins exports in 2019. Among the top exporters, the fastest-growing cucumbers exporters since 2015 were: Poland (up 158.6%), China (up 86.6%), Honduras (up 69.3%) and Canada (up 61.1%). Those countries

that posted declines in their exported cucumbers sales were led by: Iran (down -67.5%), Belarus (down -55.3%), Belgium (down -31.5%), France (down -26.1%) and Turkey (down -23.2%).

Indian Gherkin Exporter's Association (IGEA) was established on 9 February 2000 at Bangalore with the following objectives

To promote the training and cultivation of gherkins and all kinds of cucumbers in India

To promote the welfare of and safeguard the interest of exporters of gherkins and other cucumber growers in India

To encourage and develop the friendly co-operation, mutual understanding and good relation amongst farmers, traders and exporters engaged in business of growing or cultivating gherkins and cucumbers

To provide information, comparative data or any other statistical information, market survey reports to its members relating to the business of exporting gherkins, cucumbers and other agro products

To educate, arrange for seminars, meetings and discussions regarding the cultivation, processing or export of gherkins, cucumbers, seeds or other inputs

To find remedies to the problems faced by the gherkin exporters

To open, establish, conduct, manage and provide facilities and finance for the training, research and scientific experiments for the cultivation, development of gherkins and cucumbers

To represent, enter into arrangements with government authorities, local bodies, trade associations of any persons as regards matters offering them.

MANAGEMENT COMMITTEE

The management committee of IGEA has 11 members who are elected among the association members. Of the 11 members, there is a President, Vice-President, Hon. Secretary, Treasurers and the remaining 7 are the committee members. Management Committee meets regularly to address the issues of the members of the association.

AGRICULTURAL EXPORT ZONE FOR GHERKINS

Being an export oriented industry, both the Centre and State Governments have extended considerable support and encouragement to the gherkin industry. A major initiative was the setting up of a separate "Agri Export Zone" for gherkins in Karnataka with a financial implication of USD 2.33 Millions. Agricultural and Processed Food Products Export Development Authority (APEDA), under the Ministry of Commerce and Industry, Government of India and Karnataka State Agricultural Produce Processing & Export Corporation Limited (KAPPEC) are the nodal agencies at the Central and State levels respectively for implementing the concept of Agri Export Zone. At present in Karnataka, gherkins are being grown in an area of about 50,000 acres involving about 1,00,000 small and marginal farmers. The Indian Gherkin Exporters' Association (IGEA) closely work with all the stakeholders to make the industry more competitive in the global market.

Material and Discussion

In this study the problems faced by the exporters of Cucumber and Gherkin in India are studied by using TOPSIS method. Ten core problems identified based on the preliminary study and the same problems are ranked by selected ten exporters in order to apply TOPSIS analysis.

Ten Core problems rated by 10 selected Exporters

S. No	Statements	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
1	Quality and Standards	5	9	1	3	4	3	8	1	10	1
2	Exim Policy	3	8	1	10	6	10	7	1	7	3
3	Procedural Problems	2	7	1	1	7	1	9	1	5	5
4	Procurement Problems	1	6	1	2	9	2	6	1	3	7
5	Government Norms	4	4	1	5	8	5	10	1	1	9
6	Forex Rate Fluctuations	8	5	1	4	5	4	5	1	2	10
7	Competition from Small Exporters	9	2	1	6	2	6	3	1	4	8
8	Durability	7	1	1	7	1	7	4	1	6	6
9	Preservation	6	10	1	9	10	8	1	1	8	4
10	Processing (Use of chemicals)	10	3	1	8	3	9	2	1	9	2

Square root of square sum of data

S. No	Statements	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
1	Quality and Standards	25	81	1	9	16	9	64	1	100	1
2	Exim Policy	9	64	1	100	36	100	49	1	49	9
3	Procedural Problems	4	49	1	1	49	1	81	1	25	25
4	Procurement Problems	1	36	1	4	81	4	36	1	9	49
5	Government Norms	16	16	1	25	64	25	100	1	1	81
6	Forex Rate Fluctuations	64	25	1	16	25	16	25	1	4	100
7	Competition from Small Exporters	81	4	1	36	4	36	9	1	16	64
8	Durability	49	1	1	49	1	49	16	1	36	36
9	Preservation	36	100	1	81	100	64	1	1	64	16
10	Processing (Use of chemicals)	100	9	1	64	9	81	4	1	81	4
		385	385	10	385	385	385	385	10	385	385

Normalised Decision Matrix (Xij/Sqrt sqre sum)

S. No	Statements	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
1	Quality and Standards	0.255	0.459	0.316	0.153	0.204	0.153	0.408	0.316	0.510	0.051
2	Exim Policy	0.153	0.408	0.316	0.510	0.306	0.510	0.357	0.316	0.357	0.153
3	Procedural Problems	0.102	0.357	0.316	0.051	0.357	0.051	0.459	0.316	0.255	0.255
4	Procurement Problems	0.051	0.306	0.316	0.102	0.459	0.102	0.306	0.316	0.153	0.357
5	Government Norms	0.204	0.204	0.316	0.255	0.408	0.255	0.510	0.316	0.051	0.459
6	Forex Rate Fluctuations	0.408	0.255	0.316	0.204	0.255	0.204	0.255	0.316	0.102	0.510
7	Competition from Small Exporters	0.459	0.102	0.316	0.306	0.102	0.306	0.153	0.316	0.204	0.408
8	Durability	0.357	0.051	0.316	0.357	0.051	0.357	0.204	0.316	0.306	0.306
9	Preservation	0.306	0.510	0.316	0.459	0.510	0.408	0.051	0.316	0.408	0.204
10	Processing (Use of chemicals)	0.510	0.153	0.316	0.408	0.153	0.459	0.102	0.316	0.459	0.102

Formula used

Calculation of normalized value n_{ij} .

$$n_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}}, \text{ for } i \in I = \{1, 2, \dots, m\} \text{ and } j \in J = \{1, 2, \dots, n\}.$$

Weighted Normalised Decision Matrix (Assuming equal weights)

S. No	Statements	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
1	Quality and Standards	0.025	0.046	0.032	0.015	0.020	0.015	0.041	0.032	0.051	0.005
2	Exim Policy	0.015	0.041	0.032	0.051	0.031	0.051	0.036	0.032	0.036	0.015
3	Procedural Problems	0.010	0.036	0.032	0.005	0.036	0.005	0.046	0.032	0.025	0.025
4	Procurement Problems	0.005	0.031	0.032	0.010	0.046	0.010	0.031	0.032	0.015	0.036
5	Government Norms	0.020	0.020	0.032	0.025	0.041	0.025	0.051	0.032	0.005	0.046
6	Forex Rate Fluctuations	0.041	0.025	0.032	0.020	0.025	0.020	0.025	0.032	0.010	0.051
7	Competition from Small Exporters	0.046	0.010	0.032	0.031	0.010	0.031	0.015	0.032	0.020	0.041
8	Durability	0.036	0.005	0.032	0.036	0.005	0.036	0.020	0.032	0.031	0.031
9	Preservation	0.031	0.051	0.032	0.046	0.051	0.041	0.005	0.032	0.041	0.020
10	Processing (Use of chemicals)	0.051	0.015	0.032	0.041	0.015	0.046	0.010	0.032	0.046	0.010

Formula used

Calculation of weighted normalized value v_{ij} .

$$v_{ij} = w_j n_{ij}, \forall i \in I, \forall j \in J.$$

Positive-ideal solution A^+ and the negative-ideal solution A^- .* (Beneficial criteria for the worst problem)

S. No		E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	
A+	Ideal Best	0.051	0.051	0.032	0.051	0.051	0.051	0.051	0.032	0.051	0.051	MAX
A-	Ideal Worst	0.005	0.005	0.032	0.005	0.005	0.005	0.005	0.032	0.005	0.005	MIN

Formula used

Determination of positive-ideal solution A^+ and the negative-ideal solution A^- .

$$A^+ = \{(v_1^+, v_2^+, \dots, v_n^+)\} = \{(\max_i v_{ij} | j \in S_B), (\min_i v_{ij} | j \in S_C)\}$$

$$A^- = \{(v_1^-, v_2^-, \dots, v_n^-)\} = \{(\min_i v_{ij} | j \in S_B), (\max_i v_{ij} | j \in S_C)\}$$

Euclidean distance from ideal best

S. No	Statements	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	Sj+
1	Quality and Standards	0.00065	0.00003	0.00000	0.00127	0.00094	0.00127	0.00010	0.00000	0.00000	0.00210	0.0798
2	Exim Policy	0.00127	0.00010	0.00000	0.00000	0.00042	0.00000	0.00023	0.00000	0.00023	0.00127	0.0594
3	Procedural Problems	0.00166	0.00023	0.00000	0.00210	0.00023	0.00210	0.00003	0.00000	0.00065	0.00065	0.0875
4	Procurement Problems	0.00210	0.00042	0.00000	0.00166	0.00003	0.00166	0.00042	0.00000	0.00127	0.00023	0.0883
5	Government Norms	0.00094	0.00094	0.00000	0.00065	0.00010	0.00065	0.00000	0.00000	0.00210	0.00003	0.0735
6	Forex Rate Fluctuations	0.00010	0.00065	0.00000	0.00094	0.00065	0.00094	0.00065	0.00000	0.00166	0.00000	0.0747
7	Competition from Small Exporters	0.00003	0.00166	0.00000	0.00042	0.00166	0.00042	0.00127	0.00000	0.00094	0.00010	0.0806
8	Durability	0.00023	0.00210	0.00000	0.00023	0.00210	0.00023	0.00094	0.00000	0.00042	0.00042	0.0817
9	Preservation	0.00042	0.00000	0.00000	0.00003	0.00000	0.00010	0.00210	0.00000	0.00010	0.00094	0.0607
10	Processing (Use of chemicals)	0.00000	0.00127	0.00000	0.00010	0.00127	0.00003	0.00166	0.00000	0.00003	0.00166	0.0776

Formula used

$$d_i^+ = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^+)^2}, \forall i \in I.$$

Euclidean distance from ideal worst

S. No	Statements	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	Sj-
1	Quality and Standards	0.00042	0.00166	0.00000	0.00010	0.00023	0.00010	0.00127	0.00000	0.00210	0.00000	0.0768
2	Exim Policy	0.00010	0.00127	0.00000	0.00210	0.00065	0.00210	0.00094	0.00000	0.00094	0.00010	0.0906
3	Procedural Problems	0.00003	0.00094	0.00000	0.00000	0.00094	0.00000	0.00166	0.00000	0.00042	0.00042	0.0663
4	Procurement Problems	0.00000	0.00065	0.00000	0.00003	0.00166	0.00003	0.00065	0.00000	0.00010	0.00094	0.0637
5	Government Norms	0.00023	0.00023	0.00000	0.00042	0.00127	0.00042	0.00210	0.00000	0.00000	0.00166	0.0796
6	Forex Rate Fluctuations	0.00127	0.00042	0.00000	0.00023	0.00042	0.00023	0.00042	0.00000	0.00003	0.00210	0.0715
7	Competition from Small Exporters	0.00166	0.00003	0.00000	0.00065	0.00003	0.00065	0.00010	0.00000	0.00023	0.00127	0.0680
8	Durability	0.00094	0.00000	0.00000	0.00094	0.00000	0.00094	0.00023	0.00000	0.00065	0.00065	0.0659
9	Preservation	0.00065	0.00210	0.00000	0.00166	0.00210	0.00127	0.00000	0.00000	0.00127	0.00023	0.0964
10	Processing (Use of chemicals)	0.00210	0.00010	0.00000	0.00127	0.00010	0.00166	0.00003	0.00000	0.00166	0.00003	0.0834

Formula used

$$d_i^- = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^-)^2}, \forall i \in I.$$

Outcome

Performance score and ranking

S. No	Statements	Sj+	Sj-	Ri	Rank
1	Quality and Standards	0.07977	0.07679	0.4905	5
2	Exim Policy	0.05943	0.09060	0.6039	2
3	Procedural Problems	0.08753	0.06625	0.4308	9
4	Procurement Problems	0.08827	0.06365	0.4190	10
5	Government Norms	0.07350	0.07961	0.5199	3
6	Forex Rate Fluctuations	0.07473	0.07153	0.4891	6
7	Competition from Small Exporters	0.08058	0.06800	0.4576	7
8	Durability	0.08170	0.06586	0.4463	8
9	Preservation	0.06073	0.09643	0.6136	1
10	Processing (Use of chemicals)	0.07763	0.08343	0.5180	4

Formula used

$$R_i = \frac{d_i^-}{d_i^+ + d_i^-}, \text{ for } i \in I.$$

Preservation is the worst problem faced by the exporters; it is followed by Exim policy and Government norms

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