TABLE III. COMPARISON OF KA AND CPLEX

Problem	Total Cost		% Error
	CPLEX	KA	
1	272,536	280,520.2	2.929595
2	290,022.4	290,635.1	0.21126
3	331,002.4	332,325.2	0.399635
4	687,891.3	691,232.1	0.485658
5	681,244.8	689,217	1.17024
6	721,717.7	732,578.8	1.504896
7	1,085,000	1,086,091	0.100553
8	1,244,800	1,245,002	0.016228
9	1,498,999	1,504,232	0.3491
10	1,895,800	1,872,901	1.20788

IV. CONCLUSION

The proposed supply chain's effectiveness with the developed objective for the considered constraint was studied with both GAMS and KA. From Table III, KA has given better solutions comparatively, but the % of the variation is small.

$$Error\% = \frac{KA - CPLEX}{CPLEX} \times 100$$

The results show that the performance of GAMS is better than KA to reduce the total cost. For optimum solution Keshtel Algorithm, GA and SA are used in a hybrid fashion. The proposed network is designed to effectively serve the markets that use the value of the discarded orange peels after juice extraction.

CONFLICT OF INTEREST

The authors, Rajan Ponnusamy and Shahul Hamid Khan, affiliated with the Indian Institute of Information Technology Design and Manufacturing, Kancheepuram, Chennai, 600127, India, declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Rajan Ponnusamy conducted the research and drafted the manuscript. Shahul Hamid Khan analyzed the data and revised the manuscript. Both authors reviewed and approved the final version of the paper.

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