DECISION SUPPORT SYSTEM FOR SELECTION OF MARKET FOR PURCHASE OF FOOD GRAINS – A RETAILERS PERSPECTIVE

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ABSTRACT

The revolution in Indian retailing industry has brought many changes and also opened door for many foreign players. In a market like India there is a constant clash between challenges and opportunities but chances favor those companies that are trying to establish themselves. So to sustain in a market like India companies have to bring innovative solutions.

It is observed that although the retailing in India is booming but it is still dominated by the unorganized retail sector. According to an estimate the unorganized retail sector has 97% presence whereas the organized accounts for merely 3%.With the increase in retail players and demand from the market, there is a need to ensure continuous supply of products at low cost. It is observed that most of the unorganized retailers are unaware of the market rates for different products. Especially in case of food grains product cost and transportation cost plays an important role in the profit calculation. There decision merely depends on the nearness to market.

This paper discussed the problem associated with the selection of market for purchase of food grains. Further it proposes a Genetic Algorithm(GA) based Decision Support System(DSS) to help retailers in market selection for purchase of food grains in an optimum manner.

Keywords: genetic algorithm, Decision Support System, Evolutionary Algorithm, Optimization

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I INTRODUCTION

Retailing is still in its early years in India. In the name of retailing, the unorganized retailing has dominated the Indian landscape so far. According to an estimate the unorganized retail sector has 97% presence whereas the organized accounts for merely 3% . Industry has already predicted a trillion dollar market in retail sector in India by 2010. However, the retail industry in India is undergoing a major shake-up as the country is witnessing a retail revolution. The old traditional formats are slowly changing into more complex and bigger formats. Malls and mega malls are coming up in almost all the places be it – metros or the smaller cities, across the length and breadth of the country.[7]

A McKinsey report on India (2004) says organized retailing would increase the efficiency and productivity of entire gamut of economic activities, and would help in achieving higher GDP growth. At 6%, the share of employment of retail in India is low, even when compared to Brazil (14%), and Poland (12%).Govt of India's plan of changing the FDI guidelines in this sector speaks of the importance attached to retailing.[9]

India is the country having the most unorganized retail market. Traditionally it was a family's livelihood, with their shop in the front and house at the back, while they run the retail business.More than 99% retailer's function in less than 500 square feet of shopping space. Global retail consultants KSA Technopak have estimated that organized retailing in India is expected to touch Rs 35,000 crore in the year 2005-06. The Indian retail sector is estimated at around Rs 900,000 crore, of which the organized sector accounts for a mere 2 per cent indicating a huge potential market opportunity that is lying in the waiting for the consumer-savvy organized retailer.[9] With the increase in retail players and demand from the market, there is a need to ensure continuous supply of products at low cost. It is observed that most of the unorganized retailers are unaware of the market rates for different products. Especially in case of food grains product cost and transportation cost plays an important role in the profit calculation. There decision merely depends on the nearness to market.

II FINDINGS

1. The retailers are unaware of price list of different market.
2. Their decision regarding purchase of food grain is mainly depends on nearness of market.
3. The market rate varies on the basis of area, district and state.

4. The retailers rely on agent for sales whose intention is to maximize his own profit rather than that of retailer.
5. The market rates are not fixed .They are fluctuating in nature.
6. They normally purchase all type of food grains to single market which results in loss.

III PROPOSED MODEL: DECISION SUPPORT SYSTEM FOR PURCHASE OF FOOD GRAINS

There is a need of a system which helps retailers in selecting a market for the purchase of different food grains. The proposed model not only help them in optimum selection but also help to find out the transportation cost involved. The objective of this model is to minimize the cost subject to different cost and quality factors involve in purchase. The problem formulation is stated below:

Minimize Cost= ΣQiPj + ΣTj*Qi

Where

Qi – Quantity of foodgrains 1,2,3, ----- (in tonnes)

Pj – Price of foodgrains 1,2,3, ----- (in Rs./tone)

Tj – Transportation cost of foodgrains 1,2,3, -----(in Rs./tone/km)

IV ASSUMPTIONS

1. The price taken is for three different quality of food grain.
2. Transportation cost is considered as uniform irrespective of market.
3. The rates are considered as constant within the range.
4. The purchasing is considered in cash.

V DATA USED FOR TESTING

market_Master										
			Rate of Food Grains				Probability of Change in Price			
M_Name	address	distance	Wheat	Rice	Jawar	Makka	Wheat	Rice	Jawar	Makka
Itwari	Itwari	10	1990	3000	1650	1900	5	6	6	8
Kalamna	kalamna	25	1950	2900	1600	1850	4	6	3	2
yavatmal	yavatmal	150	1600	2680	1250	1150	7	6	7	4
Hinganghat	hinganghat	120	1600	2700	1290	1250	4	6	5	3

Katol	Katol	55	1650	2650	1190	1280	5	8	7	5
Saoner	saoner	48	1700	2600	1250	1300	3	4	5	6
Bhandara	Bhandara	60	1650	2580	1200	1310	3	4	5	2

Table 1 Market Details for Purchase of Food Grains

VI GENETIC ALGORITHM: AN OPTIMIZATION TOOL

A Genetic Algorithm (GA) is a type of metahueristic algorithm, designed to operate on optimisation problems. Optimisation problems typically demand that a certain variable be either minimised or maximised, whilst remaining legal within some set of constraints. To enumerate every possible solution and evaluate them to determine which is the optimum would take an inordinate amount of time. In certain applications, where optimality is not necessary, metahueristics can be used to find a 'good enough' solution, often in a very short time. Metahueristics vary in their strategies, but all use some technique to explore the space of all possible solutions. One such example of a metahueristics approach is GAs [2]. GAs are a special subset of metahueristics, which use a form of biological mimicry which emulate the process of natural selection. "Three billion years of evolution can't be wrong. It's the most powerful algorithm there is." [4] This quote from Dr. Goldberg sums up the aim of Genetic Algorithms; to model nature, and harness their proven ability to refine solutions, or animals, to a very efficient form. They are a form of metahueristic search in that they find solutions to hard problems, possibly even NP-hard, where it is not feasible to enumerate all possibilities in order to find the best solution.

Anatomy of A Genetic Algorithm

It will become clear that each section is indeed an algorithm in its own right, and that there are numerous choices of strategy for each. A GA is simply an abstraction of a subset of algorithms. It should also be noted that the huge variation of approaches possible for each of the several components of a GA mean that there is a vast number of programs that fall under this catch-all title. A taxonomy of different approaches to the GA idea would be an extremely complex tree. [1]This paper uses both single point and double point crossover operator with 95%probability index. The mutation operator is also used with an index of 5%.

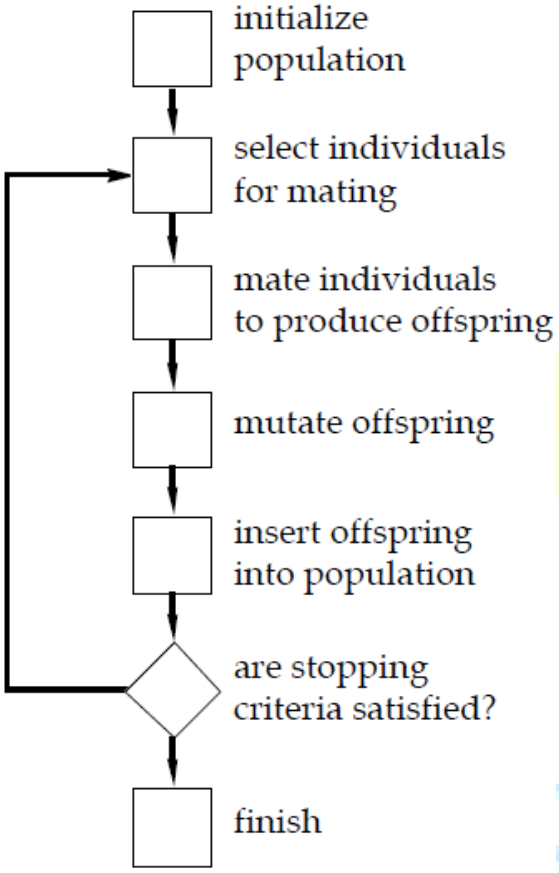
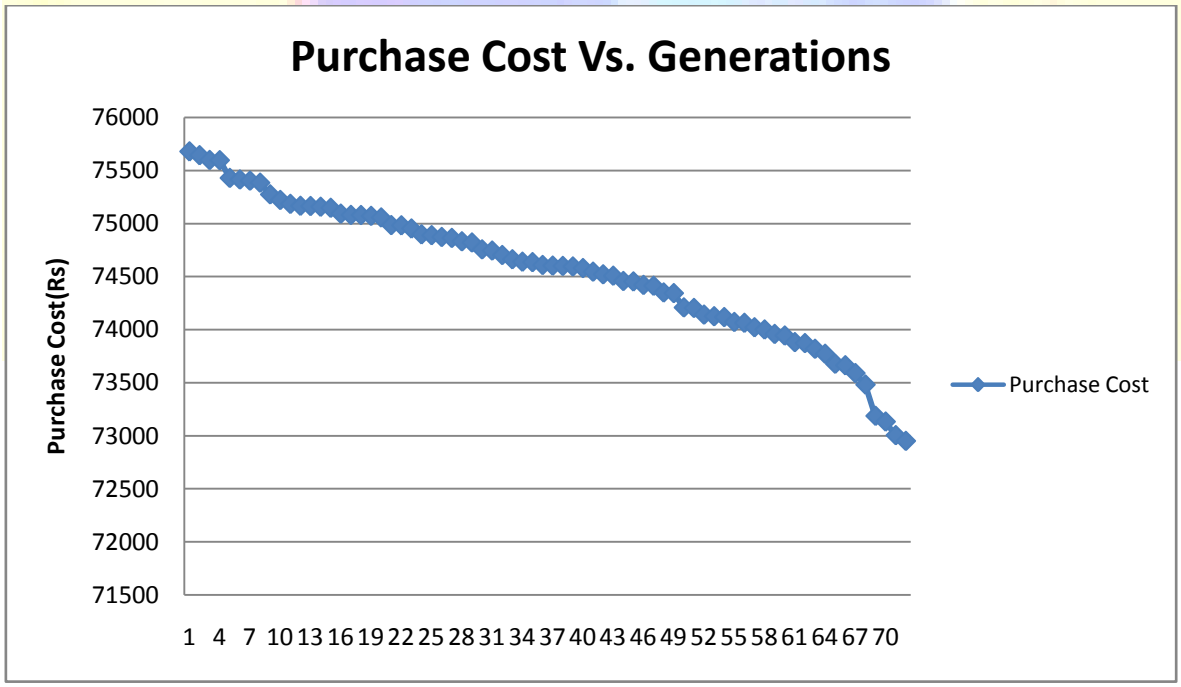


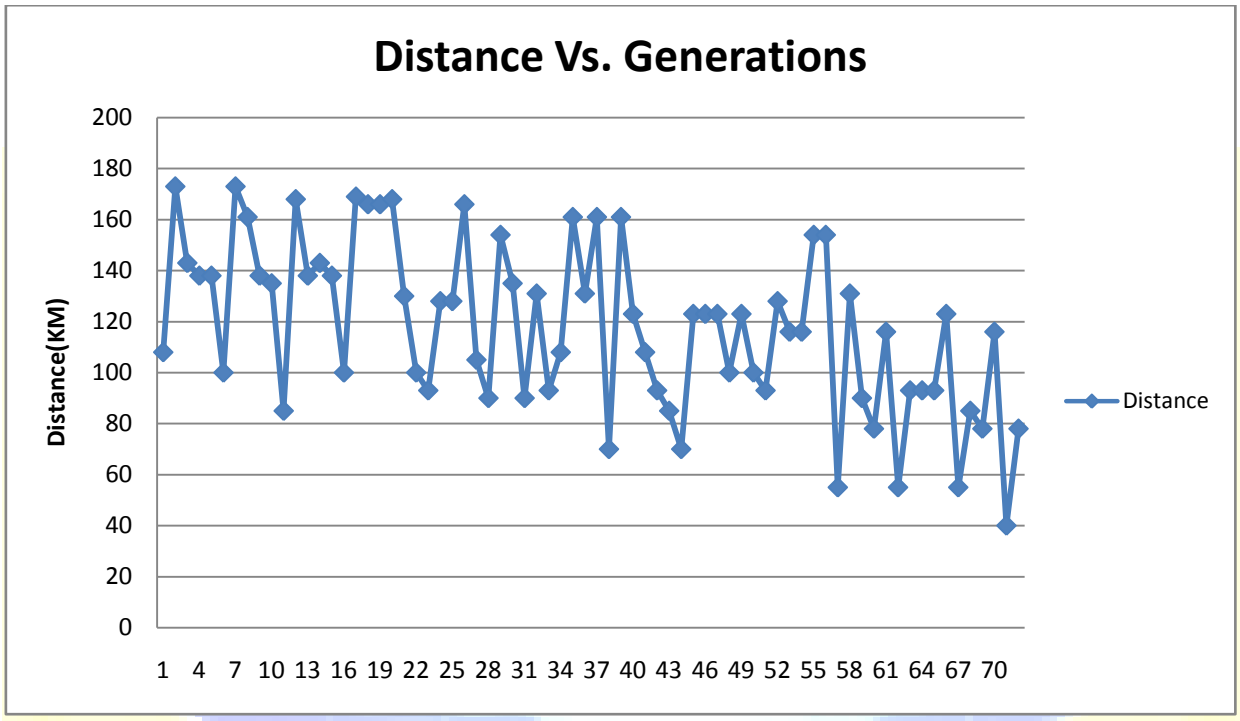
Fig. 1 Simple anatomy of GA

VII GRAPHICAL REPRESENTATION



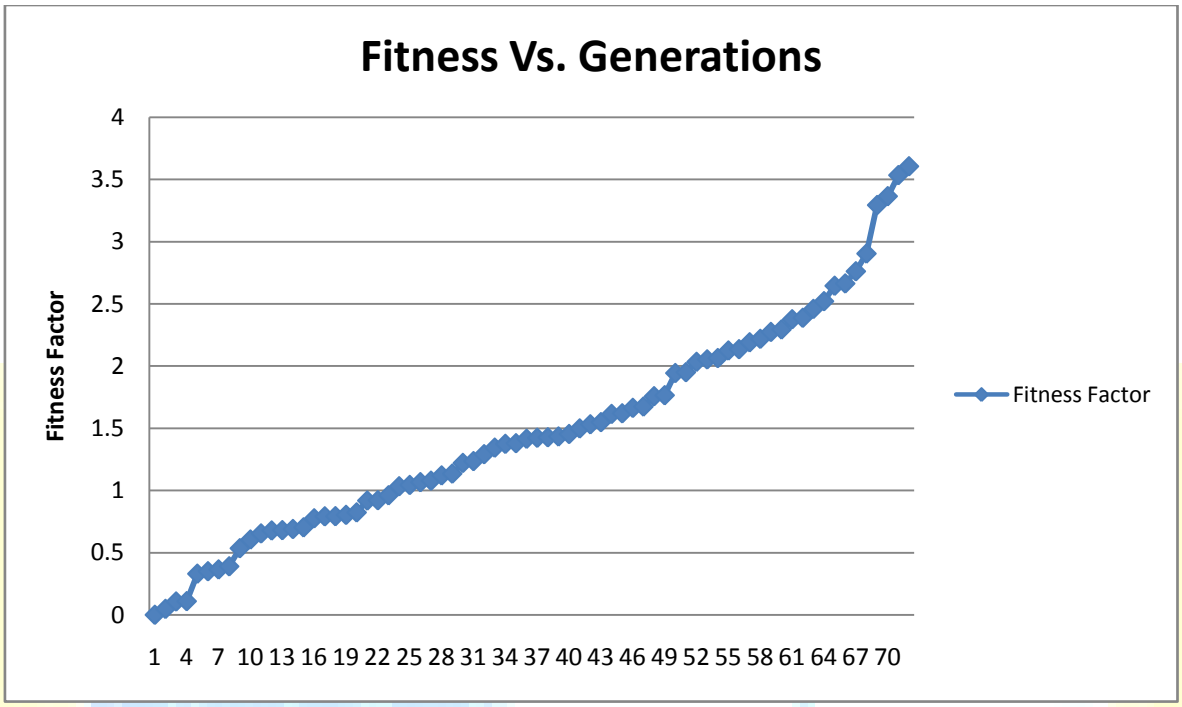
Graph 1 Purchase Cost Vs Generations

As shown in the graph, the cost of purchase decreases as we apply genetic algorithm. The above result is obtained by applying several cycles of genetic algorithm. Although the solution obtained is not the optimum but it is much better than the available production mix.



Graph 2 : Distance Vs Generations

As shown in the graph, as we apply genetic algorithm the distance required to travel to purchase food grains get optimized. In cost calculation, the transportation cost is one of the important variable. With application of GA, it get reduced as we oncrease the number of iterations.



Graph 3 Fitness Factor Vs Generations

The above graph shows that as we move from generation 1 to 2 , there is an improvement in the fitness factor. It indicates that the solution get better and better as we move ahead.

The above graph shows the market selection for purchase of food grains. As shown, with proper application of GA, the transportation cost can be reduced thereby reducing the cost of the total purchase.

VIII GA RESULTS

Market				Distance	cost	Fitness
Wheat	Rice	Jawar	Makka			
6	0	0	4	10	75222	0.60518
0	1	1	1	3	75185	0.65407
4	5	0	4	13	75167	0.677854
0	5	4	1	10	75165	0.680497
1	5	0	6	12	75158	0.689746
5	1	0	4	10	75148	0.70296
4	0	0	1	5	75093	0.775634

1	5	5	5	16	75081	0.79149
5	5	0	6	16	75080	0.792812
0	5	5	6	16	75072	0.803383
0	5	4	4	13	75057	0.823203
4	0	0	4	8	74985	0.91834
0	0	4	1	5	74983	0.920983
1	0	5	0	6	74953	0.960624
5	0	0	6	11	74898	1.033298
0	0	5	6	11	74890	1.043869
6	5	0	5	16	74873	1.066332
0	5	0	0	5	73187	3.294133
0	5	0	5	10	73133	3.365486
0	0	0	0	0	73005	3.534619
0	0	0	5	5	72951	3.605973

Table 2 GA Results for Purchase of Food grains

As shown in the table 2, there is definite improvement in purchase decision. As compare to available methods of market selection, GA can reduce the purchase cost by reducing the transportation cost. From study it is found that a retailer purchases around 50 tones of foodgrains for every season. Hence With proper application of GA, he can save Rs. 5,000 to 10,000 per season.

IX CONCLUSIONS

The revolution in Indian retailing industry has brought many changes and also opened door for many foreign players. In a market like India there is a constant clash between challenges and opportunities but chances favor those companies that are trying to establish themselves. So to sustain in a market like India companies have to bring innovative solutions. Most of retailers perform purchasing in an unorganized way. The proposed DSS helps retailers to select the optimum market for the purchase of food grains . From the above case, it is proved that GA based DSS can help retailers to reduce the purchase cost by optimum selection of market for

purchase of food grains. This will motivate them to increase purchase and sale and keep them informed about the latest trends in business.

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