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Multiple objective decision making criteria in crop production with the help of network diagram (Pert and CPM)

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ABSTRACT

The paper contains a multiple objective decision making in crop production ,which minimizes the complexity of decision making by providing a method to deal with different goals arise in crop production with the help of network diagram of PERT AND CPM. Here, the programming is solved by multi-objective decision making criteria and network diagram. This method is used to solve the problems in the production of wheat, oats, pulses etc.

Keywords: Multiple objective; decision making; PERT; CPM

Introduction

Multiple objective decision making concept was originated in middle of 19th century by economist and applied mathematicians and it is implemented in 1960. Since then it is spread in all over the world with vast properties and application in management science and operation research. After World War II, industrial world faced allot of problems to solve various objectives. Industries use this method which was very successful in solving their complexities. Multiple objective decisions making is very useful way to deal with selection of best among same object of different material with different properties. To get the best and economic product, this method is very useful. This becomes a major part of operation research to solve complex management problems in industries. Also the networking plays a very effective role in solving large scale production and distribution problems in day to day life as well as in industries.

The introduction of electronic computer in 1950 makes a rapid growth in operation research. Networking is the best example of growth in this area .This also helps in solving large problems in business world. In this paper we are going to use this method with PERT and CPM network to provide the best method to select the best wheat and after that to make the production of wheat qualitative with minimum cost.

Problem on Wheat production

We explain the concept by taking an example of wheat production from my native place Bihar, India (SELF CREATED PROBLEM)

Take four kinds of wheat:-
1) W1
2) W2
3) W3
4) W4

The objectives associated with wheat production:
1) Land (high –low)
2) Taste (high-low)
3) Cost (in rupees/kg)
4) Labor (in number)

5) Time (in month)

Decision making matrix for wheat production

PRODUCT /FEATURES	**LAND(HIGH/LOW)**	**TASTE**	**COST**	**LABOUR**	**TIME (in days)**
W1	HIGH	GOOD	40	15	3
W2	AVERAGE	VERY GOOD	30	12	5
W3	VERY HIGH	AVERAGE	45	10	6
W4	LOW	VERY GOOD	50	7	4.5

Now we categories the given objectives into two Parts: Beneficial and Non-Beneficial

	BENEFICIAL	BENEFICIAL	NON-BENEFICIAL	NON-BENEFICIAL	NON-BENEFICIAL
PRODUCTS/ FEATURES	LAND	TASTE	COST (in Rupees)	LABOUR	TIME (in hour)
W1	HIGH	GOOD	40	15	3
W2	AVERAGE	VERY GOOD	30	12	5
W3	VERY HIGH	AVERAGE	45	10	6
W4	LOW	VERY GOOD	50	7	4.5

Let the parameter for land from high to low will be between (1-5): high (4);average(3);very high(5);low(2) and let the parameter for taste from good to very good will be given as : very good (5);good(4);average(3).

	BENEFICIAL	BENEFICIAL	NON-BENEFICIAL	NON-BENEFICIAL	NON-BENEFICIAL
Product /feature	Land	Taste	Cost	Labor	Time
W1	4	4	40	15	3
W2	3	5	30	12	5

W3	5	3	45	10	6
W4	2	5	50	7	4.5

Mathematical formulation:
For beneficial = Xij /max (Xij)
For non-beneficial = min (Xij) /Xij

WEIGHTAGE	20%	30%	25%	10%	15%
	Beneficial	Beneficial	Non-beneficial	Non-Beneficial	Non-beneficial
Product/feature	Land	Taste	Cost	Labor	Time
W1	0.8	0.8	0.75	0.46	1
W2	0.6	1	1	0.58	0.6
W3	1	0.6	0.67	0.7	0.5
W4	0.4	1	0.6	1	0.67

SUM AND RANK DETERMINATION

FINAL DECISION MATRIX

PRODUCT /FEATURE	Land	Taste	Cost	labor	Time	sum	rank
W1	0.16	0.24	0.1875	0.046	0.15	0.7835	2
W2	0.12	0.3	0.25	0.058	0.090	0.818	1
W3	0.2	0.18	0.1675	0.07	0.075	0.6925	4
W4	0.08	0.3	0.150	0.1	0.1005	0.7305	3

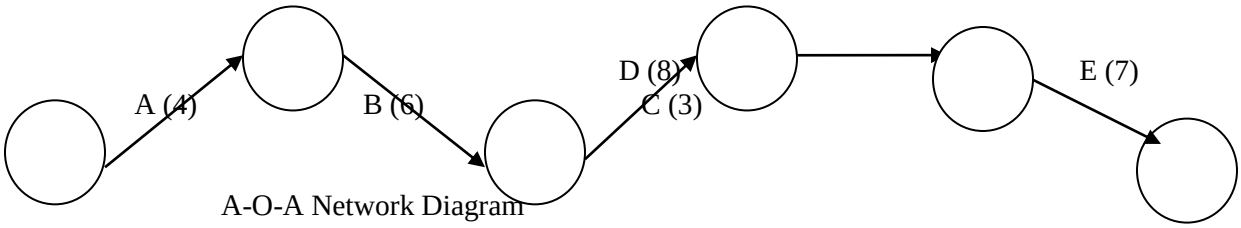
Clearly, we select to produce the wheat W2 for best and economic perspective

NETWORK CHART FOR SCHEDULING THE WORK OF BEST WHEAT FOR PORODUCTION IN HIGH RANGE

PROSSES	ACTIVITY	TIME DURATION (IN DAYS)
Plugging(A)	-	4
Irrigation (B)	FOLLOW A	6

Seedling(C)	FOLLOW B	3
Cutting(D)	FOLLOW C	8
Oscillation(E)	FOLLOW D	7

Network Diagram of wheat production



A-O-A Network Diagram

Result

With the use of multiple objective decision making criteria we select the best wheat (W2) among various kind of wheat which is beneficial for increasing the income of farmers as well as industries. After that to increase the production of W2 ,PERT and CPM network diagram helps in planning, controlling and scheduling the production process, which helps to increases the overall production with minimum cost and on prime time. This combination of MODM with PERT and CPM Network diagram reduces the complexities of achieving multiple goals associated with the production of wheat.

Conclusion

We notice that the optimal solution includes the connectivity of wheat (crop) selection and hence the PERT and CPM network helps to produce the selected wheat (crop) at wide range with minimum cost and best quality . This method definitely help the industries as well as farmers to choose the best wheat for production according to the demand of market and management of production process of wheat helps them to get the best wheat (crop) with a lot of qualities.

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