European International Virtual Congress of Researchers

EIVCR
May 2015

Progressive Academic Publishing, UK
www.idpublications.org

FARM MANAGING BASED ON DECISION-MAKING TREE

Rexhepi, Aziz
UET University
TIRANA, ALBANIA/KOSOVO

ABSTRACT

The situation where the decisions are made, not rarely are characterized with the lack of information about the possibility of a particular economic occurrence, with the exception of the decision-making based on the same possibility criteria, according to which it is assumed that each of the economic occurrence will have the probability of happening around 50%. But, we have to emphasize that the decision-maker doesn't always lack sufficient information about the economic consequences that could happen on the future, because in many cases the decision-maker has information on future occurrences, so to the benefit of decision-making process they can use probability to come up with the decision. What is worth mentioning has to do with the fact that even though probability could be used, there are criteria that aid the decision-maker. Among these criteria we will talk about two of those, the expected monetary value, and the loss of the expected possibility.

Keywords: decision-making, probability, expected monetary value, loss of the expected possibility.

INTRODUCTION

Making rightful decisions is a key to successfully managing agribusiness enterprises. Evaluating the entire process of decision making, we can consider that making a decision can be described as an action of "selecting among alternatives", which at the first glance seems like a really simple procedure. In a way decision making can be considered as an action of choosing between alternatives. What the article emphasizes has to do with the fact that not always the decision maker has sufficient information about the economic consequence that could occur in the future. In these conditions, we aim to explain that it is possible for the decision-maker to obtain information about the future occurrences, and could use the probability to the benefit of the decision-making process. What is worth mentioning has to do with the fact that even though probability could be used, there are criteria that aid the decision-maker. Among these criteria we mention two of those, the expected monetary value, and the loss of the expected possibility.

Using the concept of the expected value, it is necessary for the decision maker to firstly estimate the possibility of recognizing each economic consequence. After making these estimations, the expected value for each decision-making alternative is calculated by multiplying each outcome (of decision) with the probability of the possibilities each occurrence and then adding the respective result. The best decision we could make is the one that results with a high expected value.

Another decision making criteria connected with the expected value is the loss of the expected possibility. In this case we multiply the probabilities of regret of each result and on the other hand we multiply the decision results with the probability of occurrence, just as we did with the expected monetary value.

METHODOLOGY

To enable the use of the concept of the expected value it is necessary that in the beginning the decision-maker estimates the possibility of the realization of each of the economic consequences. After these calculations are done, the expected value is estimated for each alternative (of decision-making) by multiplying each conclusion (from the decision) with the probability of the occurrences and then by adding the respective results. To accomplish this idea, let us refer to the problem linked with the need to select the investing alternatives. Let us assume, based on predictions, that the organization will expand its business activities, so it is investing considering three alternatives. Of course, the investments should take into consideration particular probabilities of the possibility of good or bad economic conditions. Let us suppose that these probabilities are 0.06 and 0.04 respectively.

Table 1. Table of salaries with the probability of economic occurrences.

Nr	Decision Alternatives	Economic consequences		Loss of expected possibility (LEP) $
		Good economic Conditions P=60	Bad economic Conditions P=40	
1	Alternative 1	$ 50,000	$0	50000*(0.60)+(0.40)*0=$30000
2	Alternative 2	0	70000	0*(0.60) + 70000*(0.40) =$28000
3	Alternative 3	70000	20000	70000*(0.60)+20000*(0.40) = $50000

As we can easily understand, the best decision we could make is the one that results with the highest expected value and in our case that is the second alternative, with the expected value of 44 000. But is this the decision we should make? We should not rush and say YES, because the differences in cost are very high when we compare it with the two other alternatives, good and bad economic conditions (100000$ or -400000$). Another decision making criteria related to the expected value is the loss of the expected possibility (regret). In this case we multiply the possibility of regret for each outcome and on the other side we multiply the decision results with the probability of occurrence, just as we did with the monetary expected value. Let's consider that the investor decides to buy a warehouse, but he learns that in the future the economic conditions will be better. This is disappointing for him because he could have won more from the second alternative and thus the regret level would be 70 000$, the difference between the investors decision and the best decision. In these conditions, the decision-maker attempts to avoid regret by making a decision that minimizes the maximal regret.

Referring to the regret criteria, in the beginning maximal profit is chosen for each economic consequence. Maximal profit for best economic conditions is 100 000$ and 30 000$ for bad economic conditions. All other profit from each economic consequence is subtracted from these maximal profits as below:

- Good economic conditions,
- Bad economic conditions,

100,000$ - 50,000$ = 50,000$ 30,000$ - 30,000$ = 0$
100,000$ - 100,000$ = 0$ 30,000$ - (- 40,000$) = 70,000$
100,000$ - 30,000$ = 70,000$ 30,000$ - 10,000$ = 20,000$

These values represent the regret of the decision-maker if he was to make a decision that results in less than maximal profit. This is summarized in a modified version in the salary table known as regret table, or the loss of possibility table.

Table 2. Regret table (loss of possibility)

Nr	Decision Alternatives	Economic consequences		Loss of expected possibility (LEP) $
		Good economic Conditions P=60	Bad economic Conditions P=40	
1	Alternative 1	$ 50,000	$0	50000*(0.60)+(0.40)*0=$30000
2	Alternative 2	0	70000	0*(0.60) + 70000*(0.40) =$28000
3	Alternative 3	70000	20000	70000*(0.60)+20000*(0.40) = $50000

As we can see, the best decision will minimize regret, in this case, by minimizing the expected regret or the loss of possibility. Starting from the fact that the minimal regret is 28000$, the best decision that should be made would be alternative 2. As we can see, the decision recommended based on the calculation of the expected value, and the one calculated based on the loss of possibility is the same, alternative 2. As mentioned above we can conclude that the decision made based on the calculation of the expected value and the loss of possibility are entirely depended on the level of objective evaluation of probabilities by the decision-maker, which means that if incorrect probabilities are used then we will have wrong decisions. It is important that the decision-maker is as accurate as possible in determining probabilities of every economic consequence.

Decision-making Tree

Another usable technique to analyze a decision-making situation is the technique known in literature as the decision tree technique. The decision tree is nothing other than a graph diagram containing decision knot (the root), possible events (branches) and the possible results for each event. In this technique, in the decision tree, the expected value of each result is calculated and the decision is made based on these expected values. The primary profit taken from using the decision tree is the illustration of a prediction, in other words, ensuring a general landscape of the decision-making process.

4.1 An example of decision-making using the decision tree:
Different decisions, probabilities and initial results of the previous example are illustrated in the following decision-making tree. (Fig 1)

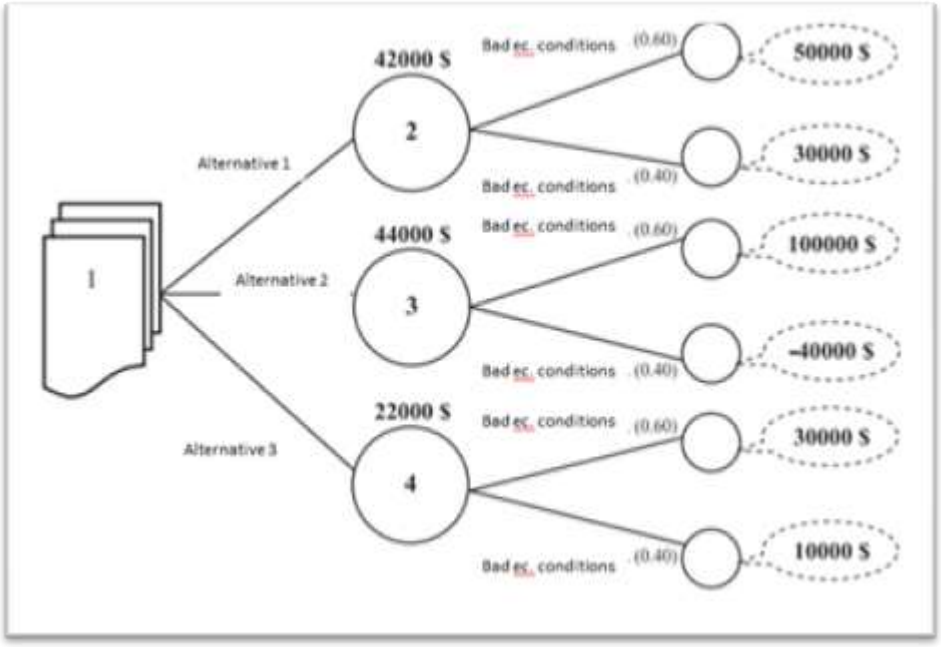


Fig.1 The decision-making tree from table 1 data.

The process of making the best decision using the decision tree, consists on calculating the expected value of each probability knot which result as follows:

o EV (knot 2) = 0.60($ 50000) + 0.40 ($ 30000) = $42000
o EV (knot 3) = 0.60($100000) + 0.40 ($-40000) = $44000
o EV (knot 4) = 0.60($ 30000) + 0.40 ($ 10000) = $22000

These three values are now viewed as expected payments of each of the three branches coming out of knot 1 in the previous graph (Fig.1). Each of these three expected values in knot 2, 3, and 4 are possible results of a decision that results from knot 1. Moving towards knot 1, the chosen branch will results from a probability knot that offers the highest expected value and in our case that is the alternative number 2 with e profit of 44000$. The decision for this alternative, with a payment of 44 000$, is the same result we got before using the expected value criteria. As conclusion we can say that if we make a single decision, then the outcome using the decision tree will result in the same decision and the same expected payment will result as when we used the expected value criteria.

RESULTS AND DISCUSSION

Decision Analysis with addition information

We discussed above the concept of the expected value in condition of perfect information. We said that if we could ensure perfect information regarding the economic consequences we would face in the future, then without a doubt that the decision maker would make good decisions. But because perfect information is hard to get it is necessary to obtain additional information to enable the improvement of decision-making. Using the expected value criteria, we found the best decision - the second alternative with the expected value of 44000$. We also calculated, with perfect information, the expected value of 28000$. This means that the organization will be prepared to pay 28000$ for information about economic consequences in favor of quality improvements in the decision making process.

Let us suppose that the organization has decided to employ an expert of economy who would secure additional information about the future economic conditions. The expert studies the economic situation in continuity and the decision of the investor will be supported by his research. Supported by his duties the expert should provide the management with a report containing detailed future economic situation. The report could be positive, testifying that good economic conditions will dominate the future, or negative, inferring that in future we will face bad economic conditions. Based on the expert and his predictions regarding future economic condition, the leaders of the enterprise should determine the conditioned probabilities of results suitable to different situations provided in the report.

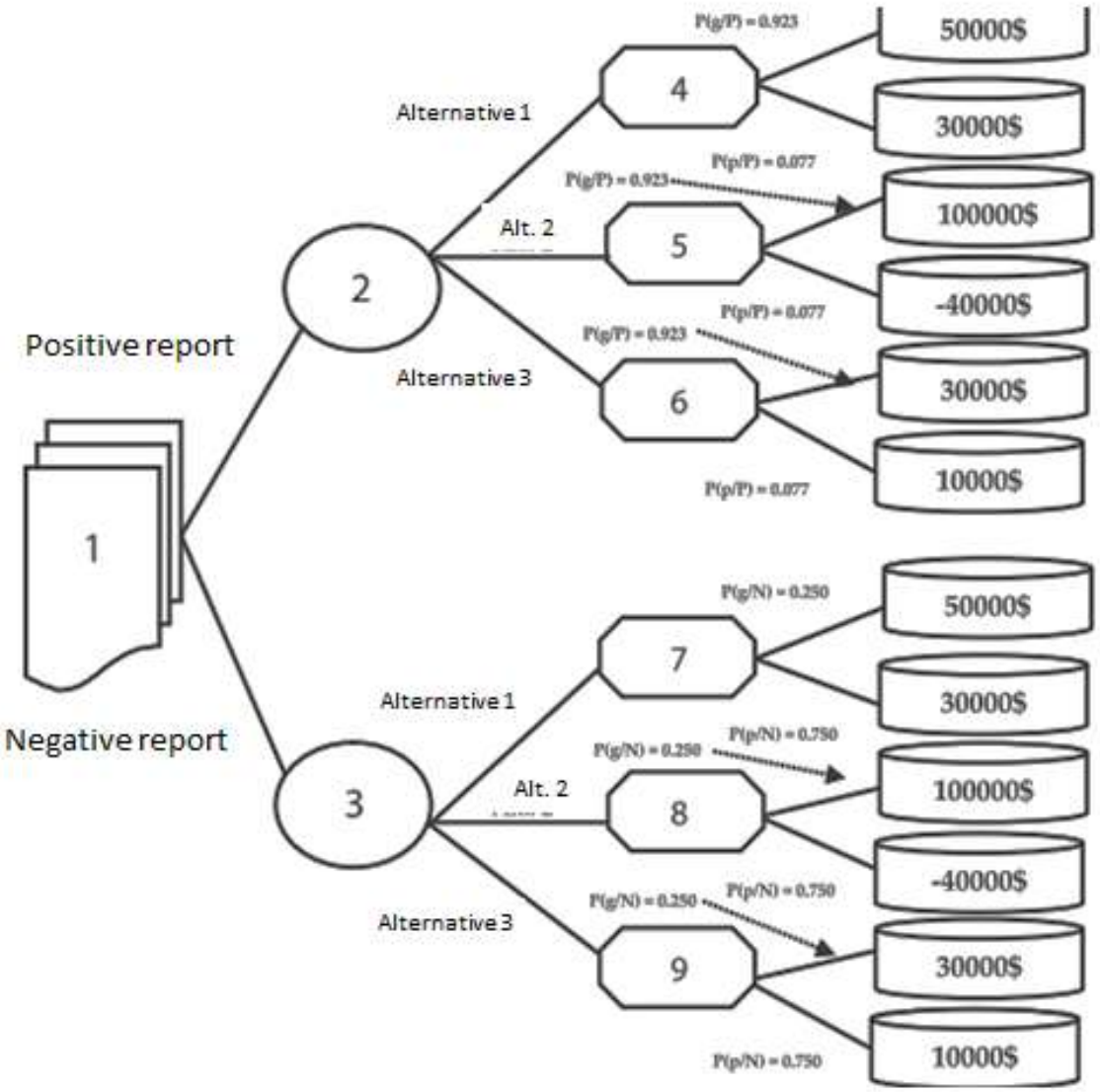
g = good economic conditions
p = bad economic conditions
P = positive economic report
N = negative economic report

Let us suppose that the conditioned probabilities of each result from the report given the chance are:
P (P/g) = 0.8
P (N/g) = 0.2
P (P/p) = 0.1
P (N/p) = 0.9

Previous probability which in future will face good economic conditions is 0.6. However, ensuring additional information presented by the expert based on a positive report, the organization could reprocess the previous probability of the possibility of occurrence of good economic condition. Calculations show that previous probability of the possibility of occurrence of good economic conditions is 0.923. Meanwhile, other (subsequent) probabilities are: P (g/N) = 0.250, P(p/P) = 0.077, P(p/N) = 0.750.

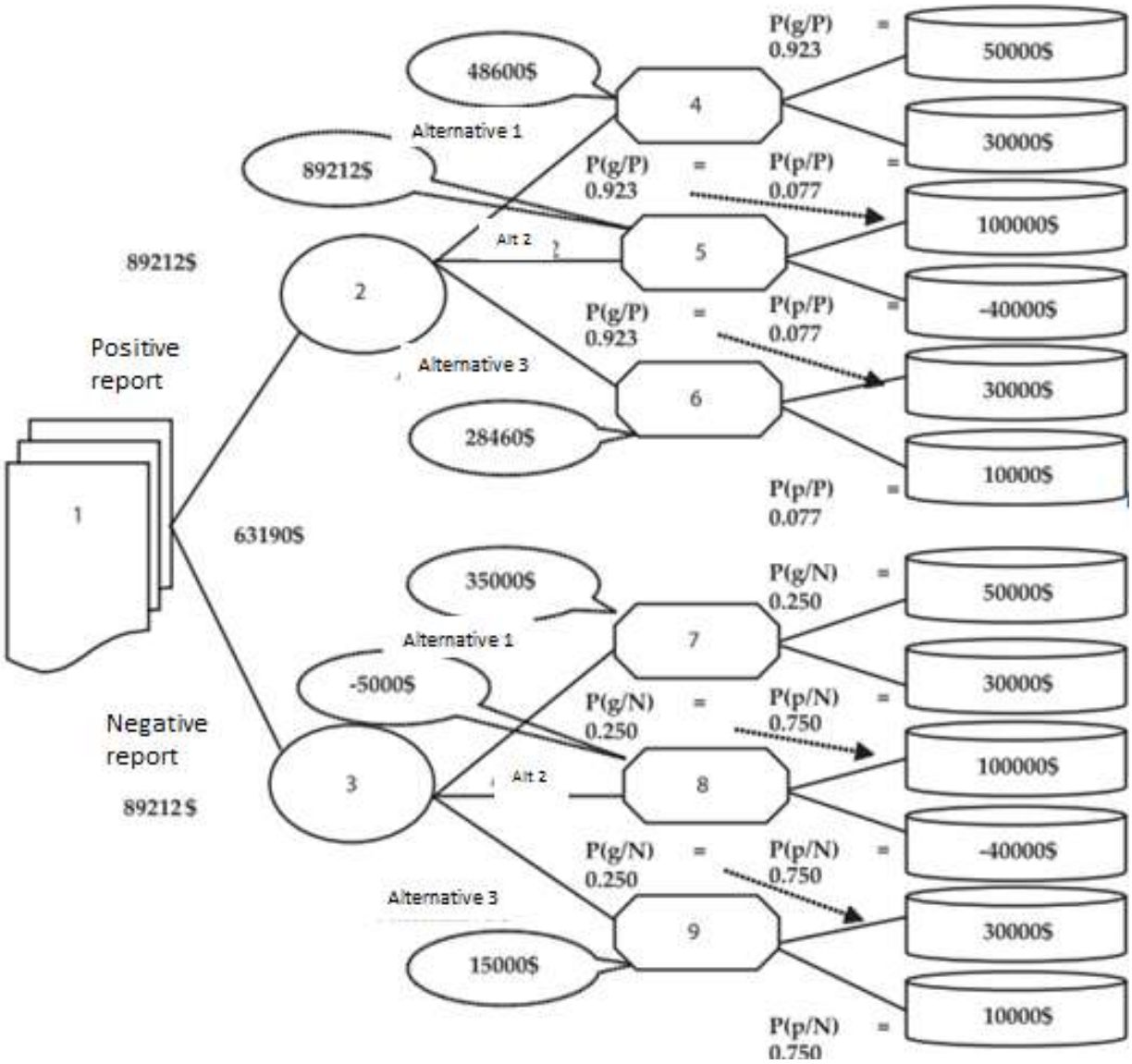
Now that the company has processed probabilities of future economic conditions, the issue at hand is how to use that probable information in decision-making process? The answer could best be determined within the frame of decision-making tree. Using this decision-making tree, we determined that the suitable decision is alternative 2 with the expected value of 44000$. But, as we discussed above, the data obtained from the expert offered new possible probabilities. This constitutes, obviously, another additional phase in the decision-making process presented in the decision-making tree in fig.2.

Fig 2. Decision-making tree with subsequent probabilities



This decision-making tree is very similar to the trees in fig. above but for two differences. The first difference has to do with the existence of two new branches in the beginning of the decision-making tree and these new branches represent the two results of the report that could be faced in the future. The second difference is that the probabilities of chance of economic consequences are not given with the previous probabilities in fig.1; instead the subsequent revised probabilities are given. For example, if the report results positively then in fig above a higher branch is reached (from knot 1 to knot 2). If alternative 1 is chosen (the branch from knot 2 to knot 4), the probability of good economic conditions is 0.923, while the probability of bad economic conditions is 0.077. These are subsequent revised probabilities of economic conditions based on the possible positive report. However, before we do the analysis of the expected value using decision-making tree, we need to determine another set of probable information – the probability of the initial branches of a positive or negative economic report. Now we have all the necessary information to do a decision tree analysis. The analysis of the decision tree for our example is shown in the fig 3 below.

Fig 3. Decision tree analysis



To show how a decision tree works let us start from knot 4 (alternative 1);
(Ev Alternative 1) = $50000*(0.923) + 30,000*(0.077)= $ 48460 and that is the expected value of alternative 1 having data from two economic conditions. And in the same way the expected values of alternatives 5, 6, 7, 8 and 9 are calculated. It is supposed that the investor will make the best decision regarding which investment he is going to make based on knot 2 and 3. The decision from knot 2 will be alternative 2 with the expected value of 89,212$ while the decision on knot 3 will be alternative 3 with an expected value of 35000$. These two results, from knot 2 and 3 refer precisely the decision strategy. These represent a plan of decisions that should be made having the positive and negative report from the economic expert as a source of data.

CONCLUSIONS

In many situations the decision-maker possesses information about the future occurrences. For this reason, in favor of the decision-making process they can use the probability to make decisions. What needs to be said is that even though the probability can be used, there are some criteria that help the decision-maker. We talked about two of them; the expected

monetary value, and the loss of the expected possibility. Using the concept of the expected value, it is necessary that initially the decision-maker estimates the realization possibility of each of economic consequences. After estimations are done, the expected value is calculated for each decision-making alternative by multiplying each conclusion (from the decision) with the probability of the possibility that these occurrences can happen, and then by adding the respective results. The best decision we could make is the one that results with the highest expected value.

Another decision-making criterion regarding the expected value is the loss of the expected possibility (regret). In this case, we multiply the probability of regret for each outcome and from the other side we multiply the decision results with the probability of occurrence just as we did with the expected monetary value. In order to analyze a decision-making situation, a technique known in literature as the decision tree technique. According to this technique, in the decision tree the expected value of each result is calculated and the decision is made based on these expected values. The main profit from using the decision tree is the illustration of prediction, in other words obtaining a general panorama (landscape) of the decision-making process.

ACKNOWLEDGEMENTS

I am very appreciative and thankful to professor Vasilika Kume for her motivation given to me. I also thank my close family, my wife and four children for their support.

REFERENCES

G. Beierlein, James and Woolverton, W. Michael, Agribusiness Marketing. The Management Perspective, 1991.
Kume, Vasilika, Managerial Decision-making, 2002, Tiranë, Albania.
Luthans, Fred and Hodgetts M. Richard, Business, second edition, 1992.
P. Erikson, Steven et al, Agribusiness Management, third edition, 2002.
P, Robbins, Stephen, Management, third Edition, 1991.
W, Taylor, Bernard, Introduction to Management Science, second edition, 1986.