METHODOLOGIES FOR ANALYSIS AND EVALUATION OF RISK IN AGRICULTURAL EXPLOITATIONS

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Abstract:

Risk is a probabilistic phenomena associated with all economic activities. Size and charge decisions to reduce risk is greater in agriculture, given the conditions in which the production is obtained. Whether is about the risk of production, caused by natural or economic risk factors, influenced by the inherent market interventions, in agricultural exploitations the risk appears to be least controllable variable, making it necessary to use methodology for its analysis and evaluation.

This paper supports the assertion that the risk is even lower as the knowledge from the past tendencies of phenomena (production, price, demand, supply, state natural factors) is more analytical and addresses the issue risk management by its evaluation, turning to methods, indicators, mathematical modeling.

The aim is to highlight the positive effects of prevision, using the specific methods and indicators, and to reveal that programming has, in addition to the direct role to guide agricultural unit in respect of the allocation of resources, prevision production, income and expenditure, the role to prevision size of risk, through its inclusion in the program

Keywords: methodologies, risks, agricultural exploitations, programming, decisions

JEL Classification: P48, Q10, Q50

Introduction

Agriculture is conducted under conditions of risk as a result of its particularities and of the influence of factors whose an unfavorable action may cause significant damage.

Consequently, decisions, most of them, are taken in hazardous conditions. It is based on the choice of alternatives that could lead to more favorable results.

Managers take a risk when opting for a certain variant in the production process, trading, because any good are options regarding the level of production per hectare and income per hectare (higher selling prices in a certain period of time can influence the attitude manager / producer), there are situations that can not be accidental or planned, or controlled (hail, plagues of insects, diseases in animals).

Risk evaluation involves, first, analysis, searching for the causes that led to their appearance in order to reduce the degree to manifestation of it.

Resorting to methods and specific indicators to determine risk, but also the programming elements of agricultural activity may provide the forms and effects caused by different risk factors, achieving in this way, the necessary support to adapt of exploitations to these probabilistic phenomena.

Material and method of working

For to achieve the objectives of this study was used analysis of risk in agriculture, the content of the elements necessary to identify and reduce it through programming of activities, the approach being eased by the previous concerns of scientific research.

Has resorted to a correlative and causal analysis in an attempt to capture the trends of various types of risks in agriculture and were made conclusions, using the synthesis, these being premises for courses of action to mitigate risks influences in agricultural exploitations.

RESULTS AND DISCUSSIONS

Risk and its management are very complex issues, present in all types of agricultural exploitations, which depend heavily on their achievements. Be it to the individual exploitations, characterized by self-consumption production and empirical management or units by society type, with production exclusively for the market and the structural and managerial organization, their activities are to most often runs in hazardous conditions, which determine as the results to wear mark phrases “eventuality, probability”.

The researches in this field show that the activity of agricultural exploitations is influenced by risks which come from various sources, these being the criterion and support of risks outburst (figure 1). It is easy to understand that most part of the “state” exploitations is determined by environmental factors, be he

ecological, technological or economic. These being elements which support the existence and functioning of the exploitations, made necessary implication and exercise of management, in sense of mitigating the negative effects (risks), generated by factors imbalances carriers.

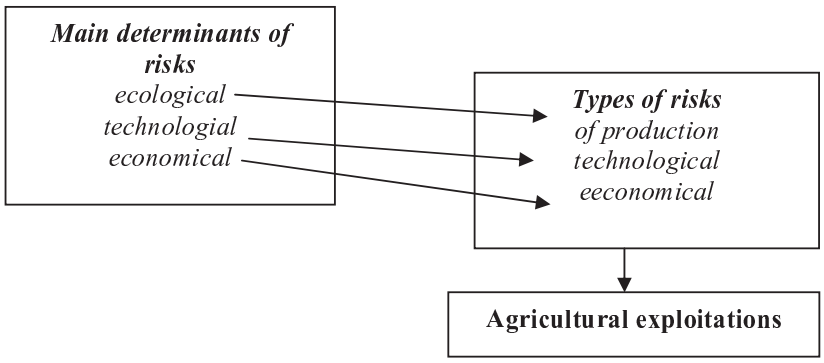

Fig. 1 Determinants and types of risks in agricultural exploitations

With regard to agricultural activities, some conducted in open field, the most stronger risk factor is the ecological. This can arise from phenomena like excessive drought, persistent over time, which affects non-irrigated land, or on the contrary, floods, both having as result in reducing of level and quality of agricultural production, in some cases even lost of it.

With a certain intensity, depending on the type of exploitations and its size, is manifest technological and economic risk. Technological risk is determined by the failure of modern technology and is meet in case of exploitations to society type (agricultural society, commercial society). The effects of this risk consist in increasing production expenditure, with impact on product cost, and thus on reducing unit and total profit. In terms of economic risk, it is the cumulative effect of three factors: quantity sold, production cost and selling price. Each of these factors, being a subject to restrictions resulting from changes in economic environment, influence the results of agricultural exploitations.

Besides the show, sources of origin and the risks they generate and that are manifested in agricultural exploitations are and other nature (figure 2).

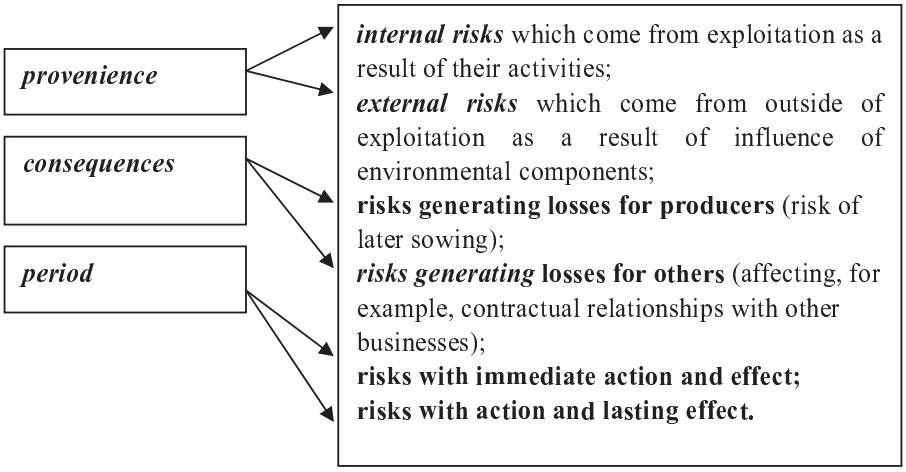

Fig. 2 Sources and risks in agricultural exploitations

Also included are other types of risks such as resources risks. These appears when the availability are less than needs, respectively when resources are limited quantitative or when their prices varies linear, the intensity with which this is manifest, this type of risk depending on the source of resources, respectively agriculture and industry. In agricultural exploitations, the risk is manifested in case practice of branches (activities) that require the same factors of production and at the same time (concurrent branches).

The producers is faces with a decisional problem to allocating of factor, so the productions level or of profit per unit production to be optimal. Interested, also, the expenditures that use the factor it generates, given its variable nature and impact of the risk.

The mentioned show the need for management intervention in risk, it can derive from the use of indicators to identify the specific nature of their activity level to programming methods, in sense of determining the best combinations between branches, and the optimal sizing resources (production factors).

Indicators and methods from evaluation uf risk in agricultural exploitations. For risk evaluation are used different methods, some taken from mathematics such as probability analysis, other specifically, economy.

1. Expected value

Be:

VA (a) = expected value of event

P (a) = probability of the event ***a***

So:

VA (a) = P(a) * E (a), where:

E (a) = effect of the event ***a***

According to probability theory, the occurrence of an event is determined by:

P (a) = m / n, where:

m = number of cases favorable of event ***a***;

n = number of cases equally possible.

2. Hope math is calculated as the sum of the product between possible levels of the element of risk (possible to achieve average production level) and its probability distribution.

S (x) = ∑ pi * xi, where: xi is a variable for which estimates the size of the risk.

3. Size of risk is calculated using the coefficient of risk:

$\sigma i = \sqrt{\sum_{i=1}^{n} (R - S)\ 2\ p}$, where:

R = risk;

S = mathematical expectation;

p = the probability of occurrence of the phenomenon.

4. Coefficient of risk

ri = σ / S

Risk evaluation can be done using mathematic modeling. This means, among other things, resorting to strategic game theory[1].

Applying models of strategic games in decision-process from agricultural exploitations should take into account their specific features, starting from the certainty of the event occurrence and manifest risk factors.. For this purpose, they use a series of statistical information proper of risk element on which is made probabilistic calculation.

In case of natural factors (these having the most influence on fhe production results of agricultural exploitations), the probability to find, exactly, the state of them, is with so greater, with so base of information, on observations made in time, are large.

[1] Rusu, Elisabeta, *Decizii optime în management, prin metode ale cercetării operaţionale*, Ed. Economică, Bucureşti, 2001.

Having the necessary data is pass to elaborating of a decisional matrix and to the calculation of alternatives, their multitude defining the behaviour of nature state.

The matrix includes:

a. alternatives, denoted as A1, A2, ..., Ai ..., I, in which i = 1, 2, 3, ..., m;

b. states of nature denoted by N1, N2, ..., Nj, ..., Nn, where, j = 1, 2, 3, ..., n.

At the intersection each lines with column pass results, matrix bearing the name of the matrix results (table 1).

Table 1. Results matrix

States of nature / Alternative	N_1	N_2 ...	N_j ...	N_n
A_1	R_{11}	R_{12} ...	R_{1j} ...	R_{1n}
A_2	R_{21}	R_{22} ...	R_{2j} ...	R_{2n}
A_i	R_{i1}	R_{i2} ...	R_{ij} ...	R_{in}
A_m	R_{m1}	R_{m2} ...	R_{mj} ...	R_{mn}

At the intersection line A_i with the column N_j are Rij which is the result of alternative A_i in conditions appearance of natural state N_j. The relationships that exist in the matrix can be written in general form as follows: Rij = f (Ai, Nj). In the matrix, the results or consequences can be expressed in physical or value.

The possibility to predict the occurrence of Nj is depending to the level of knowledge of the system uncontrollable factors, on whether there, is generally a large number of precedents and an abundant amount of data.

In this case, the probability of a certain state of nature Nj, is denoted by Pj. Since there is a probability for each state of nature, the sum of probabilities of all states of nature is equal to the unit according to the relation:

$$\sum_{j=1} P_j = 1$$

Establishing best alternative is made to use hope math, calculated by the formula presented above. Depending on the criterion to be optimized, that maximize profit or minimize costs, the best option would be one that will match the highest level of expectancy value math, for profit, and the minimum value, for expenditure.

As mentioned above, there are specific situations that require competing branches of production decisions on the allocation of factors whose quantity is limited. Optimization of such a process will reduce the risk of production intensity. Studying the optimal allocation of production factors found in limited quantities for multiple products, is using the monofactorial type production functions.

Using technical and economic function, it will set the maximum distribution of crop factor, which determines the best production and economic results. For vegetable production, with its experimental data on production levels per hectare allocated to the different amounts of crop factor, resulting in graphical functions in a system of axes xoy are like[1].

$$Y_1 = a_1 + b_1x_1 + c_1x_1^2$$
$$Y_2 = a_2 + b_2x_1 + c_2x_1^2$$
$$\vdots \qquad \vdots \qquad \vdots$$
$$y_j = a_j + b_jx_j + c_jx_j^2$$
$$\vdots \qquad \vdots \qquad \vdots$$
$$Y_m = a_m + b_mx_m + c_mx_m^2$$

Xm optimal distribution factor requires the following relations:

$$p_{y_1} \cdot d_{y_1} / x_1 = p_{y_2} \cdot d_{y_2} / x_2 = ...p_{y_m} \cdot d_{y_m} / x_m = ct \quad \textbf{1.}$$
$$x_1s_1 + x_2s_2 + ... + x_ms_m = D \quad \textbf{2.}$$

Symbols have the following meanings

$p_{y_1} \cdot d_{y_1} / x_1,..., p_{y_m} d_{y_m} / x_m$ – value marginale productivity of crop m;

x_i = quantity of factor returns crop I *I;*

$y_1, ..., y_j$ = average production (ha) to crop *j* ($j = \overline{1, m}$ *);*

$s_1, s_2.....,s_m$ –area crop 1….m;

D = availability factor (x_m).

After determination of quantity of factor which returns to one culture is made analysis of production functions, to type monofactorial, studying extreme points (maximum or minimum).

Along with the show, managing risks in agricultural exploitations implies and using other elements for prevision. Application of linear programming models for determining the best variants of the structure of production may reduce the ecological and economic risks. Finding that combine crop and / or animal species in terms of restrictive factors (risk) is the result not only of operational research, but also an effort by the makers."Bending" at knowledge of probabilistic phenomena is a condition for reducing of negative effects and a support for increase of economic and ecological performance of agricultural exploitations.

[1] Voicu, R., Dobre, Iuliana, *Organizarea si strategia dezvoltarii unitatilor agricole*, Ed. ASE, Bucuresti, 2003.

Conclusions

1. Risks are not abstract elements, they appear and manifest, having, often, influence decisive on the economy of agricultural exploitations.
2. Risk factors and their results exist in all types of agricultural exploitations, but the degree of perception is much higher in exploitations by type society, which producing for the market.
3. Reducing the risk requires actions, taking the application of recognized methodology in the literature.
4. Is needed to managerial intervention which, through knowledge, to contribute to predict probabilistic phenomena, natural, technological, market etc.

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