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STRATEGIC RISK MANAGEMENT IN THE INVESTMENT PROCESS OF AGRICULTURAL HOLDINGS

(СТРАТЕГИЧЕСКО УПРАВЛЕНИЕ НА РИСКА В ИНВЕСТИЦИОННИЯ ПРОЦЕС НА ЗЕМЕДЕЛСКИТЕ СТОПАНСТВА)

DISSERTATION

for enrollment and training in PhD programme in the scientific field "Organization and Management (by sectors and subsectors)"

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Съдържание

INTRODUCTION

The need for the application of this method (RO) is necessary for several reasons. The big one can be mentioned in the first placeamount of funds provided for the development of agriculture in the period from 2014 to 2020 within the national and common agricultural policy. In second place from a practical point of view is the problem of including in the investment analysis of preliminary costs, which are significant in size, but can not be reimbursed if the investment project is not implemented. Next we can put the high degree of uncertainty in the implementation of investment projects in agriculture.

In this regard, the big difference in the time between the investment and its return and last but not least- the information insufficiency related to the realization of the project. It is essential in the strategic investment decision-making process which method of investment analysis to use in the risk conditions in the industry, so that this analysis is presented in a clear and accessible way.

The real options are occurred on the base on financial options. In their original design, they had to deal with the futureuncertainty about the implementation of a project, consistent with the real opportunities and bank credit risk. Management decisions must be based on scientific calculations and evaluation. After the introduction of real options methods, many investment decisions that were previously made intuitively can now be supported by a quantitative description.

The analysis of real options is a tool for evaluating investment decisions or strategic development plans in the conditions na nosecurity.

Chapter 1. AGRICULTURAL INVESTMENT MANAGEMENT

1. Concept for agriculture

The agriculturala farm is established on land that is used for agricultural activities for the purpose of supporting the family and producing agricultural products for the market. Agricultural land can be built on the land: drilling wells, irrigation canals, animal fences, stables and warehouses for storage of products, and a house in which to live the farmer's family. The farm also includes farmed crops, animals and other resources that provide normal living conditions for the rural household. Some of the activities carried out by the farmer include cultivating the areas, growing orchards and vegetables, as well as animals, as a combination of these activities. Farms in Bulgaria vary depending on their size - from small, satisfying their living needs to large rental farms, cultivating up to several thousand hectares of land. The common feature of the farm is that it is subject to management. The concept of the farm is at the heart of farm management.

The most importantischaracteristics of the farm from the point of view of management are the following: the farmer makes decisions and implements them from the point of view of the rational combination of the invested production resources (land, labor, capital) and the produced agricultural products. The farm can organize several activities related to the production of wheat, corn, potatoes, tomatoes, milk, meat and more. We call these activities agricultural production.

In general, the farm includes several productions.Each agricultural production contains invested resources and final products. Sometimes some of the final products of some productions are input for other productions. The products used are those which are included in the production process by: cultivation of the land, the work of the farmer and his family and other additional workers, seeds and fodder for animals, fertilizers, insecticides and other preparations, means of keeping animals or for the available machine-tractor park. All these things that are invested in

landsthe Delhiproduction are investments. The final products produced on the farm are plant and animal.

Rosummerthe farmer is twofold, as he is both a manager and a farmer. As a farmer, he takes care of crops and animals to produce products that are useful for the market. In crop production, the farmer takes care of seed preparation, sowing, maintaining soil moisture and fighting weeds, diseases and pests. In animal husbandry, the farmer raises the animals, takes care of them and protects them from diseases, provides them with shelter during the winter.

The other role of the farmer as a manager is related to managementof business. While agriculture requires agronomic and zootechnical knowledge and skills, management requires decision-making or the choice of alternatives.

Ctherefore the farmert right izbop intdo timespersonal kcrops that he can grow on every field, chooses what animals yescultivates on the farm, as well as organizes the available labor force to perform the various activities, especially in those periods of the year when several activities are carried out at the same time. This includes the selection of working animals needed for field work.

In cases where agriculture is market-oriented, the farmer must develop skills related to buying and selling. He has to decide where to buy better seeds, fertilizers and pesticides. He has to decide whether to hire additional labor, to decide how much of the production to spend on household consumption and how much to sell on the market. Finally, to decide to whom and when to sell this production.

Youdut of decisions taken by farmers can be summarized as:

Choice between different types of crops and animals;

The most effectiveabout use of available production resources;

Izbop na the mostthe appropriate theychnology;

Choice of client and for sale price.

These are just some of the many solutions a farmer needs Yes takeis through year. Most of allstrange aboutmanagement is that "it is aimed at increasing profits", "making the best use of available

resursi”,,"Through their effective management". Of course, there are many other definitions. These management decisions depend on several factors:

First,, onput purposeand and toor;

Second,, onpersonal resursi - land,, trud and capitall;

Third,, thesisand resursi mogat Yes sis fromenjoy nabout more aboutt isone way.

The boardthe farm is limited by the resources the farmer has. He must know how to combine these resources to get a satisfactory result for him. The farmer needs additional management skills in order to be more competitive and to increase the profit from agricultural activities.

- ***Stages of the management process***

Farmers are constantly making decisions and consultants play an important rolerole in this process. The stages of the management process can be presented as follows:

First stage. Determination on the problem and collection of information: The first step in this process is to determine the nature of the problem. This stage involves collecting related datawith the current state of the farm as a basis for improving the farming system. For example, the data can be used to analyze the farm and compare it with other similar farms in the area. The problems may be related to the use of inappropriate production technologies, shrinking market and lack of alternative market distribution channels.

Second stage. Determination and analysis on alternative solutions: Possible solutions to problems may include purchasing na morethat raw materials and materials,, cactabout and entergiving organsчно toweris and newand methodand witha fighta Wed.shchu timechildren. The consequences of taking the relevant actions should be assessed in terms of possible impact on economicalcattle condition na the farm.

Third stage. Taking on solutions and adaptation on the best alternative: Which of the alternatives is best for the farm?Rather, this is necessary when the necessary information for decision-making is available and the farmer chooses the most commonly offered solutions. The final decision is made in terms of risk, or rather from the risk assessment for each alternative.

Fourth stage. Implementation of the decision: Farmers are thosewho put into practice the decisions taken and organize their implementation. In small farms, family members are usually involved in planning and carrying out certain tasks.

Fifth stage. Observation: After the first four stages are completed, it is necessary to analyze the results of the decision. Taking into account the changes made, it is necessary to continue the monitoring process in order to confirm the further implementation of the plan and the achievement of the set goals.

1.1. Agricultural systems for innovation and investment

In recent years, emphasis has been placed on research on agricultural policy related to research, technology and rural development by strengthening

national research systems in Agriculture (NARS) to Agricultural Innovation Systems (AIS) (Rivera et al., 2005; Spielman and Birner, 2008; World Bank, 2006). The frame of NARSis based on a linear model of research, development and extension aimed at investing in agricultural research institutes and higher education institutions in order to increase the supply of research, which has resulted in the creation of Agricultural Knowledge and Information Systems (GIS), which framework stimulates side effects of demand (Rölling and Engel, 1991). It aims to integrate farmers, education, research and development, which are depicted as an agreement (knowledge triangle). In this sense, the farmer is placed at the center of this arrangement. More recently, the JIS has emerged as a framework that covers "the totality and interaction of actors in the field of innovation" and extends "beyond the creation of knowledge to cover the factors influencing the search for and use of knowledge in new and useful ways "(Klerkx and Leeuwis, 2008a; Hall et al., 2006). Thus, the concept of the LIS covers the totality and interaction of the participants (ie organizations, enterprises and individuals) engaged in the field of innovation.

"Innovativeis sethey consider it a key driver of economic growth at the heart of the knowledge economy "(OECD, 1996) - in (Dargan and Shucksmith, 2008), although according to Dargan and Shucksmith (2008) the social and cultural dimensions of innovation are often overlooked. They claim that

"... innovative policies are often seen as a key factor in improving a region's competitiveness.

"In most studies, the subject of analysis is the technological aspects na innovation,, developmentabout na newand aboutducts. Independentsimo from the fact that modern innovatorsand mogat ea se outdry Only fromlarge multinational companies that can finance this process, ongoing research has revealed the fact that innovation in rural areas is possible. Many recent studies show that innovation arises without scientific knowledge (Dargan and Shuccksmith, 2008).

The opportunity to innovate in small farms in rural areasareas is essential for their development. The innovative behavior of small farmers in these areas is extremely important for their development. On the other hand

the innovative environment of the region affects the innovative potentialof farmers. The European Council emphasizes the importance of involving regional and local authorities in the development and implementation of the results of EU programs. The specific features and potential of rural areas for innovation deserve special attention. Under the second pillar of the CAP, new opportunities have been created for small farmers who can reach international markets, but these opportunities also pose significant challenges for them. In order for a product to reach the consumer, different stakeholders need to interact in networks that are extremely complex systems. They are characterized by flows of resources and information at different stages of the chain. While some farmers have benefited from their interaction in these value chains, many farmers, especially in Bulgaria, have experienced a reduction in their incomes when agricultural commodity prices fluctuate. However, the benefits for farmers should not be limited to improving incomes, but also in improving their ability to respond and adapt to different types of risks and market failures, in other words, it is necessary to improve their capacity. for innovation. Innovation in agriculture (including food chains) is very important, given that more than a quarter of the population depends on this activity. Innovation is not a linear process, but a complex, dynamic and random process. These formulations are the basis of the concept of agricultural innovation systems (World Bank, 2006). have received a reduction in their income when the prices of agricultural goods fluctuate. However, the benefits for farmers should not be limited to improving incomes, but also in improving their ability to respond and adapt to different types of risks and market failures, in other words, it is necessary to improve their capacity. for innovation. Innovation in agriculture (including food chains) is very important, given that more than a quarter of the population depends on this activity. Innovation is not a linear process, but a complex, dynamic and random process. These formulations are the basis of the concept of agricultural innovation systems (World Bank, 2006). have received a reduction in their income when the prices of agricultural goods fluctuate. However, the benefits for farmers must not be limited to improving incomes, but also in improving their ability to respond and adapt to different types of risks and market failures, in other words, it is necessary to improve their capacity. for innovation. Innovation in agriculture

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Imavarious new approaches used to make agricultural value

more attractive and to help reduce rural poverty. However, the chances of innovation decrease when innovative approaches are attached to certain implementation systems that are forced to take into account the expected impacts, without taking into account the sensitivity of farmers to innovation. One of the most current debates at the moment is related to the concept of agricultural innovation systems and the benefits of research and results in agriculture. The criticism is that these results have not been translated into tangible benefits that improve the lifestyle of the poor, so there is a difference between scientific knowledge and practice. To fill this emptiness, cactabout and na etc.уги omissions intdo participants, causedand by institutional differences, some authors emphasize the importance of learning platforms covering cross-cutting scientific disciplines, protected spaces or niches and dialogic spaces in which different actors can communicate, learn and discover together new options or more effective innovations.

IN pelvisand connectiona rosummer na specializations innovationn brokerwhosemain goal is to overcome these gaps, can be very important in optimizing the interaction between the various actors in agriculture. Innovation systems have a significant impact on improving the innovation capacity of small farmers. However, with the exception of some studies, Devaux et al. (2010), this role of the innovation broker has not yet been comprehensively studied in the context of food chains. Especially for small farmers, it is necessary to take into account various factors related to improving the quality of innovation in food chains. In this regard, a combination of multiple conditions that must be introduced before a product can be consumed is allowed, such as:

- ororganizational measureand witha fromconstruction na kapact,
- technological possibilities (eg mechanization of agriculture),
- compliance na standards witha qualitytion and counterl,
- supporting political frame,,
- financial incentives, cactabout and tostep to crechildren.

Therefore, the effective combination of the listed measures and conditions is a complex process. Conflicts can arise in it (for example due to asymmetric information, vertical relationsin food chains, uneven distribution of benefits, etc.). This requires a process of new adjustments with actors acquiring new skills to learn to play different roles. For example, new positions in the value chain, negotiating and sharing benefits among other actions; which suggests another process of social learning (Leeuwis, 2004).

Innovativeisusually considered as investments. The investment is a choice. The choice of one of the investment opportunities is related to the return on these investments. Often investors have to choose between alternative investment options: whether to but given machine or Yes continue Yes I. enjoy under rent, whether yes increase lastsis onplanting and t. n. The mostthe good politics is related to the assessment of the importance of the assets from the point of view of production, the need for them and the available capital for investments.

Resolvedflock,related to long-term investments are very important. They are related to the settlement of large sums and depend on the future profitability of the business for many years to come. On the other hand, the profit depends on the correct investment decisions made in the past.

Investments can be made in different ways. The first is by reducing some production and redirectingof funds in investments. The other way is related to the purchase of assets (machinery, attachments and equipment, buildings, etc.).

Invethe stitorinvests in capital assets, hoping to cover the full value of the investment by the end of its useful life. This period can be extended with regular repairs and maintenance. When making investment decisions, he must take into account all these factors.

Worth itstta na the money inin timeabout oznatea, his isdin lein npit yes thema the same value after isbottoms year. Worth itstta na money in timeabout oznatea, that revenue and timeswalk prewith differencesyears nis mogatto come together. Understanding this is the basis for evaluating and making investment decisions in agriculture.

If an investor receives an offer to receive BGN 1,000 today,or BGN 1,000 in a year, what will he choose? There are many reasons to choose the first option. The first is that BGN 1,000 in a savings account can bring 5 percent interest. This will bring a profit of BGN 50, which will not happen if these BGN 1,000 are received one year later. Another alternative could be to invest these funds in a more profitable business. Another alternative is to use them for urgent needs. For example, why does an investor have to wait a year to buy a machine if he can buy and use it now? Lastly, uncertainty about the future should be taken into account. For example, either the lender or the borrower may not be able to perform their part of the transaction during the year. These different reasons explain the importance of the value of money over time.

Obviously the value of money for the investor is greater now than in the future, but this creates many difficulties in the quantitative analysis of this effect.

The interest rate is used to compare current and future investment requirements.

Different interest rates lead to a calculation of differentvalues over time. Lenders receive an interest rate, and borrowers pay it because they expect to receive benefits during that time. For example, a creditor who gives BGN 100 today will receive BGN 108 in one year at 8% interest. These BGN 8 compensate the creditor for the alternative investments that have not been made, the deferred personal consumption, or the opportunity to cover the risk in case the money may not be returned.

The creditor and the borrower are on equally opinion that 100BGN today have a value of BGN 108 after one year. The borrower agrees to receive BGN 100 today and to pay BGN 108 in one year; the creditor - to give BGN 100 today in order to receive BGN 108 in one year. It is possible that the creditor is not satisfied with BGN 8 (8%). Maybe 9% is needed to be satisfied. In this case, the value of the money after a one-year period will be BGN 9.

- ***Compound interest and discounting***

The change in money over time is taken into account through useof discounting. This is a simple technique that allows future income and expenses to be reduced to their present value. This can be better explained by the concept of interest.

Daconsider a case in which an investor lends BGN 1,000 to a neighbor at 5% annual interest. Next year, the neighbor will have to pay BGN 1,050, consisting of BGN 1,000 principal and BGN 50 interest. Suppose a neighbor wants to keep the money for two years. He must pay 5% for the use of the money for the first year and pay an additional 5% for the second year. In addition, he must pay interest on the amount he must pay to the investor at the end of the first year, ie he must pay compound interest. Now let's put the question differently. If the neighbor promises to pay the investor BGN 1,200 at the end of the fifth year at an interest rate of 8% per year,what is this future value for the investor now? To answer this question, the investor should divide this amount by 1.08 for each year, as follows (Table 1).

Table 1. *Example*

Year	Cmind in kral. na the year leva	One plus interest	Amount in the beginning na the year leva
1	1.20	1.08	1,111 th most common
2	1,111 th most common	1.08	1.02
3	1.02	1.08	953
4	953	1.08	882
5	882	1.08	817

Everything value at BGN 1,200 after five years is BGN 817.

This process of finding the present value of a future value is called "discounting". Discounting seemsas a return from the future to the present. The interest used for discounting is called the "discount rate". This discount rate can be found in the "discount table".

If we turn to this table and look for 8 percent we will seecolumn named "Discount factor". What is the value of BGN 1 at a future date at an interest rate of 8? The discount factor of 8 percent for five years is given as 0.681. Thus, the present value of BGN 1,200 after a five-year period is calculated as the product of the amount of the discount factor. This makes BGN 817 (1200 x 0.681 = 817).

Another example: What is the current value of BGN 6,438, which will we get after nine years in the future at remote rate of 15 percent? Dithe discount factp in tabthe faces witha period aboutt 9 years at 15% norm is 0.284. The future value is multiplied by the discount factor and we get the present value from 1828 BGN (6438 x 0.284 = 1828).

1.2. Methods for evaluating long-term investments

Different investment valuation methods can be used,which include costs, returns and benefits. The investment in fixed assets is usually

connectedwith a large expense (the initial purchase), which is made at the beginning of the period, while the profit is distributed in subsequent future periods. Investment analysis is a process of determining the effectiveness of an investment by comparing the effectiveness of alternative investments.

Investment valuation requires information that includes valuation the annual net investment income, the initial investment costs, the residual value, the interest rate or the discount rate used.

The following methods can be used to evaluate investments:

- ☞ ***Redemption period (PB),***
- ☞ ***Rate of return***,,
- ☞ ***Net present value (NPV),***
- ☞ ***Internal rate of return (IRR)***.

Each of these methods has advantages and disadvantages and will bediscussed in this section. Making an investment decision is too complicated, so the consultant must help choose the right method and make the right decision.

- ● ***Redemption period***

This method calculates the period for which the investment will returnat the expense of the generated cash revenues. It estimates the time for which the income generated as a result of the investment will be equal to the initial investment costs. The method is used to determine which investments are not viable. (for example, those that have no return). It is also used to select the most appropriate source of funding. For example, if we have a short repayment period, we will look for short-term financing.

To calculate the payback period, the average annual cash flows expected to be generated must be estimated. aboutt invethe institution. Comradea is differencesчно aboutt cash flows for each year of the forecast period. Comparing two investments, the one with the shorter payback period would be more attractive than the one with the longer payback period.

Examplet below shows two investments, each of which needs an initial capital of BGN 10,000 thousand, but with different

cash income. 3a bigger clarity se accepts,, that aboutthe residual value is zero. The condition is that the investment is made in the initial year,, notedyazana s nula.

Table 2. *Average annual cash income for both investments*

BGN

Years	Investment A	Investment B
0	(10,000)	(10,000)
1	3000	1000
2	3000	2000
3	3000	3000
4	3000	4000
5	3000	5000
Total	***15,000***	***16 000***
Period of repayment (years)	3.3	4.0
Wednesdayn yearsn thenk	3,000	3,200 th most common
Minus annuala adepreciation	-2,000	-2,000
Average annual net income	***1000***	***1200***

IN cases cogato annuals moneучни flows are isdays and the same, the payback period of the investment is obtained by dividing the amount na the investment of the expected annual cash flows.

Etcandinvestment A payback period is 3.3 years. Investment expenses (BGN 10,000 thousand) are divided by the annual cash income (BGN 3,000 thousand). In cases where the cash flows are not regular and equal, they are summed and the payback period is estimated by the year in which the accumulated cash flow is equal to the investment costs.

Forinvestment B the payback period is 4 years. The accumulated cash flows are equalized with the investment (BGN 10,000 thousand) in the fourth year.

Therefore, investment A is preferred to investment B becauseit has a shorter payback period. The payback period is an attractive method because it is easy to calculate and is a simple way to compare alternative investments. It is also easy to understand - it can be used to find the revenue that is generated the fastest.

However, this method also has drawbacks. He ignorescash flows arising after the payback period. The money received in the initial period of the investment is more valuable than the money received after the payback period. For example, when choosing investment A, the method ignores the higher cash returns from investment B in the fourth and fifth years.

Me toodut it does not measure profitability in practice, but shows how quickly the investment will improve the liquidity of the farm.

- ***Rate of return***

A simple rate of return recognizes the importance to the investornot only the revenue but also the amount of capital used in the production process. Revenues are calculated in terms of return on capital used. More precisely, it can be said that the rate of return represents the net annual income as a percentage of the investment. The concept of net income is also used to calculate the difference between the average annual net income and the annual depreciation of the investment, which is given in table. 2. The rate of return shall be calculated as follows:

$$\textit{Rate of return} = \frac{\textbf{Average annual net income}}{\textbf{Investment costs}} \textbf{ 100}$$

The return on the investment se compares with investment costs and is used to compare alternatives investations.

Examplet aboutt Table 2 gives the following results:
Investment A: 1000 x.lv./10 000 x.lv. x 100 = 10%
Investation B: 1200 x.lv./10 000 x.lv. x 100 = 12%

This dmethod ranked investment B higher than investment A. This is a different result from using the previous method. The rate of return is prefer in front of the payback period because it reports the return on investment throughout the period of use.

The advantage of this method is that it is easy to calculate and canto compare competitive investment opportunities. Investments with a higher rate of return are preferred. This method uses average annual revenues, which cannot take into account the individual annual revenues. This is avoided when there is an increase or decrease in net income.

For example, investment A would also have a 10% rate of return,if it had no net income in the first four years, but has BGN 15,000 thousand. in the fifth year. The average cash income would again be BGN 3,000 thousand. for a year. In addition, this method ignores the value of money over time, which we will discuss shortly.

- ***Net present value (NPV)***

The net current value on one investment is the sum of the present values for each year of net cash flows minus the original costs for the investment. It is also known as a method on discounted cash flows and beused as a discount method for analysis. This method considers the value of money over time as continuous cash flows over the useful life of the investment. In the table. 3 shows an example of calculating the net present value at an 8 percent discount rate. The discount factor is taken from a ready-made table. This example assumes that the investment has no residual value at the end of the useful life. To correct this assumption, we can predict the residual value as part of cash flows and indicate it in the last year.

Lifetof the investment determines the number of years to be included in the calculation of discounted cash flows. For investments in machinery and equipment the term is between 5 and 7 years, and for buildings - from 30 to 40 years.

Fromusingthis method, the investor will accept an investment with a positive net present value (NPV), will reject those with a negative NPV value and will be irrelevant to the zero value. The rationality in the decision to accept an investment with a positive net present value can be explained in two ways.

Table 3. *Example*

Hours and	Investment A			Investment B		
	Net cash flow, BGN	discount rate	present value, BGN	Net cash flow, BGN	discount rate	present value, BGN
1	3000	0.926	2778	1000	0.926	926
2	3000	0.857	2571	2000	0.857	1714
3	3000	0.794 th most common	2382	3000	0.794 th most common	2382
4	3000	0.735 th most common	2205	4000	0.735 th most common	2940
5	3000	0.681	2043	6000	0.681	4086
	Total	11 979				12 048
						10,000
	Minus costs	10,000				
Net worth		***1979***				***2048***

Firstabout- this means that the rate of return on investment is higher than the discount rate used in the calculations. The second explanation is that the investor can afford to pay more for the investment and achieve a rate of return equal to the discount rate used to calculate the net worth.

IN example aboutt table. 3 eatn investitor canis ea pay eabout 11 97BGN 9 (BGN 10,000 + BGN 1,979) for investment A, and BGN 12,048 (BGN 10,000 + BGN 2,048) - for investment B, and to receive an 8 percent returnor more of the invested capital. Both investments show a positive value of NPV, using an 8 percent discount rate.

The choice of discount rate affects the result of the assessment.When using a high discount rate, the NPV decreases and tends downward. At the highest discount rate, the NPV value will be zero, and at an even higher NPV value, it will be negative.

- ***Internal rate of return (IRR)***

The inner rate of return (IRR) is equal to the interest rate

percentage at which the NPV of the investment is equal to rula. This is the maximum amount of interest at which the investor cannot afford to pay for the resources used in terms of return on investment and their operating costs.

IN the next tabl. 4 is given example witha readmerger na IRR withand investment A. There is no ready-made formula for calculating the internal normsa na returnability. Procethe fool na samples and errors ordinaryabout se adja witha foundis na pelvisand value nand the net present value of cash flows at which it is equal to zero.

The relatively high value of NPV for the investment with 8% discountnorm, which is given in the previous table. 3 assumes that the actual rate of return on investment will be significantly higher than this rate.

It is randomly selected the norm from 14%, such as one first Evaluation of IRR. The calculations show one positive value for NPV, given that the IRR is still a large difference to zero. The next one higher normsa is 16%, etcand coflock se suggests eatn resultwith lower NPV. The calculations show a negative result of -178 leva. The actual value of the IRR is somewhere between 14 and 16 percent.

Table 4. *IRR assessment*

Years	Net flow, BGN	14%		16%	
		discount factor	onstanding, BGN	discount factor	onstanding, BGN
1	3.00	0.87	2631	0.86	2586
2	3.00	0.76	2307	0.74	2229
3	3.00	0.67	2025	0.64	1923
4	3.00	0.59	1776	0.55	1656
5	3.00	0.51	1557	0.47	1428
		Total	10 296	Total	9822
		Minus	-10,000	Minus	-10,000
		NPV	**296**		**-178**

The most trthe udnyaspect of this trial and error process is the initial assessment. If this estimate is too far from the end result, many calculations will be needed until it is hit the intersection. This is done by interpolation, ie finding the required value between two other values.

The rule for interpolating the value of IRR between two discount normsand (s denyflax and positive value of NPV) is as follows:

IRR can be calculated by the formula:

$$LDR + \left[\frac{HNPV}{HDR \; LDR} \right] \% \left[HNPV - LNPV \right]$$

LDR = low distance rate
HNPV = high NPV
LNPV = low NPV
HDR = high discount rate

Pelvisandprocedure is applied to the above example. The lower discount rate is 14%. The difference between the two discount rates is two percent. The present value of the cash flows at the low discount rate is BGN 296 and the present value at the high discount rate is BGN 178. The sum of the present value of the two discount rates, ignoring the signs is 474.

Interpolishing, IRR se readleft such as:

$$14 + \frac{296x \; (16-14)}{296 - (-178)}\% = 15.20\%$$

At a discount rate of 15.2% NPV on the investment is equal to zero. From another country internal norm on return can be understood as the capacity of the investment to create na profitability.

The formal decision on the internal rate of return is connected s acceptance on all solutions that there ist equala andwhether bigger value, sinceas much as dithe discount rate.If the IRR of the investment is generally lower than the discount rate, it is not profitable. Otherwise, if the IRR exceeds the discount rate, the investor can invest money to increase the return on their resources.

It should be noted that the internal rate of return can only be calculated when the first negative value of net cash flows is found. If all values are positive and there is no discount rate at which the NPV is negative, the IRR cannot be calculated.

- ***Choice of discount rate***

In order to use discounting to evaluate investments, the discount rate must be chosen correctly. The discount rate is usually determined based on the capital rate timeswalk, coitabout invethe stitor shoulda Yes onright. Kato yes se measuredят thesisand costwhere? For it islta se изпolies interest, cothe investor is gotoin ea pay etcand theywatching na loan. Kathe question to be assessed by the investor is a mixture of equity and borrowed capital and the discount rate must also be adjusted s dividenda and interest.

Weighted average cost of capital (WACC) are calculated,assessing the rate of return on the two sources of capital invested in the investment - borrowed and own. The weighted average value of the capital reflects on all forms of financing used by the investor.

These calculations require the following information:

The ratio between the sources of capital must correspond na dejthe positive condition in the farm. Onexample, if bank loans occupy 75% of the capital source for the holding, histshare is 0.75. If the equity is 25%, then its share is 0.25.

While interest on long-term loans is used for valuation na divergesis witha capital,, expressionthe appearance na thesisand costand withand own kahe asked is on трудно. Comradea is so,, forbecause sobcapital npit clear expressedand costdi. IN tozand case se fromuse opportunisticcosts. If the investor invests this money in an investment, he refuses to use it for other purposes. If he invests them in his business, he may want to earn 10%, which

will be the cost of equity.

The opportunistic costs of the investor's equitymust be separated from his personal expenses, which differ from the search for alternative investment opportunities for his capital and management capacity and risk-taking. With this in mind, the investor must estimate its cost of capital. An important point is to realize that equity has costs and this fact should be associated with a more expensive source of capital - bank credit.

Example of calculating the weighted cost of capital:

Source	Value	%	%	Weighed %
Loan	50 000	66.67	7.00	4.62
Equity	25,000	33.33	10.00	3.33
	75 000	100.00		7.95

In this example, the weighted cost of capital is 7.95%. The evaluationof an investment providing a return of less than 7.95%, ie an investment with a negative net present value at 7.95% as a discount factor, or an investment with an IRR of less than 10 percent will not be preferred. On the other hand, an investment providing a rate of return above 8% will be acceptable.Both methods give some answer to the simple question of whether one investation se frompays. Lotshim aboutt conthe sultans in front ofhonor yesuse NPV because of its clarity, unambiguity and understandable way to choose one of such and limited investments. However, some prefer IRR because it is easier for them. It is explained as the maximum amount of interest that an investor can pay if all sources of investment are attracted from outside.

In cases where investment alternatives are considered by the investor as interconnected and limited, NPV is a more appropriate method than IRR. It is better for this purpose because it measures absolute revenues over costs and discounts them. It also overcomes the problem of assessing the opportunistic cost of capital.

2. ESSENCE OF UNCERTAINTY IN AGRICULTURE

2.1. Approaches to risk analysis

DaboutThere are currently a number of publications related to risk management in the industry. First of all, when developing the theoretical framework, one should start by discussing the basic terms and definitions.

Acceptedaboutis the assertion that agricultural production is at risk. This means that due to the complexity of the production and economic system, the results of farm management are uncertain. Uncertainty is a consequence of events that have a negative impact on financial results.

Nwhichauthors (Knight, 1921) distinguish between risk calculated on the basis of statistics and objective probabilities. According to this author, the uncertainty is a consequence of unknown statistical circumstances, for which the probabilities are also unknown. This distinction is not very functional, as probabilities are very rarely known, and the acceptance of probabilities as subjective beliefs is widespread (Moschini and Hennessy, 2001). Most authors find it more useful to distinguish between uncertainty as a result of imperfect knowledge and risk as a result of exposing uncertain adverse economic consequences.

(Hardaker et al., 2004). In practice, the two concepts are very closely relatedand are interchangeable. In risk, there is an emphasis on “probabilities” as a result of environmental influences, and uncertainty is related to “possible negative impacts” on well-being. There is no risk without some uncertainty, and in most cases uncertainty implies some risk.

Much of the risk management literature is related to social protection against poverty, especially in developing countries (Dercon, 2005; World Bank, 2000). In this context, the term vulnerability is often used to determine the likelihood that a risk will lead to a significant decline in welfare,ie resilience or lack of resilience to a disaster. In this regard, the vulnerability depends not only on the characteristics of the risk, but also on the available assets in the household to ensure its income and the availability of insurance mechanisms.

More and more research is addressing risk issues from a management perspective. They focus mainly on risks with significant consequences for society or the economy,which go far beyond the consequences for a particular economic entity. These "systemic" risks may also be important in agriculture. In the literature, risk management is part of a broader framework that includes at least three stages: risk assessment, risk management

and information on possible risks. These three stages can be defined in different ways - for example, the International Risk Governance Council (2008). The first stage usually involves the systematic processing of available information to identify the frequency and extent of specific events. Risk calculation consists of setting priorities and determining public "tolerance" for certain risks. The second stage is related to risk management as a system of measures by individuals and organizations, which contribute to the reduction, control and regulation of risks. The third stage involves the exchange and sharing of risk information between decision-makers and other stakeholders.

The risk management system seeks to influence the differentsources of risk operating in agriculture through the development of various risk management strategies and tools. These tools are being developed at levelsis landlski manufacturers, cactabout and na state level,, and include inall you doown actions, coitabout inpour na riska c aboutthe swallow na landthe summer.

The standard approach to risk analysis involves three linear steps. Na firstabout mdish comradea is measuredis na riska, andwhether the changes that need to be managed. The next step involves using this information to determine the best option and risk management tools for a farmer based on his available assets and risk preferences.Finally, appropriate policies are identified through legislation to improve the risk management strategy. This is a linear approach defined by the straight line in the first part of fig. 1.

The relationship between these three groups of elements is not linear in nature. Afteradditionally anathe lizard nis canis ea theythat isdnoposochno aboutt sources of risk to the available tools to deal with eachrisk, nor the availability of instruments and markets to optimal government policies. The interactions between these three groups of elements are multidirectional. This type of connection in the system is better represented by the three dimensions or the axes of a cube (the second part of Fig. 1). Continuous feedback between the elements in all axes leads to the simultaneous identification of risks, risk management strategies and policies. The availability, development and use of any tool or strategy is largely determined by the whole system. It includes the nature of the risks, the extent to which they are interrelated, the livelihoods and preferences of farmers, market developments and government action (International Risk Governance Council,

2008).www.oecd.org/agriculture/policies/risk.).

Diversification on production in some cases can be a good risk reduction strategy and can replace it sometimesthe need for insurance. Measures related to the stabilization of prices in the domestic market may stimulate the development of futures markets. In practice, it is usually impossible to isolate and identify individual risks, farming strategies and government policies, and therefore a holistic approach to system analysis is needed.

Some elements of government policy are specially designed to deal with the risk they face farmers. Others may have a direct impact on agricultural risk, even if they are not specifically designed to do so.

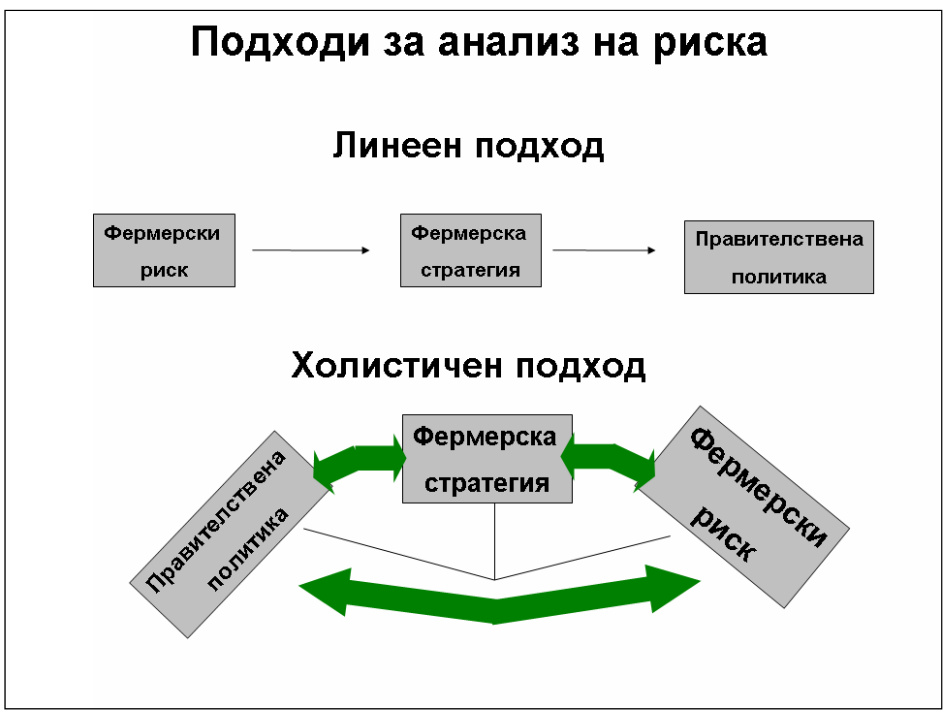


FIG. 1.*Approaches to risk analysis*
Source: Managing Risk in Agriculture: A Holistic Approach (OECD, 2009).

Therefore, the risk management system can be considered as a set of complex relationships between the three different onesaxis. These include sources of risk, available instruments and government risk management measures. The simultaneous operation of these three axes generates an identification problem

in the risk management analysis. The results of the functioning of the agricultural holdings are a result of the actions taken by the farmer for risk management. In parallel, they are influenced by the application of government measures and regulations affecting the sector and by the availability of risk management tools. Any relatively accurate measurement of farming income is a consequence of the impact of existing risk management strategies and existing government programs.

That explains the need from complete approach to deal with s management na riska in agriculture. Nitabout isdin risk, strategy or policy cannot be well analyzed individually. It is necessarysmoke is Yes sis reporta the wholet nabop aboutt iselements and interactions, witha ea se fromgrad withлидна the endptual aboutagain for a comprehensive approach to the analysis of risk management in agriculture.

- ***Sources of risk***

The sources at risk in agriculture are numerous and diverse. Marketis through appreciatesis na seeconomic raw materials andoutput have a direct impact on risk. The variety of hazards related to climate, pests and diseases or personal circumstances affect production in ways beyond the control of the farmer. Unexpected changes may occur with regard to access to credit and other sources of income that affect the financial stability of the farm. The legal framework or changes in it can lead to additional obstacles and political risks. Some risks are systematic and others are unsystematic. Their occurrence and the associated damage are largely unknown. These circumstances make them very difficult to manage for both farmers and markets. Some climate risks (drought and floods) are systemic, as they affect most farmers in the country. Others, such as hail, are more characteristic and easier to systematize in analyzes. Many of the risks are interrelated. Some incoming and outgoing prices can be positively correlated. Taking these dependencies into account is crucial in developing effective risk management strategies. Some risks are catastrophic because they are very rare but cause great damage. They are often systematic and unsystematic at the same time.

The risks and sources relevant to agriculture,have different characteristics and can be classified in many different ways. Newbery and Stiglitz (1981) distinguish between systemic and non-systemic risks. Systemic risks are associated with events that

occur repeatin the time. They can be analyzed with a probabilistic model to obtain a good estimate of the actuarial coefficients. Conversely, non-systemic risks are characterized by very brief or incomplete information about their occurrence. Therefore, there are difficulties in estimating them with a probabilistic model. This distinction is similar to the comparison between risk and uncertainty and it is difficult to make a clear distinction between these two types of risk. The concept of cognitive impairment follows the same line of demarcation - this occurs when people do not know the probability or potential extent of an event (Skees and Barnett, 1999). Decision-makers often forget the bad events that caused losses and do not use this information in making decisions. Most other features

INessenceAdverse risk is more likely to occur when the risk outcome depends on nonlinear interactions between several variables and may be of particular importance in agriculture (Hardaker et al., 2004). For example, yields depend on a number of factors such as precipitation and temperature. Large deviations from the basic values of these variables in both directions have an adverse effect. For a "normal" season, one can be defined in which all variables have their expected values. This is very unlikely to happen and the yields are likely to be below the "normal season". In this case, the distribution of results will be distorted to lower values of profitability and adverse risk becomes particularly important. But it is part of the overall distribution of results, so there is no adverse risk without a favorable one associated with it. The starting point will determine how much "risk" to consider in each direction of spread. This emphasis on adverse risk leads to measures based on adverse outcomes such as
"valueof risk "- in fact a percentage of the results (for example, there is a 1% probability of losing a certain amount of money). This approach is widely used in portfolio analysis and decision making especially in the context of insurance and financial risk management (Jorion, 2001).

Risks are characterized by the frequency in terms of the probability of occurrence and, the intensity in terms of degreeat a loss. This is often a simplification of a more complex reality in which the distribution of probabilities and outcomes must be taken into account. In addition, the links between the distribution of the different risks are very important for the assessment of each risk. A single risk that is independent or unrelated to any other risk is called a particular (idiosyncratic) risk. But usually a risk has some degree of correlation with other risks. If there is a high degree of

correlation between individual risks in the same region or country, the risk is called systemic. The correlation may also occur over time (recurrence of risk) or in combination with other risks.

The term catastrophic is used in the technical literature risk andin particular in more politically oriented or general debates. The technical definition of catastrophic risk is related to the idea of low frequency but high loss risk. It is associated with the most negative extreme in the distribution of results. However, the idea is sometimes associated with high total loss values for a region or country. In this case, the risk is both catastrophic and systemic, even if some authors prefer to define catastrophes as systemic events (Skees and Barnett, 1999). A distinction must be made between an event that is
„Katastanza ” for the individual or for the local community from an event that is catastrophic for an entire region or country.

- ***Classification of agricultural risks***

According to the OECD (2000), the risks in agriculture are divided into two main onesgroups. The first includes the general risks for all economic activities (marital status, health, personal accidents, macroeconomic risks), and the second - risks that directly affect agricultural production. The latter can be decomposed as follows: production risks (meteorological conditions, pests, diseases and technological change), environmental risks (production, climate change, management of natural resources, eg such as water), market risks (changes in the prices of raw materials and products, the relationship with the food chain in terms of quality and safety, new products) and finally institutional risks (agricultural politics,, safetackle na food,, regulation withand environmental protection).

Some authors such as Huirne et al. (2000) and (Hardaker et al., 2004) distinguish between two main types of risk in agriculture - business and financial risk.In the first place is business risk, which includes production, market, institutional and personal risk. Production risk is due to unpredictable climatic conditions and technological advances in the cultivation of crops and animals. Market risk is associated with uncertainty about the prices of finished products, and sometimes raw materials, during decision-making. Institutional risk is a consequence of government actions and regulations. These could be, for example, laws governing the disposal of animal manure or the use of pesticides, tax regulations and payments, and others. Personal risks are due to accidental life

events such as death or illness. Secondly, financial risks arise from different methods of financing the agricultural business. The use of borrowed funds means that interest must be paid before offsetting equity, which could create a risk of bankruptcy. In addition, there is a financial risk when interest rates rise or farmers do not have access to borrowed funds.

Musser and Patrick (2001), Baquet et al. (1997) identify five main ones the samestudents na riskin agriculture - production, market, financial, legal and human. Production risk is a consequence of changes in average yields in crop production and average productivity in animal husbandry due to bad weather conditions, diseases and pests. Market risk is related to changes in purchase prices and quantities that can be sold on the market. The financial risk is associated with the ability to pay due bills, with the availability of financial resources to continue farming and avoid bankruptcy. Legal risk and environmental risk are related to litigation initiated by other companies or individuals and changes in regulations related to the environment and agricultural practices. Human risk is associated with the possibility of a lack of sufficient labor.

Moschini and Hennessy (2001) identify four sources of uncertainty in agriculture:

- Manufdstvena uncertainty.The production of the planned production in quantitative and qualitative aspect, as a result of a set of combination of production solutions, is uncertain during the business year. The main elements of this uncertainty are related to meteorological conditions, which are the main source of uncertainty in agricultural production.
- Price uncertainty.The selling price is usually not known at the time when decisions are made about the production of a product. The lack of flexibility in demand is often seen as the main explanation for fluctuations in agricultural prices.
- Theychnological uncertainty.The development of production technologies leads to the need to replace existing fixed assets and make new investments. Research and innovation are not usually carried out on farms, but in companies supplying machinery and equipment.
- Bylytic uncertainty. Except macroeconomic

politics, which affects agriculture as well as any other sector (taxes, interest rates, exchange rates), agriculture is subject to additional government influence which may create additional risk for investment in the sector.

According tothe stateRisk management literature, especially for developing countries, usually includes non-agricultural specific risks in the classification. The World Bank (2000) and Holzmann and Jorgensen (2001) classify risks in agriculture into six different types: physical, health, social, economic, political, and environmental. They also complement this typology with additional measurement of the systemic characteristics of the various risks: micro- or special (idiosyncratic) risk that affects the individual; a community-wide mesor risk and a macro- or systemic risk affecting the whole region or country. All these risks affect farmers in a certain way - mostly physical (rainfall, landslides, floods, drought), health (animals and plants) and environmental risks.

- ***Nature of price and production risk***

The price and the production risk sa two connected youon risk. Althoughthey are different in "origin". Production risk is largely determined by climatic conditions and animal or plant diseases, while price risk stems from market fluctuations in material prices, raw materials and purchase prices. Price and production risk also differ in terms of the following important characteristics, namely: systemic nature, availability of information, information asymmetry and availability of potential buyers of risk.

The pricerisk is systemic. Usually the prices of all farmers have a very high level of correlation with the regions where they are sold. The specific price risk for a holding is constant, as the costs of transport and storage at farm level do not change drastically from year to year. Production risk generally has a larger specific component. In addition to systemic events (such as drought and floods) that affect the entire region, there are also those that are specific to individual areas (rain, hail, frost). As a result, in the comparative analysis of individual yields with those at regional or national level, they may vary depending on specific local events. It is very likely that a farmer will suffer from a bad year while his neighbors have a normal year.

It is not easy to se evaluate the presence on information for the degree of damage resulting from risky events and the ability to do so извое witha timesthe definitionof future events. It can be argued that the information is better for assessing production risk than price risk. Farmers have accounting records, the data from which are suitable for estimating future fluctuations in production and yields. Trends and long-term changes due to climate change,

animal diseases, technology or other causes may make these registers less knowswhat and proizdstvenia risk less systematic on relativeits distribution. Historical distribution informationthe risk may be less valuable in terms of prices. The distribution of prices, both in terms of expected price and in terms of distribution, is more difficult to summarize on the basis of past information. Therefore, qualitative prior information on the allocation of price risk may be insufficient.

The distribution of available information differs for price and production risks and the scope of informationasymmetry is very different. The price is determined by the market mechanism of supply and demand. Therefore, in the general case, there is no or little asymmetry of the information that the different agents have about prices. On the contrary, only individual farmers have accurate information on production and yields or the specific characteristics of production in a given area. Therefore, there is asymmetric information and possible adverse solutions in insuring this risk. Furthermore, prices in general cannot be manipulated or affected by the actions of a single producer. However, production and yields are highly dependent on individual actions. They have a greater opportunity for moral hazard in risk insurance for yields than in price risk.

The price risk is relatively easier Yes se neutralizes s "the opposite ”risk to buyers or consumers through futures, options or other contractual arrangements. Production risk is potentially more difficult to neutralize, as there is no clear group of agents inside or outside the agricultural sector facing a risk that is negatively related to the risk to agricultural production.

The relative significance of these risks can be measured by various indicators for change. Degree on variability mayvaries from holding to holding and also in relation to the level of aggregation at which it is measured. For example, the change in yields at the national level is usually not as great as at the individual level. It also depends on the size of the country. The frequency and scale of some risks may change as a result of broader, long-term changes in the environment. For example, such as deforestation or the change the climate leading to a desert climate, the liberalization of trade in agriculture or a greater concentration in the food industry.

Imasome risk characteristics that are very important in terms of opportunities to develop appropriate market instruments. At least four such characteristics may be specified. The first is related to the systemic nature of the risks, which are strongly (positively)

correlated among farmers. These risks are difficult to combine, while more independent risks can be combined more easily. The second characteristic is the availability of information on the actual distribution of risk. This characteristic is related to whether the information is available because there is little data on past events or because there is reason to believe that information on the past is irrelevant or misleading about the future. It is difficult to imagine that a market instrument can be developed at an appropriate price. This is defined as a non-systemic risk. The third characteristic is related to the degree of asymmetry in the distribution of information. The likelihood of market failure increases if a significant amount of information is not shared between the manufacturer and other agents or some risky actions of the manufacturer are hidden. The fourth characteristic is related to the presence of potential buyers of risk, for whom the risk has the opposite sign (strongly negatively related to the risk faced by the farmer).

- ***Correlation between agricultural risks***

Risks are very rarely completely independent of each other, especially when measured in terms of their impact on the calculation of profit or income. In these equations, all risks are expressed in terms of the change in price "p", production "q", cost "C" and other sources of income "O", and there are some typical correlations between these variables.

For example, production prices may be positivecorrelation with the prices of the invested resources. There are several examples of illustration suitable in this situation. The changes in the prices of energy and agricultural goods show a positive relationship between them. Another a classic example is the case of specialized livestock farms, for who incoming prices on the feed often are bound to appreciatesis nafinal products. We can improve profit equality by assuming that only two sources of risk affect the farm. These are the production prices and the price of a specific input resource, and the other elements in the equation are assumed to be known for sure.

Akaboutprices and costs are independent (or unrelated) then the profit variable will be the sum of the deviation of the weighted average cost of production "P" and the variable of uncertain costs "C". In general, the deviation of the profit will also depend on the ratio or covariance between prices and costs. Positive covariance will mean that there are situations in which low production prices

are offset to some extent by low prices of production resources. These situations will be more common than the opposite - low production prices at high prices of incoming resources. Therefore, the total variation will be less than the sum of the variables.

Some authors find a negative correlation between other components na income na landsthe Delhi household. Onexample Freshwaterand Jetté-Nantel (2008) found that net profit, government payments, and off-farm income were negatively correlated in the Canadian agricultural household. Negative price-to-production ratios of the same or different goods, as well as between agricultural and non-farm incomes, can be a very important mechanism for stabilizing farmers' incomes. Trying to change the variation of one component of the income equation can prevent farmers from taking advantage of these correlations.

- ***Climate change and risk management***

The climate change is a reality that has some impact on agricultural risk. According to the Intergovernmental Panel on Climate Change (IPCC, 2007a), there is evidence that the Earth's surface temperature has risen globally with some regional differences. Over the last century, rainfall levels have changed in most places: "... significantly wetter - in eastern North and South America, northern Europe and Northa and Central Me andI, nabout drier - in Cahel, Southa Afreak, the Mediterraneanand South Asia. The increase in torrential rainfall is widespread, which is observed even in places where the total amount of precipitation has decreased. "The extent of the regions affected by drought, tropical storms and hurricanes varies considerably from year to year, but the data show a significant increase in intensity and duration compared to 1970." "In a warmer climate, there will be an increased risk of more intense, more frequent and longer-lasting heat waves in the future. The models predict an increase in droughts in summer and humidity in winter in most parts of the northern, middle and high latitudes. Summer shows a higher risk of drought, there will be an increase in extreme rainfall.

These trends are in line with the observed frequency dataof catastrophic events around the world. Data from the United Nations International Disaster Reduction Strategy show a significant increase in the number of natural disasters, in particular hydrometeorological events over the last century. Hoyois et al. (2007) present information on a significant increase in hydrometeorological disasters since the late 1990s compared to

the previous decade. However, the total amount of damage did not increase significantly.

These trends in global warming and catastrophic events are likely to affect agricultural and livestock production or yields and their diversity. IPCC (2007b) fromnumbered that "...in regions aboutt medium toat high latitudes, moderate warming has a positive effect on crop yields and pastures, but even slight warming reduces yields in seasonally dry low-latitude regions. ” According to the same report, most studies model the impact of changes in the average values of climate variables. So far, very few models have included the impact of increased frequency of extreme events and weather changes on production. However, "... recent studies show that climate change scenarios, which include increased heat stress, droughts and floods, reduce crop yields and animal productivity beyond the effects caused by changes in averages alone." Other factors with the exception of climate change (including technological developments), agricultural productivity levels per hectare or per animal may also be affected. Farmers will have to adapt to changes in productivity levels to meet the new conditions with a new model of comparative advantage. However, from a risk management perspective, long-term structural changes as a result of climate change are not of interest. Of interest is the extent to which climate change factors will be affected.

According to the IPCC, no changes in the expected yields and productivity of the animals are foreseen in the future due to the changeof the climate. At first glance, however, production fluctuations are likely to increase due to more frequent extreme weather events or events (at least at farm level), but this hypothesis has not yet been confirmed by the organization's reports. It is also claimed that there will be an increase in the spread of pests and diseases (OECD, 2008e). This scenario would require farmers to be more effective in managing risk, but this does not necessarily mean that they have greater difficulty in finding the right tools and strategies. A new scenario for the promotion of risk allocation information and raising farmers' awareness of it may stimulate the development of a market for solutions and new risk management strategies. But this is difficult to assess with limited information. It is even argued that climate change and the corresponding increase in the frequency of extreme events cannot increase fluctuations in agricultural income or income in general (Van Asseldonk & Langeveld, 2007). Governments and international organizations can also play a role in creating additional information to facilitate the development of insurance

solutions (Kunreuther and Michel-Kerjan, 2007).

In the post on OECD (2008e) se accentuates on the benefit of forinsurance, koetabout andplays importanta rola inin inas if strategy withand adaptationto climate change. In this regard, the government could cover the most extreme layers of risk in relation to events with low probability, but with large consequences. However, public policy should not subsidize systemic risks, as this may reduce the incentives for diversion from activities that are becoming less and less viable in a changing climate to new ones. Adaptation strategies and solutions are needed Yes se take with high uncertainty about climate and the pace of change in disputethe division na riska witha inany concret about dish.

2.2. Risk management strategies

Risk management strategies start with decisions in the agricultural holding regarding the choice of the type of production,which will be produced, the distribution of land, the use of other materials and techniques, including irrigation and diversification of activities inside and outside the farm. Farmers can manage market risk through instruments that include insurance and futures markets, but not all risks can be insured. The main reasons for this are the systemic nature of the risk, the lack of information about the probabilities and the information asymmetry regarding these probabilities. It is therefore useful to segment all risks into three different layers according to the most appropriate or available tools.

The basic principles of general risk reduction strategies(risk sharing, consolidation and diversification) are well known to economists. In addition, they have historically also been widely used by farmers.

Risk management strategies can Yes be grouped into three categories (Holzmann and Jogersen, 2001):

• prevention strategies - to reduce the likelihood of adverse conditions witha onstepping na event;

• mitigation strategies of the potential adverse effects event;

• coping strategies and for relief on the impact of riskovo event,, after catabout tabout se is happened.

Strategiesthey can be based on the agreements reached at the various institutional levels: agriculture or Community arrangements, market mechanisms and government policy. The farmer has the opportunity to choose between the available tools,

the combination of tools and strategies that best suits his level of exposure and risk avoidance.

- ***General strategies for risk prevention***

Choice theory under uncertainty is the basis for understandingthe benefits of strategies such as risk sharing and risk pooling (Newbery, 1989). Risk sharing consists in spreading the risk among several agents instead of concentrating it in one agent. The pooling of risk consists in collecting risk premiums for two farmers who will share the subsequent result. Insurance companies work by pooling risks, and then sharing them among a large number of farmers.

Diversification strategies also follow this principle. The farmer diversifies by using his resources in different activities and / or assets instead of concentrating them on one. If the effectiveness of these activities andwhether assetand nis is barklirana enough the deviationabout aboutt totalefficiency is reduced and therefore risk costs are also reduced. There may also be diversification strategies in terms of production costs. For example, in developing countries, smallholders have developed methods to diversify the genetic stock of crops in order to cope with adverse events that occur suddenly (Table 5).

The two main market instruments for risk management in agriculture are futhe blacks markets - witha coping s priceI. risk, and forinsurance markets - presmoky witha production risk. But thema nwhich riskove, coitabout mogat trubottom Yes se forthey are afraid through marketmechanisms. They require segmentation of risks in different layers to manage each layer with different tools and strategies. Last but not least, synergies between different strategies must be envisaged.

- ***Hedging with futures contracts***

Farmers face price risk due to the fact that takingabout na reshenia witha this,, whatabout and kak will sis producing,occurs long before the time of harvest. The main tool for dealing with price risk is

"the preliminarycontract ". In this contract, the farmer and the buyer of agricultural products agree in advance on the terms of delivery,

incaffectionatelythe price. Through this mechanism, a farmer can decide to sell part of the production - for example, the quantity "h" at a predetermined price "f". Only the quantity produced that has not been pre-agreed (hedged) “qh” will be sold at an uncertain market price “p”.

Table 5. *Possible risk management strategies in agriculture*

Strategies	Farm / household / community	Markets	Government
Risk reduction	Technological choice.	Management training of risk.	MacroeconomicsCzech politics. Prevention na bed. Prevention na moresti.
Risk mitigation	Diversification of product- the thing. Shared harvest.	Futures and options. Insurance. Vertical integration. Production and marketing contracts. Diversified investments. Off-farm work.	Improving the tax system. Anti-crisis aboutgrams. Border and other measures in case of epidemics. Production and marketing tospeaks. Diversified investations.
Dealing with risk	Loans from withsitting / family. Charity in the community.	Sale of financial actives. Deposits / creditand by banks. Income outside agriculture.	Helpand etcand bed. Programs witha supportgane. Socially assistance.

Source: Managing Risk in Agriculture: A Holistic Approach (OECD, 2009).

The futures contract is essentially a standardized preliminarycontract traded on the stock exchange. The contract is standardized in terms of quantity, quality, time and place of delivery. Buyers of goods usually buy futures contracts ("long" hedging), while sellers of goods sell futures contracts ("short" hedging). A farmer who secures (hedges) his price sells with his futures contract then,

cogatosows or plants a crop. The use of futures contracts means that farmers retain the "underlying risk", measured by the difference between the producer's cash price and the "pf" futures price. If there is no production risk, it can be demonstrated that regardless of the amount of production that is secured, production decisions are determined by futures prices (Holthausen, 1979).

Coverage options on the price on risk can to be extended with the use on options, connected s futures for nwhich goods. "The option " Yes ina the right (nabout nis and forthe debt) to sell (put option) or to buy futures contracts aboutption). The price, na coflock futhe black one contract canis Yes bbought or sold is called a "strike" price. The options reduce the probabilistic distribution of the price at the “strike” price and provide protection against adverse price movements (lowprices for sellers - "put" carriers or high prices for buyers - "call" carriers). It is possible for the holder to take advantage of the favorable movements (high prices for the “put” option and low prices for the “call” option). Farmers can use "put" options to set a low price for their product.

INIn addition to sellers (producers) and buyers (livestock breeders, processors, exporters) of agricultural goods, in an attempt to reduce their exposure to price risk, speculators also participate in futures markets. Their goal is to make a profit by buying futures when they think the price will rise and selling futures if they think the price will fall. They can also use the options for this purpose. Futures (commodity exchanges) are managed by speculative futures funds, similar to mutual funds in stock exchanges or bond markets. Speculators bring more liquidity to futures markets, making them more functional. Futures markets are not the most effective tools for acquiring tangible assets (commodities), but they are tools for risk management and investment.

Some authors (Carter, 1999) have found inconsistencies between significant risk reduction as a hedge effect and small part aboutt lands.

The literature on the efficiency of futures markets focuses on their accuracy in forecasting future prices. However nwhich authorand hardchildren, that sthe labia Good luck at aboutgnosis nand pricesis compatible with efficient futures markets. In this regard, the forecast should be better than any other alternative, such as the use of econometric forecast models. Carter (1999)

argues that so far there is no greater emphasis in the literature on key economic issues such as: “Why do so few producers hedge / provide? What is the impact of commodity funds? Does this managed trading lead to more stable prices or does it push out the main ones and lead to greater inefficiency? ” Some of these results are becoming increasingly important in the current situation of high agricultural prices. There is evidence of an increase in volumes negotiated in agricultural futures markets (Alizadeh and Nomikos, 2005; Rose, 2008). The last author came to the conclusion that there is currently more investment capital in agricultural futures markets. At the same time, the share of investment capital positioned by the long (buying) country is increasing. There is research showing a growing shortage of convergence between futures and cash prices as of the delivery date (Irwin, Garcia and Good, 2007).

- ***Agricultural risk insurance***

From the point of view of the sensitivity of agricultural production to meteorological and other risks, there is a potentialsearch for crop insurance. Crop insurance exists in a number of countries and depends to a large extent on state support. Non-subsidized private insurance is mostly limited to one risk, such as hail insurance. The main difficulty lies in the high transaction costs associated with crop insurance markets due to the presence of information asymmetry. This makes private premiums very expensive in terms of payments and reduces or eliminates demand from farmers. The demand for insurance is also influenced by the relative costs of alternative strategies, such as diversification and financial management.

The insurancecontract means that the farmer pays an insurance premium for the purchase of insurance. The contract gives the right to compensation for specific events (single-risk insurance) or with a drop in production / production below the threshold value (multi-risk insurance). The amount of compensation is related to the calculation of losses. The high costs of offering insurance contracts are partly related to the information asymmetry. Moral risk in this context arises when it is impossible or extremely expensive to draw up a contract on the basis of everything that the farmer can invest in agriculture. Unfavorable choice arises when contracts based on all significant environmental parameters are unenforceable.

Yield insurance provides benefits based on the average yield of an appropriately large area, which eliminates the problem s moral risk and potentially reduces unfavorable choices (Mahul, 1999). However, it is done at the expenseof adding a base risk that can be borne by the farmer. Similar arguments can be made for climate index insurance, which is often offered as a solution in developing countries (Barnett and Mahul, 2007; World Bank, 2005) and for which there are already many examples (Skees, 2007).

The insuranceRevenue is also a popular concept because it directly refers to the combination of price and production risk that farmers actually face. Unlike any combination of futures contracts and crop insurance, this insurance could fully stabilize revenue. This can increase the impact on farmers' well-being at a certain price or on the costs of managing production risk (Hennessy, Babcok and Hayes, 1997).

A standard management solution is usually given in the literature na you are notaccuracy in developingis se markets, a namelyoh through forinsurance markets. Thesisand marketand yfacilitate exchangea nand riskwith other agents, realizing potential gains from pooling or sharing the risk. However, not all risks that affect agriculture have a corresponding.

Not all risks can be insured. Insurance contracts for some risks do not exist, as the insurance premium covering all costs will be very large. There are some conditions that need to be known in order to have risk insurance. They can be grouped as follows (Skees and Barnett, 1999):

- The respective risks for the different agents must be independentor special. Risks that are highly correlated cannot be easily pooled and can generate large potential losses with very large liabilities to the insurer. These large debts are very difficult and expensive to reinsure.
- There must be information or a method available to assess the probability of a risk event occurring and to assess the financialcosts associated with each event. The risk allocation assessment is necessary in order to be able to calculate the premium correctly.
- The information must be available to market agents, so that the potential for moral hazard and unfavorable choices is minimized.
- Faithclarityfrom the occurrence of risk should be in the "medium" range: if it is too high the premium will not be available; if it is too low, it will not be possible to use historical information to estimate the probable distribution as accurately as possible.

EtwoIs there an agricultural risk that meets these strict insurance requirements? Miranda and Glauber (1997) emphasize the need for risk to be independent among policyholders. Due to the ratios between the yields of different crops, agricultural insurers face a specific risk "portfolio". It is about ten times larger than that faced by private insurers offering more conventional lines of insurance (cars, fire, etc.). Reinsurers are reluctant to take a "portfolio" risk with the possibility of very large liabilities. They constitute a continuous process of risks along one axis, which moves from a completely independent risk to a correlated risk. Cars, life and fire hazard are very close to independent extremes and are suitable for insurance decisions. Agricultural commodity prices are very close to a perfectly correlated extreme and are more suitable for options and futures markets. Agricultural production is somewhere in the middle. Some specific weather hazards affecting yields, such as hail or frost, are more independent than others. Insurance against animal diseases, including communicable diseases, is also provided in some countries, such as Spain and Germany (MAP, 2008).

- ***Segmentation of risk layers***

The literature usually focuses on catastrophic risk and the likelihood of market failure if it occurs (World Bank, 2005). This argument is basedof the basic risk management technique, which consists in segmenting the risk into different layers. Segmentation can help to "offer" each risk with different risk "buyers" or risk management mechanisms available. These layers can be determined in terms of the probability of occurrence and the amount of losses and therefore the extent to which the risk is catastrophic. The first layer includes losses that result from existing risks in a normal business environment. They are very common, but cause relatively limited losses. Farmers must manage this type of risk themselves with tools and strategies that are at farm level. In addition, they include strategies to diversify incomes and facilitate market consumption (financial asset management, non-agricultural activities) or through the implementation of government policies (tax system). This layer is a "normal" or risk retention layer.

The secondt stallow corresponds to na rishackles, coitabout are more significant andrarer. In this layer, there is an opportunity for farmers to use additional specific market instruments - such as insurance or market options, which are specifically designed to help overcome farmer risk. This is a layer of the insurance market.

The thirdt layer containsrisks that are catastrophic in nature. They can cause very large losses even if their frequency is low. This risk is more difficult to share or pool through market mechanisms, especially if it is systemic. There are arguments in favor of some government action in the case of catastrophic risks. This layer is called "catastrophic" or market failure.

The distinction of risks in relation to two different criteria - frequency of occurrence and amount of losses can to be in contradiction, akabout the big ones forloses nis are connected s usprobability.There are many risks or a combination of risks that can lead to the spread of consequences causing large losses that are associated with lower probabilities. Most of the results will be in the first layer, where it is considered that the risk should be managed by the farmer. Only a small part of the results will be in the third layer - the layer of market failure.

Comradeadifferentiation is easy to implement when there are clearly defined boundaries between layers, but this is not usually the case. The first difficulty is related to the determination of the respective variable in the risk distribution. The second difficulty - with determining the actual probability distribution, and the third difficulty is related to determining the limits in terms of probability. Finally, this approach must have appropriate tools to deal with the risk of each layer.

Layer risk segmentation can be the first step towards creating a risk map and the corresponding appropriaterisk management tools. In FIG. 2 presents the three levels of risk with continuity between specific and systemic risk and an approximate picture of the risk management tools.

When markets fail when catastrophic risks occur, social protection and disaster reliefwill be important risk management tools. However, depending on the farmer's situation, he may still have access to savings or work off the farm and may or may not deal with specific catastrophic events. In fact, these tools can be potentially available for any risk layer and any degree of correlation.

"The insurance ”or the market layer may include different types of instruments for different degrees of matching between agents participating in the market. For example, independent risk insurance in case of hail or frost, as well as futures and options - for price risk management. In addition, some hybrids may be proposed in this aspect insurance contracts for lost yields or revenues. Private bothwatermelons (coperation, mutualand backgrounddove) iland sucha no food believeha, too I cant Yes

bdate valuableand intools withand management na nwhich speciesis risk.

"Normthe flax ”risk layer is managed by the farmer. In this layer, ordinary instruments of the tax system are used, which can have a stimulating effect on agricultural income. Savings mechanisms and loans are also normal instruments that should be fully accessible and used by farmers in the same way as by other businesses and households.

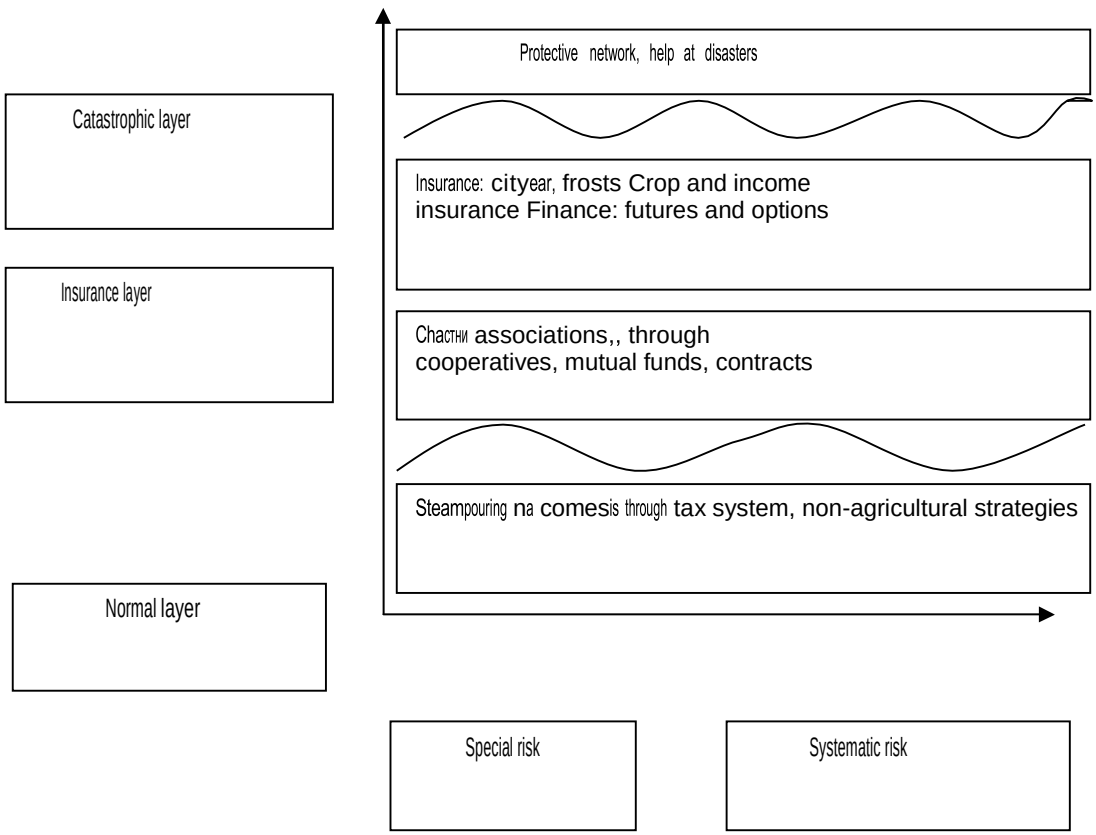


FIG. 2.*Map of risk management tools*
Source: Managing Risk in Agriculture: A Holistic Approach (OECD, 2009).

The existence and development of some tools and agricultural risk management strategies cannot be explored isolatedabout aboutt the availability of other tools.

2.3. Information asymmetry and transaction costs

Information is expensive not only because there is information asymmetry, nabout and on relationsis na potencycostsfor all agents in a transaction. Information is crucial for developing effective insurance contracts and market-related risks.

Because the farmer is more suitable than anyone else to have information about the distribution of its base risk, asymmetries in the information or high transaction costs associated with the information are very likely to occur with respect to this underlying risk.

Transaction costs for information can Yes be large in terms of agricultural insurance markets.They are part of the problems in the functioning of markets and explain the existence of incomplete markets or incomplete contracts (Chavas and Bouamra-Mechemache, 2002). It has been shown that reducing transaction costs expands the possible set of results and thus can increase efficiency on the Pareto principle for profits. Furthermore „Concurentni market structures (with a large number of traders) are unlikely to arise at high information and transaction costs ".

When risks are positively correlated, they are difficult to consolidatebetween agents in order to reduce fluctuations. Prices are usually strongly linked and are a source of systemic risk for farmers. For farmers, the price risk is negatively related to the cost of risk for buyers of agricultural products. Pooling price risk between sellers and buyers is the basic idea of futures markets, vertical integration or bargaining. In well-developed markets, this can be done at relatively low transaction costs.

At regional or national level, the risks of production and yields are interrelated with costs.

The insurance company's exposure to this risk maybe of a high degree and therefore reinsurance is required, often through international reinsurance companies. This facilitates diversification, pooling and risk sharing. Incomes in different regions of the world do not tend to correlate and there is more scope for pooling risk.

When divergesis nabout transactions, connected s developedabout andyou useof market instruments are significant, more effective solutions can be found within the relevant institutional framework. This is the basic idea of the new institutional economy (Ménard and Shirley, 2005; Coase, 1937). In the field of agricultural risk management, it provides the basis for strategies, agreements and decisions on farms or households, as well as for specific agricultural contracts such as mortgages. Sometimes the traditional cost approach to information asymmetry is opposed by the traditional model of
"Princespal-Agent " (Alln and Lueck, 2005). And etcand both onincome explains why there is no opportunity for development on the marketof alternative institutions and contracts to facilitate risk management. The new institutional economy can help clarify the potential role of government in building the relevant institutions, especially with regard to risk information exchange mechanisms.

- ***Opportunities in case of market inefficiency***

Imaseveral circumstances in which market inefficiencies may occur (Mas-Collel, 1995). The first possibility is related to the presence of external factors in some characteristics of public goods, when the actions of one agent affect the usefulness of production groups of other agents. In the field of risk in agriculture, this could occur when the efforts of one farmer reduce the risk for both him and the other producers. One such example is the control of communicable diseases on the farm or the investment to reduce floods in agriculture (Morris et al., 2008). The farmer can reduce the risk for other producers by reducing his own risk. When an agricultural

manufacturervaccinates his animals, it simultaneously reduces the risk of infecting the herd and prevents the spread of the disease to other herds. Some authors' arguments in favor of the public good in terms of risk are generally more difficult to maintain (Newbery, 1989). The potential of the public good and the risk characterization appear only in the case of systemic risk, which affects catastrophic events for an entire region or country. In this situation, it can be argued that the loss of profits from those who directly suffer damage directly affects the well-being of other members of society or has a social focus on helping the victims.

The presence of a market force can Yes lead to inefficiency ofmarket. This can happen when a small number of traders participate in the market (Chavas and Bouamra-Mechemache, 2002). This is not specific to market risk, but may be relevant in policy action. In cases where insurance companies are small in number, they may be able to generate large profits. Other risks in the presence of related markets are related to futures and options. Players in them tend to be more competitive with a large number of participants.

Asymmetric information is the third source of inefficiency namarket. In general, the farmer knows better than any other agent (including insurance companies) the degree of risk exposure associated with making their own production decisions (hidden information that may give rise to negative choices). Farmers also have less incentive to avoid risk once they are insured (covert actions that create moral hazard). These situations can create market inefficiencies in related risk markets. Information asymmetry affects the types of risk in different ways. For example, price risk does not usually generate information asymmetry, as market prices are known to all agents at the same time. Conversely, information on average yield (production risk) is related to information asymmetry. The farmer is much more aware of ownits production risks than any other market agent. The existence of "cognitive deficits" can also contribute to the generation of information asymmetry. Under these conditions, the potential role of government is to help create, regulate and control market risk, as well as to provide appropriate risk instruments. But it is also possible that “asymmetric information is also available in the relationship between citizens and government, leading to government failure and political risk” (Holzman and Jorgensen,

2001).

The basic theorem of a market economy is that the distributionof resources derived from competitive equilibrium is always efficient (according to the Pareto principle). However, this theorem applies only if there is complete information and a complete set of markets (including futures and risks). These conditions are extremely restrictive. We know that this is not usually the case. For example, futures markets refer to only a few months of the year and only to some commodities. In this context, the volume and distribution of information are essential for the existence and efficiency of markets. If markets are limited, competitive equilibrium does not guarantee optimal results. Limited efficiency in this case refers to efficiency under certain limitations. The situation is more special in terms of the presence of market risk. With limited efficiency, the optimal well-being of some agents cannot be improved without reducing the well-being of others given the risks involved and the markets involved. Theoretical results show that even this type of less demanding efficiency is not achievable at market equilibrium (Newbery, 1989; Newbery and Stiglitz, 1981) except under very restrictive conditions. In this regard, the government could increase the well-being of some agents without affecting others and achieve the planned economic and social results. "Unfortunately, however, the direction of deviation could be toward more or less risk, so it is not simply the rule (risk subsidization) that always improves distribution" (Newbery and Stiglitz, 1981).

- ***Possibility for redistribution***

Economicsait is not only related to efficiency but also to equity. It is well known that the risk affects different producers in different ways - especially the poorest. Poorer producers are more likely to fail, affecting agricultural income. These failures push economically weak farmers below the poverty line or below the minimum level of consumption that is
"acceptable ” iland standard in givenabout aboutcreature.

Moredaysand smaller producers do not have access to assets or financial instruments that can help deal with the problems of adverse events in agricultural production. That is why poorer producers are more worried about their livelihood and income. They may incur greater relative losses from adverse events due to their limited access to relevant risk management strategies. This means that they are more vulnerable to agricultural risk (Dercon,

2005).

Society can express its social preferences for support na citizens,, onoffered na goalям stress in resultat fromrisk, including farmers affected by agricultural catastrophic risk. This is particularly the case when an event pushes a farmer down to a minimum level of consumption that affects his economic and social standard of living. There is a major unbiased argument in favor of measures to avoid the consequences of risk. In this regard, farmers are just one example of social concern and social protection. This protection for farmers or any other citizen must be based on an assessment of the general condition of the individual, taking into account all sources of income and wealth, as well as possible alternative strategies.

IN all societies have redistributive policies related to taxation systems or social protection programs. Some of them are adapted to the specific needs of special groups or activities, such as farmers. Fairness considerations are the main driver of these policies, which are usually related to household income, other income, well-being, the specific social situation of the household or the individual. These policies are aimed at equalizing the income or consumption of individuals or families.

Sales prices and production tend to correlate negatively due to their interaction in the product market.This is especially true for seasonal production, where supplies are reduced and higher prices follow. As a result of this negative correlation, information asymmetry and insurance costs, agricultural income insurance (price and production risk together) are in theory a cheaper and more effective way to manage risk. This is in comparison with the insurance of the price and production risk separately. However, market decisions for price and production risk are generally divided into two different markets: futures markets, and crop insurance markets. By their nature, these instruments are specific and do not allow a correlation to be sought between price and production / production risk.

2.4. The role of the state

The role of government can se considered from point of viewwhether the country's economy provides the most appropriate "set" of markets. If this is not the case, the government may try to establish or develop a basis for creating new risk-related markets.

Second is the question of whether resources are allocated efficiently, given existing markets. If existing resources are not allocated efficiently, government can play a crucial role in improving the welfare of the state. The main potential for market failure in risky markets is due to the presence of information asymmetry and transaction costs associated with access to relevant market information. The government's ability to improving resource allocation depends on access to informationI, t. is. aboutt hersI. aboutgrip iland isefficiency.

The government can pursue goals other than promotion na effectivelystta at the distributionabout na resursite. Undoubtedlyis that through the redistributive objectives of the budget, especially in the event of catastrophic events, the government may place particular emphasis on certain groups of economic agents, including farmers. These goals are to reduce some specific risks or deviations. From a political economy perspective, the government's goal is to respond with adequate action when farmers "suffer" or consider themselves "vulnerable." The extent to which these goals are "good" is a political question that economists cannot answer. For example, the goal of reducing price fluctuations faced by farmers may seem economically ridiculous, as farmers' well-being depends on income or, more precisely, on relevant market fluctuations. This depends on many other components and circumstances and is not automatically related to price changes. But if this is the goal in itself, the government's economic policy has special obligations to the effectiveness of the measure to achieve this goal. Related to this are the effects on fluctuations in household incomes, synergies with other risk reduction strategies, and the effects on efficiency and redistribution.

The role of government can be analyzed in strict regulationsa framework for consultation on the economic effects and consequences of alternative policy measures. This implies the choice of policy measures that are best for improving efficiency and redistribution (regulatory approach). However, and especially in areas with many ambiguities regarding risk management, a positive policy approach in the economy is needed to understand the policy-making process (Innes, 2003) and the implications of risk management (Renn, 2006). The social perception of risky events requires political responses and political pressure on governments, which are the result of the whole institutional framework and governance. On the table. 6 presents a summary of the actions taken in practice by

Table 6. *The role of government in risk management in agriculture based on observed policy measures*

	Creating markets	*Modifying market sensitivity*	*Risk reduction*	*Dealing with risk*
Ex ante *Undertaken*	• *Stablea macroico-economic policy and business environment* • *Training for Risk Management and information about agricultural manufacturers* • *Facilitate its creation* *exchange of information concerning the risks* • *Increasing of competition in the insurance market* • *Law and institutions for markets of futures and options* • *Determine the boundaries of responsibility of governments and farmers in Risk Management* • *Ppublic / private partnership*	• *Insurance premium subsidies* • *Subsidies for reinsurance* • *Subsidies for futures contracts* • *Participation in mutual funds* • *Savings incentives deposits* • *Facilitate access to credit* • *Market interventions* • *Regulations (stabilization of prices)* • *Border measures (tariffs and etc.)*	• *Prevention of disasters (floods, counterl and so called)* • *Prevention animal diseases (internaland and borderline measures)* • *Institutes for research and development of new ones varieties or breeds* • *All agricultural programs for assistance*	• *All agricultural programs for assistance*
Ex post *Triggered*			• *Programs for* Risk Management • Tax system for leveling *income* *Boundary and other measures in case of outbreak on contagious disease* *Ad hoc special payments for fast economic recovery*	• *Socially assistance* • *Disaster relief (payments, subsidized loans, etc.)* • *Other special subsequent payments*

Source: Adapted table from Managing Risk in Agriculture: A Holistic Approach (OECD, 2009).

governments in the field of agricultural risk management (OECD, 2000; OECD, 2008). No analysis is made in the table whetherthese measures are appropriate. They are systematized into two groups - before the event (ex ante) and after an event has occurred (ex post) (Cafiero et al., 2007). All government efforts to support market creation or change market incentives are by definition Ex ante measures.In the field of risk reduction and mitigation and dealing with it, both types of measures are possible - preliminary and subsequent. Most of the actions of governments described in Table. 6, are related to the effective risk management in agriculture.

Daydance of government-related assets play a significant role in Ex post interventions where individual farmers are unable to maneuver and risk management strategies need to equalize consumption.

- ***Creating a market***

In the absence of risk management markets, the government can play an important role in supporting the development of new ones. The market,, incllegibly markets na riskovo management nand the ruraleconomy, develops much more easily in the context of a stable macroeconomic and business environment. Providing this environment is an important task for the government. It is known that the lack of information is the main reason for the failure of the market for risk management in agriculture. The role of government is to create missing information through direct research. The government can also ease information exchange arrangements that would otherwise be asymmetrically distributed between farmers and insurance companies. Public-private partnerships are also possible. These measures generate confidence in the fairness of market-based instruments and thus stimulate demand.

From country na turhay, landlskite proizchildren mogat eand improve their risk management skills through training and information on the work of different tools for management of riska (inclaffectionately futures, aboutпции and forinsurance).

Comradeacan contribute to a more stable market demand and therefore facilitate its development. On the supply side, the presence of fair competition between forinsurancecompanies makes the products more attractive to farmers. In some specific markets (such as futures and options), the government may

provide relevant legislation and institutions to facilitate market development.

It is important to draw the line between the role of government and the responsibility of farmers forRisk Management. Farmers will make the most appropriate risk management decisions if these decisions are part of an overall farm and household management strategy. With a good distribution of responsibilities, the relevant costs will be borne by the farmer. In this way, farmers will increase their awareness and willingness to pay for appropriate solutions.

- ***The right choice of market incentives***

In all cases, the actions of the government there is no to be in condition Yes generate full nabop aboutt riskovi markets. In this imperfect world, the role of government is to act to change prices through taxes and subsidies - in order to achieveof a more cost-effective result or achieving a specific risk coverage objective. It is generally accepted that in the absence of certain risk markets, insurance is ineffective. That is why governments provide subsidies to stimulate demand for risk management tools. However, the existence of these subsidies does not mean that they are well targeted or contribute to improving efficiency.

Several OECD countries subsidize agricultural insurancecultures (USA, Canada, Mexico, Spain, France, Japan) to different degrees and with different organization. The amount of the subsidy is not the only important and determining element for the impact on an insurance system. The nature of actions to facilitate the exchange of information, reduce opportunities for moral hazard and unfavorable choices, increase competition in the insurance market, build confidence in the insurance system, affect other government programs and payments, which are also important elements of the analysis. The grant may cover a certain level of the administrative costs associated with

forinsurance, nabout thathundred onthrows comradea levelabout (Glauber, 2004). Nit is clear whether general subsidies solve the problem of inefficiency na market, aboutsven in case cogato are connected with measures which improve the efficiency of the use and dissemination of information.

Some countries also provide for reinsurance subsidies, usually through reinsurance arrangements involvingthe state. Reinsurance can help in the event of a potential market failure due to systemic agricultural risk, especially in the event of catastrophic

risks. Facilitating reinsurance makes insurance policies cheaper. Some economists (Miranda and Glauber, 1997) include reinsurance in their definition of appropriate new roles for government. Instead of providing subsidies for crop insurance that fail to address information asymmetry, the government could facilitate the creation of yield zoning and weather-indexed insurance related to climate change. Such measures are said to be much cheaper alternatives and more effective in combating asymmetric information. Some authors (Mahul, 2001) go further and propose a division of individual risk into two components: specific risk, which can be managed through insurance, and systemic risk, the consequences of which can be covered by this type of “time-indexed insurance” (weather- indexed insurance) or bonds and options issued to cover catastrophic risks. The role of the government in this case is the regulator, and the goal - to facilitate the development of such products in the insurance markets.

Compareflaxsubsidies for futures contracts are less common, but there are some countries that provide such support. This is the case in Mexico, where it is easier to subscribe to futures and options on US futures markets through a subsidy.

Farmers can create and participate in mutualfunds to cover certain types of risk. These funds are the property of those involved. Mutual funds have a regional or local dimension - farmers can get to know each other and thus reduce the possibility of moral hazard and unfavorable choices. In some countries, such as the Netherlands, there are mutual funds for infectious animal diseases. These funds receive financialsupport from the government, which subsidizes part of the costs (Van Dongen, 2008). In the case of communicable diseases, the government can create incentives for early warning at each outbreak and for promoting self-protection (Goodwin and Vado, 2007). This type of "compensation" allows the external costs of late notification to be included in the incentive for farmers. Other government actions, such as mandatory notification and severe economic sanctions for non-compliance, are difficult to implement due to information asymmetry.

Some governments (such as Australia and Canada) provide subsidies or tax incentives to save costs in order to improve the financial management of agriculturalhouseholds. In practice, farmers do not always benefit from these income relief mechanisms, but if they are financially attractive this becomes an element of the overall risk management portfolio (OECD, 2005c).

LotshimOECD governments have tried to stabilize the producer

prices faced by the farmer. Such actions are in response to price risk. The case of credit to cover the payment deficit in the United States and the intervention price system in the European Union is similar (no longer applicable to many products). Countercyclical payments that do not directly affect consumption do not need border measures. On the other hand, measures to intervene in the market through the state reserve affect consumer prices and usually require border measures.

- ***Risk reduction and mitigation***

Relevant government action is sometimes seen as part of the responsibility for enforcing legislation,aimed at reducing the likelihood and / or harmful effects of risky events. This is often claimed in cases of catastrophic events that are unlikely but with potentially large and systemic losses. Two types of government action can be taken in this context - direct government action and a change in the structure of incentives for agricultural holdings. In this context, there is potential for the role of the state in relativesewing of legislation, public works and subsidies.

Acceptpthat is why there is flood control, for which there are various alternatives. In some cases, public initiatives can help reduce the risk of floods. Actions on the farm to drain water can also reduce the risk of flooding.

In the field of animal disease prevention possiblemeasures include both domestic and border measures where there is a risk of a disease that can be imported from abroad. There are many publications dealing with the optimization of policies for managing this type of risk. Such is the publication by the OECD (2007), which argues that a detailed risk assessment and revenue-expenditure analysis must find the optimal policy mix before and after an outbreak (Wilson and Anton, 2005). As already mentioned, the introduction of appropriate on-the-spot compensation mechanisms before each outbreak can create incentives for early notification and early action through low private marginal costs compared to the high potential for external revenue in the sector.

Imamany legal measures to facilitate risk reduction and mitigation. For example, an appropriate legal framework for agricultural property can facilitate risk management in an appropriate way. By providing the appropriate legal form for farms, it makes it possible to distinguish the business risk associated with farmers from the consumer risk to the farming household.

In many countries, after a risk event in the tax system has

occurred, some mitigation of the effect onnet income. Sometimes the fiscal or social security system in agriculture differs from those in other sectors of the economy. This special regime affects the quality of the systems to deal with the risks of agriculture. For example, if for farmers the taxes are based on standard nominal calculations, there is not much opportunity to compensate for income losses. In this case, ex post rapid economic recovery activities are most often applied compared to other measures related to rapid reinvestment or others - on an ex post or ad hoc basis.

- ***Risk management (consumption relief)***

Once all available measures and tools to reduce orrisk elimination are exhausted, only strategies to alleviate consumption can address the remaining problems. Of course, all agricultural support programs contribute to some extent to alleviate consumption or income. Risk management refers to situations where measures are needed to ensure minimum consumption requirements for farmers or their families and they are by definition related to equity considerations.

Cice catabout isbottom riskovo event is onstep, the government can have a strong political incentive to provide assistance. Ex post government actions may include social assistance, disaster relief, payments, subsidizedloans, etc.). If the aim is to help and correct a risk that can reduce household consumption to the poverty line (equity considerations), the criterion for this assistance should be proximity to the poverty line. On the other hand, fairness considerations suggest that in the first option of the best policy option, it is better to include all agricultural incomes of households and / or their financial situation in the assessment.

- ***Interaction between government actions and market strategies***

All agricultural measures for support farmers affect risk management under some way. OECD (2004) assesses the impact on fluctuations in total revenues from different categories of Producer Support Estimate (PSE). It has been found that most PSE categories are associated with a reduction in total fluctuationsin revenue. In particular, to support market prices, a reduction in fluctuations was found in all cases analyzed. However,

the reduction is not proportionate to the amount of aid and therefore there are payments and programs that are more risky than others.

Interaction between policy measures is very important (OECD, 2005; Coble Heifner, Zuniga, 2000). In particular, there is a possibilityto displace market measures that cover the same type of risk as government programs - compensatory payments, price stabilization schemes. These schemes can replace price hedging through futures and options. There is also evidence that insurance subsidies can increase farm specialization (O'Donoghue, Roberts and Key, 2009).

Threeisrisk levels presented in fig. 2, illustrate the interaction between these measures and strategies. If government action extends to risk layers 1 (catastrophic) and 3 (normal risk, risk retention layer), the opportunities for insurance markets to develop and be viable are reduced. If government action takes the form of insurance subsidies and expands too much, there may be little room to develop third-tier instruments, which should generally be retained by the farmer. Defining and limiting the limits of state responsibility leaves room for market mechanisms and on-farm strategies developed and implemented by the farmer himself.

- ***Distinguishing risk management from "support"***

Poveread onlytically measures,, listedand in table. 6 - specialabout inin the second cowomb na market incentives, suggestsome net support for farmers. It is important to distinguish between agricultural aid and measures aimed at reducing risk or improving risk management in agriculture. Measures that involve a net transfer of income to farmers may have some positive impact on farmers' incomes and well-being. This makes them attractive to farmers, regardless of their risk management characteristics. This additional income stream is part of farmers' risk management strategies, especially for more untied programs that have a more efficient transfer. Therefore, it is not easy to distinguish the risk management component from the support component of many measures.

For example, most price stabilization tools havea support component that makes them attractive to farmers regardless of the potential countercyclical characteristics of that support. Insurance subsidies lead to net premiums for farmers that are lower than expected benefits. They are attractive to manufacturers regardless

of their risk preference, as there is a positive expected value from this insurance policy. However, more stable prices and insurance also serve directly to manage risk. Appropriate assessment of alternative risk management policy measures requires consideration of both risk support and risk reduction components. In any case, in practice it is difficult to distinguish them.

If the government aims to support expected farm incomesthe most effective transfer policy must be chosen. On the contrary, if the government aims to reduce the risk on the specific income, the measures aimed at this goal must also be carefully chosen. Some authors (Anton and Giner, 2005) compare the impact of income and the risk reduction effects of insurance subsidies and fixed area payments. They find that area payments are a more efficient means of transferring income, and insurance subsidies are more effective in reducing income fluctuations. However, from the point of view of farmers' well-being, the impact of area payments has been found to be greater than that of insurance subsidies (Glauber, 2004).

IN the given example in table. 7 it is assumed that the net cash flows before financing are given. The investor takes a loan for BGN 10,000 at 10% interest and a repayment period of 5 years. The calculations made to service the loan are described below.

The investor receives a BGN 10,000 loan at an interest rate of 10%. He paysannual interest in year 2, amounting to BGN 1,000. The principal, which is paid annually for a period of five years, is BGN 2,000. The interest to be paid in the third year is calculated on the basis of the off-balance sheet value of the loan after repayment of the principal. We assume that the principal is paid at the end of the year, with interest paid on the full amount of the principal from the previous year. In year 3, off-balance sheet value of the loan is equal to BGN 10,000 minus 2000 BGN, coflock predstavljava frompaid firsta himrespiratory outsideska, t. is. 8000 leva. Leecatches na 8000 BGN is 800 leva (8000 x 10%) and comradea ethe payment of interest in the third year. For the sixth year the off-balance sheet value from the end of the fifth year is BGN 2,000 and the interest is BGN 200.

Pelvisand situation is presented graphically na FIG. 3.

Table 7. *Credit service* (Example)

	1	***2***	***3***	***4***	***5***	***6***	***7***

Cash flows before funding	-26,000	25,000	25,000	25,000	25,000	30,000	20,000
LOANS							
Long-term loans	10,000						
OFF-BALANCE SHEET							
Long-term loans	10,000	8000	6000	4000	2000	0	0
Principal		2000	2000	2000	2000	2000	0
Interest		1000	800	600	400	200	0
Long - term loans TOTAL FINANCE EXPENSES		3000	2800	2600	2400	2200	0
NET FINANCING	10,000	-3000	-2000	-2600	-2400	-2200	0
Net cash flows after financing	-16,000	25,000	25,000	25,000	25,000	30,000	20,000
Cumulative cash flow	-16,000	9000	34 000	59 000	84 000	114 000	134 000

In this example, the cumulative amount of cash flows is positivefor each year of the investment starting from the second year. This shows that the investor has a liquidity problem in the first year, but in the second he can finance the cost of the loan. If the cumulative net cash flow shows a financial deficit, ie a negative value in a year, then the investor needs additional financing to cover this deficit. The difference can be covered by renegotiating loan payments, using equity, investing additional working capital to cover the deficit or receiving help from friends or family.

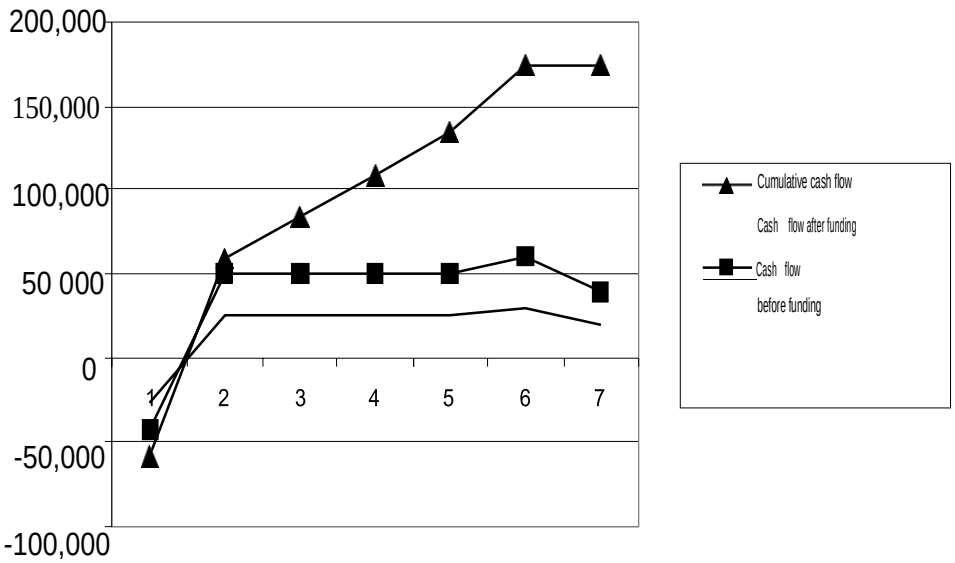


FIG. 3.*Graphical expression of cumulative cash flow, cash flow after financing and cash flow before financing*

3. THEORY OF REAL OPTIONS

3.1. Difference between the theory of real options and the traditional theory of investment decisions

Myers(1977) applied for the first time the concept of "real options" (RO) and pointed out the similarities between financial and real options. When the investment project has a high uncertainty, the value of the project must be equal to the net present value (NPV) of the project plus the value of the future option. Ross (1978) analyzes risky projects. It defines the inherent potential investment opportunities. Trigeorgis (1993) divides real options into seven categories according to differences in the flexibility to execute the investment: deferral option, phased investment, option to change the operating size, opt-out option, switch option, growth option, and interactive option.

Amran and Kulatilaka (1999) apply a variant of the theory of pricing and the rules for financial markets of the assessment of non-marketable assets, helping managers take advantage of their own option, the right to make management decisions in option areas such as strategic investment, research project and innovation.

Myers (1984) focuses on the limitations of the discounted cash flow (GMP) method. Hodder and Riggs (1985) emphasize that s me tooYes na DPP se eviluses in practice. Over time, the risk of a project gradually decreases, as like him becomes тechущ project. Flexibility na management too canis eand reducethe risks for the project. The use of only one discount rate in the whole project evaluation process is inappropriate from this point of view.

Trigeorgisand Mason (1987) point out that when managers use traditional NSS or GMP methods to make decisions, their theories are based on the assumption that expected future cash flows can be estimated on the premise of their future security. Therefore, if there is uncertainty, the NPO or GMP cannot assess the flexibility in managing and changing investment intentions and making appropriate decisions. Thus, from the point of view of investment

analysis in an uncertain environment, it can lead to biased results in the evaluation of the investment program using NNS.

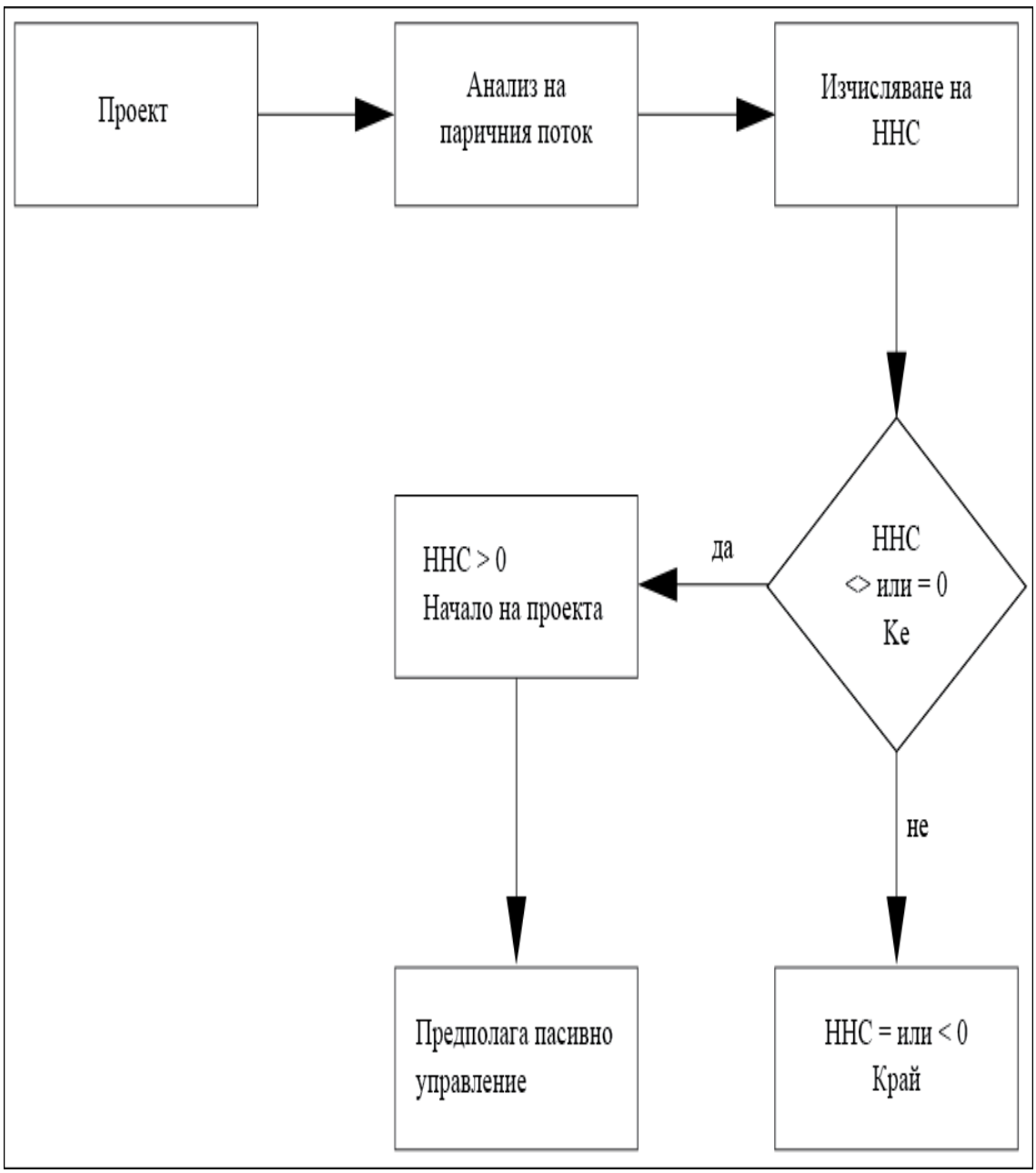
Traditional methods of investment valuation take into account the futurewith a degree of certainty, which implies a passive approach to investment analysis. Traditional models such as NNS assume that managers have no flexibility to change investment choices and the solution is "everything" or
"Nothing". At the same time, the traditional discount method serves as a good starting point in the capital budgeting process. Allessence comradea is determinesn intool, s coyoteoh rightand opit to model the changing environment.

IN traditional NNC анализ (FIG. 4) bethe one cash flow fromthe investment is calculated and discounted to the present. If the present value minus capital expenditures is greater than zero, the investment generates the required rate of return and must be "started" other things being equal. This result of the NNS implies that the manager has prepared the project in a certain way and cannot make any changes if things do not progress as planned.

Lotshim investations howeveris I cant Yes bdatereversible, abandoned, or extended, ie, it may be better to "wait and see" if the uncertainty cannot be overcome. This situation is described in fig. 5, where the NNS values at the end of the decision tree indicate that the project may fall to either $ 0.50 or potentially increase by a factor of four. RO analysis is an important tool for capital budgeting because it captures the potential to avoid deeper losses or generate greater gains when changing important underlying variables.

FIG. 4.Traditional investment analysis
Eastnickname: Adapteda phiguru nabout Hine and Pritchett (2003).

The financial options are similar in a lot relationships s real options and can be used as a starting point for explanation na onthe following. Importanta aboutpersonality na financial



sells,if there is a benefit to it. The predetermined price at which the purchase (sale) is made is called the exercise price of the options. The "call" option is the right to buy and
"put ”the option is right to sell. For example, if a call option on the stock exchange has a value of BGN 100, at any time the share price is over BGN 100, the option will have a value, and is “money”. For any price below BGN 100 it will be "out of money".

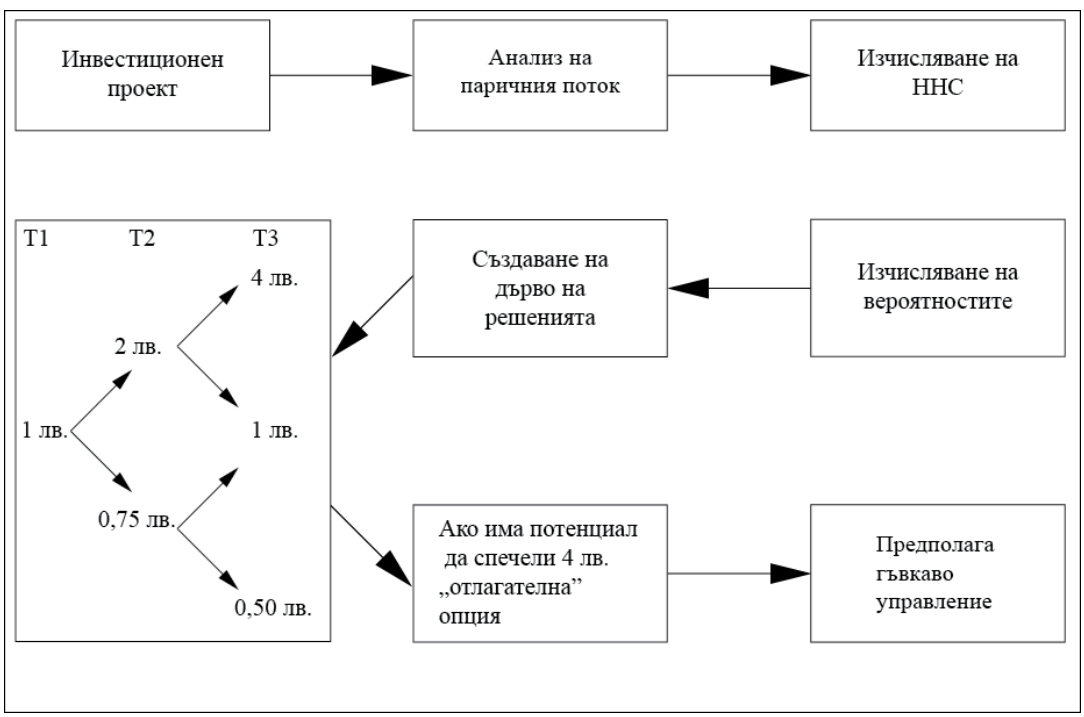


FIG. 5.*RO investment analysis*
Source: Adapted from Hine and Pritchett (2003).

Holders of financial options are not required to exercise aboutpcija, independentsimo gaveand tl. is „Col” andwhether "put ”. Yesa that, whyinvestors buy and sell "out-of-money" premium options? The answer is that in conditions of uncertainty, the option may at some point in time be a "in-the-money" option before its expiration date. The value of the option reflects the level of uncertainty. The greater

the probability that the option will become "in-money" is expressed by the higher value of the option and its premium.

The option holder also has the option to cancel the saleof the option. This option is exercised, or in other words, "wait and see" until the uncertainty is as small as possible. The analysis of RO as an instrument for investment decisions surpasses other similar instruments in the quantitative measurement of uncertainty and correctly models the managerial flexibility, which can be the following: "to give up", "to exercise", or "to wait".

For example, yes suppose that one group from Beef producers want to join the union of vertically coordinatedprocessors and traders to differentiate their product. In the traditional investment analysis, a negative NNS can show it as "unacceptable". On the other hand, RO analysis can show that joining the union can be profitable at a later date, giving producers the opportunity to "wait" and "see".

Brealeyand Myers (1992) found that R&D investments would lead to new opportunities for a company over a period of time. It has the right to decide whether to implement the investment tracking of the project. In cases where investment in research and development fails, the loss is only in the amount of the initial investment costs. However, if this project succeeds, this company will be able to create more value. In this variant, the investment costs for research and development can be considered as an additional remuneration, which is very similar to the price option. Thus, this authors propose that the theory of option pricing be applied in the evaluation of investment programs for research and development.

Dixitand Pindyck (1995) argue that in assessing traditional investment, decision-making is not based on strategic ones. If the company does not make the investment now, it will never be possible. The company must choose a decision on whether to invest at some point, without any change in decision making. In this way, the value created by the delay of investment decisions as a result of errors in project evaluation is ignored. In this way, it makes the whole investment wrong in terms of decision-making. In fact, the investment project can wait until more information appears, and then the investment decision can be made.

Ross(1995) points out that NNS and other traditional methods can lead to wrong investment decisions. For example, certain investments may include some subsequent investments over time that are not feasible at the same time. If the investment cannot be

in accordance with the standard positive NPV in advance, it may be rejected by management. While proponents of the NNS method use only the two criteria "now accept" or "never accept", this is clearly not conducive to assessing the present and future value of the investment.

3.2. Scope and approaches of real options

Lander and Pinches (1998) summarize the application of real optionsin 16 aspects: natural resources, competition and business strategy, manufacturing, real estate, research and development, public good, mergers and acquisitions, corporate governance, interest rates, inventory, labor, venture capital, advertising, legal, hysteresis effect and corporate behavior , development and environmental protection. We will focus on the most important areas of the application of real options in the research literature.

Investments in natural resources

The price of the product in the field of natural resources in investment projects has a high degree of random fluctuation, which also requires that all management options be used.

Brennan and Sehwaaz (1985) study the problem of how to calculate the value of copper production in a project with cash flow and highdegree of risk. In their research, they used portfolio financing, including short-term assets of futures contracts, as well as fixed assets of mineral ancillary sources, and then obtained a partial differential equation for copper products.

Trigeorgis (1990) analyzes the evaluations of a multinational project,related to the exploitation of a natural resource. Initially, the NNS of the project was negative. Managers identify several options: delay options, options for abandonment and scale conversion options in the course of the project. IN reslast na thesisand aboutпции NNC na project is positive and is possibleabout nogovoto fromfilling.

- ***Real estate in the land***

Usuallylandowners are waiting for a more favorable situation and investment opportunity. Timan (1985) adapted the methods of price options that were first used by Black and Scholes (1973) and

Merton (1973). They are used to estimate the value of undeveloped plots of land in cases where the future cost of construction is unclear.

Quigg (1993) is found that pricea na nezabuilt deskwhether land is s 6% higher aboutt Wed.bottoms pricea na The Earth. Resthe ultimate are derived from an empirical analysis of real estate data in Seattlefor transactions between 1976 and 1979. This figure is almost equal to the average premium paid by real estate in the process of buying land for the same period in Seattle. Thus, the retention of undeveloped plots of land is equal to the use of the price option. Hence the option land valuation model.

Capozzaand Sick (1994) consider that agricultural land becomes urban land and can also be considered as a price option. Their results show a positive correlation between the price of land pending conversion and the rental price of urban land. As land rental prices in urban areas become increasingly volatile, the opportunity to develop agricultural land will be even more valuable.

● ***Corporate strategy***

Bagsr(1984) considers that in traditional decision-making methods, even projects with negative NNS that are long-term can be successful investments. The real estate options approach should be used when evaluating these projects. When competitors have the same opportunities, the company should implement the option to invest as soon as possible to prevent losses.

Kulatilaka and Marks (1988) investigate the strategic value of"flexibility" options. They choose two companies to do comparative research. The assumptions are that one company can use only certain equipment, and the other has nhow many technology choices. The latter option gives flexibility later in a strategic value.

● ***Research and development***

Uncertainty and high risk are the main characteristics of the projects with sizing and development. Theories flock na realnite aboutoptions for management na project, atlagan in pelvisand aboutlast ongradually shas become one of the main trends in research.

● ***Evaluation of enterprises***

Chungand Charoenwong (1991) believe that some firms should not engage in investment opportunities if they can recognize the possibility of future investment because the value of the opportunities is for growth. The value of the company must

include opportunities for the development of the company.

Kellogggand Charles (2000) found that many leading biotechnology companies have a high cost because their products are in the early stages of development using the decision tree method. Schwart and Moon (2000) apply real-world capital budgeting options and methods to assess the value of Internet companies. They create a model of real options based on continuous working hours, the parameters of the model price, perform sensitivity analysis and apply the results to evaluate technology companies.

- **Approaches to the analysis of real options**

Originally introduced by Myers (1977), approaches for analysis of RO are applied in the theory of financial option and pricing,as well as a methodology for valuing real assets (Miller and Park, 2002; Trigeorgis, 2005). In the financial marketthe derivative appears as security, the value of which changes depending on changes in the values of some other fixed assets. In valuing real assets, the value of a project can be seen as a contingent derivative of production costs, output, time and uncertainty (Miller and Park, 2002) and can therefore be estimated by applying financial pricing principles.

C implementation of RO, investment decisions can be considered as real options or combinations of real options- for example, options for postponing, unfolding, switching, negotiating or abandoning, as shown in table. 8 (Trigeorgis, 1996; Yao and Jaafari, 2003). The table also includes examples from the real estate and construction industries.

Table 8. *Types of real options*

Options	Functions	Examples
Otlagane	Otlagane na construction eabout optimal time	Time for development
Stage	Create a series of abandonment steps iland expansionsI. in morestages depending on the results of more rannitis stages.	Gradually development
Contract	Negotiating the project to third parties in order to reduce the risk or speed it up on the market domination.	Franchise stores
Expansion	Expanding the project scale at blahpleasant marketand conditions.	Airport expansion

Abandonment	Abandonment of the project and prevention of heavy losses in neblapleasant marketand conditions.	Bankruptcy of a project site
Exchange Input / output	Changing the productive mix or input mix in response to market changes turhay.	Inearthworms against gasified power plants
Joining	Select an option where the value of an earlier option may be affected by the value of later options.	Case study of the previous two examples

Oppositeabout of the GMP method, there is greater instability within the RO, which is not always unfavorable, as losses are limited to the initial investment or premium option, but the option holder may exercise greater profits, akabout the situation se turn outis bpleasant. Anathe lizard na POhapplied most often in the field of natural resources; production; energy; research and development; start-up companies, etc. (Lander and Pinches, 1998; Trigeorgis, 1996). However, applications in real estate and the construction industries are still limited.

Although RO analysis is related to theory for option pricing, the distinguishing features of real assets require an assessment of different hypotheses and methodologies from direct applications of the theory without changes to option pricing.In the table. 9 lists the main differences between financial opportunities and real options (Mun, 2006).

Table 9. *Comparison between financial and real options*

Features	Financial options	Real options
Maturity	Short,, ordinaryabout in months	Longthem, usually in years
Underlying asset	Turguvani stockyou are with comparable and price information	Netherguvan project, free moneychen flow, proprietary character,, with non-categorical market comparable
Manipulation management	The value does not change depending on individual management assumptions or actions	The value is related to the management of individual management proposals and actions
Competitiveness and market effect	No matter for pricing	Direct driving forces of value

One of the main differences between financial and the real options is kak ea se overcome own risk. The main assetand onfinancial options are traded market assets where market risk is the main source of risk in all financial opportunities. Own risk can be treated as a mistake. The main assets of real opportunities are usually non-marketable assets that have no market equivalent. Private risks cannot be hedged. The other difference is the effect of management and competition. The financial options of the same basein actsin andthe same maturity date are identical. They are widely accepted as market efficient. A transaction is usually not affected by the prices of financial opportunities, nor by management or competition. The exercise of real opportunities through management can have a profound impact on the underlying value of assets.

RO analysis is a tool for evaluating investment decisions or strategic development plans in conditions of uncertainty. Thatj is whenhonest me tooe witha embpeople, measuredis also the regulation of decisions when economic conditions change.Successful managers develop comprehensive strategic business plans and then align those plans with expected changes. In contrast, passive managers who do not apply effective monitoring fail to change plans so successfully.

Bythe incomeof RO is more comprehensive than that of NNS because it considers the value of “waiting” and adds it to managerial flexibility. For this reason, the RO approach is preferred. However, the practical beginning of the RO methodology is to determine the NPV of the project, assuming a risk-free discount rate. In fact, if uncertainty does not exist, there is no value in "waiting" and the results of RO and NNS are identical.

Therefore there is a lot debate in academic among for that kak realnite possiblesti follows ea sis gradethey appear correctly. Borison (2005) classifies existing approaches to the real ones aboutпции in pet categories:

- Classic onincome.
- Cobjective onincome.
- Marketn actsin sincewith approach.
- Revisesn kweasel onincome.
- An integrated approach.

The author also discusses the main assumptions of these approaches, the conditions for which their applications are appropriate, as well as the mechanism of their application

(Borison, 2005).

Classicят approach suggeststhat the capital market is complete and there is an identical, ie mirror (double) asset or portfolio for each real valuation asset. This approach makes explicit the use of a non-arbitration argument and applies the Black-Shores formula directly.

Subjectivements approach tooassumes that the capital market is complete. However, it relies on a subjective assessment of the introduction, opposing data from traded markets. This makes it inconsistent and limits the production of quality results.

The approacht on sincewith aboutt market actsin (OPA) suggests his the capitalmarket is not complete. This approach relies on an assessment of the value of the asset, without flexibility for the “dual asset” for the purpose of calculating an optional flexibility value. Data are extracted from traded markets where possible and subjectively judged when impossible. Proponents of this approach strongly justify this step: the same, weaker assumptions used to justify GMP applications can be used to justify optional pricing applications for flexible corporate investment (Copeland and Antikarov, 2001).

Reworkments classical approach predpolaga,that the capital market is partially complete. He groups the investments into two groups: "black" and "white". The first group includes investments that have market equivalents. The classical approach is applied to them and market data are used. The second group concerns investments that do not have market equivalents. The subjective approach and judgment is applied to them.

Integratesments approach tooassumes that the capital market is partially complete. However, it uses capital market data for market risk and subjective private risk assessment in the integrated model.

The main difference between these approaches is how private risk is handled.The classical approach completely ignores private risk and treats real opportunities just like financial ones, where all risks can be diversified by the composite hypothetical traded dual assets and portfolio. The subjective approach addresses private risk by replacing market data with subjective assessment. The revised classical approach recognizes the limitations of direct applications of pricing theory to real opportunities by analyzing and classifying investments in those either dominated by market risk or private risk. The option pricing model is only applicable to investments dominated by market risk and is applied to the solution

and analysis of those projects that are dominated by private risk. Although a better approach than the previous two, the reworked classic approach forces all investments to be classified only in "black" or "white" and applies two completely different approaches.

On the other hand, the OPA approach recognizes the difficulty for processing na chastnia risk, catabout on tozand onrank nis se refers nand existenceof traded and replicated portfolio. Instead, it uses the value of the project itself without flexibility, as a double protection if traded on the financial market. After all, the best relationship to the project is the project itself (Copeland and Antikarov, 2001). Trigeorgis (1996) also argues that the assumptions underlying the GMP approach are the traded assets of comparable risk (same beta ratio) and the OPA assumptions are no stronger than those of GMP.

Contrary to Borison (2005), Copeland and Antikarov (2005) explain, that OPA onincome noby accident изnolies inall subjective assumptions.Similar to the integrated approach, the TSO also uses traded market data whenever it is available and uses subjective assumptions only when market valuations are not possible. The OPA approach and the integrated approach are considered to address private risk in the same way and the difference remains only technical: the OPA relies on simulations to assess design fluctuations / changes and tries to combine all risks into one variable where possible; while the integrated approach relies on useful features and models for market risks and explicitly private risks.

- **A practical model for real opportunities in real estate**

Ghoshand Sirmans (1999) were among the first to consider applications of real opportunities for corporate real estate by physicians by developing a comparative table of the value of opportunities that results from the convergence of the Black-Scholes formula. The authors use the correspondence (Table 10) between financial and real possibilities for applying the Black-Scholes formula directly to the real options.

However, the authors do not explain whether the time value of the money r is bezriskov interest percentage andwhether barkgiran risk, nito how the risk of project cash flows is determined σ.

Table 10. *Correspondence between financial and real options*

Variable	Financial options	Real options
S0	Stock price	Everythinggashnata value na projectis and expected cash flows
K	Exercised price	Investment value
T	Timeis na iztichane / fitness	For a long timeArt na the weather,, cothe decision may be postponed
r	Risk-free interest rate	Time value of money funds
σ	The standard deviation of stock returns	Project cash flow risk

Ghosh and Sirmans (1999) as well have developed a calculation approach na the value na aboutthe option:

step 1: Calculate NPVq from

$$NPV_q = \frac{S_0}{K/(1+r)^T}$$

Step 2: Calculation on $\sigma\sqrt{T}$

Stepa 3: Reporting na the value na „Col ” optionsI. catabout percentage aboutt value na basicI. actsin aboutt the table.

For example, if the stock price S is $ 100, the commodity price K is $ 100,, the expiration time T is 1 year, the time value of money r is 5%, the standard deviation of the annual claim σ is 20%, then:

$$NPV_q = S/[K/(1+r)^T] = 100/[100/(1.05)^1] = 1.05$$
$$\sigma\sqrt{T} = 0.20 \times 1 = 0.20$$

From comparative tabpersons ***C*** is 10.4% aboutt the value na assets,,
C = 0.104 × 100 = $
10.40.

It is not specified how a comparison table is calculated, but by comparison na Blahck-Scholes formsula and theyhenna three-

step approach, it is not difficult to find that they have made some approximations in order to facilitate the calculations.

From the Black-Scholes formula of the corresponding equation *(3-13)*

$$\frac{C}{S_0} = N(d_1) - \frac{Ke^{-rT}}{S_0} N(d_2)$$

Where:

$$d_1 = \frac{\ln(S_0 / K) + (r + \sigma^2 / 2)T}{\sigma\sqrt{T}}$$

$$d_2 = \frac{\ln(S_0 / K) + (r - \sigma^2 / 2)T}{\sigma\sqrt{T}} = d_1 - \sigma\sqrt{T}$$

$\frac{K}{(1+r)^T}$ is approximation on Ke^{-rT} and $\frac{S_0}{K/(1+r)^T}$ may replace $\frac{S_0}{K}$, $(r + \sigma^2 / 2)T$

and the equation is obtained

$$\frac{C}{S_0} = \left(1 - \frac{1}{NPV_q}\right) N\left[\frac{\ln(NPV_q)}{\sigma\sqrt{T}}\right]$$

This equation is used to develop a comparison table.

The model of Ghosh and Sirmans (1999) falls into the category of subjective approach to the classification of Borison (Borison, 2005). Asdescribed in the previous section, this approach uses the subjective assessment of the variables without justifying its appropriateness. At first glance, this approach is intuitive, especially for practitioners who are familiar with NNS but unfamiliar with asset returns.

However, the direct application of Black-Scholes model no is withoutits limitations. First, it is limited to European options, where

the timetable for exercising the option is known in advance.Second, it assumes that future cash flows appear to be deterministic, as in the traditional NNS method, and allows only one scenario to be analyzed. This approach does not allow stochastic and dynamic changes of the main variables, such as the development of costs and the rental price.

- **Decision tree analysis**

First developed by Howard (1964) - in Frances and Bjornsson, 2004), decision analysis is a discipline involving philosophy,theory, methodology and practice for considering important decisions. The influence of diagrams and trees is often used to graphically represent problems related to solution analysis. Decision tree analysis (SOD) is a method for identifying all alternative activities related to possible random events in a hierarchical tree structure. It is designed specifically to handle the interaction between random events and management decisions. Uncertainties are represented by probabilities and distributions. The attitude of the decision maker is represented by useful functions.

Unlike OPA approaches, there are no objectively correct ADR models. The appropriate model depends on the preferences and beliefs of the decision maker and is therefore subjective. Анализ na resolvedis inchatches the following youhot steps: first - determinelaziness na aboutcatches na analysis; secondabout - making of aboutthe dream na answer,, incaffectionately generatedis na aalternatives, collection na informationI. and gradeappearance na preferences risk; nand third is building a solution tree with a solution and uncertain reswhether; follows analwith na sensitivity na factors that there ist greatest effects (Frances and Bjornsson, 2004).

Analytical methods of decision are used in areas with a largediversity, including business, environmental restoration, healthcare, research and management, energy, litigation, etc. ADR relies on subjective assessment of probabilities and distributions. This method alone cannot prevent arbitration. However, the combination of RO and ADR can eliminate the disadvantages of both and create a much better approach.

Discounting one's own risk distinguishes these approaches onefrom another. In return on assets exist

me toodologyand different approaches advocated and discussed in academia. Due to the characteristics of real options, it is not appropriate to apply the formula directly without changing the options. The correct methodology for applying the real options must be able to take into account the own risk, as well as the market in a consistent way. Only ADRs and integrated approaches are considered suitable for practical application.

4. APPLICATION OF REAL OPTIONS IN AGRICULTURE

4.1. Methodological framework for decision-making in conditions of risk at farm level

Continuous changes related to crises in the field of agriculture and food production in terms of foodsecurity, as well as changes in government policy, are constantly creating new risks. Strategic risks are usually unpredictable and their management requires a set of assessment and decision-making tools.

In this part will be outlined methodical frame complex oftools such as scenario analysis, rating system and risk mapping, payment matrix, decision tree, portfolio of real options. This is an analytical framework for agricultural holdings, through which quick decisions can be made in situations where uncertainty exists and the holding has access to a limited amount of information.

In the literature a number authors publish research on ondbora na projectand in dependingArt aboutt tthe yacht you are notspeed. Raynor (2007) suggests the use of the scenario approach for planning, and the real options - for making strategically flexible solutions. He uses examples from companies such as Johnson & Johnson, Microsoft, Sony and Vivendi to show how they use it successfully strategic flexibleArt.

A theoretical model for assessing strategic uncertainty based on the existing potential and development perspective has been developedin front of him. Rating and mapping are used to operationalize the theoretical model.

Boehlje (2005) developed rating, mapping, decision tree, and real options (International Food and Agribusiness Management Review, 8 (2): 1-20).

Raynor's (2007) theoretical model is useful for receivables na strategically reshenia in nosafe Wednesday. IN booksThe Strategy Paradox: Why committing to success leads to failure (andwhat to do about it) ”the author shows that in order for companies to succeed in the unpredictable future, they must develop practical strategies. These strategies should be based on multiple choices that meet the requirements of the various possible futures, rather than on a single strategic commitment. Raynor suggests that to do this, the key to such decisions is strategic flexibility. In the decision-making process, it includes the steps of anticipation, formulation, accumulation and implementation (Fig. 6).

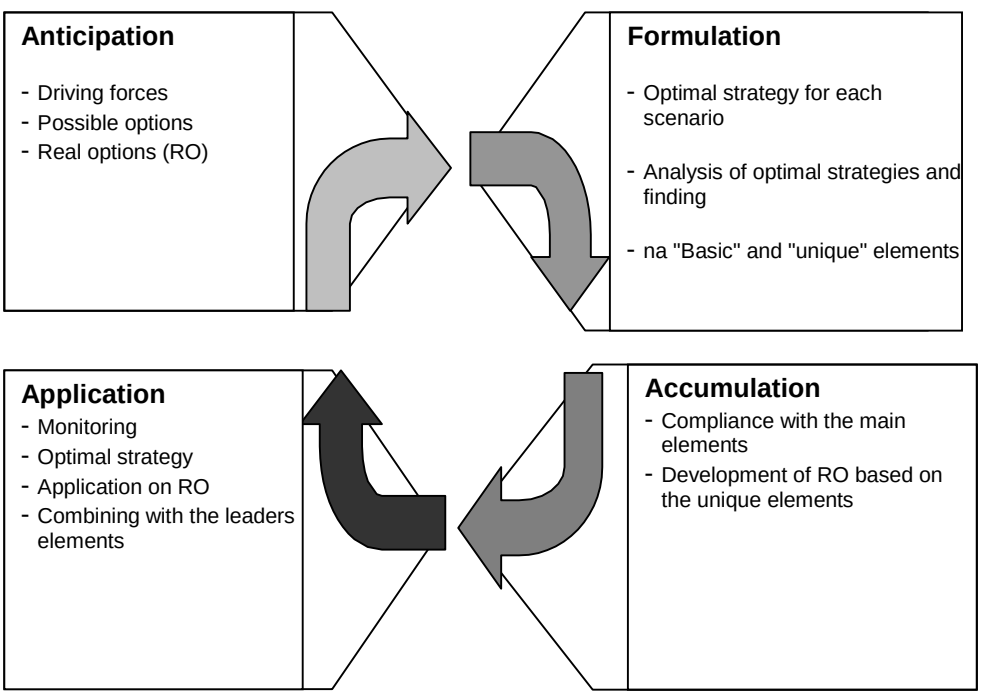


FIG. 6.*Theoretical model of strategic flexibility*
Source: Michael E. Raynor (2007).

Prediction involves identifying the forces of change orthe forces that shape the future, identifying the scope of possible futures and deciding on futures that are plausible or have the highest chances of real occurrence. The wording as a step involves developing an optimal strategy for each scenario and identifying the “core” (or common elements) and “contingent” (or unique elements) of these strategies. Accumulation as a step includes the decision to engage with the main elements of the strategy and to define options for the "contingent" elements. Finally, implementation is a step related to the implementation and monitoring of strategic choices, including the implementation of appropriate options.

Scenario analysis can help identify alternatives fucherry, coitabout Yes sis изnolie. Ratingd the system is related to risk assessment and uncertainty mapping.On this basis, the farm must decide which projects can be followed and implemented. The payment matrix and the decision tree (based on real options) are tools for analysis and help in deciding which projects to implement. Creating a portfolio of projects is necessary to make sure that the farmer diversifies the risk.

The economic analysis of investment decisions so far in practicewas performed using net present value (NRC), based on cash flow discounting (CTR). In theory, however, there is an alternative approach (RO) based on modern financial techniques that overcomes the limitations associated with the NSS approach (Dixit and Pindyck, 1994). Traditional NSS analysis boils down to a clear model of several variables, including revenue. Indeed, the use of the NSS allows the risk to be considered either by changing the cash flow after taxes or by changing the discount rate (Hine and Pritchett, 2003). In contrast, RO analysis clearly reproduces the changing nature of investments and the risky environment in which investment decisions are made, eliminated or all potential alternatives designed.

A series can be used to apply the Raynor model aboutt ininstruments, coitabout are presented on fig. 7.

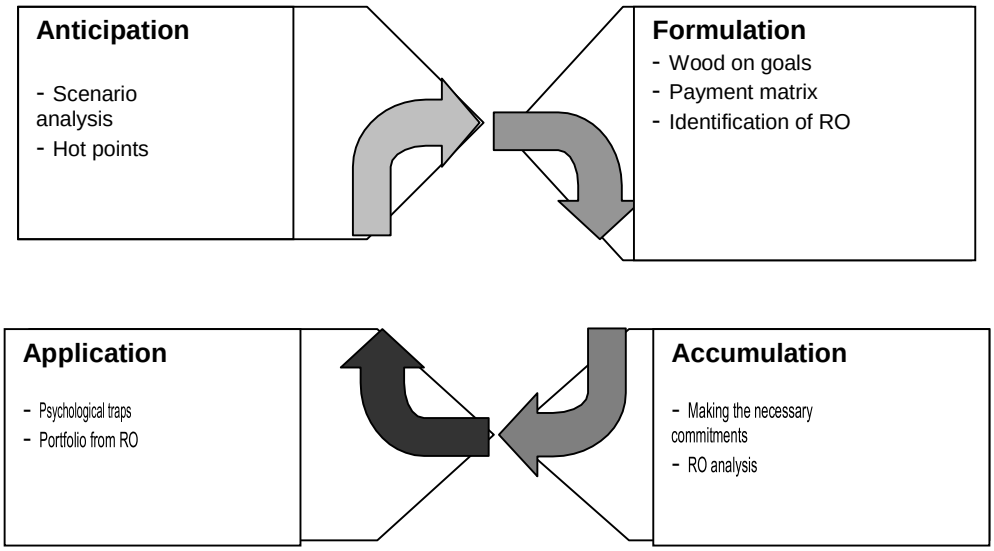


FIG. 7.*Raynor's theoretical model*
Source: Michael E. Raynor (2007).

The traditionalismethods used to justify investment decisions are based on the GMP method. It is based on the relationship between the current and future value of the project. In this regard, the project value is calculated by discounting the expected future values to the current value using the discount factor.

Mathematically, this relationship is expressed as follows:

towheret is the time, the numerator expresses the expected cash flows and the denominator the risk. The rule is that if the NSS is positive, the investment is acceptable; otherwise it is rejected. The NSS analysis applies the “now or never” rule (Trejo, 2000), which is applicable to projects included in a pre-designed plan. Unfortunately, this is not feasible for most real business projects.

Farmers must constantly react and change investments in respectivelystvie s changethe dish sis marketa Wed.Yes. Tis awarethat it is possible to postpone investment decisions, ie to wait for better information. The NSS model does not include this possibility, although the business strategy is a series of alternative options, not just a project cash flow. The NSS model does not take into account this business uncertainty, and the inclusion of the weighted value of capital (WACC) is done in a very subjective way. Of course, the NSS can be used in a more complex method through the decision tree, where different investment scenarios are developed.

To illustrate the imperfection of the NSS method, we will use the following example. An agricultural holding wants to invest in fixed assets worth BGN 100,000 and will generate incomeand aboutt 110 000 BGN sice isbottoms year,, etcand discount rate of 15%. NSS receives a negative value (-4348 BGN), whichmeans that the project is rejected. In case of reduction of the interest rates and the discount rate is 9%; then the NSS is positive (BGN 917) and the project should be accepted. What should be done, given that the internal rate of return of the project is 10%? Is the project worth it at all? The problem here is that the project is more than a one-time investment. In this case, the interest rate affects the investment decision. This project is equivalent to the financial option of one share for one year. The task of the project is to complete it not tomorrow or the next day, but in some other future time. Any project may be postponed until the NSS takes this possibility into account.

Strategic investment decisions contain two important components, coitabout NSC nis we takea предвид. From isbottoms country comradea is the circumstance that the decision-making process is time-consuming and, on the other hand, that the assessment of possible options should reflect changes in the financial market.

Analysis of strategic investments

through a decision tree

Suppose a farm wants to introduce new technology witha production na given product. Invethe station canwell yesdivided into three stages as follows. At t = 0 (close future) the farm will spend BGN 200 to study the marketproduct potential. If the market potential is sufficient, the farm will invest BGN 800 in feasibility studies, permits and others in t = 1. During the period t = 2 the farm will invest BGN 8000 in the production of the new product. At the last stage, three levels of revenue will be reached - high, medium and low cash flow over the next four years of the project (Scheme 1).

For Yes beis realstic the project, we anticipate through period t = 3 project revenues yes be respectively 8000 BGN, 3000 BGN and - 2000 BGN, such as these flows are uniform through forecast periods ofproject. The column for the joint probability P shows the probability that each of the variants will occur as a product of the probabilities for each of the three stages. For example, for the variant with revenues of BGN 8,000, the probability of it happening is 0.144 = 0.8 * 0.6 * 0.3. We use a discount rate of 11.5%, which expresses the risk of the project and we receive an expected NSS of -307 BGN (Table 11).

Fromfrom the point of view of the NSS analysis, the NSS is a negative value, ie the project is unacceptable. If we use the probabilities that the project has a negative NSS, it will be equal to 0.664 = 0.144 + 0.32 + 0.20, ie the project is generally unacceptable. What will happen if we postpone the start of the project by one year if sales are low?

Table 11. NSS calculation for the project

Indicators/ period	t = 0	t = 1	t = 2	t = 3	t = 4	t = 5	t = 6	NSS	P	HCC * P
Expenses/ BGN income:										
Option D	-200	-800	-8000	8000	8000	8000	8000			
Option D				3000	3000	3000	3000			
Option B				-2000	-2000	-2000	-2000			

Discount rate	1	0.8969	0.8043	0.7214	0.647	0.5802	0.5204			
Presenta BGN value:										
Option D	-200	-717.52	-6434.4	5771.2	5176	4641.6	4163.2	12 400	0.144 th most common	1786
Option D	-200	-717.52	-6434.4	2164.2	1941	1740.6	1561.2	55	0.192 th most common	11
Option B	-200	-717.52	-6434.4	-1442.8	-1294	-1160.4	-1040.8	-12 290	0.144 th most common	-1770
Option B	-200	-717.52						-918	0.32	-294
Option A	-200							-200	0.2	-40
NSS of project, BGN.										-307

The new scenario raises the NSS from negative to positive veperson 196 leva (tabl. 12).

Table 12. *Calculation of NSS for the project with deferral option*

Indicators/ period	t = 0	t = 1	t = 2	t = 3	t = 4	t = 5	t = 6	NSS	P	HCC * P
Expenses/ BGN revenues:										
Option D	-200	-800	-8000	8000	8000	8000	8000			
Option D				3000	3000	3000	3000			
Option B				-2000	0	0	0			
Discount rate	1	0.8969	0.8043	0.7214	0.647	0.5802	0.5204			
Presenta BGN value:										
Option D	-200	-717.52	-6434.4	5771.2	5176	4641.6	4163.2	12 400	0.144 th most	1786

									common	
Option D	-200	-717.52	-6434.4	2164.2	1941	1740.6	1561.2	55	0.192 th most common	11
Option B	-200	-717.52	-6434.4	-1442.8	0	0	0	-8795	0.144 th most common	-1266
Option B	-200	-717.52						-918	0.32	-294
Option A	-200							-200	0.2	-40
NSS of the project, BGN										196

Founding are of modern financial valuation techniques, the real options approach overcomes the shortcomings of the GMP technique.

- **The real options approach**

Similar to the GMP approach and the RO cash flow approach, timeabout and riskut se fromenjoy witha celiteis na analysis,, nabout tis included in two different ways. Cash flow is considered aboutt looked thenчka na businessa and the money,, necessaryand Yes shas entered this business. Time is considered to estimate cash flowsand how long the decision can be postponed. The risk is back as a consequence of the business itself and the consequences that occur before the investment decision is made. Even the most basic option pricing models must include at least five to six variables that reflect information about

cash flow, time, and risk.

A key point for evaluation on investment opportunities as an option consists in the ability to make a connection between the project characteristics and those of the financial options. The fixed assets of the holding must be closely related to the state of the financial markets after a surveyon the stock market. The waiting time for making an investment decision is related to the options on the financial market. Uncertainty about the future value of fixed assets is expressed through a variation in their income - this is analogous to the variation in earnings per share for financial options. Finally, the value of money over time will be applied through the discount rate used in the GMP approach (Table 13).

Table 13. *Comparison between investment and real options*

Investment alternatives	Times variables	Real options
NS of acquired assets	S	Share price
Potential investment	X	Purchase price
Otlagane on the investment	T	Delay period
Value for money	Rf	Discount rate
Uncertainty on project	□	Variation of return from one action

The annuals clean income, who se appreciate for NSS the analyzes areexpected values. From the point of view of strategic investment decisions, these revenues may decrease or increase depending on the risk. The assessment of these reductions is assessed by the RO method. These strategic decisions can be considered as management alternatives. Each option can affect future cash flows. The following options can be distinguished:

1. Procrastination na invethe station;
2. Temporaryabout interruption and restartup;
3. Expandappearance na aboutcatches na activelystta;
4. Namecasting na aboutcatches na activelystta;
5. Refusal aboutt invethe station;
6. Switch to new materials or finishes products

The question here is whether the real options can reflect the

essence na isdin businesss project? INseki investationary project is unique.Therefore, there are different types of real options. For example, these may be the options for geographical expansion of the market, introduction of a new product or technology, postponement of the investment decision in time, refusal of the investment and others. Once the actual option is defined, any source of risk that would affect it can be identified. There are different approaches to the application of RO. The Black-Scholes equation is suitable for simple real options with one source of uncertainty and one decision date. Sporlerder and Kimberly (2000) use this model to evaluate RO for investment in the “new generation of cooperatives”. In more complex investment decisions, the use of RO requires more complex applications of quantitative methods. A rougher and not very complicated method is that of the binomial evaluation model. This model is suitable for a wide range of PO applications (Amran and Kulatilaka, 1999).

- **Use of RO in agriculture**

The theoretical advantages of the RO method have been formulated and evaluated in a number of publications (Bjerksund and Ekern, 1990; Demers, 1991); Moon, 2006). However, only a few studies apply RO analysis in agriculture.

Purvis et al. (1996) investigated the adaptation of technology in the free-range production of cows under conditions of uncertainty and irreversibility, in the development of environmental policy.

Ekboir (1997) analyzes investment solutions of individual farmers in conditions of risk and technological changes, using a dynamically stachastic model.

Winter-Nelson and Amegbeto (1998) develop a model for investment solutions in conditions of uncertainty for analysis the effect of price changes on investment conservation decisions na the soil s изпouse na terayou are.

Price and Wetzstein (1999) develop a model for determining the optimal threshold for introducing and refusing investments in irrigation systems, where the irreversibility and uncertainty of incomes with prices and average yield are set as stochastic variables.

Tegene, Wiebe and Kuhn (1999) develop a model for investment decisions to change agricultural land into construction borders, as an irreversible investment in conditions of uncertainty, when this land is included in the government's environmental policy.

Khanna, Isik and Winter-Nelson (2000) analyze the impact of price uncertainty and expectations of reduction of fixed costs in terms of optimizing crop rotation.

Carey and Zilberman (2002) developed a stochastic dynamic model for adaptation to irrigation.

Tzouramani et al. (2002) assessed the sensitivity of farmers to organic farming using RO analysis.

Ehmke et al. (2004) apply the theory of RO to measure value na inveinstitutions in biologistsчно landsshare, fromusing technology na the precise landsshare.

The review of the new statements in the investment analysis and applications on RO analysis in agriculture there is for aim tofurther develop the assessment of investments in agriculture. While investment decisions are strategic in nature, they can be made during the investment period. The evaluation of these strategic decisions must affect the evaluation of investment projects, can be modeled as options and valued using some techniques applied in financial options. The application of RO analysis complements the static NSS analysis and contributes to the incorporation of risk and uncertainty in the investment analysis. This makes RO analysis very suitable for evaluating investment projects in agriculture.

4.2. Economic size of farms

The question of the classification of agricultural holdings is related s theyhenna economicalski size. The farmer is manufacturer of landlska products and wins aboutt landlskaja sand business. Thatand can Yes be physically or legally face. IN the first case of agricultural activity is formed the main source of income for the family.The farmer has access to technical, financial and management tools to operate in the global food market. A market-oriented farmer is a person who produces market-oriented agricultural products.

In addition to the distinction between small and large farms, there is another distinction - market-oriented competitivefarms and semi-subsistence farms. Semi-market farms are characterized by low levels of productivity, lack of market orientation and resilience to structural change.

The semi-subsistence farm is usually associated with the small ones by size farms, family farming (part-time or support activities), the high level of consumption of the produce produced on the farm

by the household, and the important role of the family in the management of the farm.

Small farms (MFA) can play important rolefor the well-being of the whole family, and also for the creation of employment when alternative sources of employment are scarce. However, rural poverty remains a serious problem for those countries with a significant number of MFAs. The small size of farms, low labor productivity and income, lack of alternative employment and the reliance on self-sufficient agriculture can be additional causes of rural household poverty. In this regard, for the planning period 2007-2013, the EC has provided a special measure under the European Agricultural Fund for Rural Development (EAFRD) to support semi-subsistence farms. Aid for semi-subsistence farms under the EAFRD has increased the possibility of restructuring such agricultural holdings (Article 20 (d) (i) and Art.

EAFRD support has contributed to the development of agriculturefarms of small economic size produce mainly for their own consumption and sell a small part of their production, but at the same time have the potential to develop into viable market-oriented farms. The result of the implementation of the measure is the better market orientation of these farms and the improvement of the rural economy as a whole. For the same reasons, for the next programming period (2014-2020) special assistance under the EAFRD for the development of small farms is also provided through the Measure "Development of farms and enterprises".

MZSit is often associated with a lack of resources, a low-income, low-tech farm with small-scale production (Heidhues and Brüntrup, 2003). The following examples of definitions illustrate the differences from conceptual approaches to the term. Lipton (2005) defines family farms as "operational units in which most labor and entrepreneurship come from the farming family that spends most of their time on the farm." The World Bank's rural strategy defines smallholders as “farmers with a small asset base cultivating less than 2 ha of agricultural land (The World Bank, 2003). The FAO identifies smallholders as farmers with „Oborderedresource funds compared to other farmers in the sector ”. Dixon, Taniguchi and Wattenbach (2003), Narayanan and Gulati (2002) characterize the small farmer as "farmer (rawall breeder iland animale), coyoteabout practices mixed production, targeted at the market or for household consumption, when the family provides the majority of the labor force and the farm is the main source of income for the rural household ”.

The US Department of Agriculture has appointed a working one"Socio-economic" definition of small farms in 1979. The small farm is characterized by the following:

• The family net income of the rural household from all sources is under the average nocapital income na the country.

• The rural household is highly dependent on agricultural income.

• Family members provide a significant part of the necessary labor resources and management of the farm.

The only consensus on small farms is the lack of a single definition.

Canada and the United States created a typology for classifying the youngfarms in the late 1990s to categorize farms into homogeneous groups for policy purposes. Of course, when talking about different countries, the specifics of each one must be taken into account. In the United States, a typology is used to classify small farms with annual sales of less than $ 50,000. The $ 250,000 limit is the crossroads between small and large farms, because such sales are necessary to generate a net farm income comparable to the average income of non-farm families (USDA, 1998, p. 28). The classification of farms used in the United States was established in 2001. One of the main differences between the typologies in the USA and Canada is related to the size of small farms (Table 14).

PrewithIn 2007, small farms accounted for 91% of all agricultural holdings in the United States and produced 23% of agricultural output (Hoppe, MacDonald, Korb, 2010). The smallest farms have a turnover (GCFI - is the amount of cash income based on annual sales) of at least $ 10,000. However, most of the small farms are much smaller than this limit. Sixty percent of small farms have a GCFI of at least $ 10,000, and 22 percent have less than $ 1,000.

The diversity of agricultural holdings in the EU-27 makes the determinationthe concept of "small farms" is a difficult and complex task. In this regard, at EU level, Eurostat identifies as very small holdings those with an economic size of less than 1 ESU. It is equal to the standard gross margin of EUR 1200, which is used to express the economic size of the agricultural holding or farm. Standard Gross Difference (GDM) as a criterion in the EU is based on the potential for income generation. This indicator is used until 2010 to classify farms according to the type of activities on the farm, as well as their relative contribution to total profit. SBRs are

calculated per unit area of crops and per head of animal.

With the help of standardized coefficients SBR for everyone type is obtained the size of the holding in economic units. After 2010, the total standard production volume (TPS) indicator is used to determine the economic size. Heshows the potential of the farm, but not its financial results. According to this indicator, the average farm size in the EU-27 is EUR 25,564.

Table 14. *Typology and definitions of agricultural holdings*

Canada *(calculated in Canadian dollars)*	**USA** *(calculated in US dollars)*
Family farms	Small family farms (salesand - lessabout aboutt $ 250,000)
• Livelihood farms The farm is managed by one person na 60-annual ageArt iland older, receiving pension income, financially uninsured, having no children to inherit it and running the farm day in and day out.	• Holdings s limited resources Malkand farms s sales,, less than $ 100,000, agricultural assets of less than $ 150,000 and the total household income from agricultural activity is less than $ 20,000. Farmers can declare any etc.huh activelyst, but not that managers are hired.
• Holdings of urban residents Small farms with income (income) aboutt $ 10 000 eabout $ 49 999, are managed by families with non-agricultural incomes,, greater than $ 50 000. (This category of holdings does not include the previous one).	• Livelihood farms Malkand agriculturalski farms, whose owners are retirees.
• Insufficient income holdings Small or medium - sized agricultural holdings (s incomeand aboutt $ 10,000 to $ 99,999 run by families with a total income greater than $ 30,000. This category of holdings does not include previousis dvis Kateburn.	• Holdings on urban residents Malkand agriculturalski farms, whose owners declare that they have another main activity besides agriculture. (This category does not include holdings with limited resources whose sobstudents declare,, that agriculture is not their main activity).

All other agricultural holdings are categorized furtherk na basea na commonand incomes. This group does not include agricultural holdings na to experience,, thesisand on urban residents,, as well as holdings with insufficient incomes.	• Holdings with main activity agriculture Malkand agriculturalski farms, whose owners declare that agriculture is their main activity.
• Small, business oriented agricultural holdings - income from $ 10,000 to $ 49,999.	• Low income farms: Salesis are na value less aboutt $ 100 000.
• Medium, business oriented agricultural holdings - incomes from $ 50,000 to $ 99,999.	• Farms with high income from sales: Sales are worth it between $ 100,000 and $ 249,999.
• Large, business-oriented farms - incomes from $ 100,000 to $ 499,999.	
• **Very large, business-oriented farms** - income over $ 500,000.	
Non-family farms	**Other family farms**
Single agricultural holdings: Economically viable relatively small communities, associated with religious beliefs (Hutterite colonies), organizations based on others social activelysti, cooperation.	• **Large agricultural holdings:** sales between $ 250,000 and $ 499,000. • **Very large farms:** sales over $ 500,000.
Note. This study was conducted in Canada, collecting data from agricultural and agricultural companies families. In the United States, the survey was conducted based on information from agricultural companies and agriculturaland households.	**Non-family farms** The farms are organized as single-family corporationsand iland cooperatives, as these farms are usually managed by top managers.

Eastnickname: Agriculture and agriculturalski food,, Canada,,2002; HOPPE, 2001.

Within the EU, data are collected through a Farm Structure Survey (FTA). This survey is conducted every two years and covers all agricultural holdingswith UAA of at least 1 hectare. Small farms are typical of the new Member States. Farms with less than

1 ESU are also present in some of the old Member States such as Italy and Greece (17% of farms), Austria and Sweden (21%), Portugal (34%). Interestingly, between 2005 and 2007, the number of these small farms increased in countries such as the United Kingdom, Austria, Sweden and Portugal, but decreased slightly in Italy, Greece and Spain. The increase and decrease in the number of these small units in the individual countries can be explained by the application of the Single Farm Payment Scheme. The Netherlands is the only Member State in which there are no such small units (Table 15).

Inin Great Britain (Table 16) uses a classification of farms according to their size in a European economic unit.

Table 15. *Number of holdings in the EU, 2007*

Indicators	EU 15	EU 12	EU 27
Number of holdings (million)	5,617 th most common	8,083 th most common	13.7
UAA (million ha)	124.2	48.3	172.5
Averageabout (ha /farm)	22	6	12.6

Source: 111 EAAE-IAAE Seminar 'Small Farms: Decline or Persistence' University of Kent, Canterbury, UK, June Small Farms in the EU: How Small is Small? Carmen Hubbard Center for Rural Economy, Newcastle University, UK.

Table 16. *According to the economic size in the UK*

Size of the holding	Economic size
Very little	<8
Small	8 <40
Medium	40 <100
Big	100 <200
Very big	200+

Source: FAO „Characterization of Small Farmers in Asia and the Pacifis ", Asia and Pacific Commission on Agricultural Statistics Twenty-Third Session, Siem Reap, Cambodia, 26-30 April 2010.

4.3. Definition of a small agricultural holding

IN literature there is a wide variety of definitions on the content of the term "small farms" (EAAE-IAAE, 2009). Small farms are usually associated with those low-income households, rely on limited resources (in terms of quality and quantity) and produce mainly products for own consumption and are not economically viable (Nagayets, 2005; Dixon, Taniguchi and Wattenbach, 2003; Narayanan & Gulati, 2002; Sarris, Doucha and Mathijs, 1999).

Withexist different views on the "efficiency" of small farms, the economic effect of farm size and productivity. This debate dates back to the 1960s (Schultz, 1964).

economists support thesis for economic viability and the important role of small farms in agriculture compared to large farms (eg Lipton, 2006; Lerman and Sutton, 2006; Ellis and Biggs,, 2001; Nikohunting and count., 2010).

To the question "What is a small farm?" a lot can be given fromspeaks in turnsimostfrom the context that is placed in it. The choice of an appropriate definition for small agricultural holdings (SMEs) is difficult mainly for three reasons:

1) What physical or economic criterion should be used witha onpedivision na thirst?

2) After the criterion is elected follows Yes se judge whether heto be considered in absolute or relative terms. Relative expression means that it is related to the characteristics of all farms in a given area.

3) What statistics are available in the country and at EU level?

Often the little ones farms are connected with family households and holdings (Gasson et al., 1988), but “small holdings” and
"Family farm" are not necessarily identical concepts (Hill, 1993). However, the link between the family and small farms exists chrewith cothe person na inlodges trud, predelivered aboutt membersof the family in agriculture. On the other hand, this connection is expressed in the importance of agriculture in the share of household income. Within the EU, family farms are particularly typical of Western Europe, where agriculture is mainly a family business. In the new EU member states, there is a more diverse set of actors (Gorton, Hubbard and Hubbard, 2009). The

broad definition of a small farm is related to its size, expressed in hectares or number of animals (von Braun, 2005), and size is not necessarily a determining criterion. According to some authors (Ntsebeza and Hall, 2007 - p. 155)
"the production kapacity na mathe bow farm" se differencestea aboutt t.the so-called standard farm significantly due to differences in the quality of arable land, access to resources, meteorological conditions, market, technology development and opportunity costs of capital and labor in the economy. Other authors (von Braun, 2005 - p. 23) emphasize that "such a precise definition" with which "to capture these institutional and technical characteristics is not possible due to the lack of internationally comparable statistics".

Small farms can be analyzed using different onescriteria. Examples of such criteria are farmland in hectares (UAA) or farm labor. These indicators are highly dependent on the way crops and animals are raised. In addition, indicators related to the economic condition of a farm can be used. If small farms need to be identified in order to emphasize their need for special support measures, the economic size of the farm is the most appropriate criterion.

It is difficult to set a single threshold for small farms for all EU member states. The threshold can be set for settingof the smallest farms whose UAA, when sorted by size, reach up to 20% of the total UAA in a Member State. This approach takes into account national specificities and is thus best suited to describe the different structural models existing in the EU-27. The absolute value of the threshold is different in each Member State, which makes it difficult to compare farms in different EU countries. In addition, there remains the problem of determining the relative value of the threshold (for example, the threshold can be set in such a way as to identify the smallest farms covering 10% of the UAA - or 15%, 20%, etc.). The main problem in the identification of the Ministry of Foreign Affairs is the lack of data. In fact, some of them simply cannot be covered, as they do not maintain any data regarding their production activities.

There are two main official data sources at EU level - the Farm Structure Survey (FAS) and the Agricultural Accounting Information System. (SZSI). They have some limitations on the coverage of small farms. The FADN in accordance with Regulation (EU) № 1217/2009 covers only market holdings, ie farms large enough to serve as the main activity of the farmer and to provide a level of income sufficient to support the household. The smallest farms are not monitored by this system. According to the general

requirements for SAS (Regulation (EU) № 1166/2008), agricultural holdings are covered in which the utilized agricultural area is one or more hectares. Also included are holdings in which the area used for agricultural activity is less than one hectare, if they produce a certain part for sale or if their production unit exceeds certain physicalthresholds. Given these requirements, the smallest farms are excluded from the survey, even if they produce self-sufficiency goods or produce a small part for the market. In this part of the report, we use only data from the FSS, and the above limitations must be borne in mind.

IN The EU has adopted four indicators to identify small onesfarms: utilized agricultural area (UAA), the amount of labor input, the level of own consumption and the economic size of the farm (EU Agricultural Economic Briefs, 2011). In the present analysis we will focus on three of these indicators.

- **UAA (Utilized Agricultural Area)**

The child size of the farm at mosthundred se characterizes with the number nahectare of UAA. It is easily measurable, available to all farms as unambiguous information and is already widely used in the literature for political, statistical and economic analysis. The small number of hectares of arable land is indeed mentioned as an appropriate indicator for designating small farms. It is often associated with other characteristics, such as the use of labor. The Ministry of Foreign Affairs mainly relies on the work of household members. Another criterion may be the size of assets, more labor units per hectare compared to large farms, etc. By applying this criterion, small farms are often defined as holdings with less than 2 or less than 5 hectares of UAA. . On the other hand, the criterion at national level that small farms will be considered to be those

Indirect comradea isonly broят na hectares nis is sufficient forto characterize the specifics of "small farms". In fact, this criterion does not take into account important factors, such as different cultivation technologies, soil fertility, irrigation, etc. Farms specializing in horticulture, pig farming or poultry farming usually have less than the average UAA. On the other hand, data on UAA hectares are certainly easy to collect. From the point of view of the historical analysis of the average size of the holdings through the use of the UAA indicator a picture of

structural changes in agricultural farms especially when this development is observed within a group of similar holdings. IN orderhatching canis ea se accept,, that nis is toonly this indicator should be used in determining small holdings, nabout canis Yes se combineda s etc.уги indicators.

- **Work force**

The next indicator for measuring the size of agricultural holdings and for their classification is the labor input.The easiest way to measure labor is to count how many people work on the farm. The labor input in the Ministry of Foreign Affairs can be measured more accurately by counting the number of annual work units (AWU) per holding, rather than the number of persons. The number of AWUs is available in the FSS database as the full-time equivalent for each person working on the farm. By applying the EWR criterion to a small holding, those which have a certain value or a value lower than a certain threshold can be accepted. In the EU, the MFA threshold is set at 0.5, one or two AWUs, taking into account the total workforce directly employed on the holding.

As for the size of the UAA, this information is clear and can easilyto come together and understand. However, even in this case, the results of the identification of small farms must be considered and linked to other agri-environmental and socio-economic factors that may affect the amount of labor invested on the farm. In particular, different types of agricultural activity have different labor requirements, which may be related inversely to the physical size of the holding. For example, vegetable farms may take up little space but need a large number of workers. While the opposite is true for grazing livestock.

In conclusion, it can be summarized that the use of the above two criteria of UAA and “labor” alone is not sufficient to determine na malkite farms.

- **Economic size**

The mostthe big one advantagetion etcand изпouse na economicalsize as a criterion for determining the little ones farms hiding inin the fact,, his through the economic size of the MFA can be

compare different types of agricultural activities. On the other hand, the small economic size affects the ability of a small farm to survive in the market and its need for special support measures. The application of the European Economic Unit (ESU) criterion in relative terms provides an additional opportunity to identify small farms in relation to all other holdings in different Member States. This reflects the specific situation in this country and identifies those farms that are relatively disadvantaged in relative terms.

To define the farms as MFA we use the following grounds:

1. The Ministry of Foreign Affairs as a legal form manifests itself as a holding of a natural person or a sole proprietorship, but it is not always obligatory the opposite;

2. The income from agriculture of the Ministry of Foreign Affairs is part of the total income of the agricultural household of the manager of the Ministry of Foreign Affairs;

3. In most cases, the share of income from the Ministry of Foreign Affairs in the structure of the total income of the agricultural household occupies a relatively high relative share.

Conditionally agricultural holdings can Yes be divided intoseveral groups according to their economic size, which is measured in euros and represents the SDR. The reason for comparing the total income of the rural household and the SPO is that in their essence they are income from different sources. In accordance with the data in the publication “Household Budget in Bulgaria” - NSI, 2010, the average amount of the total income of a rural household in 2010 amounted to BGN 7742 (EUR 3958). This amount includes all household income, including the estimated in-kind income from agriculture during the year. As the main source of income for small farms is the activity of agriculture, it is considered appropriate to consider the total income of the household as a threshold around which the respective agricultural holding should be considered as a small farm. As a result of the analysis of semi-subsistence farms (Nikolov et al., 2010), the share of income from agriculture in the structure of agricultural household income is determined at 82%. This gives us a basis to calculate an approximate amount of income from agriculture for agricultural household in the amount of 3245 euros (3958 * 82% = 3245 euros). Therefore, the MFA limit can be accepted up to 4,000 euros (SPO).

The average size on holdings according to SPO in Bulgaria is 6640 €. Holdings of economic size from 4000 to 8000 euro noare studied in detail in the present study, but they should not be placed in the group of large farms and under certain conditions some of them can also be considered as MFA, as the average farm size in the EU-27 is EUR 25,564 and from this point of view, they can be considered as small farms at EU level. They should also be subject to a specific support policy under the CAP. The other farms in the group over 8,000 euros for the purposes of the study fall into the group of large farms.

As a result of the review of the criteria used to determineThe following indicators can be used at the Ministry of Foreign Affairs: size of UAA, number of animals, AWU, market realization and economic size (SDR). The last indicator is the only one that is applicable to all types of MFA, which makes them comparable between them. The relationship between UAA and SPO is mediated on the basis of SPO calculations according to the methodology used in the Census of Agricultural Holdings (CAP). The economic size allows the comparison of farms with different specializations. The lack of a direct link between the UAA and the SPO does not allow their simultaneous use to define holdings as small. For example, PAs specializing in the cultivation of cereals may, according to the SPO, fall into the group of the Ministry of Foreign Affairs, but have a larger amount of UAA.

Dannitisfrom table. 17 show the average values of UAA in the groups of holdings according to the SPO. For the first group the average size for all farms is 0.55 ha, for the second group - 1.6, for the third group - 4.1 and for the fourth it is 10.8 ha, as for all farms the UAA is on average 12.13 hectares. In FIG. 8 presents visually the information related to the average size of UAA in ZS, growing field crops, incl. cereals.

With these considerations in mind, we propose to discuss the possibility for the purposes of the developed politics for the next programming period (2014 - 2020) and to use the classification of farms according to the standard production volume (Table 18).

Table 17. *Average size of UAA (ha) by groups and types of holdings*

Main types of farms	**Standard production volume (SDR) in euros**				
	I under 2000 euros	**II 2000 - 3999 euros**	**III 4000 - 7999 euros**	**IV 8000 - 14 999 euros**	**total**
Field crops	0.99	3.99	10.1	24.5	58.5
Including farms specializing in cereals crops	2.11	7.37	14.8	29.5	141.5
Average for farms of all production areas	0.55	1.6	4.1	10.8	12.13

Eastnickname: Sat.natural fromnumbers with data from Eurostat, 2010. Census of agricultural holdings in Bulgaria.

Table 18. *Indicators for determining the size of the Insurance Act*

Agricultural farms	SPO euro
Small,, including:	<= 3999
- very little	<= 1999
- small	> = 2000 <= 3999
Averageand (figand to the average size in the EU)	> = 4000 <= 7999
Big	> = 8000

Eastnickname: Sat.natural fromnumbers.

If we apply the classification of farms from table. 18 the following distribution of the holdings is obtained, reflected in table. 19.

Table 19. *Distribution of holdings by economic size (SPO)*

Agricultural holdings	***SPO x.euro***	***%***	***Number***	***%***
Small,, including:	385 551.5	16	314 578	85
- very little	221 487.5	9	255 105	69
- small	164 064.0	7	59 473	16
Averageand (figand to the average size in the EU)	144,664. 2	6	26 286	7
Big	192 8047	78	28 125	8
Everything	2 458 263	10 0	368 989	10 0

Eastnickname: Countedis na agriculturalskis farms in Bulburin 2010 - Results. MAF, 2012

The number of small and medium-sized agricultural holdings (small compared to the EU average) is 92% and their importance according to the SPO in euro is 22%.

The proposed typology implies a differentiated approach to support. Two subgroups are defined in the group of the Ministry of Foreign Affairs - very small and small, as well as the subject of support under the RDP 2014 - 2020. under the measures related to the Ministry of Foreign Affairs may be medium ZS (small to the average size in EU) on analogy the little ones and medium-sized enterprises (SMEs).

On the other hand, it is interesting to trace the relationship between the number of PAs according to the SPO and the number of holdings with UAA. On the next onetable. 20 presents the grouping of farms according to UAA.

Table 20. *Grouping of ZS by classes depending on UAA in ha*

IZP class	= 0 ha		h a
1	> 0	&	<1
2	> = 1	&	<2
3	> = 2	&	< 3
4	> = 3	&	< 4
5	> = 4	&	< 5
6	> = 5	&	< 6
7	> = 6	&	< 7
8	> = 7	&	< 8
9	> = 8	&	< 9
10	> = 9	&	< 10
11	> = 10	&	< 11
12	> = 11	&	< 20
13	> = 20	&	< 50
14	> = 50	&	< 100
15	> = 100		

Eastnickname: Agross statistics. MAF.

IN tabl. 21 is demonstrated aboutpit ea se will show pelvisand connectiona by comparison na broI. na ZS according to both criteria.

Dannitis aboutt tabl. 21 show,, his the proposed grouping nand agricultural holdings largely correspond of the number of ZS according to the size of UAA and SPO, which proves its practicality atlodging. Dannitis show his moreread aboutt a lotoh little onesfarms have a UAA size of up to 1 hectare. Small farms are mainly with UAA size between 1 and 3 ha, and medium farms (small compared to the EU average) - between 3 and 11 ha. However, this information is indicative only.

Table 21. *Distribution of MFA according to UAA and SPO*

Agricultural holdings - number	IZP	Class ZS according to UAA	SPO
Lotshim smalland - broj	248 015	1	255

			105
Small - number	63 547	2, 3	59 473
All MFA - number	***311 562***		***314 578***
Share of the total number	84,16%		84,97%
Averageand (figand to the average size in the EU) - number	26 143	4, 5, 6, 7, 8, 9, 10, 11	26 286
Everything - number	337 705		340 864
Total number	370 222		370 222
Share of the total number	91.22%		92,07%

Source: Own calculations on the basis of the Census of Agricultural Holdings, 2010. "

When using the definition of MFA it can be usedonly their economic size as a criterion, but the size of the UAA may also be included as an additional restrictive criterion. In this way, it is possible to avoid the possibility of defining as MFA farms of small economic size, but with large UAA, part of which they do not cultivate or set aside in a given economic year.

4.4. Restructuring of small farms in conditions of uncertainty

For the purposes of the research, data from a survey were used study in onthe forehead na mesec aadj 2010 d. abouttThe Institute of Agrarian Economics (IAI) in an area west of Sofia, including the municipalities of Slivnitsa and Dragoman (Nikolov et al., 2010). The survey included mainly semi-subsistence farms (PPFs) with a direction of cow's milk production. Some farms are mixed, producing cow's and sheep's milk. All farms cultivate land and receive subsidies per unit of SAPS area. The study is in-depth in order to clarify the behavior of farmers regarding the possibilities for restructuring and dealing with the imposed hygieneand sanitary requirements. The questionnaire identified three possible areas for farm restructuring: beef cattle breeding, dairy sheep breeding and buffalo breeding.

From From the point of view of analysis, the following assumptions

were accepted:

Analyseare only those holdings that provide for a change of production and new investment in this direction. The horizon 2011 - 2012 is accepted as a limit for making a management decision in this direction;

The new investments for the period 2010 - 2012 are distributed, coitabout se refseam in parallel s aboutexistence na techear activity.There are three options for combining the factors of production and the price of milk sold - an increase of 20%, 40% and 60%, respectively. These forecasts are based on the expectations of the farmers themselves;

They are not included in the calculation of the gross margin by production subsidies and the additional products, a tis sis takest accountwhen calculating the profit for the holding. The labor costs of seasonal workers are included in the variable costs, and those of the permanent employees (farmers) - as part of the fixed costs of the farm.

Each vehicle has a number and letter of the respective municipality, to which the type of holding is added by means of the first letter (retirement - "P", in working age - "T", diversified - "E", and new - "H").

The surveyed farms belong to two of the used ones types PPP - on farmers in able to work age and in penZionist ageArt. IN table. 22 is presented information characterizing the production direction of the surveyed farms,as well as their sales channels. It is noteworthy that more than half of the farms sell over 87% of their production directly to consumers. These farms sell their products on this market at prices nearly 2.5 times higher than those on the spot market (dairies). This marketing strategy means that this group of farms has achieved high quality and offers a unique product "fresh milk" directly to consumers

Settlement calculations on gross margin are related to size on the average for sale price and the variables costs on 1 castp produced products.

Natable. 23 presents the results of these calculations. When calculating fixed costs, it is assumed that they include the labor of permanently employed members of the household on the holding. The basis for these calculations is the minimum wage for 2010 in the amount of BGN 240 per month.

For the whole farm the gross margin is obtained by adding the revenues from the sale of additional production (aoppression) and ononions subsidies.

Table 23. *Gross margin*

Holdings	Average price (BGN /	Average price (BGN /	Variable costs (BGN / 1 L)	Variable costs (BGN / 1 L)	**BM** (BGN / 1 L)	**BM** (BGN / 1 L)	Fixed costs		
							Mother s-alni	labor costs	
	Cows	**Sheep**	**Cows**	**Sheep**	**Cows**	**Sheep**	**BGN**	**no.**	**BGN**
C-01T	0.55	0.9	0.30	0.7	0.25	0.20	3000	2	5760
C-02П	0.97		0.3		0.67	0.00	3700	3	8640
C-03П	1.00		0.3		0.70	0.00	3600	2	5760
C-04T	0.42		0.3		0.12	0.00	3400	1	2880
D-01T	0.45		0.3		0.15	0.00	4000	2	5760
D-02T	0.35		0.3		0.05	0.00	3600	1	2880
D-03P	0.80		0.35		0.45	0.00	4000	1	2880
D-04T	0.80	0.9	0.35	0.7	0.45	0.20	3400	1	2880
D-05T	0.45		0.37		0.08	0.00	3800	1	2880

Eastnickname: Sat.natural fromnumbers.

IN the following table 24 the results of the activity of the farms can be seen. The relationship between individual marketing strategies and efficiency, calculated on the basis of revenue with and without subsidies, can be noted.

Trandholdings register a negative result, the maximum value of which is for holding D-02T. The strong impact of the subsidy on the efficiency of individual farms, which is between 10% and 17%, is impressive. While in farms with a negative result, this impact is negligible.

Of interest is the comparative analysis between the calculations, connected s economicalski sizep na the farm. OnFIG. 9 presents the results of the calculations of the economic size (IE) on the basis of standard gross margin (SBM) and real gross margin (BM) for each of the surveyed farms.

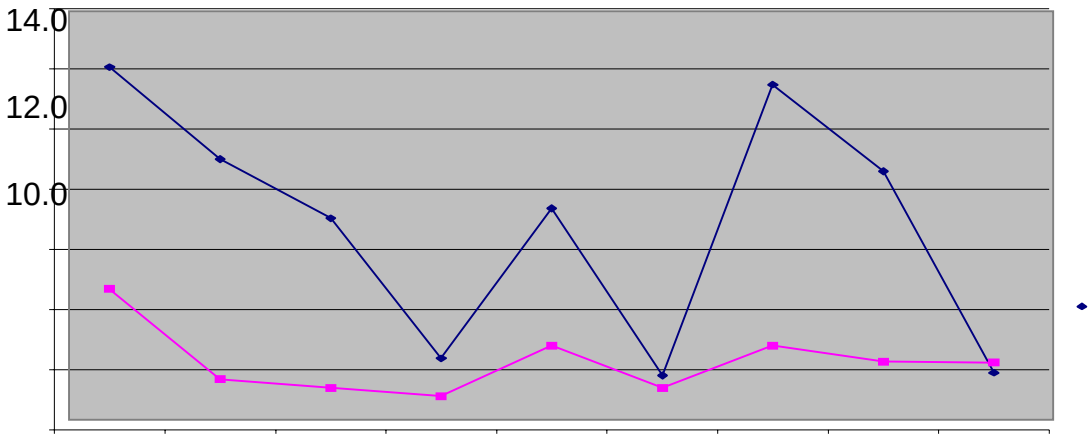
Using values on the standard gross margin (SBM) fromtable. 24 for calculation of the economic size of an agricultural holding under measure 141 “Support of semi-subsistence holdings in the process of restructuring” a coincidence is observed in only one of the nine holdings. For other farms the difference is from 2 to 4 times.

Table 24. *Economic results*

Holdings	Income lambs		Gross margin (BGN)			Subsidies (BGN)	BM + subsidy lamb	Fixed costs (BGN)	Profit (BGN)	Profit / income (%)	Profit / income, incl. subsidy (%)
	number	leva	**Cows**	**Sheep**	total						
C-01T	225	18000	3750	3200	6950	4000	28950	8760	20190	50%	45%
C-02П	0	0	15410	0	15410	6192	21602	12340	9262	42%	32%
C-03П	0	0	13 300	0	13 300	3600	16900	9360	7540	40%	33%
C-04T	0	0	2301	0	2301	3400	5701	6280	-579	-7%	-5%
D-01T	0	0	6675	0	6675	11,000	17 675	9760	7915	40%	26%
D-02T	0	0	950	0	950	3400	4350	6480	-2130	-32%	-21%
D-03P	0	0	17550	0	17550	10,000	27550	6880	20 670	66%	50%
D-	90	720	4950	1080	6030	7400	2063	6280	14	67%	50%

04T		0					0		350		
D-05T	0	0	3760	0	3760	800	4560	6680	-2120	-10%	-10%

Eastnickname: Sat.natural fromnumbers.



The real options when assessing the possibilities for restructuring of small agricultural holdings

• Overtaking off na landsdelta activity;atter alternative. One of them provides for the Farm S-01T. This farm is expected to have 1 cow left for milk production and transition to dairy sheep breeding with overstatement on count on the sheep mothers from 150 to 200 pieces. Investments in the repair of stable for 50BGN 000 in 2010 (t = 0), purchase of equipment and attached equipment for BGN 20 000 in 2011 (t = 1) and BGN 10,000 investments in 2012 (t = 2). The farm envisages a change in the variable costs and no change in the purchase prices of milk. During the individual periods, the probabilities (P) for the investments are presented and in column P the calculated total probabilities for each of the options for restructuring the holding are presented (Scheme 2).

Forcalculation of the net present value (NRS) during the individual periods is added the profit from the activity before the restructuring of the farm - in this case BGN 20,190. 25 presents the calculation of NSS for farm C-01T.

Analysis of the C-01T project through the decision tree

Options	t = 0	t = 1	t = 2		t = 3	t = 4	t = 5	t = 6	P
D				0.2	31310	31310	31310	31310	0.192
G			-10000	0.4	31130	31130	31130	31130	0.192
IN				0.4	30950	30950	30950	30950	0.096
		0.6							0.48
	0.8	-20000	STOP						
B	-50000	0.4							0.32
A	0.2	STOP							0.2

Scheme 2. *Analysis of the C-01T project through the decision tree Eastnickname:* Sat.natural fromnumbers.

The result of the calculation of the NSS with the application on the RO method is BGN 9,328. A similar result of BGN 12,505 is obtained from the calculation of the NSS by the traditional method

based on the price ratios of option "B".

Farm S-02P. This farm is expected to leave 1 cow for milk production and switch todairy sheep breeding with the purchase of 50 pcs. ewes. Investments in repair of the barn for BGN 15,000 in 2010 (t = 0), purchase of equipment and attached equipment for BGN 15,000 in 2011 (t = 1) and BGN 12,500 investments for animals are envisaged. in 2012 (t = 2). The farm envisages a change in the variable costs and a change in the purchase prices of milk. During the individual periods, the probabilities (P) for the investments are presented and in column P the calculated total probabilities for each of the options for restructuring the holding are presented (Scheme 3).

Forcalculation of the net present value (NSS) during the separate periods is added the profit from the activity before the restructuring of the farm - in this case BGN 9262. On the table.

Table 25. *NSS calculation for the C-01T project with a deferral option*

Indicators/ period	t = 0	t = 1	t = 2	t = 3	t = 4	t = 5	t = 6	NSS	P	HCC * P
Expenses/ income BGN:										
Option D	-29 810	190	10190	31 310	31 310	31 310	31 310			
Option D				31 130	31 130	31 130	31 130			
Option B				30 950	30 950	30 950	30 950			
Discount rate	0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523			
Presenta BGN value:										
Option D	-26 616	151	7253	19 898	17 766	15 863	14 163	48 478	0.192 th most comm on	9308
Option D	-26 616	151	7253	19 784	17 664	15 771	14 082	48 089	0.192 th most comm on	9233
Option B	-26 616	151	7253	19 669	17 562	15 680	14,000	47 700	0.096	4579
Option B	-26 616	151						-26 465	0.32	-8469
Option A	-26 616							-26 616	0.2	-5323

NSS of the project BGN										9328

Source: *Own calculations.*

Analysis of the C-02P project through the decision tree

Options	t = 0	t = 1	t = 2		t = 3	t = 4	t = 5	t = 6	P
D				0.2	4311	4311	4311	4311	0.192
G			-12500	0.4	5696	5696	5696	5696	0.192
IN				0.4	7047	7047	7047	7047	0.096
		0.6							0.48
	0.8	-15000	STOP						
B	-15000	0.4							0.32
A	0.2	STOP							0.2

Scheme 3. *Analysis of the C-02T project through the decision tree Eastnickname:* Sat.natural fromnumbers.

Table 26. *Calculation of NSS for the project C-02P with deferral option*

Indicators/ period	t = 0	t = 1	t = 2	t = 3	t = 4	t = 5	t = 6	NSS	P	HCC * P
Expenses/ BGN revenues:										
Option D	-5738	-5738	-3238	4311	4311	4311	4311			
Option D				5696	5696	5696	5696			
Option B				7047	7047	7047	7047			
Discount norm	0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523			
Presenta BGN value:										
Option D	-5123	-4574	-2305	2740	2446	2184	1950	-2683	0.192 th most com	-515

									mon	
Option D	-5123	-4574	-2305	3620	3232	2886	2576	311	0.192 th most com mon	60
Option B	-5123	-4574	-2305	4478	3999	3570	3188	3232	0.096	310
Option B	-5123	-4574						-9698	0.32	-3103
Option A	-5123							-5123	0.2	-1025
NSS of the project BGN										**-4273**

Eastnickname: Sat.natural fromnumbers.

In this farm, the real options method shows a negative NSS value for the project of BGN 4273, which meansthat the project is inadmissible from the point of view of the method. A similar negative result for NSS of BGN 13,961 is obtained from the calculation of NSS by the traditional method based on the price ratios of option "B".

Farm S-04P. This farm is expected to leave 1 cow for milk production and switch to млечно sheepdstvo with orderhope na 100 no. sheepis mothers. Investments in the repair of the barn for BGN 20,000 are envisaged in 2010 d. (t = 0),, orderhope na technique and attached inventoryp witha 7500 BGN through 2011 d. (t = 1) and 7500 BGN investations witha animaland through 2012 years(t = 2). The farm envisages a change in the variable costs and a change in the purchase prices of milk. During the individual periods the probabilities (P) for the investments are presented and in column P the calculated total probabilities for each of the options for farm restructuring (Scheme 4).

Analysis of project C-04T through the decision tree

Options	t = 0	t = 1	t = 2		t = 3	t = 4	t = 5	t = 6	P
D				0.2	14164	14164	14164	14164	0.192

G			-7500	0.4	16288	16288	16288	16288	0.192
IN				0.4	17764	17764	17764	17764	0.096
		0.6							0.48
	0.8	-7500	STOP						
B	-15000	0.4							0.32
A	0.2	STOP							0.2

Scheme 4. *Analysis of the C-04T project through the decision tree Eastnickname:* Sat.natural fromnumbers.

For calculation of the net present value (NRC) during the separate periods is added the result of the activity before the restructuring of the farm, ie in this case - BGN 579. The calculation of NSS for farm S-04T is presented in table. 27.

Unlike the previous two analyzed farms, here the assessment on the basis of the traditional method on the basis of the price ratios of option "B" NSS is a positive number (BGN 7839), while on the RO method the result of NSS is negative (-9212 BGN).

Analyzed holdings should strive for improvementthe conditions of animal husbandry, to increase their productivity and the introduction of hygiene standards to ensure the quality of milk produced. The analysis of the investment intentions with a deferred option shows that the dynamic factors related to the changes in prices and materials require an increase in the planned investments in ewes. The minimum size of the flocks must be increased on holding C-02P from 50 per 100 ewes and on holding C-04T by 100 to 135 ewes.

Table 27. *NSS calculation for the S-04T project with a deferral option*

Indicators/ period	t = 0	t = 1	t = 2	t = 3	t = 4	t = 5	t = 6	NSS	P	HCC * P
Expenses/ BGN revenues:										
Option D	-20 579	-807 9	-8079	14 164	14 164	14 164	14 164			
Option D				16 288	16 288	16 288	16 288			
Option B				17	17	17	17			

				764	764	764	764			
Discount norm	0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523			
Everythinggashna BGN value:										
Option D	-18 374	-6441	-5750	9001	8037	7176	6407	56	0.096	5
Option D	-18 374	-6441	-5750	10 351	9242	8252	7368	4648	0.192 th most common	892
Option B	-18 374	-6441	-5750	11 289	10 080	9000	8036	7839	0.192 th most common	1505
Option B	-18 374	-6441						-24 815	0.32	-7941
Option A	-18 374							-18 374	0.2	-3675
NSS of project BGN										-9212

Eastnickname: Sat.natural fromnumbers.

From the point of view of the development of the dairy sector in the country and the preservation of the potential it is appropriate to develop a special program for restructuring of the semi-market dairy cattle breeding farms, неporадащи in first categoriesI. and yes sis prestructured in dairy sheep farms.

The made investment analysis and the applications of RO analysis in livestock PPP there is for purpose Yes further development the assessment of inveinstitutions in landthe summer. Dockabout the investmentis resolutions are of a strategic nature they can be take during the period ofthe investment. The evaluation of these strategic decisions affects the evaluation of investment projects, which can be modeled as options. The application of RO analysis complements the static NSS analysis and contributes to the incorporation of risk and uncertainty in the

investment analysis. This makes RO analysis very suitable for evaluating investment projects in agriculture.

5. CONCLUSION

IN The monograph presents a modern methodology that can be used to manage uncertainty in making strategic investment decisions in agriculture with an emphasis on small farms.

Based on the concept of agriculture are analyzedmodern systems of innovation and knowledge. The need to implement innovations in rural areas, mainly through small farms, has been highlighted. The connection between innovations and options in decision-making from the point of view of their implementation in farms is emphasized. An analysis of traditional methods for evaluating investments, their advantages and disadvantages.

The link between uncertainty in farm management and investment has been revealed in the direction of different approaches witha analwith na riska. IN reslast aboutt madeI analysis the holistic is the approach that best optimizes the relationship between markets, government policy and farming strategies.

Considering in theory the management strategies of the risk prepares the basis for applying the method of real optionswhen evaluating strategic investments. That is why the main emphasis is placed on market risk management strategies based on futures and insurance contracts.

On the basis of the New Institutional Economy and the transaction costs in methodological terms the logic for concluding effective insurance contracts in landthe summer. Informationala asymmetry is analyzeda catabout a friend the sameчник of market inefficiency.

The role of government is seen in terms of uncertaintyin agriculture, depending on whether the country's economy provides the most appropriate "set" of markets. The role of the government in this process is defined.

A comparative analysis of the traditional methods of analysis is made and this one on the real ones options. The traditional methods for investment evaluation take into account the future with a degree of certainty,which implies a passive approach to investment analysis. Traditional models such as net present value suggest that managers have no flexibility to change

in the investment choice and the decision is "everything" or "nothing". The analysis of real options as an instrument for investment decisions surpasses other similar instruments in the quantitative measurement of uncertainty and correctly models the managementflexibility, which can be as follows: "to give up", "to exercise", or "to wait". From a theoretical point of view, an analysis of the application of real options is made.

Based on the typical dualistic structure of agricultural holdings in the country has been developed the typology of these holdings based on the standard production volume indicator. Special attention is paid to small agricultural holdings and the indicators that can be used to define them.

The analysis of real options is a tool for evaluating investment decisions or strategic development plans in the conditionsof uncertainty. It is a quantitative method for monitoring, measuring and regulating decisions when economic conditions change.

Strategic risks are usually unpredictable and their management requires a set of assessment and decision-making tools. It is adapted for the needs of agricultural holdingsmethodological framework, including a set of tools such as scenario analysis, rating system and risk mapping, payment matrix, decision tree, portfolio of real options. This is an analytical framework for agricultural holdings, through which quick decisions can be made in situations where there is a high degree of uncertainty and the holding has access to a limited amount of information.

The real options are a flexible approach to overcoming neothe limit (possiblesti witha theychnologically and ecoproduction,economic efficiency of production, market prices and trade opportunities). The essence of this method is the basis for developing future business alternatives and making the right decisions. When applying the method, an attempt is made to reduce the risk by monitoring the implementation of its decisions and at the same time the necessary management decisions to be adaptable throughout the life cycle of the project.

The proposed Methodological tools are new for the economic practice in our country and for this reason it is important theoriesCzech and practical knows.

First - this is a new approach as a methodology and framework for evaluation and analysis of investment solutions in agriculture and in in particular - c malkite landlski farms.

Second - this is a methodological approach to managing uncertainty in making strategic investment decisions and these

decisions take into account the maximum possible alternatives. in pelvisand onjuice.

Third - this new one approach for evaluation on investment decisions in agriculture is crucial in the restructuring of agricultural holdings in changing market conditions, individual regions and government policies.

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