

# APPLYING SWOT ANALYSIS IN ASSESSING THE CAPACITY OF AGRICULTURAL PRODUCTION IN CONDITIONS OF DROUGHT AND CHANGING CLIMATE

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**Abstract:** Soil and water resources, used for the needs of farming production are strategically important on a regional, national and global scale. One of these resources – soils, has an extremely long recovery period, hence it is assumed practically unrecoverable. The second resource – water, has the property of not being wasted in nature; in fact, it only changes its physical state, and is purified if in movement. At the same time, due to considerably short-sighted human activity, a process of aeration sets over already fertile arable land, precipitation changes location, as well as intensity.

Analysing strengths and weaknesses of applying technological processes in farming, especially in the conditions of prolonged droughts and changing climate, will be crucial to making the right decisions, concerning the development of farming production technologies. But mere analyses, no matter how detailed and accurate they are, will be useless without the next step-planning.

Therefore, applying SWOT analysis as a tool can help the awareness of guidelines and failures during the strategic planning for the usage of these irreplaceable natural resources.

**Key words:** AGRICULTURAL PRODUCTION, SWOT ANALYSIS

## 1. Introduction

As with other systems, the technological processes in agriculture can be analysed when the four factors, identifying the object under review, are considered. They are: S (Strengths); W (Weaknesses); O (Opportunities); T (Threats), Table 1.

**Table 1.** Main factors influencing the implementation of technological processes

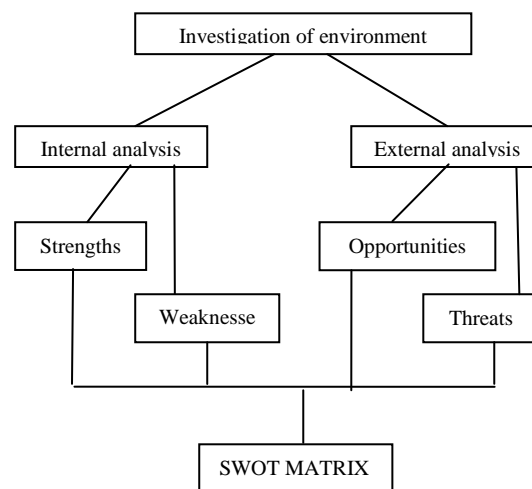
	Positive influence	Negative influence
External environment	Strengths	Weaknesses
Internal environment	Opportunities	Threats

Investigating carefully the external and the internal environments, where the agricultural production is developing, is an important part of the process of its optimisation. Moreover, the optimization of the technological processes with the aim to prevent the negative impact of climate changes is a matter of strategic planning. Consequently, using the SWOT analysis, we can formulate the strategy for development of agriculture in the conditions of drought and changing climate.

The Strengths and Weaknesses are *internal factors*, which create or destroy quality. They may include assets, skills and resources, which the agricultural producers have at their disposal as opposed to their competitors. These can be measured by using internal assessment or comparison to the best practices – internal or external for the system of agricultural production.

The Opportunities and Threats are *external factors*, which also create or destroy quality. They cannot be controlled by the farmers. They are outlined either by the dynamics of competition in the agricultural sector of the market, or by climate, demographic, economic, political, technological, social, legislative and other factors.

Through SWOT analysis information is presented, which is useful for the critical comparison of the resources and the potential of the agricultural sector to face the competitive environment in which it operates, fig.1.



**Fig1.** Analysis of the agricultural production environment

**The Strengths** of agricultural production are the resources (soil, water, climate), and the abilities of specialists, producers and suppliers, which can be used as a foundation for creating a competitive advantage: producing healthy foods, their enhanced demand, availability of upgraded facilities, high VAT from implementation of innovations, relatively low cost of raw materials, farmers with established good reputation, price advantage of own know-how, exclusive access to real natural resources, etc. The Strengths are characteristics of the agricultural production that help to achieve the goal of this investigation – namely, improvement of the technological processes in the conditions of drought and changing climate. One of the answers can be sought in the ways of using these Strengths.

**The Weaknesses** of agricultural production can be viewed also as lack of compelling strengths; lack of protection of applicable technologies; poor reputation among customers; expensive equipment, which in some cases is an end in itself; no access to the best soil resources, etc. The weaknesses are characteristics of the agricultural production, which prevent the attainment of the goal. In this case, we should look for an answer to the question: How can Weaknesses become Strengths?

Through an analysis of the environment, and in terms of the opportunities provided by the agricultural production technologies, they can be identified as a means of economic growth and environmental renewal. It is possible, as a result of the environment analysis to find compelling new opportunities for improvement such as maintaining and increasing soil fertility, increasing the yields, conserving soils and water.

**Threats** for agricultural production can also be presented as changes in the external environment: climate change, changes in machine constructions, which require additional investments, developing alternative technologies, increased demands on protection of natural resources, etc. Threats are the external conditions, which can delay, hinder or directly interfere with the implementation of innovation technologies. When analyzing the threats, we should be looking for an answer to the question: How can agricultural production be protected from any threat?

Strategies for improving the technological processes through applying expanded SWOT analysis.

**2. Materials and methods**

A combination of internal and external factors can be used in the different strategies for improving the technological processes in the conditions of drought and changing climate, Table 2.

**Table 2.** Possible strategies for improving the technological processes

SWOT analysis		Internal environment	
		Strengths	Weaknesses
External environment	Opportunities	<u>S-O strategies:</u> Using the opportunities for implementation of the strengths	<u>W-O strategies:</u> Eliminating weaknesses for creating new opportunities
	Threats	<u>S-T strategies:</u> Using the strengths for eliminating the threats	<u>W-T strategies:</u> Developing strategies preventing the activation of weaknesses by threats

The strengths of the SWOT analysis in agriculture must correspond and give answers to the following questions:

What are the advantages of the improved technological processes compared to the commonly used classical ones?

What is it that provides an advantage of the improved technological processes over all others?

Does agriculture have at its disposal unique or very good profitable technologies, which other producers do not have?

Which are the factors, helping the farmers to conserve the soils, preserve the soil fertility and increase their yields?

Which is the unique proposal, which can be used for improving the technological processes without waste of time and resources?

Strengths in a SWOT analysis in agriculture could be anything that forms a competitive advantage.

Weaknesses could include using inappropriate technologies or expensive resources, lack of patent protection, bad reputation among the producers, no access to quality natural resources, unfavorable access to information, etc. The analysis of the weaknesses should provide answers to the following questions:

What can be improved in the production technologies?

Which technologies, so far applied in agricultural production, should be avoided because they no longer provide high enough dividends?

What is a weakness of agricultural production according to those dealing with agriculture?

Which are the reasons for farmers to miss innovation moments?

In most of the cases a weakness can be the opposite of a strength. For example, the vast arable land of an agricultural production unit can be its strength, but it can turn into a weakness in periods when the company cannot use this land due to insufficient availability of equipment, climate changes in the

form of intensive erosion rainfall and inability to carry out agro-technical measures in optimal time, etc.

When the opportunities are reviewed, it is advisable to analyse the strengths, in order to determine whether they are a prerequisite for finding new opportunities. Alternatively, the weaknesses could be analysed to find out whether it would not be possible to find new opportunities by eliminating the weaknesses. The analysis of the opportunities should provide answers to the following questions:

What good opportunities exist for improving the technological processes in agriculture?

What interesting technological innovations come on the agenda?

In this case, the beneficial opportunities may come through changes in technology, the equipment used, etc.

The analysis of threats is crucial and must provide answers to a number of questions such as:

What obstacles do farmers face?

What is the competition doing?

Are quality standards and requirements for agricultural production changing?

How do changes in technologies and improvements of technological processes affect the agricultural producers?

Can any of the weaknesses threaten the positions of agricultural production seriously?

**Table 3.** SWOT analysis of agricultural production (grain production)

<u>Strengths</u>	<u>Weaknesses</u>
<ul style="list-style-type: none"> <li>• Long-standing traditions in the field of agriculture</li> <li>• Continuous growth of food demand</li> <li>• Good reputation of those dealing with agricultural production</li> <li>• Active relationship with the research institutes and universities</li> <li>• Favourable soil and climate conditions for the development of agricultural production</li> <li>• Availability of potential irrigation</li> <li>• Upgraded tractor and equipment fleet</li> <li>• Availability on the market of good quality sowing material</li> <li>• Well developed world chemical industry and presenting good quality pesticides on the market</li> <li>• Opportunities for continuous improvement of skills and knowledge</li> <li>• Opportunities for specialization</li> </ul>	<ul style="list-style-type: none"> <li>• Continuous application of conventional technologies for tillage</li> <li>• Annual deep tillage</li> <li>• High yields due mainly to application of mineral fertilizers and pesticides</li> <li>• Continuous decrease of organic content in the soil</li> <li>• Continuous increase of the weight of machinery used</li> <li>• Using the machinery in conditions that are inadequate for the health of the soil (at degraded physical and mechanical properties)</li> <li>• Highly reduced use of organic fertilizers</li> <li>• Morally and physically obsolete irrigation systems, which are already destroyed</li> <li>• Reducing the productive soil layer as a result of erosion processes</li> <li>• Growing of row crops on sloped terrains with tillage in the direction of the slope</li> <li>• Not using the ability</li> </ul>

<p>abroad under international programmes</p> <ul style="list-style-type: none"> <li>• Experience in soil conservation in developed countries through application of modern technologies</li> <li>• Production and import of advanced machinery and equipment</li> </ul>	<p>of the plants to cover the soil and protect it from degradation processes</p> <ul style="list-style-type: none"> <li>• Not using the so called „cover plants“</li> <li>• Conservative attitude to implementing innovations in agriculture</li> <li>• Presence of various forms of land management</li> </ul>
<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• Participation in the Common Agricultural policy of the European Union (politics, business and media impact)</li> <li>• Developing pilot projects</li> <li>• Development of technologies and innovations</li> </ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Demographic collapse in the population, dealing with agriculture</li> <li>• Climate change</li> <li>• Prolonged droughts</li> <li>• Presence of intense rainfall, causing erosion processes</li> <li>• Desertification of vast regions, including Europe, and loss of arable land</li> <li>• Soil degradation</li> <li>• Reduced yields</li> <li>• Reduced interest to agriculture</li> </ul>

	demonstration in real conditions.
User	Who is it offered? It is offered to all concerned such as farmers, scientific organisations, sponsoring institutions, regional directorates, offices for counselling services in agriculture, the Ministry of Agriculture and foods (MAF)
Distribution	How to reach the user? Through demonstrations on the spot, applying mass planting, involvement in demonstration trials of leading seed producing companies, councils, advertising materials, etc.
Finance	Prices, investment costs.
Management	How to manage the product offered?

**Putting the SWOT analysis into action**

With this table full of information, it is necessary to prepare a list of ideas, which will be transformed into specific goals. The main objective is to concentrate on the relation “Strengths – Opportunities”, i.e. how the strengths of agricultural production can become most beneficial for the opportunities, which will become the target of technological innovations.

Another possibility for ideas is to review the weaknesses of agricultural production and to decide how to neutralise them, taking into account the strengths.

A third possibility is to review the opportunities for farmers and to decide whether they themselves have a hidden potential for eliminating some threats.

Generally, Albert Humphry recommends the development of objectives and action plans in six fields. These six fields (categories) outline the frame for practical use of the SWOT analysis, Table 4.

In this case, the SWOT analysis is applied for optimization of the technological processes in agriculture.

**Table 4. Directions for using the SWOT analysis**

Spheres	Directions for development
Product	The product “Technology for soil conservation through reducing the number of treatments and using the so called “cover crops”.
Product	How is the product offered? The technology and the set of machinery are offered as

Putting the SWOT analysis in action through the six categories, provides the direction needed for research, since these six categories identify what a farmer should do. Thus in all six categories accurate measurements can be used, and the analysis becomes more focused, specific and controllable.

**Combining the elements of the SWOT analysis**

Using the four elements of the SWOT analysis– strengths, weaknesses, opportunities and threats, we can trace the results from combining those elements in pairs. In each pair there is one element, inherent to the internal environment (strength or weakness), as well as one element, inherent to the external environment (opportunity or threat).

**Combining Strengths and Opportunities**

It is exactly here that the priorities in the development of technologies should be used. On the basis of their strengths and the existing opportunities, farmers should plan activities, from which to derive maximum favourable outcomes. It would be favourable in that it would most probably result in the highest possible yields. Besides, it will probably be the fastest and the easiest mode of action.

**Combining „Weaknesses and Opportunities**

Careful analysis of weaknesses can unlock interesting potential opportunities for development, which could bring good return.

The Opportunities could also have higher return than that from the combination Strengths and Opportunities, due to the change and the unexpected benefits, which can be drawn from agriculture, if weaknesses are to be analysed and corrected successfully.

If farmers see realistic opportunities for eliminating their weaknesses and taking advantage of improvements that can bring sustainable benefits, then they should direct their efforts into doing this.

**Combining Strengths and Threats**

In this area, agriculture has easy opportunities for protection and counteraction to threats, due to its Strengths, which can be used to neutralise the threats. The investment of time and resources in such endeavours is reliable and secure in general.

**Combining Weaknesses and Threats**

The combination weaknesses and threats brings a potentially high risk to agriculture. The correct risk evaluation is of critical importance.

If the risk value is low, the farmers could ignore the threats and not to be distracted when undertaking any activity.

If the risk value is high, then actions should be planned for neutralising the weaknesses. These actions should be clear, specific and carefully considered, since the danger of failure and trouble is serious.

Every production unit (farmer, cooperation or another type of association) should strive for adaptation to the local environment. SWOT analysis is a very good tool for analysis of internal strengths and weaknesses and of external opportunities and threats. This is just the first step to taking the environment into account. The real adaptation to the external environment is often the hardest activity for the production unit.

In order to create a strategy, which takes into account the profile made through the SWOT analysis, a matrix of the identified factors should be developed – TOWS matrix. This matrix is viewed as a set of tools for combining internal and external factors, and it is sometimes called *Opposing matrix*, Table 5.

**Table 5. Strategy Building Matrix**

	Opportunities	Threats
Strengths	<p><u>Offensive strategy (S-O)</u></p> <p>Pursuing opportunities, which correspond to the strengths of agriculture</p>	<p><u>Adaptive strategy (S-T)</u></p> <p>Identifying ways for using the strengths of a company to reduce its vulnerability to external threats</p>
Weaknesses	<p><u>Defensive strategy (W-O)</u></p> <p>Overcoming weaknesses through pursuing opportunities</p>	<p><u>Survival strategy (W-T)</u></p> <p>Creating a defensive plan with the aim to prevent the weaknesses from making farmers too vulnerable to external threats.</p>

Another interpretation of the strategies reviewed is possible:

- *Offensive strategy – maxi-maxi strategy*: agricultural production is a powerful system, and the external environment is quite favourable, which gives the possibility to adopt a more ambitious strategy;

- *Adaptive strategy – strategy maxi-mini*: we have strong organisation of agricultural production and unfavourable external environment. This calls for adopting a strategy for overcoming the threats;

- *ODefensive strategy – strategy mini-maxi*: agricultural production is weak, but the external environment is favourable – this combination shows that a strategy should be embarked on, which is related to strengthening agriculture through internal changes in the organisation;

- *Survival strategy – strategy mini-mini*: weak agricultural production and organisation in an unfavourable external environment. This combination would put agriculture in the most unfavourable situation and any action undertaken, would be doomed to failure.

**Advantages of SWOT analysis:**

- Easy to develop;
- Generates new ideas for taking advantage of the strengths and protects from threats;
- Awareness of the respective threats allows the development of preventive action plans.

**Disadvantages of SWOT analysis:**

- It can be understood as a list of ideas, without proposing what is really important for achieving of your goals;
- Presents the ideas uncritically and without clear priorities, so there can be weak opportunities for balancing strong threats;
- The result is usually a simple list of ideas, presented rather uncritically

### 3. Conclusions

- The SWOT analysis is an extremely useful tool for understanding different situations and making decisions for improving the technological processes in the conditions of drought and changing climate. It provides the necessary frame for reviewing the strategy and identifies the best direction for development of the technological processes in agriculture.

- The strengths and weaknesses are an integral part of the agricultural producers, who can be influenced and controlled directly. The opportunities and threats are external “things”, which should be taken into account, but cannot be influenced directly and they are out of control.

- After the strengths and weaknesses, as well as the opportunities and threats have been identified, the analysts should take advantage of the strengths, to decrease or neutralise the weaknesses, to invest in the opportunities and heed the threats.

- Concerning the internal elements of the SWOT matrix – the strengths and weaknesses, are identified on the basis of information from research, focus groups, levels of satisfaction, etc., information from employees, as well as on the basis of the capacity of farms, resources available and the internal processes occurring in them.

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