# Strategic Methods for Managing Risk Insurance in Crop Production

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**Abstract:**

Doing any entrepreneurial activity takes place under conditions of risk and uncertainty. Agricultural production is distinguished by a special risk environment, since it manifests natural and climatic risks that are very dangerous and have the maximum effect on the final results of operations. At the same time, the economic damage caused by them is not only comparable to the scale of the financial results of commodity producers, but periodically exceeds them. Households also suffer losses as a result of the risks that are traditional for any commercial activity (production, marketing, financial): the size of these losses is large, difficult to estimate, and the consequences are disastrous. Therefore, the complex impact of agricultural risks obliges commodity producers to put stability and guaranteed result in the first place in the system of their interests.

**Keywords** crop production; strategic management; insurance; risk; insurance system; agricultural insurance

**JEL Classification:** M21; M29

## Introduction

Today, insurance is a necessary sign of a civilized, modern and efficient business system. At the same time, insurance in agriculture and in our country in particular, is one of the riskiest sectors of the economy, since agriculture in Kazakhstan is carried out in unpredictable and unregulated natural and climatic conditions. At present, the existing fundamental shortcomings of the compulsory insurance mechanism in crop production make it necessary to develop new, principled and clear approaches to financial and credit policy, more relevant to the needs of agricultural producers.

Crop production in Kazakhstan is a successful and long-growing industry in agriculture with a large export potential, that the efforts of the government allowed domestic farmers not only to stand on their feet, but also to exceed the figures of the Soviet era. In addition, consequently, here the strategy takes into account the favorable situation for the country (which developed not by itself, but thanks to timely measures) in order to maintain the development trend in the future.

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## 1. Literature review

In theory, Gobbi insurance is considered as the distribution between many individuals of future, unknown and random needs. V.I. Serebrovsky, considering the theory of Gobbi as a fundamental idea, believed that the main purpose of insurance is to satisfy a random need. In fact, as insurance practice shows, insurance is intended, first, to satisfy the property and monetary needs of citizens and legal entities that arise when certain random circumstances occur (Gracheva and Boltinova 2011).

So, for example, Grave and Lunts (1960) under insurance in the broad sense of the word understood, first of all, a set of measures to create material and (or) cash resources, through which the damage is repaired, losses in the public sector are restored during natural disasters or accidents. In conditions when private ownership becomes predominant, when private entrepreneurship develops, there is a need to protect personal and property interests from not only unforeseen natural, technological and other phenomena, but also a wide range of risks associated with entrepreneurial activities from agricultural producers. It is in these conditions that insurance acquires special significance (Reitman 2016).

The existing insurance system in crop production is obligatory and determines the conditions of the standard policy of insurance of direct production costs, which all insurance companies and EIA are obliged to keep, including the crops and risks that have been insured, the amount of insurance for each crop at each regional and district level. However, at present insurance in agriculture is regulated by the Law of the Republic of Kazakhstan dated March 10, 2004 No. 533 “On Compulsory Insurance in Crop Production” aimed at financially protecting agricultural producers from possible losses in the event of crop failure and, although the existing agricultural insurance model is constantly changed and supplemented, it still has a number of unresolved problems that concern both insurers, who are less and less active in this market segment, and agricultural private producers, constantly reducing the demand for the services of insurance companies (Law 2004). The presence of a number of problems does not allow this type of insurance to reveal its potential and increase its share in the total market volume.

Given the importance of the agricultural sector in the country's economy and its dependence on natural and climatic conditions, insurance in crop production was classified as a mandatory species (Law 2006). However, compulsory insurance of farmland has not led to proper risk management in the agricultural sector.

In his research on risk management, Malashikhina (2014) notes that agricultural producers face many risks: price fluctuations, yields, partial or complete loss of resources, and changes in government policy. In addition, agricultural production is at risk of natural disasters and emergencies. Such natural hazards as drought, hail, flood, can lead to serious industrial losses.

Since Kazakhstan is located in the area of highly risky farming, where the average annual frequency of drought is 40% (2 years out of 5), and in the west of the country reaches 60% (3 years out of 5), the problem of frequent adverse weather events is further complicated by their systemic character, when droughts or floods affect vast areas of the country's agricultural lands, they can lead to massive (unpredictable) losses for agricultural producers (hereinafter referred to as agricultural farming). The consequences of adverse weather conditions also have an impact on the financial stability and solvency of agricultural producers, who are mostly borrowers for loans and most often, such loans are provided through government concessional loans.

In his publication, Kruglov (2011) explains that the insurers themselves note the unprofitability of insurance of agricultural crops associated with the presence of a high risk of farming in the regions of the country and the inadequacy of insurance tariffs. Unprofitability also depends on the activities of agricultural producers themselves, who do not seek to improve production technologies, and in some cases do not comply with certain crop standards, which often leads to yield loss even with a slight deterioration in weather conditions. Under these conditions, for the state an important task is to ensure the effectiveness of investments, as well as support and stimulate the growth of agricultural production.

## 2. Methodology

In the theory and practice of insurance, Zhuravlev and Sekerzh (2013) note that in many countries the state directly intervenes and regulates the situation on the domestic market of agricultural products, thus trying to reduce the problems associated with the risk in agricultural production. However, nowadays, in the context of growing globalization and the associated liberalization of markets, such risk management tools lose their legitimacy. In connection with this, in many, first, developed countries, the issue of developing and wider dissemination of risk reduction strategies based on market mechanisms and complying with WTO rules becomes relevant. Insurance is one of the tools whose use does not violate WTO rules and can potentially serve as an effective tool for stabilizing the incomes of agricultural producers and the rural population as a whole.

International experience in solving such problems is associated with the introduction of agricultural insurance schemes. Building a comprehensive system of agricultural insurance in the Republic of Kazakhstan on market conditions with the participation of professional participants of the insurance market and on the basis of advanced market technologies ensures the solution of three tasks simultaneously:

- consists in protecting agricultural producers from the loss of crops due to the influence of adverse weather events.
- to assist agricultural producers in gaining access to rural finance, which protects loans from default due to weather conditions.
- to improve the effectiveness of government programs to support crop production.

In the Republic of Kazakhstan, the Law "On Compulsory Insurance in Crop Production" is currently in force, which should provide at least minimal protection for agricultural producers. The purpose of compulsory insurance in crop production is to protect the property interests of the producer of crop production from the consequences of adverse natural phenomena that entailed partial or complete loss of the crop, through insurance payments in cases, amount and procedure stipulated by the Law of the Republic of Kazakhstan N 533-II "On Mandatory Insurance crop production "dated March 10, 2004 (with further changes and additions) (Law 2004). But after 10 years, the main problems of the current Law were revealed, which are as follows:

*1) Systemic risk and lack of risk management*. The problem of frequent adverse weather events leads to significant losses for insurers. For insurers, by virtue of the obligation of the Law, it is not possible to refuse insurance to an unfair agricultural producer even if there is an obvious moral hazard (fraud). The situation is aggravated by the fact that the Law does not provide for regional or global diversification of risks through reinsurance.

*2) Insufficient insurance rates*. The law defines the minimum and maximum rates for different crops. In practice, insurance premiums are calculated at the minimum rate due to fierce competition between insurers and mutual insurance societies (EIA), and this practice, as practice has shown, is not sufficient to form a reserve of future insurance payments, which jeopardizes financial stability and sometimes even solvency insurer and OBC. Also, for participating in insurance of EBC, the possibility of reducing the tariff below the minimum is provided for, which leads to insurance from the side of the EIA at tariffs 2-3 times lower than the minimum. Current tariffs were calculated in 2005 and have not been updated since then, which is unacceptable from the point of view of adequacy of tariffs to the level of risk.

*3) Inefficiency of current government subsidies.* Currently, state support within the framework of the Law is provided at the expense of 50% reimbursement to insurance companies and mutual insurance societies of the amount of insurance payments. The existing mechanism of subsidizing insurance payments reduces the motivation of insurance companies and the EIA for proper assessment of losses and contributes to moral hazard, which can lead to collusion between the insurer and the insurer to overstate the amount of insurance payments.

*4) There is no regulation of mutual insurance societies.* In connection with the departure of most commercial insurers from the crop insurance market due to high unprofitability and unfair competition, agricultural producers increasingly rely on cooperation with the Mutual Insurance Societies, which are most often established by them. Since the EIA is not subject to insurance supervision by the National Bank or any audit requirements, the risk of inadequate loss assessment and fraud by the EIA is high. In the absence of reserves of losses, solvency margins and reinsurance of the EIA can not provide any significant insurance coverage against natural disasters and, thus, can not be considered as underwriters and organizations that can handle the risks. At best, the MRA may act as a so-called mutual aid fund, whose obligations are limited to the amount of the annual insurance premium collected from its members. But such an approach can only work for diversified risks and is completely unsuitable for highly correlated risks, as a result of which annual losses can easily exceed premium charges.

*5) Imperfect loss settlement system.* Since the Law does not provide for the participation of insurers in inspecting insurers, analyzing agricultural production practices and restricting insurers 'participation in damage assessment, insurers have no incentive to properly take care of improving agricultural technologies and make their crops more resilient to climate change. As a result, the Law does not allow the insurer to refuse to pay insurance indemnity, even in cases of obvious fraud (for example, when agricultural producers argue that there was a crop loss due to a natural disaster, although the field was never planted).

Considering these moments, as Prosandeeva (2016) notes in her articles, certain forms of contracts, methods of payment, other documents are already quite typed, but the entire agricultural insurance service does not yet have a complete form that is clear and comfortable for the agricultural producer. This requires additional

work on its development, and, with the participation of all parties to agricultural insurance: insurance companies, associations of insurers and agricultural producers, government agencies and support for agricultural insurance.

In this regard, we would like to note that ensuring the country's food and economic security, the social importance of agriculture and its dependence on climatic and many other external factors require state support for this sector of the economy.

Shumilina (2012) in its publications on state support of the agricultural insurance system, states that a high degree of dependence of crop production on weather conditions is the main reason for the development and implementation of index schemes for insuring risks to agricultural organizations, which are based on the frequency of occurrence of certain adverse weather events, their size and intensity.

World experience shows that in most countries this support is carried out through various channels, among which insurance is not the last, the indicators of which are shown in Table 1 by the example of the EU member countries.

Table 1. Agricultural insurance indicators in EU member states for 2017

| Country | The degree of insurance coverage,% | Insurance Subsidies | |
|---|---|---|---|
| | | M€ | % insurance premium |
| Austria | 78 | 24 | 46 |
| Cyprus | 100 | 4,4 | 50 |
| Czech Republic | 35 | 7 | 30 |
| Germany | 43 | 0 | 0 |
| Italy | 8 | 180 | 67 |
| Latvia | less that 1 | 0,05 | 50 |
| Portugal | 22 | 32 | 68 |
| Spain | 26 | 232 | 41 |
| Total from EU | | 497 | 32 |

Source: compiled by authors according to www.actuary.kz

By the example of the EU member states, Cyprus can see 100% insurance coverage, 78% in Austria, 43% in Germany, 26% in Spain, *etc*. (Amanova and Saduakasova 2015). According to the National Union of Agricultural Insurers (NSA), the main group of risks that caused insurance claims are phenomena associated with drought, mainly atmospheric, and dry winds. They account for more than 72% of payments. The next most important is the risk of frost, which led to 21% of payments, then hail - about 5% of payments, and the list of winter freezing is less than 2%.

If we talk about the Republic of Kazakhstan, the procedure for receiving the insurance payment and confirmation of the insured event is so complicated that some farmers do not even apply for payment. Insurance rates do not take into account the actual risks of agricultural production, depending on the region. In such a situation, it is easier for farmers to pay a fine than to participate in the insurance system and receive an amount that is not commensurate with its risks.

According to the statistics of the National Bank of the Republic of Kazakhstan, as of January 1, 2019, the volume of insurance premiums in compulsory crop insurance collected by two insurance companies that did not refuse this type of insurance amounted to more than 394 million tenge (Table 2 and Table 3).

Table 2. Receipt of insurance premiums in crop production for the period from 2010-2017 (in thousand tenge)

| Name of insurance/reinsurance organization | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| JSC DSK Halyk Bank of Kazakhstan Halyk - Kazakhinstrakh | 212.311 | 242.993 | 179.813 | 232.164 | 161.787 | 105.462 | 102.735 | 83.089 |
| JSC Grain Insurance | 209.843 | 144.764 | 161.423 | 237.767 | 318.006 | 286.619 | 314.668 | 312.160 |

*Source*: compiled by authors according to Data of the National Bank of the Republic of Kazakhstan

Table 3. Insurance payments in crop production for the period from 2010-2017 (in thousand tenge)

| Name of insurance (reinsurance) organization | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| JSC DSK Halyk Bank of Kazakhstan Halyk-Kazakhinstrakh | 341.380 | 111.088 | 231.369 | 37.309 | 45.480 | 27.917 | 2.464 | 3.484 |
| JSC Grain Insurance | 336.588 | 447 | 677.258 | 270.285 | 941.659 | 128.659 | 19.238 | 72.482 |

*Source*: compiled by authors according to Data of the National Bank of the Republic of Kazakhstan

According to the Statistics Committee of the MNE RK, the main grain-producing regions, North Kazakhstan, Kostanay and Akmola regions sent 145.6 billion tenge to the industry, which accounted for the majority of investments in agriculture, forestry and fisheries (41.3%). In 2016, investment growth was also significant, at 46.7%. This increase in investment in the industry is largely due to the implementation of state programs to support agriculture. The total area under crops allocated for grain crops in 2017 remained almost unchanged and amounted to 15.4 million hectares. 78% of the area was set aside for wheat. At the same time, the state policy of agricultural development is aimed at diversifying the acreage and reducing the area set aside for wheat in favor of other crops. As a result, the sown area of wheat in 2017 decreased by about 4%, or by 459.5 thousand hectares. Kazakhstan has three largest grain-sowing regions: Akmola region (which accounts for 28% of the acreage of grain); Kostanay region (27%); North Kazakhstan region (20%).

## 3. Study case

Grain harvest, according to the Statistics Committee of the MNE RK, in 2017 amounted to 20.6 million tons, which is close to the results of 2016. This included 14.8 million tons of wheat (72% of the total grain harvest). In the Akmola region 4 million tons of wheat were harvested (27% of the total wheat harvest), 4.2 million tons in the Kostanay region (28%), and 3.7 million tons (25%) in the North Kazakhstan region (Table 4).

Based on the gross crop yield indicators for the last seven years, the data of which are shown in Table 4, we will build a trend model for wheat and other crops. Graphical analysis of the data showed that the best specification of the model is a parabolic trend.

Table 4. Indicators of the gross grain harvest in the Republic of Kazakhstan for the period from 2010-2017

| Type | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| Crop | 9,6 | 22,7 | 9,8 | 13,9 | 13,0 | 13,7 | 15,0 | 14,8 |
| Other | 2,5 | 4,2 | 3,0 | 4,3 | 4,2 | 4,9 | 5,6 | 5,8 |

*Source*: compiled by authors according to Data from the Committee of Statistics of the MNE RK

The general view of the model is as follows:

$$y_t = b_0 + b_1 t + \beta_2 t^2, \quad (1)$$

We will estimate the parameters of the trend equation using the regression analysis tool (Data Analysis in Excel). As a result of approximation of data for wheat, we obtain the protocol, which is presented below (Sedelev 2017).

Table 5. The estimated parameters of the trend equation using the regression analysis tool

| Regression statistics | | | |
|---|---|---|---|
| Multiple R | 0,653573153 | | |
| R- square | 0,427157867 | | |
| Normalized R-squared | 0,140736800 | | |
| Standard error | 3,642392594 | | |
| Observations | 7 | | |
| Analysis of variance | | | |
| | df | SS | MS |
| Regression | 2 | 39,57190476 | 19,78595238 |
| Remainder | 4 | 53,06809524 | 13,26702381 |
| TOTAL | 6 | 92,64 | |
| | Coefficients | Standard error | t-statistics |
| $b_0$= | 24,157142860 | 5,676258888 | 4,255821190 |
| $b_1$= | -5,501190476 | 3,253003365 | -1,691111216 |
| $b_2$= | 0,627380952 | 0,397417614 | 1,578644053 |

Thus, the equation of the parabolic trend for the volumes of wheat harvest is:

$$y_t = 24{,}157 - 5{,}502t + 0{,}627t^2$$

Table 5. Approximation of the data for other cultures

| Regression statistics | | | |
|---|---|---|---|
| Multiple R | 0,893486765 | | |
| R-squire | 0,798318599 | | |
| Normalized R-squared | 0,697477899 | | |
| Standard error | 0,526330514 | | |
| Observations | 7 | | |
| | | | |
| Analysis of variance | | | |
| | df | SS | MS |
| Regression | 2 | 4,386190476 | 2,193095238 |
| Remainder | 4 | 1,108095238 | 0,27702381 |
| TOTAL | 6 | 5,494285714 | |
| | Coefficients | Standard error | t-statistics |
| Y- intersection | 3,857142857 | 0,820226864 | 4,702531733 |
| Variable X 1 | -0,154761905 | 0,470063259 | -0,329236336 |
| Variable X 2 | 0,066666667 | 0,057427367 | 1,160886699 |

The parabolic trend for the harvest of other grains is as follows:

$$y_t = 3{,}857 - 0{,}155t + 0{,}067t^2$$

We define the predicted values of the considered indicators on 2019 year, for this, we substitute the value into the obtained trend equations. Then we get:

- for wheat, the forecast will be:

$$y_t = 24{,}157 - 5{,}502 \cdot 9 + 0{,}627 \cdot 81 = 25{,}464 \quad m\ln.tg$$

- for wheat, the forecast will be:

$$y_9 = 3{,}857 - 0{,}155 \cdot 9 + 0{,}067 \cdot 81 = 7{,}864 \quad m\ln.tg$$

In 2017, the wheat yield increased to 12.4 centners per hectare from 12.1 centners per hectare in 2016. The highest yield indicator was achieved in Zhambyl oblast - 21.1 c/ha, and in second place Almaty oblast - 20.1 c/ha. In 2016, a high wheat yield indicator was also observed in the South Kazakhstan region, but in 2017, the yield decreased to 16.4 c/ha.

According to Kiseleva (2013), in her researches concerning the stabilization of the financial situation of agricultural enterprises, undoubtedly, many factors influenced the yields, in particular, wheat, one of which was climatic conditions. At the same time, the weather risk is superimposed on the economic one, which complicates its identification and analysis. Therefore, as noted by Kurmanbaev, Alibayeva (2015) in their articles, it is necessary to identify effective ways to reduce agricultural risks, which are carried out on the basis of the development of scientifically based recommendations and require knowledge of the structure and sources of financial support provided by equipment, protection means in crop production, financial guarantees of insurance protection. The impact on the risk of the method of insurance means that other methods do not fully compensate for possible damage and losses from various risks.

The lack of effectiveness of the existing mechanisms for compulsory insurance in the plant growing industry in Kazakhstan forces the Ministry of Agriculture to make conceptual changes and propose a new bill. Therefore, at present, there are only two insurance companies left in the market that provide compulsory insurance in this segment. Initially, there were a little more players - six, but they refused the corresponding licenses under the influence of a very high level of unprofitability, exceeding 100% in recent years.

Thus, the use of digital technologies will increase the transparency of the insurance system and the credibility of the insurance mechanism as a whole, and an objective definition of insurance claims will be provided. This infrastructure will allow further transition to voluntary insurance in crop production.

Building a comprehensive system of agricultural insurance in the Republic of Kazakhstan on market conditions with the participation of professional participants of the insurance market and based on advanced market technologies ensures the solution of three tasks simultaneously:

- *the first task* is to protect agricultural producers from the loss of crops due to the influence of adverse weather events;
- *the second task* is to assist agricultural producers in gaining access to rural finance, which protects loans from default due to weather conditions;
- *the third task* is to increase the effectiveness of government programs to support crop production.

Taking into account the international experience and practices of other countries, as well as with the participation of the World Bank, together with the Swiss Secretariat for Economic Affairs (SECO) and the Global Environment Facility (GEF), which was described in the Insurance Market magazine, proposals were made for the development and implementation of a scheme agricultural insurance in the Republic of Kazakhstan based on the study of materials and technical support of the Government of Kazakhstan and the local insurance market in overcoming the adverse effects of climate change through the development of advanced insurance market first infrastructure that will support mass sale of the local insurance companies of obligatory and voluntary insurance products disasters.

Based on the analysis of the main problems of the current compulsory insurance system in crop production, the basic provisions of the new agricultural insurance system in the Republic of Kazakhstan may look as follows:

1) Due to the fact that, in accordance with the legislation of the Republic of Kazakhstan, the mandatory nature of the Law implies strict regulation of procedures and tariffs directly in the Law, in order to ensure the flexibility of the agricultural insurance system, it is advisable to abandon the mandatory nature of insurance and make the transition to imputed insurance. Imputed insurance means putting on the loss of the current Law and developing economic incentives that will allow agricultural producers to have material benefits when buying voluntary insurance (for example, access to cheaper credit resources, insurance policy - as collateral, participation in various programs of support and development of the agro-industrial complex). In turn, the requirements for voluntary insurance contracts that will be entered into for the purpose of access to programs with state support should be partially regulated (not in terms of tariffs and underwriting, but in terms of procedures).

2) For the successful operation and further development of the agricultural insurance system, it is necessary to create an infrastructure institute that will be responsible for collecting and processing statistical information for insurance purposes. The actuarial model, on the basis of which insurance tariffs are calculated, requires reliable statistical data, which is based not only on the reporting data of agricultural producers, but also on data from an objective remote monitoring (space monitoring system, with which you can monitor crops, determine crop type and forecast yield at certain sites). The centralized collection and processing of information by the infrastructure institute will provide up-to-date and reliable data that will be the basis for developing a policy of state support for crop production, a basis for calculating insurance rates and an analytical tool for evaluating the effectiveness of the agricultural insurance system in general.

3) For the effective functioning of the agricultural insurance system, taking into account its voluntary-imputed nature, it is necessary to subsidize part of the insurance premiums on the part of the state and state participation in guaranteeing catastrophic loss. State support through the organization of guaranteeing minimum payments in the event of catastrophic events can be organized through the Catastrophic Guarantee Fund, which will provide agricultural producers who have registered with the Fund guarantee payments in case of catastrophic weather events.

## Conclusion

Serious problems constantly faced by agricultural production, as well as its specific features, reinforce the backlog of agricultural enterprises in the application of modern management tools. Strategic planning has not yet become part of the practice of most agribusiness entities. However, without developing a scientifically based strategy for the development of the industry at all levels of government, it is impossible to overcome crisis phenomena and lay the foundation for the advanced development of the agricultural sector of the economy.

Insurance is the most affordable and effective tool for managing agricultural risks, allowing you to cover a wide range of them. It is necessary to build a unified state system of agricultural risk management, within which the improvement of the most effective mechanism for protecting the property and property interests of producers - insurance - will be a central task.

Agricultural production annually suffers significant losses due to climatic, marketing and other agricultural risks, and the degree of compensation by the state for losses is very low. State support for insurance of agricultural risks is incomparably more effective than financial assistance provided by the state in adverse years, in the form of direct cash additional subsidies, credits, write-offs, *etc*. Insurance allows you to cover damages in a fairly high volume, it reduces the burden on the country's budget due to the fact that compensation is paid by the insurance business.

The dual nature of agricultural risk insurance is manifested in the fact that, acting as an effective regulator of the reproductive processes in agriculture, it must itself be the object of state regulation and support in order to ensure its own sustainability and, therefore, complete coverage of large-scale losses.

According to Nikitin (2016) agricultural production in modern conditions is characterized by a high degree of risk. Agricultural producers in the process of economic activity are faced with such risks as price fluctuations, yields, partial or complete loss of material resources. In addition, agricultural production is subject to the risk of natural disasters and emergencies, which can lead to serious production losses. Foreign experience of insuring agricultural risks indicates that insurance is not only a mechanism for protecting the property interests of producers themselves, but also of investments that are channeled into modern innovative technologies of agricultural production.

From the above, in our opinion, one of the effective risk management tools in agriculture can be a comprehensive insurance program for agricultural producers, which includes the inclusion of insurance of the main types of risks characteristic of agricultural production at reduced tariffs, which will ensure improved financial sustainability and sustained development agro formations.

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