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UNDERWRITING PRINCIPLES AND TECHNICAL BASES OF CROP INSURANCE

PROFESSIONAL PAPER

Abstract

Open-field crops and fruit are permanently and directly connected with a number of natural factors or forces that are difficult or impossible to predict. For these reasons, fruit and crops are often unprotected and exposed to different natural hazards (risks) that occur every year, whereas their intensity may be lower or higher, and at times even disastrous. For insurance companies, crop insurance is one of the riskiest forms of underwriting, whereas for the insured persons it represents one of the most important insurance lines. Certain principles of insurance science and technology are applied to the insurance of crops and fruit. Technical bases of crop insurance are contained in the terms and conditions and premium tariffs for insurance of crops and fruit.

Keywords: *Insurance of Crops and Fruit, Insurance Terms and Conditions, risks in crop insurance, underwriting.*

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1. Introductory Considerations

In Serbia, insurance of crops and fruit is written on a voluntary/optional basis. This means that farmers decide on taking out the insurance cover at their own option. Insurance improves agricultural production acting as an economic measure taken to counter certain natural hazards and render farmers' entrepreneurial activities more stable and certain. Given that the measures of prevention and repression are not sufficient to fully eliminate economic losses caused by natural hazards (risks), insurance is of fundamental and practical importance in countering these perils. According to its very purpose, insurance eliminates harmful consequences of particular occurrences and enables a smooth and uninterrupted development of the production process. This is why insurance business is regarded as the most modern economic method used to protect operating results and funds invested in the process itself. Insurance is written after the policyholder and the insurer enter into an insurance contract, which makes such contract the main instrument used to establish an insurance relationship.

The Law of Contracts and Torts, which specially regulates the conduct in carrying out obligations and realizing rights, in Article 18 states that in carrying out their obligations, parties to obligation relations shall be bound to act with the care of a good businessman. In addition, the Law stipulates that in carrying out obligations, parties to obligation relations shall be bound to act with increased care, according to professional rules and usage, namely, the standard of care of a good expert.⁵

This legal provision is of special importance for employees of insurance companies who conclude insurance contracts on a daily basis, and assess and settle insurance claims in compliance with insurance terms and conditions, premium tariffs, and legal provisions.

Employees in insurance companies are obliged to duly apply the terms and conditions and consistently respect all legal provisions with the care of a good expert. No one has the right to contract relations contrary to insurance terms and conditions and premium tariffs.

Insurers are also required to deploy external and internal factors in order to offer insurance service consumers the widest possible range of covered risks and subjects. In this way, the insured persons or policyholders can see their financial interest and realize that the fruit of their labour needs to be insured.

This means that in their relationships with the insureds and policyholders, insurance employees in Serbia, in addition to informing about legal regulations, should satisfy customers with the service quality and quantity, support, information,

⁵ Slobodan Perović, Dragoljub Stojanović, *Komentar Zakona o obligacionim odnosima*, Faculty of Law, Kragujevac, 1980 Volume 1 pp.162.

knowledge, behaviour, and are expected to efficiently and fairly resolve all claims for damages, in accordance with their business policy and in the spirit in which insurance services were created and sold.⁶

In addition to the Law of Contract and Torts, which regulates property and legal matters as a source of insurance law, there are also general and special insurance terms and conditions, which will be discussed later. The risk accepted by the insurance company should be neither lower nor higher than the average amount of claims assumed based on actuarial mathematics. Risk survey and underwriting in insurance of crops and fruit involves several different activities taken to assess whether and in what manner the insurance contract will be concluded.

Insurance companies organise that part of the work in a special Directorate for underwriting in agriculture. However, there is a part of the risk which agents and insurance specialists are entirely authorised to underwrite, usually when it comes to potentially small claims.

The business of insurance companies largely depends on their due and proper work, i.e. their skills and competencies. Their task is to properly assess not only the risk but also the ethics and morals of the insured person, given that in insurance business, mutual trust between the contracting parties is crucial. In these matters, it is important to be prudent, but this certainly does not mean that the insured persons, who are more likely to experience the occurrence of a loss event, should be rejected.

The task of the insurer is to develop the awareness of potential customers about the need for insurance, where the application sent by a prospective insured to the insurer could be the first step. It is then the task of the insurance agent to assess whether the risk is acceptable or requires the introduction of special clauses.⁷

Based on their established policies, insurance companies issue underwriting guidelines on applying premium rates, insurance terms and conditions, market niches, and risks that should be avoided. This requires that the employees possess extensive knowledge, experience, large amount of information, and high morale.

After deciding that there is a possibility to accept the risk, the risk acquisition officer negotiates with the policyholder the other elements of insurance contract. The key is to contract the coverage of standard risks, as well as additional ones, then the sum insured, insurance premium (determined on the basis of the agreed sum insured and previously determined premium rates), deductible, bonus and malus, additional warranties, etc.⁸

The analysis of agricultural market was performed in the Republic of Serbia, where this insurance is voluntary, and this voluntary nature, together with the

⁶ National Bank of Serbia, *Guidelines on Minimal Standards of Conduct and Good Practice of Insurance Market Participants*, 2018.

⁷ Boban Gajić, Ivan Radojković, Risk Assessment Methodology in Crop Insurance, *Insurance Trends*, no. 2/2019, pp. 27.

⁸ Vladimir Njegomir, *Insurance*, Novi Sad, 2011, pp. 344.

diversity of insurance terms and conditions and offered risk covers, contribute to a large number of different insurance options.

Taking into account the specifics of the research subject, we applied different methods to meet the basic methodological requirements: objectivity, reliability, generality, and systematicity. Scientific theoretical knowledge, relevant literature and modern business practice were studied using the methods of complex observation and content analysis. The significance and goal of this paper lies in understanding the key elements of crop insurance. The terms and conditions for insurance of crops and fruit issued by different insurance companies were used for the purpose of comparison, clarification, and their additional explanation to insurance agents, insurers' representatives, and insurance service consumers.

Insurers offer different covers and insurance terms to determine damages after the occurrence. Due to a large amount of information that must be analysed, farmers often make their choices based on unverified rumours, which may lead to the loss of money and unexpected consequences.

For the purpose of the analysis, the data of the National Bank of Serbia were used and three Serbian insurers with market share exceeding 50% in total were selected. Here, we will use a comparative research method to compare and analyse the general terms and conditions and part of the special terms and conditions for insurance of crops and fruit. These are Dunav Insurance a. d. o, Beograd; "Triglav osiguranje" a. d. o, Beograd, and "Generali osiguranje Srbija" a. d. o, Beograd.

2. Crops and Fruit Insurance Terms and Conditions

Insurance contract, as an adhesion contract, is a take-it-or-leave-it contract. In insurance contract, one party has pre-defined conditions under which the contract will be concluded, whereas the other party may either accept or refuse such conditions.⁹

The contractual part of the policy contains general and special insurance terms and conditions which regulate in more detail the scope of insurance cover, and rights and obligations of insurers and policyholders. General and special terms and conditions define the subject-matter of insurance, standard and additional risks (fire, hail, storm, flood...), obligations of the insured effective during the conclusion, validity, and upon the occurrence, exclusions from insurance, insurance period, method for determining insurance indemnity, paid premiums, and others.

2.1. Subject-Matter of Insurance

The relevant characteristics of the insurance subject that are entered in the contract or policy are determined by field inspection of the items to be insured.

⁹ Ilija Babić, *Leksikon obligacionog prava*, Official Gazette of FRY, Beograd, 1997, pp. 414.

In crop production, the subject matter of insurance may be all types of crops while unharvested or unpicked. The subject of insurance may be: crops (including stubble crops, green manure crops and intercrops), fruit; meadow grass, medicinal herbs; ornamental plants; orchards and vineyards; young orchards and vineyards until bearing fruit; fruit, vine and forest planting material. Crop insurance covers harvest-yield, namely those parts of plants which represent special value and are the reason for cultivation.

In accordance with this principle, the insurance covers the following:

1. grains, oil plants and other cultures for seed production – only grains (seed); within grains, stalk may be insured (straw-stover), and in connection with sorghum – tassel, if separately contracted;
2. root and tuber plants – root and root tuber;
3. vegetables, aromatic, medicinal and ornamental plants – according to the purpose of growing; paprika and tomato – seed, and if specially contracted, the insurance may also cover fruit (flesh);
4. for hemp – stem, and if seed is produced, seed only; for hemp for seed production the insurance may also cover the stem, if separately contracted;
5. flax – stem and seed;
6. hop - fruit (cone);
7. cotton - fruit (pod);
8. poppy – seed and opium;
9. tobacco – leaf; if for seed production, then seed as well – if separately contracted;
10. fodder plants and meadow grasses – forage mass, and in seed production – seed only;
11. seedlings - plant;
12. orchards and vineyards – only fruit and if separately contracted, tree or grape vine may be subject to insurance;
13. young orchards and vineyards before bearing fruit – tree or grape vine;
14. young forest cultures - stalk;
15. fruit, vine and forest planting material - stocks, grafts, cuttings and seedlings as well as graft branchlets in orchards and canes (grafts) in vineyards – so far, only recorded;
16. willow for wickerwork - twigs;
17. cane - stalk.¹⁰

¹⁰ „Generali osiguranje“ Srbija a.d.o., Beograd, *General Terms and Conditions for Insurance of Crops and Fruit*, Article 13, 2014.

2.2. Crops Excluded from Insurance

The subject matter of insurance may not be non-bearing orchards and vineyards, except for young orchards and vineyards until bearing fruit. Excluded are also crops and fruit already damaged by the occurrence of the insured risk, regardless of the risk severity and nature of the damage. If it is subsequently determined that the crop was already damaged by the occurrence of the insured risk before the insurance has been written, such insurance will be cancelled, the premium will be returned to the insured, and the insured will not be entitled to compensation. In order for the risk to be covered by insurance, it is necessary for it to meet certain conditions. One of such conditions is that the subject of insurance must be a future event. The insurer assumes the obligation and pays indemnity only in connection with those particular events that may occur after the conclusion of the insurance contract (future event). Thus, the insurer is not obliged to pay to the insured the insurance indemnity for hail risk insurance in case when at the time of insurance contract conclusion, the hail has already damaged the plants.

2.3. Insured Perils – Risks

Natural perils or risks covered by insurance may be divided into risks of standard insurance (standard risks) and risks in supplementary insurance (additional risks). Risk is the most important insurance determinant. As shown by insurance history, insurance would not exist without the existence of risks.¹¹

Standard insurable risks of crop insurance are hail, fire and lightning. The risk of hail is among the most represented risks, according to both its prevalence and severity of its consequences. It is estimated that in Serbia, insurance against the risk of hail accounts for 90% of crop insurance.¹²

Additional insurable risks of crop insurance are storm, flood, spring and autumn frost.¹³

Insurance against additional risks may be concluded only if insurance of standard risks has been previously concluded, provided that it is separately contracted and that the corresponding premium has been paid.

Particular standard risks covered by insurance have the following characteristics:

¹¹ Boris Marović, Dragan Marković, *Insurance: Catastrophe Losses and Climate Change*, Belgrade, 2016, pp. 41.

¹² Gordana Radović, "Comparative Analysis of Special Terms and Conditions for Crop Insurance in the Agriculture Insurance Market in Serbia", *Insurance Trends*, no.1/2018, pp. 78.

¹³ *Priručnik za obuku za polaganje stručnog ispita za sticanje zvanja ovlašćenog posrednika i ovlašćenog zastupnika u osiguranju*, Serbian Chamber of Commerce and Industry, Belgrade, 2015, pp. 397.

2.3.1. Risk of Hail (Ice)

Hail is a natural disaster which consists of balls or irregular lumps of ice formed in the atmosphere. Hail is produced in clouds called cumulonimbus which have a strong updraft. Hail occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into balls of ice i.e. they turn into hail. Hailstone is suspended aloft by air with strong upward motion until its weight overcomes the updraft and falls to the ground. Such hailstones are often not bigger than five millimetres in diameter, but they can grow much larger and make a lot of damage, particularly in agricultural production, and may even pose a threat to people.

Hail is a form of solid precipitation (ice) of 5 mm in diameter or more, which by its impact provokes considerable damage and destruction of crops, and may cause damage to other facilities (buildings etc.).¹⁴

Hailstones may differ in shape resembling small balls, being egg-shaped, or of triangular or irregular shape, and are composed of transparent ice or snow particles. Stone size commonly varies between 0.5 and 2 cm and, as already mentioned, it can grow much larger. In the practice of crop insurance i.e. in loss assessment, the size of hailstones is commonly depicted as pea-sized, bean-sized, nut-sized, walnut-sized, egg-sized of a pigeon or a hen, and the like. In our region, the hail commonly occurs from May to September, but it may also fall beyond this timeframe.¹⁵

In the insurance protection of crops, the insurance against the perils-risks of hail is of paramount importance. With this risk, given the potential damage that can be caused to agricultural production, the need for insurance is particularly stressed, whereas in the insurance of crops and fruit, this risk always comes first.

2.3.2. Risk of Fire and Lightning

In crop production, fire and lightning strike are also standard insurable perils. The causes of damage by fire are usually agricultural machinery or negligence when burning plant remnants in the surrounding plots. The most affected cultures are wheat, corn, and sunflower. The risks of fire and lightning are automatically attached to the risk of hail making one whole cover, which means that a special part of the insurance premium is not calculated but treated as a bonus to hail risk insurance.

Particular additional risks covered by special terms and conditions for insurance of crops and fruit have the following characteristics:

¹⁴ Instructions of the Unique Methodology for the Assessment of Losses from Natural Disasters, *Official Gazette of SFRY*, no. 27 of 10 April 1987.

¹⁵ B. Gajić, pp. 30.

2.3.3. Risk of Frost

Frost is a natural phenomenon (hazard) which may occur in a particular period and under particular weather conditions, in a smaller or bigger area. Spring frost means the drop in air temperature below 0 degrees Celsius, which occurs from 1 March to 30 June.¹⁶ Frost hazard is the highest in concave terrains – basins and valleys. This is because at night, the bottom of the basin is the coolest. At the same time, slopes are getting cooled and the cool air, having greater specific gravity, goes down the valley slope to the bottom and the steeper the slope the faster acceleration. In that way, at the bottom of the basin so-called „cold-air pools” are created.¹⁷

In insurance of crops and fruit against the risk of frost, this risk is limited to include spring frost only.

2.3.4. Risk of Storm

Wind is horizontal movement or flow of air masses. Wind is classified in different categories according to its direction, speed and strength. Wind is usually classified according to its blowing direction, speed in m/s or km/h, and its force is expressed by Beaufort scale.

According to the Special Terms and Conditions for Insurance of Crops and Fruit against Storm issued by Serbian insurers, the storm is defined as movement of air masses, that is the wind measuring 17.2 m/sec and more.

The occurrence of the risk of storm is evidenced by the reports of the Serbian Hydrometeorological Service of the wind speed, for the area where the insured crops and fruit are situated. The insurer is obliged to obtain such reports. If the Serbian Hydrometeorological Service does not have the data on the wind speed in the area where the damage has occurred, the risk of storm to the insured crops and fruit is determined based on the nature of mechanical damages such as twisting, breaking, tearing, pulling, and the like.

The insurer is not liable to compensate the damage occurred due to the wind of a lesser force or hot air flows during the summer, such as seeds falling off due to overripeness, interfering with flowering and fertilization, lodging due to high crop density, excessive moisture or plant diseases, etc.¹⁸

This risk may be included in insurance until 15 May of the production year, at the latest.

¹⁶ Dunav Insurance Company a.d.o., Beograd, *Special Terms and Conditions for Insurance of Crops and Fruit against Spring Frost*, 2019, Article 2.

¹⁷ Bruno Toscano, *Osiguranje biljne proizvodnje, rizici, uslovi i procena šteta*, Belgrade, 2018. pp. 35.

¹⁸ Dunav Insurance a.d.o., Beograd, *Special Terms and Conditions for Insurance of Crops and Fruit against Storm*, Belgrade, 2019, Article 2.

2.3.5. Risk of Flood

Within the meaning of the terms and conditions issued by insurers, the risk of flood is elemental, unexpected inundation of the terrain due to outflow of river from its bed, canal and because it broke through a dyke or a dam.¹⁹

The risk of flood also includes the risk of torrents which is understood as an elemental unexpected flooding of the terrain by water mass formed on slopes due to heavy precipitation and flowing down the streets and roads.

Crops and fruit in moors, lands between rivers and dikes, and unprotected and frequently flooded lands which have no dikes may not be the subject of insurance.²⁰

2.4. Value of the Insured Crops and Fruit

The Terms and Conditions for Insurance of Crops and Fruit are applied according to the principle that the value at which crops and fruit are insured (sum insured) is determined not only on the basis of production costs, but also to include the expected profit. This takes into account the expected yield that would be achieved at the wholesale market price formed during the harvest – cropping season. The sum insured is the amount to which the crop or fruit is insured. It is expressed per unit of area and represents the maximum liability of the insurer.

The sum insured indicated in the policy should reflect as much as possible the value that crops or fruit will have during the harvest or picking. This is highly important for the insureds because insurance indemnity is paid out, as follows:

- 1) from the sum insured – if the value of the damaged crop or fruit is equal to, or higher than the sum insured;
- 2) from the value of the damaged crop or fruit – if such value is lower than the sum insured.²¹

The sum insured is determined when contracting the cover and is calculated taking into account the elements concerning the area, yields, and price per unit of measure.

- a) Area is expressed in hectares (ha) and acres (a), and in some areas also in 160 rods (kj.) and square fathom (kv. hv.)

¹⁹ Dunav Insurance a.d.o., Beograd, *Special Terms and Conditions for Insurance of Crops and Fruit against Flood*, Belgrade, 2005, Article 2.

²⁰ Dunav Insurance a.d.o., Beograd, *Special Terms and Conditions for Insurance of Crops and Fruit against Flood*, Belgrade, 2019, Article 2, paragraph 3.

²¹ „Triglav osiguranje“ a.d.o., Beograd, *General Terms and Conditions for Insurance of Crops and Fruit*, Beograd, 2008, Article 13.

Table 1 Units of measure for area of agricultural land

1 hectare (ha)	=	10 000 m ²
1 acre (a)	=	100 m ²
1 hectare	=	100 a
1 square rod	=	5 754 m ²
1 square fathom	=	3,60 m ²

In some crops, the area may be replaced by the number of pieces (trees, vine plant stalks, seedlings).

b) Yield is expressed in kilograms, metric hundredweight (1 cwt = 100 kg).

c) Price is expressed in Dinars per kg or cwt.

Table 2 Provisional ranges of yield and prices of crops

Crop		Yield kg/ha		Price per kg	
		min.	max.	min.	max.
1	Wheat ²²	4	10	15	20
2	Barley	3	6	15	20
3	Common oats	3	5	20	30
4	Common rye	3	5	20	30
5	Triticale	3	6	15	20
6	Corn ²³	4	8	15	20
7	Sunflower	2	5	45	55
8	Soya bean	2	4	40	60
9	Sugar beet ²⁴	45	80	5	10
10	Tomato ²⁵	40	80	30	50
11	Paprika ²⁶	20	40	40	80
12	Apple ²⁷	20	40	30	50
13	Pear	15	25	50	100
14	Plum	10	20	20	40
15	Sour cherry	10	20	40	60
16	Apricot ²⁸	10	30	50	80

²² Stevan Jevtić at Al., *Posebno ratarstvo*, Nauka, Beograd, 1992, pp. 95.

²³ S. Jevtić (1992), pp. 147.

²⁴ S. Jevtić (1992), pp. 528.

²⁵ Miroslav Popović, *Povrtarstvo*, Nolit, Beograd, 1991, pp. 161.

²⁶ M. Popović (1991), pp. 184.

²⁷ Spasoje Bulatović, Evica Mratinić, *Biotehnoške osnove voćarstva*, Newlines, Beograd, pp. 458.

²⁸ Zoran Keserović, Nenad Magazin, Biserka Milić, Marko Dorić, *Voćarstvo i vinogradarstvo*, University of Novi Sad, Faculty of Agriculture, Novi Sad, 2016, pp. 72.

Crop		Yield kg/ha		Price per kg	
		min.	max.	min.	max.
17	Strawberry	10	30	50	80
18	Raspberry	5	30	100	120
19	Blackberry	5	35	50	80
20	Blueberry ²⁹	5	10	150	200
21	Grapevine – table grapes ³⁰	12	20	30	50
22	Graševine (green peas) – wine grapes ³¹	7	15	30	60

Source: Dunav Insurance Company A.D.O. – Insurance of Crops and Fruit in 2020

The price ranges of individual crops are presented according to market trends in 2020 obtained from the data available to Dunav Insurance Company. By multiplying the sown / planted area, the expected yield and the expected price, the insured value i.e. sum insured is obtained. If the insured has a concluded contract on production and buy-up, the value indicated in the contract is taken as the sum insured.

In insurance of young non-bearing orchards and vineyards and insurance of yielding fruit trees and vine plant stalks, the sum insured is determined up to the amount of total costs for establishment and cultivation of plants, namely, based on total costs of investments, where the costs from the previous years accumulate counting from the first year of establishment of plants.

2.5. Obligation to Insure all Crops and Fruit of the Same Kind

It is mandatory for the insured (it is his obligation) to insure all areas where crops and fruit of the same kind are planted, unless it is possible to clearly establish the position, cadastral number, area and other identification elements of a plot where crops to be insured are planted and where all areas owned by the insured belong to the same class of hazard.³² This provision of insurance terms and conditions is in line with the principles of achieving the best possible mix of favourable and adverse risks (risk spread). In addition, in that way, certain difficulties regarding the identification of insured or uninsured areas-plots are eliminated or reduced to a minimum.

If all crops or fruits of the same species and kind are not covered, and if special areas are not identified, the insurance indemnity shall be paid in proportion between the insured and actual area on which such crops and fruits are planted. In such insurance, indemnity is paid according to the following formula:

²⁹ Mihajlo D. Nikolić, Jasminka M. Milojević, *Jagodaste voćke, tehnologija gajenja*, Beograd, 2010, pp. 135.

³⁰ Lazar Avramov, Aleksandar Nakalamić, Dragoljub Žunić, *Vinogradarstvo*, University of Belgrade, Faculty of Agriculture, Belgrade, 1999, pp. 308.

³¹ L. Avramov, A. Nakalamić, D. Žunjić (1999), pp. 287–296.

³² „Generali osiguranje Srbija“ a.d.o., Beograd, *General Terms and Conditions for Insurance of Crops and Fruit*, Article 17, paragraph 1.

$$\text{Indemnity} = \frac{\text{Insured area X amount of damage}}{\text{Actual sown (planted) area}}$$

2.6. Inspecting the Condition of Insured Crops and Fruit

The policyholder is obliged to notify the insurer, when concluding the contract, of all circumstances important for the risk assessment, known to him or which could not have remained unknown.³³ In insurance, there are a number of circumstances that are important for risk assessment. Some of these circumstances affect the amount of premium, while others depend on the scope of insurance cover, and there are also circumstances that make certain risks uninsurable.

Nevertheless, the insurer has the right to inspect crops and fruit before effecting insurance and during the insurance period in order to determine the situation (circumstances related to risk assessment) in relation to the subject matter and written risk, as well as the obligations arising from the concluded insurance contract.

Inspection and determination of facts in connection with the condition of crops and fruit is carried out by a professional appointed by the insurer, in the presence of the insured. On that occasion, the professional establishes general condition of the crops, their appearance, implemented agrotechnical measures, protection against plant diseases and pests i.e. their existence, degree of damage, potential reduction of the expected yield due to particular natural hazards not covered by insurance, provisional assessment of the expected yield, assessment of particular implemented agrotechnical measures aimed at preventing the aggravation of losses and recovery of the damaged crops. When inspecting the condition of crops and fruit, special attention should be paid to the overall condition and appearance of crops and fruit, as well as possible damage from insured and uninsured risks. Analysing the crop insurance terms and conditions issued by Serbian insurers, we concluded that certain perils are insurable, whereas certain perils cannot be insured, and during the process of risk survey and underwriting, it is very important to know the types of damage these natural factors inflict to plants. Further in the text we will give an overview of damages.

2.6.1. Damage Due to Hail

Hail inflicts damage on particular parts or the whole plant and thus, vegetative parts (stem, leaf) and generative structures (spike, panicle, flower, anther, pistil) could be affected by the damage. These damages occur in different forms.

³³ Law of Contract and Torts, *Official Gazette*, (*Official Gazette of SFRY* no. 29/78, 39/85, 45/89 – decision of the CCY and 57/89, *Official Gazette of FRY* no. 31/93, *Official Gazette of Serbia and Montenegro* no. 1/2003 – Constitutional Charter and *Official Gazette of RS* no. 18/2020), Belgrade, Article 907.

Injuries may be minor or major and of different shapes. Fraction occurs when the stem or any other part is fractured, but the connection with the plant was kept. Fraction may occur from other causes and when that is the case, the fraction manifests itself in different directions and not only from the direction of hail fall. Fraction caused by hail has characteristic injuries on the damaged parts of the plant. There is also beating, when the beaten down part is completely separated from the plant and has fallen to the ground. In particular plants, beating down of the generative organs causes total loss. Extraction or impact on grains or fruit of a plant after the fall on the ground also occurs under the impact of hail.³⁴

2.6.2. Damage Due to Spring Frost

Spring frosts inflict the biggest damage to leaves, buds, flowers, grafts and berries that have just developed, causing them to wither, become dark and dried out.

2.6.3. Damage Due to Storm

The harmful effects of storm on plants are reflected in mechanical damages, lodging, scission, fractions, fruit falling over, branch breaking and even uprooting, whereas in particular regions storm buries plants with sand drifts and causes soil erosion.

2.6.4. Damage Due to Flood

Agricultural crops are highly sensitive to flooding due to excessive moisture which prevents the oxygen to enter the soil and causes the crops to suffocate, become brown, rotten and decayed.

2.6.5. Damages Caused by Perils Not Covered

Most often, these are plant diseases caused by various pathogens, lack/excess of nutrients, different climate impacts, as well as agrotechnical measures. Damages to plants vary depending on the host plant itself, the phenophase of its development, the type of parasite and environmental conditions. We will provide an overview of the damage to plants, that is, of the most commonly detected symptoms by groups.

Changes in colour (mosaic, yellows, chlorosis, albinism, redness), changes in leaf morphology (crinkling, puckering, shoestring), atrophy and nanism (restricted growth, stunting), hypertrophy (witches' brooms, enations, tumours), drooping,

³⁴ Milenko Smiljanić, *Priručnik za procenu šteta na usevima i plodovima*, Beograd, 1974, pp. 38.

necrosis (dying of tissue), tissue destruction, slime and resin flux, presence of a parasite or its product on the surface of the plant.³⁵

Based on the risk survey, the sum insured for conclusion of the insurance contract is defined or, if the contract has already been concluded, the insurance is adjusted in the agreement with the insured. After the survey of crops and fruit, a report on their status is made.

2.7. Beginning and End (Termination) of Insurer's Liability

In insurance of crops and fruit, the liability of the insurer to pay the insurance indemnity begins upon the expiry of 24.00 hours on the date indicated in the policy as the insurance inception date,³⁶ provided that until that date the premium has been paid, or otherwise, upon the expiry of 24.00 hours of the date when the insurance premium is paid and when other underwriting conditions are met in connection with particular phenophases in the development of the insured plants, namely, for particular vegetation status: for vineyards, raspberries and hop – after the shoots sprout from the buds; for fruit – when it is dried out, that is, when corollas fall off with 50% of flowers of the same kind; for fruit, grapevine and forest reproductive material, ornamental shrubs and young forest cultures – from the beginning of vegetation, that is, from the moment of sprouting or planting; for vegetables, tobacco and flowers – from the date of seeding, and if the vegetables or flowers are produced by planting at a permanent place – from the moment of sprouting; for other crops – from the moment of sprouting. Such solutions or provisions of the insurer are questionable because they do not allow the accurate insurance inception date to be determined. Some of the proposed solutions that would amend this Article of insurance terms and conditions could be the following: for vineyards, raspberries and hop - when the shoots reach a length of 2-3 centimetres after sprouting from the buds, for fruit - when corollas dry out or fall off the flowers of the same species. It is also relevant to accurately determine the inception date of insurance (for example, in connection with the risk of spring frost it is 15 March of the production year). Particular insurers differently define the beginning of insurer's liability: The liability of the Insurer to indemnify for claims arising from the perils of hail and storm shall not incur prior to the expiry of the 24th hour from the date indicated in the policy as the inception of the insurance coverage.³⁷ We assume that these provisions on the time of the commencement of the insurer's obligation have to do with the elements of risk, i.e. the following provision: to be accepted in the insurance coverage, the risk has to

³⁵ Mališa Tošić, *Fitopatologija*, Beograd-Zemun, University of Belgrade, Faculty of Agriculture, 1993., pp. 24-34.

³⁶ Triglav osiguranje a.d.o., *General Terms and Conditions for Insurance of Crops and Fruit*, Article 20, paragraph 1.

³⁷ Dunav Insurance a.d.o., Beograd, *Crop and Fruit Insurance General Terms and Conditions*, Article 5, paragraph 5.

be uncertain. Insurer can provide insurance only for those events the occurrence of which is, in particular aspects, uncertain. For example, when providing the cover for motor vehicles against the risk of damage in a traffic accident or loss due to theft, the insured event is uncertain because it is not known whether it will occur at all, neither can it be determined when the accident will occur. However, a sufficient degree of uncertainty will also exist in the cases when it is certain that an insured event will occur, but it is not known when. In personal insurance against the risk of death, it will be considered that the insured event was not uncertain if at the time of concluding the insurance contract it was already in progress or if the risk occurrence was imminent. If the actual risk of flood occurs, because the water level is so high that the flood can happen at any moment, the policyholder and the insurer cannot conclude a valid insurance contract against the risk of flood, regardless of the fact that no damage has occurred yet, because it has become certain that the risk will be manifested, that is, the risk will be actuated and the loss event will occur and thus, uncertainty no longer exists.

The insurance cover and liability of the insurer to effect the payment of insurance indemnity for particular crops and fruit shall terminate after the harvesting, or once they are harvested, sheared or otherwise gathered: for root crops and tuber crops – after the root or tuber is taken out of the soil; for fruit, grapes, hop and vegetable crops – after the fruit or yield is picked; for fruit, grapevine and forest reproductive material and for young forest cultures, ornamental shrubs and willow for wickerwork – after lifting or cutting.

Insurance and indemnity period for all crops and fruit expires not later than at 24.00 hours on 31 December, unless agreed otherwise.

2.8. Insured Event and Liability of the Insured upon the Occurrence

After the occurrence of the insured event which is the cause for claim for indemnity, the insured is obliged to: promptly notify the insurer of the occurrence, not later than three days upon the knowledge thereof. Except in the case of life insurance, the insured shall inform the insurer of the occurrence of the insured event not later than within three days from his knowledge thereof.³⁸ Regarding the duty to notify of the occurrence of the insured event, as well as the manner in which that duty is regulated in the mentioned Article of the Law of Contract and Torts, several questions can be asked. These are:

- a) who is obliged to inform about the occurrence of the insured event;
- b) to whom the notification is addressed;

³⁸ Law of Contract and Torts, *Official Gazette*, (*Official Gazette of SFRY* no. 29/78, 39/85, 45/89 – decision of CCY and 57/89, *Official Gazette of FRY* no. 31/93, *Official Gazette of Serbia and Montenegro* no. 1/2003 – Constitutional Charter and *Official Gazette of RS* no. 18/2020), Belgrade, Article 917.

- c) form and content of the notification;
- d) deadline for notification;
- e) the consequences of the failure to fulfil this duty.

It is quite clear who is obliged to inform about the occurrence of the insured event. Namely, the insured shall submit to the insurer a notification of the occurrence of the insured event. This answers the question to whom the notice should be addressed. However, if the insurance contract was concluded by the insurer's agent, then the notice may be served to such an agent and will have the same legal effect.

In their General Terms and Conditions for Insurance of Crops and Fruit, the insurers regulate the matters of form and content: in case of a verbal or telephone notification, such notification is to be confirmed in writing, immediately and/or not later than within three days. The notification of the occurrence should specify the date and hour of the occurrence, and the crops and fruits and/or areas that sustained damage per type of crops and plots of land.³⁹ The Article of the Law of Contract and Torts lays down the notification period of three days from the moment of the occurrence, however, if the insured became aware of the occurrence later, this period is counted from the day of his becoming aware of it. Consequences of the failure of the insured to notify the insurer of the occurrence within such period are regulated in Article 917, paragraph 2 of the Law of Contract and Torts: "Should the insured fail to fulfil this obligation within the designated time, he shall be obliged to compensate the insurer for the loss sustained due to such failure".⁴⁰ It is important to note that the insured's right to insurance compensation is not forfeited. Instead, the amount of indemnity might be reduced by the amount of damage sustained by the insurer. The insurer is obliged to prove such damage.

3. Elements for Premium Calculation

Insurance premium is a price of service that the insured pays to the Insurer for the written risk. Determining premium rates is one of the key operating activities in the underwriting process. The amount of premium in insurance of crops and fruit is in direct proportion to the risk size, amount of the sum insured, and insurance period. Two most important elements for determining the price of crops and fruit insurance are the classes of hazard and sensitivity classes.

Classes of hazard. In terms of geography, Serbian territory is divided into several classes of hazard. Such division is made based on exposures to particular

³⁹ Dunav Insurance a.d.o., Beograd, *Crop and Fruit Insurance General Terms and Conditions*, 2019, Article 21, paragraph 1, item 3.

⁴⁰ Law of Contract and Torts, *Official Gazette*, (*Official Gazette of SFRY* no. 29/78, 39/85, 45/89 – decision of CCY and 57/89, *Official Gazette of FRY* no. 31/93, *Official Gazette of Serbia and Montenegro* no. 1/2003 – Constitutional Charter and *Official Gazette of RS* no. 18/2020), Belgrade, Article 917, paragraph 2.

risks. Namely, the insurers keep track of technical result (ratio between premium and claims in the period of ten years), number of hail days during the year, number of days with temperatures below zero degrees centigrade, number of stormy days, and damages caused to a crop by particular perils.

Sensitivity classes of plants. Based on morphological, physiological and biological properties, all cultivated plants can be classified into several classes of sensitivity in relation to the insured risk. All plants are not equally sensitive to hail, frost, storm - some are more sensitive than the others, some remain in the open field for a longer and some for a shorter period, some form fruit above ground and some in the ground. All of this impacts the plant sensitivity and thus, the insurance is accordingly priced. Insurance of vines (grapes) and fruit is much more expensive than insurance of wheat, corn, clover, and grass.

4. Final Considerations

In the preparation of this paper, the goal was to use comparative analysis in order to provide the parties to the crop and fruit insurance, salesforce, agents and brokers, as well as the insured persons with the explanation and detailed clarification of the basic principles and techniques used in crop insurance. In view of the set goal, the subject matter of the terms and conditions for crop and fruit insurance was covered in detail, in terms of what can be insured (subject of insurance) and which standard and additional risks can be covered, providing a description for each risk and a description of injuries that individual risks leave on plants after the occurrence. Insurance of crops and fruit is a complex and responsible job requiring expertise and a lot of skills and knowledge of the very insurance process, but also of the line of business carried on by a farmer, namely, the knowledge of botany, physiology and morphology of plants. Based on the conducted research, it can be concluded that in determining the sum insured or the value of insured crops and fruit, a principle is applied according to which crops and fruit are insured not only on the basis of production costs, but also to include the expected profit. Consulting the professional literature and trends in the market of agricultural products, breakdown of yields and prices by frequently insured crops is provided to facilitate the work of insurers' agents in defining the sum insured. Many years of experience have shown that misunderstandings between the parties to the insurance contract arise because at the conclusion of the contract the insured person is not sufficiently aware of the differences between the cover offered by the insurer in accordance with its terms and conditions and the one that the insured wants to take out. The insurer's representative, insurance agent, underwriter, and broker are obliged to acquaint the policyholder with all the details of the policy he wants conclude, and notably about the insurance premium, interpretation of the terms and conditions, and the

scope of insurance cover. To fulfil this obligation, they must thoroughly know the characteristics of the product they sell, that is, offer. These details are contained in the insurance terms and conditions and premium rates. In our future research, we will analyse the terms and conditions for insurance of crops and fruits issued by other insurers.

The authors took efforts toward continuous improvement of knowledge of the basic principles and techniques on which crops and fruit insurance is based and will appreciate any well-meaning suggestions they could use in their future work.

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