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AGRICULTURAL SCIENCES

INFLUENCE OF HARVESTING METHODS ON MICROCLIMATE CHANGE ON THE LOGGING SITE IN FRESH SUBBOREAL CONDITIONS

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ВПЛИВ СПОСОБІВ РУБОК ГОЛОВНОГО КОРИСТУВАННЯ НА ЗМІНУ МІКРОКЛІМАТУ НА ЛІСОСІК В УМОВАХ СВІЖИХ СУБОРІВ

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Abstract

The analysis conducted at the experimental sites showed that the microclimate in logging areas after logging changes, especially in the surface air layer and on the soil surface. The article analyzes that high soil temperatures and decreased air humidity pose a great danger to successful forest regeneration. As a result, these phenomena can lead to root collar burns and disruption of the physiological processes of pine growth. The authors of the publication propose that in order to prevent the negative effects of logging, it is necessary to clearly regulate some parameters, for example, the diameter of windows and gaps in logging should not exceed half the average height of trees. In addition, it is important to take into account the direction of strips and clearcuts, which is recommended to be from west to east. In clearcuts, in the first years after felling, shrub undergrowth and the growth of some hardwoods can serve to protect the soil from overheating.

Анотація

Проведений аналіз на дослідних ділянках вказав на те, що мікроклімат на лісосіках після вирубки деревостанів змінюється, особливо в приземному шарі повітря та на поверхні ґрунту. У статті проаналізовано, що для успішного відновлення лісу велику небезпеку становить висока температура ґрунту та зниження вологості повітря. І як наслідок, такі явища можуть призвести до опіку кореневих шийок та порушення фізіологічних процесів розвитку соснового підросту. Авторами публікації надана пропозиція, що з метою запобігання негативних наслідків рубок, необхідно чітко регламентувати деякі параметри, наприклад, діаметр вікон і прогалин на рубках не повинен бути більшим за половину середньої висоти дерев. Крім того, важливо враховувати напрямок смуг і суцільних вирубок, який рекомендується проводити від

заходу на схід. На суцільних вирубках у перші роки після рубки можуть виконувати функцію захисту ґрунту від перегріву чагарниковий підлісок і підріст деяких листяних порід.

Keywords: felling system: continuous, gradual, selective; solar radiation: total, direct, scattered, reflected; air and soil temperature; air humidity.

Ключові слова: система рубки суцільна, поступова, вибіркова; сонячна радіація сумарна, пряма, розсіяна, відбита; температура повітря, ґрунту; вологість повітря.

Вступ.

У зв'язку із складною демографічною ситуацією та військовим станом в країні, знову зросла зацікавленість до способів та технологій рубок головного користування, котрі дають можливість сформувати нове покоління деревостану із найменшими витратами людської праці. Розширюються досвідно-виробничі роботи по поступовим, вибірковим вузьколісосічним рубка, спрямовані на збереження наявного під наметом стиглих насаджень підросту основних лісоутворюючих порід [1, 4, 5, 9]. В умовах Українського Полісся встановлено, що використання бережливих технологій лісозаготівлі дає можливість зберегти достатню кількість життєздатного підросту головних порід навіть при виконанні лісосічних робіт лісозаготівельними машинами [2, 3, 6, 7]. Однак рубки головного користування і лісовідновлювальні рубки поряд із прямим (фізичним, механічним) впливом на підріст і молодняк на лісосіці впливають на їх збереженість і ріст опосередковано або відносно, через абіотичні фактори, до яких у першу чергу відносять мікрокліматичні [2, 7]. Зрідження деревного намету або суцільне вирубування деревостану призводить до суттєвих змін складових сонячного радіаційного балансу, температури та вологості повітря та ґрунту [7, 8]. Визначення конкретних параметрів цих показників дає можливість обґрунтовано розробити системи заходів по формуванню високопродуктивних насаджень із збереженого підросту.

Методика.

Дослідження були проведені на дослідному об'єкті у Тетерівському лісництві Філії «Тетерівське лісове господарство» ДП «Ліси України». Лісосіки закладені у чистому одноярусному сосновому деревостані XII класу віку природного походження. Середній діаметр – 34,2 см, середня висота – 27,5 м, клас бонітета – I, повнота – 0,6, запас – 300 $м^3 \times га^{-1}$. Тип лісу – свіжий дубово-сосновий субір. У підліску поодинокі екземпляри горобини звичайної (*Sorbus aucuparsa* L.), крушини ламкої (*Franqula alnus* Mill.), ялівця звичайного (*Juniperus communis* L.), зіноваті руської (*Chamaecytisus ruthenicus* (Fisch. et Woloscz.) Klaskova). Живий надґрунтовий покрив представлений: із мохів – плевроцій Шребера (*Pleurozium schrebera* (Willd. Ex Brid.) Mitt.), дикран багатоніжковий (*Dicranum polysetum* Sw.), а із квіткових – верес звичайний (*Calluna vulgaris* (L.) Hull), чорниця (*Vaccinium myrtillus* L.), брусниця (*Vaccinium vitis-idaea* L.), конвалія звичайна (*Convallaria majalis* L.), куничник наземний (*Calamagrostis epigeios* (L.) Roth), грушанка круглолиста (*Pyrola rotundifolia* L.), буквиця лікарська (*Betonica officinalis* L.), орляк звичайний (*Pteridium aquilinum* (L.) Kuhn), тонконіг вузьколистий (*Poa angustifolia* L.). У прогалинах ґрунт сильно задернілий. Рельєф злегка хвилястий, із дуже незначимим поступовим пониженням у північно-західному напрямку. На стовбурцях наявні сліди низової лісової пожежі 15-20 річної давнини.

У компактний стиглий сосновий деревостан вклинюються ділянки лісових культур сосни звичайної (*Pinus sylvestris* L.) III, IV класів віку площею від 0,3 до 2,7 га, що являють собою певну перешкоду для роботи лісозаготівельних машин.

Дослідний об'єкт загальною площею 40 га складається із серії дослідних лісосік, де випробовували такі способи рубок: 1 – суцільна зі збереженням підросту – 3,4 га; 2 – смугово-поступова – 6,4 га; 3 – групово-вибіркова з вікнами у наметі деревостану діаметром до 25 м – 7,2 га; 4 - рівномірно-поступова – 7,4 га; 5 – смугово-вибіркова – 15,6 га. Дослідна лісосіка смугово-поступової рубки розділена на секції дво- і тризахідної рубки з вибіркою в перший захід усіх дерев на 15-метрових смугах відповідно через 15 і 30 м. Перший захід смугово-вибіркової рубки проведено на кожній п'ятій 15-метровій смузі, при цьому вибирали всі дерева на волоці, а на частині смуги, що залишилася, селективним методом зріджували деревостан за рахунок призначення у рубку суховершинних, пригнічених, уражених шкідниками та хворобами дерев.

До початку рубки і після її проведення на дослідних об'єктах на 1010 облікових площадках розміром 2×2 м був проведений кількісний та і якісний облік підросту і молодняку лісоутворюючих деревних порід, що дало можливість визначити його склад, якісний стан, розподіл за віком та висотою, загальну забезпеченість лісових ділянок і характер його розміщення. Під час обліку кількості та якості збереженого підросту після проведених рубок головного користування відзначається ослаблення підросту уже у перший вегетаційний період. Спостерігається пожовтіння та зрідження глиці, всихання гілок та стовбурів, зменшення приросту по висоті, пошкодження стовбурів соснового підросту великим сосновим довгоносиком (*Hylobius abietis* L.). На лісосіці суцільної рубки обкільцювання стовбурів становило 34,2% збереженого підросту. Така невтішна тенденція є наслідковою причиною зміни окремих параметрів мікроклімату на зрубі та лісосіках.

Для дослідження змін мікроклімату на кожній дослідній лісосіці і на контролі (у тому самому насадженні за межами досліду) в шести пунктах були встановлені станції спостереження. У період спостереження (друга декада червня місяця) на всіх станціях виконували актинометричні та градієнтні

вимірювання. Актинометричні спостереження містить визначення прямої, розсіяної та відбитої сонячної радіації за допомогою альбедометра, а градієнтні – температури повітря, поверхні та верхніх шарів ґрунту, вологості повітря на висоті 0,5 і 2,0 м. У центрі станційних майданчиків встановлювали психрометричні стовпи, на яких кріпили психрометри і підставки для альбедометрів. На поверхні майданчиків розміщували термінові, максимальні та мінімальні метеорологічні термометри, на глибині 10 і 20 см – ґрунтові термометри Савінова. Показання приладів знімали 5 разів на добу: 7:00, 10:00, 13:00, 16:00, і 19:00 годинах у десятикратній повторності. Погода в період спостереження була безхмарною, метеорологічні умови – звичайними для Українського Полісся.

Основна частина.

Мікроклімат лісових ділянок формується під впливом сонячної радіації. Залежно від способу рубки, ступеня зрідження материнського деревостану видозмінюється радіаційний баланс лісосіки. Сонячні промені по-різному нагрівають приземні шари повітря і поверхню ґрунту. На всіх дослідних лісосіках порівняно з контролем у денні години спостерігається збільшення середніх значень сонячної радіації, що надходить на діяльну поверхню об'єкта (рис. 1). Найбільше значення сумарної сонячної радіації помічено о 13-й годині на зрубі суцільної рубки – 1239,6 Вт×м$^{-2}$, по тім у цей час закономірно слідують групово-вибіркова (752,5), рівномірно-поступова (574,3), смугово-поступова (100,6), смугово-вибіркова (103,4 Вт×м$^{-2}$) рубки. На контрольній незрубуваній ділянці сумарна сонячна радіація становила о 13-й 734,0 Вт×м$^{-2}$, або в 16,9 рази менше, ніж на суцільній рубці, у 6,1 рази менше, ніж у вікні групово-вибіркової, і в 4,5 рази – ніж на рівномірно-поступовій.

На дослідних лісосіках смугових рубок максимальне надходження сонячної радіації спостерігається не опівдні, а раніше. Пов'язано це з напрямком вирубаних смуг (із заходу на схід) і їхньою шириною (15 м), що не перевищує половини середньої висоти деревостану. О 10-й годині сонце стоїть над горизонтом не високо, але сонячні промені падають зі сходу на поверхню ґрунту безпосередньо. Пізніше вирубана смуга затіняється сусідньою невирубаною і сумарна сонячна радіація дещо зменшується. У другій половині дня пряме сонячне проміння знову потрапляє на вирубану смугу із заходу, що знижує інтенсивність зменшення кількості сонячної радіації в цей час доби, характерне для дослідних лісосік суцільної, групово-вибіркової та рівномірно-поступової рубки.

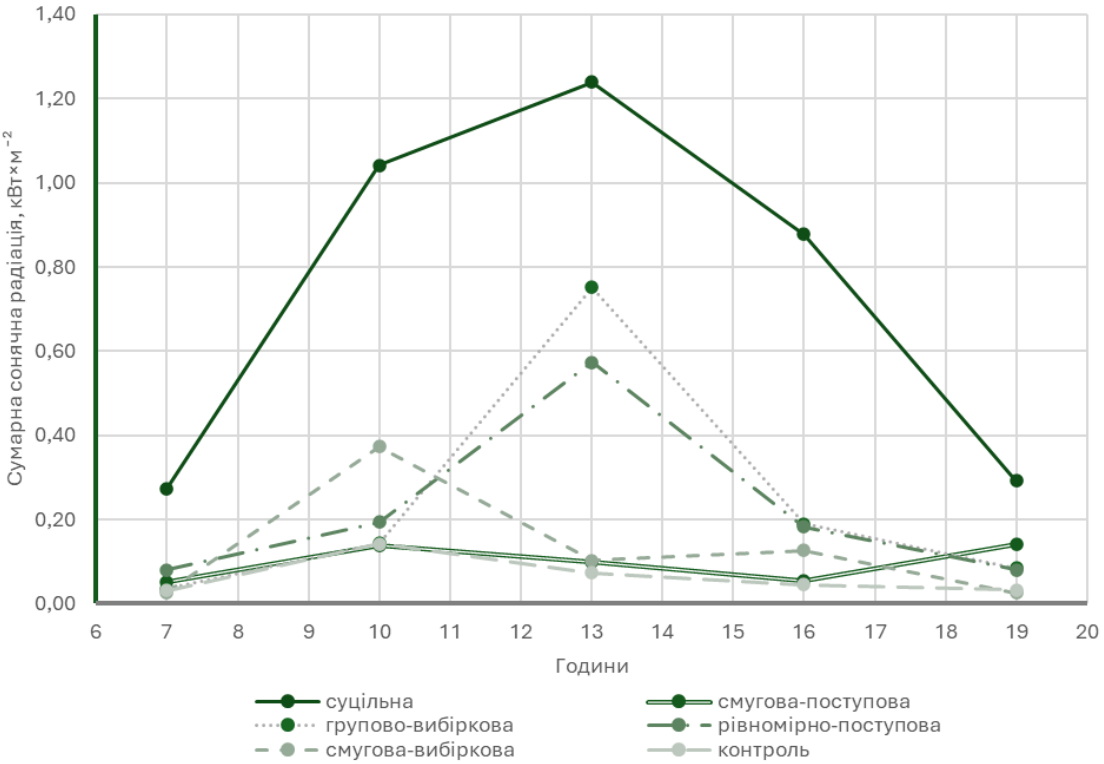

Рис. 1. Добовий перебіг сумарної сонячної радіації на лісосіках

Подібні ж тенденції простежуються і для фізичних величин прямої та розсіяної радіації (табл. 1). Але співвідношення їх суттєво змінюється залежно від способу рубки. Так, о 13-й годині на зрубі суцільної рубки розсіяна радіація становила 30,3% прямої, у вікні групово-вибіркової рубки – 22,5%, на прогалині рівномірно-поступової – 41,3%, у смугах, що залишилися, смугово-поступової – 155,7%, смугово-вибіркової рубки – 310,3%, а на контролі – 126,8% прямої радіації (рис. 2). Оскільки деревна рослинність краще пристосована до дифузного освітлення, співвідношення прямої та розсіяної радіації є сприятливим для лісовідновлення на дослідних лісосіках смугово-поступової та смугово-вибіркової рубок, несприятливим для рівномірно-поступової, суцільної та особливо групово-вибіркової рубок.

Таблиця 1

Середні значення складових сонячної радіації, M ± σ

Спосіб рубки	Час спостереження	Сонячна радіація, Вт×м$^{-2}$		
		пряма	розсіяна	відбита
Суцільна	7:00	162,1±65,26	111,6±20,24	64,4±7,62
	10:00	731,3±15,43	311,1±2,94	184,4±21,48
	13:00	951,0±118,72	288,6±104,19	150,9±4,42
	16:00	580,4±2,05	298,1±63,15	114,9±7,56
	19:00	166,1±41,04	126,9±4,42	34,1±0,00
Смугово-поступова	7:00	33,5±9,14	18,6±2,39	7,6±2,76
	10:00	59,5±0,51	79,2±10,86	29,0±4,14
	13:00	39,3±28,99	61,2±25,36	28,0±6,21
	16:00	25,5±15,36	29,5±0,55	20,7±13,11
	19:00	107,6±31,04	34,7±10,87	19,7±5,18
Групово-вибіркова	7:00	5,6±2,35	29,0±4,34	10,9±1,00
	10:00	56,4±22,58	86,4±5,60	55,3±4,52
	13:00	614,2±81,29	138,3±39,00	168,2±31,6
	16:00	92,6±20,32	96,5±8,47	50,8±3,38
	19:00	57,6±18,06	27,7±1,69	11,9±0,56
Рівномірно-поступова	7:00	38,8±17,55	42,5±12,10	32,2±9,60
	10:00	111,0±65,53	83,4±25,26	59,3±5,49
	13:00	406,3±17,57	168,0±27,45	124,1±8,78
	16:00	177,3+23,60	105,4±60,39	67,5±22,51
	19:00	43,9±2,20	36,8±14,82	20,9±9,88
Смугово-вибіркова	7:00	25,0±1,45	1,9±0,63	4,6±1,52
	10:00	284,9±71,87	88,3±22,70	59,9±0,63
	13:00	25,2±3,78	78,2±15,13	37,8±2,52
	16:00	25,2±10,09	102,1±13,87	30,3±2,52
	19:00	10,7±6,94	15,1±6,30	10,7±1,89
Контроль (незрубана ділянка)	7:00	15,2±7,09	16,0±0,34	6,0±0,89
	10:00	64,8±48,62	77,0±23,30	43,0±7,60
	13:00	32,4±20,26	41,1±0,00	25,8±5,57
	16:00	46,3±13,72	–	16,6±4,39
	19:00	33,4±1,01	–	11,1±2,02

Примітка. M — середнє арифметичне, *σ* – похибка середньої арифметичної

В умовах дослідного об'єкта більша частина радіації, що надходить на ґрунт і в приземні шари повітря, поглинається ґрунтовим покривом і ґрунтом, про що свідчить співвідношення відбитої та сумарної сонячної радіації. Амплітуда величин альбедо відносно незначна, а самі величини становлять від 0,12 до 0,43 залежно від способу рубання та часу доби. Таким чином, о 13-й годині найнижчий рівень альбедо зареєстровано на суцільній рубці (0,12), потім – на групово-вибірковій і рівномірно-поступовій (0,22), смугово-поступовій (0,26), зростаючи на смугово-вибірковій до 0,37, що практично дорівнює альбедо незайманого рубкою насадження. Пов'язано це з підвищеним поглинанням сонячної радіації мінералізованим ґрунтом. З одного боку, цей фактор сприятливо впливає на рослинність, активізуючи процес фотосинтезу, але з іншого, надмірний перегрів слабко-здерев'янілих сходів і однорічних сіянців у спекотні літні дні може призвести до їхньої загибелі. Збільшення прямої сонячної радіації може призвести до значного підвищення температури поверхні ґрунту. Це підтверджується результатами кореляційного аналізу. Коефіцієнт кореляції між прямою сонячною радіацією і температурою поверхні ґрунту становить 0,71.

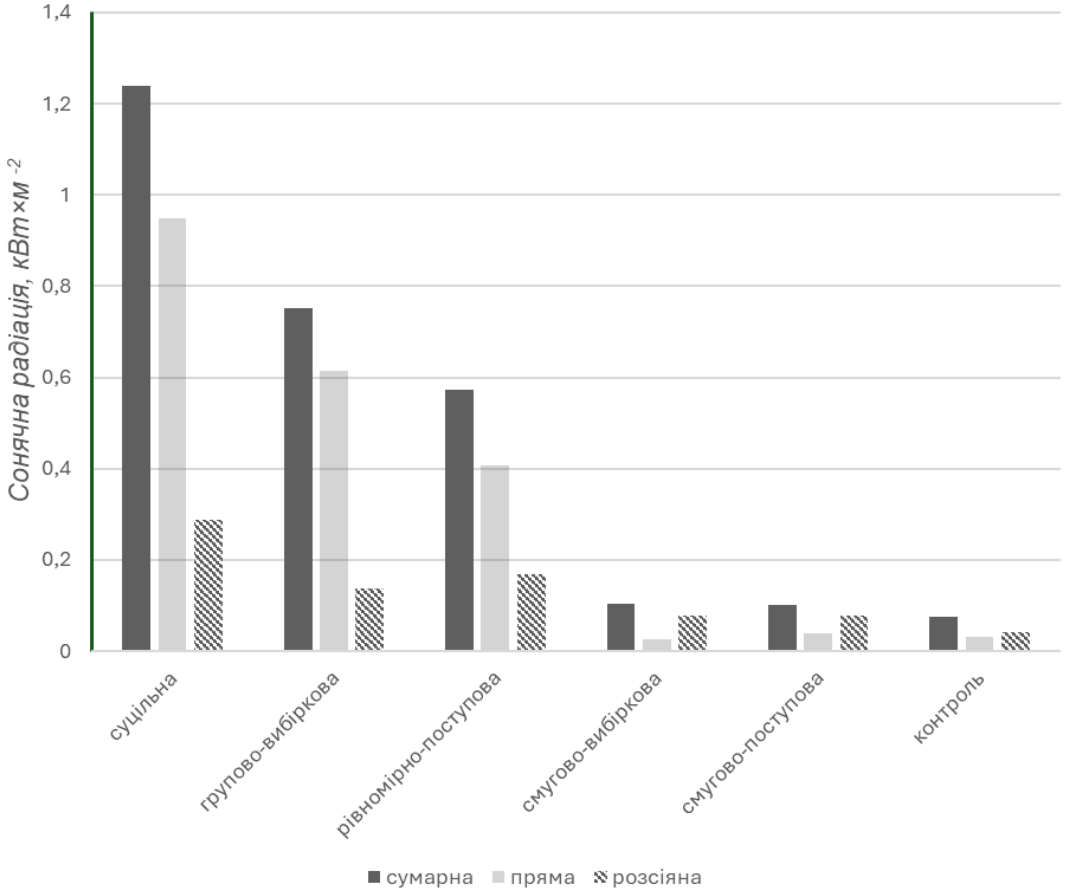

Рис. 2. Сумарна, пряма і розсіяна радіація на лісосіках о 13:00 годині

Найбільше нагрівання настає на відкритій ділянці. Тому закономірно, що на дослідній лісосіці суцільного рубання спостерігається порівняно з контролем підвищення температури поверхні ґрунту, прогрівання поверхневих шарів і приземного шару повітря протягом усього світлого часу доби (табл. 2). О 13-й годині середня температура повітря на зрубі суцільної рубки підвищується на 2,9° порівняно з насадженням, де рубка не велася (контроль). На поверхні ґрунту відповідне збільшення сягає 14,7°, на глибині 10 см – 2°. Контрастна зміна температурного режиму несе певну небезпеку для підросту. Улітку на лісосіці визначальним показником стає максимальна температура поверхні ґрунту, яка досягає найбільшої величини о 13:00-16:00 год. Чітко простежується зростання середньої температури поверхні ґрунту в цей час доби від контрольного деревостану (29,1 і 27,8°) і незрубаної смуги смугово-вибіркової рубки (29,0 і 27,5°) до ділянки суцільного вирубування (43,8 і 45,8°) і вікна групово-вибіркової рубки (47,6 і 39,3°). Якщо на контрольному пункті спостережень денна амплітуда коливань температури становила 12,6°, то на зрубі суцільної рубки – 27,3°, у вікні групово-вибіркової рубки – 30,7°. На суцільній вирубці о 16-й годині було зареєстровано максимальну температуру поверхні ґрунту – 49,2°, а у вікні групово-вибіркової рубки – 51,5°, що відповідно в 1,7 і 1,8 рази більше, ніж на контрольному пункті. Тут температура досягає критичної точки існування живої плазми (50-54°). У липні та серпні температура поверхні ґрунту може в окремі дні перевищувати відмічені в період досліджень величини, виникає пряма небезпека опіку кореневої шийки соснових стовбурів та їхньої загибелі. Негативно впливає на ріст і збереженість підросту і значна амплітуда температур, що може призвести до зниження тургорного тиску в клітинах молодих рослин, до зменшення стійкості останніх до інших несприятливих чинників зовнішнього середовища, особливо до лісових шкідників і хвороби лісу. Наведені дані свідчать про те, що найбільш несприятливі умови для підросту сосни утворюються в умовах свіжих суборів у вікнах групово-вибіркової рубки, де температура поверхні ґрунту о 13-й годині перевищує навіть відповідний показник посеред суцільної вирубки 100-метрової ширини. Пов'язано це з уповільненням циркуляції нагрітого повітря у вікнах деревостану, що залишився, а також із підвищеною мінералізацією ґрунту під час механізованих лісорозробок на лісосіках цього складного способу рубок.

Статистичний аналіз одержаних даних показав, що найбільша кількість різниці за t – критерієм Стьюдента на 5-% рівні значущості між середніми показниками, які характеризують мікроклімат на дослідних і контролем, спостерігається о 13-й годині і найбільш притаманна на суцільній, групово-поступовій і рівномірно-поступовій лісосіках, а найменша – на лісосіках, де інтенсивність вибірки деревостану невелика.

Таблиця 2

Середні значення складових сонячної радіації, M±σ

Спосіб рубки	Час спостереження	Температура			
		повітря	поверхня ґрунту	глибина, 10 см	глибина, 20 см
Суцільна	7:00	18,0±1,01	18,5±2,11	16,8±0,47	17,1±0,37
	10:00	25,4±4,10	35,5±3,50	17,2±0,65	16,9±0,40
	13:00	28,2±4,15	43,8±2,25	19,0±0,50	18,1±0,10
	16:00	33,1±0,10	45,8±0,25	20,4±0,35	18,1±1,10
	19:00	29,4±0,10	30,6±1,35	20,2±0,45	18,6±0,90
Смугово-поступова	7:00	17,3±1,73	16,9±1,30	15,1±0,38	15,0±0,00
	10:00	20,8±3,45	18,2±1,95	15,0±0,45	14,6±0,35
	13:00	24,4±3,50	25,1±3,10	15,6±0,60	15,3±0,55
	16:00	27,4±2,45	28,4±5,90	16,1±0,19	15,7±0,14
	19:00	28,8±030	30,8±0,75	16,2±0,00	15,8±0,25
Групово-вибіркова	7:00	17,6±1,71	16,9±1,39	17,1±0,06	16,2±0,57
	10:00	22,8±4,15	31,0±7,50	17,4±0,35	16,6±0,60
	13:00	27,4±4,20	47,6±5,95	18,6±0,50	18,4±0,55
	16:00	30,3±1,30	39,3±0,75	18,7±0,33	18,4±0,61
	19:00	28,3±0,00	29,4±0,30	18,9±0,05	18,5±0,40
Рівномірно-поступова	7:00	19,1±0,88	18,7±1,09	16,7±0,27	16,3±0,27
	10:00	22,6±3,50	25,0±4,00	17,0±1,05	16,5±0,50
	13:00	25,8±3,95	42,2±7,75	19,5±1,50	17,2±0,75
	16:00	31,2±0,35	33,8±0,35	21,0±0,00	18,0±0,00
	19:00	28,5±0,50	28,0±0,00	20,3±0,25	17,8±0,25
Смугово-вибіркова	7:00	16,4±1,55	15,8±1,17	15,8±0,44	15,5±0,29
	10:00	21,9±3,40	21,5±3,50	16,5±0,50	15,8±0,30
	13:00	27,0±4,55	29,0±8,00	17,8±1,25	16,5±0,50
	16:00	29,6±1,46	27,5±0,00	18,5±0,50	16,8±0,25
	19:00	27,7±1,45	25,0±0,50	18,2±0,25	17,0±0,00
Контроль (незрубана ділянка)	7:00	16,7±1,30	16,5±1,92	15,1±0,46	15,4±0,31
	10:00	21,8±3,55	22,5±4,50	16,4±0,85	16,6±0,15
	13:00	25,3±3,70	29,1±2,10	17,0±1,00	16,6±0,60
	16:00	26,6±2,46	27,8±2,92	17,8±0,07	16,9±0,24
	19:00	27,6±0,50	26,5±1,00	17,8±0,25	17,3±0,25

Посилене нагрівання поверхні ґрунту спричиняє прогрівання верхніх його шарів, де міститься основна частина фізіологічно активних корінців підросту. Однак тут температура підвищується порівняно незначно. На глибині 10 см вона нижча, ніж у повітрі о 13-й годині, на 6,3-9,2°, а на глибині 20 см – на 8,6-10,5° . О 13-й годині на суцільній рубці температура ґрунту на глибині 10 см становила 19,0°, на контролі – 17,0°, на глибині 20 см – відповідно 18,1 і 16,6°. Суттєво зменшується амплітуда коливання температур: на глибині 10 см – 3,6°, на глибині 20 см – 1,2-2,3°. Отже, у верхніх шарах ґрунту на лісосіках зберігається помірна стабільна температура, яка тільки за дуже критичних умов гідрологічного режиму може негативно позначитися на кореневих системах підросту.

Температура приземного шару повітря послідовно, хоча й менш рівномірно, збільшується від насадження без рубки (о 19-й годині – 27,6°) до смугової-вибіркової та смугової-поступової (відповідно 29,6 і 28,8°) і до рівномірно-поступовій та групової-вибіркової (31,2, 30,3°) рубок і найбільшої величини досягає на суцільній вирубці (33,1°).

Найвища вологість повітря на висоті 0,5 і 2,0 м спостерігається в ранкові години (незалежно від способу рубки) з подальшим денним зниженням аж до вечора. Відносна вологість на висоті 0,5 м вища, ніж на висоті 2,0 м над поверхнею ґрунту, що створює у полуденні години сприятливіші умови для 1-3-річного підросту сосни. Досить виразно простежується відмінність у бік зменшення на ділянці суцільної вирубки за величиною вологості повітря порівняно з дослідними лісосіками, де деревостан частково зберігся на корені. Якщо вранці на суцільній вирубці вологість приземного шару повітря була меншою по відношенню до контрольної невирубуваної ділянки на 3,7-6,4%, то о 16-й годині – вже на 7,5-10,0%. Увечері спостерігається зворотна залежність. На суцільній вирубці о 21-й годині вологість повітря наростає значно швидшими темпами, ніж під пологом лісу. Деяка невідповідність цифрових даних, наприклад, на смугово-вибірковій рубці пов'язана з випаданням опадів у нічний час. За тривалого посушливого періоду зниження вологості повітря на суцільній рубці в денний час може послужити додатковою причиною порушення фізіологічних процесів розвитку підросту.

Висновок.

Результати опрацювання даних спостережень свідчать про те, що на лісосіках в умовах свіжої суборі мікроклімат вирубок і деревостанів, зріджених першими прийомами поступових і вибіркових

рубок, істотно змінюється, причому найбільше це помітно в приземному шарі повітря та на поверхні ґрунту. Загалом радіаційний баланс і температурний режим вегетаційного періоду сприятливий для формування на лісосіках нового покоління лісу зі збереженого соснового підросту. Небезпеку становить висока температура поверхні ґрунту, яка на відкритих ділянках може стати причиною опіку кореневої шийки підросту, а за підвищеного дефіциту вологості - причиною порушення фізіологічних процесів розвитку підросту, зниження його стійкості до шкідників і хвороб лісу. Щоб запобігти негативним наслідкам такого впливу, слід чіткіше регламентувати деякі параметри рубок головного користування в умовах, коли лісосічні роботи виконуються з використанням агрегатних лісозаготівельних машин. Так, діаметр вікон і прогалин на групово-вибіркових і поступових рубках не повинен перевищувати половини середньої висоти дерев. Це стосується і ширини смуг, які вирубують під час смугово-поступових і смугово-вибіркових рубок. Напрямок смуг і суцільних лісосік – із заходу на схід. На суцільних вирубках у перші роки після рубки функцію захисту ґрунту від перегріву можуть виконувати чагарниковий підлісок і підріст деяких листяних порід доти, доки вони не складатимуть серйозної конкуренції головним лісоутворювальним породам.

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MEDICAL SCIENCES

FOOD INTOLERANCES AND ALLERGIES IN AUTISM SPECTRUM DISORDERS

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Background Autism is often associated with immune system problems, gastrointestinal problems, and changes in the gut microbiome. This can be caused by a sensitivity to certain foods or even a food allergy. Several previous studies have investigated the relationship between allergic conditions and autism spectrum disorder (ASD). This disorder remains throughout life, directly affecting not only the diagnosed individuals, but also their families, who must adapt to the new life context and make decisions about the treatment and therapies necessary for recovery. According to recent research, the prevalence of autism spectrum disorder has increased by 123% in the past decade. The alarming increase in the prevalence of autism is directly proportional to the responsibility of parents and professionals to identify effective treatments and therapies.

Objectives Assessment of the state of health. Determining the intestinal microbiome is important for children with autism because imbalances at this level can seriously affect the state of homeostasis. Material and methods Analyzing the main biochemical markers through laboratory analyses. The biochemical imbalance can influence the symptoms in autism and it is important that the therapeutic intervention must be carried out on all the affected levels.

Results After analyzing the case study, we notice that after starting the treatment with multi-strain probiotic and vitamin D, the symptoms of autism improved. A reduction in asthma attacks and an increase in immunity were also observed. The nutritionist recommended the introduction of a ketogenic diet as well as a diet rich in foods that contain vitamin D.

Conclusion Our results suggest that gastrointestinal disorders and food sensitivities may be more common in children with autism spectrum disorders, and the application of dietary diets may help the autistic child to improve their health.

Keywords: autism, asthma, food allergy, healthy lifestyle, gut microbiome

Introductory notions

According to the United States Centers for Disease Prevention and Control (CDC, 2020), autism spectrum disorder (ASD) has become a common disorder, affecting 1 in 54 children, that is usually diagnosed in childhood (Medavarapu, 2019). People diagnosed with ASD often receive controversial treatments (Simpson, 2005), mainly because the beneficiaries are not sufficiently informed, but also because of the lack of an entity that regulates these forms of treatment. According to Simpson's definition, a controversial treatment is any method or strategy that has not been supported by scientific evidence. These forms of treatment are called alternative therapies, and in English - complementary and alternative medicine and therapy. It is important that parents of children with ASD choose in an informed manner the correct form of therapy and are informed about the lack of positive effects of alternative treatments and their disadvantages. By looking at these forms of scientifically unproven therapies and knowing that there is no cure yet to change this life condition, the decision-making process will be easier and clearer. Gluten-free casein-free diet involves dietary elimination of certain proteins such as gluten and casein. This therapy is based on the theory that the accumulation of peptides and toxins in the body affects the proper functioning of the brain. Incomplete processing of peptides acts like opioids, reduces pain sensitivity and increases the severity of specific behaviors in children with ASD (Baspinar, 2020). However, studies have not shown mechanisms to support this theory. It is a myth that a gluten-free and casein-free diet is risk-free (Mari-Bauset, 2014), so parents choose this approach without having the big picture. There are no conclusive studies demonstrating the lack of risk associated with the elimination of these proteins from the body (Dosman, 2013). Also, families who choose this therapy may face financial difficulties and an expensive diet. Currently, there is insufficient scientific evidence to recommend a gluten-free diet as a treatment for autism spectrum disorder (Buie, 2013). A review of studies in this area found no benefit for ASD symptoms (Piwowarczyk, 2017). Furthermore, clinical trials did not detect behavioral changes (Gonzales-Domenech, 2019), alt-

hough a post-intervention diet effect was observed, associating behavioral changes with urinary beta-casomorphin levels. Autism spectrum disorder is a complex neurodevelopmental disorder characterized by deficits in social interaction, language and communication, as well as the presence of limited repetitive behaviors. The etiology of ASD includes both genetic and environmental risk factors, and it is estimated that up to 40–50% of the variance responsible for ASD can be attributed to environmental risk factors. Allergies are often a major problem in patients with autism and attention deficit hyperactivity disorder.

Doctors who regularly treat autistic patients often find that a disproportionate number of these children also have chronic allergy problems, such as: rhinitis (nasal congestion), sinusitis (sinus infection), recurrent ear infections, otitis media (fluid in the middle ear), asthma, eczema (inflammation of the skin). New research suggests that the immune system plays an important role in autism. This means that people with autism are twice as likely to have food allergies, skin allergies or respiratory allergies (Lyall et al., 2015).

Parents of children with ASD who have gastrointestinal symptoms often report improvements in certain behaviors and resolution of gastrointestinal symptoms after implementing dietary interventions such as a casein-free/gluten-free diet. Such observations suggest that food allergies may influence behavioral symptoms in some children with autism spectrum disorders (Guifeng et al., 2018). Food allergies, in particular, can worsen behavioral symptoms because the child cannot communicate their discomfort very effectively. Aberrations of the immune system are one of the frequently observed problems, including frequent infections, altered cytokine levels, and increased prevalence of autoimmune diseases. It has been suggested that the association of food allergy with autism spectrum disorder may be a major reason for the high prevalence of gastrointestinal problems in children with autism spectrum disorder (Onore et al., 2012).

Children with autism may not be able to communicate their discomfort when dealing with an allergic reaction. You may notice changes in behavior such as becoming more extreme; they can even start to dissolve or cause adverse reactions to certain foods. Here are some signs: irritability, sleep problems, difficulty concentrating, repetitive behavior, hyperactivity.

Researchers from the Department of Epidemiology at the University of Iowa found that 11 percent of children with autism had food allergies, compared to 4 percent of neurotypical children. Almost 19% of children with autism spectrum disorder had respiratory allergies than other children. Many had skin allergies; this rate was nearly 17%, compared to nearly 10% of non-spectrum children (Nardone, Elliot, 2016). However, there is no proven link between allergies and autism or that allergies are associated with the development of autism disorders. Food intolerance is a common problem in children with autism. This can cause discomfort and increase behavior problems. Although an intolerance is not the same as an allergy, they have similar treatments (Billeci et al., 2015).

In recent years, experts have discovered that the bacteria in the intestines affect the development of diseases and our mood. While this science is still in its infancy, researchers have found that the gut microbiome of children with autism is different. Certain foods can cause discomfort, pain and fear in people with autism spectrum disorders. Autistic children are more likely to suffer from constipation, diarrhea or stomach pain. Some types of food allergies are more common in children with autism than others. People with autism are more likely to be allergic to the following foods: egg protein, soy protein, casein or milk protein, corn protein, gluten or wheat protein (Vargas et al., 2005; Gottfried et al., 2015).

Immune dysfunction is a possible link between environmental risk factors and autism spectrum disorder. Children with autism spectrum disorders have often been reported to have symptoms of immune system disorders, such as frequent infections and an increased prevalence of autoimmune diseases. In addition, maternal infection, inflammatory cytokines, and autoimmune diseases during pregnancy have also been associated with autism spectrum disorder in children in some studies (Theoharides et al., 2016; Moaaz et al., 2016).

Treating allergies often appears to improve not only the child's health, but can also have a positive effect on function and parameters of autism spectrum disorder, including eye contact, joint attention, social interaction, and language processing function.

Conclusions

Autistic spectrum disorder is a disease that affects a person's development, especially in social interaction, causing behavioral problems and lack of communication skills. Children with ASD are generally underdiagnosed and undertreated for allergic diseases as well as other non-allergic diseases that are common in children. Anaphylaxis can be a life-threatening condition. A child on the autism spectrum with recurrent infections deserves an immune evaluation for immunodeficiency. An autistic child with eczema, chronic nasal symptoms, asthma, significant gastrointestinal symptoms, or recurrent respiratory infections requires a more thorough evaluation to identify whether they are suffering from various food allergies or intolerances.

CASE STUDY

A.V.M - boy, born in the city of Constanta on 19.02.2018. At the moment, the family lives in the city of Ovidiu, Constanţa county.

Diagnosis:

1. ADHD
2. Infantile autism

Personal anamesis:

During the pregnancy, the mother was very stressed because she experienced a death in the family. She was legally married to the father of the child for 6 years, he being sick with a cancerous tumor in the spine, diagnosed 1 year before the birth of the child. She was not a smoker and did not consume alcohol. The child's birth was on time, but by caesarean section due to complications that arose at the last moment. The APGAR score at birth was 9. The child was born with a congenital malformation on the left ear, which was detected after birth through audio tests performed by

the attending doctors. He started walking at the age of 2 years and was crawling normally at the age of 1 and a half years.

Somatic and thoracic development, within normal limits: normal appearance, proportional body.

Family Anamnesis:

He is the first child in the family. At birth, the mother was 25 years old and the father 36 years old. The mother worked at a grocery store, and the father was retired due to illness. They lived together. The parents separated in 2021, 3 years after the boy was born. A week after the divorce papers were issued, the child's father died, the causes being the illness he suffered. Their lifestyle was orderly and balanced, without arguments but only with small misunderstandings. While the mother was at work, the minor remained in the care of the maternal grandmother, who helped him a lot. The child's relationship with the other family members was good, he being very close to his maternal grandmother. The child shows emotional disturbances and increased psychomotor agitation, impatience and poor concentration. He is not interested in things that make loud noises, being frightened by them. Controls were carried out by ENT doctors from the Constanţa County Clinical Hospital, to be continued at the Audionova ENT clinic, where audio tests were performed while awake and asleep. The audio tests performed showed that he hears very little with his left ear, and the right one is in perfect condition.

Recommendations:

- Implantation of the affected ear with a cochlear implant,

- Speech therapy to develop language,

The implantation was carried out at the hospital in Târgu Mureş. The controls were carried out at the Marie Curie children's hospital in Bucharest and the behavioral assessment was carried out at several speech therapists and psychiatrists in Constanta.

The child has now started to develop his language by repeating words and forming short phrases, through speech therapy 3 times a week for 1 hour.. He presents, in addition to hearing and language problems, bronchial asthma, frequent colds because he has deficient immune system and has frequent gastrointestinal problems. Because of intestinal transit disorders such as constipation that seemed to worsen autism symptoms, he went to a psychiatrist in Iasi. The doctor suggested him to perform several laboratory analyses, including the analysis of the intestinal microbiome, which, according to the doctor, would be behind the child's serious problems. After performing the analyses, it was observed that there are several biochemical markers that are below normal values. In the case of vitamin D, the situation is worse because the value obtained is 14 nanograms, and the minimum normal value is 30 nanograms. The analysis of the intestinal microbiome did not turn out well, which required sending the results to the doctor in Iaşi, who subsequently sent him the treatment. The large amount of positive lipopolysaccharide bacteria required a two-week probiotic treatment. One month after the start of the treatment, the mother had a dysbiosis analysis. The analysis showed an improvement of the problems that initially appeared in the intestinal microbiome. It was recommended to start a ketogenic diet under the guidance of the nutritionist because gluten intolerance was detected. The doctor also created a recuperative nutritional plan to increase the value of vitamin D. After a period of 3 months from the start of the diet, it was noticed that the symptoms were reduced, the intestinal transit was regulated, the immunity increased, even the bronchial asthma improved.

Conflict of interest statement

The authors declare that the study was conducted in the absence of any commercial or financial relationships that could be interpreted as a potential conflict of interest.

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PEDAGOGICAL SCIENCES

THE DISCIPLINE “INTRODUCTION TO PHYSICS” AS A BASIS FOR NATURAL SCIENCES, GENERAL TECHNICAL AND SPECIAL DISCIPLINES

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ДИСЦИПЛИНА “ВВЕДЕНИЕ В ФИЗИКУ” КАК БАЗА ЕСТЕСТВЕННОНАУЧНЫХ, ОБЩЕТЕХНИЧЕСКИХ И СПЕЦИАЛЬНЫХ ДИСЦИПЛИН

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Abstract

There is a need to ensure optimization of the information being studied to the level of its practical application and taking into account the future professional activity of the specialist. The task of forming an interconnected unified system of skills and abilities at the level of integrated use of methods of individual disciplines to solve any practical problem remains. Establishing a system of flexible connections between different areas of knowledge remains the task of each of the disciplines studied. The fundamental knowledge base, which is the basis for the study of special disciplines, should be considered to varying degrees in courses of all natural science disciplines on the basis of various methods of their practical use, with the obligatory involvement of modern mathematical apparatus. It is necessary to eliminate adaptation problems that arise among first-year students, taking into account the real level of their preparation when studying academic disciplines of the natural and mathematical cycle. The hypothesis was confirmed that the use of problem-based learning methods when teaching the discipline “Introduction to Physics” helps to increase the efficiency of the educational process. It is concluded that the availability of textbooks on paper is mandatory, which increases students’ opportunities for self-educational activities. There is an opportunity to further increase the efficiency of the educational process for students of technical specialties through the further use of problem-based learning methods for the discipline “Introduction to Physics”.

Аннотация

Имеется необходимость обеспечения оптимизации изучаемой информации до уровня ее практического применения и с учетом будущей профессиональной деятельности специалиста. Сохраняется задача формирования взаимосвязанной единой системы умений и навыков на уровне комплексного использования методов отдельных дисциплин для решения любой практической задачи. Установление системы гибких связей между различными областями знаний остается задачей каждой из изучаемых дисциплин. Фундаментальная база знаний, являющихся основой при изучении специальных дисциплин, должна быть в разной степени рассмотрена в курсах всех естественнонаучных дисциплин на основе различных методов их практического использования, с обязательным привлечением современного математического аппарата. Необходимо устранение проблем адаптационного характера, возникающих у первокурсников с учетом реального уровня их подготовки при изучении учебных дисциплин естественно-математического цикла. Подтверждена гипотеза о том, что использование методов проблемного обучения при преподавании дисциплины «Введение в физику» способствует повышению эффективности образовательного процесса. Сделан вывод об обязательности наличия учебных пособий на бумажных носителях, что повышает возможности студентов к самообразовательной деятельности. Имеется возможность дальнейшего повышения эффективности учебного процесса для студентов технических специальностей за счет дальнейшего применения методов проблемного обучения для дисциплины «Введение в физику».

Keywords: mathematical apparatus, physics, problem-based learning methods, natural and mathematical disciplines

Ключевые слова: математический аппарат, физика, методы проблемного обучения, дисциплины естественно-математического цикла

Введение

Подготовка специалистов с широкой базой фундаментальных знаний и навыков не должна основываться только на заучивании больших объемов теоретического материала из области каждой естественнонаучной дисциплины. Необходимо обеспечить оптимизацию и, в некоторой степени, минимизацию предлагаемой информации до уровня ее

практического применения и с учетом будущей профессиональной деятельности специалиста. В основе образовательного процесса сохраняется задача формирования взаимосвязанной единой системы умений и навыков на уровне комплексного использования методов отдельных дисциплин для решения любой практической задачи. При этом установление системы таких гибких связей между различными областями знаний остается задачей каждой из изучаемых дисциплин. Фундаментальная база знаний, являющихся основой при изучении специальных дисциплин, должна быть в разной степени рассмотрена в курсах всех естественнонаучных дисциплин на основе различных методов их практического использования, с обязательным привлечением современного математического аппарата, и, естественно, с учетом интересов будущей профессиональной деятельности [2].

Особое значение в фундаментальном образовании студентов технических специальностей является такая дисциплина как «Введение в физику».

Целью изучения дисциплины «Введение в физику» является устранение проблем адаптационного характера, возникающих у первокурсников с учетом реального уровня их подготовки при изучении учебных дисциплин естественно-математического цикла, в частности, при изучении физики, создание необходимой базы знаний для последующего изучения дисциплины “Физика” и других смежных естественнонаучных, общетехнических и специальных дисциплин а процессе обучения в техническом вузе.

Для достижения поставленной цели реализуются следующие задачи:

1. формирование навыков и умений по рациональной организации умственной деятельности, восприятия и конспектирования теоретического материала,
2. развитие логического мышления и овладение методами решения задач различных разделов физики путем построения математических моделей физических процессов и использования приемов математики для решения физических задач;
3. формирование навыков обработки экспериментальных данных с применением элементов теории ошибок, построения графиков зависимостей физических величин;
4. формирование умения выделить конкретное физическое содержание в прикладных задачах учебной и профессиональной деятельности;

Методика

Одним из способов решения проблемы повышения эффективности образовательного процесса по дисциплине «Введение в физику» является применение методов проблемного обучения, хорошо зарекомендовавших себя при изучении дисциплины «Физика» [1].

К методам проблемного обучения относятся:

1. Метод монологического изложения (монологический метод). При использовании монологического метода преподаватель рассказывает (монолог), сообщая готовые выводы науки, правила, факты, показывает образец действия и даёт учащимся задание на заучивание учебного материала и его воспроизведение и т.д. При этом доминирует исполнительная деятельность учащихся: наблюдение; наблюдение; запоминание; выполнение действий по образцу.

2. Метод диалогического изложения (диалогический метод). При использовании диалогического метода изложения учебного материала преподаватель ведёт в форме сообщающей беседы. При этом проблемная ситуация создаётся постановкой проблемных вопросов или показом противоречивости фактов, явлений. А учащиеся как бы помогают преподавателю в обосновании гипотезы и её доказательстве. Но сущность новых понятий объясняется преподавателем.

3. Метод эвристической беседы (эвристическая беседа). Данный метод характеризуется тем, что изложение учебного материала преподаватель ведёт в форме эвристической беседы. А отличается она от сообщающей беседы, главным образом постановкой основной проблемы, делением её на подпроблемы и организацией поисковой деятельности учащихся по её решению.

4. Метод исследовательских заданий (исследовательский метод). Данный метод характеризуется самым высоким уровнем познавательной самостоятельности учащихся.

5. Метод алгоритмических предписаний (алгоритмический метод). Основные признаки алгоритмического метода – это инструктирование учащихся. При этом преподаватель указывает, что следует делать и как делать. Учащиеся обычно пользуются инструкционными картами. Применяется этот метод в основном на лабораторно-практических занятиях и в кружковой работе (моделирование, конструирование и т. д.)

6. Метод программированных заданий (программированный метод). Этот метод заключается в подготовке учебного материала путём "пошаговой" разбивки его в форме вопросов, задач и заданий (часто с выбором ответов). Нужно отметить, что метод программированных заданий обуславливает самостоятельную работу учащихся в основном репродуктивного типа [3-4].

Основная часть

В процессе изучения дисциплины имеются только практические занятия, включающие в себя теоретический материал, то есть проводимые в виде лекции. Наиболее эффективно показали себя лекция с заранее запланированными ошибками, диалогический метод, эвристическая беседа.

Лекция с заранее запланированными ошибками, развивая у студентов умение оперативно анализировать профессиональные ситуации, выступать в роли экспертов, оппонентов, рецензентов, выделять неточную, неверную информацию, формируя, таким образом, профессиональное мышление. Преподаватель должен заложить в лекцию определенное количество ошибок содержательного, методического или поведенческого харак-

тера. Студенты фиксируют в ходе лекции обнаруженные ошибки, в конце лекции отводится десять минут для их обсуждения. Обсуждение должно проводиться при помощи диалогического метода или метода эвристической беседы. Обнаружение студентами ошибок, будет способствовать повышению самооценки и мотивации к научению [1].

Применение диалогического метода и метода эвристической беседы на практических занятиях позволяет выстраивать не только диалог преподаватель-студент, но и студент-студент, формируя навыки работы в команде и способность к самоорганизации и самообразованию.

В результате проделанной работы было выявлено, что благодаря применению методов проблемного обучения на занятиях происходит повышение эффективности образовательного процесса. Критерии эффективности, выявленные в процессе опроса, следующие:

1. приобщение студентов к объективным противоречиям развития научного знания и способов их преодоления;
2. формирование профессионального мышления;
3. повышение мотивации научения.

Выводы

В работе была подтверждена гипотеза о том, что использование методов проблемного обучения при преподавании дисциплины «Введение в физику» способствует повышению эффективности образовательного процесса. При использовании методов проблемного обучения происходит повышение самооценки студентов и мотивации научения, что способствует стремлению студентов к самообразовательной деятельности. В связи с тем, что “Введение в физику» изучается студентами инженерных специальностей на первом курсе, когда не все студенты в достаточной степени владеют необходимым программным обеспечением, сделан вывод об обязательности наличия учебных пособий на бумажных носителях, что повышает возможности студентов к самообразовательной деятельности. На основании проделанной работы можно сделать заключение о том, что использование методов проблемного обучения при преподавании дисциплин естественнонаучного цикла студентам инженерных специальностей ТулГУ будет способствовать повышению эффективности образовательного процесса.

Имеется возможность дальнейшего повышения эффективности учебного процесса для студентов технических специальностей за счет дальнейшего применения методов проблемного обучения для дисциплины «Введение в физику».

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PHILOLOGICAL SCIENCES

OVER THE SEMANTIC TRANSITION OF SOME RELIGIOUS PHRASEOLOGICAL UNITS IN THE SPANISH LANGUAGE TO THE TERMINOLOGICAL SYSTEM

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Abstract

Several studies about the transition of phraseological units to the terminological system have shown that the phraseology and terminology which seem irrelevant and contradictory to each other are actually closely related. Terminology usually consists of a lexical category with limited use and nonfigurative language. Phraseology, on the other hand, is made up of a number of expressions that are widely used and have figurative meaning. It is an undeniable fact that both fields enrich each another. One can note the integration of the phraseological and terminological systems in the term formation process and said process occurs thanks to usage of units which already exist in a language with linguopragmatic adequacy without adding the new ones. The types of terminology based on semantic change are distinguished by their expressiveness, emotionality and stability. By means of the examples given in this article, we will be able to detect that the usage of the religious phraseological units in the Spanish language expands by integrating with the terms that belong to different fields and this process takes place thanks to the internal capabilities of the language. However, it's an undeniable fact that, the phraseological units which switch to terminological system compromise to some extent their expressiveness and style. This process is observed not only in Spanish, but also in other languages.

Keywords: terminology system, discourse, phraseology, expressivity, precedent onym

When we approach from a different perspective to the componential analysis of the religious phraseological units in the Spanish language, we can note various interesting, but unfortunately not quite researched processes in the lingupragmatic conditioning of the expressions with presedent onyms and their semantic evolution in the following stage. Among the processes that captured our attention, we can especially emphasize the great role that the religious phraseological units in Spanish language plays in enrichment of various fields of terminology.

N.N. Pickup, who studied the interrelation between terminological and phraseological units, points out in his research: *"In the classical sense, the terms portray the neutral class which has an individual and limited processing area of the lexicon and doesn't have a figurative meaning. However, observing the term-formation process makes us to think about the integration of terminological and phraseological units"* [1, p.138-140]. Such integration process directly turns out to be the logical conclusion of the processes that take place on the basis of the pragmatics in language and it happens thanks to the usage of units that already exist in the language with linguo-pragmatic adequacy, without having to add up new ones. S. A. Sasanina, who evaluated the pragmatic potential of the interaction between Terminology and Phraseology, was right when he said that *"the pragmatic information of the text makes it possible to determine the pragmatic communicative context… The meaning of the phraseological unit (the one that is related to terminology) is revealed in a pragmatic context"* [9, p.157]. The analysis of the facts about the usage in terminology of the biblical phrases and generally speaking, the religious phraseological units in Spanish language lets us draw conclusions that they play an important role in the verification of the semantic capacity of context.

"Esta enfermedad recibió los nombres de "fuego sagrado", "mal de los ardientes", "fuego infernal" o "fuego de San Antonio" [29, p.74]. *El ergotismo, denominado en el uso coloquial como "fiebre de San Antonio", "fuego de San Antonio" o "fuego del infierno", es una enfermedad causada por la ingesta de alimentos contaminados por mico toxinas (toxinas producidas por hongos parásitos), o por abuso de medicamentos que contengan esta misma sustancia* [21].

Exactly the context helps us to comprehend the expression *"fuego de San Antonio"* not in a metaphorical, but terminological way. It should be recalled that, in the etymological sense, a special type of food poisoning, of which gangrene is an accompanying symptom was related to the treatment of *ergotism* [12] in the Middle Ages under the auspices of the representatives of The Order of Saint Anthony. And Saint Anthony is considered as the patron saint of "fire prevention" in history.

It is obvious that, *"the phraseological system of a language embodies such a multilayered system that its components have unique structural-semantic features and characteristic aspects"* [7, p.119-122]. In this regard, it is not possible for the transition of multiple Spanish religious phraseology, specifically, a certain number of precedent onyms to the terminological layer to not attrackt one's attetion. Y.A.Krylov, who studied structural and discursive features of anthroponyms in Spanish, has mentioned that many of the religiouos phraseological units with precedent onym of Spanish like *"lira de Davis, síndrome de la mujer de Lot, síndrome de Lot, nuez de Adán, manzana de Adán, mal*

de San Roque, mal de San Benito, mal de San Mauro, mal de San Juan, enfermedad de San Lupo, fiebre de San Antonio/ fuego de San Antonio" have been successfully utilized in medical terminology.

Let's pay attention to the functional positions of some of them:

La nuez de Adán es una pequeña estructura semicircular que es más prominente en la parte delantera de la garganta de un hombre [27], *la prominencia laríngea (popularmente conocida como nuez de Adán, manzana de Adán) es una protuberancia o abultamiento ubicada en la parte delantera del cuello y formada por la articulación de las dos láminas del cartílago tiroides que rodea la laringe* [35].

The phraseological units such as *"nuez de Adán"* that we encounter in the previous examples stand for "laryngeal prominence" or "thyroid cartilage protrusion" in Spanish and the first one of this expressions, the one that means "Adam's apple" in literal translation, is almost widely used as a medical term.

"...Porque es a esa parte que sobresale, y por tanto visible, a la que conocemos como nuez de Adán...Tanto los hombres como las mujeres tenemos cartílago tiroides, o "nuez de Adán" [37].

The phraseological unit *"manzana de Adán"* which signifies "Adam's apple" has a high frequency of use as an alternative medical term.

En cuanto a las mujeres, el crecimiento de la manzana de Adán suele ser causa de un desequilibrio hormonal, genético o de deformación menor durante la adolescencia, algunas mujeres pueden sentirse abrumadas o afectadas en su autoestima por ello, pero existen tratamientos quirúrgicos que ayudan a reducirla [34]. *La manzana de Adán es una pequeña estructura semicircular, que es más prominente en la parte delantera de la garganta de un hombre y que se mueve al tragar* [28].

Intriguingly, even though "Adam's apple" isn't widely used in the medical terminology of Azerbaijani, it has limited functionality in medical media discourse under the influence of international terminology. *The thyroid gland sits beneath the cartilage on the front of the neck which is called "Adam's Apple"* [21]. However, as a phraseological unit, the expression "Adam's apple" in our language stands for "the thing that makes a man to commit a sin" and it has played a part in the appearing of other medical terms (of which we will talk about later) such as "Complejo de Adan", "Complejo de Adan y Eva".

According to the statement of Y.A. Nikulina, one of the researchers who conducted a systematic study of the legal terminology and phraseology according to their semantic-functional characteristics formed on the basis of phraseological units, the types of terms that are formed of the semantic transition have their own sense of expressiveness, emotionality and at the same time stability. Furthermore, the main difference between these units and the other phraseological ones is that, although the phraseological units with similar structure embody stable compounds with a complex (metaphorized – R.A.) semantic capacity, "old phraseological units" that have already moved to the terminological base can reflect a scientific concept [4, p.3]. Specifically, the possibility of using the phraseological units such as "nuez de Adan" and "manzana de Adan" as medical terms, proves that these units can also have terminological meaning. In other terms, such phraseological-terminological units in Spanish that are used in medical or media discourse have a meaning far from being directly related to the etymological basis of the expression. It is worth recalling that, this phraseological term expression has an analogous terminological status in Russian *(Адамово Яблоко)*, English *(Adam's apple)* and in French *(pomme d'Adam)* and it is etymologically based on the "Bible". In "Bible" it is said about that apple: *Y mandó Jehová Dios al hombre, diciendo: De todo árbol del huerto podrás comer;* 17 *más del árbol de la ciencia del bien y del mal no comerás; porque el día que de él comieres ciertamente morirás.* (Génesis 2:16-17) [22]. Although the phraseological units like "nuez de Adán" or "manzana de Adán" used for an example are not directly related to "the first human sin" semantics, they reflect a new terminological meaning based on the metaphorical transition. I.e. the metaphorical implication "chain" is divided into two parts: **1.** Anatomical concept (oval shaped laryngeal prominence), **2.** The phraseological "version" of that concept (The oval-shaped fruit stuck in Adam's throat, that is, the apple of sin).

Expressions like "complejo de Adán" or "complejo de Adán y Eva" can be used as an example for the terminological denomination related to the "first sin" that Adam committed.

Y. A. Krylov has stated that the phraseological units which have acquired a terminological status in Spanish language like *"deficiencia de Adán"* and *¨complejo de Adán"* have occupied a stable place in medical terminology and the first expression is andropause (Adam lives 930 years, according to the Bible), the second one means *"symptoms of dysfunction of a manager who considers it important to put his personal "label" on everything around him and considers himself a primary human being"* [8, p.237]. However, whether these examples or the explanations about this expression in Spanish media make it possible to say that Y.A.Krylov's concept isn't totally right and the expressions "Complejo de Adan" or "Sindrome de Adan" can be also interpreted as "the act of putting the blame on someone else when a man commits a sin but finds it difficult to admit". More specifically, we can see in the first example below that this phraseological unit has the meaning of "psychological complex of a manager" and in the second one it characterizes the psychological state of "refusing to confess guilt".

Me gustan este tipo de espacios en los que como sociedad planteamos los retos para los próximos 4 años de gobierno. Ojalá que nadie tenga en octubre Complejo de Adán: a empezar todo desde cero [24]. *Juan Manuel Santos no escapa a este comportamiento, conocido como el complejo de Adán* [15].

Anoche te hablé un poco de lo que yo he dado en llamar "el Síndrome de Adán". Me refiero a la tendencia que tenemos los seres humanos a desviar la atención de la responsabilidad de nuestros errores por medio de revertir su culpabilidad en otros [19].

The roots of the second meaning go back to the instinct of self-preservation which is one of the traits of the human psyche. According to the famous research of Anna Freud, "The Ego and The Mechanisms of Defense", Sigmund Freud, the father of psychoanalysis has mentioned that the human uses a special type of defense mechanism - "repression" - in order to keep disturbing or threatening psychological thoughts from becoming conscious [11, p.17]. Among the courage of a person that is coping with a guilt complex to face the consequences of their actions and the defense mechanisms used by them when they can't morally deal with those consequences comes the attempt to blame others in order to deflect responsibility for their actions off themselves. Taking the example of Adam and Eva, who committed the "original sin" of human history, we can observe more specifically that Adam in his conversation with God tried to avoid the responsibility of tasting the forbidden fruit. 11. *Y Dios le dijo: ¿Quién te enseñó que estabas desnudo? ¿Has comido del árbol de que yo te mandé no comieses?*

12. *Y el hombre respondió: La mujer que me diste por compañera me dió del árbol, y yo comí* (Génesis 3:11-12) [23].

In Spanish, it can be determined that the second meaning is used more often: *Lo vivido estas semanas me ha recordado una enseñanza de antiguos sacerdotes que referían que uno de los primeros defectos de la raza humana que aparece en la Biblia es el llamado "complejo de Adán": consumada la desobediencia al proyecto de Dios, cuando es interpelado por el Creador, Adán dice: "Fue Eva", se defiende proyectando en ella toda la responsabilidad del pecado* [18]. S.A. Mazayev, who studied the "Adam complex", did research about the guilt complex known in family psychology paying attention to an interesting part in "Bible" and stated that the reason why Adam tried to hide from God was that he no longer could conceal his sin from him and wanted to get away from the environment that reminded him of the sin that he committed [3]. Actually, it says in "Bible": *Y oyeron la voz de Jehová Dios que se paseaba en el huerto, al aire del día; y el hombre y su mujer se escondieron de la presencia de Jehová Dios entre los árboles del huerto* (Génesis 3:8) [23].

It should be noted that, the forbidden "fruit of the tree of knowledge of good and evil" which Adam and Eva ate made them to see the weight of their sin and feel ashamed when they became aware of their nakedness [2, p.345-355]. 7. *Entonces fueron abiertos los ojos de ambos, y conocieron que estaban desnudos; entonces cosieron hojas de higuera, y se hicieron delantales* [23]. As a side note, it was this time when another phraseological unit with presedent onim appear: *"en traje de Adán" or "en traje de Adán y Eva", that is "naked".* Although that expression doesn't have a wide range of functionality in the terminological system, it has a high frequency of use as a phraseological unit in modern Spanish: *Endiablado se pasea en traje de Adán* [20]*; Raúl Zuazo evalúa salir en "traje de Adán" para película de horror* [39]. It can be seen that another version of the same phraseological unit in Spanish, *en traje de Adan,* is also widely used: *Fiestas en traje de Adán y Eva la llevan en Argentina. Pasarlo bacán con los amigos, bailando como el Pulento los mandó al mundo, es la nueva tendencia en Bifelandia* [32].

"Síndrome de Job" can also be an example of the religious Spanish phraseological units that switched to the terminological system. This expression is based on the hardships of Prophet Job written in the "Bible", more specifically, the skin-eating disease that he was afflicted and it is used as a medical term in modern Spanish. *¿Qué es el Síndrome de Job? El síndrome de Job es conocido también con el nombre síndrome de hiperinmunoglobulina E. Responde a una infección del tipo estafilocócica, recurrente, por causa de un efecto genético que trae consigo un incremento altísimo de anticuerpos, entre ellos la inmunoglobulina* [36]. In a section of the "Old Testament" where the life of Prophet Job is written - Libro de Job (Book of Job) it is said: 7. *Entonces salió Satanás de la presencia de Jehová, e hirió a Job con una sarna maligna desde la planta del pie hasta la coronilla de la cabeza* [26]. The moment of Job's serious illness that tested his faith was the one that played an important role in the formation of an alternative nominative unit of immune disease which has a similar description. The illness which is known in the international-scientific terminology as "Buckley syndrome" – with the name of the scientist that has described it for the first time, is mostly presented as a phraseological unit-term containing the name of the "Bible" character in Spanish media discourse (*El síndrome de hiperinmunoglobulina también se conoce como síndrome de Job. Se le denomina así por el personaje bíblico Job, cuya fe fue puesta a prueba por una aflicción de úlceras y pústulas que supuraban* [40]), as well as in medical literature (Lo denominaron "Síndrome de Job" haciendo alusión al personaje bíblico del Antiguo Testamento que sufría de lesiones cutáneas recurrentes [14]).

As another medical term referring to the phraseology based on the "Bible" we can highlight the expression of "mal de San Lázaro". *Motivo por el que la lepra fue llamada "mal de San Lázaro", puesta bajo la advocación de este santo* [33], *La Lepra, también conocida como Enfermedad de Hansen o Mal de Lázaro, es una enfermedad infecciosa que se puede curar, sin dejar ninguna huella* [17].

As can be seen, this phraseological unit is based on the presedent-onim used in "El rico y Lázaro" (The Rich Man & Lazarus) of "The Gospel of Luke" (Evangelio de Lucas). 19 *Había un hombre rico, que se vestía de púrpura y de lino fino, y hacía cada día banquete con esplendidez.* 20 *Había también un mendigo llamado Lázaro, que estaba echado a la puerta de aquél, lleno de llagas,* 21 *y ansiaba saciarse de las migajas que caían de la mesa del rico; y aun los perros venían y le lamían las llagas*. (Lucas 16: 19-21) [31]. According to that story, the beggar named Lazarus goes to heaven when he dies, but the rich man who didn't help him goes to Hell. Although the story talks about the poor beggar, the phraseological unit in Spanish "mal de San Lazaro" based on the story, was formed on a certain confusion, based on the leprosy of the man, which is stated in Jose Neira Ramirez's study [38, p.150], as

well as, in other sources in Spanish. *Los enfermos tenían la enfermedad de San Lázaro y eran llamados enfermos con el "Mal de San Lázaro". Así a los primeros hospitales o casas que cumplieron estas funciones se les llamaron Hospitales de San Lázaro o lazaretos, también llamados leproserías* [33].

For instance, the phraseological unit in Russian «петь Лазаря» that is based on the same story doesn't refer to his illness, but to the fact that he is poor and a beggar [5] and signifies "poverty and begging, persistently asking for financial assistance, exploiting" [6].

The formation of this term which is frequently used in modern Spanish as a scientific alternative of leprosy makes us agree with the statement of Y.I. Trubayeva who has made a research about the phraseological units becoming terms. As the philologist rightly points out, comprehending the transition of that type of phraseological units to the terminological system, i.e. the level of comprehension of the society plays an important role in here. It is on this basis that the phraseological unit gradually starts to transition to the terminology [10, p.204-206]. Exactly the process of gradual semantic transition provided semantic correlation of the term "lepra" (leprosy) with the phraseological unit "mal de San Lázaro". *"En el siglo XII, se creó una orden religiosa militar con la denominación de San Lázaro, para el cuidado de los leprosos, puesto que se denominaba entonces a la lepra como "mal de San Lázaro"* [16].

It should be noted that, the presedent onym in this expression played a role in the formation of another medical phraseological term *lazareto* (infirmary). *Un **lazareto** es un hospital o edificio similar, más o menos aislado, donde se tratan enfermedades infecciosas* [30]. The examples given not only reveals the important role that the religious phraseological units in Spanish play in the enrichment of different fields of terminology, but also allows to determine the accomplishment of the universal semantic transition processes. As Y. A. Yuryeva mentioned, the phraseological units lose their primary expressiveness inevitably during the transition process. However, the terms (i.e. the terms that are based on phraseological units – R.A.) obtain a wider range of functionality not only in scientific style, but also in colloquial style, by losing their conceptuality and monosemy [13, p.18].

As a result, it can be seen that the process of transition of phraseological units to the terminological system occurs thanks to the internal capabilities of the language and it happens not only in Spanish, but also in other languages as well.

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PHYSICAL SCIENCES

FROM THE PHYSICAL REALITY OF IMAGINARY NUMBERS IT FOLLOWS THAT THE INVISIBLE AFTERLIFE WORLD, PREDICTED BY ALL RELIGIONS, IS IN FACT PHYSICALLY REAL[1]

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Abstract

The article proves that the generally accepted version of STR, which states that imaginary numbers are physically unreal, is incorrect. Experimental evidence is given of the general scientific principle of the physical reality of imaginary num-bers, with the use of which a corrected version of the SRT was created. She argues that in addition to our visible universe, there are many other mutually invisible uni-verses in nature. And they form the actually physically existing after-life invisible world, predicted by all religions.

Keywords: imaginary numbers, special theory of relativity, invisible universes, afterlife invisible world

1. Introduction

Imaginary numbers were discovered 500 years ago by Scipione Del Ferro, Niccolò Fontana Tartaglia, Gerolamo Cardano, Lodovico Ferrari and Raphael Bombelli [1], are known to everyone and are currently used in all exact sciences. They are even studied in school mathematics courses. But unlike other numbers that are understandable to everyone - integers and fractions, positive and negative, scalar and vector, etc. - their physical essence has not yet been explained. Indeed, what 2 kg., 3 m., 4 sec. is clear to everyone, but what is 2*i* kg., 3*i* m., 4*i* sec.,

where $i = \sqrt{-1}$, no one can explain. Nevertheless, no one cared about this, just as, for example, now no one can explain. Nevertheless, no one cared about this, just as, for example, now no one cares that the phenomenon of ball lightning is not explained.

But at the beginning of the 20th century Joseph Larmor [2], Nobel Prize winner Hendrik Anton Lorenz [3], Jules Henri Poincaré [4], Nobel Prize winner Albert Einstein [5] and other outstanding scientists created the special theory of relativity, which rightly accepted to be considered an outstanding scientific achievement of physics of the 20th century, because it proposed the principle of relativity. And which is therefore now studied in all physics textbooks used in the educational process even at the most prestigious universities. However, in this theory, calculations using relativistic formulas, which were the final result of all reasoning, in some cases led to a result measured by imaginary numbers. And this result already needed to be explained. After all, no one would need a theory that even its creators could not explain. But the authors of SRT did not know how to do this. And the fate of the service station hung in the balance. But it was saved by the fact that an additional postulate was introduced into the SRT, called the principle of not exceeding the speed of light, from which it followed that quantities measured by imaginary numbers do not exist in nature. And therefore, there is no need to explain them.

This is the form in which SRT is still taught.

2. The physical reality of imaginary numbers.

But besides STR there are other sciences. Including the theory of electrical circuits, which is used in radio engineering, electrical engineering and computer science. Fundamental to this theory is Ohm's law [6], [7], discovered in 1826 for DC electrical circuits, which is now studied even in school physics textbooks. And in 1893, Charles Proteus Steinmetz proposed its interpretation of Ohm's law for alternating current electrical circuits [8], which is now used daily by millions of engineers around the world in their work. In this theory of electrical circuits, the imaginary resistances of capacitors and inductors, which can be measured by instruments, were recognized as actually physically existing. And if these imaginary resistances were recognized as physically unreal, as follows from SRT, then neither radio engineering, nor electrical engineering, nor computers, nor radio measuring instruments should exist.

[1] This is reprint of the article "Antonov A. A. From the physical reality of imaginary numbers it follows that the invisible afterlife world predicted by all religions actually exits. Norwegian Journal of development of the International Science. 130. 36-41. https://doi.org/10.5281/zenodo.10975059".

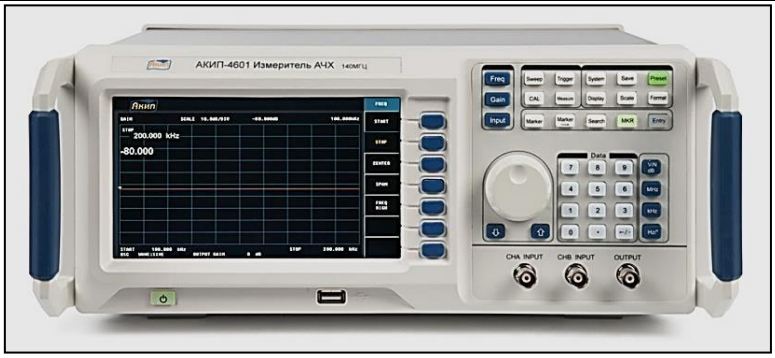

Fig. 1. In any radio-technical laboratory there are devices called frequency response meters, which prove the physical reality of imaginary and complex numbers by their mere existence

But they do exist. And thereby they prove the physical reality of imaginary numbers [9]-[28]. Consequently, by the existence of radio- and electrical engineering, the generally accepted version of SRT was refuted even before its creation. Other proofs of the physical reality of imaginary numbers have been published in [29]-[43]. Therefore, the logical conclusion is that the version of STR currently presented in all physics textbooks is incorrect [44]-[64].

3. Physical reality of invisible parallel universes

In the existing generally recognized version of SRT from its relativistic formulas and the principle of non-exceeding the speed of light also follows that in nature there is only our visible universe in which everything is measured only by real numbers.

However, in the corrected version of SRT [65]-[74], from its relativistic formulas it follows that in our Multiverse [75]-[85], in addition to our visible universe, there are also about twenty other mutually invisible parallel universes

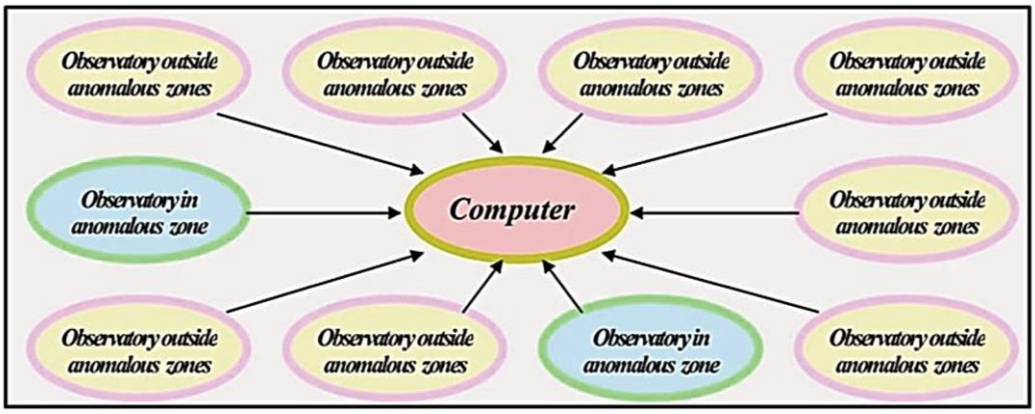

Fig. 2*. Scheme of an astronomical experiment to detect invisible universes*

And one can be convinced of their existence [86]-[91]. as a result of astronomical observations of the starry sky in portals [92]-[94], since the constellations in them will differ - and the further into the portal one penetrates, the greater the differences will be - from the constellations observed at the same time in the same region outside the portals. And since there are a lot of anomalous zones [95]-[98] on Earth, presumably being entrances to portals, some observatories have already are located in such anomalous zones. Like, for example, the main astronomical observatory of the National Academy of Sciences of Ukraine, located in Goloseyevsky forest 12 km from the center of Kyiv. Therefore, in order to verify the existence of neighboring invisible universes adjacent to our visible universe, it is enough to compare on a computer the observations of this observatory with the observations of neighboring observatories located outside the anomalous zones.

4. Why, despite all the refutations of the generally accepted version of SRT, set out in all physics textbooks, it continues to be taught.

But this simple and low-cost experiment, which in the most indisputable way will allow us to answer the question of whether there are invisible universes neighboring our visible universe, no one has done or is going to do. Obviously, because physicists do not need such an answer, since it will refute the version of SRT studied in textbooks.

The corrected version of SRT states that imaginary numbers are physically real and invisible universes exist. Therefore, having become convinced of the existence of invisible universes, we will have to admit that the corrected version of SRT is correct and once again be convinced that imaginary numbers actually physically exist. And then it will inevitably be necessary to explain their physical meaning of imaginary numbers. And it is obvious - in addition to our visible world, there is an invisible world.

5. The existence of a physically real invisible world

However, the usefulness for science of the above experimental evidence of the physical reality of imaginary numbers goes beyond problems of correcting the version of SRT given in physics textbooks. From experimentally proven principle of the physical reality of imaginary numbers, one will inevitably have to conclude that the results of all studies described by imaginary numbers in all other exact sciences also are physically real.

Then many difficult questions will arise. For example, what exists in the looking glass when we see ourselves in the mirror? And therefore, in the end, we will have to admit that in ad-dition to our visible world, there is also a huge (most likely even much larger than our visible world) invisible world [99]-[106]. Indeed, in addition to the room in which we are now and which we see, there are a large number of other invisible to us rooms in other apartments, houses, cities and countries. The same situation is in space – in addition to our visible universe, in other dimensions there are about twenty other parallel universes of the hidden Multiverse that are invisible to us. And outside of our hidden Multiverse in the Hyperverse, there are many other Multiverses.

And the existence of such a world invisible to us, in which Gods and the souls of the dead live, was long predicted by all world religions. Consequently, what these religions say about the world order, about the afterlife, is true. And therefore, all of us, the inhabitants of planet Earth, will now have to believe in this.

6. Conclusion

The author hopes that the information presented in the article will be an incentive to unite the efforts of science and religions in their activities for the benefit of people.

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POLITICAL SCIENCES

PENTABASIS AND AGE-RELATED PENTAPSYCHOLOGY

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PENTABASIS ET PENTAPSYCHOLOGIE LIÉE À L'ÂGE «PARIS»

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Abstract

The application of the structural-functional approach to the study of the human psyche is explored. To analyze personality, a five-component approach (pentapsychology) is used, and to analyze the human psyche as a whole, an eight-component approach (octanalysis) is used. The properties of five components (instances) of personality are analyzed: three instances of consciousness and two instances of the unconscious. The question of the personality instances hierarchy is considered. It is shown that human behavior and the effectiveness of his activities largely depend on the instances hierarchy of his personality chosen by a person. The application of the five-component approach to describe the psychological properties of both the personality and to describe the psychological properties of any association of the personalities (family, society, state, country, civilization) is analyzed. The Pentabasis is considered - a five-level worldview model proposed by the administration of the President of Russia as a value ideology of Russian society. Age-related pentapsychology, a section of pentapsychology, explains the essence of Pentabasis and offers a practice-tested methodology for selecting personnel to increase the effectiveness of large-scale application of Pentabasis in the life of the country.

Abstract

L'application de l'approche structurale-fonctionnelle à l'étude de la psyché humaine est explorée. Pour analyser la personnalité, une approche à cinq composantes (pentapsychologie) est utilisée, et pour analyser la psyché humaine dans son ensemble, une approche à huit composantes (octanalyse) est utilisée. Les propriétés de cinq composantes (instances) de la personnalité sont analysées: trois instances de conscience et deux instances de l'inconscient. La question de la hiérarchie des instances de personnalité est abordée. Il est démontré que le comportement humain et l'efficacité de ses activités dépendent en grande partie de la hiérarchie des instances de sa personnalité choisie par une personne. L'application de l'approche à cinq composantes pour décrire les propriétés psychologiques aussi bien à la personnalité qu'à toute association de personnalités (famille, société, état, pays, civilisation) est analysée. Pentabasis est considérée comme un modèle de vision du monde à cinq niveaux proposé par l'administration du Président de la Russie en tant qu'idéologie de valeurs de la société russe. Pentapsychologie liée à l'âge, une section de la pentapsychologie, explique l'essence de Pentabasis et propose une méthodologie éprouvée pour sélectionner le personnel afin d'augmenter l'efficacité de l'application à grande échelle de Pentabasis dans la vie du pays.

Keywords: five-component theory of personality, octanalysis, personality psychology, Pentabasis, age-related pentapsychology

Mots clés: théorie des cinq composantes de la personnalité, octanalyse, psychologie de la personnalité, Pentabasis, pentapsychologie liée à l'âge

Introduction

Dans le domaine scientifique, l'analyse structurale-fonctionnelle est souvent utilisée pour obtenir des connaissances fiables.

Bien que la psyché humaine soit invisible, une telle analyse est tout à fait applicable pour étudier la psyché humaine et étudier les propriétés de sa personnalité.

Pour décrire les propriétés de la psyché humaine, le psychologue, psychanalyste, psychiatre et neurologue autrichien Sigmund Freud (1856-1939) fut le premier à utiliser l'analyse structurale-fonctionnelle. Il a proposé un modèle structurel de la psyché à trois

composantes. Bien entendu, l'approche à trois composantes n'est pas suffisante pour décrire la psyché.

L'étude détaillée de l'auteur sur les traits de personnalité montre que pour obtenir des connaissances fiables sur les traits de personnalité, il est nécessaire d'utiliser une approche à cinq composantes (pentapsychologie), et pour décrire la psyché humaine dans son ensemble, une approche à huit composantes (octanalyse) [1-23].

Pentapsychologie et octanalyse ont été créées sur la base de l'article de Iatsenko V.I. «Théorie à cinq composantes de la personnalité» [1], enregistrée par la Société russe des auteurs. Tous droits réservés. ® Iatsenko V.I. 2002

Pentapsychologie note que l'approche en cinq composantes est applicable pour décrire les propriétés psychologiques aussi bien à la personnalité qu'à toute association de personnalités (famille, société, État, pays, civilisation).

Actuellement, les structures gouvernementales de certains pays se fixent pour objectif d'utiliser une approche psychologique à cinq composantes pour résoudre le problème «développement et amélioration» dans les domaines suivants: personnalité, famille, société, État, pays, civilisation.

Par exemple, depuis 2022, on connaît Pentabasis [24] - un modèle de vision du monde à cinq niveaux proposé par l'administration du président russe comme idéologie de valeurs de la société russe.

Une comparaison de Pentabasis et de pentapsychologie montre que lors du développement de Pentabasis, une approche à cinq composants de l'analyse de la personnalité et une hiérarchie d'instances de personnalité ont été utilisées, qui sont considérées dans pentapsychologie liée à l'âge, une section de pentapsychologie.

Considérons les possibilités d'utiliser pentapsychologie liée à l'âge pour expliquer l'essence de Pentabasis et l'utilisation efficace de Pentabasis dans la vie du pays.

Description de Pentabasis

Le modèle méthodologique "Pentabasis" se compose de cinq blocs: personne, famille, société, État, pays. Ils sont décrits en détail dans l'article scientifique «Perception des valeurs fondamentales, des facteurs et des structures du développement socio-historique de la Russie» (Journal of Political Research, Vol. 6 n° 3, 2022). Ses auteurs sont indiqués le chef du département chargé d'assurer les activités du Conseil d'État Alexander Dmitrievich Kharichev, l'idéologue de «l'ADN de la Russie» Andrei Vladimirovich Polossin, le doyen de la Faculté des sciences politiques de l'Université d'État de Moscou Andrei Yurievich Shutov et la chef du département de recherche stratégique et de prévision de l'Institut expert de recherche sociale (EISR) Ekaterina Nikitichna Sokolova.

Pentabasis est un ensemble de principes de valeurs clés, comprenant des attitudes, des normes et des idéaux de base qui déterminent le comportement et l'interaction des membres de la société. Ces principes constituent la base du système socioculturel et déterminent sa structure.

Un système de cinq composants, dont chacun a sa propre dominante de valeurs:

Personne - Création

Famille - Traditions

Société - Consentement

État – Confiance dans les institutions

Pays - Patriotisme.

Les composants de Pentabasis peuvent différer et présenter des variations en fonction de l'époque spécifique, du contexte historique et culturel, mais ils sont universels et universels pour l'humanité, car ils reflètent les besoins et aspirations fondamentaux de la société. [24].

Description de pentapsychologie liée à l'âge

Pentapsychologie étudie les propriétés de cinq composantes (instances) de la personnalité qui, dans l'exercice de leurs fonctions, dominent dans la personnalité à leur tour. Et ici se pose la question de la hiérarchie supportée des instances de personnalité.

Une personne a la liberté de choix et peut établir dans sa personnalité n'importe quelle hiérarchie d'instances de personnalité. Le comportement d'une personne et l'efficacité de ses activités dépendent en grande partie de la hiérarchie supportée des instances de personnalité.

En pentapsychologie, cinq instances de personnalité ont désignations: trois instances de conscience 5-Âme, 4-Cœur, 1-Raison et deux instances de l'inconscient 3-Irratio, 2-Ratio. Dans cette désignation, les chiffres 5, 4, 3, 2, 1 montrent la place de l'instance de personnalité dans la hiérarchie naturelle et harmonieuse des instances de personnalité, de haut en bas, la 54321-hiérarchie.

Pentapsychologie a découvert une propriété fondamentale de la personnalité: une hiérarchie harmonieuse d'instances de conscience individuelle - 541-hiérarchie: 5-Âme - en première place, 4-Cœur - en deuxième, 1-Raison - en troisième place.

En 2010, grâce aux méthodes pentapsychologiques, l'effet de la domination innée des instances de personnalité a été découvert [4].

Selon la date de naissance d'une personne, les cinq instances de sa personnalité diffèrent considérablement les unes des autres par le degré de dominance innée. La formule de personnalité octanalytique et le code de personnalité octanalytique montrent le degré de domination innée de chacune des cinq instances de personnalité.

La domination innée des instances de personnalité influence considérablement le comportement d'une personne et l'efficacité de ses activités. Le degré de domination innée de l'instance de personnalité persiste tout au long de la vie d'une personne et permet de prédire les caractéristiques du comportement d'une personne dans diverses situations de la vie [13-18].

Pentapsychologie liée à l'âge note que cinq instances de personnalité commencent à montrer une activité liée à l'âge à différentes périodes de la vie d'une personne dans la séquence: 3-Irratio, 2-Ratio, 1-Raison, 4-Cœur, 5-Âme.

Au cours de la période prénatale, de la conception à la naissance d'un enfant, seulement l'instance du

inconscient 3-Irratio montre une activité liée à l'âge dans la personnalité de l'enfant.

Au cours de la période de l'enfance innocente, de la naissance à 1,5 - 2 ans, deux instances de l'inconscient, 3-Irratio et 2-Ratio, montrent une activité liée à l'âge dans la personnalité du bébé.

Au cours de la période préscolaire, de 1,5 - 2 ans jusqu'à 6 ans, trois instances du triangle dramatique de Stephen Karpman montrent une activité liée à l'âge dans la personnalité de l'enfant: deux instances de l'inconscient 3-Irratio (rôle Victime), 2-Ratio (rôle Sauveteur) et une instance de conscience 1-Raison (rôle Poursuivant).

Pendant la période scolaire, de 6 ans à 18 ans, dans la personnalité d'un enfant ou d'un adolescent, quatre instances montrent déjà une activité liée à l'âge: deux instances de l'inconscient 3-Irratio, 2-Ratio et deux instances de conscience 4-Cœur, 1-Raison. Durant cette période, une crise d'adolescence peut se manifester: double pouvoir des instances de conscience 4-Cœur (convivialité) et 1-Raison (égoïsme). Dès que le choix de la hiérarchie des instances de conscience est fait (41-hiérarchie ou 14-hiérarchie), la crise prend fin.

Au cours de la vie adulte, à partir de l'âge de 18 ans, les cinq instances de personnalité montrent une activité liée à l'âge dans la personnalité d'un adulte: deux instances de l'inconscient 3-Irratio, 2-Ratio et trois instances de conscience 5-Âme, 4-Cœur, 1-Raison. Durant cette période, une crise de la quarantaine peut se manifester: double pouvoir des instances de conscience 4-Cœur (convivialité) et 5-Âme (altruisme). Dès que le choix de la hiérarchie des instances de conscience est fait (45-hiérarchie ou 54-hiérarchie), la crise prend fin.

Propriétés des instances émotionnellement instables de l'inconscient:

– instance-extraverti 3-Irratio – créativité, irrationalité, spontanéité des actions, dans l'analyse transactionnelle d'Eric Berne l'état Enfant, selon Stephen Karpman le rôle Victime, le type de tempérament est colérique;

– instance-introverti 2-Ratio – actions rationnelles et logiques, suivre des traditions, des lois, des accords, caractère pratique des actions, dans l'analyse transactionnelle d'Eric Berne l'état Parent, selon Stephen Karpman le rôle Rescuer, le type de tempérament est mélancolique.

Propriétés des instances de conscience émotionnellement stables:

– instance-extraverti 1-Raison – capacités intellectuelles, construction de relations selon le schéma «Je suis supérieur, tu es inférieur», égoïsme, sentiment de supériorité, manque de principes, tromperie, agressivité, trahison, selon Stephen Karpman le rôle Persécuteur, le désir de divertissement, d'obtention de plaisir personnel, de jouissance, la consommation ostentatoire, la tendance à donner la priorité au bonheur à court terme plutôt qu'à la satisfaction à long terme et à la croissance personnelle, le type de tempérament est sanguine, capacité à faire un choix intellectuel conscient et indépendant;

– instance-introverti 4-Cœur – capacité de gestion, construction de relations selon le schéma «Moi et toi sommes au même niveau», convivialité, égalité, fraternité, relations cordiales, dans l'analyse transactionnelle d'Eric Berne l'état Adulte, le type de tempérament est flegmatique, capacité à faire un choix de gestion indépendant et conscient;

– instance-extraverti 5-Âme – construction de relations selon le schéma «Tu es supérieur, je suis inférieur», altruisme, soumission, service, dévotion, sacrifice, le type de tempérament est sanguine, capacité à faire un choix émotionnel conscient et indépendant.

Pentapsychologie liée à l'âge note que trois instances de conscience (5-Âme, 4-Cœur, 1-Raison) commencent à montrer une activité liée à l'âge dans la séquence: 1-Raison (à partir de 1,5 - 2 ans), 4-Cœur (à partir de 6 ans), 5-Âme (à partir de 18 ans). Une telle séquence est directement opposée à la 541-hiérarchie irréprochable des instances de conscience et est à l'origine de l'émergence chez l'homme d'une fausse idée de la réalité.

En l'absence d'une formation ciblée et systématique de la personnalité d'un enfant ou d'un adolescent, il peut avoir l'idée erronée que la 145-hiérarchie est une hiérarchie naturelle d'instances de conscience et que cette hiérarchie doit être respectée.

En fonction des propriétés dominantes innées de l'individu, des conditions de vie et de l'éducation, un adolescent peut former 14-hiérarchie ou 41-hiérarchie de instances de conscience, et un adulte peut former 145-, 154-, 415-, 451-, 514 ou 541-hiérarchie d'instances de conscience.

Lors de la formation d'une personnalité harmonieusement développée chez un enfant, un adolescent ou un adulte, la tâche de la pédagogie est avant tout la formation dans leur conscience de 541-hiérarchie harmonieuse de instances.

Cinq valeurs dominantes de Pentabasis et cinq instances de personnalité

Comparons les cinq valeurs dominantes de Pentabasis et les cinq instances de personnalité en pentapsychologie:

– «PERSONNE (création)» – instance 3-Irratio, créativité, actions irrationnelles;

- «FAMILLE (traditions)» – instance 2-Ratio, actions rationnelles;

- «SOCIÉTÉ (consentement)» – instance 1-Raison, capacités analytiques, usage de la raison pour parvenir à un consentement;

- «ÉTAT (confiance dans les institutions)» – instance 4-Cœur, capacités managériales, actions managériales basées sur la convivialité, opposition à la «cinquième colonne»;

- «PAYS (patriotisme)» – instance 5-Âme, service, dévouement, sacrifice, altruisme pour le bien de la préservation de la souveraineté du pays.

Sélection du personnel pour l'utilisation de Pentabasis

La comparaison de Pentabasis et de pentapsychologie montre quelle instance de personnalité, lors de la sélection du personnel, doit faire preuve d'une dominance innée afin d'augmenter l'efficacité de la mise en œuvre des valeurs dominantes de Pentabasis:

– instance 5-Âme – «PAYS (patriotisme)»;

– instance 4-Cœur – «ÉTAT (confiance dans les institutions)»;

– instance 3-Irratio – «PERSONNE (création)»;

– exemple 2-Ratio – «FAMILLE (traditions)»;

– exemple 1-Raison – «SOCIÉTÉ (consentement)».

Sur la base du code de personnalité octanalytique, il est possible de sélectionner un candidat dont l'instance de personnalité nécessaire montre un degré élevé de dominance innée.

Par exemple, pour mettre en œuvre la valeur dominante de Pentabasis «PAYS (patriotisme)», il faut tout d'abord des personnes avec la domination innée de l'instance 5-Âme.

Pentapsychologie note que les personnes nées dans une année se terminant par le chiffre 2 ou le chiffre 3, par exemple 2012, 2013, 2022, 2023, ont de tels traits de personnalité innés dominants.

Conclusions et offres

Pentapsychologie liée à l'âge explique clairement l'essence de Pentabasis. Pentapsychologie propose également une méthode éprouvée de sélection du personnel pour accroître l'efficacité de l'application à grande échelle de Pentabasis dans la vie du pays.

Compilation d'une formule octanalytique de personnalité

Compilation d'une formule de personnalité octanalytique permet de révéler la dominance congénitale des instances de personnalité. Dans l'état de dominance de l'instance de personnalité, dans la psyché les propriétés de cette instance de personnalité se manifestent, tout d'abord.

Le choix professionnel d'une personne, son comportement, ses traits de caractère dépendent dans une large mesure d'une telle tendance congénitale des instances de la personnalité à dominer.

Octanalyse étudie cinq instances de la personnalité 5-Âme, 4-Cœur, 3-Irratio, 2-Ratio, 1-Raison. Avant le nom d'une instance, son numéro de série dans la hiérarchie naturelle des instances est indiqué, de haut en bas: 5, 4, 3, 2, 1.

L'étude de la personnalité à l'aide d'octanalyse montre que chez chaque personne, selon la date de naissance, de deux à cinq instances de la personnalité ont une tendance innée à dominer.

En octanalyse, une méthode a été développée pour compilation une formule octanalytique de personnalité, qui révèle la "Première Dominante" et la "Deuxième Dominante" - des instances congénitalement dominantes de personnalité associées à la date de naissance d'une personne. La dominance de la première dominante est plus prononcée que la dominance de la deuxième dominante.

Cette dominance congénitale de l'instance de la personnalité se manifeste dans la même mesure tout au long de la vie d'une personne, quelles que soient les conditions de sa vie.

Le terme «formule octanalytique de personnalité» utilisé dans octanalyse est étayé par de nombreux tests pratiques des caractéristiques d'une telle formule lors de la description des propriétés de la psyché de personnes spécifiques.

Cher lecteur! Vous trouverez ci-dessous le Tableau avec lequel vous pouvez compiler indépendamment une formule octanalytique de personnalité pour toute personne à la date de sa naissance.

Pour décrire les propriétés de la psyché humaine sur la base de la formule octanalytique de personnalité, il est nécessaire d'utiliser non seulement le Tableau, mais également de connaître en détail les propriétés des instances de personnalité 5-Âme, 4-Cœur, 3-Irratio , 2-Ratio, 1-Raison. Des nombreuses propriétés de ces instances sont décrites dans des articles sur octanalyse sur le site "Huit instances de la psyché" www.8-in.com.

Principales propriétés de cinq instances de personnalité:

• instance de conscience 5-Âme - service, sacrifice, altruisme;

• instance de conscience 4-Cœur - les capacités de gestion;

• instance de l'inconscient 3-Irratio - les capacités créatives;

• instance de l'inconscient 2-Ratio - les capacités rationnelles;

• instance de conscience 1-Raison - les capacités analytiques, égoïsme.

Tableau.

Compilation d'une formule octanalytique de personnalité par date de naissance

43-Buffle	32-Tigre	23-Lapin	13-Dragon	42-Serpent	31-Cheval
19.02.1901	08.02.1902	29.01.1903	16.02.1904	04.02.1905	25.01.1906
06.02.1913	26.01.1914	14.02.1915	03.02.1916	23.01.1917	11.02.1918
24.01.1925	13.02.1926	02.02.1927	23.01.1928	10.02.1929	30.01.1930
11.02.1937	31.01.1938	19.02.1939	08.02.1940	27.01.1941	15.02.1942
29.01.1949	17.02.1950	06.02.1951	27.01.1952	14.02.1953	03.02.1954
15.02.1961	05.02.1962	25.01.1963	13.02.1964	02.02.1965	21.01.1966
03.02.1973	23.01.1974	11.02.1975	31.01.1976	18.02.1977	07.02.1978
20.02.1985	09.02.1986	29.01.1987	17.02.1988	06.02.1989	27.01.1990
07.02.1997	27.01.1998	16.02.1999	05.02.2000	24.01.2001	12.02.2002
26.01.2009	10.02.2010	03.02.2011	23.01.2012	10.02.2013	31.01.2014
12.02.2021	01.02.2022	22.01.2023	10.02.2024	29.01.2025	17.02.2026
21-Chèvre	**12-Singe**	**41-Coq**	**34-Chien**	**24-Cochon**	**14-Souris**
13.02.1907	02.02.1908	22.01.1909	10.02.1910	30.01.1911	18.02.1912
01.02.1919	20.02.1920	08.02.1921	28.01.1922	16.02.1923	05.02.1924
17.02.1931	06.02.1932	26.01.1933	14.02.1934	04.02.1935	24.01.1936
05.02.1943	25.01.1944	13.02.1945	02.02.1946	22.01.1947	10.02.1948
24.01.1955	12.02.1956	31.01.1957	18.02.1958	08.02.1959	28.01.1960
09.02.1967	30.01.1968	17.02.1969	06.02.1970	27.01.1971	15.02.1972
28.01.1979	16.02.1980	05.02.1981	25.01.1982	13.02.1983	02.02.1984
15.02.1991	04.02.1992	23.01.1993	10.02.1994	31.01.1995	19.02.1996
01.02.2003	22.01.2004	09.02.2005	29.01.2006	18.02.2007	07.02.2008
19.02.2015	09.02.2016	28.01.2017	16.02.2018	05.02.2019	25.01.2020
06.02.2027	26.01.2028	13.02.2029	03.02.2030	23.01.2031	11.02.2032

Nombres des dominants - signe du zodiaque	Période du signe du zodiaque
43- Poissons	19 février - 20 mars
32- Bélier	21 mars - 19 avril
23- Taureau	20 avril - 20 mai
13- Gémeaux	21 mai - 21 juin
42- Cancer	22 juin - 22 juillet
31- Lion	23 juillet - 22 août
21- Vierge	23 août - 22 septembre
12- Balance	23 septembre - 23 octobre
41- Scorpion	24 octobre - 22 novembre
34- Sagittaire	23 novembre - 21 décembre
24- Capricorne	22 décembre - 20 janvier
14- Aquarium	21 janvier - 18 février

Dans le Tableau, pour chaque année de naissance, le Nouvel An est indiqué selon le calendrier oriental. Il tombe sur la deuxième nouvelle lune après le solstice d'hiver (après le 21 décembre). Dans le calendrier grégorien, cela correspond généralement à l'un des jours entre le 20 janvier et le 20 février.

Les limites des périodes des signes du zodiaque indiquées dans le Tableau ne sont pas clairement établies et dépendent de l'année de naissance. Par exemple, les années bissextiles, la frontière se déplace légèrement. Sur les limites des périodes des signes du zodiaque, les dates sont indiquées, transitionnelles d'un signe du zodiaque à un autre signe du zodiaque.

La première dominante du signe du zodiaque est mise en évidence en gras. Il montre que lorsque les signes du zodiaque changent, la première dominante change selon le 43214-cycle.

Passons maintenant à la compilation de la formule octanalytique de personnalité.

Par exemple, nous devons compiler une formule octanalytique de personnalité pour une personne née le 2 juillet 1954.

Le Tableau montre la date de début de 1954 selon le calendrier oriental 03/02/1954. Cela signifie que, avec une date de naissance entre le 03/02/1954 et le 23/01/1955, l'entrée "31-Cheval" doit être utilisée. Et avec une date de naissance du 01 janvier au 02 février 1954, vous devez utiliser l'entrée "42-Serpent".

Le début de l'année selon le calendrier oriental tombe sur la deuxième nouvelle lune après le solstice d'hiver et se déplace donc entre le 20 janvier et le 20 février.

Selon le Tableau, on retrouve la combinaison: le signe du zodiaque du calendrier occidental 42-Cancer et le signe de l'Animal, calendrier oriental, 31-Cheval. Ici "42" signifie que la Première Dominante congénitale est l'instance 4-Cœur, et la Deuxième Dominante congénitale est l'instance 2-Ratio. La désignation "31" montre que la Première Dominante est l'instance 3-Irratio, la Deuxième Dominante est l'instance 1-Raison.

La désignation 42-Cancer montre qu'avec une planification d'actions à court terme pour une période d'un mois ou moins (court terme), tout d'abord, dans le comportement humain les propriétés des instances 4-

Cœur (Première dominante) et 2-Ratio (Deuxième dominante) se manifestent.

La désignation 31-Horse montre qu'avec une planification à long terme des actions sur une période d'un an ou plus (perspective à long terme), tout d'abord, dans le comportement humain les propriétés des instances 3-Irratio (Première dominante) et 1-Raison (Deuxième dominante) se manifestent.

Pour décrire l'état de la psyché "42-Cancer", il est nécessaire de connaître en détail les propriétés des instances de la psyché 4-Cœur et 2-Ratio. Et pour décrire l'état de la psyché "31-Horse", il est nécessaire d'étudier en profondeur les propriétés des instances de la psyché 3-Irratio et 1-Raison.

Dans l'exemple donné de compilation d'une formule octanalytique de personnalité, quatre instances de personnalité 4-Cœur, 3-Irratio, 2-Ratio et 1-Raison montrent une dominance congénitale. Mais très souvent, il y a des cas, selon la loi de probabilité de naissance uniforme des personnes au cours de l'année, où seulement trois ou même deux instances de la personnalité montrent une dominance congénitale, par exemple, la combinaison: formule octanalytique de personnalité 34-Sagittaire / 34-Chien, pour les personnes nées dans la période du 23 novembre au 21 décembre en 1934, 1946, 1958, 1970, 1982, 1994, 2006. Dans de tels cas, une personne a besoin d'un soutien pédagogique et psychologique particulier pendant l'enfance.

L'absence de dominance congénitale de l'instance de personnalité peut être partiellement compensée par la formation délibérée de la dominance acquise de l'instance de personnalité par l'éducation et la formation. Une telle mesure préventive est d'un grand avantage pour une personne dans la mise en œuvre de son adaptation sociale et personnelle dans la société. Le service de patronage octanalytique exécute systématiquement de telles mesures préventives et la vie d'une personne devient plus confortable et heureuse. Pour inscrire une personne à un service de patronage octanalytique, il est nécessaire de diagnostiquer les dominantes congénitales de sa personnalité. Une formule octanalytique de la personnalité peut être compilée cinq minutes après la naissance d'un enfant, et cette formule octanalytique de la personnalité d'une personne sera valable tout au long de sa vie.

Il faut noter que la dominance acquise de l'instance de personnalité se manifeste toujours beaucoup plus faible que la dominance congénitale. Lors de l'exécution d'un travail, une personne avec une dominance acquise de l'instance de personnalité ne peut pas rivaliser avec succès avec une personne qui a une dominance congénitale de cette instance de personnalité.

Par exemple, avec une combinaison 34-Sagittaire / 34-Chien, une personne n'a pas de besoin congénital pour la dominance des instances 1-Raison et 2-Ratio. Une telle personne n'a pas une tendance congénitale à analyser constamment et profondément la situation et à formuler des conclusions (propriétés de l'instance de conscience 1-Raison). De plus, une personne n'a pas tendance à se conformer constamment aux lois, accords, règles, il n'y a aucune inclination à effectuer des actions rationnelles, un apprentissage cohérent et systématique (propriétés de l'instance de l'inconscient 2-Ratio). Pour une telle personne, le besoin d'analyse de la situation et de comportement rationnel doit être formé par son éducation et sa formation. Et pour cela, vous devez d'abord savoir si une personne a un tel problème. À cette fin, vous devez compiler une formule octanalytique de personnalité.

Formule octanalytique étendue de personnalité

La formule octanalytique étendue de personnalité est plus précise. Lors de sa compilation, il est nécessaire de prendre en compte les propriétés de ce que l'on appelle la dominante d'arrière-plan - l'une des cinq instances de personnalité. La dominante d'arrière-plan est déterminée par l'année de naissance d'une personne et se manifeste dans le comportement d'une personne en tant que dominante congénitale. Les instances de personnalité (5-Âme, 4-Cœur, 3-Irratio, 2-Ratio, 1-Raison), en tant que dominantes d'arrière-plan congénitales, correspondent définitivement aux éléments de la philosophie orientale "U-sin" (Eau, Bois / Air, Feu, Terre, Métal) et correspondent aux éléments de la philosophie grecque antique (Ether, Eau, Feu, Terre, Air).

Sur la base des données sur les propriétés des éléments de la philosophie orientale "U-sin" , tous les dix ans, les cinq instances de la personnalité (5-Âme, 4-Cœur, 3-Irratio, 2-Ratio, 1-Raison) dominent comme dominante d'arrière-plan, tour à tour deux années de suite.

Instance 1-Raison domine comme dominante d'arrière-plan dans les années se terminant par 0 et 1. Instance 5-L'âme domine dans les années se terminant par 2 et 3. Instance 4-Le cœur domine dans les années se terminant par 4 et 5. Instance 3-Irratio domine dans les années se terminant en 6 et 7. Instance 2-Ratio domine dans les années se terminant en 8 et 9.

Par exemple, l'instance 5-Âme domine, comme dominante d'arrière-plan, dans la psyché des personnes nées en 2022 et 2023, l'instance 4-Cœur - pour celles nées en 2024 et 2025, etc. La séquence des changements dans les années de dominance d'arrière-plan des instances de personnalité correspond à 543215-cycle.

L'instance de la personnalité, qui domine dans l'année de naissance d'une personne comme dominante d'arrière-plan, est un facteur congénital important de la psyché, qu'il convient de prendre en compte lors de l'élaboration de la formule octanalytique de la personnalité. Dans ce cas, la formule de personnalité aura une forme différente.

Par exemple, pour une date de naissance du 02/07/1954, la formule de personnalité habituelle est 42-Cancer / 31-Horse. Le dernier chiffre de 1954 montre que pour cette année l'instance de la personnalité 4-Cœur est la dominante d'arrière-plan. Dans cet esprit, nous écrivons la formule de personnalité étendue comme suit: 42-Cancer / 4-31-Horse. L'entrée "4-31-Horse" montre que l'instance 4-Cœur est la dominante congénitale "4" pour les personnes nées en 1954-1955, et dans la combinaison des dominantes "31", l'instance 3-Irratio est la première dominante, et l'instance 1-Raison est la deuxième dominante. Ainsi, une entrée supplémentaire dans la formule de personnalité montre qu'en relation avec la

dominance d'arrière-plan de l'instance 4-Cœur, ses capacités managériales congénitales se manifestent plus clairement.

Formule octanalytique raffinée de personnalité

La formule octanalytique étendue de personnalité discutée ci-dessus change dans un cycle de 60 ans, ce qui permet de compiler la formule pour les personnes qui vivaient il y a plusieurs siècles.

Dans cette formule, nous avons pris en compte l'influence des dominantes congénitales du signe du zodiaque solaire, ce qui montre l'impact sur la psyché humain de l'état du Soleil sur fond de constellations le jour de sa naissance.

Cette formule peut être affinée, en tenant compte également de l'influence des dominantes congénitales de la personnalité du signe du zodiaque lunaire, ce qui montre l'influence sur la psyché humain de l'état de la lune sur fond de constellations le jour de son naissance.

Le signe du zodiaque lunaire change dans un cycle de 19 ans (avec une précision de + 2 heures 5 minutes). Les phases de la lune avancent d'un jour par rapport à celles calculées depuis 219 ans.

Introduisons la notation:

(0%) – le pourcentage d'illumination de la lune dans la phase de nouvelle lune est 0%;

(28% +) – le pourcentage d'illumination de la lune dans la phase "lune croissante" est 28%;

(50% +) – le pourcentage d'illumination de la lune dans la phase "Premier Quartier" est 50%;

(100%) – le pourcentage d'illumination de la lune dans la phase "pleine lune" est 100%;

(50% -) – le pourcentage d'illumination de la lune dans la phase "Troisième Quartier" est 50%;

(23% -) – le pourcentage d'illumination de la lune dans la phase "lune décroissante" est 23%.

Pour la date de naissance 02/07/1954 dans le moteur de recherche Internet, pour la requête en anglais "moon phase July 2, 1954" on obtient en anglais:

"On this day, the moon is 2.06 days old and 4.59% illuminated with a tilt of -137.099°. The approximate distance from Earth to the moon is 380,083.28 km and the moon sign is Leo."

Ensuite, la formule octanalytique raffinée de personnalité pour la date de naissance du 2 juillet 1954 ressemblera à:

3 jour lunaire / 31-Lion / 4% + // 42-Cancer / 4-31-Cheval.

Dans cette formule, les données obtenues à partir du calendrier lunaire,

"3 jour lunaire / 31-Lion / 4% +"

sont des informations supplémentaires sur les propriétés congénitales de la psyché humaine.

Code de personnalité octanalytique

Sur la base des données de la formule de personnalité octanalytique (Formule 1), nous composons un code de personnalité octanalytique (Formule 2), qui montre le degré total de dominance innée de chacune des cinq instances de personnalité 5-Âme, 4-Cœur, 3-Irratio, 2-Ratio, 1-Raison.

Supposons que le degré de dominance de la première dominante est de deux points, celui de la deuxième dominante est d'un point et celui de la dominante d'arrière-plan est d'un point. Ensuite, dans le code de personnalité octanalytique (Formule 2), le point total est de dix.

Le code de personnalité octanalytique (Formule 2) a la forme

5-Âme/0 points – 4-Cœur/3 points – 3-Irratio/4 points – 2-Ratio/1 point – 1-Raison/2 points

ou, sous forme abrégée, 5/0 – 4/3 – 3/4 – 2/1 – 1/2,

sous une forme plus abrégée, 034-12.

Dans le code de personnalité octananalytique (Formule 2), la désignation «4-1» indique le degré total de dominance innée pour les instances de l'inconscient: 3-Irratio – 4 points, 2-Ratio – 1 point.

D'autres chiffres du code de personnalité octanalytique montrent le degré total de dominance innée pour les instances de conscience: 5-Âme - 0 point, 4-Cœur - 3 points, 1-Raison - 2 points.

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SOCIAL SCIENCES

THE ADOPTION OF AN EFFECTIVE EUROPEAN BILL WILL BE NECESSARY TO REDUCE FOOD WASTE

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Abstract

The purpose of this analysis is to highlight the urgency of quickly obtaining an effective European law against food waste. This analysis demonstrates the blockages (lobbing and long and slow procedures), and solutions are proposed in view of the social and environmental emergency. This analysis is therefore all the more important as it applies in a disrupted and unbalanced social and environmental situation. Indeed, with millions of poor people on the European continent on the one hand and the emergence of worrying global warming on the other, citizens are expecting effective and innovative legal tools. Legislative decision-making between the different bodies of the European Union (European Commission, European Parliament and Council of the European Union) is a legal challenge that must be taken up. It should indeed be remembered that the DrawDown project (2020) and IPCC (2022) reports have confirmed that reducing food waste is one of the three main solutions to combat global warming. Can European law therefore reconcile economic production and social redistribution for better equity between everyone ? This is the objective of this legal analysis.

Keywords: Food Waste, European Law, sustainable development, Food loss

INTRODUCTION

The Food and Agriculture Organization of the United Nations (FAO) estimates that thirty percent of the food produced worldwide is wasted[3].

This amounts to one out of every three foods worldwide.

However, according to the Food and Agriculture Organization (FAO), 783 million people globally faced hunger in 2022, and 3.1 billion people lacked access to a good food in 2021[4].

At the same time, the organization estimates that, globally, « 13% of food is lost in the distribution chain, from post-harvest to pre-retail and that an additional 17% of food is wasted at the household, food service and retail levels »[5] [6]

The demand for food items has increased globally in recent decades due to changes in eating patterns and demographic growth.

Modern agriculture faces a myriad of challenges that impede its productivity and sustainability. These challenges include inherent limitations in crop yields, the necessity for effective integration of technological advancements, the increasing frequency and severity of natural disasters exacerbated by climate change, the encroachment of urbanization on fertile agricultural lands, and the ever-growing scarcity of water resources essential for cultivation.

In light of these challenges, there arises a pressing need to bolster agricultural productivity to ensure an adequate and sustainable food supply for the world's growing population. However, simply striving for increased productivity may not be sufficient. Another critical aspect that demands attention is the reduction of losses and waste throughout the food production and distribution chain.

The distinction between 'losses' and 'waste' within the agricultural context is nuanced and often blurred due to the diverse array of circumstances encountered across different regions and nations. 'Losses' typically refer to the reduction in quantity or quality of agricultural products during production, harvesting, storage, and transportation stages. This can result from factors such as pest infestations, diseases, spoilage, mishandling, or inadequate storage facilities. On the other hand, 'waste' encompasses the inefficiencies and excesses that occur further downstream in the food supply chain, including retail, distribution, and consumption stages. This may include discarded or unsold food products, expiration of perishable items, overproduction leading to surplus disposal, and consumer behavior contributing to unnecessary waste generation.

Addressing both losses and waste in the food system requires a multifaceted approach involving collaboration among stakeholders at various levels. Strategies

[2] « Nobel Prize for sustainable development: lawyer Arash Derambarsh rewarded » : https://clever-energies.com/en/nobel-prize-for-sustainable-development-lawyer-arash-derambarsh-rewarded/
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may include investment in improved infrastructure and technology to minimize losses during production and distribution, implementation of effective storage and preservation techniques, adoption of sustainable agricultural practices to mitigate environmental stressors, promotion of consumer education and awareness campaigns to reduce food waste at the household level, and the development of policies and incentives to incentivize responsible consumption and production practices.

According to the FAO, 30% of food produced worldwide is wasted.

1.3 billion tons of food, or more than half of the world's grain supply, are lost or wasted annually worldwide, from agricultural production to ultimate consumption.

The issue at hand is worldwide : 670 million and 630 million tons of food are wasted annually in wealthy and developing nations, respectively.

According to FAO estimates, there will be an additional 2.3 billion people on Earth by 2050, bringing the total population to more than 9 billion. By 2100, there will be more people on the planet than 11 billion.

Food production will need to expand in order to keep up with the population's continued need for food.

Demand for food will continue to increase and it will be necessary to intensify food production to feed this population.

If this trend continues, the FAO estimates that global food production will have to increase by 40 to 70% by 2050 to meet needs.

It won't be sufficient to increase output at this rate of waste.

By examining the true demands of the consumer, we must investigate the strategies that should be used at every link in the food chain.

At every level, progress is achievable.

To create solutions that both « feed more » and « feed better » for a growing population, all stakeholders must band together.

Food waste and food insecurity are therefore two complex and interdependent phenomena. Food waste is a major problem, both environmentally and socially.

It represents a loss of valuable resources and can have a negative impact on people in food insecurity.

Therefore, the concept of food insecurity is often reduced to the question of access to sufficient food in quantity and quality.

However, a broader approach is needed to take into account the social, cultural and political issues associated with food.

By considering food insecurity through the prism of social and political factors, we are led to re-examine the legal issues that a rise from it, as evidenced by the history of the right to food. Indeed, Nicolas Bricas, Damien Conaré and Marie Walser highlight the relational and political dimension of food, which transcends many domains and profoundly influences our world. Rather than considering it as an isolated domain, an ecological approach to food suggests using it as a lever to rethink our society in crisis.

That said, the consumer-citizen, a specific actor, must be convinced of the importance of fighting against food waste and appropriate this approach, thus underlining the importance of lifelong education, training and communication. From this perspective, the causes of food insecurity are multiple and complex. They can be related to economic, social, political or individual factors.

It is precisely because there is a social emergency and a crisis at the level of the food chain that it is appropriate to legally regulate these dysfunctions and economic imbalances.

So, can the law reconcile economic productivity and social redistribution ?

Our analysis responds to this problem with a requirement to accelerate the legislative process at the European level.

MAIN PART

I- A food scandal in front of social and environmental emergency

For a long time, food contributions were the subject of a controversy as most supermarkets tossed away their unsold stock instead of donating it to the underprivileged or nonprofit organizations[7].

The fact that the Observatory of Inequalities estimates that 5.3 million individuals in France lived below the poverty level in 2023 makes this scenario much more concerning.[8]

Therefore, in order to put an end to this plague, specific answers had to be given.

The #StopFoodWaste movement led to the adoption of a legislation in France requiring retailers to give unsold food, preventing over 10 million meals from ending up in landfills and resulting in a 22% increase in food contributions to charitable organizations.[9]

Every grocery store in the European Union continues to discard more than 40 kg of food every night, despite the fact that more than 95.3 million people (or 22% of the population) live in poverty and frequently struggle to provide for their families in 2022.[10]

The #StopFoodWaste campaign's straightforward solution to this issue was to pass a national law encouraging stores to donate unsold food instead of throwing it out.

[7] The Telegraph « Iceland staff 'pour bleach onto waste food to stop homeless people eating it' » : https://www.telegraph.co.uk/foodanddrink/foodanddrinknews/7564402/Iceland-staff-pour-bleach-onto-waste-food-to-stop-homeless-people-eating-it.html

[8] France Info : https://www.francetvinfo.fr/societe/plan-pauvrete/precarite-en-2023-5-3-millions-de-personnes-vivaient-sous-le-seuil-de-pauvrete-en-france_6304863.html

[9] Anti-food waste law: what results after 18 months ? (Le Figaro – 2018) : https://www.lefigaro.fr/economie/le-scan-eco/2018/10/16/29001-20181016ARTFIG00007-loi-anti-gaspillage-alimentaire-quel-bilan-apres-18-mois.php

[10] Poverty in Europe (Statista 2023) : https://fr.statista.com/infographie/17748/niveaux-de-pauvrete-en-france-et-en-europe/

Passed on 3rd February 2016 [11], the new law seeks to tackle food waste by obliging all French supermarkets to give away their unsold food and distribute it to those in need, ensuring that nothing is wasted. Supermarkets are free to support the aid association or charity of their choice, and every citizen can apply to create an authorised association to assist in food distribution.

Over 10 million meals are prevented from ending up in landfills each year thanks to the regulation, which has also increased food donations to social assistance organizations by more than 22%. In addition to mobilizing volunteers and streamlining the distribution of food contributions through affiliated organizations, the initiative has increased public awareness of the problem of food waste at the municipal level.

II- A European legal framework difficult to obtain

Encouragingly, the effort now aims to spread throughout the European Union.

It is necessary to expand and strengthen this attempt lawfully.

In actuality, the law mandates that stores with more than 400 square meters provide their unsold merchandise to the organization of their choice. This law has caused large supermarkets to modify their operations, but with limitations.

Since the French legislation has proven beneficial and the state of society in Europe is obviously concerning, we must secure a directive prohibiting food waste in order to bring the law to our continent.

Such a directive's effect at the European level would enable us to partially end hunger on our continent.

An act of normative action adopted by the European Union's institutions is called a directive.

Community directives are a component of EU secondary legislation, along with rules, rulings, views, and suggestions.

In contrast to a community law that is applicable in its entirety, a directive sets goals for member nations to meet within a certain timeframe. The national governments can adjust to the new laws thanks to this delay.

According to Article 288 of the Treaty on the Functioning of the European Union (TFEU)[12], the directive leaves the national authorities flexibility on the form and means of achieving the goal, but it is obligatory on the Member States that are its beneficiaries (one, multiple, or all).

Secondary EU legislation includes directives. Based on the treaties, the European institutions adopt them. The Member States then transpose them so that they become enforceable laws.

Similar to the French law, this rule is straightforward in that it would force supermarkets to contribute their unsold inventory to the group of their choosing. It would make it easier for volunteers to retrieve unwanted consumer goods from a store.

After then, the latter might give them out right away to those in need, especially the homeless.

Three effects would arise from this European legal framework:

The ability to form an association and receive permission from the appropriate authorities is available to all citizens of Europe.

Every European national will then be able to get in touch with the brand of their choosing, who will then be able to provide them with unsold merchandise to distribute that same evening.

A supermarket will also face a hefty fine if it continues to reject. A fine of 10,000 euros applies in France.

According to Article 17(2) of the EU Treaty, the European Commission has the exclusive right to propose legislation inside the Union.[13]

The legislative proposals that will be approved by the European Parliament and the Council are also created by this same Commission.

But because the European Commission is hampered in its actions by numerous lobbyists, this procedure appears altered. When discussing significant subjects, having too many obscure mediators might cause disruptions.

Thus, it is fitting that the idea originates from a head of state in full openness.
A European regulation in this food-related field must also be flexible enough to be voted on in light of the social emergency in order for European law to be implemented and administered in a timely manner.

III-Requirement to obtain an accelerated procedure in specific and emergencies situations

In fact, delays are often very long.

So, in compliance with Articles 289 and 294 of the Treaty on the Functioning of the European Union, the European Commission, on the one hand, submits a proposal to the Council and the European Parliament.[14] [15]

After that, a legislative proposal is either adopted at first reading or second reading by the Council and the Parliament.

In the event that no date is given for the first reading in the Council and Parliament, each institution's second reading deadline is three months, with a one-month extension conceivable.

A conciliation committee is constituted if, following the second reading, the two institutions are unable to come to an agreement. The conciliation committee has to get together in six or eight weeks. After then, the committee has six weeks to approve a shared text.

Following these steps, a decision must be made by the Parliament and the Council within six weeks after the approval date of the common text.

[11] Law No. 2016-138 of 11th February 2016 relating to the fight against food waste : https://www.legifrance.gouv.fr/jorf/id/JORFARTI000032036290

[12] EUR-Lex : https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A12012E288

[13] EUR-Lex : https://eur-lex.europa.eu/legal-content/FR/TXT/HTML/?uri=CELEX%3A12012M%2FTXT

[14] EUR-Lex : https://eur-lex.europa.eu/EN/legal-content/summary/legislative-procedures.html

[15] EUR-Lex : https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A12012E294

The legislative act becomes law if, at third reading, both institutions agree to the wording chosen by the conciliation committee.

The process comes to an end and no legislation is approved if a legislative proposal is rejected at any point during the process or if Parliament and the Council are unable to come to an agreement.

These delays are significant given that around 100 million people in Europe live in poverty.

In order to swiftly enact a European rule prohibiting food waste throughout the continent, it is imperative that the legislative process be shortened and made more adaptable.

Therefore, it would not be unreasonable to request that these procedure durations be shortened in emergency situations, such when food aid is needed for charity. French legislative procedure expedited.

Article 45, paragraph 2, of the Constitution states that the expedited procedure in France is characterized by a measure being subjected to just one reading by each body of Parliament (National Assembly and Senate) before to adoption.

As a result, this limits the parliamentary shuttle to only one text communication.[16]

As a result of public pressure, and especially after over 1.6 million Europeans signed a petition, the EU has worked hard to establish a uniform framework for dealing with FLW. [17]

Additionally, the Juncker Commission unveiled a fresh plan for a circular economy in 2015.[18]

However, these measures are insufficiently successful, and on a continent where serious poverty is a problem now more than ever, passing the French law against waste must be the top priority.

CONCLUSION

As we have analyzed, the social situation is alarming. And in the face of this, European citizens are legally helpless.

The current social landscape presents a myriad of challenges, from economic disparities to food insecurity, environmental degradation, and access to basic necessities. Amidst these complexities, European citizens are confronted with a sense of legal helplessness, where existing frameworks may not adequately address their needs or provide sufficient avenues for recourse.

One of the critical areas where this legal vulnerability is pronounced is in addressing issues such as food waste and hunger. Despite growing awareness and initiatives aimed at combating these challenges, the legal tools available to European citizens often fall short. There is a gap between the scale and urgency of social issues and the legal mechanisms designed to address them, leaving individuals and communities feeling marginalized and without effective means of redress.

Furthermore, the complexity of the European legal system, with its multiple layers of governance and decision-making processes, can hinder timely and decisive action. The intricate relationship between national and EU-level regulations, coupled with bureaucratic hurdles, can impede efforts to enact meaningful change.

To empower European citizens and address these pressing social concerns, there is a need for a comprehensive review and reform of existing legal frameworks. This involves not only strengthening laws and regulations but also streamlining processes to ensure greater accessibility, transparency, and accountability.

Moreover, fostering a culture of active citizenship and engagement is essential in shaping policies that are responsive to the needs of the people. By promoting dialogue, participation, and collaboration between policymakers, civil society organizations, and affected communities, we can co-create solutions that are both effective and equitable.

Indeed, the legal tools made available to Europeans to combat food waste and contribute to reducing hunger are not suitable.

Building upon the analysis conducted earlier, it becomes evident that streamlining the voting and decision-making processes within the various legislative bodies of the European Union is imperative. Additionally, enhancing the fluidity of the relationship among key institutions such as the European Parliament, the European Commission, and the Council of Heads of State of the European Union is crucial.

The complexity and inefficiency of current decision-making processes often hinder timely and effective action on pressing issues, including those related to social welfare, environmental protection, and economic stability. Lengthy deliberations and bureaucratic hurdles can delay the adoption of much-needed policies and reforms, exacerbating the challenges faced by European citizens.

By compressing the voting and decision-making processes, we can expedite the formulation and implementation of policies aimed at addressing societal needs and promoting the common good. This may involve streamlining procedures, reducing bureaucratic red tape, and promoting greater cooperation and consensus-building among EU institutions.

Furthermore, enhancing the fluidity of relationships among key EU bodies can facilitate more cohesive and coordinated efforts in addressing shared objectives and challenges. Closer collaboration between the European Parliament, the European Commission, and the Council of Heads of State can foster greater alignment of priorities, enhance communication, and enable more effective decision-making processes.

[16] Article 45 paragraph 2 of the French Constitution of 4th October 1958 (Legifrance) : https://www.legifrance.gouv.fr/loda/article_lc/LEGIARTI000019241040

[17] « Stop Food Waste in Europe » (Change.org) : https://www.change.org/p/mettons-fin-au-gaspillagealimentaire-en-europe-stopfoodwaste?source_location=search

[18] Closing the loop: Commission adopts ambitious new Circular Economy Package to boost competitiveness, create jobs and generate sustainable growth (European Commission) : https://ec.europa.eu/commission/presscorner/detail/en/IP_15_6203

Ultimately, by reforming the structures and processes governing EU governance, we can create a more agile, responsive, and accountable system that better serves the interests and needs of European citizens. This requires a concerted effort from all stakeholders, including policymakers, legislators, civil society organizations, and the public, to drive meaningful change and build a stronger, more cohesive European Union.

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TECHNICAL SCIENCES

FEASIBILITY STUDY OF BIOFUELS PRODUCTION IN UKRAINE

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Abstract

The purpose of the article is to consider results of a feasibility study of biofuels production in Ukraine and to determine the most promising types of motor biofuels for the country. The performed techno-economic assessment covers bioethanol and biodiesel from different types of feedstocks as well as hydrotreated vegetable oil. The study includes analysis of the potential of biomass available for the production of biofuels and energy in Ukraine. Factors for a possible growth of the potential in a long-term period are considered. The demand for motor biofuels in the country and their export potential are analysed. To determine feasible types of projects, techno-economic assessment of biofuels production in Ukraine's conditions has been performed. The obtained results show that under the current circumstances, some projects are much more feasible than the others, the simple payback period of the projects being 3-4 to 6-9 years. Based on analysis of relevant international studies, available biomass potential in Ukraine and results of the performed feasibility study, some prospective types of motor biofuels for the production and consumption in Ukraine have been determined. To support further development of this sector it is necessary to introduce some additional incentives on the state level.

Keywords: biomass, biofuels, bioethanol, biodiesel, feasibility study.

Introduction.

Decarbonisation of economy and energy is a global challenge of the present time caused by the necessity to mitigate greenhouse gas (GHG) emissions and hold down the process of climate change. The European Green Deal is the main current strategy of the EU focused on achieving climate neutrality by 2050. Present contribution of the transport sector to the EU's total GHG emissions is 25% with the rising tendency. To reach the 2050 goal of carbon neutrality in Europe, a considerable, up to 90% reduction of GHG emissions in transport should be attained. The emphasis is on road transport, aviation sector and maritime sector. Boosting the production and use of biofuels in these sectors is an important part of the ambitious transport strategy within the European Green Deal (Chiaramonti 2021, Lundberg 2023, Tsakalidis 2020). For example, it is planned to reduce emissions from cars by 55% and emissions from vans by 50% by 2030 as well as provide zero emissions from new cars by 2035. To promote the consumption of sustainable aviation fuels (SAF), the minimum share of SAF required for blending with kerosene by European suppliers of aviation fuel has been increased. To give an incentive for using renewable and low-carbon marine fuels, a goal to gradually reduce the annual average GHG intensity of energy used by ships has been set.

Main provisions of the EU Renewable Energy Directive 2018 (RED II) regarding the transport sector were generally in line with the European Green Deal transport policy. The main mandatory goal was to reach at least 14% of renewable energy in the final energy consumption in transport. At that, the Directive promoted the production of advanced biofuels, that is biofuels obtained from lignocellulosic material, non-food cellulosic material, biomass fraction of municipal and industrial waste and other types of feedstocks listed in Part A of Annex IX of RED II (Dusser 2019, Panoutsou 2021). The new version of the Renewable Energy Directive adopted in 2023 (RED III) allows the Member States to choose between a transport target expressed as a GHG intensity reduction (at least 14.5% by 2030) or as a share of renewable energy consumption in the transport sector (at least 29% by 2030). RED III encourages the production of advanced biofuels and its use in road transport, aviation and maritime transport. It is expected that the list of feedstocks for obtaining advanced biofuels, which is now under consideration, will be specified and expanded in RED III.

Being a member of Energy Community on its way to European integration, Ukraine is gradually implementing main provisions of Renewable Energy Directives. One of them applies to the introduction of renewable energy, including biofuels, in the transport sector. The National Transport Strategy of Ukraine until 2030 establishes a target to achieve 50% consumption of biofuels and electricity (renewable and traditional) in the total energy consumption in transport. The same target is stated in the draft National Energy and Climate Plan of Ukraine for 2025-2030. Such an ambitious goal can be reached only with a considerable contribution of biofuels.

Methodology.

Feasibility study of biofuels production should be started with analysis of Ukraine's biomass potential. Existing assessments show that Ukraine has a big potential of biomass available for energy production. This is probably one of the most important preconditions for the development of bioenergy sector in the country and replacement of expensive fossil fuels (Geletukha 2021,

Geletukha 2022). The economic potential of biomass is assessed at nearly 26 Mtoe/y with the biggest contribution from agricultural residues (42% of the total) and energy crops (21%) (Tryboi 2023, Zheliezna 2024). By 2050, the biomass potential may increase to about 44 Mtoe/y due to a number of factors, the main of which are possible increase in the yield of main agricultural crops; possible expansion of area under energy crops; development of sustainable growing intermediate/cover crops as feedstock for the production of biogas/biomethane.

Analysis and comparison of European and Ukrainian statistical data on agriculture shows that Ukraine still has room for increasing the yield of some cereal crops (for example, wheat and maize) by at least 1.2-1.25 times. Besides, Ukraine has quite a big area of permanently unused agricultural land (about 3 million hectares) that can be partly utilised for growing energy crops such as willow, poplar, miscanthus, camelina, maize (silage). Biomass of the energy crops can be used as feedstock for the sustainable production of solid, liquid and gaseous biofuels. A new promising direction of bioenergy development in Ukraine is growing intermediate/cover crops to obtain biomass for biogas/biomethane production. Bioenergy experts are now actively studying this issue. It should be noted that another important research area attracting increasingly more attention in the country is the production of synthetic renewable methane (Klimenko 2023).

Due to some obstacles, current production of liquid biofuels in Ukraine is very low being represented only by first-generation bioethanol. Nevertheless, analysis of structure and volume of the current and prospective biomass potential in the country indicates good prerequisites for the production of different motor biofuels including advanced ones. Now, it is a question of biodiesel and bioethanol for road transport; however, in the postwar period it is necessary to study the matter of biofuels for aviation (SAF) and for waterborne transport (biodiesel, Fischer-Tropsch diesel, bio-oil of biomass fast pyrolysis) (Zheliezna 2022).

Analysis of international theoretical and practical studies indicates the following leading-edge technologies for further research and development:

- Production of advanced bioethanol and Fischer-Tropsch diesel from lignocellulosic feedstock.
- Production of hydrotreated vegetable oil (renewable diesel fuel).
- Production of sustainable aviation fuels such as synthesized paraffinic kerosene (SPK) from hydroprocessed esters and fatty acids, alcohol to jet SPK, Fischer-Tropsch hydroprocessed SPK.

This article considers only motor biofuels for road transport while further studies surely should cover the issues of sustainable fuels for aviation and waterborne transport.

In addition to the biomass potential, the feasibility study of biofuels production should take into account the demand for motor biofuels in Ukraine. This demand is mainly determined by combination of the current consumption of petrol and diesel and existing technical constrains for replacing them with bioethanol and biodiesel, respectively. The consumption of main motor fuels in Ukraine during 2017-2021 was quite stable with some small fluctuations: petrol 1.7-2.0 Mt/y, diesel fuel 5.1-5.8 Mt/y. At that, the use of liquefied propane and butane increased from 0.89 Mt in 2017 to 1.3 Mt in 2021 (Table 1). Statistical data for the period later than 2021 are not available because they are not published due to the state of martial law in the country.

Table 1.

Consumption of motor fuels in Ukraine.

Fuel type	2017	2018	2019	2020	2021
Motor petrol, Mt	2.0	1.8	1.7	1.8	2.0
Gas oils (diesel fuel), Mt	5.1	5.4	5.8	5.2	5.7
Liquefied propane and butane, Mt	0.89	1.0	1.2	1.4	1.3

Based on data on the use of motor fuels in Ukraine in 2021, the volume of domestic market for bioethanol can be estimated as 210 kt/y (on condition of blending 10% vol. bioethanol with petrol), and that for biodiesel is 290 kt/year (on condition of blending 5% vol. biodiesel with diesel fuel). In case of production of hydrotreated vegetable oil (HVO), the volume of its use in Ukraine's domestic market can be much larger, since the properties of HVO allow its use as direct substitute for diesel fuel (Soo-Young 2014). Besides, if there is a large number of flex-fuel vehicles in use in Ukraine, the volume of bioethanol consumption in domestic market will also be considerably higher. The design of flex-fuel vehicles allows their running on petrol mixed with up to 50-85% bioethanol (Delavarrafiee 2018).

Bioethanol is used as an oxygen-containing additive to petrol, diesel or as a biologically renewable alternative substitute for petrol. When added to petrol, it increases its octane number and saturates it with oxygen, which leads to more complete combustion and a reduction in emissions of harmful substances. From the chemical point of view, biodiesel is a mixture of fatty acid methyl ethers (FAME) of vegetable oils that contain 11% of oxygen, while diesel fuel and HVO are hydrocarbons that do not contain oxygen. Due to its oxygen content, FAME has a lower calorific value resulting in higher biofuel consumption as compared to traditional diesel fuel. Diesel fuel comprises aromatic hydrocarbons while HVO consists only of fully saturated paraffinic hydrocarbons. Cetane number and lower calorific value of HVO is higher than those of diesel and FAME. Applications of FAME under a cold weather are limited due to poorer low temperature properties as compared to the conventional diesel and HVO.

It is expected that the amount of potentially produced biofuels that exceeds Ukraine's domestic demand may be exported. First of all, this applies to advanced (second-generation) biofuels as they are sustainable. Sustainability of biofuels that are exported can

be confirmed by a relevant certification system, for example, by ISCC (International Sustainability and Carbon Certification). Such certification is obligatory for biofuels that are exported to the EU and voluntary for biofuels that are exported to countries outside the EU.

According to McKinsey & Company's forecast made in 2022, the global demand for sustainable motor fuels will grow to about 220 Mt/y until 2035 with a subsequent decrease to the level of 2025 (about 170 Mt/y) (Figure 1). By 2050, the largest increase in demand is expected for sustainable fuels from lignocellulosic feedstock (Figure 2). At that, there will remain quite a large demand for fuel from oils of edible crops. It is predicted that in 2030, the largest importers of bioethanol will be Brazil, the USA, Japan, Canada, the United Kingdom, and importers of biodiesel will be the EU, the USA, the United Kingdom, Canada, and Peru. The general situation may remain approximately the same also for some period after 2030.

Taking into account the above data and forecasts, we have elaborated a middle-term scenario for the production of motor biofuels in Ukraine (Table 2) (Zheliezna 2023). The scenario covers first- and second-generation biodiesel and bioethanol from different types of feedstocks, which takes into consideration the available biomass potential in Ukraine. After 2035 it seems reasonable to gradually switch from the production of biodiesel to HVO as well as to restrict the production of first-generation bioethanol in favour of advanced biofuel. In general, the suggested basic scenario is in line with the draft National Energy and Climate Plan of Ukraine for 2025-2030 that also envisages the production of first- and second-generation biofuels.

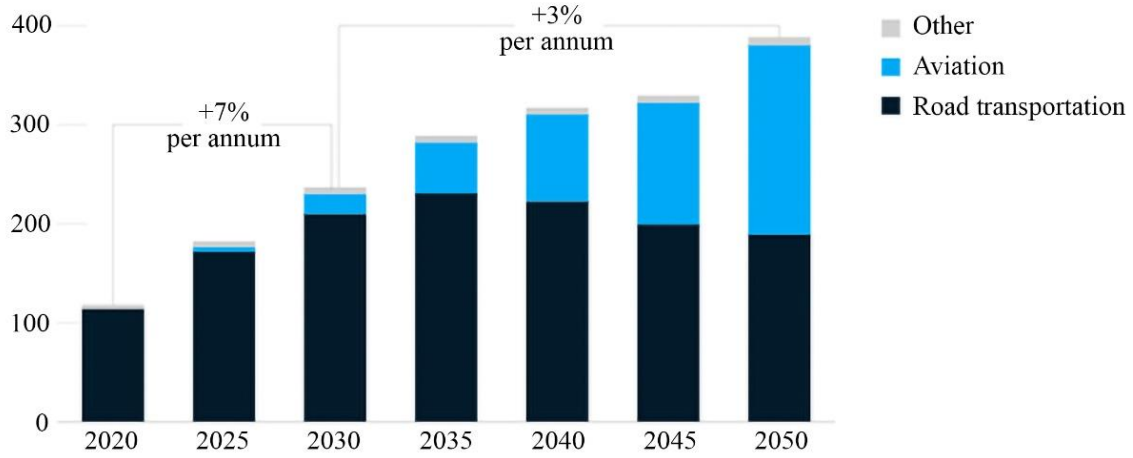

Figure 1. Global sustainable fuel demand by sectors until 2050, Mt.

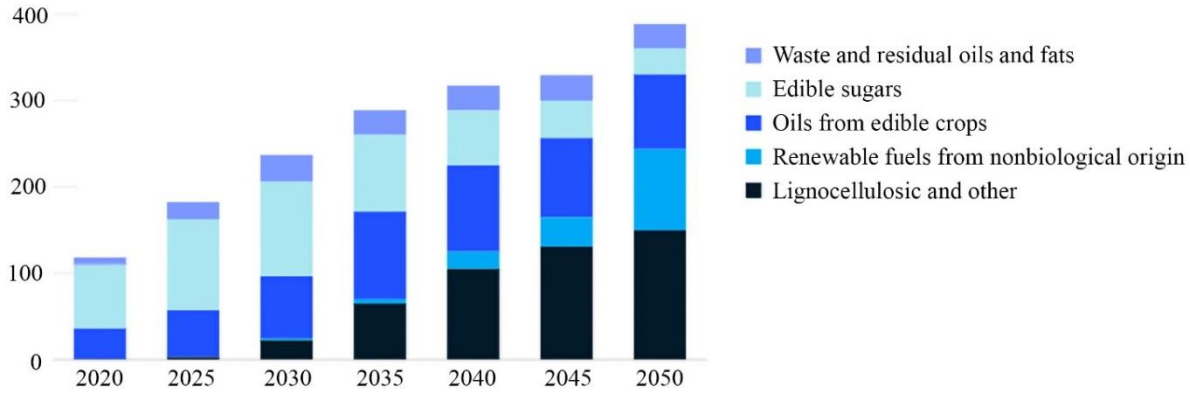

Figure 2. Global sustainable fuel demand by feedstock type until 2050, Mt.

Table 2.

Basic scenario for the production of motor biofuels in Ukraine until 2035, kt.

Biofuel type	2025	2030	2035
Biodiesel from:			
- rapeseed	56	113	226
- used cooking oil (UCO)	6	11	23
- unconditioned oils, vegetable and animal fats	0.2	0.5	0.9
- fats from livestock and poultry slaughter	6	8	11
- oil energy crops (advanced biofuel)	11	56	113
Bioethanol from:			
- maize grain	109	202	312
- molasses (advanced biofuel)	55	62	70
- residues of grain maize production (advanced biofuel)	31	78	234

Main part.

Feasibility might be a crucial aspect of biofuel production, which depends on maturity of a certain technology, cost of feedstock and other input materials and energy, possible sale price of the main product and by-products. An important feature of a biofuel production technology is its materials and energy intensity. Technologies for the production of first-generation biofuels are well established and worked out, though they may be less sustainable as compared to advanced (second-generation) biofuels in terms of GHG emissions.

Advanced biofuels are sustainable as they are obtained from waste and nonedible raw materials. However, the respective technologies are very complex and the final product may be too expensive to be competitive with traditional motor fuels. In addition to the main product (a biofuel), there can be one or more by-products which are of interest of the market. For example, dried distillers grains (DDG) and maize oil are by-products in case of bioethanol production from maize grain (Table 3). When producing advanced bioethanol, the process generates its own energy for use in the process. The required input energy can be obtained from the lignocellulosic feedstock residues (unreacted biomass), and the surplus energy can be sold to gain additional income.

Table 3.

Mass balance for the production of motor biofuels.

Inputs and outputs	Bioethanol from maize grain	Advanced bioethanol from lignocellulosic feedstock	Biodiesel from vegetable oil	Biodiesel from UCO	HVO
Inputs to obtain 1 litre of a biofuel:					
Feedstock, kg	2.4	3.38	0.893	0.977	0.97
Chemicals, kg	-	0.38	Methanol 0.086	Methanol 0.087	Hydrogen 0.035
Power, kWh	0.20	-	0.036	0.08	0.085
Natural gas, MJ	7	-	0.93	1.71	0.27
Outputs:					
Biofuel (1 litre), kg	0.79	0.79	0.88	0.88	0.77
By-products, kg	DDG 0.72 Maize oil 0.03	Power 0.70 kWh	Glycerine 0.09	Glycerine 0.09	Fuel gas 0.03 Bio-propane 0.025 Naphtha 0.06

It should be noted that techno-economic assessment of biofuels production in Ukraine's conditions has been performed with detailed consideration of the relevant mass balances, especially regarding the input of required chemicals. The obtained results show that some projects are more feasible than the others. Simple payback period (SPP) within 4 years may be achieved when producing bioethanol from maize grain and biodiesel from UCO (Table 4). These projects have the lowest capital expenses (CAPEX) and operating expenses (OPEX) of the considered options.

Table 4.

Results of feasibility study of biofuels production in Ukraine's conditions.

Indicators	Bioethanol from maize grain	Bioethanol from straw	Biodiesel from rapeseed oil	Biodiesel from UCO	HVO (rapeseed oil)
Production output, kt/y	50	50	50	20	100
Operational time, h/y	8000				
Expenses:					
Feedstock consumption, kt/y	152	214	50.7	22.2	126
Feedstock purchase price, EUR/t without VAT	102	50	810	300	810
Feedstock cost, mln EUR	15.5	30.4	45.1	8.7	120.2
CAPEX, mln EUR	32.3	139.3	32.0	26.6	112.0
OPEX, mln EUR/y	23.8	39.0	49.0	11.1	131.4
Biofuel production expenses, EUR/l	0.376	0.616	0.86	0.49	1.012
Depreciation charges, EUR/l	0.020	0.088	0.023	0.047	0.034
Income:					
Sale price of by-products, EUR/t without VAT	DDG 133.2 Maize oil 629.7	Power 0.079 EUR/kWh	Crude glycerine 100	Crude glycerine 100	Bio-propane 1041 Naphtha 528 Fuel gas 646
Income from sale of by-products, mln EUR/y	DDG 6.1 Maize oil 1.2	Power 3.5	Crude glycerine 0.51	Crude glycerine 0.20	Bio-propane 3.38 Naphtha 4.1 Fuel gas 2.5
Biofuel net cost, EUR/l	0.28	0.65	0.88	0.53	0.97
Biofuel sale price*, EUR/l without VAT	0.55	1.0	0.98	0.98	1.2
Economic performance indicators:					
Loan share of CAPEX, %	70				
Lending period, years	5				
Loan rate in EUR, %	6				
Internal return rate (IRR), %	45%	13.3%	17.3%	33.7%	19.9%
Simple payback period, years	3.3	8.5	6.8	4.0	6.3

* The price does not take into account the excise tax of 100 EUR/1000 l.

Obtaining bioethanol from lignocellulosic feedstock (such as straw) is a complex technology, therefore capital expenditures are high. As a result, SPP is more than 8 years despite comparatively low price of the feedstock (straw). Nevertheless, as such technologies are developing and improving, one can expect a noticeable decrease in the production cost of cellulosic bioethanol even in a short-term period. A promising direction for future research and development may be also obtaining advanced bioethanol from organic fraction of municipal solid waste [19].

As opposed to straw and other crop residues, rapeseed oil is an expensive feedstock, which negatively affects the biodiesel production projects (SPP is about 7 years). A possible solution can be switching over to a cheaper feedstock, for example, oil energy crops. UCO is not suited for this purpose as its amount is rather limited and collection is not well organized in Ukraine. Oil energy crops can be cultivated on permanently unused agricultural land (about 3 mln ha in Ukraine), which is considered a sustainable approach to obtaining feedstock for biofuels. Another approach to improve feasibility could be the introduction of state subsidy or other type of support for producers of biofuels, especially the advanced ones. Now the only incentive is a zero-excise tax for bioethanol that is used for the production of blended petrol and for bioethanol that is exported. Obviously, it is not enough for the further development of the sector.

Findings.

Decarbonisation of the transport sector is an important part of the global GHG emissions mitigation. The problem is that it is rather difficult to decarbonize this sector, especially freight transportation, as compared to other energy sectors such as heat and power production. One of the possible directions is switching over from the traditional motor fuels to biofuels. Advanced biofuels are especially effective as their use leads to high reduction of CO_2 emission as compared to the consumption of petrol and diesel.

Based on complex analysis of international studies

and results of the performed techno-economic assessment for Ukraine's conditions, we consider a number of biofuels to be prospective for the country's transport sector. They include bioethanol from maize grain, bioethanol from lignocellulosic feedstock such as straw of cereal crops, biodiesel from used cooking oil, biodiesel from oil energy crops and hydrotreated vegetable oil. The sector of motor biofuels still is at an early stage of development in Ukraine. Thus, the scientific novelty is that the recommended technologies indicate a possible way for solving some urgent environmental and energy problems, in particular, reduction of GHG and exhaust gases emissions, utilization of waste and residues, saving of expensive fossil fuels. The focus is expected to be on advanced biofuels as they can solve the mentioned problems more efficiently.

Ukraine has enough biomass to produce first- and second-generation biofuels for domestic market and for export. To promote the production and consumption of motor biofuels we recommend an early approval of the draft National Energy and Climate Plan of Ukraine for 2025-2030 as the Plan sets quite ambitious goals for the development of motor biofuels sector. In addition, we consider it necessary to adopt an existing draft Law that envisages the introduction of an obligatory share of biofuels in transport. The draft Law was registered in Ukrainian Parliament as far back as in 2020.

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