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Сучасні тенденції розвитку зовнішньоекономічної діяльності України в умовах війни

Modern Trends in the Development of Foreign Economic Activity of Ukraine in the War Conditions

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Анотація. Повномасштабна війна Росії проти України негативно позначилась на тенденціях розвитку зовнішньоекономічної діяльності України. Метою статті є розкриття тенденцій та представлення перспектив розвитку зовнішньоекономічної діяльності України в умовах війни. Встановлено, що за березень 2022 року загальний обсяг експорту товарів з України скоротився на 8792507 тис. дол. США, а імпорту – 8869453 тис. дол. США у порівнянні із січнем-лютим поточного року. Результати показали, що найбільше скорочення експортно-імпортних операцій за товарами відбулося у регіонах, території яких зазнали прямого повномасштабного вторгнення Росії. З'ясовано, що області, які розташовані на заході України, становлять на сьогодні основний канал здійснення експортно-імпортних операцій. Визначено основні перешкоди розвитку експорту товарів в умовах російсько-української війни – це блокування морських портів, розрив логістичних та виробничих ланцюгів, суттєве збільшення логістичних витрат.

Практичне значення одержаних результатів дослідження вказує на те, що у статті розкрито тенденції зовнішньоекономічної діяльності України та представлено перспективи розвитку експорту товарів в умовах війни з огляду на обмеженість інформації, складність проведення дослідження, виходячи із нестабільності, невідомості та невизначеності ситуації у просторово-часовому вимірі. Перспективами подальших досліджень виступає комплексний аналіз можливих напрямків (шляхів) переорієнтації українського експорту товарів в умовах війни, в основу якої закладено пошук нових логістичних маршрутів та нових ніш на ринку Європейського Союзу.

Ключові слова: економіка України; зовнішньоекономічна діяльність; експорт; імпорт; товарні групи; логістичний маршрут; лібералізація торгівельних відносин; російсько-українська війна.

Abstract. Russia's full-scale war against Ukraine has harmed the development trends of Ukraine's foreign economic activity. The article aims to reveal the trends and present the prospects for the development of Ukraine's foreign economic activity in war conditions. It was established that in March 2022, the total volume of export of goods from Ukraine decreased by \$8,792,507 and imports – by \$ 8,869,453 compared with January-February of the current year. The results showed that the most significant reduction in export-import operations by goods occurred in the regions, the territories of which were

subjected to a direct full-scale invasion of Russia. It was found out that the areas located in the west of Ukraine are currently the main channel of export-import transactions. The main obstacles to the development of the export of goods in the conditions of the Russian-Ukrainian war have been identified - the blocking of seaports, the breakdown of logistics and production chains, and a significant increase in logistics costs.

The practical significance of the obtained results of the study indicates that the article reveals the trends of the foreign economic activity of Ukraine and presents the prospects for the development of export of goods in the conditions of war, taking into account the limited information, the difficulty of conducting the study, based on the instability, obscurity and uncertainty of the situation in the space-time dimension. Prospects for further research are a comprehensive analysis of possible directions (paths) of reorientation of Ukrainian exports of goods in war conditions, which is based on the search for new logistics routes and new niches in the European Union market.

Keywords: economy of Ukraine; foreign economic activity; export; import; product groups; logistic route; liberalization of trade relations; Russian-Ukrainian war.

ВСТУП

24 лютого 2022 року – початок повномасштабного російського вторгнення та територію України. Починаючи із цього дня було введено військовий стан. Як наслідок – це призвело до виникнення труднощів та проблем в усіх сферах національної економіки, а особливо у сфері зовнішньоекономічної діяльності України. Повномасштабна війна, спричинена Росією проти України, негативно позначилась на тенденціях міжнародної торгівлі нашої держави, зокрема, це спричинило погіршення стану експортної орієнтації економіки України. Станом за березень поточного року через бойові дії агресора 10 областей України не мали змоги економічно розвиватись. У довоєнний період саме ці області, включно із м. Києвом, формували майже 55% ВВП країни. У квітні 2022 року активні бойові дії відбувались на території 6-ти областей України, однак варто зауважити, що і ці області відіграють вирішальну роль у розвитку економіки України, адже формують 20% ВВП країни. Акцентуючи увагу на ситуації, яка відбувається зараз, то доцільно зауважити, що економіка України поступово відновлюється. І все це завдяки областям, на території яких не ведуться активні бойові дії. Зокрема, вирішальну роль виконують області, які розташовані на заході України, адже саме через їх територію сьогодні проходять важливі логістичні шляхи, тому що поставка товарів, яка раніше відбувалась за допомогою морського транспорту на півдні України – заблокована Росією, яка є країною-агресором, окупантом, ворогом.

Аналіз останніх досліджень і публікацій свідчить про те, що питання розвитку зовнішньоекономічної діяльності України в умовах російсько-української війни досліджує на сьогодні досить незначна кількість науковців.

Так, колективом науковців ДУ «Інститут регіональних досліджень імені М. І. Долишнього НАН України» під керівництвом І. З. Сторонянської розкрито «питання ідентифікації та оцінювання викликів та загроз соціально-економічного розвитку регіонів України в умовах російсько-української війни, зокрема масштабного вторгнення Росії 24 лютого 2022 року» у науково-аналітичному виданні «Економіка регіонів України в умовах війни: ризики та напрямки забезпечення стійкості» [1]. Водночас А. І. Швець розглянуто особливості «скасування торговельних обмежень зі сторони ЄС як безпрецедентного кроку в історії Євросоюзу, щоб допомогти відновленню українського бізнесу, який постраждав від війни» [2]. Особливості регулювання зовнішньоекономічної діяльності в умовах війни представлено у працях [3, 4].

Опираючись на вищенаведене, доцільно зауважити, що практично відсутні дослідження у напрямку розкриття сучасних тенденцій розвитку зовнішньоекономічної діяльності України в умовах війни, починаючи із початку повномасштабного вторгнення ворога на територію України.

Метою статті є розкриття тенденцій та представлення перспектив розвитку зовнішньоекономічної діяльності України в умовах

війни. Досягнення мети дослідження передбачає вирішення таких завдань: 1) здійснити аналіз товарної структури зовнішньої торгівлі України в умовах війни; 2) проаналізувати обсяги експорту-імпорту товарів у регіональному розрізі; 3) розкрити особливості зовнішньоекономічної діяльності України.

У процесі дослідження використано загальнонаукові і спеціальні методи, зокрема: метод системного аналізу, синтезу, спостереження та опису – для розкриття основних тенденцій розвитку зовнішньоекономічної діяльності України в умовах війни; таблично-графічний метод – для представлення динаміки основних індикаторів розвитку зовнішньоекономічної діяльності України.

Основу інформаційної бази для дослідження склали аналітичні дані Державної служби статистики України, а саме статистична інформація [5] про: 1) обсяги товарної структури зовнішньої торгівлі України; 2) обсяги експорту-імпорту товарів у регіональному розрізі.

РЕЗУЛЬТАТИ ДОСЛІДЖЕННЯ

З початку повномасштабного вторгнення Росії на територію України відбулись негативні

тенденції у зовнішньоекономічній діяльності України. Так, у відповідності до даних Державної служби статистики України [5] щодо січня-лютого 2022 року (не враховуючи 5-ти днів місяця лютого, коли вже тривало повномасштабне вторгнення ворога на територію України), за березень 2022 року загальний обсяг експорту товарів з України скоротився на 8792507 тис. дол. США. За цей період найбільше зниження експорту відбулося за такими товарними групами: I. Живі тварини; продукти тваринного походження (на 78,38%); II. Продукти рослинного походження (на 84,60%); III. 15 Жири та олії тваринного або рослинного походження (на 86,43%); IV. Готові харчові продукти (на 87,51%); VI. Продукція хімічної та пов'язаних з нею галузей промисловості (на 87,31%); VII. Полімерні матеріали, пластмаси та вироби з них (на 76,43%); X. Маса з деревини або інших волокнистих целюлозних матеріалів (на 78,96%); XIII. Вироби з каменю, гіпсу, цементу (на 75,75%); XV. Недорогоцінні метали та вироби з них (на 81,05%); XVII. Засоби наземного транспорту, літальні апарати, плавучі засоби (на 86,72%). Зовсім незначне зниження експорту спостерігалось за товарною групою XVIII. Прилади та апарати оптичні, фотографічні (на 5,58%) (таблиця 1).

Таблиця 1 – Товарна структура зовнішньої торгівлі України за I квартал 2022 року (сформовано за даними Державної служби статистики України [5])

Товарні групи	Експорт				Імпорт			
	за I квартал, тис. дол. США	у % до I кварталу 2021	за березень, тис. дол. США	у % до березня 2021	за I квартал тис. дол. США	у % до I кварталу 2021	за березень, тис. дол. США	у % до березня 2021
Усього	14100691,4	102,9	2654092,1	-49,3	12378035,7	137,7	1754291,4	-72,1
I. Живі тварини; продукти тваринного походження	300248,3	119,3	53368,7	-44,2	300796,2	85,9	30657,1	-77,8
II. Продукти рослинного походження	3734197,4	149,5	498185,0	-47,6	560139,3	77,1	98819,1	-66,1
III. 15 Жири та олії тваринного або рослинного походження	1672933,1	108,4	199900,2	-58,0	64703,2	72,6	6235,7	-84,1
IV. Готові харчові продукти	810357,1	90,2	89981,9	-72,6	543148,6	75,7	61131,1	-79,9
V. Мінеральні продукти	1581857,6	80,3	532937,6	-28,1	3981231,5	146,4	741017,4	-34,0
VI. Продукція хімічної та	497145,4	103,6	55999,8	-67,6	2045914,1	96,6	267013,4	-31,4

Товарні групи	Експорт				Імпорт			
	за I квартал, тис. дол. США	у % до I кварталу 2021	за березень, тис. дол. США	у % до березня 2021	за I квартал тис. дол. США	у % до I кварталу 2021	за березень, тис. дол. США	у % до березня 2021
пов'язаних з нею галузей промисловості								
VII. Полімерні матеріали, пластмаси та вироби з них	218547,6	88,8	41680,5	-53,7	766404,1	78,0	64955,7	-84,4
VIII. Шкури необроблені, шкіра вичинена	37637,7	87,2	11509,0	-30,3	54962,0	75,8	8373,4	-69,5
IX. Деревина і вироби з деревини	466049,3	112,9	153332,9	-6,2	71598,3	97,9	3909,9	-87,0
X. Маса з деревини або інших волокнистих целюлозних матеріалів	93019,5	86,4	16166,7	-60,8	205514,6	86,9	16991,9	-87,8
XI. Текстильні матеріали та текстильні вироби	193897,8	97,9	59974,1	-10,6	453769,7	79,4	54326,6	-76,5
XII. Взуття, головні убори, парасольки	43614,4	92,1	11784,3	-34,6	122172,5	67,0	9497,8	-86,8
XIII. Вироби з каменю, гіпсу, цементу	102613,6	87,2	20029,5	-58,0	139694,1	141,2	11638,4	-83,0
XIV. 71 Перли природні або культивовані, дорогоцінне або напівдорогоцінне каміння	15413,5	53,8	4396,5	-32,6	28379,1	52,9	571,5	-97,2
XV. Недорогоцінні метали та вироби з них	2771584,8	90,2	441532,2	-66,4	700335,9	90,8	55892,7	-82,1
XVI. Машини, обладнання та механізми; електротехнічне обладнання	1132691,5	89,9	356252,2	-26,3	2399634,6	82,9	202117,6	-83,0
XVII. Засоби наземного транспорту, літальні апарати, плавучі засоби	102518,7	70,4	12015,2	-77,3	1093391,3	68,7	47951,7	-93,4
XVIII. Прилади та апарати оптичні, фотографічні	41431,1	107,7	20120,9	3,6	206521,8	63,7	22259,6	-84,4
XX. Різні промислові товари	264167,7	91,6	74341,9	-31,5	202191,0	73,4	16964,6	-84,9

На відміну від експорту, імпорт України за березень 2022 року у порівнянні із січнемлютим поточного року знизився на 8869453

тис. дол. США. За цей період суттєве зниження експорту відбулося за усіма товарними групами, однак найбільше за такими як:

IX. Деревина і вироби з деревини (на 94,22%); XIV. 71 Перли природні або культивовані, дорогоцінне або напівдорогоцінне каміння (на 97,94%) та XVII. Засоби наземного транспорту, літальні апарати, плавучі засоби (на 95,41%).

Акцентуючи увагу на обсягах експорту-імпорту за перший квартал поточного року у регіональному розрізі, то доцільно зауважити, що найбільше скорочення експортно-імпортних операцій за товарами відбулося у регіонах, території яких зазнали прямого повномасштабного вторгнення Росії, яка є дер-

жавою-терористом, державою-агресором, державою-окупантом, ворогом нашої держави.

Аналізуючи статистичні дані, доцільно відзначити, що за перший квартал поточного року у порівнянні із аналогічним періодом 2021 року, відбулося суттєве зростання обсягів експорту товарів у Вінницькій, Волинській, Закарпатській, Львівській, Миколаївській, Одеській, Рівненській, Тернопільській, Черкаській та Чернівецькій областях, приріст експорту товарів яких становив понад 20% (таблиця 2).

Таблиця 2 – Обсяги експорту-імпорту товарів за перший квартал 2022 року у регіональному розрізі (сформовано за даними Державної служби статистики України [5])

Регіон	Експорт			Імпорт			Сальдо
	тис. дол. США	у % до I кварталу 2021	у % до загального обсягу	тис. дол. США	у % до I кварталу 2021	у % до загального обсягу	
Вінницька	320012,9	131,3	2,3	126443,6	81,8	0,9	193569,3
Волинська	206193,2	121,6	1,5	338291,0	101,9	2,4	-132097,7
Дніпропетровська	2093542,7	80,0	14,8	1144947,5	97,8	8,1	948595,2
Донецька	1073053,1	82,2	7,6	487602,8	132,0	3,5	585450,4
Житомирська	169088,2	97,7	1,2	138880,9	100,3	1,0	30207,4
Закарпатська	542611,0	141,0	3,8	382717,8	98,5	2,7	159893,1
Запорізька	854387,2	85,1	6,1	362410,0	85,7	2,6	491977,2
Івано-Франківська	253881,8	95,6	1,8	211117,3	110,6	1,5	42764,5
Київська	550763,7	115,9	3,9	963547,8	80,0	6,8	-412784,1
Кіровоградська	220220,5	98,7	1,6	55536,4	89,4	0,4	164684,1
Луганська	27104,2	68,8	0,2	36894,9	58,7	0,3	-9790,7
Львівська	763482,3	124,6	5,4	1045868,5	106,3	7,4	-282386,1
Миколаївська	802112,5	167,7	5,7	360177,5	156,6	2,5	441935,0
Одеська	372265,6	152,7	2,6	373986,3	81,5	2,6	-1720,7
Полтавська	668760,1	85,4	4,7	394556,1	123,8	2,8	274204,0
Рівненська	175892,5	126,4	1,2	108013,4	113,2	0,8	67879,1
Сумська	197288,0	87,4	1,4	149287,5	78,5	1,1	48000,5
Тернопільська	173874,4	136,5	1,2	89508,1	77,5	0,6	84366,4
Харківська	277172,4	74,5	2,0	347248,8	61,7	2,5	-70076,4
Херсонська	60691,3	90,3	0,4	37480,2	67,8	0,3	23211,1
Хмельницька	226550,5	108,4	1,6	119776,7	87,8	0,8	106773,7
Черкаська	239233,3	150,5	1,7	215883,3	81,2	1,5	23350,1
Чернівецька	60790,0	127,6	0,4	50175,9	120,6	0,4	10614,1
Чернігівська	228129,4	77,4	1,6	82636,2	82,3	0,6	145493,2

Що стосується імпорту товарів, то за січень-березень поточного року у порівнянні із аналогічним періодом 2021 року значний приріст імпорту товарів був присутній у Донецькій, Івано-Франківській, Миколаївській, Полтавській, Рівненській та Чернівецькій областях.

Якщо звернути увагу на географічну структуру зовнішньоекономічної діяльності України, то області, які розташовані на заході України, становлять на сьогодні основний канал здійснення експортно-імпортних операцій.

Що стосується торгівлі із нашим ворогом, то 09 квітня 2022 року Кабінетом Міністрів

України (далі – КМУ) було ухвалено Постанову «Про застосування заборони ввезення товарів з Російської Федерації» [6], згідно якої офіційно введено повне ембарго на імпорту товарів із цієї країни.

Доцільно зауважити, що за умов воєнного стану було введено відповідні зміни. Так, варто відзначити створення окремого розділу «Експорт в умовах війни» на Дія.Бізнес. Завдяки інформації, яка представлена у цьому розділі, суб'єкти зовнішньоекономічної діяльності можуть для себе знайти актуальну інформацію щодо можливих напрямків постачання своєї продукції за кордон.

Враховуючи те, що до 24 лютого 2022 року, незважаючи на події російської збройної агресії проти України з лютого 2014 року, була присутня значна залежність нашої держави від постачання деяких товарів із РФ та Білорусі, зокрема – пального, обсяг імпорту якого становив понад 60% від загального обсягу імпорту пального в Україну. Однак, сьогодні Україна поступово переорієнтувалася на постачання пального із Польщі, Литви, Румунії, Азербайджану [7].

Через блокування морських портів, розрив логістичних та виробничих ланцюгів, а також внаслідок суттєвого збільшення логістичних витрат, ринок експорту України не може розвиватися (як відомо у мирний час експорт товарів з України майже на 90% здійснювався через морські порти [8]). Покращення такої ситуації, і тим самим, забезпечення суб'єктам зовнішньоекономічної діяльності налагоджених нових логістичних маршрутів, які проходять за допомогою використання автомобільного, залізничного та внутрішньоводного транспорту, дасть можливість частково переорієнтувати експорт та знайти нові ринки збуту.

«Росія намагається спровокувати глобальну цінову кризу. Щоб почався хаос на всіх базових ринках і особливо на продовольчому. Український експорт допоможе стабілізувати ринки. Отже, це вигідно не тільки нам, а й усім європейцям. Мешканцям усіх країн, по яких можуть вдарити російські деструктивні амбіції», – із звернення Президента України В. Зеленського, 27 квітня 2022 року [9].

Тут варто також відзначити проблему, яка на сьогодні характерна для експорту сільськогосподарської (а особливо зерна) та металургійної

продукції. Так, експорт сільськогосподарської та металургійної продукції є обмежений недостатньою пропускну здатністю інфраструктури, яку би міг у максимальних обсягах забезпечити морський транспорт. Ще одна проблема металургійної промисловості, яка виникає з іншого боку – це неможливість забезпечити виробництво належних обсягів металургійної продукції внаслідок руйнування металургійних комбінатів та заводів (зокрема – Азовсталь, Меткомбінат ім. Ілліча). Так, станом на кінець травня 2022 року обсяги виробництва металургійної продукції в Україні навіть не сягають 20%-ти минулорічного показника.

У березні 2022 року (Постанова КМУ від 05 березня 2022 р. № 207), квітні (Постанова КМУ від 09 квітня 2022 р. № 418) та травні (Постанова КМУ від 07 травня 2022 р. № 549) Кабінетом Міністрів України було затверджено низку правил щодо експорту сільськогосподарської продукції. Зокрема, введено ліцензії на такі види сільськогосподарської продукції, як: 1) кури свійські; 2) велику рогату худобу, живу; 3) м'ясо великої рогатої худоби, морожене; 4) м'ясо та їстівні м'ясні субпродукти, солоні або в розсолі, сушені або копчені; їстівне борошно з м'яса або м'ясних субпродуктів: м'ясо великої рогатої худоби; 5) просо; 6) цукор. Однак, на строк дії воєнного стану Кабінетом Міністрів України запроваджено заборону на експорт таких товарів: овес, гречка, сіль, жито [7].

Кабінетом Міністрів України також запроваджено нульову квоту на здійснення експорту мінеральних добрив та скасовано ліцензію на експортно-імпортні операції соняшникової олії та кукурудзи [7].

Прогресивним у розвитку експорту України став Регламент Європейського Парламенту та Ради № 2022/870 про тимчасові заходи з лібералізації торгівлі, який набув чинності 04 червня 2022 року. Положеннями цього документу передбачено розширення можливостей, які передбачено Угодою про асоціацію між Україною та ЄС, для українських експортерів. Так, тимчасово призупиняються: мито для промислової продукції; система вхідних цін на овочі та фрукти; тарифні квоти для продукції сільського господарства; антидемпінгові мита на імпорту товарів, які походять з України; глобальні захисні заходи, які спря-

мовувались проти експорту товарів з України [10].

Таким чином, лібералізація торговельних відносин між Європейським Союзом та Україною має на меті те, що українськими експортерами у контексті здійснення експортних операцій має бути дотримано ряд установлених правил. Зокрема, це дотримання положень Угоди про асоціацію між Україною та Європейським Союзом та установлених Європейським Союзом обмежень на імпорт.

Тривалість дії вищезазначених правил Європейського Союзу становить один рік. За цей період передбачено надати можливість українським виробникам та експортерам вистояти у неочікуваних та вкрай важких умовах, які створила та надалі створює російсько-українська війна. Однією із цілей Регламенту виступає зміцнення позицій українських експортерів на ринках країн-членів Європейського Союзу.

Отже, отримані результати проведеного дослідження дають підстави стверджувати, що доцільно погодитися із позиціями науковців [1, 2, 3, 4], зокрема у аспектах підтримки української економіки в умовах війни, відбудови України. Водночас варто зазначити, що нами розкрито тенденції зовнішньоекономічної діяльності України, а також представлено перспективи розвитку експорту товарів в умо-

вах війни з огляду на обмеженість інформації, складність проведення дослідження, виходячи із нестабільності, невідомості та невизначеності ситуації у просторово-часовому вимірі.

ВИСНОВКИ

Умови, в яких сьогодні знаходиться український експорт, треба неодмінно покращувати за рахунок переорієнтації на нові ринки збуту. За результатами проведеного огляду основних тенденцій розвитку зовнішньоекономічної діяльності України в період російсько-української війни, встановлено, що обсяги експорту товарів з України, які по факту суттєво зупинилися на початку війни, зараз поступово відновлюються. Одним із шляхів відновлення довоєнних обсягів експорту – це переорієнтація із логістики морського транспорту (через блокування портів з боку Росії – держави-терориста, держави-агресора, держави-окупанта) на логістику альтернативних видів транспорту.

Перспективами подальших досліджень є комплексний аналіз можливих напрямків (шляхів) переорієнтації українського експорту товарів в умовах війни, в основу якої закладено пошук нових логістичних маршрутів та нових ніш на ринку Європейського Союзу.

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Застосування підходів ризикології для трьохконтинуальної моделі керування підприємницькими ризиками в системі цінностей сталого розвитку

Application of Riskology Approaches for the Three-Continuum Model of Business Risk Management in the Value System of Sustainable Development

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Анотація. У статті розкрито питання, що стосуються застосування підходів ризикології для трьохконтинуальної моделі керування підприємницькими ризиками в системі цінностей сталого розвитку. За результатами проведеного дослідження розроблено інформаційно-комп'ютерну технологію для визначення ефективності інноваційного проекту бізнес-структури щодо керування економічними процесами та підприємницькими ризиками в системі сталого розвитку. В основу інформаційної технології покладаємо трьохконтинуальну економетричну модель процесів з урахуванням функціоналу якості, балансових співвідношень для інформаційних та фінансових потоків, які описують процедури керування підприємницькими ризиками відповідно до концепції сталого розвитку бізнес-структур. Запропоновано для інноваційного проекту обмежуючі співвідношення екологічного характеру і критерії ефективності системи менеджменту, що враховують: а) норми доходів; б) ризики; в) обсяг інвестицій; г) фондівіддачу основних засобів підприємства; д) частку фондів підприємства, які витрачено на підвищення кваліфікації та компетентності робітників і управлінського персоналу.

Ключові слова: бізнес-структура; інновації; інвестиції; підприємницькі ризики; інформаційні технології; оптимізація; дохід; управлінські рішення.

Abstract. The article deals with the issues related to the application of riskology approaches for the three-continuum model of business risk management in the value system of sustainable development. Based on the research results, information and computer technology were developed to determine the effectiveness of the innovative project of a business structure regarding the management of economic processes and business risks in the system of sustainable development. The basis of information technology is a three-continuum econometric model of operations, taking into account the quality function, balance ratios for information and financial flows, which describe procedures for managing business risks by the concept of sustainable development of business structures. Limiting ratios of ecological nature and effectiveness criteria of the management system are proposed for the innovative project, which take into account: a) revenue norms; b) risks; c) volume of investments; d) capital return of fixed assets of the enterprise; e) the share of the company's funds spent on improving the qualifications and competence of workers and management personnel.

Keywords: business structure; innovations; investments; business risks; Information Technology; optimization; income; management decisions.

ВСТУП

«... Сьогодні виникає необхідність пошуку шляхів адаптації суб'єктів господарювання до різних умов з ціллю ... досягнення стратегічної мети стійкого розвитку ... через гармонізацію і комплексне поєднання економічних, соціальних і екологічних імперативів у цілісну системну структуру. Стабільний розвиток і рівновага між зазначеними вище імперативами виступають головними елементами сталого розвитку цієї системної структури. За таких засад спостерігається актуалізація цілей щодо реалізації шляхів забезпечення сталого розвитку та зростання суб'єктів господарювання, зокрема підприємств, на довготермінових засадах, оскільки такий розвиток націлений на первинний сегмент економіки, здійснення діяльності в якій дозволяє забезпечити, насамперед, належний економічний, соціальний розвиток цієї структурної системи» [1] (С. Князь, Ю. Тиркало, О. Фільц). Водночас з'ясовано, що проблемам застосування підходів ризикології для керування підприємницькими ризиками в системі цінностей сталого розвитку приділяється все більше уваги в сучасній економічній науці.

Аналіз останніх досліджень і публікацій свідчить про те, що значний внесок в окремі аспекти у цьому питанні зробили такі вчені-економісти та практики: Р. Скриньковський [3, 4], А. Катаєв, О. Заяць, Г. Андрущенко, Н. Попова [5], Ж. Семчук, Н. Костюк [6], Н. Павленчик, Ф. Горбонос, А. Павленчик [7], W. Knechel [8], F. Cheng, N. Jengte, W. Min, B. Ramachandran, D. Gamarnik [9], Y. Shi, T. Manning [10], M. Jurisch, Z. Rosenberg, H. Krcmar [11], B. Nocco, R. Stulz [12], A. Marchetti [13], J. Fraser, R. Quail, B. Simkins [14], S. Hunziker [15], J. Jean-Jules, R. Vicente [16], I. Jonek-Kowalska [17] та інші. За результатами дослідження встановлено, що в даний час недостатньо уваги приділено питанням, які стосуються застосування підходів ризикології для трьохконтинуальної моделі керування підприємницькими ризиками в системі цінностей сталого розвитку.

Метою статті є дослідити і розкрити особливості застосування підходів ризикології для трьохконтинуальної моделі керування підприємницькими ризиками в системі цінностей сталого розвитку, а також представити відповідні висновки і пропозиції у цьому напрямі.

РЕЗУЛЬТАТИ ДОСЛІДЖЕННЯ

Виходячи із інформації у дослідженнях [18, 19, 20, 21, 22, 23, 24, 25, 26], аналогічно як у працях [27, 28] сформулюємо основні принципи формування і реалізації інноваційної стратегії для промислових підприємств, відповідно до яких стратегія ґрунтується на аналізі й оцінці таких компонентів (складових), як інноваційна інтенсивність суб'єктів господарювання (підприємницьких структур, бізнес-структур) $E(x_i)$, стратегічний інноваційний потенціал $P(x_i)$, ризики інноваційної діяльності $R(x_i)$, технічний капітал суб'єктів господарювання $K(x_i)$.

Тут $Y_j = Y_j(x_i)$, де Y_j – множина функцій ($j=1, 2, 3, \dots, j_z$) і параметрів x_i ($i=1, 2, 3, \dots, i_z$), які характеризують економічний стан підприємства. Як x_i , так і Y_j приймають дійсні числові значення і для них під час обчислень з допомогою інформаційних технологій будемо використовувати ключове слово – *real*.

Згідно з концепцією сталого розвитку підприємницьких структур [1, 27, 29], враховуючи положення про континуальні підходи, обмежимося розглядом 3-х континуумів для 3-х множин функцій (з підфункціями) і параметрів (з критеріальними значеннями), які характеризують відповідні сфери, а саме: економічну (e); соціальну (s); екологічну (n).

Тут, зокрема, можна розглядати 3-и типи функцій ризику $R_e(x_i)$, $R_s(x_i)$, $R_n(x_i)$ у відповідних 3-х континуумах, аналогічно як у праці [30].

Для економіко-математичного моделювання впливу інновацій на бізнес-процеси і розвиток підприємств (у межах економічного континууму), враховуючи інформацію у працях [18, 31, 32, 33, 34], уведемо функції прибутку $\Pi_e(x_i)$, а також ризику $R_e(x_i)$ і обсягу продукції $\Psi_e(x_i)$, аналогічно як у економічних моделях [35] – співвідношення (1), (2):

$$\Pi_e(x_i) = f_1(\Psi_e, R_e, L_e, K_e, r_e, w_e, \lambda_e, x_i), \quad (1)$$

$$\Psi_e(x_i) = f_2(\Pi_e, R_e, L_e, K_e, r_e, w_e, \lambda_e, x_i), R_e(x_i) = f_3(\Pi_e, \Psi_e, L_e, K_e, r_e, w_e, \lambda_e, x_i), \quad (2)$$

де (у співвідношеннях (1), (2)): w_e – відповідає середньому значенню заробітної плати для персоналу; L_e – характеристики робочої сили (кількість, якість, кваліфікація);

λ_e – множник Лагранжа;
 f_1, f_2, f_3 – символи функціональної залежності між функціями і параметрами;
 K_e – основний капітал підприємства.

Співвідношення (1), (2) є основою економетричної моделі для функцій і параметрів економічного континууму (e) з урахуванням ризиків інноваційної діяльності. До ризиків інноваційного процесу відносимо аналогічно як у праці [36]:

- 1) ризик помилкового вибору інноваційного проекту;
- 2) ризик незабезпечення інноваційного проекту достатнім і оптимальним рівнем фінансування;
- 3) маркетингові ризики;
- 4) ризики невиконання господарських договорів (контрактів);
- 5) ризик посилення конкуренції;
- 6) ризик недостатнього кадрового забезпечення;
- 7) ризики, які пов'язані із забезпеченням прав власності на інноваційний проект.

В основу системи цінностей сталого розвитку підприємницьких структур покладемо такі активи, як кванти інформації $I_{ce\eta}$ та фінансових ресурсів I_{rek} . Для $I_{ce\eta}$ та I_{rek} запишемо бала-

нсові співвідношення аналогічно як у [35]:

$$\partial I_{ce\eta} / \partial t + \text{div} J_{ce\eta} = \sigma_{ce\eta}, \quad \partial I_{rek} / \partial t + \text{div} J_{rek} = \sigma_{rek}, \quad (3)$$

де $\partial / \partial t$ – часткова похідна за часом t ;

$J_{ce\eta}$, J_{rek} , $\sigma_{ce\eta}$, σ_{rek} – потоки та інтенсивності джерел інформації, а також ресурсів, які характеризують динамічні процеси у підприємствах;

$\eta, k = 1, 2, 3, \dots, m$; m – загальне число інформаційних та фінансових потоків, які мають відношення до підприємств (економічного континууму (e)) з урахуванням системи цінностей активів сталого розвитку;

$\text{div}(\cdot)$ – символ дивергенції.

Поряд з тим, розширення системи балансових співвідношень з урахуванням аналогічних співвідношень для соціального (s) і екологічного (n) континуумів доцільно доповнити умовами взаємопроникнення континуумів.

Для оптимізації інформаційних $J_{ce\eta}(x_i)$ і фінансових потоків $J_{rek}(x_i)$ підприємства й аналізу ризиків економічного континууму (e) використовуємо аналогічно як у [35] екстремальну модель з функціоналом якості $\Omega_e(\cdot)$ у вигляді економіко-математичного виразу (4)–(5):

$$R_e(x_i) = f_5(J_{ce\eta}, J_{rek}, FB_{cr\xi}(x_i), \Pi_e, \Psi_e, L_e, K_e, r_e, w_e, \lambda_e, x_i) \Rightarrow \min, \quad (4)$$

$$\Omega_e(x_i) = f_4(J_{ce\eta}, J_{rek}, FB_{crq}(x_i), R_e, \Pi_e, \Psi_e, L_e, K_e, r_e, w_e, \lambda_e, x_i) \Rightarrow \text{opt}, \quad (5)$$

де $FB_{crq}(x_i)$, $FB_{cr\xi}(x_i)$ – функції, які характеризують обернені зв'язки (*Feed-back*) з урахуванням потоків, джерел, функцій (з підфункціями) і параметрів (з критеріальними значеннями), які характеризують стан підприємств. Тут символ *opt* відповідає умові оптимальності відповідного функціоналу якості $\Omega_e(x_i)$ (5), що регулюється за допомогою відповідних конкретних потоків.

Співвідношення (1)–(5) – основа для удосконаленої моделі системи керування інформаційними і фінансовими потоками, відповідної інформаційної технології керування підприємницькими ризиками в системі цінностей сталого розвитку для континууму функцій (з підфункціями) та параметрів (з критеріальними значеннями) економічного (e) середовища.

Аналогічні як (1)–(5) співвідношення можна записати для параметрів та функцій соціального (s) та екологічного (n) середовищ. Тут також можна сформулювати теоретичне наповнення для економетричних моделей відпові-

дних континуумів (s) і (n). Далі можна сформулювати узагальнену інформаційну технологію для такої трьохконтинуумної моделі з урахуванням: 1) підприємницьких ризиків та цінностей для умов сталого розвитку відповідних підприємств; 2) умов взаємного проникнення фінансових і інформаційних активів за допомогою потоків. Водночас доцільно зазначити, що така трьохконтинуумна модель буде громіздкою. Громіздкі моделі можуть продукувати нестійкі часткові випадки та результати. Тому у першому варіанті доцільно обмежитись системою співвідношень типу (1)–(5) для економічного (e) середовища, а зі сторони двох других континуумів (s)

та (n) враховувати ризики $R_s(x_i)$, $R_n(x_i)$, обмежуючі співвідношення, а також кванти інформації $I_{cs\eta}$, $I_{cn\eta}$ та фінансових ресурсів I_{rsk} , I_{rnk} .

Для $I_{cs\eta}$, $I_{cn\eta}$ та I_{rsk} , I_{rnk} запишемо балансові співвідношення (6)–(7) аналогічно як у співвідношеннях (3):

$$\partial I_{cs\eta} / \partial t + \text{div} J_{cs\eta} = \sigma_{cs\eta}, \quad \partial I_{rsk} / \partial t + \text{div} J_{rsk} = \sigma_{rsk}, \quad (6)$$

$$\partial I_{cn\eta} / \partial t + \text{div} J_{cn\eta} = \sigma_{cn\eta}, \quad \partial I_{rnk} / \partial t + \text{div} J_{rnk} = \sigma_{rnk}, \quad (7)$$

де $J_{cs\eta}$, J_{rnk} , $J_{cs\eta}$, J_{rnk} , $\sigma_{cs\eta}$, σ_{rnk} , $\sigma_{cs\eta}$, σ_{rnk} – потоки та інтенсивності джерел інформації, ресурсів, які характеризують динамічні процеси у підпри-

ємствах зі сторони соціального (s) та екологічного (n) континуумів з урахуванням ризиків $R_s(x_i)$, $R_n(x_i)$ та цінностей активів сталого розвитку.

Отже, співвідношення (1)–(7) – основа для удосконаленої трьохконтинуумної моделі інформаційно-комп'ютерної технології для визначення ефективності інноваційного проекту щодо керування економічними процесами та підприємницькими ризиками в системі цінностей сталого розвитку (рисунок 1).

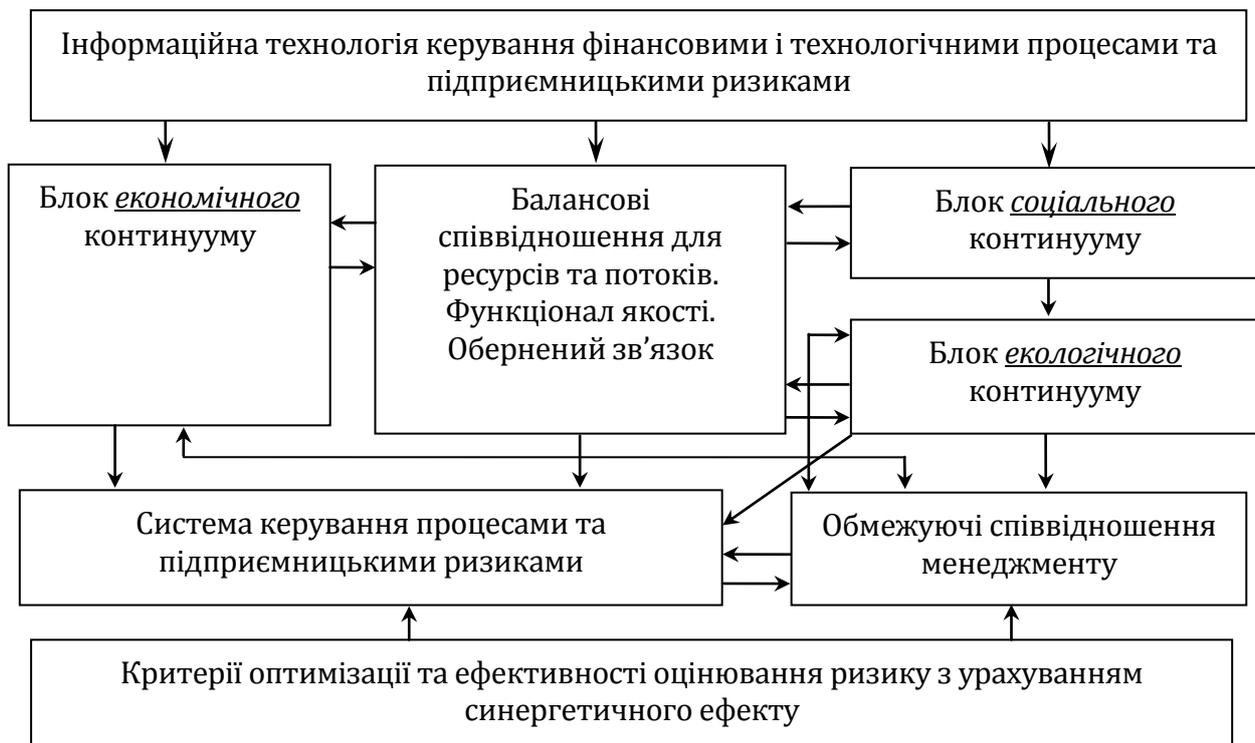


Рисунок 1 – Модель інформаційно-комп'ютерної технології для визначення ефективності інноваційного проекту щодо керування економічними процесами та підприємницькими ризиками в системі цінностей сталого розвитку

Для прикладу розглянемо сферу діяльності підприємств будівельної сфери в околі озер з прісною водою (наприклад, озер Шацького національного заповідника: Світязь, Пісочне тощо). В цьому випадку потрібно врахувати аспекти екології. Діяльність підприємств у прибережній смузі часто супроводжується шкідливими викидами, забрудненням води і погіршенням якості водного середовища. Якість води в озерах пов'язана також і з соціальними аспектами, оскільки неякісна вода може мати відношення до евтрофікації озер (процесу поступового перетворення озера в

болото), хвороб і погіршення стану здоров'я населення.

Теоретико-методичні засади фінансового ризик-менеджменту підприємств будівельної сфери та науково-практичні рекомендації щодо підвищення ефективності керування фінансовими ризиками українських будівельних підприємств подано у працях [31, 33, 37, 38, 39].

З урахуванням співвідношень між азотом (N) і фосфором (P) запишемо два критерій для оцінювання умов стійкості водного середовища озерної екосистеми в літній період [40]:

$N_P/P < 29/1$ – домінування синьозелених водоростей, стійкість водного середовища озерної екосистеми порушена. (8)

$$d_{NP} = (N_{P*} - N_P) / N_{P*}, N_{P*} = 29, N_{P*} > N_P. \quad (9)$$

Тут N_P і P концентрації азоту та фосфору в умовних одиницях; d_{NP} відносний (безрозмірний) параметр, який характеризує ризики (відхилення параметра N_P).

Обмеження щодо екологічних параметрів та процесів також доцільно формулювати на основі стандартів ISO/IEC 17025 (Загальні вимоги до компетентності випробувальних та калібрувальних лабораторій) та ISO 14000 (Міжнародний стандарт, що містить вимоги до системи екологічного керування [41]), відповідно до яких проходить сертифікація приладів для вимірювання параметрів водного середовища).

Стандарти ISO/IEC 17025, ISO 14000 мають відношення до результатів вимірювань, на основі яких контролюють стан, стійкість та параметри ризику екологічного (в даному прикладі водного) середовища.

Основні етапи керування підприємницькими ризиками відображено у міжнародному стандарті ISO 31000:2018 [42]:

- 1) класифікація та ідентифікація типів ризиків;
- 2) вибір та формулювання методів оцінювання ймовірності настання ризикової події;
- 3) вивчення причин та факторів, на основі яких визначаємо рівні ризиків для підприємства;
- 4) оцінювання можливих фінансових втрат під час настання ризикової події;
- 5) вибір та формулювання керівного рішення щодо зменшення або нейтралізації негативних наслідків для окремих типів ризиків;
- 6) організація моніторингу ризиків на підприємстві;
- 7) контроль та керування ризиками.

Запропонуємо як приклад для підприємства будівельної сфери інноваційний проект з урахуванням системи цінностей активів у вигляді фондівіддачі (FV) засобів підприємства та рівня дохідності (D) проекту. Для цього сформулюємо аналогічно як у працях [35, 43] два критеріальні співвідношення і додаткове співвідношення для обсягу інвестицій I

NV [15], які записуємо у вигляді економіко-математичної моделі (10)–(11):

$$\Delta\Phi = \frac{K_{\phi} \cdot I_{\phi}}{\Phi_{\phi M}} \cdot \left(\frac{1}{I_{\phi}} - 1 \right) - \Phi_{\text{нв}} - \Phi_F \Rightarrow \text{opt } (FV) \quad (10)$$

$$IRR_{pr} \geq D_R, J_{tcf} / (1 + IRR_{pr}) = INV, (D) \quad (11)$$

де $\Delta\Phi$ – оптимальні інвестиції у сферу діяльності будівельного підприємства в межах інноваційного проекту з урахуванням фондівіддачі основних засобів підприємства і частки фондів, які витрачені на підвищення кваліфікації та компетентності робітників і управлінського персоналу;

K_{ϕ} – фактична величина вартості (цінності) усіх одиниць обладнання того типу, що використовується для виготовлення аналізованого типу продукції (будівельних конструкцій), грн.;

I_{ϕ} – індекс зміни цін на обладнання;

$\Phi_{\phi M}$ – вартість фондівіддачі основних засобів підприємства;

I_{ϕ} – індекс зміни цін на продукцію, що виготовляється за допомогою нового (інноваційного та інвестиційного) обладнання;

$\Phi_{\text{нв}}$ – вартість основних засобів підприємства, які не використовуються у виробничому процесі, але можуть застосовуватись для виготовлення покращеного типу устаткування та обладнання, грн.;

Φ_F – частка фондів підприємства, які витрачені на підвищення кваліфікації робітників і управлінського персоналу;

J_{tcf} – сумарний вхідний грошовий потік.

У критерії рівня дохідності (D) (11) (перший вираз) для будівельного підприємства IRR_{pr} – математичне сподівання внутрішньої норми доходу проекту; D_R – норма доходу портфеля інноваційного проекту з рівнем ризику R .

Параметр D_R визначають у результаті розв'язання оптимізаційної задачі, або на базі апроксимаційної моделі, а ризик R визначається як середньоквадратичне відхилення внутрішньої норми доходу проекту [43].

Варто відзначити, що співвідношення (10), (11) мають загальний характер і можуть використовуватись не тільки для будівельних підприємств.

Аналогічно як у працях [44, 45] сформулюємо мультиплікативний кваліметричний критерій якості для трьохконтинуумної моделі (1)–(11) і відповідний математичний вираз подамо у вигляді (12):

$$Z_1 = \prod_{i=1}^m k_i = k_1 \cdot k_2 \cdot k_3 \cdot k_4 \cdot k_5 \cdot k_6 \cdot k_7 \cdot k_8 \cdot k_9 \Rightarrow \max, \quad (12)$$

де k_i – параметри ($i=1, 2, \dots, 9$), які характеризують план удосконалення моделі керування ризиками, зокрема:

k_1 – керування та контроль даних, які отримані в результаті відбору даних про систему функцій та параметрів економічного континууму (e);

k_2 – методики сприйнятливості обмежень та ризиків;

k_3 – методи оцінювання функцій та параметрів екологічного континууму (s);

k_4 – методи оцінювання функцій та параметрів соціального континууму (n);

k_5 – методики вибору профілактичних та пом'якшувальних заходів;

k_6 – методики реагування системи (підприємства) на надзвичайні (катастрофічні) ситуації;

k_7 – методики навчання та обміну знаннями для підвищення якості робочої сили (персоналу);

k_8 – методики оцінювання терміну безаварій-

ної роботи T_s (ресурсу) підприємства;

k_9 – методики керування ефективністю інноваційного проекту (з урахуванням ключових показників ефективності (КПЕ), підприємницьких ризиків) [1, 18, 21, 31, 33, 37, 39, 46].

ВИСНОВКИ

На основі співвідношень (1)–(12) розроблено інформаційно-комп'ютерну технологію для визначення ефективності інноваційного проекту бізнес-структури щодо керування економічними процесами і підприємницькими ризиками в системі сталого розвитку. В основу інформаційної технології покладаємо трьохконтинуальну економетричну модель процесів з урахуванням функціоналу якості, балансових співвідношень для інформаційних та фінансових потоків, які описують процедури керування підприємницькими ризиками відповідно до концепції сталого розвитку бізнес-структур.

Запропоновано для інноваційного проекту обмежуючі співвідношення екологічного характеру і критерії ефективності системи менеджменту, що враховують: а) норми доходів; б) ризики; в) обсяг інвестицій; г) фондівддачу основних засобів підприємства; д) частку фондів підприємства, які витрачено на підвищення кваліфікації та компетентності робітників і управлінського персоналу.

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Resident's Satisfaction and Preferences in Housing Provision by Government and Private Partnership in Abuja

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Abstract. This study came when the need for shelter by man has always been an issue for both the person in need of a house and the people in charge of supplying or designing the house. It is widely known the demand for housing came in second in the hierarchical system of man's needs after meals. This study examined residents' satisfaction and preferences in Abuja's housing provision by the government and public-private partnerships. Participants were given questionnaires at the Public Estate, of which 36 were recovered; 300 questionnaires were served at the Public Estate, with 227 recovered. Participants in this study are tenants in both the Public Partnership Estate and the Private Partnership Estate. According to the findings, 30 housing estates in the Ministerial Housing Estate (Public) in Abuja (PPP). Residents' preferences in the study areas are preferred, according to the respondents. The difference between residents' satisfaction and preferences in the houses provided by the government and PPP in the study area was also ascertained using a T-test analysis. The ANOVA results also revealed a significant difference in residence satisfaction between public housing estates and PPP at 0.06 and 0.011, less than the 0.05 significance level. Developers in the public and private housing sectors should work to bridge the gap between residents' preferences and their own. They should improve the drainage systems, waste management, and sewage disposal to increase resident satisfaction. According to the survey results, respondents' satisfaction and preference for residents are very high, high, and moderate, respectively.

Keywords: resident's satisfaction; resident's preferences; housing provision; government; Abuja; Nigeria.

INTRODUCTION

Housing was believed essential to someone's health and wellbeing and a reference for individual fulfilment [11]. Housing is one of humanity's three basic needs. Its efficiency should be commensurate with both technical and general user expectations. Because it significantly influences people and the country's lives, the home's function in providing human comfort through humans and nature is critical [18]. Housing is an intricate good with various aspects, including constructions that include all of the physical characteristics of the dwelling, accessibility and facilities that comprise a bundle of housing-related services, and nearby qualities that have

the environment in which the home exists [25]. Affordability in housing refers to ensuring that specific housing or other needs are met at a cost or rent that does not place people in undue financial hardship [25]. In most instances, the rental values of housing in one residential neighbourhood differ substantially from those of similar properties in another residential area within the same city [24]. Residents' perceptions of their neighbourhood and living environment influence their satisfaction with their housing. This demonstrates a low level of dissatisfaction and a high level of agreement between planned and actual conditions, as well as the satisfaction of tenants' basic housing demands [2].

Public housing is a type of housing delivery that emphasizes the role of the state (the government and its agencies) in assisting in the delivery of housing, especially for the have-not, low-income, and more vulnerable groups in society [20]. One of the primary goals of both public and private real estate developers is to provide habitable and satisfactory residential housing in terms of standard, quality, user needs, and preconceptions and desires [17]. Despite efforts from corporate and public housing developers, resident satisfaction remains a significant challenge in developing countries, including Nigeria [17]. Residents' satisfaction is a broad concept affiliated with various factors such as physical, social, and neighbourhood factors, as well as psychological and social-economic attributes of the residents [5].

Controlling spatial development related to housing requires public participation, particularly in developing countries such as Nigeria [3]. The study looked at the housing quality in five public housing estates in Lagos State's Amuwo-odofin local government area. A total of 77 dwellings were sampled. The quality of housing units was assessed using building elements. A five-point Likert scale was used for the analysis. The overall condition of building components in the sampled estates was described as fair. In contrast, the overall condition of the infrastructure was described as harmful [14]. The self-administration of 640 structured questionnaires was administered to the occupants of five housing estates in Minna, and FCT Abuja was used to assess Public-Private Partnership (PPP) in housing provision in Minna and FCT Abuja. Authors [24] studied Housing provision and Soldiers' housing preferences at Shadawanka Barrack Bauchi to meet military personnel's housing demands in the study region. The study used a quantitative technique, a survey strategy, a descriptive and exploratory research design, and a questionnaire instrument to collect data. The population of the study was military personnel, with a sample frame of 248 dwellings, assuming one personnel per house. According to the findings, the barracks' general or average housing conditions were rated fair. The variables with the highest adequacy levels are water supply and security, while drainage and road networks have the lowest levels of adequacy and reaction. However, none of those other studies focused on resident satisfaction and preferences in housing provided

by the government and private-public partnerships, a gap that this study seeks to fill. This research aims to compare residential properties offered by the government and public-private associations in FCT Abuja to propose ways to improve residents' satisfaction and preferences in FCT Abuja. The research objectives are as follows:

1. To evaluate residents' satisfaction with housing provision by the government and Private Partnership in FCT Abuja.
2. To investigate the significant areas of residents' preferences in housing provided by the government and Public-Private Partnership in FCT Abuja.
3. To assess the differences in residents' satisfaction and preferences in the study area's houses provided by the government and public-private partnerships.

Literature review

Satisfaction is a feeling that results from fulfilling one's needs and desires. According to [23] satisfaction can be defined as either emotional or cognitive. The experience and its evaluation are based on what is received compared to what was expected [23]. Customer gratification is frequently associated with customer satisfaction. Products or services that are a source of satisfaction provide their customers with desirable value, at least to a certain extent. According to ISO 10004, satisfaction is a judgment, an opinion expressed by the customer. The level of satisfaction refers to the difference between the customer's perception of the expected product and the customer's perception of the delivered product Standard.

Residential satisfaction is defined as the sense of wellbeing that one feels when one's needs or desires in one's home are met. Various researchers have studied it, and the results are regarded as a critical determinant of an individual's perception of the quality of a house, as well as an evaluative way of measuring the success of government and non-governmental housing [16]. As a result, the concept of residential satisfaction has evolved. In recent years, the idea of residential satisfaction has expanded to include the total actualization of residents' basic housing needs, including structural and physical deficiencies, as well as the provision of necessary amenities, equipment, and

installations, as well as access to livelihood, to make the neighbourhood a safe and comfortable place for human habitation [17].

Authors [10] recommended that one potential option for meeting residents' facility needs is to investigate factors that account for residents' satisfaction or dissatisfaction with their housing situation. Similarly, authors [8] opined that for the housing sector to improve the quality of its products, it must investigate and comprehend users' needs and expectations. The author [6] defines residential Satisfaction (RS) as the extent to which residents believe their housing is assisting them in achieving their goals. According to most theories, RS measures the difference between an occupant's actual and desired housing and their neighbourhood. Housing satisfaction refers to how a consumer of a housing product reacts to the overall components of such a product as determined by their taste his expectations. The extent to which (the residents) believe their housing is assisting them in reaching their goals [12]. It also refers to an individual's assessment of their living environment in light of their requirement, preconceptions, and accomplishments.

Public-Private Partnership (PPP) is a concept for public projects and services in collaboration with the private sector [21]. The idea of PPP originated in the United Kingdom in the 1960 as PFI (Private Finance Initiative). It can be summarized as the overall concept and understanding of responsibility, sharing parameters between the public and private sectors [15]. Public-Private Partnership was further defined as a relatively new concept of executing public projects and services through "partnership arrangements with the private sector, particularly in the areas of infrastructure," which originated in the United Kingdom in the 1960 as PFI (Private Finance Initiative). They define PPP as a spectrum of different contributions from public and private arrangements. This spectrum of possible PPPs ranges from businesses controlled by the private sector at one end to those held by the public sector at the other.

Nigeria has adopted PPPs to increase urban housing stock while addressing housing affordability and accessibility issues [9]. The author [13] defines PPP as cooperation between the public and private sectors. A public-private partnership (PPP) is an agreement in which private parties

collaborate to provide infrastructure support. It refers to a government service or private business venture founded and operated due to collaboration between the government and one or more private sector companies [4]. Partnerships between the public and private sectors are a critical means of encouraging the private sector to participate actively in addressing Nigeria's growing urban housing crisis. PPP is not the acquisition of an asset but the payment of a stream of services under specified terms and conditions. Partnerships, collectively known as Public-Private Partnerships (PPPs), represent a wide range of institutional arrangements between the public and private sectors in sharing responsibilities, perks, and threats in housing, infrastructural facilities, and service delivery [9]. The involvement of the private sector in urban infrastructure provision is expected to reduce the burden of public sector financing while also ensuring accountability, monitoring, and management in infrastructure provision [19].

In Nigeria, implementing Public-Private Partnership in housing provision was intended to increase urban housing provision while addressing housing affordability and accessibility issues [9]. Authors [1] investigated the beneficiaries of housing units' perceptions of the nature of the loan and the Public-Private Partnership's housing provision drive in Cross River State, Nigeria. The snowball sampling technique was used to sample 90 people. All respondents were pleased and satisfied with the role of public-private partnerships in housing provision. However, a small percentage of respondents perceived the process to be riddled with anomalies such as cronyism.

METHODOLOGY

In this study, quantitative research methods were used. At the Public Estate, 40 respondents were given questionnaires, of which 36 were returned. At the Public Estate, 300 questionnaires were served, of which 227 were returned. Participants in this study are tenants in both the Public Partnership Estate and the Private Partnership Estate. As a result, the survey's population includes all occupants of the two Estates. Following thorough data collection, descriptive, mean ranking, and multiple linear regression were used to evaluate the field data using SPSS Version 22.

RESULTS AND DISCUSSION

Respondents filled out background information such as gender, age, household size, monthly income, and educational qualification in the Ministerial housing estate. Table 1 contains information on these.

Table 1 – Demographic information of respondents (Ministerial Housing Estate, Public)

Variables	Options	Frequency	%
Gender	Male	16	44.4
	Female	20	55.6
Age	Under 30 years	20	55.6
	31 to 60 years	16	44.4
Household size	Below 4 people	16	44.4
	5 to 8 people	11	30.6
	9 to 12 people	9	25.0
Monthly income, N	Less than 50,000	6	16.7
	50,001–100,000	14	38.9
	101,000–150,000	4	11.1
	151,000–200,000	9	25.0
	Above 200,000	3	8.3
Education qualification	Primary / secondary	10	27.8
	Diploma / NCE	10	27.8
	Degree / HND	10	27.8
	Master Degree and above	6	16.7

According to the Table 2, the age distribution of respondents is as follows: less than 30 years has 10.6 %, 31-60 years has 78.8 %, and over 60 years has 10.6 %. This indicates that most respondents in the study area are between the ages of 31 and 60.

It was discovered that males made up 58.1 % of the respondents, while females made up 41.9 %. This demonstrates that male respondents make up the vast majority of those polled in the study area.

Table 2 – Demographic information of respondents (Abuja @ 30 housing estate, PPP)

Variables	Options	Frequency	%
Gender	Male	132	58.1
	Female	95	41.9
Age	Under 30 years	24	10.6
	31 to 60 years	179	78.8
	Above 60 years	24	10.6
Household size	Below 4 people	101	44.5
	5 to 8 people	123	54.2

Variables	Options	Frequency	%
	9 to 12 people	2	0.9
	Above 13 people	1	0.4
Monthly income, N	Less than 50,000	23	10.1
	51,000–100,000	23	10.1
	101,000–150,000	69	30.5
	151,000–200,000	55	24.2
	Above 200,000	57	25.1
Education qualification	Informal education	6	2.6
	Primary / secondary	16	7.0
	Diploma / NCE	18	8.0
	Degree / HND	113	49.8
	Master Degree and above	74	32.6

Table 2 also revealed that households with fewer than four people account for 44.5 %. In comparison, those with five to eight people account for 54.2 %, those with nine to twelve people account for 0.9 %, and households with more than thirteen people account for 0.4 %. This indicates that most homes in the study area have 5 to 8 people. Regarding educational qualifications, informal education accounts for 2.6 % of respondents. In comparison, 7 % have a first leaving/secondary certificate, 8 % have a Diploma/NCE certificate, 49.8 % have a first degree/HND certificate, and 32.6 % have a Master's degree or higher. This indicates that degree/HND holders outnumber non-degree holders in the study area.

Table 3 revealed that privacy, floor quality, window conditions, and toilet facilities ranked first, second, third, and fourth with mean scores of 4.52, 4.19, 4.17, 4.16 and standard deviations of .796, .781, .569, and .576, respectively.

In contrast, sewage disposal, drainage system, ventilation, and waste management ranked 11–14 with mean scores of 3.55, 3.31, 3.29, 3.19 and standard deviations of 1.0. The results of the rank ordering of the ten type constructs on residents' Satisfaction in PPP revealed that privacy, floor quality, window and toilet facility conditions, and waste management were the highest-ranked, while sewage disposal, drainage system, ventilation, and waste management were the lowest-ranked. The findings are consistent with [8] findings, who discovered that occupants are satisfied with the quality of the floors, toilets, and ceiling but are dissatisfied with the location and access to local facilities.

Table 3 – Level of Residents' Satisfaction in Ministerial Housing Estates (Government)

Variables	Mean	Std. Deviation	Ranking	Remarks
Floor quality	4.00	1.000	1st	Very satisfied
Privacy	4.00	1.291	2nd	Very satisfied
Conditions of windows	3.97	.921	3rd	Very satisfied
Paintings of the walls	3.96	.991	4th	Very satisfied
Parking space	3.91	1.164	5th	Very satisfied
Ceiling	3.78	1.204	6th	Very satisfied
Doors	3.76	.971	7th	Very satisfied
Walls	3.72	1.070	8th	Very satisfied
Roof	3.70	.849	9th	Very satisfied
Toilets facilities	3.69	.925	10th	Very satisfied
Sewage disposal	3.39	.920	11th	Moderate satisfied
Ventilation	3.15	1.091	12th	Moderate satisfied
Waste management	3.03	1.180	13th	Moderate satisfied
Drainage system	3.00	1.073	14th	Moderate satisfied

Table 4 revealed privacy, floor quality, and window and wall conditions with mean scores of 4.08, 4.04, 4.01, 3.92 and standard deviations of 1.139, .859, .806 and .830 ranked first, second,

third, and fourth, respectively, while ventilation, toilets facilities, drainage system, and sewage disposal ranked 11–14, respectively.

Table 4 – Level of Residents' Satisfaction in Abuja @ 30 Housing Estates (PPP)

Variables	Mean	Std. Deviation	Ranking	Remarks
Privacy	4.52	.796	1st	Extremely satisfied
Floor quality	4.19	.781	2nd	Very satisfied
Conditions of windows	4.17	.569	3rd	Very satisfied
Toilets facilities	4.16	.576	4th	Very satisfied
Roof	4.14	.603	5th	Very satisfied
Walls	4.10	.646	6th	Very satisfied
Doors	4.08	.661	7th	Very satisfied
Ceiling	3.87	1.284	8th	Very satisfied
Parking space	3.86	.739	9th	Very satisfied
Paintings of the walls	3.77	.892	10th	Very satisfied
Sewage disposal	3.55	.944	11th	Very satisfied
Drainage system	3.31	1.037	12th	Moderately satisfied
Ventilation	3.29	1.059	13th	Moderately satisfied
Waste management	3.19	.987	14th	Moderately satisfied

The rank ordering of the fourteen type constructs on residents' satisfaction in private housing developers revealed that privacy, floor quality, window and wall conditions ranked highest, while ventilation, toilet facilities, and security ranked lowest. The drainage system and sewage disposal were ranked last. This finding is consistent with [6] research on post-occupancy evaluation of residential Satisfaction in Oniru Estate, Lagos. Road accessibility, functionality, spatial adequacy and efficiency, aesthetics, security, and privacy are all evaluated. In contrast, external visual quality, quality of maintenance, struc-

tural quality, quality of services, quality of estate roads, quality of the landscape and open spaces, environmental layout, and location are also considered.

Table 5 revealed privacy, floor quality, and window and wall conditions with mean scores of 4.4026, 4.2987, 4.1991, 4.1983 and standard deviations of .80097, .45868, .40022, and .40007 ranked first, second, third, and fourth, respectively. In contrast, sewage disposal, ventilation, drainage system, and waste management ranked 11–14.

Table 5 – Major Areas of Residents' Preferences in Ministerial Housing Estates (Government)

Variables	Mean	Std. Deviation	Ranking	Remarks
Privacy	4.4203	.79346	1st	Highly preferred
Floor quality	4.3188	.46944	2nd	Highly preferred
Windows	4.2174	.41549	3rd	Highly preferred
Walls	4.2003	.40449	4th	Highly preferred
Doors	4.1973	.40017	5th	Highly preferred
Roof	4.1304	.53996	6th	Preferred
Parking space	4.1014	.30413	7th	Preferred
Paintings of the walls	3.8406	.71995	8th	Preferred
Ceiling	3.8116	1.08838	9th	Preferred
Toilets facilities	3.7246	1.02733	10th	Preferred
Ventilation	3.3623	.99957	11th	Moderately preferred
Sewage disposal	3.3188	1.00722	12th	Moderately preferred
Drainage system	3.2319	.98735	13th	Moderately preferred
Waste management	3.0319	.97625	14th	Moderately preferred

The rank ordering of the fourteen type constructs on residents' preferences in PPP revealed that privacy; floor quality, window and wall conditions, and waste management were the highest-ranked, while sewage disposal, ventilation, drainage system, and waste management were the lowest-ranked. The findings are consistent with those of [15] as well as [26]. The study found that apartment residents in Tehran prefer houses with a high level of privacy, good doors,

adequate parking space, good toilet facilities, and an adequate waste disposal system.

Table 6 revealed privacy, floor quality, and window and wall conditions with mean scores of 4.3750, 4.3333, 4.2083, 4.2013 and standard deviations of .82423, .48154, .41485 and .41243 ranked first, second, third, and fourth, respectively, while sewage disposal, ventilation, drainage system, and waste management with mean scores of 3.2500, 3.2083, 3.1667, 3.0017 and standard deviations of .98907, 1.02062, .96309.

Table 6 – Major Areas of Residents' Preferences in Abuja @ 30 Housing Estates (PPP)

Variables	Mean	Std. Deviation	Ranking	Remarks
Privacy	4.4026	.80097	1st	Highly preferred
Floor quality	4.2987	.45868	2nd	Highly preferred
Windows	4.1991	.40022	3rd	Preferred
Walls	4.1983	.40007	4th	Preferred
Doors	4.0998	.37683	5th	Preferred
Parking space	4.0996	.30007	6th	Preferred
Roof	4.0779	.56182	7th	Preferred
Ceiling	3.7922	1.08352	8th	Preferred
Paintings of the walls	3.7576	.79242	9th	Preferred
Toilets facilities	3.7143	.98498	10th	Preferred
Sewage disposal	3.2944	1.00862	11th	Moderately preferred
Ventilation	3.2597	1.01813	12th	Moderately preferred
Drainage system	3.1948	.98297	13th	Moderately preferred
Waste management	3.0048	.98007	14th	Moderately preferred

The rank-ordering of the ten type constructs on residents' preferences in private housing developers revealed that privacy, floor quality, window and wall conditions, and waste management were the highest-ranked, while sewage disposal, ventilation, and drainage system, and waste management were the lowest-ranked. This find-

ing is consistent with the findings of [7]. Alterations' impacts on the sustainability of low-cost housing schemes in Sri Lanka, which revealed that occupants of low-cost housing schemes prefer houses with good floor qualities, a good drainage system, proper waste management, parking space and privacy.

Table 7 revealed the significance of ANOVA, which shows no significant difference.

Table 7 – Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Residents satisfaction	2.849	2	319	.059
Residents Preferences	.060	2	321	.942

Still, there is a substantial difference between residents' preferences and residents' satisfaction at 0.00, which is less than 0.05.

Table 8 revealed the level of comparison of an individual type, government and PPP. In terms of resident satisfaction, there is a significant difference between public and PPP at 0.011.

Table 8 – ANOVA

		Sum of Squares	Df	Mean Square	F	Sig.
Residents' satisfaction	Between Groups	4.889	2	2.445	7.797	.000
	Within Groups	100.017	319	.314		
	Total	104.906	321			
Residents Preferences	Between Groups	.061	2	.030	.109	.896
	Within Groups	88.990	321	.277		
	Total	89.051	323			

According to the study findings, respondents in the Ministerial housing estate (public), Abuja @ 30 housing estates (PPP), indicated that their housing satisfaction level in the study areas is delighted. According to the study's findings, respondents in Ministerial housing estate (public), Abuja @ 30 housing estates (PPP), indicated that the level of resident preference in the study areas

is preferred. T-test analysis was also performed to determine the difference between residents' satisfaction and preferences in the study area's houses provided by the government and PPP. ANOVA results also revealed a significant difference in residence satisfaction between public housing estates and PPP at 0.06 and 0.011, which is less than the significance level of 0.05.

Table 9 – Tukey HSD Multiple Comparisons

Dependent Variable	(I) Type	(J) Type	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval
						Lower Bound
Residents' satisfaction	Public	Private	-.14415	.13320	.526	-.4578
		PPP	-.36932*	.12009	.006	-.6521
	Private	Public	.14415	.13320	.526	-.1695
		PPP	-.22517*	.07770	.011	-.4081
	PPP	Public	.36932*	.12009	.006	.0865
		Private	.22517*	.07770	.011	.0422
Residents Preference	Public	Private	-.03714	.12478	.952	-.3309
		PPP	-.00421	.11292	.999	-.2701
	Private	Public	.03714	.12478	.952	-.2567
		PPP	.03292	.07224	.892	-.1372
	PPP	Public	.00421	.11292	.999	-.2617
		Private	-.03292	.07224	.892	-.2030

CONCLUSIONS

The study came when the need for shelter by man has always been an issue for both the person in need of a house and the people in charge of providing or designing the house. It is common

knowledge that the need for shelter ranks second in the hierarchy of man's needs after food. According to the survey results, respondents' satisfaction and preference for residents are very high, high, and moderate, respectively. The study found no significant difference between resi-

dents' satisfaction and preferences in houses provided by the government and PPP in the study area, indicating that the outcome was homogeneous. The ANOVA results also revealed a significant difference.

There is an immediate need to have developers in both the public and private sectors to significantly improve the drainage system and waste

management because it is virtually the least preferred service in the sampled states. Developers in the public and private housing sectors should bridge the gap between residents' preferences. They should also improve the drainage systems, waste management, and sewage disposal to increase resident satisfaction.

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Measuring the Impact of Bank Deposit Mobilisation on the Growth of the Nigerian Economy

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Abstract. This study explores the effects of bank deposits on Nigeria's economic growth for the period 1985 to 2020. The specific objectives are to establish the impact of commercial and merchant bank deposits on Nigeria's economic growth. The ex-post facto research design was employed. We carried out preliminary tests (unit root and descriptive) and diagnostic tests (autocorrelation, heteroscedastic, normality, CUSUM, etc.). Estimation was done with the autoregressive distributed lag model technique. It was found that bank deposits had a long-run relationship with economic growth and that the error correction term is significant and negatively signed. Thus, we recommended, amongst others, that a substantial share of bank deposits should be directed to the real sectors of the economy like agriculture and manufacturing, as this will act as an economic growth enabler.

Keywords: commercial banks; merchant banks; deposits; economic growth.

INTRODUCTION

Globally, many factors have been identified as influencers of economic growth. These include savings, investments, infrastructure level, and leadership quality. Savings are critical for capital formation and will lead to economic growth if allocated efficiently. Savings play a vital catalytic function for project financing and thus increase [5, 50, 53]. According to [51], savings are essential for determining countries' per capita income. Various savings platforms exist in the bank and non-bank financial institutions, such as commercial banks, merchant banks, specialised banks, insurance companies, mutual funds, etc. In the banking sector, these savings are simply deposits.

Financial institutions are an essential conduit for the pooling of savings as they facilitate mobilisa-

tion, utilisation and transfer of funds from savers to borrowers. In the course of this intermediation service, they contribute to determining short and long-run economic growth rates. According to [2], gathering and allocating funds foster economic growth through enhanced deposit mobilisation and resulting wealth creation and investment. Financial institutions as avenues for pooling of funds, project appraisal, risk mitigation, oversight of managers and enhancement of financial activities facilitate the invention of technology and subsequent economic growth [26].

It should be remarked that banks are the most conspicuous institution amongst all the intermediaries, especially in developing economies, as they are usually and nearly the only existing organisation in such economies for more significant mobilisation of funds for economic growth [2,

54]. Out of all the financial intermediaries, banks stand out as the leading and most prominent institutions in attracting funds [11]. Some distinguished scholars such as [10, 29] have attested to the capability and effectiveness of banks in promoting economic growth using deposits aggregation. Further, the author [47] contended that banks' mobilisation and allocation of funds are vital in developing any economy. Within the banking sector, the short-term money institutions enjoy and command the patronage of a large customer base because of their large numbers, strategic locations and the simplicity with which they deliver their services. Bank-based savings or deposits are significant components of the total or gross savings. Many of these savings come primarily from commercial banks rather than merchant and microfinance banks. The bank's savings majorly include demand and time deposits.

Mobilisation of savings or deposits, however, is not easy to achieve. Most developing economies find it difficult to achieve a high level of protection due to high inflation rates, low-interest rates and deteriorating disposable income, all discouraging savings. Depositors must be assured of preservation of the actual value of their savings, and there must be a safe financial atmosphere, attractive returns and relatively stable macro-economic variables to attract protection. The crisis of confidence in our banks is a significant setback for attracting savings, particularly long-term deposits. For instance, Nigeria's gross national savings scaled to GDP have varied over the past years. In recent years, it has declined through the period 1999 to 2018. But in 2012, it peaked at about 33 %, after which it declined steadily. The creation of mutual funds and some wealth management products is geared towards stimulating savings.

Similarly, it has been alleged with great worry that Nigeria's banks have deviated from their principal functions. The widespread accusation is that virtually all the banks are not keeping to the rules of engagement and have been involved in sharp financial practices such as unethical forex manipulation, intermediating drug and terrorist funds besides other unconventional practices in a bid to make quick money which has negative consequences on the economy. The primary responsibility of banks all over the world is to aid in economic development through the mobilisation of savings.

Notwithstanding the assertions that bank intermediation fosters economic growth, some researchers have held dissenting views contending that finance is inconsequential in stimulating economic growth. They argue that it is economic growth that engenders financial development. Among the proponents of this line of thought are [20]. They stated that the growth of the core economic sectors spurs the rising demand for financial services with its resultant expansion of the financial industry. The author [30] has cautioned that the importance of finance in economic growth has been exaggerated. Similarly, the author [46] believes that financial development is a consequence of economic growth. Also in this train of thought are authors [5], arguing that the relationship flows from economic growth to financial development.

Over the years, a good number of research works have been carried out on the connection between savings and investments, savings and consumption, savings and economic growth. These include [5, 6]. However, little literature exists on the link between bank deposits/savings and economic growth, particularly in Nigeria. This leaves a gap as it is essential to investigate the degree to which deposit money banks play a catalytic function in the growth and development of the Nigerian economy through deposit mobilisation.

Literature review

Conceptual Framework. There has been increasing recognition of financial organisations' role in stimulating economic growth, primarily deposit money institutions. A good number of scholars would always contend that banks promote professionalism, proficiency and resultant large-scale economic productive capabilities and facilitate an enabling economic environment for executing government policies. Banks' traditional mandate is to attract and allocate funds between savers and borrowers. This critical financial function is one of the duties of the commercial banks, and it majorly constitutes accepting financial resources from savers and giving out same to borrowers and consequently converting savings into advances. Authors [11] have cautioned that the non-existent money deposit institutions to offer financial intermediation will slow down project financing and affect the speed with which profits are reinvested.

Early economists recognised banks' contribution to promoting technological advancement using their intermediation activities. According to them, adequate allotment of funds leads to the achievement of economic growth. The preceding assertions of the positive influence of banks on economic growth have also been echoed by these economists [26, 32, 48], among others. Customer deposits are interchangeably used as bank savings and are the main source of loanable funds [24]. Bank savings are deposits housed in banks. Major banks' savings include savings in the different accounts of deposit money banks, merchant banks and microfinance banks. Bank savings come through savings, demand, and time (fixed) deposits.

Theoretical Framework. Among the significant savings and economic growth, theories are neo-classical economic theory, the Harrod-Domar hypothesis of evolution, and the theory propounded by Solow. Adherents of economic neo-classicism have remarked that people are duty bound to choose between current consumption and savings and that the decisions usually depend on stable, independent propensity and opportunity set. These theorists propounded the permanent income hypothesis and life cycle hypothesis to elucidate their model. Some of the high points of the theories are that future income depends on current savings and investments. And that saving stabilises consumption in the face of fluctuating current income. However, they explain that the ability to save depends mainly on the stage (age) of the individual's life.

The growth theory by Harrod-Domar states that as savings rise in any economy, it will positively induce its economic growth rate, emphasising savings and investments as significant drivers of economic growth. The Solow theory is an improvement on the Harrod-Domar growth version; they added capital, labour inputs, ideas and new technology as crucial in increasing economic growth.

Empirical Review. A reasonable amount of research has been carried out regarding the effects of deposits on the economy's growth. However, it is instructive to note that they produced mixed results as some showed positive relationships while others indicated negative connections. Again, some results are significant and others insignificant.

Authors [33, 45], in their investigation, found that savings will spur economic growth via in-

vestment. They noted that the lack of deposits limits the economic expansion of emerging nations. They recommended that the government focus on factors that influence the growth level of domestic savings. Authors [18] discovered that the banks, insurance, equity markets, and bond markets, through their intermediation, are beneficial for economic advancement. Employing longitudinal data from 125 countries, they found that financial intermediation strongly influences growth, particularly in emerging nations. Also, authors [15] discovered that savings promote economic growth. A related work by [34] examined the relationship between domestic savings and economic progress in 25 countries across different levels of income classifications. The study used the granger causality test and Johansen method and obtained mixed results; the paper, therefore, concluded that income class has a crucial implication in the causal relationship between deposits and economic progress.

In Nigeria, some studies indicated a positive relationship between savings and economic growth. They include [41], which employed Toda and Yamamoto and covered the period 1970 to 2006. Findings indicated a unidirectional causality from savings to economic development. A study by [3] on the role of deposits in Nigeria found that it significantly increased domestic financing to the non-public sector and the total stock of money in the system and concluded that savings positively and profoundly influence the growth of the Nigerian economy. Also, the findings of [35] discovered that aggregate bank deposits and bank loans positively and substantially influenced Nigeria's economic development. Authors [39], using an error correction model, showed that banks' deposits had a long-run linkage with economic growth. Similarly, with ordinary least squares (OLS) and autoregressive distributed lag (ARDL) model,

The author [8] examined the influence of deposits and financial development on economic expansion and established that savings positively affected economic growth.

Further, in a related study, authors [36] noted that financial development contributed positively to economic growth. In their contemporary work, [9] also indicated a positive relationship between GDP per capita and banks' liquidity creation. Liquidity creation positively and significantly influences the growth rate of physical assets at the country level.

Contrarily, some studies have argued against the existence of causation between savings and economic growth. The author [13] studied the relation between the gross domestic savings, investment, and development in Nepal from 1974 to 2010. With the autoregressive distributed lag (ARDL) model, the study tried to find whether there were co-integration and causal linkage among the variables. The findings instead established co-integration among the three variables of interest and showed a short-run bidirectional causal link between investment and gross domestic product. However, it failed to indicate any causality between gross domestic product and gross domestic savings. Some other studies that concluded that banks' deposits do not affect economic growth are the works of [6, 30, 44, 52]. According to them, the issue of whether or not financial development is an influencer of economic growth remains a question for further empirical consideration.

Yet other studies still established that financial development negatively affects economic growth. The studies showed that bank-based savings adversely affect economic growth. Among the works are [1, 4, 13, 14, 56]. From the preceding, it is clear that there are mixed findings on the relation between banks-based savings and economic development; thus, more studies are necessary. Besides, it is also important to note that most of the earlier works largely employed the Engle and Granger residual-based co-integration test. At the same time, few used the Johansen and Juselius approach, and very few used the ARDL's autoregressive distributed lag (ARDL) bounds test approach to co-integration. We believe that the appropriateness of this model for this study has a good feature for a small size sample [38]. Thus, this investigation is apt and timely.

METHODOLOGY

We employed secondary data in our estimation. These are annual data from 1985 to 2020 collected from various official sources such as the National Bureau of Statistics (NBS) and Nigeria's apex bank, the Central Bank of Nigeria (CBN). To determine the nature of the linkage between banks deposits and economic growth, we develop a functional relationship thus.

$$GDP = f(CBD, MBD, ABD) \quad (1)$$

GDP measures the economy's growth while CBD and MBD are proxies for commercial and merchant bank deposits, respectively, with ABD representing aggregate bank deposits. The aggregate bank deposits constitute deposits by commercial and merchant banks, including microfinance banks. Presenting the above functional relationship in a model form, we have (2):

$$GDP_t = \alpha_0 + \alpha_1 CBD_t + \alpha_2 MBD_t + \alpha_3 ABD_t + \varepsilon_t \quad (2)$$

where α_0 is the constant, α_1 , α_2 and α_3 stand for parameters of the independent variables, and ε_t is the residual, α_1 , α_2 and α_3 are expected to be less than zero (0).

The dynamic regression model in the form of the Autoregressive Distributed Lag Model (ARDL) following [43] is employed as the critical estimator for this study because of its numerous advantages over other regression and co-integration models¹. The generalised ARDL model is specified as (3):

$$y_t = \alpha_0 + \sum_{i=1}^p \gamma_j y_{t-i} + \sum_{i=0}^q \delta_j X_{t-i}^{\beta_{j,i}} + \varepsilon_t \quad (3)$$

where p and q respectively represent past period values of the regressand, the regressors are selected automatically following VAR lag selection criteria.

We chose the Akaike information criterion (AIC) as the optimal lag (the lag with the minor information criterion and maximum log-likelihood). The model jointly captures the short-run and the long-run elasticities of economic growth to deposit mobilisation in Nigeria with appropriate substitutions as follows (4):

$$LGDP_t = \alpha + \sum_{i=1}^q \beta_i LGDP_t + \sum_{i=1}^p \delta_i LCBD_t + \sum_{i=1}^k \theta_i LMBD_t + \sum_{i=1}^k \pi_i LABD_t + \delta_i LCBD_t + \theta_i LMBD_t + \pi_i LABD_t + \varepsilon_{i,t} \quad (4)$$

¹ It produces an efficient estimate even in the face of small sampled observations. It accepts a combination I(1), and I(0) variables, even fractional integration, but excludes I(2) variables. Given its dynamic nature, it redresses the common diagnostic problems of other estimation techniques like the Ordinary Least Squares (OLS).

We log-linearised the series to ensure linearity and standard weight for all variables. Preliminary tests, including descriptive statistics and unit root tests, and model validation tests such as residual, parameters and stability tests are used to determination of the reliability of the estimates.

RESULTS AND DISCUSSION

Data Description and Unit Root Test. Table 1 presents the results of the data description.

Table 1 – Summary of Data Description and Unit Root Results

Variables	GDP	CBD	MBD	AGD
Mean	8.9428	6.1957	2.7448	6.3025
Median	9.1696	6.2171	2.7413	6.2870
Std.Dev	2.1182	2.4591	1.3879	2.3612
Skewness	-0.3357	-0.0672	0.2521	-0.0615
Kurtosis	1.7925	1.5924	2.2857	1.6300
JB	2.7042	2.8321	1.0830	2.6803
Prob	0.2586	0.2426	0.5818	0.2617
Coeff of Var	0.24	0.39	0.51	0.37
Unit root test				
ADF Stat	-3.34	-4.44	-8.52	-4.27
Critical value @ 5%	-2.95	-2.95	-2.96	-2.95
Order of Integration	1(1)	1(1)	1(1)	1(1)

Notes: Stationarity at 0.05 significance level

Table 2 – Bounds Test with ARDL

Test Statistic	Value	Significant	I(0)	I(1)
F-Statistic	3.70	5%	2.79	3.67

Lag length Selection Criteria Using VAR

LAG	LOGL	LR	FPE	AIC	SIC	HQ
0	8.3627	-	0.0438	-0.2908	-0.1040	-0.2310
1	32.47376	40.1850*	0.0094	-1.8315	-1.5980*	-1.7568
2	34.0218	2.4769	0.0090*	-1.8681*	-1.5878	-1.7784*
3	34.0857	0.0979	0.0097	-1.8057	-1.4787	-1.7011

Notes: the lag with the highest * Indicates the optimal lag order

Premised on the above, we estimated the speed of error correction mechanisms of the relationship. Akaike Information Criterion (AIC) was used to select the appropriate and optimal lag length indicated with an asterisk (*), which in this case is lag 2 in the Table 3.

Such averages as mean, standard deviation, skewness and kurtosis appraise the investigated variables' distributional features. Also, table 1 contains information about the stationarity properties and persistence of the series.

The coefficient of variation, which is a directionless evaluation of the degree of dispersion around the mean, shows that all the variables have less than one relative standard deviation, respectively. This is symptomatic of distributions that are close-knit and are not highly dispersed. Evidence of normality is found, given that the JB-stat for all the series is reportedly significant. The JB-Stat is a combined measurement of skewness and kurtosis with a threshold of zero skewness and kurtosis of three.

The lower rung of Table 1 shows the stationarity test results in the lower rung. All the series have unit roots at levels; however, at the first difference, they all became integrated. The test statistics are more damaging than the critical values at the conventional significance level of 5%. Therefore we justifiably failed to accept the null hypothesis and concluded that the variables are stationary at order one I(1). This justified the use of ARDL as our primary estimation technique.

Cointegration Test and Lag Selection. From the Table 2, it can be seen there is co-integration because the F-statistic of 3.70 at 5% is greater than the lower bound I(0) of 2.79 and upper bound of I(1) of 3.67.

Table 3 – Summary of Short Run Elasticities and Error Correction Term

Variable	Coefficient	t-statistic	Prob
D(LNGDP(-1))	0.2887	2.0863	0.0487
D(LNAGS)	-0.446270	-1.680873	0.1069
D(LNCBS)	0.4687	1.7268	0.0982
D(LNCBS(-1))	0.2437	2.3148	0.0303
ECT	-0.0853	-3.670765	0.0013

Notes: F-stat=6.4762; Prob(F-stat)=0.000493; DW stat= 2.2788

We focus on the error correction term (etc.) with a coefficient of -0.0853. It can be seen that it is negatively signed and statistically significant. This means that the disequilibrium in the short run can be adjusted in the long run. The correction speed is, however, low as it will take 12 years and five months for complete equilibrium to be restored following a deviation in economic growth triggered by deposit mobilisation.

Validity Test: Residual Based Diagnostic Tests. We conducted an autocorrelation test with Breusch-Godfrey LM (BG) to check for serial correlation. BG has an advantage over the Durbin Watson test because it is a higher-order serial correlation test. We also checked for heteroscedastic residuals as reported in Table 4.

Table 4 – Breusch-Godfrey Serial Correlation and Heteroscedasticity Tests

F- statistic	0.5273	Prob. F (1,27)	0.5981
Obs* R ²	1.6030	Prob. Chi ² (1)	0.4486
Heteroscedasticity Test			
F- statistic	0.8955	Prob. F (1,27)	0.5451
Obs* R ²	8.5800	Prob. Chi ² (1)	0.4769

The probabilities of F (0.5981) and Chi² (0.4486) statistics of the BG test confirm the absence of autocorrelation. Also, the probabilities of F- and Chi-squared statistics of 0.5451 and 0.4769, respectively, show no heteroscedastic residuals in the model.

Stability-Based Diagnostic Test (Figure 1). The blue line between the red lines is within the 95% confidence level, showing that the model is stable and correctly specified.

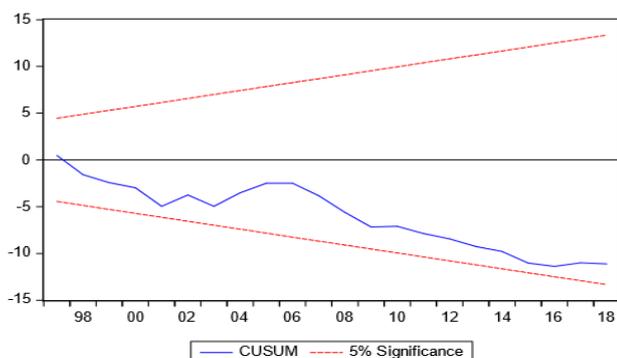


Figure 2 – CUSUM Graph

In addition, a test of confidence in using variables, as shown in Figure 2, supports the appropriateness of the model variables.

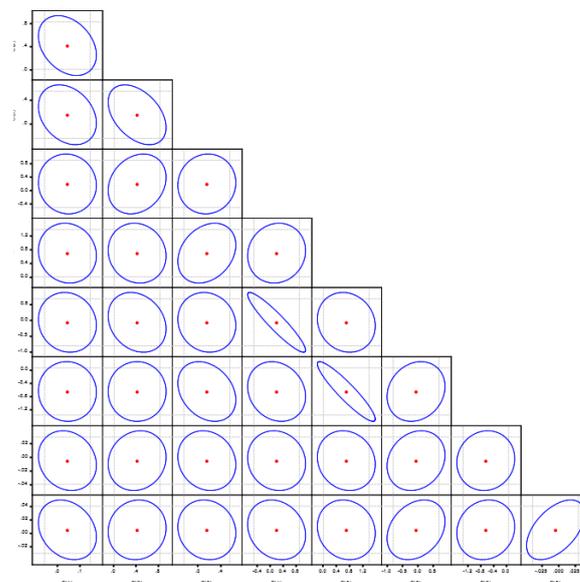


Figure 2 – Confidence Eclipse

Coefficient-Based Diagnostic Test. The long-run ARDL estimates are presented in Table 5 due to the responsiveness of economic growth for deposit mobilisation in Nigeria.

Table 5 – Results of ARDL Long-Run Test

Variable	Coefficient	t-statistic	Prob
LNCBD	0.1721	4.2461	0.0075
LNMBD	-0.1127	-0.3098	0.7592
LNAGD	-0.5954	-0.1210	0.9046

Notes: Author’s computation (extract from e-views)

Commercial bank deposits show an overwhelmingly positive and significant impact on the Nigerian economy; the coefficient and probability of commercial bank deposits are 0.1721 and 0.0075, respectively, in the long run. This means that a 1% change in commercial bank deposits causes a 17 % significant increase in the economic growth rate in Nigeria. For merchant bank deposits, the coefficient shows it is negatively linked with economic growth. Also, the stakes have no significant impact on the economy with a probability of 0.7592, more significant than 0.05. This is also the case with aggregate bank deposits with a coefficient of -0.5954, which is not statistically significant.

CONCLUSIONS

This investigation focused on bank deposits' effect on Nigeria's economic growth. It was found that commercial bank deposits had a positive relationship with the economy and exerted a significant impact on it. Contrarily, merchant bank deposits neither had a positive relationship nor a significant negative impact on the Nigerian economy. In the same vein, aggregate deposits had negative and non-significant relations with economic development.

Our work supports the finding of [39] that bank deposits have a long-run relationship with economic growth. This also follows the results of [8, 27, 35] for Nigeria, who all found that bank deposits have a substantial effect on economic growth. However, our finding on merchant bank deposits and the economy does not agree with [31, 49]. They found that merchant bank deposits are positively related to the economic growth of Mexico. This geographical divergence in findings between Mexico and Nigeria cannot be unconnected with the dominance of commercial banks in the Nigerian financial ecosystem over merchant banks.

By way of policy implications, it is advised that banks should be redirected to fair lending and fund channelling in the interest of the economy. Most banks do not channel deposit funds to priority (core) sectors of the economy like manufacturing and agriculture. Banks are more disposed to invest these deposits in trading activities, round-tripping, treasury bills, and other short-term securities. Additionally, these banks' unattractive low interest to depositors and exploitative commissions they collect are very discourag-

ing, making the public patronise unconventional and unregistered financial institutions like esusu, etc. This creates a leakage in fund channelling and reduces monetary policy effectiveness.

Additionally, this study discovered that the two variables of interest: bank deposits and economic growth, are cointegrated. The error correction term has a negative sign and is also significant, but the speed of adjustment is relatively deficient. It is therefore recommended that the government at all levels support the deposit mobilisation drive to boost savings in Nigeria. In addition, there should be an improvement in the interest rate regimes, especially the Monetary Policy Rate (MPR), as this will incentivise deposit mobilisation through increased savings. The monetary authority using its credit guidelines, needs to advise and compel the deposit institutions to allocate their credits to the critical sectors of the economy like manufacturing and agriculture.

Moreover, restoring confidence in the financial intermediation process is essential to building a solid financial system less vulnerable to domestic and external shocks. Rural banking schemes should be further encouraged to mainstream every fund and economic resource in the system. Commercial Banks should also be made by moral suasion or law to set up their offices beyond the cities and mobilise funds from the hinterland to allocate the same to the investors. This will, essentially, improve the banking habits of the rural dwellers. These measures can be growth enablers not just for the Nigerian economy but for other developing economies alike.

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Заходи адміністративного примусу у сфері податків і зборів в Україні

Measures of Administrative Coercion in the Field of Taxes and Fees in Ukraine

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Анотація. У статті на підставі методології комплексного системного аналізу розглянуто заходи адміністративного примусу у сфері податків і зборів в Україні. Зазначено, що заходи адміністративного примусу мають універсальний характер. Проаналізовано різновиди адміністративного примусу: заходи адміністративного припинення, заходи адміністративного відновлення, заходи адміністративно-процесуального забезпечення, заходи адміністративного стягнення у сфері податків і зборів. Визначено зміст, завдання, мету, підстави та порядок застосування різних заходів адміністративного примусу. Розглянуто засади адміністративної відповідальності у сфері податків і зборів. Розкрито окремі аспекти адміністративного оскарження та оскарження у адміністративно-юрисдикційному процесі та адміністративному судочинстві рішень, постанов та ухвал щодо адміністративних правопорушень у сфері податків і зборів в Україні. Охарактеризовано тенденції у застосуванні заходів адміністративного примусу. Запропоновано вирішення проблемних питань щодо заходів адміністративного примусу в податковому праві на підставі кодифікації, уніфікації та систематизації зазначених заходів, що значно посилить захист прав і законних інтересів платників податку та зборів, податкових агентів, банківських установ в Україні.

Ключові слова: податки; збори; адміністративний примус; адміністративна відповідальність; припинення правопорушення; відновлення прав; стягнення; оскарження.

Abstract. Based on the methodology of complex system analysis, measures of administrative coercion in the field of taxes and fees in Ukraine are considered. It is noted that estimates of administrative coercion have a universal character. Types of administrative coercion are analyzed: measures of administrative suspension, measures of administrative recovery, measures of administrative and procedural support, measures of administrative enforcement in the field of taxes and fees. The content, task, purpose, grounds and procedure for applying various measures of administrative coercion are defined. The principles of administrative responsibility in taxes and fees are considered. Different aspects of administrative appeals and appeals in the administrative-jurisdictional process and administrative proceedings of decisions, resolutions and judgements regarding administrative offences in the field of taxes and fees in Ukraine are disclosed. The trends in the application of administrative coercion measures are characterized. It is proposed to solve problematic issues regarding measures of administrative coercion in tax law on the basis of codification, unification and systematization of these measures, which will significantly strengthen the protection of rights and legitimate interests of tax and fee payers, tax agents, and banking institutions in Ukraine.

Keywords: taxes; fees; administrative coercion; administrative responsibility; termination of the offence; restoration of rights; penalty; appeal.

ВСТУП

Як відомо, Національна економічна стратегія на період до 2030 року, затвердженої постановою Кабінету Міністрів України від 03.03.2021 р. № 179 [1], передбачає реформування податкової системи України щодо поступового наближення до норм і стандартів Європейського Союзу, охоплюючи при цьому податкове адміністрування, питання юридичної відповідальності за порушення податкового законодавства, інші проблемні аспекти у сфері податків і зборів в Україні [1, 2, 3]. У чинному законодавстві України про податки і збори передбачені різноманітні заходи адміністративного примусу, які спрямовані на: припинення порушення податкового законодавства; забезпечення провадження у справах про адміністративні правопорушення. Це породжує ряд питань, які пов'язані з розмежуванням цих заходів.

Секретар судової палати Касаційного адміністративного суду у складі Верховного Суду Р. Ханова зазначає, що «... одна із найбільш складних категорій справ – податкові спори. Адже вони торкаються як малих підприємців, так і великих інвесторів. Окрім того, податкове законодавство в Україні досить плінне, ... Станом на 1 листопада 2021 року до судової палати з розгляду справ щодо податків, зборів та інших обов'язкових платежів надійшло 88 244 скарг/справ, з яких розглянуто 81 613» [4]. Практично у всіх справах у певній мірі розглядаються питання адміністративного примусу.

Вагомий внесок у дослідження адміністративного примусу в контексті адміністративного і податкового права зробили такі вчені-юристи і практики: В. Авер'янов, Ю. Битяк, В. Бортняк, З. Будько, Л. Воронова, Н. Гребенюк, Н. Губерська, О. Дмитрик, Л. Касьяненко, В. Кириченко, Т. Коломонець, А. Комзюк, М. Кучерявенко, Ю. Лозинський, П. Лютіков, М. Макарейко, Н. Маринчак, Т. Мацелик, Н. Пришва, І. Проць, А. Сліденко, А. Тимченко, О. Циганкова та інші. Адаптація законодавства України до законодавства і вимог Європейського Союзу потребує проведення більш системних і ґрунтовних теоретико-правових досліджень з метою удосконалення заходів адміністративного примусу за порушення податкового законодавства.

Отже, з огляду на викладене вище, *метою статті* є дослідження заходів адміністрати-

вного примусу у сфері податків і зборів в Україні.

РЕЗУЛЬТАТИ ДОСЛІДЖЕННЯ

В системі правових наук теорія держави і права розглядає державний примус у контексті припинення, відновлення права і юридичної відповідальності. Адміністративний примус як галузевий вид державного примусу – це метод державного управління, що полягає у застосуванні суб'єктами функціональної влади встановлених нормами адміністративного і адміністративно-процесуального права примусових заходів впливу, спрямованих на забезпечення неухильного виконання юридичних обов'язків особами, у зв'язку із вчиненням протиправних дій.

На думку О. Лецик [5], «... раніше вчені одностайно наголошували на тому, що адміністративний примус регулюється нормами адміністративного права ... з появою фінансового, митного, податкового, земельного, екологічного права та інших слід також визнати існування нових різновидів державно-правового примусу, при цьому варто акцентувати увагу на тому, що всі інші ознаки, крім галузевих, запозичуються з адміністративного примусу, що ставить під сумнів доцільність їх відокремлення як самостійних» [5, с. 179].

В контексті цього з'ясовано, що доцільним є виділення у складі адміністративного примусу в податковому законодавстві України таких заходів: заходи адміністративного припинення; заходи адміністративного відновлення; заходи адміністративно-процесуального забезпечення; заходи адміністративного стягнення у сфері податків і зборів.

Існуюча система заходів адміністративного примусу у сфері податків і зборів передбачає припинення протиправних діянь, вчинених суб'єктами податкових правовідносин, не наділеними публічною владою.

Заходи адміністративного припинення можуть бути спрямовані на припинення податкових правопорушень, зокрема – передбачених статтями 163-1 «Порушення порядку ведення податкового обліку, надання аудиторських висновків», 163-2 «Неподання або не своєчасне подання платіжних доручень на перерахування належних до сплати податків

та зборів (обов'язкових платежів)», 163-3 «Невиконання законних вимог посадових осіб податкових органів» чинного Кодексу України про адміністративні правопорушення [6].

Адміністративні заходи припинення у сфері податків і зборів – це комплекс заходів адміністративно-примусового впливу, передбачених різними галузями законодавства: адміністративного, податкового, цивільного, про банки і банківську діяльність, про банкрутство.

Мета застосування – привести реальну поведінку у відповідність до правової моделі при виконанні податкових обов'язків платниками податків. У разі відхилення поведінки від правової моделі у сфері податків і зборів, поведінка повинна приводитися у відповідність до правової моделі комплексом заходів адміністративного припинення, за змістом подібних із забезпечувальними заходами адміністративного примусу, але застосовуваних для реалізації відновлювальних заходів і заходів адміністративного стягнення у сфері податків і зборів.

Забезпечення реалізації правової моделі у податкових правовідносинах досягається шляхом застосування заходів адміністративного припинення, які мають у правовій системі універсальний характер.

Існуюча система заходів забезпечення провадження у справах про адміністративні правопорушення у сфері податків і зборів, на відміну від заходів адміністративного припинення, призначена для того, щоб забезпечити виконання прийнятих та майбутніх юрисдикційних рішень, податкових органів та судів після набуття чинності.

У системі забезпечувальних заходів адміністративного примусу за порушення податкового законодавства повинні враховуватися коло суб'єктів, зацікавлених у застосуванні та утриманні тих елементів правового статусу, реалізація яких забезпечується застосуванням цих заходів, тобто прав та обов'язків платників податків, податкових агентів, банків, повноважень податкових органів.

Визначеність правового регулювання має співвідноситися з дискрецією у застосуванні права з урахуванням комплексу інтересів, які необхідно визначити, забезпечити, співвіднести та врахувати з погляду пріоритетів.

Питання про заміну забезпечувальних заходів на зустрічне забезпечення має вирішуватися з метою забезпечення дотримання правових принципів та правових гарантій. У тих випадках, коли можна уникнути застосування забезпечувальних заходів адміністративного примусу до платників податків, використовуючи відстрочку набуття чинності або призупинення дії, або заборону примусового виконання юрисдикційного рішення до вирішення спору по суті, доцільно утримуватися від застосування цих заходів.

Незважаючи на змістовну схожість заходів адміністративного припинення та забезпечувальних заходів, необхідно проводити грань на підставах і порядку застосування, маючи на увазі, що метою заходів адміністративного припинення є припинення протиправної поведінки, а забезпечувальних заходів – забезпечення належного виконання юрисдикційного акту за умови законності та обґрунтованості.

Одне з правил призначення адміністративних покарань полягає в тому, що притягнення до адміністративної відповідальності не звільняє особу від належного виконання обов'язку, за невиконання або неналежне виконання якого особа притягується до адміністративної відповідальності. Це свідчить про наявність правового зв'язку між відновлювальними заходами та заходами адміністративного стягнення, що передбачає розмежування та виключає заміну одних заходів іншими.

Відновлювальні заходи та заходи адміністративного стягнення за порушення податкового законодавства виконують охоронну функцію права. Належна реалізація охоронної функції, враховуючи інформацію у працях [2, 3, 7, 8], забезпечує виконання регулятивної функції права у сфері податків і зборів. Водночас у податковому регулюванні повинні враховуватися фіскальна та регулююча функції податку.

Завдання відновлювальних заходів адміністративного примусу у сфері податків і зборів – примусове забезпечення повного і належного виконання невиконаного податкового обов'язку з компенсацією втрат, які зазнав бюджет у зв'язку з несвоєчасним виконанням податкового обов'язку у повному обсязі, та витрат за примусове виконання.

Завдання заходів адміністративного стягнення у сфері податків і зборів – адміністративне покарання особи за вчинене адміністративне правопорушення у сфері податків і зборів. Потрібно враховувати, що розмір компенсації втрат бюджету через неотримання сум податкових платежів у встановлений термін повинен визначатися зменшенням вартості грошей через інфляційні процеси в економіці, а компенсація витрат має бути обумовлена додатковими витратами публічної влади, оскільки інший підхід призводить до комерціалізації публічного управління.

Щодо адміністративних санкцій за порушення податкового законодавства, то вони мають мотивувати дотримання невідворотності застосування та відповідності вчиненому. Розмір адміністративних санкцій за порушення податкового законодавства не повинен бути нижчим, ніж очікувана вигода від порушення податкового законодавства з урахуванням ризиків виявлення.

Заходи адміністративного стягнення у системі адміністративного примусу не повинні мати фіскально-каральний характер, що призводить до заміни регулюючої функції фіскальною та негативному сприйняттю системи обов'язкових платежів. Це підштовхує до агресивного податкового планування чи зміни податкового резидентства [9].

Зазначені тенденції з урахуванням рівня корупції ведуть до збільшення частки тіньової економіки та погіршення інвестиційного клімату в країні, тому їх не можна допускати. Також тут необхідно врахувати роль неурядових організацій щодо запобігання та протидії корупції у сфері оподаткування [8].

Конституційно-правове значення диференційованого підходу при застосуванні адміністративних санкцій для мети індивідуалізації адміністративної відповідальності у провадженні у справі про адміністративне правопорушення, беручи до уваги всі обставини, що підлягають встановленню, було підкреслено Конституційним Судом України щодо своєчасної сплати податку [10].

Зазначені обставини визначають різну інституційну і навіть галузеву належність відновлювальних заходів та заходів адміністративного стягнення у сфері податків і зборів. Відновлювальні заходи мають бути предметом

правового регулювання адміністративного і податкового законодавства України.

Це не виключає субсидіарне застосування інститутів державного контролю, адміністративної юрисдикції, а також адміністративної юстиції, але не позовного провадження для забезпечення судового захисту прав і законних інтересів платників податків у разі порушення суб'єктами податкового адміністрування під час застосування відновлювальних заходів.

Заходи адміністративного стягнення мають бути предметом правового регулювання лише законодавства про адміністративні правопорушення, оскільки вони охоплюються інститутом адміністративної відповідальності. Ігнорування такого розмежування у правовому регулюванні та правозастосовній практиці призводить до змішування відновлювальних заходів і заходів адміністративного стягнення, до заміщення одних другими.

Приклади цієї тенденції у податковому законодавстві – уніфікований порядок стягнення відновлювальних та майнових санкцій у Податковому кодексі України, що призводить до негативних наслідків, виходячи з аналізу [11], а саме:

- встановлення однакового правового режиму застосування;
- розповсюдження принципу винного застосування на відновлювальні заходи з одночасним фактичним нівелюванням принципу презумпції невинності при застосуванні заходів адміністративної відповідальності за порушення податкового законодавства;
- порушення однакової в правовому регулюванні відновлювальних заходів компенсаційного характеру, функцію яких виконує пеня.

Це призводить до порушення не тільки принципів адміністративної відповідальності – презумпції невинності, одноразовості, юридичної рівності, справедливості і пропорційності, а й принципів оподаткування та зборів, загальності, пропорційності, рівноправності та рівного податкового навантаження.

Зазначені принципи служать гарантіями належної реалізації правового статусу суб'єктів податкових правовідносин і забезпечують баланс публічних та приватних інтересів у сфері податків і зборів у податковому праві.

Розмежування за змістом, метою, підставами та порядком застосування в законодавстві та правозастосовчій практиці відновлювальних заходів і заходів адміністративного стягнення у сфері податків і зборів – це правова гарантія належного дотримання зазначених принципів.

Досягти мети застосування відновлювальних заходів і заходів адміністративного стягнення в окремих випадках неможливо без субсидіарного чи альтернативного використання інших видів юридичної відповідальності за порушення податкового законодавства платниками податків, податковими агентами, банками та суб'єктами публічної влади.

Можливість застосування за порушення податкового законодавства відновлювальних заходів, передбачених іншими галузями права, за винятком податкового шахрайства, передбачає необхідність виключення суспільної небезпеки [12]. Визначення суспільної небезпеки призводить до порушення принципів оподаткування та адміністративного примусу у сфері податків і зборів, прав і законних інтересів платників податків, податкових агентів та банків, як розрахунково-касових центрів у податкових правовідносинах.

Підтвердженням служить негативна тенденція підміни відновлювальних заходів, а в ряді випадків заходів адміністративного стягнення за порушення податкового законодавства, незважаючи на публічно-правовий характер податкових правовідносин, заходами цивільно-правової відповідальності щодо договорів, або щодо заподіяння шкоди.

Зазначені тенденції свідчать про недосконалість існуючого механізму правового регулювання відновлювальних заходів і заходів адміністративного стягнення за порушення податкового законодавства. Виправити ситуацію може інституційна систематизація, уніфікація та кодифікація адміністративного примусу в адміністративному законодавстві без галузевих вилучень та винятків, але з правовою регламентацією у податковому законодавстві особливостей застосування відновлювальних заходів.

Науковці С. Скрипник, О. Боярова та О. Дем'янишина [13], розглядаючи очікування бізнесу від нової системи оподаткування, зазначають, що однією з основних передумов реструктуризації податкової системи України

є потреба у формуванні сучасного механізму протидії ухиленню від оподаткування [13, с. 15].

Норми податкового законодавства, адміністративного та адміністративно-процесуального законодавства мають співвідноситися як спеціальні та загальні норми, виходячи з пріоритету спеціальної норми галузевого податкового законодавства над загальною нормою адміністративного законодавства у правовому регулюванні відновлювальних заходів.

У правозастосовній практиці особливу складність представляє процесуально-правове розмежування застосування відновлювальних заходів і заходів адміністративного стягнення.

Юрисдикційним актом – документальною підставою застосування чи незастосування відновлювальних заходів і заходів адміністративного стягнення за порушення податкового законодавства учасниками податкових правовідносин є передбачене у Податковому кодексі України повідомлення-рішення (або рішення) про притягнення, або відмови у притягненні до відповідальності щодо порушення податкового законодавства (п. 112.5 ст. 112 Податкового кодексу України [11]).

Перевірка законності та обґрунтованості рішення ведеться у межах єдиного юрисдикційного процесу адміністративного оскарження та перегляду справи про адміністративне правопорушення одночасно вищим податковим органом, а потім у межах процесу судового оскарження та перегляду справи про адміністративне правопорушення.

Єдність процесу виключає прийняття суперечливих юрисдикційних актів щодо різних видів адміністративного процесу. В інших випадках, в адміністративному процесі поділяється рішення як документальна підстава для застосування відновлювальних заходів щодо адміністративних процедур, пов'язаних із завершенням заходів державного контролю, та постанова у справі про адміністративне правопорушення як документальна підстава для застосування заходів адміністративного стягнення щодо виконавчого провадження у справі про адміністративне правопорушення.

Перевірка законності та обґрунтованості рішення проводиться вищими адміністратив-

ними органами щодо адміністративно-юрисдикційного процесу на підставі адміністративної скарги або судами під час здійснення адміністративного судочинства, тобто судового контролю за законністю актів управління за заявами осіб, права та законні інтереси яких порушені.

Рішення оскаржується як ненормативний управлінський акт застосування відновлювальних заходів, який незаконно покладає обов'язок на особу щодо якої застосовувалися відновлювальні заходи.

Перевірка законності та обґрунтованості постанови у справі про адміністративне правопорушення або рішення за скаргою на зазначену постанову проводиться у межах адміністративно-юрисдикційного процесу перегляду справ про адміністративні правопорушення.

Постанова у справі про адміністративне правопорушення про притягнення або про відмову у притягненні до адміністративної відповідальності та рішення за скаргою може бути оскаржена особою, яка притягується до адміністративної відповідальності, або потерпілим, органом, посадова особа якого склала протокол у справі про адміністративне правопорушення, суб'єктом адміністративної юрисдикції.

Це передбачає винесення у межах двох різних адміністративних проваджень ухвали та постанови у справі про адміністративне правопорушення при виявленні одного адміністративно-протиправного діяння, усунення якого вимагає вживання відновлювальних заходів на підставі рішення, а покарання – заходів адміністративного стягнення на підставі постанови у справі про адміністративне правопорушення. Зазначене допускає у правозастосовній практиці різні оцінки суб'єктів адміністративної юрисдикції та адміністративного судочинства за одним фактом адміністративно-протиправного діяння.

Це призводить до прийняття у правозастосовній адміністративній та судовій практиці адміністративно-юрисдикційних актів та актів адміністративного судочинства, які суперечать один одному, фактичними підставами прийняття яких є одні й ті самі протиправні дії.

Внаслідок цього Верховний Суд як вища судова інстанція іноді займається вирішенням

проблем неузгодженості позицій судів у справах про адміністративні правопорушення з позиціями судів у справах про визнання недійсними ненормативних правових актів [14].

Це пов'язано з тим, що судові акти, винесені за результатами розгляду та перегляду справи про адміністративне правопорушення та справи про визнання недійсним ненормативного правового акту, спочатку містять протилежні висновки, хоча ґрунтуються на правовій оцінці одних й тих самих фактичних обставин шляхом застосування одних регулятивних норм права.

Вирішенням проблеми є правова регламентація видачі рішення про усунення порушення законодавства з повним відновленням порушених прав, компенсацією бюджетних втрат та покриттям витрат адміністрування при прийнятті постанови у справі про адміністративне правопорушення. Питання про застосування відновлювальних заходів і заходів адміністративного стягнення за порушення податкового законодавства необхідно вирішувати одночасно, системно та узгоджено одним суб'єктом адміністративної юрисдикції.

Узгодженість повинна виключати використання відновлювальних заходів і заходів адміністративного стягнення за відсутності протиправності. За наявності протиправності та обставин, що виключають провадження у справі про адміністративне правопорушення або які передбачають застосування альтернативних заходів адміністративного впливу, можуть бути застосовані тільки відновлювальні заходи, необхідні для забезпечення законності, відновлення та захисту порушених прав та законних інтересів.

Системність у використанні відновлювальних заходів і заходів адміністративного стягнення у сфері податків і зборів полягає у реалізації їхнього потенціалу для забезпечення ефективності фіскальної та регулюючої функції податків з урахуванням того, що пріоритетною є фіскальна функція оподаткування.

Якщо в законодавстві та правозастосовній практиці врахувати ці пропозиції, можна буде встановити необхідну єдність та провести чітке розмежування матеріально-правових і процесуально-правових норм для належної регламентації адміністративного примусу.

Єдність інституту адміністративної відповідальності необхідно забезпечити для усунення порушення та покарання з розмежуванням у законодавстві та правозастосовній практиці відповідних відновлювальних заходів і заходів адміністративного стягнення за умови узгодженості та системності використання.

Проблема узгодженості рішення про усунення порушення законодавства та постанови у справі про адміністративне правопорушення має бути вирішена в єдиному адміністративно-юрисдикційному процесі винесення та перегляду, а не як сьогодні у чинному Податковому кодексі України та у існуючій практиці застосування шляхом прийняття постанови у справі про порушення податкового законодавства, на підставі якої використовуються одночасно відновлювальні заходи та заходи адміністративного стягнення без належного розмежування підстав та порядку застосування. Зазначене збігається з поглядами науковців Т. Коломоець і В. Колпакова у контексті доктрини адміністративного права [15].

ВИСНОВКИ

Відсутність системного підходу у правовій регламентації заходів адміністративного

примусу у законодавчому регулюванні адміністративної відповідальності призводять до нівелювання принципів застосування, порушення прав і законних інтересів осіб, до яких вони застосовуються.

Ці недоліки можуть бути усунуті шляхом систематизації, кодифікації та уніфікації заходів адміністративного примусу в адміністративному законодавстві без винятків із загальних правил адміністративно-правового регулювання. Створення єдиної цілісної інституційної системи правового регулювання заходів адміністративного примусу передбачає розмежування у законодавстві та правозастосовній практиці видів заходів, мети, підстав, змісту, умов і порядку застосування.

Як проміжний етап такого процесу може бути прийнята концепція кодифікації інституту адміністративної відповідальності в Кодексі України про адміністративні правопорушення з галузевою кодифікацією або систематизацією заходів адміністративного примусу. Превенція та стимулювання має превалювати над примусом у разі застосування комплексу заходів адміністративного впливу за порушення податкового законодавства України.

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The Challenge of Teaching in the Village and the Importance of a Competent Teacher

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Abstract. Based on the results of mentoring students from the Faculty of Teacher Training and Education in the implementation of the Community Service Program for the period November 2020 to January 2021, which was carried out in several villages in Central Lombok Regency with the theme of teaching in the village, it was found that there were various teaching challenges in the village. This is undoubtedly very important and interesting to study and socialise, especially concerning the importance of competent teachers. Therefore, this paper will discuss various findings about the challenges of teaching in the village and analyse their relation to the extent of qualified teachers. The study in this paper uses a sociological-normative approach. The results of the study show that there are various teaching challenges in the village. The challenges in question include challenges from the aspects of students, parents, infrastructure, and facilities. From the part of students, namely the number of students who do not master the primary material that should have been mastered at the previous level and the low motivation of students to learn. From the aspect of parents, namely the lack of support from parents to synergise in strengthening learning programs in schools. From the part of infrastructure and facilities, namely the lack of needed infrastructure and facilities. This challenge also shows the importance of comprehensively teaching four competencies: professional competence, educational competence, personal competence, and social competence. Competent teachers will place these challenges not as obstacles but as motivation to continue to innovate.

Keywords: challenge; teaching; village; competent teacher.

INTRODUCTION

Education is a conscious and planned effort to realise national education's goals. The purpose of national education in the 1945 Constitution of the Republic of Indonesia is affirmed in Article 31 paragraph (3), namely increasing faith and piety and noble character in the context of educating life as regulated by law. Furthermore, in Law no. 20 of 2003 concerning the National Education System, Article 3 it is emphasised that the purpose of national education is to develop the potential of students to become human beings who believe and fear God Almighty, have a noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens.

To implement these educational goals, the teacher is one determining aspect. Therefore, teachers are placed as professionals with the main task of

teaching, which is a process of helping students achieve the expected competencies, which include the competencies of spiritual attitudes, social attitudes, knowledge, and skills.

Efforts to prepare teachers as competent professionals are institutionally the responsibility of the Educational Personnel Educator Institute (LPTK). In this case, the LPTK at the University of Mataram is the Faculty of Teacher Training and Education (FKIP). Therefore, various curricular activities prepare them as professional and competent teachers, including Community Service Program (KKN) activities. For this reason, one of the themes in the thematic KKN program at the University of Mataram is "Teaching in the Village".

In the implementation of KKN from November 2020 to January 2021, mentoring has been carried out for FKIP students who take the teaching theme in the village. The performance is in sev-

eral towns in Central Lombok Regency, including Batujai Village, West Praya District; Jago Village, Praya District; Mujur Village, East Praya District.

From the results of the KKN mentoring that has been carried out, data is obtained about various teaching challenges in the village. This is a fundamental and exciting matter to be studied and socialised, especially to the need for competent teachers. It can be input for all related parties in preparing students as capable teacher candidates.

METHODS

The study in this paper uses a sociological-normative approach. The sociological approach is also called the empirical approach, which is used to obtain data based on facts or realities in the community. In this case, it is about the various challenges of teaching in the village. The sample locations for the study were three villages in Central Lombok Regency, West Nusa Tenggara Province, including Batujai Village, West Praya District; Jago Village, Praya District; and Mujur Village, East Praya District. Furthermore, a normative approach examines the norms or rules governing teacher competence. The data obtained were then analysed to find the relationship between teaching challenges in the village and the importance of competent teachers.

RESULTS AND DISCUSSION

The Challenge of Teaching in the Village. Law [16] emphasised that teachers are professional educators with the main task of educating, teaching, guiding, directing, training, assessing, evaluating, and evaluating students. Thus, teaching is one of the main tasks of the teacher.

Teaching is undoubtedly not just conveying material. The author [19] suggests that teaching is an integrative effort toward achieving educational goals. The author [18] means that teaching is an effort to organise the environment and teaching materials that lead to the learning process. The researcher [3] also defines teaching as not limited to efforts to convey knowledge but also includes guiding students to learn. Author Burton (in [18]) asserts that "teaching is the guidance of learning activities". These various opinions provide an orientation that teaching includes a broad understanding, not just the transfer of knowledge, but includes more general activities,

including guiding. Students have carried out these overall teaching activities during the implementation of KKN in the village.

The village is the lowest government structure. The author [13] explained that the word "village" comes from the Indian language, namely "swadeshi", which means place of origin, residence, country of origin, or ancestral land, which refers to a single unit of life, with a single unit of norms, and have clear boundaries.

Meanwhile, Talcott Parsons describes the village community as a traditional community, which has characteristics, among others, ascription (as opposed to achievement), which is related to quality or special characteristics that are not obtained based on unintentional efforts but are a condition that has become a habit or heredity.

Villagers do not always reflect the characteristics stated by the Talcott Persons. However, in the context of teaching, it shows that education in the village has challenges, namely something that inspires ability. This is, of course, the essence of the implementation of KKN, especially the theme of teaching in the village. In this case, students design and implement programs according to teaching problems in the chosen location to help provide solutions. In this case, there are several teaching challenges in the village which are the focus of student Community Service activities guided by the implementation of the Community Service Program from December 2020 to January 2021. The challenges referred to in general are 1) low student motivation to learn; 2) the presence of elementary school students who are unable to Read, Write, and Count, and 3) low literacy skills.

These challenges encourage KKN students to develop and implement teaching programs as alternative solutions. For example, tutoring held in Sangkareang Village, East Praya District, which was named "Asyik Belajar Coach" (ABC), Read, write, and count special guidance in Mujur Village, East Praya District, and learning guidance through the "relaxed" learning studio in Jago Village, Praya District.

In various learning studios as above, students are encouraged to explore the various abilities gained during lectures so that the teaching activities carried out can achieve the expected goals, namely increasing student learning motivation, students who cannot do Count become able, increasing literacy interest. For this reason, stu-

dents use various ways that attract students' interest in learning, namely learning while playing and singing and using image media with attractive shapes and colours.

The various efforts that students have made in facing the challenges of teaching in the village are certainly the right things. The author [9] believes that learning to read, write, and the count does not need to be considered taboo in early childhood. The most important thing is to construct a way to learn it so that students think their learning activities are like playing and shaped like a game. Furthermore, the author Brown in [6] suggests that the media serves as a tool to encourage, increase activeness, and the effectiveness of student learning. The author [3] means that images with various colours will be more attractive and arouse attention and interest in education.

Competent Teacher. The teacher is the essential element that determines educational goals' achievement. The author [2] suggests that teachers can be likened to combat troops who decide victory or defeat in battle in the educational process. The quality of teachers will determine the future of the nation. Therefore, the author [14] argues that the nation's future is determined by the number of doctors, soldiers, police and politicians and by quality teachers.

Given the importance of qualified/quality teachers, the Government has issued a policy [16] regarding Teachers, whose substance, among others, regulates the competencies required to be possessed by teachers.

Competence is a set of knowledge, skills, and behaviours that must be lived, mastered, and actualised by teachers in carrying out professional duties. Laws [16, 17] require that teachers have four competencies, including academic competence, personal competence, social competence, and professional competence. The four teacher competencies are holistic, meaning they are complete and comprehensive.

Various aspects of the four competencies are outlined in [16, 17]. It is emphasised that pedagogic competence is the ability of teachers to manage to learn, which at least includes: 1) understanding insight or educational foundations; 2) understanding of students; 3) curriculum or syllabus development; 4) learning design; 5) implementation of educational and dialogical learning; 6) the use of learning technology; 7) evaluation of

learning outcomes; and 8) developing students to actualise their various potentials.

Furthermore, law affirmed the scope of personality competence, which at least includes: 1) faith and holiness; 2) noble character; 3) wise and wise; 4) democratic; 5) steady; authoritative; (6) stable; 7) mature; 8) honest; 9) sportsmanship; 10) be a role model for students and the community; 11) objectively evaluate own performance; and 12) develop themselves independently and sustainably.

Law emphasises that social competence is the ability of teachers as part of the community, which at least includes the competence to 1) communicate verbally, in writing, and/or gestures politely; 2) use communication and information technology functionally; 3) interact effectively with students, fellow educators, education staff, education unit leaders, parents or guardians of students; 4) associating politely with the surrounding community by heeding the prevailing norms and value systems; and 5) apply the principles of true brotherhood and the spirit of togetherness.

Act affirmed that professional competence is the ability of teachers to master knowledge in the fields of science, technology, and/or arts and culture, which at least includes mastery of 1) subject matter broadly and in-depth by the standard content of the educational unit program, subjects, and/or groups of subjects to be taught; and 2) concepts and methods of relevant scientific, technological or artistic disciplines, which are conceptually overshadowing or coherent with the educational unit program, subject matter, and/or group of subjects to be taught.

The required competencies are relevant to the task carried out by the teacher, which is to help students achieve competence. In this case, the teacher's mission is not only to build knowledge but to build the four student competencies comprehensively. The four student competencies referred to in the attachment to the [10] concerning the Basic Framework and Curriculum Structure of Elementary Schools/Madrasah Ibtidaiyah includes 1) spiritual attitude competence; 2) social attitude competence; 3) knowledge competence, and 4) skills competence.

Attitude competence is related to the ability of students to appreciate and live the teachings of their religion. Social attitude competence is associated with the knowledge of students to enjoy

and live honest behaviour, discipline, responsibility, caring (tolerance, cooperation), polite, confidence, in interacting effectively with the social and natural environment within reach of association and existence. Knowledge competence is related to students' ability to understand knowledge (factual, conceptual, and procedural) based on their curiosity about science, technology, art, and culture related to visible phenomena and events.

Furthermore, competency skills are related to the skills of trying, processing, and presenting in the concrete realm (using, parsing, assembling, modifying, and creating) and abstract realms (writing, reading, counting, drawing, and composing) according to what is learned in school and other sources that are the same in point of view/theory.

Observing the four competencies that students must achieve above, it can be understood that teachers who have the four competencies as required in the Teacher Law and lecturers are necessary to help students achieve these competencies. Competent teachers will be able to help students achieve competence. On the other hand, if the teacher is not qualified, inevitably, they cannot help students achieve the expected competencies.

Teachers who have these four competencies holistically will certainly be able to help students in any condition, including students with various existing deficiencies, as is the case in villages, namely students with low learning motivation, elementary school students who cannot read, write, and Counting, as well as low literacy skills. To overcome these problems, the first thing the teacher must do is find students' learning difficulties. Related to this, the author [15] states that every teacher must have the ability, among others, the ability to understand the challenges and interests of students.

The challenges of teaching in villages as above will be overcome if handled by competent teachers. In this case, qualified teachers do not only play a role in building knowledge, but also act as facilitators, motivators, and inspirations.

As a facilitator, a competent teacher can provide convenience in learning, facilitate students to learn in a pleasant atmosphere, full of enthusiasm, and not feel pressured. As a motivator, competent teachers can encourage students to continue to be enthusiastic in learning to achieve

the expected competencies. Teacher motivation is essential for students. According to [7], in the case of learning failure, it turns out that the teacher is one of the main factors causing students' difficulties or lack of enthusiasm for learning. In this case, a teacher should appear as a motivator who always encourages students with patience and love to continue learning.

Efforts to build students' enthusiasm for learning require teacher pedagogical competence, which among other things, is related to the ability to convey material in exciting ways so that students can accept it. Related to this, author [12] suggests that learning is no longer centred on the teacher but has prioritised the activities and creativity of students in the classroom that can stimulate active student involvement.

Sound planning is needed to be carried out as expected. Related to this, author Petter, as quoted by [4], states that as a teacher, teachers are required to have the ability to plan and implement learning. The author [5] says that in the teaching and learning process, teachers must have three abilities, namely: (1) the ability to teach, (2) the ability to manage learning strategies, and (3) the ability to provide assessments.

Various studies prove the importance of teacher competence in education and learning. Among them is the research conducted by Kay in 1980, as quoted by [8], which is one of its conclusions states that the ability of teachers to teach is one of the variables that significantly influence students' academic competence.

Authors Heyneman and Loxley's in 1983 research in 29 countries consisting of 16 developed. Developing countries and 13 developed countries, as quoted by [13] in one of its conclusions, stated that among the various components that determine the quality of education (seen from student achievement), it turns out that teachers make the most significant contribution compared to the other parts.

Research conducted by Cheng and Wong in 1996, as cited by [7], concluded that teacher professionalism is one of the four characteristics of excellent primary schools (achievement) in China. Other characteristics are consistent support from the community, quality assurance, and a high desire from students to excel.

The findings above show that the quality of teachers is essential and determines the quality of education. Qualified teachers are none other

than teachers with the four competencies required in the Law on Teachers and Lecturers.

Competent teachers will view the various obstacles to teaching in the village as a challenge to continue to develop their competencies so that they can help students achieve competencies as expected comprehensively.

CONCLUSION

Based on the discussion above, it can be concluded that there are various obstacles to teaching in the village, including challenges from the aspect of students, parents, infrastructure, and facilities.

From the student aspect, the number of students who do not master the primary material that should have been mastered at the previous level. On the part of parents, namely the lack of support from parents to synergise in strengthening learning programs in schools. From the aspect of infrastructure and facilities, namely the lack of needed infrastructure and facilities. This challenge also shows the need for comprehensive teachers with four competencies: professional competence, academic competence, personal competence, and social competence. Competent teachers will place these challenges not as obstacles but as motivation to continue to innovate.

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Increasing Children's Expressive Language Development Through the Role-Playing Method

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Abstract. This study aims to improve children's expressive language skills by applying the group B role-playing method in Al-Hikmah Santong Kindergarten. This type of research is collaborative classroom action research, which consists of two cycles, each carried out in one meeting. The research procedure includes planning, implementing actions, observing and reflecting. The research subjects were all the children of group B in Al-Hikmah Santong Kindergarten, totalling 36 children. The data analysis used is descriptive qualitative, and quantitative. The results showed an increase in the expressive language skills of group B children in Al-Hikmah Santong Kindergarten. Increased expressive language skills are more emphasized in children's language, which includes expressive language indicators, namely expressing desires, feelings, and opinions in simple sentences in communicating with children or adults and expressing emotions and ideas with appropriate word choices when speaking. In the implementation of the pre-action, children's expressive language skills reached 37.5%, and the performance of the pre-action was still in the criteria of starting to develop. In cycle I, the implementation of the action increased by 55%, including the requirements for developing as expected. And the performance of Cycle II reached 93.8%, which showed the criteria for developing very well and achieved indicators of success. So the implementation of this research was stopped. Based on the study above, it can be concluded that the expressive language skills of group B children at Al-Hikmah Santong Kindergarten have increased through the application of the role-playing method.

Keywords: children; expressive language; role-playing.

INTRODUCTION

Kindergarten is a form of early childhood education unit in the formal education path that organizes educational programs for children aged 4-6 years which is a sensitive period for children to lay the first foundation in developing physical, cognitive, language, social, artistic abilities, morals and religious values. Authors [4] state that early childhood education institutions seek to develop the potential of children; where this potential has been created, the possibility of children is different from one another. Language development needs to be stimulated because human life cannot be separated from communication with the environment. Language acquisition can be in the form of spoken language, written language or sign language.

The author [1] states that language is a liaison or communication tool between community members consisting of individuals who express their thoughts, feelings, and desires. Language means using language based on personal knowledge about manners. Expressive language is one of the stages of language development for Kindergarten-age children. At school and outside school, children are expected to be able to express their thoughts through simple language appropriately in communicating with their interlocutors [5, 6, 10].

The role-playing method is a variation of the learning method. This is important to eliminate watching learning and reduce student boredom [13]. The purpose of the role-playing plan is so that the cultivation and development of aspects of children's values and attitudes will be easily achieved. This game can train: the first is to

explore children's knowledge, experience, opinions and perspectives. Second, introduce children to other people and feel empathy for the roles they play so that children are taught to live an actual event or event in the reality of real life. As for the appearance of children who play roles directly in front of their friends, they take turns in pre-determined groups based on the roles played by each child.

The author [11] states that the role-playing method is in line with previous studies where the role-playing process can help improve expressive language skills, such as speaking or communicating orally. The author [8] reveals that the media used in learning for early childhood is a tool to achieve the expected competencies by the established themes and sub-themes, where the press can optimize the empowerment of all of the child's senses during role-playing. The learning process involves many reasons that will make it easier for children to understand the material presented by the teacher. The author [2] explorations of play tools for role-playing provides opportunities for children to develop their spoken language. Authors [14] state that the play equipment can become a property for children when playing a role, supporting the child's ability to do role play well.

Based on the facts, the expressive language ability of group B children is still relatively low, especially in the Al-Hikmah Kindergarten School, Santong Village, Kayangan District, North Lombok Regency. And the learning system provided at school only focuses on reading, writing, drawing, and colouring skills, so children feel bored quickly in class. This is done to make it easier for children to enter the next level to elementary school, especially in reading and writing. The impact is that it hampers children's opportunities to develop aspects of expressive language skills, as it is known that explicit language is one of the stages of language development in Kindergarten age children. At school and outside of school, children are expected to be able to express their thoughts through language. These problems prompted the authors to research "increasing children's expressive language development through the group B role-playing method at Al-Hikmah Kindergarten in Santong village, Kayangan sub-district, North Lombok regency. From this background, the formulation of the problem in this study is how to improve children's expressive language development through the group B role-playing method in Al-Hikmah Santong Kinder-

garten. Thus, the purpose of this study was to find out efforts to improve children's expressive language development through the group B role-playing method at Al-Hikmah Santong Kindergarten.

METHODS

The researchers used the Classroom Action Research (CAR) method in this study. Classroom action research is a process of scientific inquiry in the form of self-reflection that involves teachers in certain educational situations to improve understanding and fairness about academic conditions or practices, understanding of the practices carried out, and the cases in which these practices are carried out. The approach used in this research is a descriptive qualitative and quantitative approach which aims to reveal the problems studied thoroughly, broadly and deeply.

This research was carried out in Santong Village, Kayangan District, North Lombok Regency and was carried out in mid-May 2022. The data to be studied in this study is the increase in the expressive language development of group B children in Al-Hikmah Santong Kindergarten after applying the role-playing method. This research is on group B children, as many as 36 people.

The stages of this research are 1) initial observation stage, 2) field data mining, and 3) report preparation. This study uses a design developed by Kemmis Mc. Taggart consists of four stages, starting from planning (planning), action (implementation), and observation (observation or observation and reflection) using a cycle model. If the results are not good at the beginning of the performance, then action can be taken in the next cycle until the desired target is achieved. The data collection technique in this study was carried out using observation and documentation. Authors [2] stated that this technique was used to observe closely to find and explore data through direct and in-depth observations of the subjects and objects studied.

RESULTS AND DISCUSSION

This study was conducted at Al-Hikmah Kindergarten, Santong Village, Kayangan District, North Lombok Regency, on May 24, 2022. Based on the results of research conducted by Al-Hikmah Santong Kindergarten, it can be described that the

improvement of children's expressive language development is through the group B role-playing method in Al-Hikmah Santong Kindergarten. The results obtained from the observations and documentation of the group B children studied were as follows:

1. The teacher collects children to be given directions and rules for playing, starting with an explanation given by the teacher regarding role-playing activities between sellers and buyers.
2. The teacher explains the tools that the children will use. Before the children are divided into groups, the teacher introduces the materials and tools used in role-playing activities. The media used are vegetables such as kale, spinach, carrots, and mustard greens and play money (Rp. 1000, Rp. 2000, Rp. 5000, Rp. 10000, Rp. 20000). Then, the teacher gives an example of how to play as a seller with the help of the researcher as a buyer.
3. The teacher gives directions before playing, takes the children's attendance, and counts the number of children together, starting from the male group to the female group. The teacher gives an apperception to the children about the role-playing activities that will be carried out with the theme Plants, the sub-theme of Vegetables. This learning activity is where children become sellers and buyers.
4. The teacher determines groups for children, and the teacher will give assignments to children before playing according to their groups so that role-playing learning activities can be organized, such as singing and counting with other teachers. This makes the children not scramble. Children have explained the play equipment that has been

provided. After the teacher gives examples to the children, the teacher divides them into groups of men and women to determine who is in the seller's group and who is in the buyer's group.

5. The teacher has prepared the game tools that will be used before the children start playing activities.

In the next stage, children play roles according to their respective roles. The children who act as sellers sit on chairs the teacher has prepared to sell vegetables, with vegetables placed on the table, and the children act as buyers.

The teacher supervises and assists the child in role-playing if the child needs it. The teacher does not talk much about helping the child when doing role-playing activities. Now and then, the teacher will go fishing or join a group. Still, it is only for a short time. For example, when the teacher asks if the child likes to eat Carrot vegetables, the child will answer and take Carrot if he likes it or not if the child wants it, and the teacher observes the children's play.

After playing time is up, the teacher prepares a printed Sayur Sawi drawing paper, and then the child will colour and write the name of the vegetable according to the example provided and write his name. At the same time, the teacher tidied up the tools and materials used during role-playing. The results of increasing the expressive language development of group B children in Al-Hikmah Kindergarten, Santong Village, Kayangan District, North Lombok Regency, carried out from May 22 to June 15 2022, through observation and documentation methods, can be seen in Table 1.

Table – Data Recapitulation of Pre-Action Results, Cycle I, and Cycle II

No	Criteria	Pre Action		Cycle I		Cycle II	
		Number of children	%	Number of children	%	Number of children	%
1	Undeveloped	12	33.30	4	11.10	-	-
2	Start Growing	22	61.10	9	25.00	3	8.30
3	Growing As Expected	2	5.50	16	44.40	6	16.60
4	Very Well Developed	-	-	7	19.40	27	75.00
Total		36	100	36	100	36	100

Table 1 shows that during the Pre-Action implementation, 12 children entered the criteria not yet developed with a percentage of 33.30%. Twenty-two children obtained the requirements for starting to create with a rate of 61.10%, and

two children were considered developing criteria. as expected with a percentage of 5.50%. In the implementation of the first action cycle, four children entered the undeveloped criteria with a share of 11.10%, and nine children obtained the

requirements for starting to develop with a percentage of 25.00%. There were 16 children whose criteria were developed according to expectations, with a rate of 44.40 %. Seven children included in the requirements set very well with a percentage of 19.40%. Children who entered the criteria began to develop in implementing the second cycle of actions. There were three children with a rate of 8.30%, six children included in the standards designed as expected with a percentage of 16.60%, and 27 children included in the criteria set very well with a rate of 75.00%. Authors [14], according to research, show that the role-playing method can improve children's expressive language skills.

Based on the results of research that has been carried out by researchers and collaborated with group B teachers of Al-Hikmah Santong Kindergarten, who during the Pre-Action implementation showed that the expressive language skills referred to in the criteria began to develop with the percentage obtained that was 37.50%, in the implementation of the first cycle the percentage was 55. % which shows children's expressive language skills are included in the criteria for developing as expected, and cycle II shows that children's expressive language skills have increased with a percentage of 93.8% entering the criteria for developing very well

Judging from the increase in the results of the children's expressive language ability indicators in each cycle, namely, cycle I and cycle II, it can be improved by the steps of role-playing activities implemented by the teacher. It can be seen when children retell role-playing activities directly in front of friends and teachers. Authors [4] state that retelling stories can develop children's language skills.

The author [7] states that expressiveness makes communication even more effective in the form

of expressions of feelings with a beaming face, lip vibrations, wide eyes, teardrops, smiles and/or hand squeezes. From these expressions, communication can be carried out on oneself and others, as well as determining attitudes and actions that must be taken at the right time. Language skills are generally divided into four skills: listening, speaking, reading, and writing. Role-playing activities can improve children's expressive language skills, increasing their confidence in explicit language and developing their ideas and creativity in playing their roles.

The author [12] states that role-playing is a game to play certain characters, objects, and rolls around children. Role-playing is an activity of imitating the actions of other people around them. Playing the role of children's habits and preferences for imitating will be channelled. It can develop children's imagination or imagination, as well as an appreciation of the material for the activities carried out. Children carry out the role-playing method to play a character of their choice in macro form, where children directly play the roles they play with fundamental game tools, will play roles according to their wishes or preferences, and some want to be sellers or buyers.

CONCLUSIONS

Based on the results of the discussion that has been conveyed that the expressive language skills of group B children of Al-Hikmah Santong Kindergarten can be improved by role-playing activities where this activity can motivate children to learn to play their roles, foster courage and their confidence in expressing their desires, feelings, opinions and ideas in communicating with friends during role-playing can develop children's creativity, and provide new experiences for children.

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Систематическая организация и функциональное изучение фонемного строя языка в фонологии

Systematic Organization and Functional Study of the Phonemic Structure of a Language in Phonology

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Аннотация. В статье речь идет о системном и функциональном изучении звуков языка в фонологии. Материалом исследования является звуковой строй азербайджанского языка и его фонологические особенности. Изучение места звуков языка в фонологической системе азербайджанского языка и их отношения к другим фонемам в этой системе, а также фонетический анализ фонем является научной новизной данного исследования. Изучение отношения фонологии к лексемам, морфемам и синтаксису считается актуальной темой фонологии. Эти факторы играют ключевую роль при исследовании фонологической системы языка. Автор отмечает, что изучение отношения фонологии к семантике – это изучение ударения, просодии и интонации. В зависимости от произносительной нормы азербайджанского языка звуки могут быть сгруппированы в варианты или аллофоны.

Ключевые слова: функциональная фонетика; фонологическая система; фонема; вариант; морфологический шов.

Abstract. The article deals with the systematic and functional study of language sounds in phonology. The material of the study is the sound structure of the Azerbaijani language and its phonological features. The study of the place of the sounds of the language in the phonological system of the Azerbaijani language and their relationship to other phonemes in this system, as well as the phonetic analysis of phonemes, is the scientific novelty of this study. The study of the relationship of phonology to lexemes, morphemes, and syntax is considered a topical issue in phonology. These factors play a crucial role in the study of the phonological system of a language. The author notes that the study of the relationship of phonology to semantics is the study of stress, prosody and intonation. Depending on the pronunciation norm of the Azerbaijani language, sounds can be grouped into variants or allophones.

Keywords: functional phonetics; phonological system; phoneme; variant; morphological seam.

ВВЕДЕНИЕ

Артикуляционный, акустический, перцептивный аспект не могут показать внутреннюю систему языковых единиц. Данный вопрос может быть решен в рамках функциональной фонетики или фонологии. Таким образом, фонология исследует звуки языка с системной и функциональной точек зрения.

Главной задачей здесь является изучение места звуков языка в фонологической языковой системе и их отношения и взаимосвязи с другими фонемами. Ключевую роль в этом плане играет изучение отношения фонологии к лексемам, морфемам и синтаксису. «В определении основной функции звуковых единиц и закономерностей их организации в знача-

щих единицах следует опираться на принципы системного подхода к языку, на свойства самой системы языка. В связи с тем, что основная, первичная функция фонем и других звуковых средств – определять состав значащих единиц языка, фонетическая сегментация речи, соотнесена, прежде всего, с морфологической и является ее производной» [7, с. 8].

Цель исследования – анализировать основные принципы изучения фонемного строя языка в фонологии на основе языковых материалах азербайджанского языка.

МЕТОДЫ И МАТЕРИАЛЫ ИССЛЕДОВАНИЯ

В ходе исследования были использованы описательный и описательно-сравнительный методы лингвистики. Для сравнения с другими языками, по необходимости, был использован типологически-сравнительный метод. Материалом исследования, в основном, выступают языковые материалы современного азербайджанского языка.

РЕЗУЛЬТАТЫ ИССЛЕДОВАНИЯ

Ученые давно выяснили, что разные звуки могут быть одинаковыми, а похожие звуки могут выполнять разные функции. Например, в азербайджанском языке в таких словах как /diz/, /daz/, /düz/ (дословный перевод: колена, лысина, прямая) первые согласные звуки по артикуляции и акустике различаются друг от друга. В первом слове “d” произносится мягко – [d^h], во втором слове оно звучит твердо – [d], а в третьем позиции при произношении данного звука участвуют и губы – [d^o]. Фонология доказывает, что все эти три звука – [d^h] [d] и [d^o] – несмотря на то, что материально разные, – выполняют одинаковую функцию. Для обозначения данного сходства в лингвистику был введен термин «фонема». В фонематической системе азербайджанского языка звуки [d^h] [d] и [d^o] напрямую не констатируют друг с другом, один другого не может заменить, они действуют в позициях исключая друг друга и по данной причине их называют аллофонами, т. е. вариациями одного и того же звука.

Звук – это специфическое физическое явление, возникающее в речевом аппарате человека. Звуки, представленные каждой фоне-

мой, бесконечны. Например, звуки [d], употребляемые в языке отдельных лиц, звуки [d], претерпевающие многочисленные комбинаторные и позиционные изменения в разных позициях и сочетаниях, а также «ударения, просодия и интонация, являются одними из тысяч и миллионов звуков, регулярно используемые в диалектах и говорах регионов» [6]. Например, по произношению азербайджанского языка эти звуки можно сгруппировать в варианты или аллофоны следующим образом:

первый вариант: мягкое произношение согласного звука: как в слове /diz/ – [d^h];

второй вариант: твердое произношение согласного звука, т.е. то есть произношение с отведением языка назад: как в слове /daz/ – [d→];

третий вариант: при произношении согласного участие губ: /düz/ – [d^o];

четвертый вариант: оглушение в конце слов и перед глухими согласными /sər'həd^t/-dəki [d/ç].

Кроме того, этот согласный произносится интенсивно перед ударным гласным. Иногда его называют длинным. Мы можем легко увеличить количество вариантов. Для этого нам нужно выработать фонотактический взгляд на каждую гласную и согласную.

Анализ языкового материала показывает, что эти варианты обладают одинаковой идентичностью, одинаковой инвариантностью, а также разнообразием, причем, каким бы образом они ни происходили, некоторые их характеристики остаются устойчивыми. В фонематической системе азербайджанского языка наблюдать все эти признаки на одном и том же согласном невозможно. По этой причине «звуки обобщаются в варианты, варианты в фонемы и вообще теоретически инварианты» [5, с. 14]. Путь от фонемы к звуку и от звука к фонеме проходит через вариации: [t] – звук; [t] – вариация, аллофон; /t/ – фонема, инвариант

«Тот или иной тип языка формирует в качестве минимальной сигнификативно значимой такую единицу, которая отвечает требованию необходимости и достаточности. Так, описание единиц звукового строя большинства современных индоевропейских языков в рамках таких понятий как силла-бофонема

или слово-фонема (термин «морфонема» был бы адекватнее для описания подобных случаев, но на материале, например, русского языка он перегружен другими значениями) вряд ли возможно, по крайней мере, в обозримом будущем. Как отмечают многие лингвисты, понятие фонемы неадекватно применительно к языкам типа китайского или вьетнамского, по отношению к которым само выделение такой единицы, как фонема весьма проблематично. В то же самое время тюркские языки допускают описание единиц звукового строя на основании нескольких парадигм описания, по крайней мере, двух: фонемного и силлабофонемного (и даже морфонемного)» [2, с. 1546].

Иногда в научной и теоретической литературе ошибочно предполагается, что в языке есть два вида звуков: звуки, различающие значение (фонемы) и звуки, не различающиеся по значению (варианты или аллофоны). Это в корне неверная идея. В языке нет звука без фонемы. С другой стороны, нет звука, который не представлял бы собой фонему.

Таким образом, когда мы говорим о фонеме, то это материальная сущность; устойчивая, неизменная, характеризующаяся соответствующими признаками, противопоставленная другим единицам языковой системы и служащая для различения слов, словоформ и выражений в любом языке. Фонема – наименьшая единица языка, состоящая из звуков. «Фонема отделена от акта речи морфологической гранью» [3]. Компоненты дифтонгов и африкатов никогда не пересекают морфологическую границу, поэтому имеют неделимые монофонематические значения.

Для более детального обозрения, отметим, что, например, в азербайджанском языке есть такое слово /уса/ – высокий. От данного слова можно произвести слово /уса+л/ – подниматься высоко. В данном случае /л/ является словообразующим суффиксом, и имеет морфологическую грань, отделяющей его от корня. Значит, имея определенные возможности /л/ таким образом обретает свободу и считается свободным суффиксом. Здесь мы отказываемся от техники механически сравнимых пар. Таким образом, можно выделить следующие фонемы в азербайджанском и немецком языках.

Фонемы встречаются в парадигматических и синтагматических отношениях. Например,

в азербайджанском языке

/d/ = /dən/

/t/ = /tən/

/m/ = /mən/

/s/ = /sən/

в немецком языке

/d/ = /dann/

/w/ = /wann/

/k/ = /kann/

/m/ = /mann/

Как видно из примеров, в начале слова четыре фонемы сменяют друг друга и в результате появляются новые слова. Этот тип анализа замещения называется методом коммутации. Это означает противопоставление синтагматическому подходу. Ни в одном из приведенных выше слов соседние фонемы не могут быть заменены или использованы взаимозаменяемо.

Фонемы азербайджанского языка, в основном, отличаются тем, что при их произношении кончик языка играет активную роль. Например, согласный звук /k/ в азербайджанском языке может употребляться в начале и в конце слова. Например, Müq. et: /k`arvan/ (караван), /külək` (ветер) / и т.д. Также надо учитывать, что в английском языке звук /ð/ (“there” – там) и /θ/ (“think” – думать) не характерны для других языков, или же согласный звук [r] в английском, немецком и французском языках имеет разные оттенки произношения. Рассмотрим примеры: в немецком языке /r/- [ʀ] – /u:ʀ/ “Uhr” (часы), /raus/ “raus” (вон!) и т.д. В английском языке данный звук [r] в некоторых позициях в слове звучит как ударный звук, а в некоторых позициях как фрикативный звук: /r/ – very (очень), sorry (извините) и т.д.

В азербайджанском языке фонема /z/ употребляется в основном в составах заимствованных слов. Данный звук по своей природе нехарактерен для азербайджанского языка. Поэтому такие фонемы называются фонемами с ограниченным распространением. В немецком и английском языках звук /η/, в русском и азербайджанском языках фонема /l/ являются фонемами с ограниченным распространением.

Звуки речи нельзя отделить от акта речи или речевой цепи с артикуляционной, акустической или перцептивной точек зрения. Их комплексный анализ – единственно правильный лингвистический механизм различения морфологических пограничных звуков. Критерии определения фонемы всех школ,

кроме школы классической фонетики и фонологии Ленинграда (Санкт-Петербурга), основаны на методике работы с квазиименами. «Представители этой школы в разной степени включали в сферу своих особых интересов различные аспекты изучения звукового строя. Так, «пражцы» наиболее подробно разрабатывали классификацию фонологических оппозиций, теорию нейтрализации фонологических оппозиций и теорию дифференциальных признаков; «москвичи» всегда ставили во главу угла связь фонемы с морфемой, разрабатывали теорию сильных и слабых позиций фонемы; «щербанцы», прежде всего, исследовали то, как система фонем отражается в языковом сознании носителей языка, особое внимание уделяя конститутивной функции фонемы, и первостепенное значение придавали проблемам фонологической сегментации речевого потока и функциональным основаниям отождествления фонем. Многие фонологические понятия и термины, рожденные в одной школе, усваивались и переосмыслились представителями других школ, порой изменяясь до неузнаваемости, что в условиях острых дискуссий зачастую приводило к недоразумениям. Это необходимо учитывать при рассмотрении того, как в разных школах решаются базовые проблемы фонологии, даже если решение специально не эксплицировано в работах представителей того или иного направления, но обнаруживается в исследовательской практике» [4].

Например, в азербайджанском языке такие слова как /bağ/ (сад) и /bal/ (мед) легко можно спутать, но они имеют разные смыслы благодаря таким фонемам, как /ğ/ и /l/. Другими словами, те, кто основывает свой анализ на минимальных парах, пытаются дока-

зать, что звук является фонемой, исходя из критерия различения значения фонемы. Это касается как гласных, так и согласных. Например, в азербайджанском языке для того чтобы доказать, что фонемы /a/ и /ə/ являются разными звуками их сравнивают в составе таких слов, как /lal/ (глухой) и /ləl/ (драгоценный камень). Смысловая разница в данных слов сформулирована фонемами /a/ и /ə/. В таком случае, данный факт подтверждает, что эти фонемы являются разными звуками. Также надо отметить, что в этих словах согласные под воздействием гласных меняются в качестве их произношения. В слове, где употребляется фонема /a/, наблюдается твердость согласных, а в слове, где выступает фонема /ə/ – согласные звучат мягко. Их минимальная фонетическая разница – это совпадение. Эти реалии также могут звучать как омонимы в языке.

ВЫВОДЫ

В каждом языке так много слов, что невозможно расположить их минимальными парами. Все это дает нам повод подтвердить правильность идей школы Л. Щербы, согласно которой, выделение фонемы из речевой цепи должно основываться на ее соединении с морфемой – наименьшей единицей значения.

Второй способ выделения фонем из речевого акта основан на принципе остаточных фонем, разработанном Л. Буланином [1]. Суть этого принципа состоит в том, что если одна из так называемых фонем доказывает свою самостоятельность, отделяя ее с помощью морфологической границы, то другой сегмент автоматически сохраняет свой статус.

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Методы исследования глаголов понимания в лингвистике (на основе языковых материалов английского языка) Methods of the Study of Verbs of Understanding in Linguistics (Based on the English Language Material)

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Аннотация. Изучение глаголов понимания в языковой структуре является важным вопросом для когнитивной лингвистики и для научных исследований, связанных с семантическими полями лексического уровня. Глаголы понимания в лексическом ярусе языка являются показателями когнитивного процесса освоения речи коммуникаторами и имеют широкую семантическую сферу. Центральным звеном этой сферы является слово «знать». Проанализировав формальную и семантическую валентность глаголов понимания, описав их семантико-синтаксические особенности, исследователи классифицировали их в четыре группы, определили функциональность этих глаголов по частям речи, выявили субкатегориальные признаки право- и левосторонних актанта.

Ключевые слова: глаголы понимания; когнитивная лингвистика; семантическое поле; лексическая единица; методы исследования.

Abstract. The study of verbs of understanding in the language structure is an essential issue for cognitive linguistics and scientific research related to the semantic fields of the lexical level. Verbs of understanding in the lexical tier of the language are indicators of the cognitive process of mastering speech by communicators and have a wide semantic scope. The central link in this sphere is the word "know". After analyzing the formal and semantic valency of the verbs of understanding and describing their semantic and syntactic features, the researchers classified them into four groups, determined the functionality of these verbs by parts of speech, and identified subcategorical signs of right- and left-handed actants.

Keywords: verbs of understanding; cognitive linguistic; semantic field; lexical unit; research methods.

ВВЕДЕНИЕ

В описании мировоззрения человека когнитивные глаголы играют важную роль. «Глаголы интеллектуальной деятельности являются важным материалом для исследования системных отношений в лексике, что связано с признанием их фундаментальной роли на значимых уровнях языка» [7, с. 251]. В данных глаголах наблюдается неопределенность денотата, и по данной причине в лингвистических исследованиях, анализируя глаголы понимания, лингвисты предлагают разные методы.

«Глаголы понимания можно отнести к особой группе» [5, с. 166], так как они играют существенную роль в успешной или неуспешной демонстрации общения. Ввиду неопределенности денотата глаголы этой группы представляют особый интерес для исследователей. В исследовании будут проанализированы точки зрения на выявление характеристик этих глаголов. В связи с этим внимание будет уделено взглядам авторов, избравших объектом исследования познавательные глаголы.

МЕТОДЫ И МАТЕРИАЛЫ ИССЛЕДОВАНИЯ

В исследовании основным методом выступает теоретическо-описательный и теоретическо-сопоставительный методы лингвистики. Материалом исследования, в основном, являются глаголы понимания английского языка.

РЕЗУЛЬТАТЫ ИССЛЕДОВАНИЯ

Авторы Е. Гутман и В. Лейчик, основываясь на словаре французских синонимов А. Бенака 1966 г., приняли «рациональное восприятие» как интегральный признак и приняли глагол *comprendre* в качестве основного ядра семантического поля «понимания». На основе анализа дефиниций глаголов понимания во французском языке выделяются следующие компоненты значения «понимание» [4, с. 156]:

1. Факт воздействия;
2. Наличие предмета деяния;
3. Наличие объекта деяния;
4. Реальность/нереальность объекта;
5. Физический/духовный объект;
6. Смысловое ударение (подлежащее / объект);
7. Глубина / верх.

Авторы продемонстрировали возможности изучения когнитивных глаголов посредством компонентного анализа, отражающего разделение значения на семантику. Ученый Т. Лазарис описывает лексико-семантические группы глаголов понимания на примере глаголов *understand*, *comprehend*, *realize* (понимать, постигать, реализовывать) в английском языке. Основной целью автора было проанализировать формальную и композиционную валентность глаголов данной группы и определить их семантико-синтаксические особенности. Синтаксические особенности этих глаголов изучаются на уровне специфических для этих глаголов синтаксических конструкций. Таким образом, в этих конструкциях функционирует наиболее частотный глагол понятий этой лексико-семантической группы [8].

В своей статье Т. Лазарис отмечает, что «смысловые отношения между глаголом и его актантами важны для понимания смысла предложения и для изучения семантической структуры многозначного глагола. Объект определяет характер действия» [8, с. 67].

Опираясь на мнение Н. Арутюновой о том, что «моральные (интеллектуальные, эмоциональные, волевые и др.) глаголы, определяющие процессы, происходящие в субъекте, в логике называются глаголами-интенсивами и требуют пропозитивной завершенности» [1, с. 126], он отмечает, что познавательные глаголы определяют определенные стороны интеллектуальной деятельности человека, активность и пропозициональные отношения входят в группу предикатов. «Если процесс понимания связан с определенными трудностями, то он вербализуется в языке как преодоление данных препятствий на пути движения человека к истине» [3, с. 146]. Такой же подход мы наблюдаем в исследовании Н. Каныгиной [6, с. 89].

Ученая Л. Бадмаева в своем исследовании [2] определяет понятие «понимания» как рациональное и иррациональное и на данной классификации анализирует глаголы понимания.

Специфика работы С. Сандиго-Гросса состоит в том, что исследователь не дал списка познавательных глаголов в английском языке, не указал их типы значения, не привел полевой структуры, состоящей из этих глаголов. Он начинает свою работу с обсуждения проблемы семантического поля. «Что такое поле смысла?» В поисках ответа на поставленный вопрос автор подчеркивает значение понятия, объединяющего все элементы поля и определяющего поле в целом как ключевой момент в теории разных авторов [9, с. 134]. Согласно С. Сандиго-Гроссу, для глаголов понимания важна неопределенность понятия и денотата. Используя образцы текстов для завершения своего исследования, он делит их на четыре группы, которые подразделяются по «объектам понимания». В каждом классе («ситуация», «человек», «язык», «мир») есть главный глагол, в трех из четырех классов основным глаголом является глагол *understand*, только в одном из них главным является глагол *realize*. Он пытается ответить на вопрос, что означают предложения с глаголами *comprehend*, *know*, *see*, которые находятся в одной группе с глаголом *understand*. В итоге он делает вывод, что значение «понимания» и выбор глагола зависят от разных обстоятельств и не связанных между собой такими факторами, как характер объекта понимания и содержания, которое понимается как структура (рефлексия, эмпатия, интерпретация) высказывания. Автор С. Сандиго-

Гросс соглашается с тем, что адекватное представление семантического поля «понимания» должно быть, как минимум, трехмерным. В результате важным моментом для глаголов понимания является неопределенность денотата, а также тесная связь между глаголом и его объектом значения.

В своем исследовании ученый В. Стаценко анализирует структурно-семантические и прагматические свойства глаголов *understand*, *realize* и *see* в английском языке. Автор провел подробный анализ дефиниций данных глаголов и пришел к выводу, что словари не дают основания для разграничения глаголов *understand* (понимать) и *realize* (реализовывать). «Их значение декодируется в употреблении, которое отражено в текстах» [10, с. 65]. По данным лексикографических источников английского языка описание дефиниций когнитивных глаголов показывает, что их можно разделить на ядро и периферию рассматриваемого семантического поля. Автор предполагает, что в английском языке сложные глаголы образуют семантическое поле или лексико-семантическую систему, основанную на наличии интегральных признаков этих глаголов, на основании которых их можно рассматривать как синонимический ряд. В ядро данного семантического поля можно отнести такие глаголы английского языка, как *understand*, *realize*, *see*. Другие глаголы с познавательной семантикой (*comprehend*, *conceive*, *perceive*, *apprehend*, *catch*, *grasp*, *seize* и т.д.) можно отнести к периферии семантического поля «понимание». В своем исследовании В. И. Стаценко изучает только ядерные глаголы данного семантического поля: *understand*, *realize*, *see*.

При выявлении конкретных лексико-семантических вариантов рассматриваемых глаголов в качестве описательных контекстов даются диалогические микротексты. Автор В. Стаценко отмечает, что, например, случайный выбор глагола *understand* показывает, что этот глагол в первую очередь реализует пресуппозитивное значение, то есть говорящие используют эти глаголы для понимания пресуппозиции информации. Автор изучает, в каких коммуникативных текстах эти глаголы встречаются в диалогических дискурсах.

Анализируя диалогические выражения с глаголами *realize* и *see*, В. Стаценко показывает,

что глагол *realize* реализует в диалогических текстах имплицативное и имплицативно-ситуативно-оценочное значение, а глагол *see* реализует только пресуппозитивное значение [10, с. 78-80].

Следует отметить, что познавательные глаголы в русском языкознании изучались двумя школами. В школе В. Литвиновой интеллектуальный процесс понимания и восприятия рассматриваются как неравноправные процессы в противоположном положении. Во время восприятия воспринимающий субъект и воспринимаемый объект находятся в противоположных позициях. Постижению противостоит восприятие как естественный метод объяснения. Понять – значит воспринимать объект, соединиться с ним, почувствовать его и так далее. Выделение этих интеллектуальных процессов и их лексического выражения открыло новую научную парадигму.

В школе В. Лазарева познавательные глаголы отнесены к парадигме глаголов интеллектуальных функций, различие проводится только внутри этой парадигмы. Представители этой школы применяют различные логические подходы, используя метод логической семантики, метод выделения объекта вне исследования. Статья Е. Гутмана и В. Лейчика [4] остается частным случаем, так как авторы разлагают значение слов на слоги с помощью традиционного метода (это интенсивная разбивка). Подходы, демонстрируемые в обеих школах важны, так как они акцентируют внимание на существовании двух научных парадигм, таких как понимание и восприятие.

ВЫВОДЫ

Таким образом, можно выделить четыре основных подхода в изучении понятийных (когнитивных) глаголов в современной лингвистике:

1. Методы интенсивного разделения значений слов на семантическом уровне (Е. Гутман и В. Лейчик [4]). В результате анализа словарей исследователи обнаружили некоторые новые значения слова «понимать».

2. Метод семантико-синтаксического дистрибутивного анализа (Т. Лазарис [8]). Автор проанализировал формальную и семантиче-

скую валентность данной группы глаголов и описал их семантико-синтаксические особенности. Исследователь определил функциональность этих глаголов по частям речи, выявил субкатегориальные признаки право- и левосторонних актантов (абстрагированность / конкретность, одушевленность / неодушевленность).

3. Метод дефиниции (В. Стаценко [10]). Ученый определил состав лексико-семантического компонента глаголов понимания в терминах лексико-семантических вариантов. Он описал семантико-

синтаксическую структуру предложений с участием этих глаголов с точки зрения пресуппозитивно-имплицативных отношений.

4. Дефиниционно-синонимический метод (С. Сандиго-Гросс [9]). Автор конструирует лексико-семантическое поле познавательных глаголов, выявляет их синонимический потенциал по отношению к глаголу понимать. Исследователь рассматривает семантическую среду когнитивных глаголов, выявляет четыре семантических объекта этих глаголов («ситуация», «человек», «язык», «мир»).

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Tendencies of Change of Socio-Political Lexicon in Persian and Azerbaijani Languages

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Abstract. Socio-political terms exist in all world languages and are directly related to the socio-political structure of each country. The words related to statehood, religion and political system were mentioned in sources associated with the ancient period of Persian and Azerbaijani languages. In the article, among such sources, "The Book of Dede-Gorgud", Orkhon-Yenisei" on Turkic languages, and the samples selected from the work "Shahnameh" on Persian are analyzed by the historical-comparative method.

When studying terms related to religion, it should be investigated in more detail whether these terms correctly reflect events in the socio-political life of the country they belong to, as they are subject to purposeful interventions in several cases. Considering Manichaeism, Islam, Sufism and other religious directions, which are thought to be related to Zoroastrianism and Zoroastrianism in Iran, this picture is further complicated.

In the article, medieval Persian dictionaries were also reviewed among the sources related to the Middle Ages. It was noted that words related to almost all areas of social life are included in them. The social and political situation after the Iranian Islamic Revolution and the terms that were created in connection with this situation is considered in the history of Iran. The article also contains information about using borrowed words in both languages' social and political fields. Then the place of the terms in the form of abbreviations in the speech was analyzed. In the article, the data gives grounds to say that as a result of any historical event, the most profitable sphere is linguistics. So, although the changes in other areas cause stagnation and decline in some instances, linguistics is enriched with new words. Political linguistics is also included, and the rising line of political discourse during World War I can serve as an example.

Keywords: socio-political terms; Azerbaijani language; historical-comparative method; Persian language; religious terms; middle ages sources; statehood; Iranian sources.

INTRODUCTION

Politics is not a simple system. Its foundation is based on society and humans. The economy, culture, history and geography of each community define the type and complexity of politics. Politics is explained as a science and an art form because its rules, structure, and history are studied scientifically. Because the direct support of politics is several qualities such as speed, foresight, and intelligence, it is also studied as art. As it is directly related to society, the human-centred solution to any issue becomes possible with the socio-political aspect.

In linguistics, numerous terms related to the socio-political system are often used, and their meanings are often confused. A number of socio-political terms were mentioned in ancient Turkic written monuments, such as "The Book of Dede-Gorgud", "Orkhon-Yenisei". When we analyze those words, we see that they are mostly related to titles (*xan, bək, bəylərbəyi, xatun, xanlar xanı xan // khan, bek, beylarbeyi, khatun, khanlar khani, etc.*), statehood (*divan, dövlət, qövm, nəsil // divan, state, nation, generation, etc.*) [8].

Since the earliest times in Iran, words related to the political system and social situation have been found in the monuments. As it is known,

Iran is older than its three millennia of written history. The pre-Islamic period stands on legends and myths. The most well-known and complete source that reflects three cycles (Pishdadyan, Keyaniyan and the Sasanian) is Shahnameh. One can get information about ancient mythology and the Iranian kingdom back in Shahnameh. So we come across many terms of socio-political system. The number of words of Arabic origin in work "Shahnameh" is relatively few. Part of the words of Persian heritage is not used today but generally cover a wide range of terms.

In "Shahnameh", various motive words belonging to many nations are found. Some of these words refer to China and reflect its various aspects. One of such terms is "Khagan", symbolizing "power, strength". The Chinese Khagan is a symbol of power, which means strength and power, and it is also called "Chinese faithful". A number of item names showing the power of the Chinese Khagan were also found in "Shahnameh". Among them are such words as *möhür, fildişi, taxt, qızıl, qalxan* (seal, ivory, throne, gold, and shield). Although many of these words are familiar, they are considered terms because they have socio-political content in this work. For example, the explanation of the word Chinese steel hood is as follows: "it is a military item which soldiers wore on their heads to be protected from war weapons, such as *an arrow, mace, spear* (ox, topuz, mizrag). My Iranian wrestler Rustam, preparing for battle with the Turanian army, girds his weapons. He also wears a hood made of Chinese steel on his head to protect him from weapons such as *an arrow, mace, spear* (ox, topuz, mizrag)" [3, 109].

Indeed, ancient Iranian history has not been reflected only in Shahnameh. A range of documents consists of information about the first formation period of Iran and its socio-political situation.

METHODS AND MATERIALS

Two research methods were followed in this article. Besides the historical-comparative method, the descriptive approach was also applied, and the chosen words have been analyzed within the framework of these methods. Among the studied words, there are also the words related to religion (*saslı din, din düşmәni* etc.). The interaction of faith with the socio-political situation is also reflected in the materials on the history of Iran. However, the formation of religious terms is associated with certain conditions. The author [2],

while researching the terms Akbaris and Usulis, states that these terms go back to the times when they were used and don't refer to the legislation in medieval Iran. The author also notes that considering the pressure on the religious class in Iran at those times, it becomes clear that using such terms pursues a strategic goal [2, 21]. Thus, the content of religious terms is related to socio-political structure, changes that took place in that period, and religious tendencies, including purposeful intervention in religious beliefs.

It should also be noted that before Islam, Zoroastrianism was the state religion of ancient Iran. Afterwards, Zoroastrian orthodoxy had characteristic peculiarities challenged by Mani and Mazdakites. Considering the existence of Islamic Persian Sufism, we observe a more complicated and complex system of religion and religious terms in Iran, which needs more exhaustive research.

There are words related to various groups of the socio-political lexicon in Middle-term Turkish and Iranian sources. Considered one of the primary Iranian sources of the Middle Ages, "Medieval Persian dictionaries contain words related to almost all spheres of socio-political life, but the words related to palace life and Safavid rule should be specially noted. We can refer to this group as the names, titles and nicknames given to Turkish padishahs. Although such words are the subject of research onomastic lexicon, they are of special importance for socio-political lexicon" [6, 133].

In medieval Persian dictionaries, there are numerous words with the meaning of tribal names and title names, including "yaşlı xidmətkar", "qulam", "lələ" ("old servant", "gulam", "lala") have been recorded. These words indicating kinship were used instead of negative words. In other words, these words are euphemisms and can also be called historicisms.

RESULTS AND DISCUSSION

The socio-political lexicon consists of the sum of the words related to the social structure of countries, political regimes and similar primary systems. It is one of the linguistic units that undergo the most changes. As political rules replace each other, as a result of these events, new socio-political lexical units enter the language, and the words included in a group of verbal socio-political backgrounds lose their generality. In the

Persian language, numerous such terms were left behind from the political structures of different periods. For example, the Iranian Islamic Revolution of 1979 is one such stage. In this period, terms related to the new religious system and the new content of the Republican system began to emerge and take their place in the language. The researcher of this period Ahin Tahere states that the word *reform* was never used in the Persian language literature. Instead of it, the term *islahat* was preferred. The author also compared Turkey and Iran and stated that, although the types of reforms in Turkey since the XVIII century were called in different ways, such as *tanzimat reforms*, *islahat reforms*, and others, since the XVIII century, when the thought of reform appeared in Iran, a change in meaning occurred and “enqelab – انقلاب – revolution”, “islahat – اصلاحات”, “təhəvvöl – تحول – transformation- change”, “nousazi – نوسازی – reconstruction”, “tousee- توسعه – expansion, development” “engelab – revolution – revolution” were included among the most commonly used concepts [7, 135].

Linguistics is one of the fields of science that is enriched by similar historical events. Emerging innovations related to the historical and socio-political situation appear as new words in the language. Although these events, in several cases, hurt such areas as the economy, and tourism, in most cases, they result in the enrichment of linguistics. An example of this is the emergence of many new terms in political linguistics after World War I and the completion of the formation of political discourse.

Regarding the socio-political lexicon, this lexical group covers the structure of statehood, authorities, administrative-territorial division, the socio-social form of society, party, public organizations and associations, spheres of socio-economic activity, cultural life of community, rights and obligations of citizens, the interaction between individuals, specific circumstances arising from these relations, national and revolutionary liberation movement, international relations and international associations of states, various types of political systems.

Some of the socio-political terms are borrowed terms. Some socio-political words in the Azerbaijani language are borrowed from Russian and some from Arabic-Persian languages. In addition, as in most languages, there are many socio-

political terms borrowed from European languages in the Azerbaijani and Persian languages: it should be noted that one of the subgroups of the socio-political lexicon is abbreviations. The abbreviation is word creation. Abbreviations, products of the abbreviation event, play a huge role in enriching the language's vocabulary. Lexical abbreviations cover other language words' properties [1, 42]. Abbreviations in English are often noted in Persian in explanation form. There are many examples of this:

WPC – شورای جهانی صلح

MEP – عضو پارلمان اروپا

Although the abbreviations of socio-political terms belonging to other languages are often noted in Persian in explanation form, in some convenient cases, abbreviations are also used in Persian:

وب – WWW

Along with such abbreviations, the full form of these terms can also be used in parallel:

شبکه سراسری جهانی – وب – WWW

CONCLUSIONS

Almost the same category of words is included in the socio-political lexicon in Azerbaijani and Persian languages. Religious terms are mainly related to the religious situation in the country. They are developed and formed depending on the attitude towards religion in the area where those terms are spread. In other words, political influence is the main factor in creating religious terms. Words related to state traditions form an essential part of the socio-political lexicon. Common words can sometimes be considered a term with socio-political content, depending on the processing stage and the field to which it belongs. The names of state organizations and the abbreviations denoting their names are included in the socio-political lexicon. The tendency to change terms in this group depends on the historical stage in which these terms are used. Changing state structures and political systems lead to the archaic nation of these terms or the creation of new terms, and from this point of view, the study of these terms should be carried out in the historical aspect of the stage in which they were created.

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Historical-Comparative Linguistic Analysis of the Reduction Principle in Prose Texts

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Abstract. Critical scientific issues emerge when reduction principles in the language are refined from the point of view of history and modernity. Sounds and morphological indicators do not just blindly and usually combine in the composition of words. The fact that sounds and suffixes come into contact with each other and connect in terms is a legitimate linguistic phenomenon. It is the product of many years, the specific history of which is unknown. Just as words and word combinations are the main factors for the organization of the sentence, the sentence is the main factor in the organization of the text, and they perform communicative functions in the language. When we approach words and suffixes from many linguistic categories from the prisms of historicity and modernity, the inclination to the principle of reduction as a result of historical development in the context of those words and suffixes manifests itself. It determines the dynamic character of the evolutionary process. Azerbaijanis' restoration of the omitted sound or morphological indicator in the word can be determined through its position in the word structure. It can be revealed with the help of the situation and stylistic point that determines this position. There is a long historical process of development at the basis of the tendency to reduction, and this process of growth shows that the language is more inclined toward clarity and simplicity, which are explained in the article.

Keywords: language; history; reduction principle; a tendency from complexity to simplicity.

INTRODUCTION

The principle of reduction in language appears as a result of a long evolutionary process. By following the development of the structure of any word at the language level from complexity to simplicity, we will reveal the importance of the reduction principle. For example, let's take the adjective *yengi*, which has been used in Azerbaijani since the Kitabi-Dada Gorgud epics, at least until the end of the 19 century. It is noted in the historical grammar books that the adjective *yengi* in Azerbaijani kept its old form until the middle of the 19 century and gradually became *jeni* (new) with the weakening of the consonant [q] in the composition of [n] [9; p. 74]. We have no objection to this opinion. But Azerbaijani addition is that according to the laws of the development of the Azerbaijani, the word has undergone an evolutionary path from complexity to simplicity, that is, reduction. This evolutionary process manifests itself not only in Azerbaijani but also in some of

the Turkic languages. Here, when we say the word "complex", we do not mean the type of structure of the word in the grammar books.

Or, let's take the word "tir" in the Sumerian language 5 thousand years ago, and the transfer of this word, which is currently used in the Azerbaijani in the meaning of "life", "alive", to the principle of savings, took place in various phonetic compositions. In the monuments of Orkhon, this word is used in the form of "tirig": *Mən günü diriyəm, üç yaşında atasız qaldım. (I am alive today, I was fatherless at the age of three)* [4; p. 32]. The author notes that the word "tirig" used in modern languages in the sense of "alive" (in Azerbaijani: diri) is an ancient form [5; p. 8]. In different historical periods, the word "tirig" was also used in the historical form of *teri*. Azerbaijani goal in interpreting all this is to reveal how the reduction principle manifests itself in the long process of development in the word composition.

METHODS

During the scientific research carried out in the article, analyses were carried out using historical-comparative, historical-descriptive and descriptive-comparative linguistics methods. Language materials of the Azerbaijani are used as the primary material of the research.

RESULTS AND DISCUSSION

It is also known from ancient language studies that the ellipsis of the consonant [g] at the end of the word *tirig* coincides with the end of the 13 century, as in the Azerbaijani terms *ölüg - ölü (dead)*, *çölg - çöl (desert)*, *suçik - suçi (suchi)* [4; p. 33]. Taking into account all these linguistic facts, we can show the transfer of the word *tirig* to the principle of reduction as follows: *tiri (Sumerian) tirig (in Orkhon writings) tarui (in Turkic) tiri (in Puleotoponyms) diri (in modern Azerbaijani)*. Therefore, the loss of a so-called sound due to the evolution of language is related to the tendency from complexity to simplicity, which should be evaluated as the most important indicator of reduction.

In the language of the inscriptions belonging to the ancient times of the Azerbaijani, we find the images of the word *ulu* (great) used in Azerbaijani modern literary language, *oloğ - oloq - uluğ*. Commenting on the word with the phonetic composition *oloğ - oloq - uluğ*, The author [11] shows that these words mean “the greatest of everything” [11; p. 62]. Even though these forms are not used in Azerbaijani, the term “ulu” (great), that is, a simplified, economical form of these forms, is used and means “ancient”. In our opinion, the transfer of this word to reduction was as follows: *oloğ → oloq → uluğ → ulu*.

It is known that decimal numerals are made up of the combination of cardinal numerals consisting of separate lexical units, and *səksən, doxsan* (the eighty, ninety) digits of them took the form of *səkkiz + on, doqquz + on* (eight + ten, nine + ten) in ancient times does not mean that words in appropriate positions did not take their place in simplified, released forms. It is clear from the composition and sounding of the cardinal numerals that the number ten is used by undergoing a phonetic change in the design of those words. The pronunciation is simplified in the modern forms of those numerals, and the words are shortened.

The principle of reduction in substantivized numerals manifests itself in semantic resources. For example, in the sentence *26-lar Ağcaqum çölündə güllələndilər (The 26s were shot in the Ağcaqum desert)* – the numeral 26 is a linguistic device with a specific functional value. It is used in this way due to the principle of reduction. If we solve the meaning of the substantivized numeral 26, we must list the names and surnames of those people – those who were shot, what they were doing, and why they were shot. What we mentioned, without a doubt, finds its creative solution within the framework of the micro text, and the informative aspects are implemented in the text. Substantive use of that number in the sentence structure frees the reader from physiological pain, and the reader inevitably brings 26 people to his mind in his imagination and thinking. In this regard, the author [11] correctly points out that “the human body is the Azerbaijani of the tendency to thrift. The principle of reduction in the language is a concrete manifestation of the instinct of self-preservation. It is a peculiar reaction to the over-processing of physiological tension, a process that complicates the memory trace, opposes the implementation of some functions in the brain related to the generation and perception of speech, and opposes any discomfort” [11; p. 27]. So, the word 26 manifests the names and surnames of the persons in that number in an abstract, intuitive way. First, the saving principle occurs due to the semantic ellipsis of many particular nouns. The situation with the numbers 60 and 91 used in modern Azerbaijani is the same as with the substantive number 26.

As we follow the principle of reduction on the levels of historicity and modernity, it becomes clear that a specific process of simplification has taken place in the system of pronouns in the language. In modern Azerbaijani, the word *o* indicates and expresses the third person singular and an object at particular far or near distances. In Azerbaijani, this is the only literal word spoken by a single letter with an independent and linguistic meaning. “Until the beginning of the 19 century, the pronoun *o* was used in the normal case as *ol* (“be”). However, in Azerbaijani literary language after this period, we do not find the form of the pronoun *ol* [8; p. 106]. Therefore, the dropping of the consonant [l] at the end of this pronoun in the form of *ol* (“be”) for thousands of years should be explained by the tendency of the language to reduce rather than a stylistic feature.

The author [8] shows that the reason for the phenomenon of voice drop occurring in personal and demonstrative pronouns, i.e. in the pronoun *o* ("be") is not known to us [8; p. 108]. In his research, the author [2] concluded that "there are two figurative forms of this pronoun, i.e. '*o*':*ul>ol / u>o*" [2; p. 99]. As it can be seen, both language historians and Turkologists correctly followed the transformation process of *ol* to *o* and *u*. Still, they had difficulty explaining the case of dropping the consonant [l] in the pronoun *ol*. In Azerbaijani and other Turkic languages, the change of *ol* to *o* and *u* occurred due to the tendency of the language to reduce. The use of the pronoun *o* in the form of *u* is currently also found in some dialects and accents of Azerbaijani.

In the language of the works of historical periods, the pronoun *sol* in Turkic languages is used intensively. According to [7], the pronoun *sol* is developed intensively and was formed from the components *su+ol*. As a result of the close relationship in the languages of the Turkic peoples, the pronouns *su* and *ol* have become a complete vocabulary unit (*sol*) [7; p. 102].

Dropping one of the vowels from the composition of these pronouns, which are used in parallel, is a case of the reduction principle because we can always observe such a case in Azerbaijani. When the first word ending with a vowel in Azerbaijani is combined with a second word starting with a vowel, the last vowel of the first word is lost, which is related to the tendency of the language to reduce. For example, a vowel is dropped in the words *Əliəkbər – Ələkbər, Hacığa – Hacığa* (Aliakbar-Alakbar, Hajiaga-Hajaga), and so is a vowel in the pronouns *su – ol*. From the brief explanation we have given, we conclude that *sol* was divided into its constituent parts in the evolution of the language. In some Turkish languages, it preserved its original form, *sol*.

In contrast, in others, it was completely simplified due to the tendency of the language to reduce, and we can schematize its transfer to the reduction principle as follows: *su+ol – sol – ol – o*. Apart from the final pronoun *o*, other forms are not used in Azerbaijani modern language and dialects. In Azerbaijani, the structure of the pronoun *o*, which is used as a demonstrative pronoun, was in the form of *usbu* in the ancient epoch. In the language of Azerbaijani classics until the 14-15 centuries, the intensity of use of the conditions *usbu//osbu* is observed. The author

[9] notes that in some Turkic languages, the same demonstrative pronoun is used in phonetic compositions *os//ospu* [9; p.1149-1150]. In the Azerbaijani, either *sol, sul* or its changed form *os+bu* has not been stabilized because it cannot be completely normalized. Currently, its acceptable variant "*o*" is used, and we can show this pronoun's tendency towards the reduction principle as follows: *usbu > osbu - su - so - o*.

It has been unequivocally proven in the grammar books that the demonstrative pronoun *elə* (so), which is active in modern Azerbaijani, is derived from the pronoun *öylə//söylə*, which was actively used in historical times [8; p. 114]. The *öylə* form of this demonstrative pronoun is used in almost random cases in Azerbaijani. In contrast, the *söylə* form has become archaic and left Azerbaijani vocabulary. That is, it would be correct to define the direction of transformation of reduction in the pronoun *öylə//söylə: söylə – öylə – elə*.

In Azerbaijani, the suffix *-ar,-ər* usually comes to the end of adjective roots and forms a derivative verb. In Turkology, it is assumed that this suffix is one of the variants of the suffixes *-kar, -kər, -qur, -gər,-qər* used in the ancient epoch [8; p. 131], and it has lost the first consonant of its components, and according to the reduction, it received a simple form like *-ar, -ər*. This form, which has taken shape by the reduction principle, is used actively in verbs formed by the morphological method in prose texts.

When we look at some verbs from the historical and modern aspects, it is clear that the process of moving from complexity to simplicity in the verbs created by the correction and analytical method according to the internal laws of the Azerbaijani language's evolution started from a very ancient times. For example, the old form of *idi* (was) used in Azerbaijani modern literary language was *erdi //irdi* auxiliary verbs. Still, over time, according to the reduction principle, the [r] sound dropped from the word structure, and phonetic changes took place, resulting in *-idi* (*-di, -di, -du*) in modern Azerbaijani.

Ermış//irmış forms are the ancient form of *imiş* in modern Azerbaijani. The historical development of *idi* has also been wholly related to the saving tendency.

In the modern Azerbaijani language, the suffix *-sa, -sə* is used to realize the conditional content. This morphological indicator is used in the lan-

guage of historical works – in the form of “*isər*”, and appears as a synonymous doublet of the suffix *-acaq*, *-əcək*. In historical grammar books, it is assumed that the suffix *-isər* is formed from two components (**i+sər**), and we accept this idea [8; p. 155]. The author shows that the suffix *-isər* is formed from two pieces. The first part is the conditional suffix *-ilsə* used in modern Azerbaijani language; for example, *gəlir isə – gəlirsə, almış isə – almışsa*, etc. The ancient form of this suffix is *-isər*. However, since [r], which is an aspirated vibrating sound, is not stable in Turkic languages, it gradually weakened, dropped from the end of the word and *-isər* stabilized in the form of *-sa*, *-sə*” [8; p. 155]. In our opinion, it would be correct to connect these words with the tendency of the language to the principle of reduction.

At some points in modern prose language, in cases of realization of negative content in sentences *çixa bildi* (he was able to come // to go out), *çata bildi* (he was able to reach), *görə bildi* (he was able to see) and so on, the verb *bildi* is ellipsised, according to assimilation, those sentences are used in the forms *çixammadı, çatammadı, görəmmədi* (didn't come, didn't reach, didn't see), which should be characterized as a manifestation of the reduction principle.

In Azerbaijani, from ancient times until the 19 century, the morphological indicator *-ibən*, *-ibən*, *-ubən*, *-übən*, which is a verb participle suffix, has been developed. Due to the tendency of the language to reduce, the second component of this suffix *-an*, *-ən* has been shortened to *-ib*, *-ib*, *-ub*, *-üb*. Both ancient and modern forms perform the same task in terms of meaning and function.

Since adverbs are a somewhat abstract part of speech, the tendency to reduce is evident in them. For example, in the language of Kitabi Deda Gorgud epics, words such as *çaparaq* and *qacaraq*, which indicate the manner of movement, are used as abbreviations of the suffix *çapar* + *-araq*, *qacar* + *-araq*: *Qazan bəyin qardaşı Qarağünə çapar getdi* (Kazan Bey's brother Karagune galloped away) [8; p. 164].

Compared to the modern Azerbaijani language, morphological compression is manifested in the word *çapar*, and the new adverb *çaparaq* comes to life in Azerbaijani abstract imagination. For the contemporary Azerbaijani language, the archaic *şimdi* and *qabaqcaq* and time adverbs are used in the simplified form *indi* (now) and *qabaqca* (before). The adverb *bəri* was used in the language of ancient written works in the form of

bu+əri in a complex condition. That is, the etymological structure of the word was in that form. Now its simple form is used. Therefore, a tendency to strict reduction is manifested between the word's root and the suffix. That is, significant differential differences are manifested as a result of morphological-semantic evolution. When quantitative adverbs are expressed by cardinal numerals (definite and indefinite) and various words with a sense of quantity, sometimes auxiliary terms (*kərə, dəfə, qat, qədar*, etc.) are dropped in cardinal numerals, according to the reduction that it is possible to find any number of examples of such ellipsis in the language of modern and historical works.

The ancient form of the postposition *bəri* used in the modern Azerbaijani language was *bərli*, which indicated the tense. The author [1] assumes that the postposition *bərli* is a complex word, the first component of which is a demonstrative pronoun *bu*, and the second component consists of an element that was initially an independent word and later became a suffix” [1; p. 503]. In this opinion of the Russian Turkologist, the whole reality is reflected, and in historical times, the postposition “*bərli*” was used to show the development of movement and gait from a certain point of departure, now it has completely lost its functionality in Azerbaijani. We can offer this postposition's direction of reduction tendency as follows: *bu+əri – bərli – bəri*.

It is assumed that the conjunctions with, *ilə*, *-la*, *-lə*, *-nan*, *-nən* used in Azerbaijani modern literary language are derived from the independent word *birlən*. The postposition *birlən* // *bilə* is formed from two constituent parts; that is, it was developed by the combination of the word *bir* and the suffix *-la*, which creates a verb, and the ancient verb participle suffix *-n* [8; p. 208] and expressed the meaning “together”, “in unity”.

In our opinion, the transfer of the ancient postposition *birlən* to the reduction principle took place in the following direction: *birlən – ilən – lan, lən – nan, nən – ilə -la, -lə*. Azerbaijani observations show that the latter options are more preferred in modern prose language. Regarding the postposition of *birlən* > *bilə*, synthesizing the research of [7] and other turkologists, the author [10] notes that: “The ancient Turkic postposition *birlən* > *bilə* probably came to Turkic languages through the following development path:

a) *birlən > bilən > ilən > lən*; b) *birlə > bilə > ilə > la, -lə* [10; p. 450].

The word *kim*, which acts as an interrogative pronoun, connecting, binding, and strengthening postpositions in artistic and historical materials, has performed both the function of conjunction and postposition in the form of *ki* in Azerbaijani modern literary language, except for the interrogative pronoun. For many years, the forms *kim* and *ki* were used in the language of written materials. In connection with the historical development of the Azerbaijani, a long way has passed according to the reduction principle. The element *ki* has been dropped at the end of the word.

The principle of reduction that manifests itself in the language is a manifestation of the abbreviations, contractions, and cases of sound reduction that have occurred in it for many years and centuries. In ancient times, the verb *axı* was used in the phonetic variant *axır* and expressed the same semantic content. Both variants: *axır* and *axı* mean “end of the expression”, “conclusion”, *result* content, and since the position of the consonant [r] in the Azerbaijani language is not stable, the word “axır” becomes “axı” with the ellipsis of the [r] at the end.

Conjunctions *əgərçi, əyətçi, gərçi* (if) indicating a concession began to be used in the literary language of Azerbaijan from the 14 century. From the end of the 18 century, the elements *-çi, -ci* were used in those complex forms (*əyar+çi, əgər+çi, gər+çi*) in a manner suitable for a reduction.

Working out the principle of reduction at the syntactic level of the language is one of the issues of great interest. In the written language of ancient and medieval times, we find certain features in agreement with a quantity between the sides of the first type of noun-combinations, the first side of which is made up of numbers. For example, the first type of noun-combinations which is used as *qırx namərdlər* (forty nobles) in the language of Kitabi-Deda Gorgud, *yüz min ziyalılar* (one hundred thousand intellectuals) in Khatai, *iki ələmlər* (two words) in Fuzuli, *iki əllər* (two hands) in Vagif, *iki bəylər* (two gentlemen) in Koroglu epic are used without suffixes *-lar, -lər*. From a logical point of view, such forms do not justify themselves in the modern Azerbaijani language and are considered wrong. It is also stated

in the resources related to morphology and syntax that “Combination of numbers with nouns, that is, noun combinations whose first side consists of a number, has several characteristics. First, nouns do not take a plural suffix when a specific number comes before the noun” [13; p. 24].

When we look at it from the point of view of history, we see that the first type of noun combinations is used more often in the language of Turkic-speaking ancient monuments. Taking into account the intensity of use of this type of word combination in ancient times, the author [12] writes: “This proves that the first type of word combinations is older than the second and third type of word combinations” [12; p. 169]. The author [7], speaking about the syntactic features of word combinations, shows that “the form with the relative suffix is more often used when determining: *atası oğlu, ana balası, Kazım oğlu* (father's son, mother's son, Kazim's son) [7; p. 160].

CONCLUSIONS

Our observations of the prose language materials show that the possessive case suffix falls and is saved in the third type of deterministic phrases. The first part is formed by the second person plural, as well as in the first person singular (in most cases) and the plural (in rare cases). If the combination formed in this case is similar to the second-type deterministic word combination, but in terms of content, it is considered a third-type noun combination. For example: *dağın çiçəyi - dağ çiçəyi* (flower of the mountain), *ananın südü - ana südü* (mother's milk), *ayağın tozu - ayaq tozu* (foot dust), *atanın nəfəsi - ata nəfəsi* (father's breath), etc.

It is also possible to follow the processes according to the reduction principle in sentence composition at the simple and complex levels. This is the subject of a separate large study.

Thus, the linguistic facts we have reviewed show that the language has moved from complexity to simplicity due to historical development. The manifestation of the *principle of reduction within the word occurs primarily due to the ellipsis of one or another sound* of the word.

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Social-Economic Factors that Determine the Income of Horticultural Seed Care Partner Farmers in Karang Sidemen Village, Batukliang Utara District, Central Lombok

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Abstract. One of the determinants of agricultural success is the availability of seeds to be cultivated by farmers. This is where the importance of having groups of seed breeders will later become a source of farmers' seeds. The price of kernels is relatively high and can be a source of income for farmers in addition to cultivating for consumption. The research's objective - is to see how far the process of empowering partner farmers through socio-economic factors can affect the payment of partner farmers for seed breeders. Based on the results of multiple linear regression analysis, it is known that nine independent variables have a simultaneous effect on the income of 94 %, farmer partners include selling price with a percentage of 40.24 %; total production with a rate of 32.04 %; and production costs with a ratio of 8.69 %. These results indicate that the empowerment of partner farmers in horticultural seed captive farming with related companies has good prospects huge. It can be seen that seed is one of the most vital inputs that can affect the success of a plant's productivity, so excellent sources are needed.

Keywords: partner; income; socio-economic.

INTRODUCTION

Agriculture is an activity with a broad scope, ranging from cultivation to marketing and processing of products, on and off the farm, to implement agricultural activities, of course, to get results and profits. The agricultural sector is one of the sectors of economic strength where this sector can absorb a lot of labour and produce basic needs for the community. The progress of this sector is very dependent on how to manage the agricultural resources that are owned as well as possible.

One of the determinants of agricultural success is the availability of seeds to be cultivated by farmers. This is where the importance of having groups of seed breeders will later become a source of farmers' seeds. The price of kernels is relatively high and can be a source of income for farmers in addition to cultivating for consumption. The application of agricultural technology uses a group approach, including the potential development program for seed breeders. According to [1] the organisation is a social unit that is deliberately formed with full consideration to

achieve specific goals. A group is a collection of two or more people living together. There is a reciprocal relationship and mutual influence on awareness of having a standard plan consisting of social groups and task groups [2–5]. According to [6], farmer groups play a role as a learning forum, a forum for collaboration, an organisation forum, a farming production unit, and a unit responding to technological performance feedback. The role of farmer groups and seed breeders is highly expected in implementing the preparation of regional seed reserves.

Meanwhile, not many farmers are doing seed breeding business, even though the seed breeding business can provide more significant profits. The lack of farmers and farmer groups as seed breeders is constrained by socio-economic factors. Farming activities and good cultivation management, marketing of products, and other businesses are strongly influenced by socio-economic factors inherent in farmers. Socio-economic is the position or position of a person in a community group, which is determined by the type of economic activity, education and income.

Several factors can determine the high and low socio-economic conditions of a person in a society public, namely (1) level of education, (2) type of work, (5) place of residence, (6) ownership of wealth, 7) position in the organisation, (8) economic activity. Therefore, it is necessary to see to what extent the process of empowering partner farmers through socio-economic factors can influence the income of partner farmers for seed breeders.

Literature review

Definition of Partnership. The definition of partnership, according to [7], is business cooperation between Small and Medium Enterprises or Large Enterprises accompanied by guidance and development by Medium or Large Enterprises by demonstrating the principles of mutual need, mutual strengthening, and mutual benefit.

Partnership Model. The business partnership model aims to cultivate partner groups in agribusiness-oriented agricultural development. To further improve business partnerships, assessing the level of business partnership relationships is necessary to identify problems and development opportunities [8].

According to [9], the partnership can be done in various ways, namely through models in the collaboration itself. The partnership models are divided into:

(a) Pseudo partnership (quasi partnership). An alliance occurs between two or more parties but does not cooperate in a balanced way. One party does not necessarily understand the meaning of collaboration and for what purpose it was all carried out and agreed upon. Both parties and more feel it is important to cooperate. Still, the partnering parties do not necessarily understand the substance being fought for and the benefits.

(b) Mutualism partnership (mutualistic partnership). They are departing from an understanding of the importance of partnership. Two organisations or groups with the same or different statuses cooperate. Cross-benefits between the parties who collaborate can be obtained so that they support each other simultaneously.

(c) Conjugation partnership (partnership through fusion or development). It is a partnership that is analogous to a paramecium. Two paramecia perform conjunctions to get energy, separate from each other, and further divide

themselves. Starting from this analogy, an organisation or group, individuals with weaknesses in doing business or activities can partner with this model.

Seed Breeding. Author [10] stated that seed breeding is an effort to produce superior seeds as source seeds and spread seeds that will be used to create unique varieties. In seed captivity, the source seed used for planting seed production must be one grade higher than the seed to be produced. To produce BD class seeds (essential seeds): the source seeds must be in BS class (type seeds); the source comes from critical seeds or breeders. Meanwhile, the head of BR class seeds (spread seeds) comes from the main, essential seeds or breeder seeds.

One of the efforts to increase productivity and yield quality is through the use of certified superior varieties. For this reason, the government continues to strive so that the use of certified excellent varieties seeds increases yearly. In captivity, if other types live in the seed variety itself, cleaning must be carried out on these varieties so that the purity of the seeds can be maintained. Further processes of seedling are treatment, packaging, which requires materials that can keep the moisture content of the sources themselves, and storage. This storage will later increase production costs which affect the income of rice seed breeders and the quality of the rice seeds themselves [11] as a seed breeder farmer is not easy. The farmer must meet the requirements in the seed breeding business.

For the seeds to be distributed according to the target, it is necessary to pay attention to the following matters [12]:

(1) The implementation of seed breeding must have arable land, knowledge, skills and security, and seed processing and storage facilities.

(2) Locations are easily accessible by vehicles and free from other plants that can hinder the captive area.

(3) The captive area must be adjusted to the needs of the seeds to be distributed.

(4) Seeds must be selected as primary seeds from superior varieties because they are clean and have high growing power to the nature of the parent.

(5) The preferred varieties of rice seeds are varieties that have high production power (VPT) and varieties of medium production (VPS).

Definition of Socio-Economic. According to [13], socio-economic status is a person's position in society to other people regarding the social environment, achievements, and rights and obligations to resources. Author [13] states that the main components of the socio-economic position include a measure of wealth, a measure of power, a measure of honour, and a measure of knowledge. Economic conditions play an essential role in the education of a child. According to [14] the part of economic conditions in children's education holds a critical position.

Factors Affecting Socio-Economic Conditions. According to [15] socio-economic status is seen or measured from parents' occupations, income and wealth, parents' education level, home and location conditions, relationships and social activities. The following is an explanation:

1) Education level. The meaning of education, according to [16] is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious, spiritual strength, self-control, personality, intelligence, noble character, and good skills needed by himself, society, nation and state.

2) Parents' income. According to [17] income is the amount of income received by residents for their work performance during a certain period, either daily, weekly, monthly or yearly. Income is

the total income (money and not money) of a person or a household during a specific period. According to [18], income is money received by a person and company in the form of salaries, wages, rent, and profits, including various benefits, such as health and pensions.

METHODS

The method used in the study of the extent to which social engineering results have an influence on farmers' income is carried out using secondary data from one of the seed breeder farming studies with research data collection techniques from several research journals, as well as a test study on farmers' income in Karang Sidemen Village, Batukliang Utara District, Central Lombok Regency. The tool used to analyse is the SPSS V26 application using multiple linear regression analysis.

RESULTS AND DISCUSSION

Based on results of multiple linear regression analysis (Table), it is known that the R^2 value is 0.943, which indicates that the nine independent variables of socio-economic factors have an influence of 94.3% on the income of horticultural seed breeders. In contrast, other factors influence the remaining 5.7%.

Table 1 – Results of Multiple Linear Regression Analysis of Farmers' Incomes for Horticultural Seed Breeders in Karang Sidemen Village, Batukliang Utara District, Central Lombok

Independent Variable	Regression Coefficient	t-count	t-table	R ²	F-Count	F-table
Age (X1)	0.168	1.088	2.042	0.943	54.688	2.20
Experience (X2)	-0.134	-0.642				
Land Area (X3)	-9,195	-1.248				
Total Production (X4)	0.479	9.381				
Production Cost (X5)	-1,289	-2.546				
Number of Dependents (X6)	-0.175	-0.343				
Selling Price (X7)	36,860	11.782				
Length of Cooperation (X8)	0.143	0.636				
Education Last (X9)	1.925	1.609				
Constant	-24,562	-3.807				

The data shows that the F-count value (54.688) > F-table (2.20) which indicates that nine independent variables have a simultaneous/joint effect on the dependent variable or the nine independent variables have a collective impact on the income of partner farmers. In other words,

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9$$

94.3% of the payment of horticultural seed breeders can be influenced by the nine independent variables. The following is the analysis of multiple linear regression data so that the value of each variable is obtained, namely:

$$Y = -24,562 + 0,168 X1 - 0,134 X2 - 9,195 X3 + 0,479 X4 - 1,289 X5 - 0,175 X6 + 36,860 X7 + 0,143 X8 + 1,925 X9$$

The effect of each independent variable on the dependent variable on the income of horticultural seed breeder partner farmers in Karang Sidemen Village, Batukliang Utara District, Central Lombok, according to the magnitude of the t-count can be explained as follows.

Age (X1). The variable age of seed breeders has a positive regression coefficient. The regression coefficient obtained is 0.168, which means that every 1-year addition of the age of the seed breeder farmer will increase the farmer's income by Rp. 168,000 assuming other variables are fixed. Based on the results of statistical tests, it is known that t-count (1.088) < t-table (2.042) indicates that the age factor of the farmer has no significant effect on the income of the farmer partners of seed breeders in Karang Sidemen Village. Increasing age will increase the income of partner farmers because more knowledge and skills are known beforehand. However, the older the farmer does not guarantee that the farmer has the knowledge and skills.

Experience (X2). Variable experience of seed breeder farmers has a negative regression coefficient. The regression coefficient obtained is -0.134, which means that every additional year of experience of seed breeder farmers will reduce farmers' income by Rp. 134,000, assuming other variables remain. Based on the results of statistical tests, it is known that t-count (0.642) < t-table (2.042) indicates that the experience of farmers has no significant effect on the income of farmer partner farmers in Karang Sidemen Village. The length of experience gained from seed captive farming does not guarantee that it can increase farmers' income because it is caused by education related to the knowledge and skills received to increase the income of partner farmers.

Land Area (X3). The variable land area of seed breeder farmers has a negative regression coefficient. The regression coefficient obtained is -9,195, which means that for every additional 1 ha of land area for seed breeders, it will reduce farmers' income by Rp. 9,195,000, assuming other variables remain. Based on the results of statistical tests, it is known that t-count (1.248) < t-table (2.042) indicates that the farmer's land area has no significant effect on the income of seed-breeding partner farmers in Karang Sidemen Village. If the land area is low, the partner farmers'

income could be high because the quality produced is good.

Total Production (X4). The variable number of seed breeders' production has a positive regression coefficient. The regression coefficient obtained is 0.479, which means that every additional 1 kg of the production of seed breeders will increase farmers' income by Rp. 479,000, assuming other variables remain. Based on the results of statistical tests, it is known that t-count (9.381) > t-table (2.042) indicates that the number of farmers' production has a significant effect on the income of seed-breeding partner's farmers in Karang Sidemen Village. The amount of output produced by partner farmers can affect the payment of partner farmers because the higher the number of products made, the higher the income received by partner farmers.

Production Cost (X5). The variable cost of production of seed breeders has a negative regression coefficient. The regression coefficient obtained is -1,289, which means that every additional 1 million production costs for seed breeders will reduce farmers' income by Rp. 1,289,000, assuming other variables remain. The results of the statistical test are known to be t-count (2.546) > t-table (2.042), which indicates that the farmer's production cost factor has a significant effect on the income of the farmer partners of seed breeders in Karang Sidemen Village. This shows that the expenditure of production costs by partner farmers must be managed to a minimum so that the income generated can increase so that production costs significantly affect the payment of partner farmers.

Number of Dependents (X6). The variable number of dependents of seed breeders has a negative regression coefficient. The regression coefficient obtained is -0.175, which means that each additional person in the number of dependents of the seed breeder farmer will reduce the farmer's income by Rp. 175,000 assuming other variables remain. Based on the results of statistical tests, it is known that t-count (0.343) < t-table (2.042) indicates that the number of dependents of farmers has no significant effect on the income of seed-breeding partner's farmers in Karang Sidemen Village. The addition of the number of dependents can affect the payment of partner farmers because they incur more costs so that

their income is reduced. However, increasing the number of dependents of partner farmers if they are in their productive period will affect the income of partner farmers so that they can improve their revenue. Therefore, it can be said that the number of dependents has no significant effect on the payment of partner farmers.

Selling Price (X7). The variable selling price of the production of seed breeders has a positive regression coefficient. The regression coefficient obtained is 36,860, which means that every additional 1 million selling price of seed breeder farmers will increase farmers' income by Rp. 36,860,000, assuming other variables remain. Based on the results of statistical tests, it is known that $t\text{-count} (11.782) > t\text{-table} (2.042)$ indicates that the selling price factor of farmers has a significant effect on the income of farmer partners of seed breeders in Karang Sidemen Village. This is because the guaranteed selling price provided by the partner company provides benefits for partner farmers so that partner farmers do not need to worry about their income as long as the product produced is by the standards of the partner company.

Length of Cooperation (X8). The variable length of collaboration between seed breeders has a positive regression coefficient. The regression coefficient obtained is 0.143, which means that every additional year of cooperation between seed breeders and other parties will increase farmers' income by Rp. 143,000 assuming other variables remain. Based on the results of statistical tests, it is known that $t\text{-count} (0.636) < t\text{-table} (2.042)$ indicates that the length of cooperation between farmers has no significant effect on the income of seed-breeding partner farmers in Karang Sidemen Village. The association's size can increase

revenue because of the transfer of knowledge and skills from partner companies to partner farmers.

Last Education (X9). The previous education variable of seed breeder farmers has a positive regression coefficient. The regression coefficient obtained is 1.925, which means that every additional education level of the seed breeder farmer will increase the farmer's income by Rp. 1,925,000, assuming other variables remain. Based on the results of statistical tests, it is known that $t\text{-count} (1.609) < t\text{-table} (2.042)$, which indicates that the last education factor of farmers has no significant effect on the income of farmer partner farmers in Karang Sidemen Village. As with partner farmers, they take high formal education, which causes their knowledge and skills to be high enough to affect their income.

CONCLUSIONS

From the results of the research above, it can be concluded that to determine the process of community empowerment, especially for partner farmers with related companies. Nine variables have a joint effect on the income of horticultural seed breeder partner farmers of 94.3%, where there are three variables independent factors that have a major influence on the income of partner farmers of horticultural seed breeders, including the selling price factor with a percentage of 40.24%; total production with a percentage of 32.04%; and production costs with a percentage of 8.69%. These results indicate that the empowerment of partner farmers who cultivate horticultural seeds has extensive prospects.

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Integration of Sorghum, Porang and Cow Livestock as an Effort to Increase Farmers' Income and Soil Quality in Dry Land

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Abstract. The dry land farming system is an agricultural cultivation practice dependent on climatic factors, so it is easily degraded if managed inappropriately. Degradation will cause a decrease in soil quality, which has an impact on decreasing land productivity and farmers' income. One of the efforts that can be made to overcome these problems is the application of an integrated farming system (Integrated Farming System) for crops and livestock, namely the integration of sorghum, porang, and cattle. The main goal is to reduce the risk of crop failure because dependence on a commodity can be avoided and can save production costs.

Keywords: integrated farming system; dryland; sorghum; porang.

INTRODUCTION

The dry land farming system is an agricultural cultivation practice dependent on climatic factors, so it is easily degraded if managed inappropriately. Soil degradation in dryland agricultural ecosystems is generally caused by natural elements such as erosion and management factors such as conventional farming systems, deforestation or deforestation, and traditional farming patterns. Degradation will impact decreasing dryland productivity because it is almost always followed by a decrease in soil organic C-stores [3].

One practice that can be applied in the dry land to increase land productivity while also maintaining soil quality is integrated farming practices. Integrated farming (Integrated Farming System) is an agricultural system that incorporates the activities of the farm sub-sector of crops and livestock to increase the efficiency and productivity of resources (land, humans, and other growth factors), independence and welfare of farmers in a sustainable manner [1]. Integrated agriculture can reduce the risk of crop failure because dependence on a commodity can be avoided and can save production costs.

An integrated crop and livestock farming system is an agricultural system characterised by a close relationship between plant and livestock components in farming activity. Livestock can play a role in a biological industry, as well as being able to increase meat production and provide compost [9], as well as environmentally friendly organic fertilisers.

Integrating sorghum and porang with cattle is one example of an integrated crop and livestock farming system that can be applied on dry land. Plants combined with cattle can utilise by-products and by-products of plants for animal feed. On the other hand, cattle can provide raw materials for organic fertilisers as a source of nutrients needed by plants, such as manure and bio urine, so that indirectly they can improve soil quality on dry land.

Efforts can be made to increase the yield of sorghum and porang both in terms of quality and quantity, one of which is using fertilisers. So far, farmers have mostly used inorganic fertilisers such as urea or NPK as a source of nutrients for their plants. If this is done continuously, without proper rules and doses, it will hurt the environ-

ment. The utilisation of cattle waste, both manure and urine, is a source of organic fertiliser for sorghum and porang plants that do not require high costs. Porang stems and leaves after a dormant period can also be used as green manure, while sorghum leaf trimmings can be used for animal feed. In addition, the biomass of sorghum plants, both stems, bagasse (cellulose), and seeds (starch), can be used as raw material for sugar [5]. The author [13] reported that sweet sorghum stalk sap's average Brix sugar content was 11%. The author [10] said that all components of sorghum biomass could be used as raw materials for ethanol, food, and feed, namely from:

- a) the yield of 4-6 tons/ha of seeds, 3.6 tons of starch, or 1,800 litres of ethanol per ha can be produced;
- b) stems it can produce 25 tons/ha of sap, which will produce 2,300 litres of ethanol/ha;
- c) leaves can produce 42.4 tons/ha of biomass.

METHODS

The materials used in the preparation of this article are data from relevant agencies and agencies, especially the development of porang plant production and publications in the form of books and scientific papers published in international and national journals and other information related to integrated farming systems in dry land from various sources, analysed descriptively and then poured in critical writing.

RESULTS AND DISCUSSION

Integrated Farming System. Definition and Concept. An integrated farming system is an agricultural system that incorporates the activities of the agricultural, crop, livestock, and fish sub-sectors to increase the efficiency and productivity of resources (land, human, and other growth factors) for the independence and welfare of farmers in a sustainable manner [1]. An integrated farming system manages crops, livestock and fish within their environment to produce an optimal product and tends to be closed to external inputs [6].

An integrated crop and livestock farming system is an agricultural system characterised by a close relationship between plant and livestock components in farming activity. Integrated agriculture

can reduce the risk of crop failure because dependence on a commodity can be avoided and saves production costs.

The author [11] states that the applied integrated farming system concept will produce F4, namely:

F1 (food) is a source of food for humans such as rice, corn, soybeans, beans, or even sorghum and porang, which are potential national commodities (plant products); meat, milk, eggs (livestock products)

F2 (feed) is animal feed, including ruminants (cows, goats, buffalo, rabbits), poultry (chickens, ducks, geese, etc.); freshwater cultured fish feed

F3 (fuel) energy will be produced in various forms ranging from heat energy (biogas) for domestic needs

F4 (fertiliser), the remaining agricultural products through decomposers and pyrolysis, will produce compost with various nutrients and relatively high C-organic content.

Principles and Characteristics of Integrated Agriculture. Several principles that must be considered for the integration of integrated farming systems, according to [2], are:

1. Agroecosystems that have high diversity to provide guarantees for farmers in a sustainable manner
2. Functional diversity is needed that can be achieved by combining plants and animals that have complementary properties and are related in synergistic and positive interactions, and not only improved stability but the productivity of agricultural systems with low inputs
3. Determine the combination of plants, animals and inputs that lead to high productivity, production security and resource conservation by limited land, labour, and capital.

The characteristics that can be seen in the integrated farming system, according to [2], are:

1. Comprehensive and comprehensive agricultural management.
2. Oriented to productivity, efficiency, sustainability, and socially acceptable and economically profitable.
3. An independent system with a LIESA (Low External Input Sustainable Agriculture) system that can run well without dependence from outside the system.

4) The system can be measured and evaluated at each stage.

Sorghum Plant. Sorghum is a cereal crop that has the potential to be developed in dry land because it has wide adaptability, is drought resistant, and needs less water than corn or wheat [13]. Several factors that make sorghum more drought resistant are:

1. Roots are sturdy and deep and can form secondary roots when environmental conditions, such as lack of water, are not favourable. In situations of excess water, sorghum can develop air roots that come out of the soil, increasing oxygen supply. In addition, the endodermis and silica layer in the root endodermis prevent the roots from rotting quickly due to waterlogging.

2. The endodermis of the leaves contains silica and a waxy coating to reduce water evaporation due to high temperatures and sunlight, as well as in drought stress conditions.

3. Has a dormant nature in arid environmental conditions and can grow back when ecological conditions are favourable.

4. Adaptive to extreme environmental conditions and more competitive with weeds than corn and legumes.

The results of the sorghum crop can be used to meet various needs such as food, animal feed, and energy sources. As a food ingredient, sorghum has a higher nutritional value than rice, corn and cassava. Another advantage is that it has a very high swelling power and is easily soluble in water, so these two properties are indispensable in manufacturing flour-based food products. In addition, sorghum waste such as leaves and stems can be used as animal feed, especially for cattle. The potential for stems and leaves of sorghum can reach 30-40 tons/ha wet weight. The author [10] reported that the leaves could produce 42.4 tons/ha of biomass.

Porang plant (*Amorphophallus muelleri*).

Porang (*Amorphophallus muelleri*) is a tuber-producing plant currently popular among farmers, which has two life cycles and a dormant period. The two life cycles of porang plants are the vegetative and generative cycles. The vegetative cycle begins in the rainy season, starting with shoot growth, roots growing on shoots above the tubers, followed by pseudo stems and leaves. In the dry season, plants experience a dormant period marked by pseudo stems and dry leaves for

5-6 months. If the next rainy season arrives, the porang plants, which had experienced a vegetative and dormant period, will enter the vegetative or generative cycle. When entering the vegetative cycle, porang plants will grow stems and leaves, but if they undergo a productive cycle, flowers will come out from the tubers and have no leaves [6].

Porang plants benefit from having more diverse tubers than other tubers because they can be used as an alternative to food, mainly because they have a reasonably high glucomannan content [12]. Porang glucomannan content is the highest compared to other tuber plants. The presence of glucomannan makes the porang plant not only a food ingredient. Still, it can be used in the non-food industry as a raw material for paper, textiles, adhesives, celluloid tape, paint, harmful film materials, cosmetics, and cleaners [4]. In addition, glucomannan can form positive effects in the health sector, including reducing the risk of cancer, weight, cholesterol, and constipation [8].

The role of various tuber crops as indicators of the 2020-2024 Medium Term Development Plan causes porang to be one of the potential national commodities.

Benefits of Integration of Sorghum, Porang, and Cattle on Dry Land.

The application of an integrated farming system, namely the integration of sorghum, porang, and cattle in a dry land, has enormous potential and benefits, not only for food security but can increase farmers' income while maintaining and improving soil quality in dry ground.

Soil Quality. Naturally, the organic matter content in dry land tends to decrease due to the topography, which is primarily sloping and hilly. The development of sorghum in dry land must be followed by applying organic matter, which improves the soil's physical, chemical, and biological properties. In addition, organic matter is needed for optimal plant growth because it can be a source of nutrients for plants.

To ensure the availability of organic matter sustainably in the dry land, the development of sorghum integrated with porang and cattle is one of the integrated farming systems that can be developed. This is because cow waste has a relatively higher organic matter than other livestock. In addition, the presence of residual products in the form of dormant porang stems and leaves

will increase the supply of organic matter. In contrast, the biomass produced from sorghum is an animal feed ingredient with high nutritional value, so the development of sorghum will significantly support the development of cattle in dry land faced with limited feed.

Land Productivity. Land productivity is the potential of land in farming to produce at a certain production level and unit area, such as the achievable production level per hectare. However, according to [7], land productivity in an integrated farming system can be measured based on economic and non-economic outcomes. The economic results obtained in this integration can be calculated from sorghum crops (seeds, stem juice, sorghum sugar), porang plants (froots and tubers), and cattle. Meanwhile, non-economic products such as cow dung or urine and remaining dormant porang biomass can be used as organic fertilisers that can reduce chemical fertilisers. Sorghum biomass in leaf trimmings can be used as animal feed. Therefore,

Land Use Efficiency. Applying an integrated farming model for sorghum and porang can increase land use efficiency. Cropping by intercropping will undoubtedly be more efficient in terms of space and light utilisation because the space between rows of sorghum plants can be planted with porang. The author [7] showed that the more intercropping plants planted between the

main crops, the more efficient their utilisation would be compared to monoculture plantings.

Thus, the development of sorghum which is integrated with porang and cattle, can not only generate economic value obtained from products produced from the sorghum plant (seeds, flour, other derivative products), porang (tubers, froots, spores, and other products). Derivatives and cattle products can also potentially improve soil fertility in dry land by using livestock waste and porang waste products like stems and leaves as organic fertiliser.

CONCLUSIONS

The application of an integrated farming system in dry land, through the integration of sorghum, porang, and cattle, can be used as an alternative to increase farmers' income and improve soil quality. Developing integrated sorghum plants with porang and cattle can increase farmers' income through the economic value obtained from diversified products produced from sorghum plants (seeds, flour, and other derivative products) and porang (tubers, froots, spores, and their derivative products), and cattle products. The utilisation of livestock waste and also porang waste products in the form of stems and leaves as organic fertiliser can reduce farming costs and chemical fertilisers to maintain and improve soil fertility in a dry land.

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Ntb's Potential as a Sorghum Producer for Alternative Food and Export Commodities

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Abstract. The area of sorghum planted in NTB Province is currently around 650 ha, with details of Bima Regency covering 250 ha, Bima City covering 250 ha, Sumbawa Regency covering 150 ha and West Sumbawa Regency 10 Ha (Kementan RI, 2021). Participation of farmers in sorghum farming, farmers tend to cultivate without tillage and intensive care. The level of technology adoption tends to be low, and Government support for sorghum cultivation is also standard. The Regional Government focuses on rice and corn cultivation through the Central Government program. In the end, a low public perception of sorghum cultivation was formed. The cultivation of Sorghum in NTB aims to improve farmers' welfare by cultivating alternative food crops with high economic value, becoming one of the alternative food crops and also a leading export commodity. The method used in this study is a literature study of several scientific articles, national and international journals and other sources, which were analyzed descriptively. Based on the results of this literature review, the development of Sorghum in NTB with a relatively wide dry land condition can potentially make NTB one of the producers of sorghum with export quality. This condition is supported by the Astra Prosperous Village Program, which has exported several processed sorghum products to various countries. Several countries, such as Timor Leste and Malaysia with a total export value of hundreds of millions of rupiah. The limited use of land for sorghum development is an obstacle and a challenge for sorghum productivity in NTB.

Keywords: sorghum; alternative food; export commodity.

INTRODUCTION

The need for food, especially rice, as the world's leading food ingredient, even in Indonesia, is increasing every year in line with the rapid increase in population. In 2025, Indonesia's population is predicted to reach approximately 300 million people, which will require vast amounts of food. In 2014 alone, the Indonesian government targeted rice production of 75.7 million tons of dry-milled unhulled rice [1].

At this time, the increase in national rice production is highly dependent on lowland rice. In contrast, the area of rice fields tends to continue to shrink due to the conversion of land use for non-agricultural businesses. This condition can make it difficult for Indonesia to meet its food needs, especially rice, independently if it only relies on production in lowland rice fields. As an anticipatory step, there must be an alternative that must be done to overcome future problems, one of

which is by increasing the productivity of carbohydrate-producing plants other than rice as the main non-rice food source and utilizing existing land and maximizing other lands.

Indonesia has enormous potential to produce plants that produce carbohydrates or sugar from plants that can be used as a primary food source. The diversity of plant species that have the potential as the main food source thrives and is widespread in Indonesia, namely in the form of grain crops (rice, corn, sorghum and wheat), root crops (cassava, sweet potato, potato and arrowroot), as well as other crops (sugar cane, sweet sorghum, coconut, and sugar palm).

Sorghum (*Sorghum bicolor L.*) is a dry land food crop with great potential if developed in Indonesia, especially on dry land. Sorghum can be used as a food source for producing carbohydrates instead of rice, animal feed and bioenergy (bioethanol), as well as being able to adapt to marginal

land conditions and requiring relatively more minor water (more resistant to drought than other food crops). Sorghum can grow well on marginal lands because of its tolerance to high temperatures and drought. Sorghum is also considered one of the most successful local food crops grown in dry climates [2].

Currently, sorghum is a cereal commodity that Indonesian people have not widely consumed, even though the nutritional value of sorghum is not inferior to rice. Sorghum contains 8-12% protein equivalent to wheat or higher than 6-10% rice, and 2-6% fat content, higher than 0.5-1.5% rice [3]. Sorghum seeds also contain three types of carbohydrates, namely, starch, dissolved sugars, and fibre. The dissolved sugar content in sorghum consists of sucrose, glucose, fructose and maltose. Sorghum contains insoluble or crude dietary fibre, 6.5–7.9% and 1.1–1.23%, respectively.

To several studies in the field, sorghum can be a potential food commodity that can be developed to support food diversification programs in Indonesia. The obstacles in the area that occur during the development of sorghum farming at the farmer level are the exploitation that is still not optimal. It is necessary to manage a comprehensive (holistic) sorghum production system concerning the area and the value of comparative and competitive advantages of sorghum compared to other food crops [4, 5]. Optimizing the development of large-scale sorghum production will lead to land use competition with other commodities. It can be directed at marginal and non-productive lands, widely spread in Indonesia's central and eastern regions. Sorghum can be developed as a staple food supplementation of rice and a component of the feed supply [6].

Production of food crops in West Nusa Tenggara in 2021 for main food crops: paddy 1,432,460 tons, corn and soybeans at 1,085,009 tons. Meanwhile, the first sorghum harvest in 2021 is still relatively low at 70 tons from the 14 ha harvested area belonging to the Bima City Honest Farmers Group. This data shows the opportunity for developing sorghum as a source of food, fuel and fodder in NTB. The potential of dry land owned by the vast province of NTB reached 1.84 million hectares [7].

The area of sorghum planted in NTB Province is currently around 650 ha, with details of Bima Regency covering 250 ha, Bima City covering 250 ha, Sumbawa Regency covering 150 ha and West

Sumbawa Regency 10 Ha. Participation of farmers in sorghum farming, farmers tend to cultivate without tillage and intensive care. The level of technology adoption tends to be low, and Government support for sorghum cultivation is also standard. The local government currently focuses on developing rice and corn cultivation per the central government's program. Thus, a low public perception of sorghum cultivation is formed [8].

The existing agronomic conditions in NTB for the development of sorghum can support food substitution to increase the production of sorghum as a leading commodity and excellent export and alternative food in a promising future. The purpose of this paper is to conduct a study on the strategy of developing sorghum plants in West Nusa Tenggara through a literature study.

METHODS

The material used in preparing this article is data from relevant agencies, including the Department of Agriculture and Plantation of the Province of West Nusa Tenggara, the Central Bureau of Statistics and other relevant agencies, especially the development of sorghum production. Several publications are also used in this paper, in the form of books and scientific articles published in international and national journals and other information related to the sorghum plant. Data from various sources is then analyzed descriptively.

RESULTS AND DISCUSSION

Sorghum plants have the same growth pattern as maize, but the time interval between growth stages and the number of leaves that develop can differ. So the time it takes to reach each stage of development depends on the variety and the environment in which it grows. The environmental factors include soil moisture and fertility, pests and diseases, abiotic stresses, plant populations, and weed competition. Sorghum plant growth can be grouped into three stages: vegetative, reproductive, seed formation and physiological maturity.

Sorghum is one type of staple food with a nutritional content that is not inferior to rice, so sorghum plants have great potential to be cultivated and developed commercially because they have wide adaptability [9]. Sorghum has high produc-

tivity, is resistant to plant pests and diseases and is more resistant to marginal conditions such as drought, salinity, and acid soil [10].

Sorghum plants can grow well on various soil types [11]. Soil texture is closely related to the availability of groundwater for plants. The author [12] stated that dry land in North Lombok Regency has soil made of pumice as the parent material. The physical properties of pumice parent soil related to the soil environment that supports plant growth include high soil porosity, low water-holding capacity, high water-passing rate, and low aggregate stability [12].

Sorghum (Sorghum bicolor L.) for food diversification. Indonesia needs to develop various potential plants to support national food security through a food diversification program, including in the West Nusa Tenggara region. In Indonesia, one carbohydrate-producing plant, apart from rice and corn, has the potential to become an alternative material in food diversification with great potential, which is Sorghum (*Sorghum bicolor L.*). Sorghum is suitable for food diversification because its seeds contain relatively high carbohydrates as the primary food source and have protein, calcium, minerals and vitamins that are not inferior to rice and corn (Table 1).

Table 1 – Comparison of nutrients in various foodstuffs (per 100 grams of edible parts) [13]

Commodity	Calories (cal)	Carbohydrates (gr)	Protein (g)	Fat (g)	Calcium (mg)	Phosphorus (mg)	Iron (mg)	Vitamin B1 (mg)
Sorghum	332	73	11	3.3	28	287	5.4	0.38
Rice	360	78.9	6.8	0.7	6	140	1.8	0.41
Corn	361	72.4	8.7	4.5	9	380	4.6	0.38
Wheat	365	77.3	8.9	1.3	16	106	1.2	0.41

In developing countries, sorghum is cultivated mainly as food and alcoholic beverages or for traditional ceremonies. An alcoholic beverage made from sorghum seeds can be beer derived from fermented seeds after germination. In developed countries, sorghum stems or seeds are used as animal feed. When given as animal feed, this sorghum plant's stems can accelerate the livestock's fattening - especially sweet sorghum. The stems are used as an ingredient for sugar and have a higher sugar content than sugar cane. Sorghum is cultivated in Southern Europe, North America, Central America and South Asia. The Sorghum bicolor L. moench species is the most widely grown among the *Sorghum bicolor L.* Moench species. The morphology of the sorghum plant includes roots, stems, leaves, shoots, flowers, and seeds. In addition to food, sorghum can also be used as fodder for poultry (seeds) and ruminants (stems and leaves) [14].

Improving Dryland Productivity. Indonesia has vast agricultural land and arid land. However, not all land is classified as fertile and suitable for food crop cultivation. Most of the land is classified as marginal. The most dominant marginal land is land that is often hit by drought (drought-prone areas) in the long term, acid soil (acid soil), and land with high salt content (saline soil). Many efforts have been made to increase the productivi-

ty of marginal lands by finding suitable crops, such as sorghum, which is highly resistant to extreme conditions such as drought.

Indonesian farmers have long known sorghum, especially in Java, NTB and NTT, but its cultivation and development are still shallow and limited. Sorghum has a vast and prospective potential to be developed in line with efforts to increase marginal land productivity because sorghum has wide adaptability and requires relatively little water for its growth. So, sorghum is very resistant to conditions on land with relatively low rainfall, such as on dry land. This is due to the domestication of this plant from Africa, which has an arid or semi-arid climate [15, 16]. Table 2 shows the planted area, production and productivity of sorghum in several development centres in Indonesia [4].

Wide adaptability, low water requirements and drought resistance are the main advantages of sorghum so that it can be developed in Indonesia. According to [6] potential dry land for sorghum is 108.8 million hectares. Sorghum is the most suitable crop of choice to increase the productivity of marginal dry land, vacant land or other non-productive land.

Table 2 – Average planted area, production and productivity of sorghum in several centres of sorghum development in Indonesia (various years) [4]

Location	Broad (ha)	Production (tons)	Productivity (ton/ha)
Central Java (1973/1983)	15.309	17.350	1.13
East Java (1984/1988)	5.963	10.522	1.76
DI Yogyakarta (1974/1980)	1.813	670	0.37
West Nusa Tenggara (1993/94)	30	54	1.80
East Nusa Tenggara (1993/94)	36	39	1.50

The Potential of Sorghum in NTB and Its Development Strategy. With the vast potential of dry land owned by the Province of NTB reaching 1.84 million hectares [7], the opportunity for developing sorghum as a source of food, fuel and fodder in NTB is vast and promising. Because sorghum has a high economic value, by planting sorghum, land productivity will increase and also support efforts to develop sustainable agriculture and increase food production as well as a leading export commodity from NTB farmers.

In 2020, sorghum cultivation in NTB, especially on Sumbawa Island, uses an area of 650 ha. The sorghum variety developed is the Bioguma type, with an area of 500 ha for the Ministry of Agriculture program and 150 ha for self-help. The land area is spread over 250 ha each in Bima City, 250 ha in Bima Regency and 150 ha in Sumbawa.

The Astra Welfare Village Program (DSA) Sorghum Lombok, which PT initiated. Astra International Tbk. Has started a program to encourage the growth of micro, small and medium enterprises (MSMEs), which are trying to recover from the impact of the 2018 earthquake and the COVID-19 pandemic. This program was initially started five years ago with two assisted villages. Currently, the number of assisted villages has increased to 22 villages involving more than a thousand farmers spread across North Lombok, East Lombok, Central Lombok and South Lombok by implementing the farmer corporation concept. The development of DSA Sorghum also contributes to the absorption of labour and the improvement of the welfare of the surrounding community, especially homemakers who are in-

involved in processing various foods and beverages [17].

The condition of internal and external factors in the development of sorghum, according to [18] and can also be applied in NTB are as follows:

1) Internal factors that are the strength of sorghum include (a) sorghum farming experience; (b) sorghum adaptive to the environment; (c) no pests during sorghum cultivation; (d) continuity production; (e) sorghum cultivation has a small failure risk, and (f) easy cultivation.

2) Internal factors that are weaknesses of sorghum include (a) sorghum is a less commercial commodity, (b) has high tannin content, (c) storage is not durable due to pest attacks, (d) poor farm management; (e) sorghum cultivation is not a priority for farmers.

3) External factors that are opportunities for sorghum include (a) increasing non-oil and gas exports, (b) availability of seed procurement assistance from the government, (c) development into processed products, (d) sorghum as an alternative to biofuel products, (e) suitable natural conditions for sorghum cultivation.

4) External factors that pose a threat to sorghum include (a) low selling price of sorghum, (b) unfavourable market share, (c) difficulty for people to switch to consuming sorghum as a staple food, (d) dissemination of information and cultivation development sorghum at the farmer level is not yet intensive, (e) there is competition with other agricultural products.

According to [18], alternative strategies for developing sorghum crop strategies that can also be carried out in NTB according to the results of the SWOT analysis are

1) SO strategy, which includes (a) expansion of the sorghum planting area by utilizing dry land and guidance from the government, (b) fostering regarding processing sorghum seeds into processed products, and (c) conducting business meetings with investors for large-scale processing of sorghum.

2) WO strategy, which includes (a) periodic counselling and guidance on good sorghum cultivation and (b) providing training and post-harvest technology assistance.

3) ST strategy, which includes (a) cooperation with the food processing industry, and (b) the role of the government in determining selling prices and promoting sorghum.

4) WT strategy is to increase interaction between researchers, extension workers,

Sorghum as an Alternative Food and Export Commodity. As food, sorghum seeds can be made into flour which can then be used as raw material to manufacture various types of pastries, cakes and noodles [19]. In the manufacture of different food products, sorghum flour can substitute 15-50% of flour without reducing the taste, texture, and aroma. One of the advantages of sorghum flour is that it has a higher nutritional value than rice, corn, and cassava flour. The starch content of sorghum seeds is also relatively high, around 83%. The fat and protein contents are 3.60% and 12.3%, respectively [4].

Another advantage of sorghum flour is its very high swelling power, and is easily soluble in water. Both of these properties are required in the manufacture of flour-based food products. Using sorghum in flour is more profitable because it is more practical and easier to process into various snack products. Processing of Sorghum into flour has been carried out, although on a small scale, among others, by PT Bogasari. One of the food industries in Jakarta has also used sorghum flour for crackers which are crispier than those made from wheat flour [2].

There are many benefits of sorghum. The seeds are processed into flour to replace rice flour or wheat flour as food, sorghum seeds can replace corn which is widely used as a raw material in the animal feed industry, and sugar and bioethanol are made from juice squeezed from sweet sorghum stalks. The leaves of sorghum can be used as forage for animal feed.

In addition, the sorghum pulp (bagasse) that has been extracted can be used for its fibre as raw material for pulp in the paper industry. In this case, the development of sorghum plants supports government programs in food security (food self-sufficiency program) and energy (energy independent village program). Besides that, it also supports the development of other industries, namely cattle fattening (meat self-sufficiency) and the pulp (paper) industry.

Sorghum can adapt to areas with a tropical-dry climate (semi-arid) to wet environments. Cultivating plants is easy with relatively low costs, and can be planted through monoculture or intercropping. Plant productivity is very high and can be ratified or harvested more than once in one planting with results that are not much dif-

ferent, depending on the maintenance of the plant. In addition, sorghum plants are more resistant to pests and diseases, so the risk of failure is relatively small. The sorghum plant functions as an industrial raw material with many uses and is a world export commodity [20].

CONCLUSIONS

Sorghum as alternative food in Indonesia has the potential to be developed, including in NTB, in the context of diversifying local food and reducing dependence on wheat consumption as an imported food ingredient. The potential for sorghum development is supported by the characteristics of sorghum which can grow well on dry land, and the availability of dry land in NTB is quite broad. The result of sorghum still faces various problems, especially related to aspects of cultivation technology, processing and industry, market creation and price guarantees, and institutional elements for the sustainability of sorghum development. The statistical data on sorghum, which is widely accessible for development, is relatively limited, showing the lack of attention to the development of this commodity in NTB, agronomically and economically.

The strategies and policies needed for developing sorghum in the cultivation aspect are intensive and wide-scale development, and the provision of production facilities (exceptionally superior seeds) appropriately, especially in potential areas for sorghum development. It is necessary to map the location of sorghum production centres covering growing environmental conditions, especially fertility, soil type, and rainfall.

For the aspect of processing technology and industry, it is necessary to increase the variety of processed products from sorghum seeds through the application of product processing technology that can improve taste and appearance, as well as packaging technology to increase the selling value of the product. For the economic aspect, it is necessary to expand the market by increasing the use of sorghum not only as a raw material for traditional food products but also as a raw material for the food industry, as a raw material for other industrial products, and as an ingredient for animal feed and bioethanol.

From the institutional aspect, it is necessary to build networking and community development consisting of elements of farmers as production implementers, the government as policyholders,

research institutions as the development of sorghum plants/products and industry as business actors to accelerate and maintain the sustainability of the sorghum development program.

The recommendations that can be given are that the government should carry out a program to expand the sorghum planting area, one of which is by utilizing dry land, conducting business group discussion forums with investors or the sorghum processing industry, and promoting sorghum as a secondary food, not only as an alternative food.

Agricultural instructors conduct regular training on reasonable sorghum cultivation procedures, provide training and post-harvest technology assistance, and process sorghum into processed products to increase the selling value of sorghum. In addition, other researchers should be able to analyze the potential of sorghum or the nutritional content of sorghum compared to other commodities by cultivating each item in the same land condition.

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Development of Vanilla Agribusiness and Its Export Opportunities to Support Triple Export Program (Gratitude) on Lombok Island

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Abstract. Vanilla is one of the agricultural export commodities that has a very high economic value. Vanilla is one of the plantation crop commodities directed to the Gratitude program or the Export Triple Movement initiated by Minister of Agriculture Syahrul Limpo in 2020, which is targeted for five years to unite the strength of all stakeholders of agricultural development.

Based on the explanation of export opportunities to support the triple export program, it can be seen from management's flow and quality standards. Vanilla in Indonesia has quite a good potential and supports improvements in economic, social and cultural development. This can be seen from the increasing demand from several countries for quality and the quantity of vanilla in Indonesia yearly. And efforts to strengthen value-added vanilla exports by diversifying export products by not relying on raw materials and downstreaming vanilla processed products. The types, quantity and quality of non-oil and gas export commodities will continue to be improved. The increasingly fierce competition in foreign trade requires every country to increase the quantity and quality of its products.

Keywords: vanilla; products; export.

INTRODUCTION

Vanilla is a spice plant that belongs to the orchid family (Orchidaceae). This plant is native to Mexico and Central America. Vanilla is widely used as an ingredient in the food industry and as a pharmaceutical fragrance (flavour and fragrance ingredients). Vanilla plants first entered Indonesia in 1819, which Morchal brought from the Antwerp Botanical Gardens. This plant was planted in the Bogor Botanical Gardens and could grow well and flower but does not produce fruit because it cannot self-pollinate. In 1950 Taysman practised artificial pollination (by hand) with satisfactory results. In the 1960, the vanilla plant increased from the West Java area (Garut and Banten) and continued spreading to Central Java and East Java. However, in 1967 there was an attack of stem rot which caused the vanilla plant to decline in Central Java and West Java. The subsequent development shifted to East Java, but due to theft and price fluctuations in 1980, the area of vanilla plantations in East Java decreased and then shifted to Bali and North Sulawesi [1].

The Province of West Nusa Tenggara is a suitable development area for vanilla plants regarding land suitability and climate. The development of vanilla as a supporter of the free or triple export program can absorb labour in the production process, especially during pollination, so that the wider the vanilla area, the more labour is needed, while maintaining the vanilla area requires good cooperation and management because from year to year the area is wide. Outside the vanilla plantation area, data is taken from [2]. In 2019, it was 9,532 ha, with a production of 1,461 tons of dry pods, while the 2020 figure increased slightly by 10,219 ha, with a display of 1,545 tons of dry pods. For 2021 the estimated figure is 10,582 ha, with a production of 1,688 tons of dry pods. Vanilla products are almost entirely destined for export, as for the area of vanilla in West Nusa Tenggara taken from [2] a total of 294.07 hectares with an average production of around 40.32 tons per ha. From this amount, vanilla is a plant with great opportunity and potential to support the Gratitude program for export to Eu-

ropean countries, especially the highest demand, namely from America and Canada.

It is necessary to implement technology from cultivation to post-harvest. Development and strengthening strategies can be used to increase production and quality, for example, by facilitating facilities and infrastructure as well as training on applying cultivation technology according to standards. With these conditions and phenomena, it is necessary to develop vanilla commodity areas through vanilla plant area development activities supported by increasing human resources and institutions as well as escorting and mentoring. Implementation of labour-intensive activities in the form of planting preparation and maintenance in vanilla plantation area development activities, then policies and strategies in vanilla plantation area development,

In the international market, the price of vanilla is determined by its quality. Each importing country has different quality requirements. The market in the United States requires more vanilla with low moisture content (20–25%) because it is used as a raw material for the extraction industry. The European market, generally consumed directly by households, requires whole (good looking) vanilla, high vanilla content, sharp aroma and 30–35% moisture content. Meanwhile, the International Standards Organization (ISO) has set specifications for vanilla traded in the world market. Meanwhile, nationally, it has been determined by the National Standardization Council under the Indonesian National Standard (SNI). Vanilla specifications that meet the general requirements according to the Indonesian National Standard are: smells of vanilla; glossy black or glossy black-brown to brown; full pods filled to underweight, oily, pliable to stiff; free of foreign matter; mould-free.

Featured types and varieties of vanilla. The success in planting vanilla depends on the cultivation techniques carried out, from using superior varieties, planting and maintenance procedures to harvesting and post-harvesting correctly. As of 2018, the Research Institute for Spices and Medicinal Plants has released two high-yielding types of vanilla, namely Vania 1 (yield 2.1 tons/ha with vanillin content of 2.808%) and Vania 2 (yield of 1.8 tons/ha with vanillin content of 2.983%).

In general, vanilla cultivation on the island of Lombok grows with the *Planifolia Andrews* variety, which is the best and most widely grown va-

nilla plant in the world and uses organic vanilla clusters, especially for development in the area at the foot of Mount Rinjani, Sembalun sub-district. It is very suitable for the climate and nutrients for the development of vanilla plants to continue to increase the volume of export value.

Post-harvest and vanilla processing. Indonesian vanilla is accepted in the international market, so the processing must comply with the quality standards that have been set. The quality improvement process is described as follows: 1) freshly harvested pods are washed from the attached dirt and sorted by length, thickness, damage and defective pods; 2) vanilla fruit that has been sorted must be processed immediately. The method of processing can be done using sunlight or a dryer.

The production capacity of organic vanilla that can be produced according to export qualifications is only seven wet tons or the dry equivalent of one ton. However, the potency is 15 tons damp or two tons dry vanilla. The organic also involves exporters vanilla from Organic Spices Lombok. The business actor, who is also the farmer's partner, provides knowledge about the processing methods of vanilla.

RESULTS AND DISCUSSION

Indonesian Vanilla Export. The exported NTB vanilla is organic, and NTB vanilla has export opportunities because it has a unique characteristic compared to vanilla in other regions. Significantly of the uniqueness of the aroma and taste, it is very popular with customers in the USA. The most significant vanilla production on the island of Lombok for the development of vanilla cultivation is in the districts of East Lombok and West Lombok, which are potential areas for the development of vanilla exports which can increase the income of coffee farmers financially. Vanilla farmers in West Lombok Regency have received particular attention, developed and fostered through a program to increase vanilla production with the Mataram Class I Agricultural Quarantine Center to support the triple export program.

The land for organic vanilla development is spread over several islands of Lombok, namely in East Lombok Regency in Sajang District, with a total of 69 farmers with 128 hectares of land. In Pringgasela District, there are 52 farmers with 60 ha of land. North Lombok Regency in Bayan District covers an area of 55 hectares, and West

Lombok Regency in Narmada District with 40 farmers with a land area of 60 ha.

Table 1 - Recapitulation data on vanilla plants in the Province of NTB in 2021

No	Regency	Area	Production (Tons)
1	North Lombok	63.48	1.85
2	West Lombok	125.46	10.89
3	East Lombok	94.50	27.51
4	Sumbawa Brt	2.00	-
5	Sumbawa	3.63	0.07
6	Bima	5.00	-



Figure 3 – Vanilla flowers, that are ready to be crossed



Figure 1 – Cultivation and planting of vanilla using coconut husk as the main support for plant propagation



Figure 4 – Vanilla observers from abroad check the vanilla sorting process



Figure 2 – Vanilla plants that thrive in locations in North Lombok Regency



Figure 5 – Results of the vanilla drying process



Figure 6 – The process of drying vanilla with solar power at UD Rempah Organic Lombok Location



Figure 7 – Discussion with various parties to observe the condition of vanilla

Until now, the development of organic vanilla will always promise good opportunities and increase economic value for vanilla farmers on the island of Lombok and can also lead to interest from other farmers who are interested in learning and want to cultivate vanilla. Based on requests from vanilla importing countries so far, there is no limit to the number of requests for vanilla because the demand for vanilla in these European countries is excellent.

CONCLUSIONS

Based on the explanation of export opportunities to support the triple export program, it can be seen from management's flow and quality standards. Vanilla in Indonesia has quite a good potential and supports improvements in economic, social and cultural development. This can be seen from the increasing demand from several countries for quality and the quantity of vanilla in Indonesia yearly. And efforts to strengthen value-added vanilla exports by diversifying export products by not relying on raw materials and downstreaming vanilla processed products. The types, quantity and quality of non-oil and gas export commodities will continue to be improved. The increasingly fierce competition in foreign trade requires every country to increase the quantity and quality of its products.

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Effect of Metakaolin on Strength Properties of Lateritic Soil Intended for Use as Road Construction Material

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Abstract. An excellent all-weather road is essential in providing reliable transportation services that comprise social and economic development elements. However, in most cases, the road has to be constructed on a soft foundation soil where large deformations usually occur, which causes increases in maintenance costs and leads to interruption of traffic service, especially during the wet season. It is necessary to stabilize or improve the in-situ soils. This study explores the potential of using metakaolin to improve the geotechnical properties of lateritic soil for road construction materials. The soil classifies as A-6(4) and CL according to the American Association of State Highway and Transport Officials and the Unified Soil Classification System. The soil was treated with 5, 17.5 and 30 % concentrations of metakaolin by dry weight and was compacted using three compaction energies: British Standard Light (BSL), West African Standard (WAS) and British Standard Heavy (BSH). California Bearing Ratio (CBR) and Unconfined Compressive Strength (UCS) tests were carried out to evaluate the effect of metakaolin on the soil investigated. Results showed a general improvement in the engineering properties of the soil with an increase in metakaolin content, particularly when compacted at the BSH energy level. However, the results did not meet the 1500-3000 kN/m² 7 days UCS criterion stipulated by the Nigerian General Specification for road base courses. However, 30 % lateritic soil/metakaolin blended soil compacted using WAS and BSH energy levels suffice for use as sub-base in road construction, having met the 750-1500 kN/m² 7 days UCS criterion stipulated by the Nigerian General Specification. The Peak CBR value for the treated soil, compacted using the three energy levels of BSL, WAS, and BSH, occurred at 30 % metakaolin concentration with corresponding soaked CBR values of 17, 23 and 31 %. The Nigerian General Specification recommends a nominal strength criterion of a soaked CBR value of 30 and 80 % to be attained by material to be used as sub-base and base course in road construction. Based on the above criterion, only the 30 % metakaolin treated blend compacted at the BSH energy level met the 30 % requirement for sub-base materials.

Keywords: lateritic soil; metakaolin; roads; sub-base.

INTRODUCTION

The continued support for transport sector projects reflects the close link between development and transport by development agencies. Transport services are essential for the social and economic development of poor rural and urban populations. The World Bank recognizes the importance of providing transport services, with 23 % of its loans allocated to the transport sector. Transport is an intermediate service industry providing added value to investments in other

sectors and contributing to economic growth [34]. Access to essential services by many people in developing countries is severely impeded by poor roads and the consequential poor transport services. It is estimated that some 1.2 billion people do not have access to an all-weather road and that 40–60 % are more than 8 km from a health centre. Transport is also essential in achieving the Millennium Development Goals. It is vital for inclusive, sustainable globalization to overcome poverty, promote growth, and access challenges in fragile states and for Public-Private

partnerships [24]. An excellent all-weather road is essential in providing reliable transportation services required for safe access to markets, employment opportunities, education facilities, health centres, etc., comprising the elements of social and economic development. However, in most cases, the roads have to be constructed on a soft foundation soil where large deformations usually occur, which causes increases in maintenance costs and leads to interruption of traffic service, especially during the wet season.

Lateritic soil found in some locations is not usually suitable for subgrade, sub-base and base course due to several difficulties during construction, such as workability, field compaction, and insufficient strength. Furthermore, the acidic nature of the tropical soils has raised doubts about the efficiency of soil-lime reactions in a low pH environment and hence the long-term improvement [3].

It is necessary to stabilize or improve the in-situ soils with other selected soils/aggregates or with binders, to build a strong road network to support heavier vehicles or higher traffic flows and serve in all-weather conditions [2]. These binders are cement and/or lime, which bind the soil particles together through chemical reactions [21]. However, cement production has severe environmental impacts, using vast amounts of fossil fuels and being responsible for the emission of more than 5 % of all the carbon dioxide worldwide [47]. Hence the focus of this study is to provide an alternative to reduce cement usage.

Metakaolin is a dehydroxylated form of kaolinite, following the chemical removal of the bonded hydroxyl ions from the kaolinite minerals, typically heating to approximately 750 °C. As kaolin contains no carbonates, no CO₂ is released during heating, reducing embodied CO₂ in the final materials when replacing cement or lime [16]. Due to the pozzolanic properties of metakaolin, there has been growing interest in its use as a cement replacement and an additive to lime [29, 49]. Thus, this study intends to determine the effect of treating lateritic soil with metakaolin during road construction.

METHODOLOGY

The study was conducted in two phases. Phase one involves the determination of engineering properties of the soil without the addition of the additive, index properties, and compaction: Brit-

ish Standard Light (BSL), West African Standard (WAS) and British Standard Heavy (BSH), Unconfined Compressive Strength (UCS) and California Bearing Ratio (CBR) tests were carried out by [10]. The second phase involves adding varying proportions of metakaolin by the dry weight of the soil to determine the engineering properties when metakaolin is used as a stabilizing agent. In the case of tests on the stabilized/treated soils, 5, 17.5 and 30 % concentrations of metakaolin by dry weight of the soil were added to the soil to increase the engineering properties of the soil. Similar tests were out on the treated soil by [9].

MATERIALS AND METHOD

The lateritic soil was obtained using the same method of disturbed sampling from a borrow pit at Fankacen Dumi village behind an industrial estate, Bauchi State, Nigeria (latitude 10°16'46.54"N, longitude 9°51'54.25"E). The soil is reddish brown.

The raw material for the metakaolin production is kaolin clay, sourced from Alkalari, Alkalari Local Government Area of Bauchi State. The kaolin would be burnt at a temperature ranging from 700–800 °C in a kiln at the Department of Industrial design, Faculty of Environmental Technology, Abubakar Tafawa Balewa University, Bauchi, to obtain the metakaolin.

The water used is portable drinking water; therefore, no laboratory test was conducted.

RESULTS AND DISCUSSION

Physical and Chemical Properties of Lateritic Soil and Metakaolin. Results of the physical properties test for the untreated soil are presented in Table 1.

Table 1 – Test results of the natural soil

Property	lateritic soil
Natural moisture content (%)	9
Liquid limit (%)	37
Plastic limit (%)	24
Plasticity index (%)	13
Specific gravity	2.61
Percentage passing No 200 sieve	52
Percentage Sand fraction (0.075–4.76 mm)	52
Percentage Silt fraction (<0.075 mm)	36
Percentage Clay fraction, (<2 µm)	16

Property	lateritic soil
Maximum dry density BSL (Mg/m ³)	1.82
Maximum dry density WAS (Mg/m ³)	1.86
Maximum dry density BSH (Mg/m ³)	1.90
Optimum moisture content BSL (%)	18.0
Optimum moisture content WAS (%)	16.5
Optimum moisture content BSH (%)	15.9
Unconfined compressive strength BSL (kN/m ²)	247
Unconfined compressive strength WAS (kN/m ²)	472
Unconfined compressive strength BSH (kN/m ²)	630
Soaked California bearing ratio BSL (%)	11
Soaked California bearing ratio WAS (%)	12
Soaked California bearing ratio BSH (%)	14
Colour	Reddish brown
AASHTO classification	A-6 (4)
USCS classification	CL
Silica Sesquioxide Molar Ratio of Iron and Aluminium	1.98

From the results, the soil contains 52 % sand fraction, 36 % silt fraction and 16 % clay fraction. The preliminary result also showed that the soil has a moisture content of 9 % and classifies as A-6(4) by the American Association of State Highway Transportation Officials [1] soil classification system and CL by the unified soil classification system [7]. It is reddish brown with a plasticity index of 13 %. The Optimum Moisture Content & Maximum Dry Density values recorded for the three energy levels of BSL, WAS, and BSH were 18, 16.5, 15.9 % and 1.82, 1.86, 1.90 Mg/m³, with corresponding soaked CBR values of 11, 12 and 14 % and Unconfined Compressive Strength values of 247, 472, 630 for the energy levels. These classifications showed that the soil is a silty clay soil of low plastic. The liquid limit and plasticity index values of 37 % and 13 % confirmed that the soil is indeed low plastic [7]. Existing literature has credited that Atterberg limits results have been handy indicators of soil behaviour [22]. These classifications, coupled with the low values of Maximum Dry Density, Unconfined Compressive Strength and CBR recorded, show that the soil falls below the standard recommendation for most geotechnical construction works. Especially for sub-base or base courses in highway construction [2, 11, 13, 33, 35, 39, 40].

The Oxide composition of the lateritic soil was determined using XRF spectroscopy, and the result is summarized in Table 2.

Table 2 – Oxide Compositions of lateritic soil and metakaolin

Oxide	Concentration (%)	
	Lateritic soil	Metakaolin
Silicon oxide (SiO ₂)	47.18	48.71
Aluminium oxide (Al ₂ O ₃)	16.71	28.35
Iron oxide (Fe ₂ O ₃)	7.023	1.685
Calcium oxide (CaO)	2.244	7.980
Magnesium oxide (MgO)	0.205	0.022
Sulfur Oxide (SO ₃)	0.622	0.602
Potassium oxide (K ₂ O)	3.965	0.053
Sodium oxide (Na ₂ O)	0.614	0.081
Lead oxide (P ₂ O ₅)	0.009	0.036
Manganese oxide (Mn ₂ O ₃)	0.081	0.023
Titanium oxide (TiO ₂)	0.515	2.023

The result revealed that the major components of the soil are Aluminium oxide (Al₂O₃), Silicon oxide (SiO₂), Iron oxide (Fe₂O₃), and Potassium oxide (K₂O), having a concentration of 16.71 % Al₂O₃, 47.18 % SiO₂, 7.023 % Fe₂O₃ and 3.965 % K₂O. This result indicates that lateritic soil possesses a silica-alumina ratio of 3:1 with a requisite amount of Alumina and silica. The soil's silica sesquioxide molar ratio [SiO₂/(Al₂O₃+Fe₂O₃)] was 1.98. In laterites, these ratios are less than 1.33. At the same time, those between 1.33 and 2.0 indicate lateritic soils, and those greater than 2.0 indicate other tropical soils, i.e. non-lateritic soils [8]. From these results, it is evident that lateritic soil is lateritic soil.

The metakaolin has a specific gravity of 2.56, bulk density of 0.71 Mg/m³, moisture content of 0.27 % and a pH value of 8.7, indicating that it is slightly alkali. The oxide composition is summarized in Table 2. The oxide composition determined using the XRF spectroscopy show that the significant oxide compositions are Silicon oxide (SiO₂), Aluminium oxide (Al₂O₃), Calcium oxide (CaO), Titanium oxide (TiO₂) and Iron oxide (Fe₂O₃), contributing 48.71, 28.35, 7.980, 2.023 and 1.681 %, of the total. The results indicate that metakaolin meets the [6] requirement based on SiO₂, Al₂O₃, and Fe₂O₃ composition of 70.0% by mass. It is also below the SO₃ limit of 5% by group, as specified for Class N pozzolana.

Index properties. The variation of index properties of lateritic soil treated with metakaolin is shown in Figure 1.

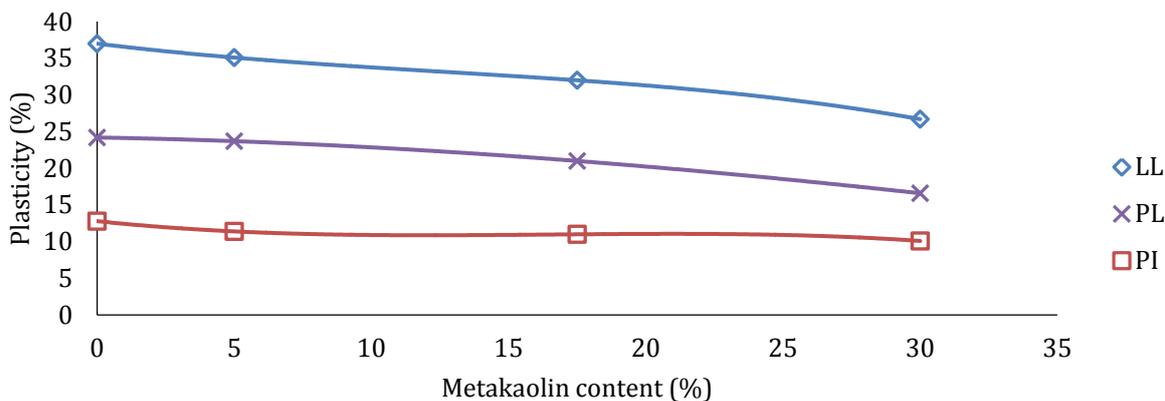


Figure 1 – Variation of Atterberg limits of lateritic soil treated with metakaolin content

The results showed a decreasing trend in the liquid limit from 37 % to 26.9 %, increasing metakaolin content from 0 to 30 %. This could be due to the porous nature of metakaolin replacing the fine soil particles. The gradual reduction in liquid limit could also be associated with the agglomeration and flocculation of Clay particles, which is a result of ion exchange at the surface of the particles [3, 15, 18, 42, 46]. Plastic limit generally decreased with higher metakaolin contents, from a value of 24.2 to 16.6 % at 30 % metakaolin content. The reduction in liquid and plastic limits resulted in a general decrease in the plasticity index value of the lateritic soil/metakaolin blend. A plasticity index value of 12.8 % recorded for the untreated soil was reduced to 10.1 % at 30 % metakaolin addition. The decrease in plasticity index is an indication of soil improvement. The decline in plasticity index is attributed to the effect of metakaolin on the affinity for H⁺ ions of clay and silt fractions which caused the clay and silt fractions to spontaneously form flocs due to negative face charges

and positive edge charges. These flocs adhere to each other, forming agglomerates [3]. This plasticity index reduction agrees with [5, 8, 26, 42].

Compaction Characteristics. Figure 2 shows the lateritic soil's relationship between moisture content and dry density. When compacted at the BSH energy level, the lateritic soil yielded the highest Maximum Dry Density value of 1.90 Mg/m³, corresponding to an Optimum Moisture Content value of 15.9 %. Consolidated at WAS and BSL energy levels, the Maximum Dry Density values obtained are 1.86 and 1.82 Mg/m³, corresponding to Optimum Moisture Content of 16.5 and 18.0 %, respectively. The trend observed is one of increasing Maximum Dry Density with an increase in compaction effort and a corresponding decrease in Optimum Moisture Content with higher compaction effort. The results are similar to those reported by [15, 31, 37]. In general, the compaction curve trend agrees with the findings of several researchers [3, 19, 23, 37, 48, 50].

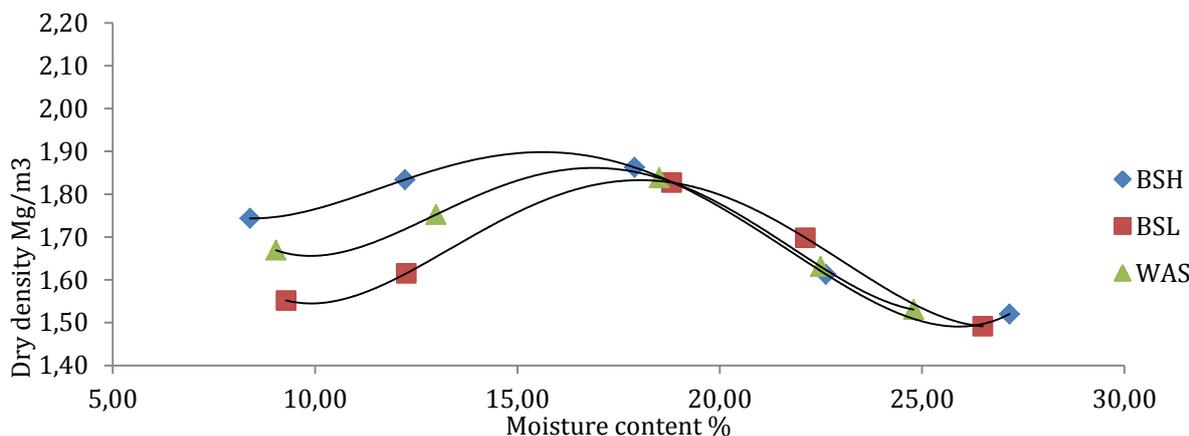
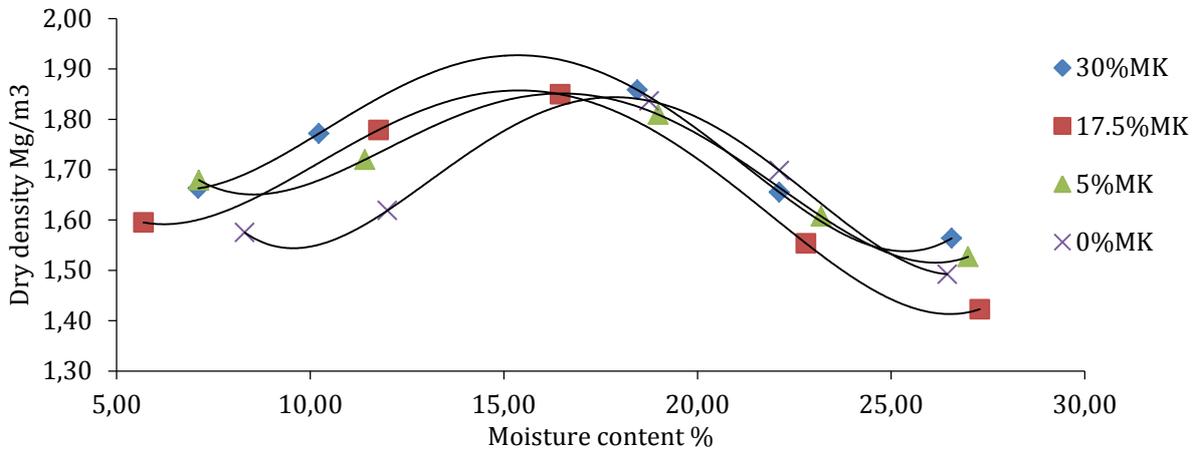


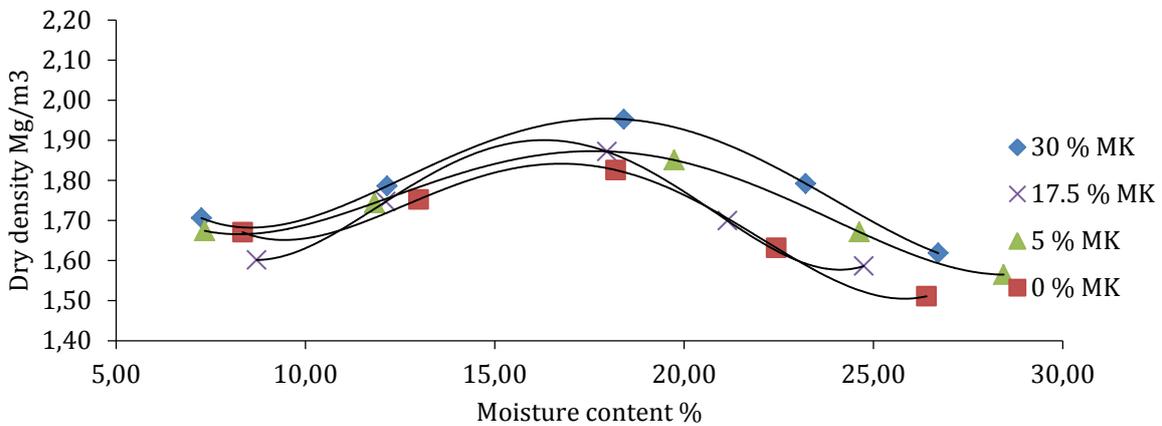
Figure 2 – Moisture - Density Relationship of the Lateritic Soil

Compaction Characteristics of Treated Lateritic and Non-lateritic Soil. The Moisture-density relationship of the various dosages of metakaolin on

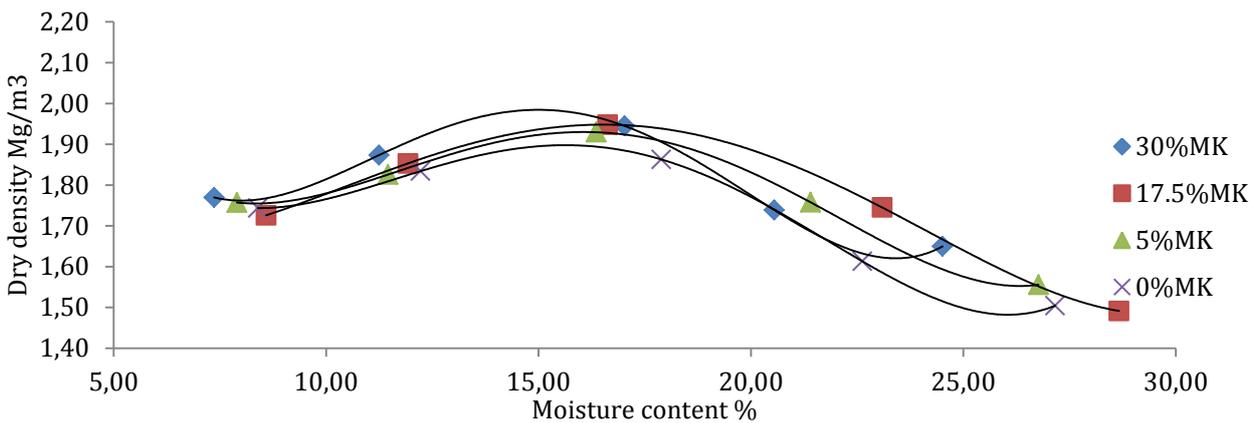
lateritic soil for the three compaction efforts used is presented in Figure 3 (a, b & c).



a) BSL compaction



b) WAS compaction



c) BSH compaction

Figure 3 – Moisture - Density Relationships of Lateritic Soil Treated with Metakaolin

From Figure 3a, it can be observed that with the addition of 5, 17.5 & 30 % metakaolin, the dry density increases, and the maximum dry density recorded are 1.83, 1.86 and 1.91 Mg/m³, respectively. This increase is 105 %, higher than the Maximum Dry Density of the lateritic soil without

adding metakaolin. Interestingly, such trends were observed when WAS, and BSH compaction efforts were used on the soil with the same 5, 17.5 and 30 % metakaolin content being admixed. From observation, it is concluded that the Maximum Dry Density and Optimum Moisture

Content of the soil-metakaolin mixtures largely depend on the soil type, the fineness of the metakaolin particles and the plastic nature of the soils. It has been well documented that soil particles are randomly oriented on the dry side, while on the wet side, the soil particle is oriented in parallel. In the parallel orientation, the extra water forms a water film surrounding the soil particles, enhancing workability and contact between the soil particles [12]. On the wet side of the Optimum Moisture Content, soil particles are arranged in parallel directions creating more connections of surface particles, resulting in easy mixing, compaction and better reaction between soil-MK mixtures. It is evident from the plot of

the Maximum Dry Density and Optimum Moisture Content that the best results were achieved using the BSH compaction effort. The effects of the various replacement levels on the moisture contents showed a divergent behaviour. As the replacement levels increase, the moisture content decrease, which is an indication of better performance.

Effect of Metakaolin on Compaction Characteristics of Lateritic soil. The variation of Maximum Dry Density of lateritic soil/metakaolin mixture for BSL, WAS, and BSH compaction effort is presented in Figure 4.

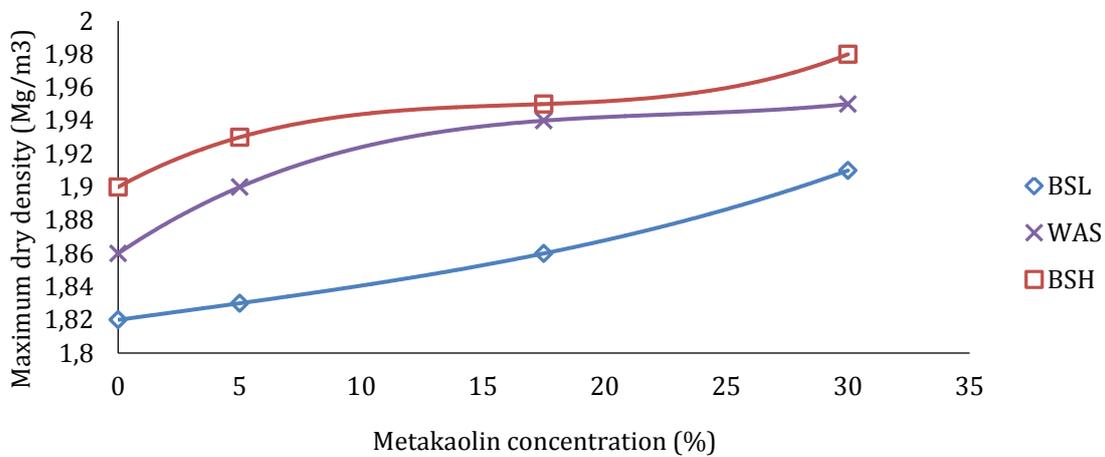


Figure 4 – Variation of Maximum Dry Density of Lateritic Soil with Metakaolin

The observed Maximum Dry Density values increased with an increase in metakaolin content for the three compaction efforts considered. An increase in Maximum Dry Density from a weight of 1.82 Mg/m³ for the natural soil to 1.91 Mg/m³ was observed at 30 % metakaolin when BSL compaction effort was used. The trend observed for WAS and BSH compacted soils are similar to

that of the BSL compacted soils. For lateritic soil/metakaolin, Maximum Dry Density values increased from 1.86 and 1.90 Mg/m³ to peak values of 1.95 and 1.98 Mg/m³ at 30 % metakaolin when WAS and BSH compaction efforts were used. The variation plot for lateritic soil/metakaolin with Maximum Dry Density for the three energies used is presented in Figure 5.

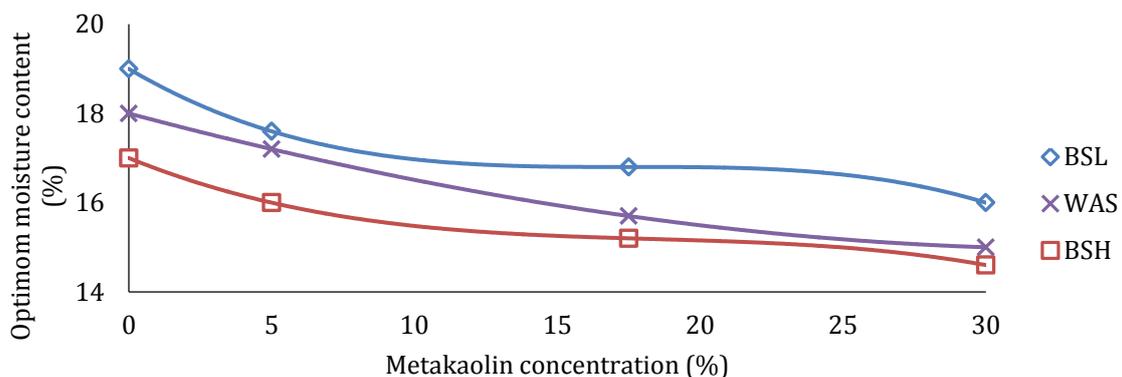


Figure 5 – Variation of Optimum Moisture Content of Lateritic Soil with Metakaolin

Authors [45, 20, 27] and [42, 44, 19, 3] reported a similar trend of increasing maximum dry densities in their respective research. The increase in Maximum Dry Density recorded for the compaction efforts may be due to flocculation and agglomeration of the clay particles, primarily due to cation exchange and the particles filling the voids within the soil matrix [14, 15, 41, 50]. The increase could also be due to metakaolin replacing the soil particles, thus resulting in the formation of a mixture with higher Maximum Dry Density, as reported by [17, 42, 50]. It could also be due to an increase in the surface area of particles at a higher dosage of metakaolin.

The general trend observed in Figure 5 is that of decreasing Optimum Moisture Content with the increase in the percentage of the additive. This indicates that the additives require little water for pozzolanic reaction with the silt and clay fractions of the soils. The presence of SiO₂, Fe₂O₃ and TiO₂ in the additives may, in part, be responsible for the enhancement of the mechanical properties of the soil specimens. A similar assertion was made by [3]. Furthermore, the soil specimens

produce heavier agglomerate particles with an attendant rise in the density of the soil. The result is consistent with those reported by [31] for peat soil modified with kaolin and heated kaolin and [3]. There for, using metakaolin treatment material for the soil is beneficial in improving the mechanical properties of the soil-additive mixtures. Also, as previously stated, on the wet side of the Optimum Moisture Content, soil particles are arranged in a parallel direction creating more contact with surface particles, resulting in easy mixing, compaction and better reaction between soil-MK mixtures.

Strength Characteristics. Over the years, the Unconfined Compressive Strength test has been the most common and suitable method for evaluating stabilized soil strength.

The variation of Unconfined Compressive Strength with various percentages of metakaolin treated lateritic soil blend compacted at BSL, WAS and BSH compaction and cured for seven days, 14 days and 28 days is shown in Figures 6-9.

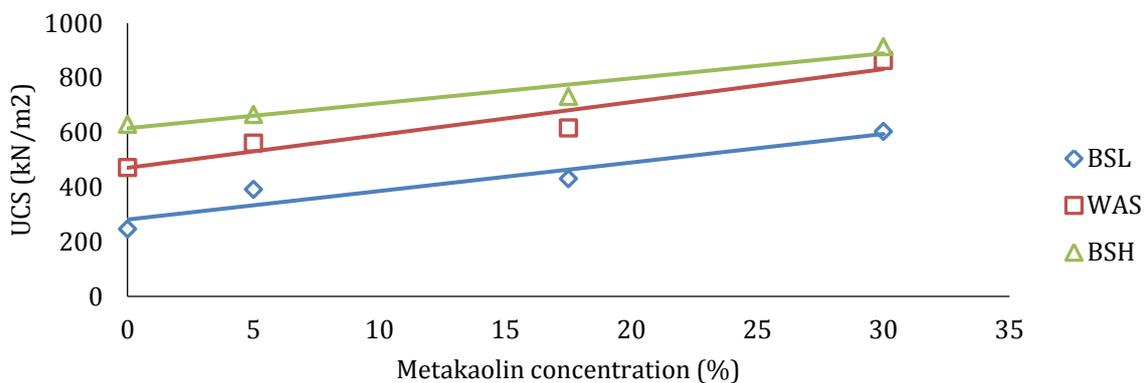


Figure 6 – Variation of Unconfined Compressive Strength (7 days curing period) of lateritic soil with metakaolin content

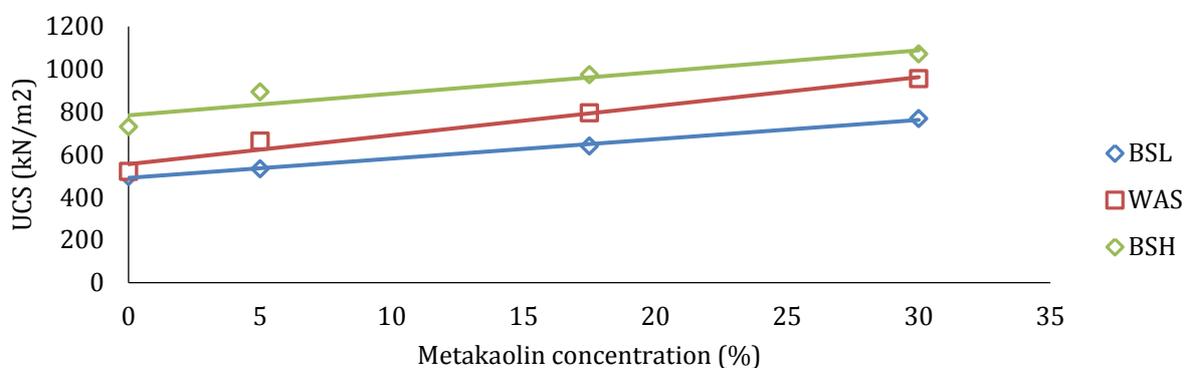


Figure 7 – Variation of Unconfined Compressive Strength (14 days curing period) of lateritic soil with metakaolin content

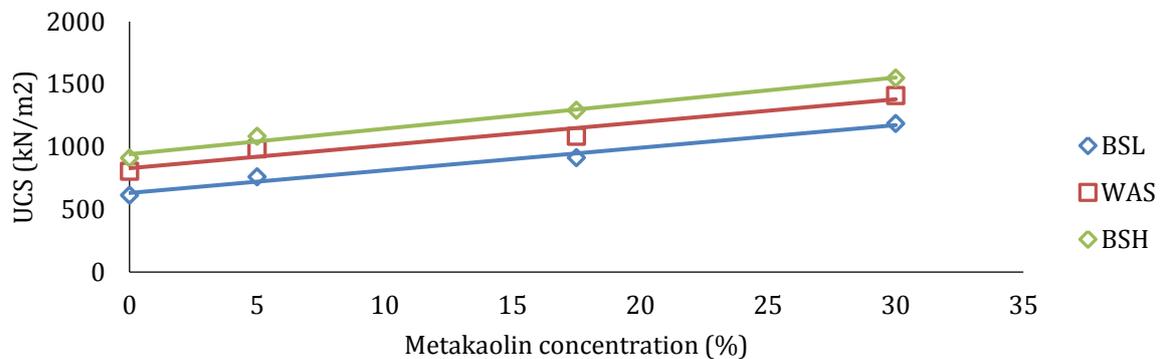


Figure 8 – Variation of Unconfined Compressive Strength (28 days curing period) of lateritic soil with metakaolin content

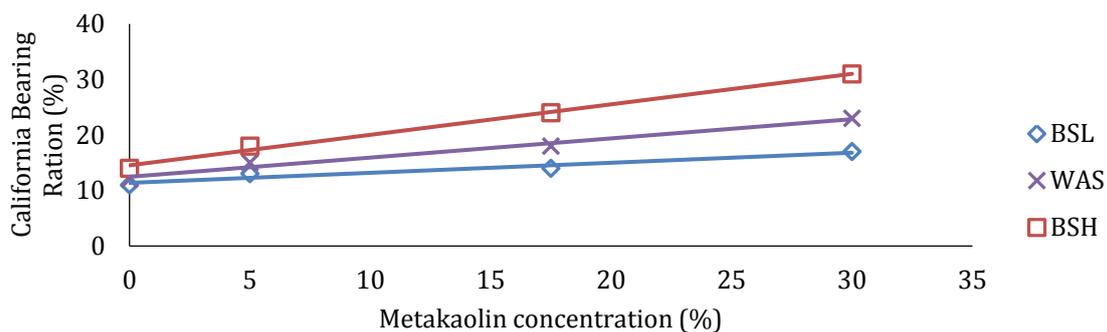


Figure 9 – Variation of Soaked CBR of lateritic soil with metakaolin content

A general improvement in the compressive strength was observed with the age of curing, metakaolin concentration and compaction energy. The results are similar to a study on expansive soil treated with up to 10 % metakaolin conducted by [4]. The increase in Unconfined Compressive Strength is attributed to hydration reactions of the soil-metakaolin mixtures induced by the high pH of the mixture caused by the metakaolin content and also due to improvement in the grain packing of the specimens by reduction of pores by the metakaolin, and thus given rise to a dense and strong structure. Authors [22, 36, 28, 50, 2] provide assertion to this belief. Furthermore, the reactive silica present in metakaolin, which reacts and produce cementitious materials and bind the soil particle together, causes a strength gain [30, 32].

It was observed that the Unconfined Compressive Strength value increased during the seven-day curing period. However, the peak seven days Unconfined Compressive Strength value of 604 kN/m² was recorded at a 30 % lateritic soil/metakaolin blend. This observed trend of BSL compaction energy was similar to that of WAS and BSH compaction energy levels. The peak Unconfined Compressive Strength values at

these energy levels are higher than those in the BSL compaction energy, as shown in Figure 7. The height Unconfined Compressive Strength values of the metakaolin treated lateritic soil occurred at 30 % metakaolin concentration with a corresponding Unconfined Compressive Strength value of 864 kN/m² and 913 kN/m² for WAS and BSH compaction efforts.

The Unconfined Compressive Strength at 14 and 28 days showed an increase in Unconfined Compressive Strength with a corresponding increase in metakaolin concentration from one another and from that of the seven days curing period for all the three compaction efforts used, as shown in Figures 8 & 9. The Unconfined Compressive Strength results indicate that metakaolin mixtures have progressive strength development with a longer curing period which is advantageous in the long run. This trend is attributed to the time-dependent strength gain of the mix due to the pozzolanic reaction. The results are consistent with those reported by [2, 18, 19, 35, 39, 42, 51].

Comparing the Unconfined Compressive Strength values of the treated soil specimens compacted at the three energy levels indicate that specimens treated with 30 % metakaolin

and compacted using the BSH compaction effort yielded maximum Unconfined Compressive Strength of 1550 kN/m² at 28 days of curing. This corresponds to an increase of 170 % compared to the result obtained for the natural soil compacted at the same energy level and cured for the same period. These results agree with various researches [2, 18, 38, 40, 42, 51].

Comparison of (UCS) results with the recommended standard. The Nigerian General Specifications [33] nominal specifications for road construction of layers recommend the range of 1500–3000 kN/m² for specimen cured for seven days as a base course material and the range of 750–1500 kN/m² as a sub-base material. Based on the 1500-3000 kN/m² Unconfined Compressive Strength recommended value for the base course, none of the recorded Unconfined Compressive Strength values of metakaolin / lateritic soil treated blends compacted using the three compaction efforts met the criteria. However, 30 % metakaolin/lateritic soil blend consolidated using WAS and BSH compaction effort met the sub-base criteria.

California Bearing Ratio. The California bearing ratio is a penetration test for evaluating the mechanical strength of road sub-grades and base courses. The results obtained by these tests are used with empirical curves to determine the thickness of pavement and its component layers. It is an important parameter used to indicate the strength and bearing capacity for base and sub-base in road construction. It is worth noting that the soaked CBR test was the primary CBR test carried out as the Nigerian General Specification [33] sub-base and base course requirements are based on saturated CBR values.

Soaked CBR. The variation of soaked CBR (96 hours soaking) of lateritic soil/metakaolin blends is shown in Figure 9. For BSL, WAS, and BSH compaction efforts, CBR values increased with higher additive contents compared with the natural CBR values. The peak values of 17, 23 and 31 % were recorded at 30 % metakaolin/lateritic soil blend for energies of BSL, WAS and BSH effort. It can be seen that the application of different compaction efforts and variation of additives give rise to a linear increase in the strength of soaked CBR values for an increase in additives and compaction effort. Generally, CBR values with higher compaction effort were observed in the order BSL, WAS and BSH compaction. The improvement in CBR is attributed to the cation

exchange, flocculation and agglomeration reactions within the admixtures. The trend conforms with the results reported by [15]. Moreover, the additives are highly pozzolanic materials and require water for hydration, improving the admixtures' strength gain and durability. Various researchers reported similar trends [38, 35, 44, 40, 18].

The Nigerian General Specifications [33] recommend a nominal strength criterion of a soaked CBR value of 80 % for a material to be used as a base course and a wet value of 30 % for sub-bases, both when compacted at optimum moisture and 100 % WAS compaction. Based on the above criterion, it suffices to state that only 30 % metakaolin/lateritic soil blend, which has a CBR value of 31 %, met the 30 % requirement for sub-base materials when compacted at BSH compaction effort.

CONCLUSIONS

This study explores the potential of using metakaolin to improve the geotechnical properties of lateritic soil obtained from Bauchi State, intended for use as road construction material. Based on the results obtained in this study, the following conclusions were drawn:

1. The lateritic soil classifies as A-6(4) by the American Association of State Highway Transportation Officials [1] soil classification system, and based on the unified soil classification system [7], the soil classifies as CL. This implies that the soil has an appreciable quantity of clay and falls below the standard recommended for sub-base or base courses in highway construction.
2. The oxide composition of the soil and metakaolin determined using X-ray fluorescence (XRF) spectroscopy revealed that the Silica Sesquioxide Molar Ratio of Iron and Aluminium for the soil is 1.98. The results also indicate that lateritic soil possesses a silica-alumina ratio of 3:1 with a requisite amount of Alumina and silica. In the case of metakaolin, the results revealed the presence of an appreciable amount of Al₂O₃, SiO₂ and Fe₂O₃ required for materials to qualify as a class N pozzolana.
3. The geotechnical properties determined for the soil fall below the standard recommended for use as sub-base or base course materials in highway construction. With the addition of me-

takaolin, there is a substantial reduction in plasticity index when compared to untreated soil.

4. Combining the soil with metakaolin improved the soil's dry density with an attendant moisture content decrease. BSH compaction effort yielded higher Maximum Dry Density due to the more incredible energy supplied. In terms of performance and workability, the treated soil would perform better as a construction material.

5. A remarkable improvement in Unconfined Compressive Strength was observed at 30 % metakaolin concentration, with an average UCS value of 604, 864 and 913 kN/m² at seven days of curing BSL, WAS, and BSH compaction efforts.

6. In general, the seven days cured UCS value of 30 % metakaolin/lateritic soil blend compacted using WAS and BSH effort falls within the range of 750–1500 kN/m² UCS value specified by the Nigerian General Specification for sub-base materials.

7. Higher UCS values were recorded for all the compaction efforts at 28 days of curing. This is attributed to the pozzolanic reaction of metakaolin, except 30 % metakaolin/lateritic soil blend compacted at BSH compaction effort, which met the 30 % Nigerian General Specifications nominal strength criteria of a soaked CBR value for sub-base materials. All other combinations fail to meet the requirements.

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Isolation of Pheophytin A and β -amyrin from *Newbouldia laevis* (P. Beauv) Leaf Extract

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Abstract. Pulverized leaves samples of *Newbouldia laevis* were extracted by cold maceration using methanol. The extract was concentrated in vacuo to yield a reddish brown solid of 120.191 g. The crude methanol extract was partitioned into n-hexane 0.1 g, dichloromethane 2.5 g, ethyl acetate 4.6 g, and methanol 10.0 g, fractions via coarse chromatography. Methanol fraction gave the highest yield and was subjected to further purification using repeated column chromatography to yield pure components, namely NLM24 (R_f 0.48), EAc:n-hex:MeOH (4:5:1) and NLM19 (R_f 0.47), EAc:n-hex:MeOH, respectively. These pure fractions were subjected to ¹H NMR, ¹³C, COSY, HSQC and HMBC spectroscopy. Pheophytin A and β -amyrin were proposed as the structures of the isolated compounds. Even though the pure fractions were not used for the analgesic activity, the literature reveals that pheophytin A & β -amyrin are potent analgesics.

Keywords: analgesic; *Newbouldia laevis*; pheophytin A; β -amyrin.

INTRODUCTION

Newbouldia laevis (P. Beauv.) is a common plant that is widely used in African traditional medicine [1], and its efficacy against specific health problems such as ulcers, pain, inflammation and microbial infections [2] has been reported and gained wider acceptance. In Nigeria, particularly in the South East, the plant is often used to construct barns for storage of farm produce such as yam, fences around houses and marking of boundaries. In Enugu State, specifically Amede Eha-Amufu and Amankanu, the plant is locally known as ojilishi and is often used to treat wounds.

Pheophytin A and β -amyrin have been naturally isolated from plants such as *Brachystelma togoense* Schltr, and *Protium heptaphyllum* [3, 4]. Pheophytin A was reported to possess numerous biological activities such as anti-cancer, antifungal and anti-inflammatory [3], while β -amyrin was found to have antihyperglycemic and hypolipidemic effects [4].

While studying the analgesic activity of *Newbouldia laevis* leaf extracts in white whisker albi-

no rats, the current research isolated pheophytin A and β -amyrin from *Newbouldia laevis*.

METHODS

Materials for Extraction

A solvent distillation machine (PS/1598) is used to distil the solvents, and big glass containers are used for cold maceration.

Precoated microscopic slides were used for spotting; capillary tubes were used for finding; hot air oven ADARSH was used for charring and colour development. Long Big column (60 cm) & 7.0 diameters used for elution of different components; silica gel 60 (70–230 mesh ASTM) used for column chromatography; silica gel 60 (230–400 mesh ASTM) used for flash chromatography.

Spectrophotometer NMR-Bruker AV3-500 MHZ was used for the structure elucidation of isolated pure compounds.

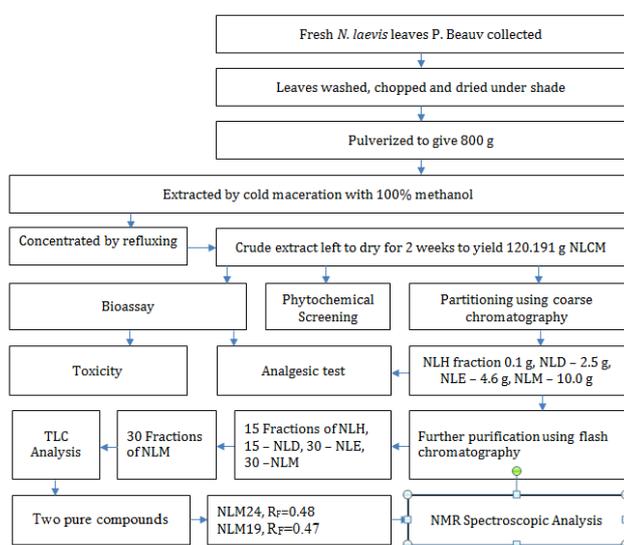
The reagents that were used are listed in Table 1.

Table 1 – Chemicals and Reagents

Reagent	Boiling point (°C)	Purity (%)	Suppliers
Ethyl acetate	77.1	Purity > 80	Sigma Aldrich
10 % Tetraoxosulphate (vi) acid	101	Purity > 90	M&B
Distilled water	100	Purity ≥ 100	Ecochem
Methanol	64.7	Purity < 100	Pubchem
Ammonia	-33.34	Purity ≥ 99.98	Pubchem
n-hexane	68.7	Purity 95–99	Sigma Aldrich
Hydrochloric acid	-85.05	Purity 35–38	Sigma Aldrich
Dil. Iron II chloride	1023	Purity > 98	Sigma Aldrich
(Pirovic acid) 2-oxopropanoic acid	165	Purity > 98	Sigma Aldrich
Acetic acid	118	Purity ≥ 99.9	Sigma Aldrich
Silica	2230	Purity ≥ 99.99	EMD
Aspirin	140	Purity > 34.07	CSUN
Dichloromethane	39.6	Purity ≥ 99.9	Sigma-Aldrich

Summary of Experimental Procedure

Partitioning and Isolation of Chemical Components from Crude Extract. About 600 mg of the crude extract was used to pack the column to partition it into four different fractions. The detailed partitioning and isolation are shown in the flowchart below (Figure 1).



Notes: NLH – *Newbouldia laevis* n-hexane extract, NLD – *Newbouldia laevis* dichloromethane extract, NLE – *Newbouldia laevis* ethyl acetate extract, NLM – *Newbouldia laevis* methanol extract

Figure 1 – Summary of Experimental procedure

Flowchart of Purification using Flash Chromatography is as follows 10.0 g NLM → Flash column chromatography → Solvent mixtures (n-hex:EA), ml → TLC Analysis → Medium (EA:n-hex), ml → Further TLC analysis → NLM24, NLM19.

Collection and preparation of plant material

The leaves of the plant *Newbouldia laevis* were collected at Amede Eha-Amufu, Enugu State, on 8 November 2019. A Forester confirmed the leaves at the College of Natural Resources and Environmental Management, Michael Okpara University of Agriculture, Umudike, Abia State. The Habarum Number was identified as Daramola FHI 35500.

The leaves were properly washed and air dried. It was further grounded into powder, weighed, and found to be 800 g. It was soaked with distilled methanol, and after two weeks, it was filtered, and the filtrate was refluxed. Thus the solvent was recovered. The crude methanol extract was then kept to air dry. After one week, it was weighed and found to be 120.191 g. It was thus labelled MCNL.

Extraction. After the fresh leaves of *N. laevis* were collected and identified, it was washed, chopped and dried under shade. The dried leaves were thus pulverized to give 800 g. The 800 g was put in a big glass container, and 100 % of methanol was poured into the container to the brim. The container was thus covered and kept. After two weeks, the sample was filtered, the filtrate was refluxed, and the crude extract was kept to dry.

The residue was resoaked again in 100 % methanol, and one week later, it was filtered, and the filtrate was refluxed; thus, the crude extract was left to air dry. The dried crude extract was weighed to give 120.191 g. It was therefore labelled *Newbouldia laevis* crude methanol (NLCM).

This method of extraction is called cold maceration. The NLCM obtained was used for bioassay, phytochemical screening and fractionation.

Fractionation. The NLCM 120.191 g was thus partitioned via coarse chromatography to give different fractions as NLH fraction 0.1 g, NLD – 2.5 g, NLE – 4.6 g, and NLM – 10.0 g.

The abbreviations above will be explained later.

Column chromatography. The following procedure was used for the column chromatography: the large column (60 & 7.0 diameter) was hung on a retort stand, and the queue was rinsed with n-hexane. Cotton wool was soaked in the solvent to be used and pushed down the bottom of the column using a steel rod. A mixture of silica gel and poured inside the column. The extract of about (600 mg) was mixed very well with a small silica gel, and the mixture of the crude extract plus the n-hexane and silica gel (slurry) was poured inside the column immediately. About 100 ml of n-hexane was used to wash down the column's sides and fill it up. The solvent system introduced into the column was (n-hexl:EAC 90/10 ml). The labelled vials bottles were used to collect the eluate. This collection continued for the subsequent mixtures of the solvent system (n-hexl:EAC), ml: 80/20, 70/30, 60/40, 50/50, 40/60, 30/70, 20/80, 10/90, 0/100.

Methanol 100 ml, a more polar solvent, was used to wash off the more polar components remaining in the column.

Thin layer chromatography. This technique was used to isolate pure compounds from any fractions collected from column chromatography. Each fraction collected was spotted on a pre-coated Thin layer Chromatography (TLC) plate with a capillary tube. About four 250 ml beakers were used to develop the spot as it travels from the origin through the solvent front. An Aluminium foil was used to cover the beaker each before the spots travelled through the solvent front. The solvent mixture adopted for a good separation are: 8:2 ml, 7:3 ml (EAc:n-Hex) and 4:5:1 ml (EAc:n-hex:CH₃OH).

A spot was made on the plate, developed in the solvent front. The dish was brought out from the beaker, 10 % H₂SO₄ was sprayed on the scale, and charred inside a hot oven at 50 °C for colour visualization. The retention factor for each spot was calculated using the relation (1):

$$R_f = \frac{\text{Distance moved by spot}}{\text{Distance moved by the solvent front}} \quad (1)$$

At the end of the TLC, similar samples with the same spot were pooled together. Thus NLM24 & NLM19 had single marks each. This means that the fractions are pure; therefore, they were packaged and sent for spectral analysis.

Spectroscopic analysis. Spectroscopy studies the interactions between particles such as electrons, protons and ions, as well as their interaction with other particles as a function of their collision energy. To be more precise, spectroscopy is the study of absorption and emission of light and other radiation by matter, as related to the dependence of these processes on the wavelength of the radiation. For the research, the following are the instrument, samples obtained and the laboratory where the experiment was done.

Table 2 – Equipment, samples obtained and the laboratory where the experiments were done

Equipment	Name of Laboratory	Samples Obtained
Long big column 60 cm and 7.0 diameter	John Igolisi' Chemistry laboratory, Markurdi (Benue State)	NLH 1-15 NLD 1-15 NLE 1-30 NLM 1-30
Flash column 30 cm and 3.5 diameter	John Igolisi' Chemistry laboratory, Markurdi (Benue State)	NLM19 and NLM24
NMR-Bruker AV3 (400 MHZ) Spectrophotometer	Chemistry Laboratory University of Glasgow, Scotland, UK	1H NMR (Pheophytin A) from NLM24 and β-amyirin from NLM19
NMR-Bruker AV3 (100 MHZ) Spectrophotometer	Chemistry Laboratory University of Glasgow, Scotland, UK	2D NMR (Pheophytin A) from NLM24 and β-amyirin from NLM19

RESULTS AND DISCUSSION

The extracts NLM, NLE, and NLDCM obtained were used to conduct chemical analysis viz: phytochemical screening, column chromatography, thin layer chromatography, and NMR spectroscopy.

Table 3 – The extracts NLM, NLE and NLDCM with their yields and appearance

Extract	Yield (%)	Appearance
NLM	10.0	Reddish brown
NLE	4.6	Greenish yellow
NLDCM	2.5	Dark green
NLH	0.1	Yellow

Table 4 – Result of Column chromatography of *Newboudia laevis* Leaves extract

Vials label	The volume of solvent mixture used for elution (ml)		Colour of fraction
	Hexane	Ethyl acetate	
	100	0	Colourless
	90	10	Colourless
NLH1	80	20	Yellow
NLH2	80	20	Light Yellow
NLH3	80	20	Yellow
NLH3	80	20	Grey
NLH4	80	20	Blue
NLH5	80	20	Deep Blue
NLH6	80	20	Deep blue
NLH7	80	20	Yellow
NLH8	80	20	Yellow
NLH9	80	20	Light green
NLH10	80	20	Light green
NLH11	80	20	Light green
NLH12	80	20	Dark green
NLH13	80	20	Dark green
NLH13	80	20	Green
NLH14	80	20	Light yellow
NLH15	80	20	Light yellow
NLD1	80	20	Light yellow
NLD2	60	40	Greenish Yellow
NLD3	60	40	Greenish Yellow
NLD4	60	40	Light yellow
NLD5	60	40	Light yellow
NLD6	60	40	Golden Yellow
NLD7	60	40	Golden Yellow
NLD8	60	40	Yellow

Vials label	The volume of solvent mixture used for elution (ml)		Colour of fraction
NLD9	60	40	Deep yellow
NLD10	60	40	Deep Yellow
NLD11	50	50	Black
NLD12	50	50	Black
NLD13	50	50	Dark brown
NLD14	50	50	Dark brown
NLD15	50	50	Dark brown
NLE1	50	50	Black
NLE2	50	50	Black
NLE3	50	50	Black
NLE4	50	50	Dark brown
NLE5	40	60	Greenish yellow
NLE6	40	60	Greenish yellow
NLE7	40	60	Greenish yellow
NLE8	40	60	Yellow
NLE9	40	60	Yellow
NLE10	40	60	Golden yellow
NLE11	40	60	Golden yellow
NLE12	40	60	Light yellow
NLE13	40	60	Yellow
NLE14	30	70	Light green
NLE15	30	70	Light green
NLE16	30	70	Light green
NLE17	30	70	Greenish yellow
NLE18	30	70	Greenish yellow
NLE19	30	70	Light green
NLE20	30	70	Light green
NLE21	30	70	Light green
NLE22	30	70	Light green
NLE23	20	80	Black
NLE24	20	80	Blue
NLE25	20	80	Yellow
NLE26	20	80	Light blue
NLE27	20	80	Light blue
NLE28	20	80	Brown
NLE29	20	80	Reddish brown
NLE30	20	80	Black
NLM1	20	80	Dark red
NLM2	10	90	Brown

Vials label	The volume of solvent mixture used for elution (ml)		Colour of fraction
NLM3	10	90	Brown
NLM4	10	90	Black
NLM5	10	90	Yellow
NLM6	10	90	Yellow
NLM7	10	90	Light blue
NLM8	10	90	Blue
NLM9	10	90	Deep blue
NLM10	10	90	Deep blue
NLM11	0	100	Reddish brown
NLM12	Methanol 100 %		Brown
NLM13			Brown
NLM14			Brown
NLM15			Reddish brown
NLM16			Reddish brown
NLM17			Brown
NLM18			Brown
NLM19			White
NLM20			Green
NLM21			Green
NLM22			Yellow
NLM23			Yellow
NLM24			Brown
NLM25			Brown
NLM26			Reddish brown
NLM27			Reddish brown
NLM28			Reddish brown
NLM29			Brown
NLM30			Brown

Notes: NLH – *Newbouldia Laevis* hexane, NLD – *Newbouldia Laevis* dichloromethane, NLE – *Newbouldia Laevis* ethyl acetate, NLM – *Newbouldia Laevis* methanol.

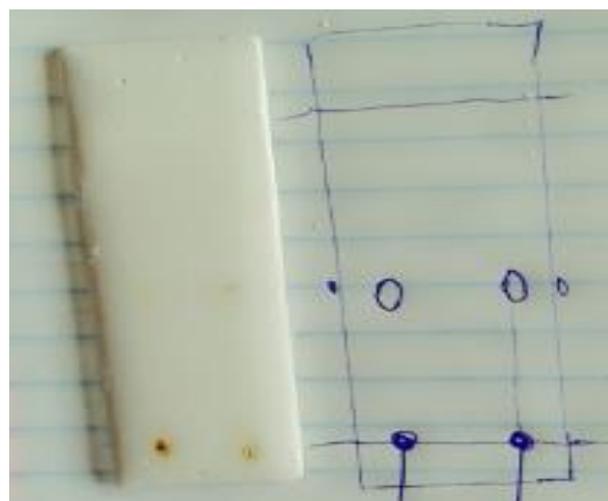
Column chromatography was done using about 10.0 g of methanol extract. The vials label, volume of the solvent mixture used for elution (ml) and colour of fractions when visualized with the naked eye are shown in Table 4 above.

With the solvent mixture of Hexane/Ethyl acetate (100/0, 90/10), respectively, the fractions appeared colourless. On changing the solvent mixture to Hexane/Ethyl acetate (100/20), about 15 bits (5 ml each) of NLH were collected. Their corresponding colours are shown in Table 4 above.

When the solvent mixture was changed to Hexane/Ethyl acetate (60/40), ten fractions (5 ml each) of NLD we collected and another five fractions (5 ml each) of NLD were collected when the solvent mixture was changed to Hexane/Ethyl acetate (50/50). Their corresponding colours are shown in the table above. Still, on the solvent mixture of Hexane/Ethyl acetate (50/50) and changing the solvent mixture (40/60, 30/70 and 20/80), 30 fraction (5 ml each) of NLE were collected. The colours corresponding to each of them are seen in Table 4 above.

Changing the solvent mixture further to Hexane/Ethyl acetate (10/90, 0/100) and finally washing down with 100 ml methanol, 30 fractions (5 ml each) of NLM were collected, and the colour of each particle can be seen in the table above. The whole bits collected were kept to dry, and further TLC was carried out on each. Afterwards, fractions with the same R_f values were pooled together. The colour of each bit signifies the possible organic compound present in it.

Thin layer chromatography results. The thin layer chromatography on the fractions obtained from column chromatography above in vials bottle labelled NLH 1-15, NLD 1-15, NLE 1-30, and NLM 1-30 and developed using a solvent mixture as EAC:n-hexane:MeOH (4:5:1) shows that only NLM24 and NLM19 gave single spot with R_f values of 0.48 and 0.47, respectively. The two pure fractions were thus packaged for NMR spectra analysis.



24 19

Figure 2 – TLC chromatogram for NLM24 and NLM19 using this solvent system EAc:n-hex (8:2, 7:3, 4:5:1 ml)

Spectral analysis results show in Table 5.

Table 5 – ^1H (400 MHz) and ^{13}C NMR (100 MHz) data of NLM24 and Literature data in CDCl_3

Position	NLM24		Literature data [10]		2D NMR		
	^1H (δ ppm)	^{13}C (δ ppm)	^1H (δ ppm)	^{13}C (δ ppm)	COSY.	HMBC(3J)	(2J)
1	-	142.1	-	141.22	-	-	-
2	-	131.7	-	131.44	-	C-1, C-3	C-2
2 ¹	3.43 (s)	12.1	3.44(S)	12.13	-	C-1, C-3	C-2
3	-	136.5	-	136.06	H-3 ¹ , H-4	-	-
3 ¹	8.03 (dd)	129.1	8.02(dd, 11.9; 17.8)	129.00	H-3 ² , 4-3	C-2, C-4	C-3 ²
3 ²	6.20	122.8	6.34(dd, 1.3; 17.8)	122.78	-	C-3	C-3
	6.30		6.17(dd, 1.3; 11.9)				
4	-	136.5	-	136.55	H-3, H-5	-	-
5	9.48 (1H, s)	97.9	9.56 (s)	99.66	H-4	C-7	-
6	-	155.3	-	131.52	-	-	-
7	-	136.5	-	145.60	-	-	-
7 ¹	3.22(s)	11.2	3.28(s)	11.32	H-8	C-6, C-8	C-7
8	-	145.2	-	149.72	H-8 ¹ , H-7 ¹	-	-
8 ¹	3.62 (q)	19.7	3.75 (q, 7.6)	19.73	-	-	C-8, C-8 ²
8 ²	1.72 (t)	17.4	1.72(t, 7.6)	19.66	-	C-8	-
9	-	149.9	-	142.87	-	-	-
10	9.50 (1H, s)	104.2	9.76 (s)	104.15	-	C-12, C-8	C-11
11	-	137.8	-	130.27	-	-	-
12	-	129.1	-	141.22	-	-	-
12 ¹	3.74 (s)	12.1	3.90 (s)	12.46	-	C-11, C-13	C-12
13	-	129.1	-	101.96	-	-	-
13 ¹	-	190.4	-	150.02	-	-	-
13 ²	6.34	64.9	-	161.04	-	-	-
13 ³	-	172.5	-	171.5	-	-	-
13 ⁴	3.91 (s)	51.9	3.74 (s)	54.16	-	-	-
14	-	149.9	-	111.34	-	-	-
15	-	104.5	-	100.45	-	-	-
16	-	162.5	-	166.33	-	-	-
17	4.16 (m)	51.9	5.14 (m)	53.70	-	-	-
17 ¹	2.35 (m)	31.9	2.81 (m)	24.77	-	C-18	-
17 ²	2.17 (m)	31.9	2.34 (m)	32.13	-	-	C-17
			2.16 (m)				-
17 ³	-	173.1	-	173.32	-	-	-
18	4.48 (m)	50.4	4.44 (m)	50.16	-	-	-
18 ¹	1.92 (d)	22.7	1.63(d)	22.72	-	C-19	C-18
19	-	172.49	-	170.90	-	-	-
20	8.64 (1H, s)	93.6	8.70(s)	93.89	-	C-18, C-2	C-1
P1	4.48 (2H, m)	61.58	4.44(m)	61.49			
P2	5.25 (1H, t)	117.94	5.14(t, 7.6)	117.74			
P3	-	-	-	-			
P13	1.58 (3H, s)	22.71	1.57(s)	16.23			
P4	1.75 (2H, m)	39.37	1.81	39.86			
P5-P14	1.4-0.9 ppm	19.73	1.61	25.04			
P6	1.09 (4H, m)	36.67					
P7	1.72 (2H, s)	32.77					
P17	0.80 (3H, d)	22.62	0.77(b,6.6)	19.63			
P8	1.25 (3H, m)	36.67					
P9	1.14 (2H, m)	22.67					
P10	1.72 (4H, m)	36.67					
P 11	1.72 (2H, s)	31.94	1.31	31.66			
P111	0.99 (2H, d)	19.73	0.80(d,6.6)	19.57			
P12	1.72 (4H, d)	36.67					
P13	1.25 (3H, d)	39.37	1.26	25.04			
P15	1.25 (3CH ₂)	31.94	1.29	31.95			
P15	0.86 (CH ₃ , d)	27.97	0.85(d, 6.6)	22.62			
P16	0.78 (CH ₃ , d)	19.42	0.85(d, 6.6)	22.62			

Spectroscopic analysis of isolated compounds. The $^1\text{H-NMR}$ spectrum of the compound showed the presence of ten methyls, thirteen methylene, eleven methine, and two ester protons. The three singlet signals seen at 9.50, 9.48 and 8.64 ppm are characteristic of H-10, H-5 and H-20 protons, respectively. This indicates the porphyrin unit of olefinic methine (=CH) protons bridging the pyrrole ring. Also, the signal is at 3.74 ppm (3H, s-12¹). 3.22 ppm (1H, s-7¹) and 3.43 ppm (3H, s-2¹) correspond to substituents (comprising four methyl and one ethyl group) attached to the pyrrole ring of the porphyrin unit. Other identified signals at 8.03 ppm include; a triplet at 3.62 ppm (2H, m-8¹), four isolated CH₃-Hs at H-13⁴, H-12¹, H-2¹ and H-7¹ as well as signals at 8.03 ppm and 6.20 ppm are characteristics of olefinic protons. The signals at 4.48 ppm (2H, m-P₁) and 5.26 ppm (1H, t-P₂) are of ester and methylene protons of the phytol group, confirming the esterified and also the presence of phytol group in the structure, the signals at 1.58 ppm (3H, s-P¹³), 0.80 ppm (3H, d), 0.99 ppm (3H, d) were assigned to the four methyl substituents at P¹³, P¹⁷, P¹¹¹ and P¹¹⁵, respectively. The signals at 0.86 ppm (3H, d P¹⁶) are characteristic of (CH₃-P¹⁶) protons

The multiplets at 1.92, 1.09, 1.25, 1.72, and 1.72 ppm correspond to the methylene protons indicated at P₄, P₆, P₈, P₁₀ and P₁₂, respectively. The remaining signals at 1.58 and 1.25 ppm were assigned to the three methylene protons labelled P₄, P₉ and P₁₃, respectively. There were no signals observed at P₃.

The singlet at 7.26 ppm in the $^1\text{H-NMR}$ spectrum of NLM24 is characteristic of the CDCl₃ solvent. This signal was due to some impurity in the deuterated chloroform used.

^{13}C NMR (100 MHz CDCl₃) of NLM24. APT (Attached proton test) was used to distinguish the carbon types (multiplicities). CH₃/CH is shown in the positive phase CH₂/C- is shown in the negative phase. The solvent CDCl₃ resonances visible in low field aromatic carbon atoms were absent.

The Nitrogen resonances were not seen. They were on the opposing side.

The ^{13}C NMR Spectrum showed 55 carbons, with a carbonyl at σ 173.1 (C-17³) in NLM24, suggesting an esterified position. One oxymethylene (σ 61.58), Ten methyl carbons at σ 129.1 (C-3¹), σ 97.9 (C-5), σ 104.2 (C-10), σ 64.9 (C-13²), σ 51.9

(C-17), σ 50.4 (C-18), σ 93.6 (C-20) & σ 117.94 (P-2), σ 32.77 (P-7) and σ 31.94 (P-11).

Eight methine C-carbons, 7 in the pheophorbide and 1 in the phytol side chain. Four methylenes in the pheophorbide at σ 19.7 (8¹), σ 31.9 (17¹), σ 31.9 (17²) and σ 122.8 (3²). Ten methylene in the phytol side chain. Also, methyl carbons were observed, 6 in pheophorbide and 5 in phytol side chain.

The signal at C-13¹ (σ 190.4) is the carbonyl of the cleaved E-ring.

The carbonyl at 17¹&17³ is carbonyl of esters resonating σ 172.5 & σ 173.1 because they are all ester carbonyl.

Signals at 104.20 ppm, 97.90 ppm and 93.63 ppm were observed in the negative phase corresponding to the olefinic methine (=CH) carbons of σ 104.2 (C-10), σ 97.9 (C-5) and σ 93.6 (C-20), which indicates a porphyrin moiety. Also, the signals at 51.90 ppm and 50.40 ppm observed in the positive phase corresponded to σ 51.9 (C-17) and σ 50.4 (C-18) methine carbons of the porphyrin moiety, while the signals at 61.58 ppm (COOCH₃ P¹) corresponds to the oxymethylene carbon which confirmed the esterification of the porphyrin ring by phytol group. More so, the signal at 117.78 (C P²) is characteristic of the olefinic carbon of the phytol group. The triplet at 77 ppm in the ^{13}C spectrum was due to the solvent (Deuterated chloroform) signal.

The $^1\text{H-}^1\text{H-COSY}$ NMR Spectrum of NLM24 showed some singlets at 9.63, 9.50 and 8.64 ppm corresponding to H-10, H-5 and H-20, respectively.

Signals were observed at 3.74 ppm (3H, d 18¹) and 1.72 ppm (3H, t²), resulting from four methyls and one ethyl group bonded to the pyrrole ring of the porphyrin unit. Also, the $^1\text{H-}^1\text{H}$ correlation signals at 4.48 ppm (2H, m-P₁) and 5.26 ppm (1H, t-P₂) were assigned to the ester and olefinic protons of the phytol group and correlated in the ^{13}C Spectrum of NLM24 with carbon signals at 61.58 ppm (2H, m-P₁) and 117.94 ppm (=CH-P₂). This confirms the esterification of the porphyrin moiety at C-17³ by phytol.

The HMBC Spectrum of NLM24 showed that the triplet at 8.03 ppm (H-3¹) displayed a wide range correlation to the olefinic methine (=CH) carbon at 122.8 ppm (C-3²) Via ^3J and ^2J coupling. In comparison, the doublet at 6.20 ppm (H-3²) showed a ^3J coupling to the olefinic (CH₂) carbon

at 129.10 ppm (C-3¹), establishing the attachment of (-CH=CH₂) group to C-3. The methyl (CH₃-8²) at 172 ppm showed a ³J coupling to the methylene at 19.70 ppm (C-8¹). They confirmed the attachment of (-CH₂CH₃) ethyl group to C-8. The methine protons at 4.16 ppm (H-17) and 4.48 ppm (H-18) also correlated to C-17 through ³J and ²J coupling, respectively. The methyl protons at 1.92 ppm (H-18¹) connected to C-17 at 51.90 ppm and C-18 at 50.40 ppm through ³J and ²J collar with the methine carbon (C-18).

Hence, the oxymethylene protons at 4.48 ppm (H-P₁) correlated to the (olefinic) carbon at 117.94 ppm (C-P₂), establishing the presence of the phytol group in the structure (NLM24).

Isolation of pheophytin A from *Newbouldial aegis* leaf is hereby reported for the first time. Pheophytin A is an Mg-free analogue of chlorophyll formed by replacing the Mg²⁺ in the chlorophyll molecules with (2H). NLM24 is brownish. It is practically insoluble in water but soluble in ethanol, diethyl ether, chloroalkanes and hydrocarbons.

The isolated compound pheophytin A has a lot of pharmacological importance, such as Antimicrobial [2], Antioxidant [5], Free radical scavenger [6], Anti-inflammatory [7], and Cancer Chemotherapy [8, 9].

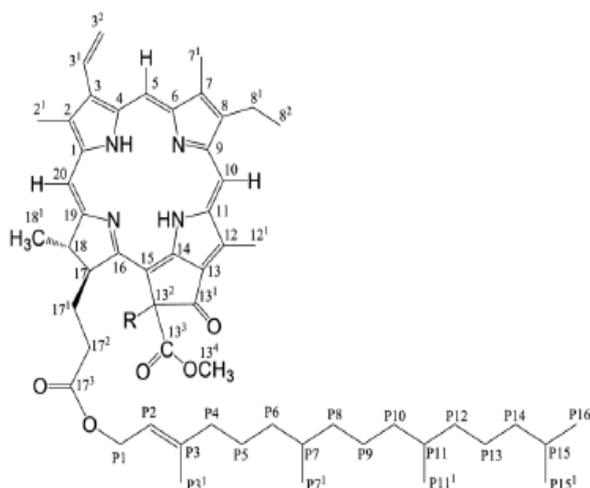


Figure 3– Structure of Pheophytin A

The signals at 0.78 ppm (s, Me-23), 0.80 ppm (s, Me-24), 0.93 ppm (s, Me-25), 0.94 ppm (s, Me-26), 0.95 ppm (s, Me-27), (s, Me-30) are characteristics of methyl protons. The rest of the signals were for methylene (Figure 4).

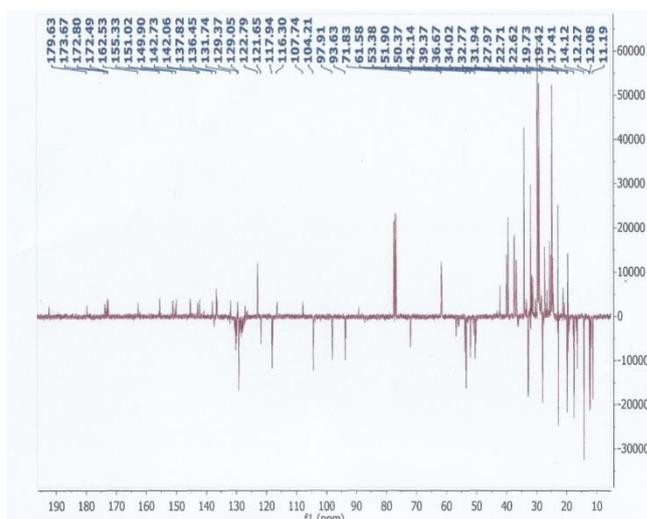


Figure 4a – ¹H-NMR spectrum for NLM24 (Pheophytin A)

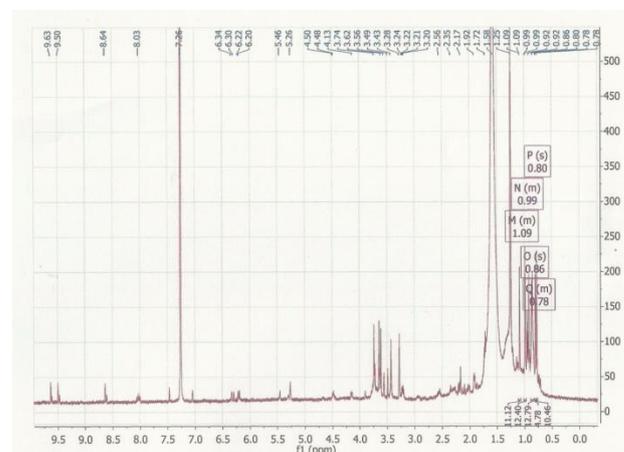


Figure 4b – ¹³C spectrum for NLM24 (Pheophytin A)

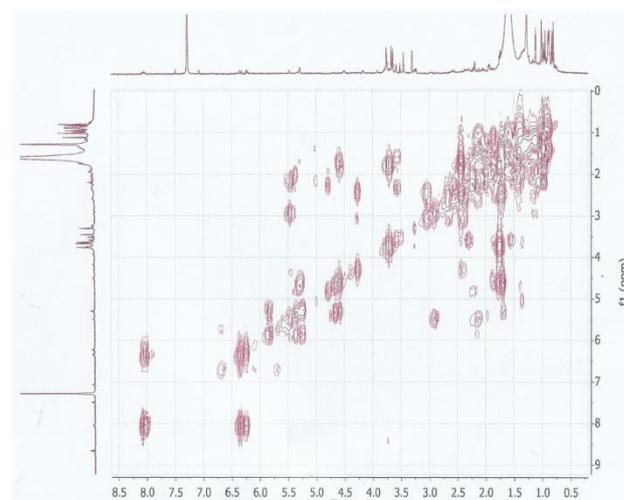


Figure 4c – COSY NMR spectrum for NLM24 (Pheophytin A)

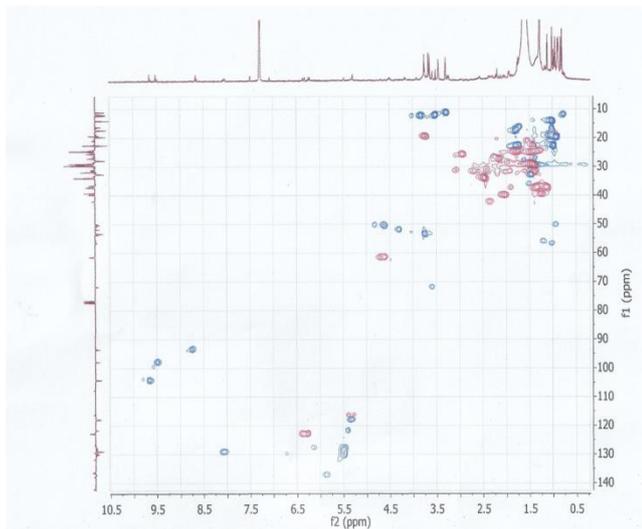


Figure 4d – HSQC NMR Spectrum for NLM24 (Pheophytin A)

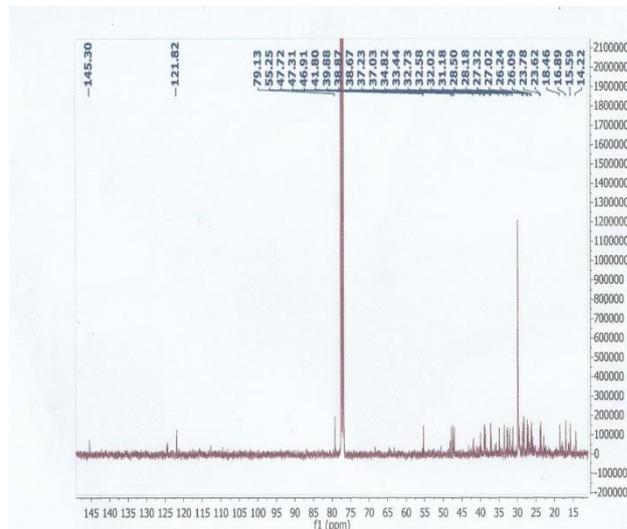


Figure 4g – ¹³C NMR Spectrum for NLM19 (β-amyirin)

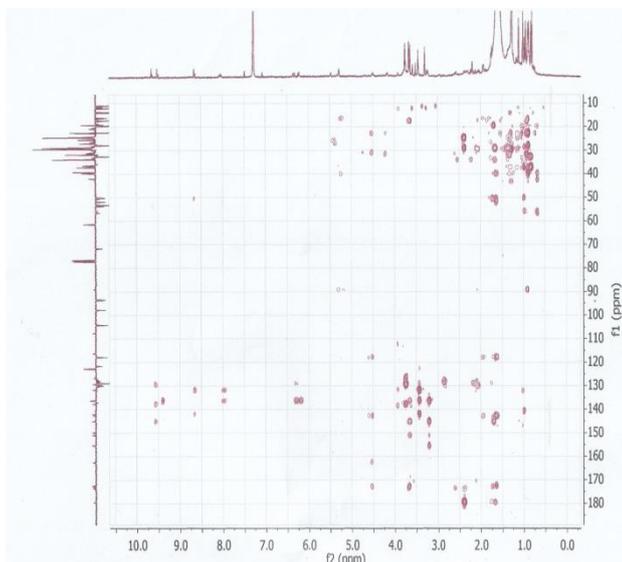


Figure 4e – HMBC NMR Spectrum for NLM24 (Pheophytin A)

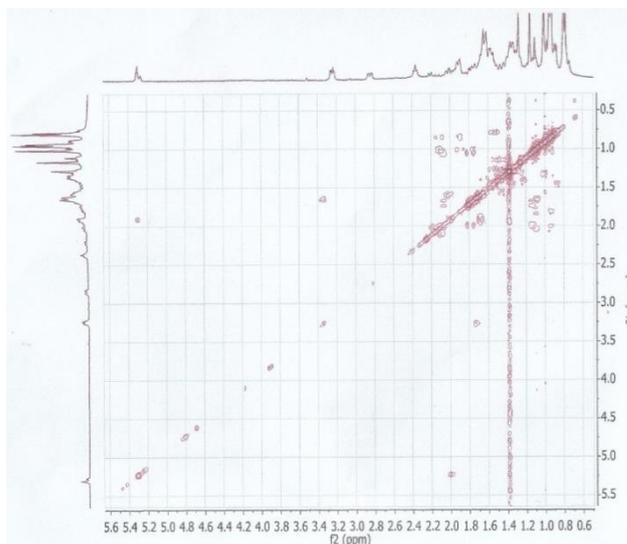


Figure 4h – COSY NMR Spectrum for NLM19 (β-amyirin)

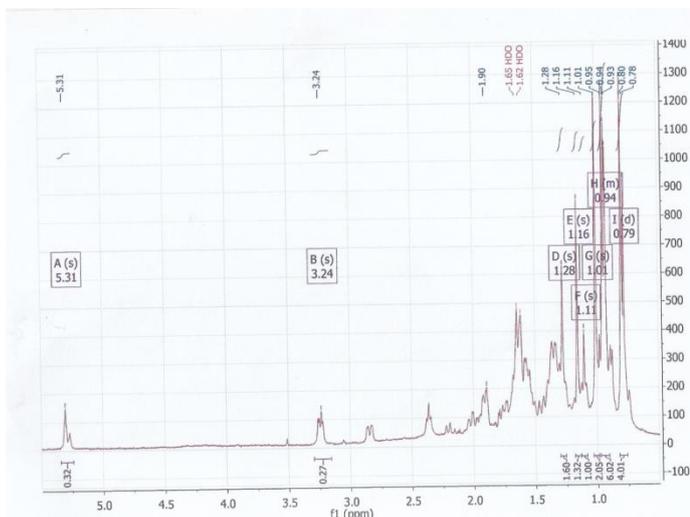


Figure 4f – ¹H NMR Spectrum for NLM19 (β-amyirin)

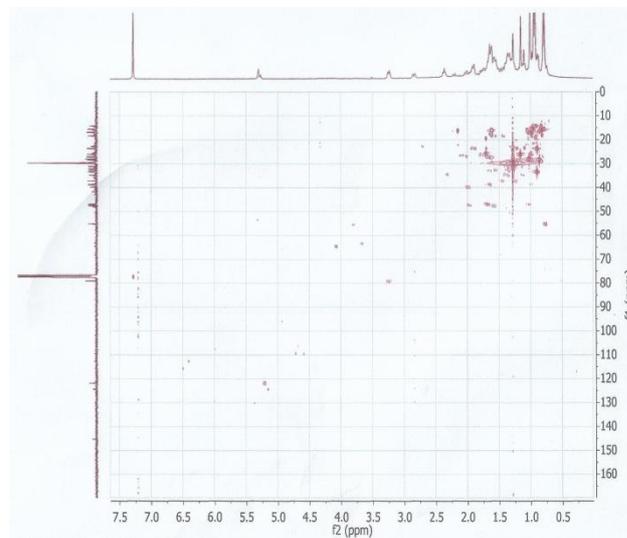


Figure 4i – HSQC NMR Spectrum for NLM19 (β-amyirin)

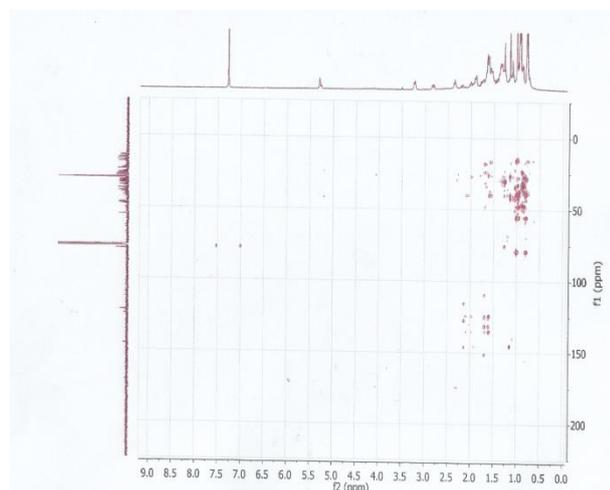


Figure 4j – HMBC NMR Spectrum for NLM19
(β-amyrin)

Characterization of NLM19 as β-amyrin. The ^1H NMR for NLM19 (Table 6) showed the presence of eight methyl singlets, one olefin proton at δ 5.31 ($J=3.5$ Hz), and an oxygenated proton at δ 3.24 ($J=4.4$, 11.5). All of them suggest an oleanane type of triterpenoid. The triplet diversity is due to coupling with the H-H protons at 1.62, 1.65 and 1.90 ppm. An oxymethine proton (H-3) at δ H.3.24 (dd, $J=11.5$) was also approximately observed and integrated for two protons.

Table 6 – ^1H (500 MHz) and ^{13}C (125 MHz) NMR Data of NLM19 and Literature Data in CDCl_3

Position	NLM19		Literature data [10]		2D NMR		
	$^1\text{H}(\delta\text{ppm})$	$^{13}\text{C}(\delta\text{ppm})$	$^1\text{H}(\delta\text{ppm})$	$^{13}\text{C}(\delta\text{ppm})$	COSY	HMBC (3J)	2J
1	1.55/1.48	38.87	1.55(Hb-1) 1.49(Ha-1)	38.8	H-2	C-3, C-25	-
2	1.52/1.56	27.32	1.52(Hb-2) 1.55(Ha-2)	27.4	H-1, H-3	-	C-3
3	3.24	79.13	3.20dd (4.4, 11.5)	79.2	H-2	-	-
4	-	38.67	-	39.0	-	-	-
5	-	55.25	0.71	55.4	H-6	-	-
6	18.5	1.53(Hb-6), 1.30(Ha-6)	18.6	H-5, H-7	-	-	-
7	-	32.73	-	32.9	H-6	-	-
8	-	39.88	-	40.2	-	-	-
9	-	47.31	1.95	47.4	-	C-5	-
10	-	37.3	-	37.2	-	-	-
11	1.90	23.62	1.84	23.8	H-12	-	-
12	5.31	121.82	5.16t (3.5)	121.9	-	-	-
13	-	145.30	-	145.4	-	-	-
14	-	41.80	-	41.9	-	-	-
15	-	26.24	-	26.4	H-16	-	-
16	-	27.02	-	27.1	H-15	-	-
17	-	32.58	-	32.7	-	-	-
18	1.90	47.72	1.89	47.8	H-19	-	-
19	1.65	47.32	1.59	47.0	H-18	-	-
20	-	31.18	-	31.3	-	-	-
21	1.62	37.03	1.66	37.4	H-22	-	-
22	-	34.82	34.9	H-21	-	-	-
23	0.78 (s)	15.59	0.77s	15.7	-	C-3, C-5, C-24	C-4
24	0.95 (s)	28.50	0.98s	28.3	-	C-3, C-5, C-23, C-5	C-4
25	0.93 (s)	15.59	0.92s	15.8	-	C-5	-
26	0.94 (s)	16.89	0.94s	17.0	-	-	-
27	1.12 (s)	26.09	1.11s	26.2	-	C-8, C-13, C-15	C-14
28	0.90 (s)	28.50	0.81s	28.6	-	C-30	-
29	0.80 (s)	33.44	0.85s	33.6	-	C-30	-
30	0.80 (s)	23.78	0.85s	23.9	-	-	-

The ^{13}C NMR spectrum showed a total of 30 carbons, with two olefinic methine carbons at $\delta 121.8$ (C-12) and $\delta 145.3$ (C-13) in NLM19 suggesting an oleanane triterpene:

- one oxygenated carbon ($\delta 79.1$);
- eight methyl carbons at $\delta 15.59$ (C-23), $\delta 28.50$ (C-24), $\delta 15.59$ (C-25), $\delta 16.89$ (C-26), $\delta 26.09$ (C-27), $\delta 28.50$ (C-28), $\delta 33.44$ (C-29) and $\delta 23.78$ (C-30);
- three methine carbon at $\delta 55.25$ (C-5), $\delta 47.31$ (C-9) and $\delta 47.72$ (C-18);
- six quaternary carbons at $\delta 38.67$ (C-4), $\delta 37.3$ (C-10), $\delta 39.88$ (C-8), $\delta 41.80$ (C-14), $\delta 32.58$ (C-17), $\delta 145.30$ (C-13), $\delta 31.18$ (C-20);
- ten methylene carbons at $\delta 38.87$ (C-1), $\delta 27.32$ (C-2), $\delta 1.53$ (Hb-6), 1.30 (Ha-6) (C-6), $\delta 32.73$ (C-7), $\delta 23.62$ (C-11), $\delta 26.24$ (C-15), $\delta 27.02$ (C-16), $\delta 47.32$ (C-19), $\delta 27.32$ (C-2), $\delta 34.82$ (C-22).

The signals observed at 121.82 and 145.30 ppm correspond to the olefinic methine (=CH) carbons of C-12 and C-13, indicating unsaturation in the oleanane skeletal structure. The signal at 79.13 ppm corresponding to C-3 indicates an oxygenated oleanane triterpene. Signals observed at 38.67, 37.3, 39.88, 41.80, 32.58, 145.30 and 31.18 ppm are characteristics of the quaternary carbons of triterpenes. The triplet at 38.87 ppm in the ^{13}C NMR spectrum was the solvent (chloroform) signal. The remaining assignments are shown in Table 6.

The ^1H - ^1H - COSY NMR spectrum of NLM19 showed some singlets at 0.78, 0.95, 0.93, 0.94, 1.12, 0.90, 0.80 and 0.80 ppm corresponded to H-23, H-24, H-25, H-26, H-27, H-28, H-29, and H-30, respectively. The signals observed at 5.16t (3.5), 3.20 dd (4.4, 11.5) resulted from the olefinic methine (=CH) carbons and the oxygenated group bonded to the oleanane structure. Also, the ^1H - ^1H correlation signals at 1.55 (Hb-1), 1.49 (Ha-1), 1.52 (Hb-2) and 1.55 (Ha-2) result from two methylenes bonded to H-1 and H-2, respectively.

The HMBC spectrum of NLM19 in Table 6 showed the methylene protons at 1.55/1.48 ppm (H-1) and 1.52/1.56 ppm (H-2) correlated to C-1 and C-2, respectively, through ^3J and ^2J coupling. The methyl protons at 0.78 ppm (H-23), 0.95 ppm (H-24), 0.93 ppm (H-24), 0.93 ppm (H-25), 1.12 ppm (H-27), 0.90 ppm (H-28) and 0.80 ppm (H-29) correlated to C-4, C-10, C-8, C-17 and C-20 through ^3J and ^2J wide range coupling, respective-

ly. Other correlations were not observed, as shown in Table 6.

It is from the above information as well as comparison with the literature data that led to the characterization of NLM19 as β -amyrin. The results were in good agreement with previous reports from [10]. Isolation of β -amyrin from *Newbouldia laevis* leaf is hereby reported for the first time. The amyryns are three closely related natural chemical compounds of triterpenes. Amyryns can exist as α -amyrin, β -amyrin and δ -amyrin [11].

The isolated compound " β -amyrin" from NLM19 is a pentacyclic triterpenoid, an oleanane substituted at the three beta-position by a hydroxyl group with a double bond between carbon positions 12 and 13.

β -amyrin was first isolated in 1968 by Corey and Gross. β -amyrin possesses a white colour and is primarily white solid upon isolation. The compound " β -amyrin" from NLM19 is soluble in ethanol and dimethyl formamide (DMF).

β -amyrin has a lot of pharmacological importance such as: Anti-inflammatory [12], Anti spasmodic activity [13], Pain-killer [14], Antinociceptive [1], Antiarthritic [15].

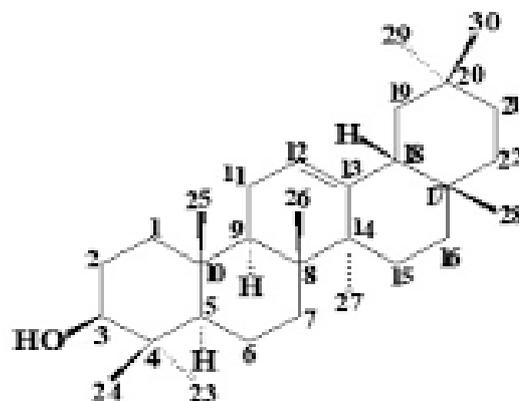


Figure 5 – Structure of β -amyrin

CONCLUSIONS

The NMR (^1H , ^{13}C , COSY, HSQC and HMBC) spectral analyses and characterization revealed the presence of pheophytin A, in NLM24 and β -amyrin in NLM19 fractions of leaf extracts of *Newbouldia laevis*.

This result shows that *N. laevis* contains bioactive components that can be used for the treatment of various health problems such as pain, inflammation, oedema, rheumatism, arthritis and heartburn.

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