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PROBLEMY ROLNICTWA ŚWIATOWEGO

PROBLEMS OF WORLD AGRICULTURE

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Łukasz Ambroziak[1]
Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej - Państwowy Instytut Badawczy w Warszawie

Wpływ pandemii COVID-19 na handel rolno-spożywczy Polski: pierwsze doświadczenia

The Impact of the Pandemic COVID-19 on Agri-Food Trade of Poland: First Experiences

Synopsis. Wybuch pandemii COVID-19 na początku 2020 r. w sposób istotny zmienił uwarunkowania rozwoju wymiany handlowej produktami rolno-spożywczymi. Celem artykułu jest próba oceny wpływu pierwszych miesięcy pandemii COVID-19 na polski handel rolno-spożywczy. Analizy dokonano na podstawie niepublikowanych danych Ministerstwa Finansów, stosując metodę statystyczno-opisową. Z wstępnych danych handlowych za pierwsze półrocze 2020 r. wynikało, że poza nielicznymi wyjątkami polski eksport rolno-spożywczy dobrze radził sobie w okresie największych ograniczeń związanych z przemieszczaniem się ludności wprowadzonych wskutek pandemii COVID-19. Było to efektem m.in. tego, iż żywność jest produktem pierwszej potrzeby (tak, jak np. leki) i cechuje ją niższa elastyczność dochodowa popytu, a także relatywnie niewielkich zakłóceń w produkcji.

Słowa kluczowe: pandemia COVID-19, eksport, import, produkty rolno-spożywcze, Polska

Abstract. The outbreak of the COVID-19 pandemic at the beginning of 2020 significantly changed the conditions for the development of trade in agri-food products. The aim of the article is to assess the impact of the first months of the COVID-19 pandemic on the agri-food trade of Poland. The analysis was based on unpublished data from the Ministry of Finance, using descriptive statistics method. Preliminary trade data for the first half of 2020 showed that with few expectations Polish agri-food exports performed well during lockdown, that is in the period of the greatest restrictions related to the movement of people introduced by the COVID-19 pandemic. It resulted, inter alia, from the fact that food is a basic necessity (such as e.g. medicines) and is characterized by lower income elasticity of demand, and also from relatively small disruptions in production.

Keywords: pandemic COVID-19, export, import, agri-food products, Poland

JEL Classification: F14, F62, Q17

Wprowadzenie

Okres członkostwa Polski w Unii Europejskiej to czas systematycznego rozwoju handlu zagranicznego produktami rolno-spożywczymi, a w szczególności eksportu. Pozytywne zmiany widoczne były już w 2004 r., kiedy to dodatnie saldo obrotów produktami rolno-spożywczymi po raz pierwszy przekroczyło 0,8 miliarda euro, a Polska odnotowała dwucyfrowe tempo wzrostu eksportu i importu. Obroty handlowe Polski produktami rolno-spożywczymi zwiększały się także w kolejnych latach. Wyjątek stanowił

[1] dr, e-mail: lukasz.ambroziak@ierigz.waw.pl; https://orcid.org/0000-0001-8708-841X

jedynie 2009 r., kiedy to na skutek spowolnienia gospodarczego wywołanego przez światowy kryzys finansowo-gospodarczy, obroty te zmalały – eksport o 1,7%, a import o 9,5% w porównaniu z rokiem poprzednim. Polski eksport okazał się zaś odporny na wprowadzenie przez Rosję embarga w przywozie niektórych produktów rolno-spożywczych z UE oraz na wprowadzone zakazy przywozu polskiej wieprzowiny do wielu krajów (Bułkowska, 2019).

W 2019 r. wartość eksportu rolno-spożywczego Polski osiągnęła poziom 31,8 mld euro, co oznaczało ponad sześciokrotny wzrost w porównaniu z 2004 r. Z zagranicy sprowadzono do Polski produkty rolno-spożywcze o wartości 21,3 mld euro, tj. blisko pięciokrotnie większej niż w 2004 r. Od akcesji Polski do UE dodatnie saldo wymiany handlowej produktami rolno-spożywczymi także systematycznie się zwiększało (z wyjątkiem lat 2008 i 2016). W 2019 r. wartość tej nadwyżki wyniosła 10,5 mld euro.
Pierwsze dwa miesiące 2020 r. przyniosły dalszy wzrost handlu rolno-spożywczego Polski. W marcu 2020 r. zmieniły się jednak znacząco uwarunkowania wymiany handlowej w związku z pandemią COVID-19 wywołaną przez wirus SARS-CoV-2. Dotyczyło to zarówno strony popytowej, jak i podażowej. Zrodziło to szereg pytań, m.in. o to, jak sektor rolno-spożywczy poradzi sobie z zachodzącymi perturbacjami na rynku. Stąd też, celem artykułu jest próba oceny wpływu pierwszych miesięcy pandemii COVID-19 na polski handel rolno-spożywczy. W pierwszej części artykułu przedstawiono na podstawie literatury przedmioty mechanizmy wpływu pandemii na handel, a w szczególności na handel produktami rolno-spożywczymi. Następnie opisano metodę badawczą i dane wykorzystane w analizie. Główną częścią artykułu jest analiza zmian w handlu w pierwszych sześciu miesiącach 2020 r. Artykuł kończy dyskusja i podsumowanie.

Przegląd literatury

Problematyka wpływu pandemii na gospodarkę wpisuje się w szerszy nurt literatury odnoszący się do skutków gospodarczych różnego rodzaju klęsk żywiołowych (m.in. Abe, Ye 2012; Haraguchi, Lall, 2015; Zhu, Ito, Tomiura, 2016). Możemy do nich zaliczyć trzęsienia ziemi i wywołane w ich następstwie fale tsunami, powodzenie, susze, pożary. Pandemia jest jednym z rodzajów klęski żywiołowej, która może doprowadzić do zakłócenia procesów gospodarczych w skali regionu, kraju czy w skali globalnej. Pandemia, której obecnie doświadczamy to zjawisko nieobserwowane na taką skalę od wieku, tj. od czasu grypy hiszpanki z lat 1918-1920. W ostatnich latach doświadczyliśmy, co prawda, epidemii (m.in. SARS, świńska grypa, Ebola), ale nie występowały one na aż taką skalę.

Gwałtowne ograniczenie aktywności gospodarczej w czasie pandemii COVID-19 zostało wymuszone względami zdrowotnymi. Wiele krajów wprowadziło stan zagrożenia epidemicznego, który skutkował ograniczeniem aktywności ludności. Pandemia negatywnie wpłynęła zarówno na popytową, jak i podażową stronę rynku (Baldwin, Tomiura, 2020). Spadek popytu był wynikiem ograniczenia mobilności konsumentów, wzrostu niepewności w związku z zagrożeniem zdrowia i utratą pracy oraz restrykcyjną polityką kredytową banków. W pierwszej kolejności załamał się popyt na usługi, z których korzystanie wymaga osobistego uczestnictwa konsumenta, takie jak: usługi rozrywkowe, kulturalne, turystyczne, czy transportowe (WTO, 2020a, 8). Ucierpiały także usługi,

których świadczenie uwarunkowane było kontaktem usługobiorcy i usługodawcy, np. usługi fryzjerskie, kosmetyczne, gastronomiczne i hotelarskie. Gruszczynski (2020) zauważa, że największymi ofiarami pandemii COVID-19 były: turystyka międzynarodowa, lotnicze przewozy pasażerskie oraz transport kontenerowy. Zmniejszył się również popyt na dobra konsumpcyjne trwałego użytku, m.in. samochody, sprzęt AGD i RTV, meble (Strange, 2020, 458). Odmiennie kształtowała się natomiast sprzedaż żywności.

Żywność jest produktem pierwszej potrzeby (tak, jak np. leki) i cechuje ją niższa elastyczność dochodowa popytu. Oznacza to, że jednostkowy spadek dochodów konsumenta powoduje relatywnie niewielki spadek popytu na żywność w porównaniu z chociażby dobrami trwałego użytku. Stąd też w większości krajów, jedyną grupą produktów, której eksport zwiększył się w okresie pandemii były produkty rolno-spożywcze (ECLHC, 2020; Kazunobu, Hiroshi, 2020).

Mechanizm reakcji konsumentów na środki zastosowane w celu przeciwdziałaniu rozprzestrzeniania się pandemii COVID-19 w większości krajów był podobny. Informacje o mających nastąpić ograniczeniach w przemieszczaniu się mieszkańców skutkowały gwałtownym wzrostem popytu na niektóre wyroby o przedłużonej trwałości. Dotyczyło to kasz, ryżu, makaronów, konserw, zup, żywności mrożonej i gotowej, mąki, czy drożdży. Niedobory tych produktów, nawet jeśli występowały, to miały krótkotrwały charakter (Szczepaniak i in., 2020). Producenci bowiem na zwiększony popyt odpowiedzieli zwiększoną produkcją tych wyrobów. W okresie szybko rozwijającej się pandemii zyskali także producenci alkoholu etylowego, gdyż gwałtownie wzrósł popyt zarówno krajowy, jak i zagraniczny na spirytus jako środek do dezynfekcji.

Ograniczenie działalności restauracji i hotelu spowodowało wyraźny spadek popytu na produkty rolno-spożywcze ze strony sektora hotelarskiego i gastronomicznego (HoReCa), zarówno w kraju, jak i za granicą (Miroudot, 2020, 121). Również zamknięcie szkół i uczelni, posiadających swoje stołówki, przyczyniło się do zmniejszenia dostaw produktów rolno-spożywczych do tych placówek. Zmniejszył się także popyt na wyroby czekoladowe oraz niektóre rodzaje alkoholi, które były zazwyczaj prezentami przy okazji różnego rodzaju imprez okolicznościowych (np. urodziny, imieniny).

Kryzys gospodarczy spowodowany pandemią COVID-19 skłonił szereg państw do wprowadzenia ograniczeń eksportu żywności, aby zapewnić dostępność podstawowych produktów spożywczych dla własnych mieszkańców (Espitia, Rocha, Ruta, 2020). Działania takie podjęły m.in.: Rosja, Kazachstan, Ukraina, Rumunia, Egipt, Kambodża, Indie i Wietnam. Szereg państw zdecydowało się także na zastosowanie innych środków, takich jak kontrola cen, czy uwolnienie rezerw strategicznych dla przeciwdziałania wzrostowi cen i niedoborom żywności na rynkach wewnętrznych wywołanych przerwaniem łańcuchów dostaw. Uderzyło to przede wszystkim w kraje uzależnione od importu podstawowych produktów żywnościowych, często kraje o relatywnie niskim dochodzie na mieszkańca.

Ponadto, w okresie recesji wywołanej pandemią zwiększyła się skłonność konsumentów – zarówno w kraj, jak i za granicą – do nabywania produktów krajowych. Mogło oznaczać to zmniejszenie popytu na polską żywność. W dłuższej perspektywie może dojść do nasilenia tendencji protekcjonistycznych i zwiększenia ochrony rynków krajowych przed żywnością importowaną, w tym z Polski. Byłoby to szczególnie niekorzystne dla polskich producentów, gdyż sektor rolno-spożywczy w Polsce rozwija się

dynamicznie głównie dzięki dużym wzrostom na rynkach zagranicznych (Szczepaniak, Ambroziak, Drożdż, 2019).

Spadek podaży był zaś konsekwencją epidemicznych restrykcji w prowadzeniu działalności gospodarczej (m.in. produkcyjnej i logistycznej) oraz ograniczenia dostępu do rynków i przerwania łańcuchów dostaw (Szajner, 2020). W szczególności dotknęły one działy przetwórstwa przemysłowego silnie zintegrowane z globalnymi łańcuchami dostaw, takie jak: przemysł motoryzacyjny, produkcję komputerów, wyrobów optycznych i elektronicznych oraz maszyn i urządzeń. Było to widocznie przede wszystkim w styczniu i lutym 2020 r., kiedy pandemia dotknęła Chiny, a w mniejszym stopniu także inne kraje Azji Wschodniej i Południowo-Wschodniej. Dążąc do minimalizacji kosztów produkcji, wiele firm z wyżej wymienionych branż ulokowało w Chinach niektóre etapy produkcji. Zakłócenia w produkcji wywołane pandemią skutkowały zakłóceniami w dostawach części i komponentów do Europy, a w konsekwencji problemami w wielu europejskich fabrykach (Strange, 2020).

W porównaniu z innymi działami przetwórstwa przemysłowego, produkcja żywności cechuje się krótszymi łańcuchami dostaw, których poszczególne ogniwa zlokalizowane są głównie w kraju. To czyni je relatywnie bardziej odpornymi na zakłócenia dostaw. Espitia, Rocha i Ruta (2020) zauważają, że na zakłócenia w produkcji sektora rolno-spożywczego najbardziej narażone były te branże, w ramach których produkcja odbywa się przede wszystkim w oparciu o pracowników. Jako przykład podają przetwórstwo ryb. Jak pokazuje przykład Polski, relatywnie odporne na zakłócenia związane z pandemią były dostawy surowców na potrzeby przetwórstwa, m.in. w branży rybnej, tytoniowej oraz kawy i herbaty.

Nieco większe problemy odnotowano w transporcie towarów, w tym produktów rolno-spożywczych. Większość z nich do europejskich odbiorców transportowana jest drogą lądową. Przywrócenie, w mniejszym bądź większym zakresie, kontroli na granicach oraz konieczność spełnienia zaostrzonych norm bezpieczeństwa zdrowotnego mogło opóźnić transport i generować dodatkowe koszty (Maliszewska, Mattoo, van der Mensbrugghe, 2020, 4). Z kolei, drastyczna redukcja lotów pasażerskich (przewożących także ładunki handlowe) sprawiła, że trudności w dostawach dotyczyły również produktów wysyłanych do odległych krajów, a ceny frachtu lotniczego wyraźnie wzrosły (WTO, 2020b, 5). W lutym 2020 r. na trasie Chiny-Ameryka Północna były one o 30% wyższe niż w październiku 2019 r., a na trasie Europa-Ameryka Północna nawet o 60% wyższe (OECD, 2020, 4). Przywracanie połączeń lotniczych od maja 2020 r. zmniejszyło ten problem.

Istotnym efektem pandemii był wzrost w okresie marzec-kwiecień cen frachtu morskiego (nawet rzędu kilkudziesięciu procent w ciągu zaledwie 2-3 miesięcy). Uwzględniając fakt, że polski eksport oparty był na niskich marżach, zjawisko to w zasadzie przekreślało opłacalność sprzedaży.

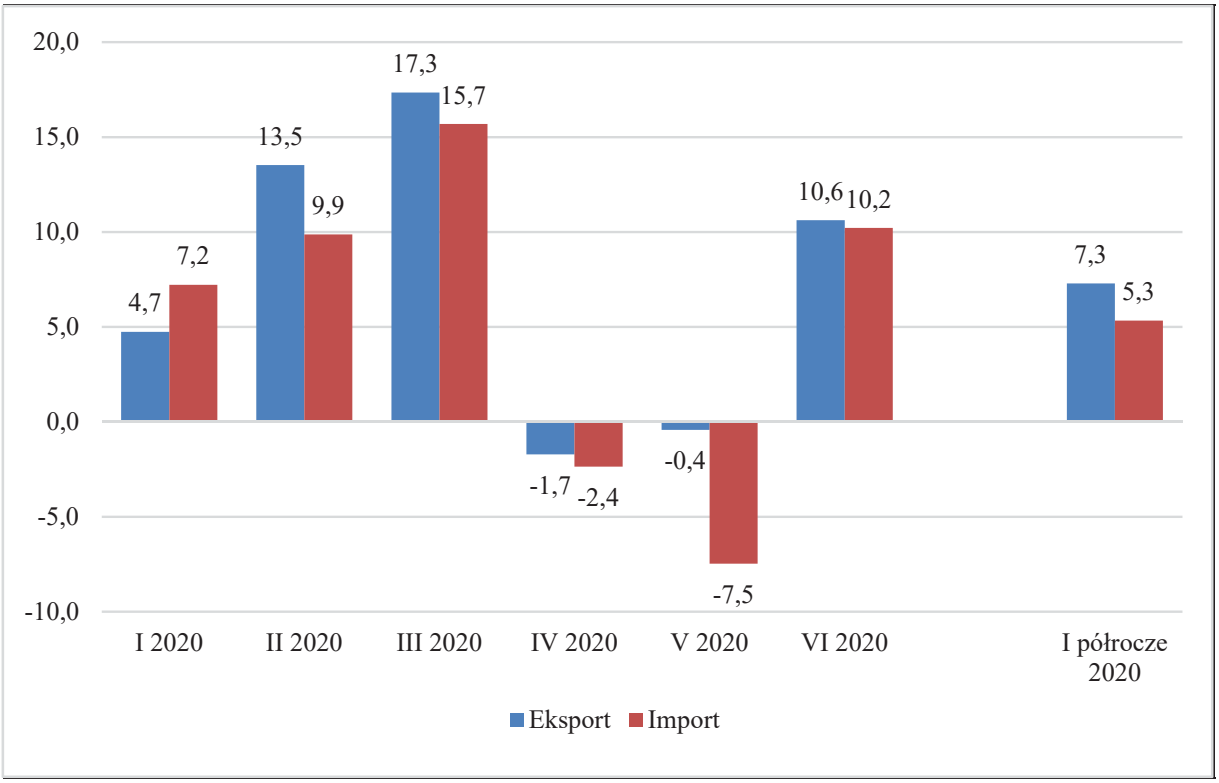
Metoda badania i źródła danych

Analizy zmian w handlu rolno-spożywczym Polski w efekcie pandemii COVID-19 dokonano na podstawie wstępnych danych o polskim eksporcie i imporcie produktów rolno-spożywczych (działy 01-24 HS) za pierwsze półrocze 2020 r. Zastosowano analizę statystyczno-opisową. Porównano zmiany w ujęciu miesięcznym, jak i za całe półrocze 2020 r. Źródłem danych były niepublikowane dane handlowe Ministerstwa Finansów.

Wyniki badania

Z wstępnych danych handlowych za pierwsze półrocze 2020 r.[2] wynikało, że – wbrew wcześniejszym obawom oraz nierzadko niepokojącym informacjom prasowym – polski eksport rolno-spożywczy kontynuował wzrostowy trend. Spadki sprzedaży zanotowano na ograniczonej liczbie zagranicznych rynków i w odniesieniu do niektórych grup towarów.

W pierwszym kwartale 2020 r. handel produktami rolno-spożywczymi wzrastał, a jego dynamika (liczona rok do roku) zwiększała się z miesiąca na miesiąc (rys. 1). W marcu eksport rolno-spożywczy (wyrażony w euro) był wyższy o 17,3% niż rok wcześniej, a import – o 15,7%. Wyraźne pogorszenie odnotowano w kwietniu i maju 2020 r., kiedy to polski eksport żywności nieznacznie zmalał – odpowiednio o 1,7% i 0,4% w porównaniu z analogicznym okresem roku poprzedniego. W większym stopniu zmniejszył się natomiast import. Czerwiec przyniósł wyraźne odbicie w handlu i ponad dwucyfrowe wzrosty (liczone rok do roku).



Rys. 1. Zmiany polskiego eksportu i importu rolno-spożywczego Polski (wyrażonego w euro) w pierwszym półroczu 2020 r., w % w porównaniu z analogicznym okresem roku poprzedniego

Fig. 1. Changes in Polish agri-food exports and imports (denominated in euro) in the first half of 2020, in percent compared with the same period last year

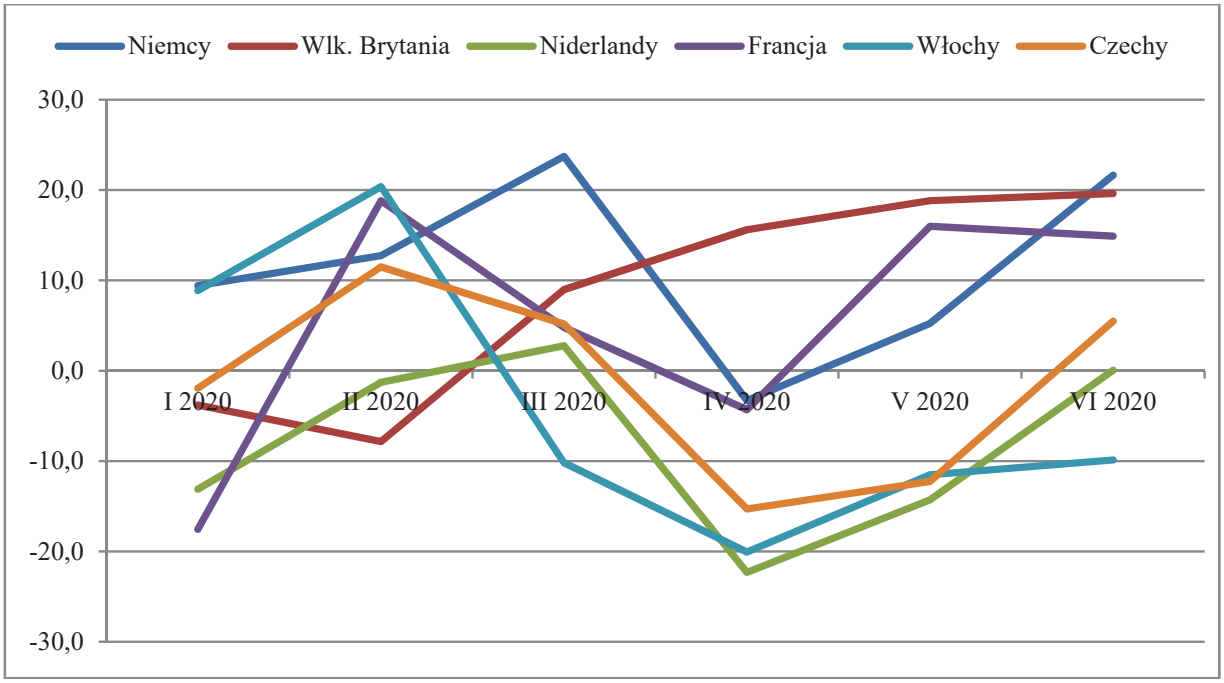
Źródło: Opracowanie własne na podstawie niepublikowanych danych Ministerstwa Finansów.

[2] Zbiór danych o obrotach handlu zagranicznego ma charakter otwarty. Dane publikowane wcześniej są korygowane w miarę napływu dokumentów celnych oraz deklaracji INTRASTAT.

Wartość eksportu rolno-spożywczego Polski w pierwszym półroczu 2020 r. wyniosła 16 475 mln euro i nadal była o 7,3% wyższa niż w analogicznym okresie roku poprzedniego (rysunek 1). Tym samym udział produktów rolno-spożywczych w polskim eksporcie ogółem zwiększył się do niespotykanego dotąd poziomu 15,0%. Wartość importu rolno-spożywczego Polski w pierwszym półroczu 2020 r. wyniosła 11 104 mln euro i była o 5,3% wyższa niż przed rokiem.

Zmiany w handlu w ujęciu geograficznym

Najwcześniej, bo już w lutym 2020 r., skutki pandemii COVID-19 odczuli producenci z branży mleczarskiej eksportujący na rynek chiński. Utrudniony był bowiem odbiór wysłanych produktów i rozładowanie kontenerów. W marcu 2020 r. sytuacja epidemiczna w Chinach zaczęła się stabilizować, a polscy eksporterzy zaczęli mieć problemy ze zbytem swoich produktów w UE. Załamał się eksport świeżej lub schłodzonej wołowiny do Włoch. W porównaniu z lutym 2020 r. jego wartość zmniejszyła się o 7 mln euro, czyli o ponad 25%. Ponieważ Włochy są największym (30,5% w 2019 r.) odbiorcą polskiej wołowiny (świeżej i schłodzonej), spowodowało to zakłócenia na krajowym rynku tego mięsa. Część nadwyżek sprzedano jednak w Wielkiej Brytanii, Niderlandach i Grecji. Popyt na wołowinę rósł ponownie od czerwca. Cały eksport rolno-spożywczy do Włoch w marcu 2020 r. był o ponad 10% mniejszy niż rok wcześniej (rys. 2).

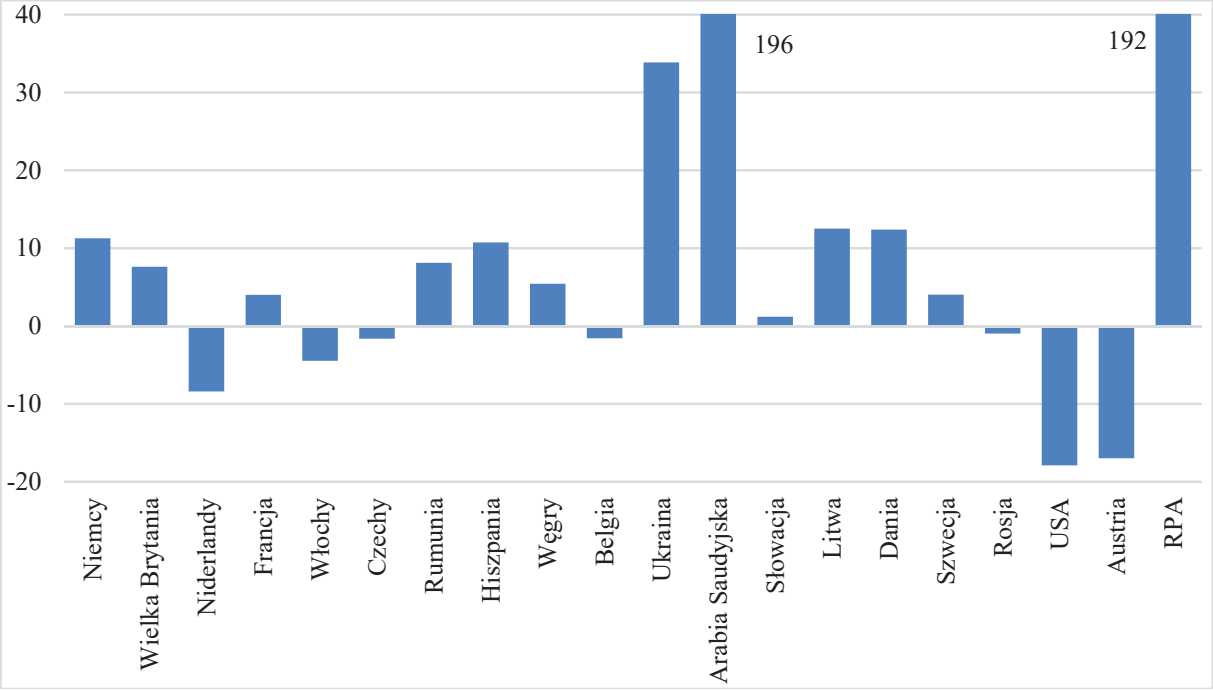


Rys. 2. Zmiany polskiego eksportu rolno-spożywczego do wybranych krajów UE w pierwszym półroczu 2020 r., w % rok do roku

Fig. 2. Changes in Polish agri-food exports to the selected EU countries in the first half of 2020, in percent year-on-year

Źródło: Opracowanie własne na podstawie niepublikowanych danych Ministerstwa Finansów.

W większości krajów eksport najbardziej ucierpiał w kwietniu 2020 r., kiedy to spadki dostaw polskich produktów rolno-spożywczych do wielu krajów były dwucyfrowe. Wśród najważniejszych rynku zbytu polskiej żywności najbardziej załamał się eksport do Niderlandów, Włoch, Stanów Zjednoczonych, Węgier i Czech. Względnie odporny okazał się zaś eksport do Niemiec i Francji, gdzie spadki sprzedaży były kilkuprocentowe. W maju i czerwcu eksport wyraźnie odbił, przy czym ponownie lepiej polscy producenci radzili sobie na rynku niemieckim i francuskim niż na innych rynkach. Nietypowo zachowywał się z kolei eksport rolno-spożywczy do Wielkiej Brytanii, co można wiązać z efektem bazy statystycznej. Otóż w pierwszym kwartale 2019 r. wielu brytyjskich odbiorców gromadziło zapasy przed mającym nastąpić twardym brexitem, a w konsekwencji powrotem ceł i kontroli na granicach. W drugim kwartale zaś na skutek zgromadzonych wcześniej zapasów eksport do Wielkiej Brytanii wyraźnie się zmniejszył. Stąd też w styczniu i lutym 2020 r. eksport na rynek brytyjski był mniejszy niż rok wcześniej, tuż przed mającym nastąpić twardym brexitem. W kolejnych miesiącach tempo dostaw do Wielkiej Brytanii systematycznie rosło.



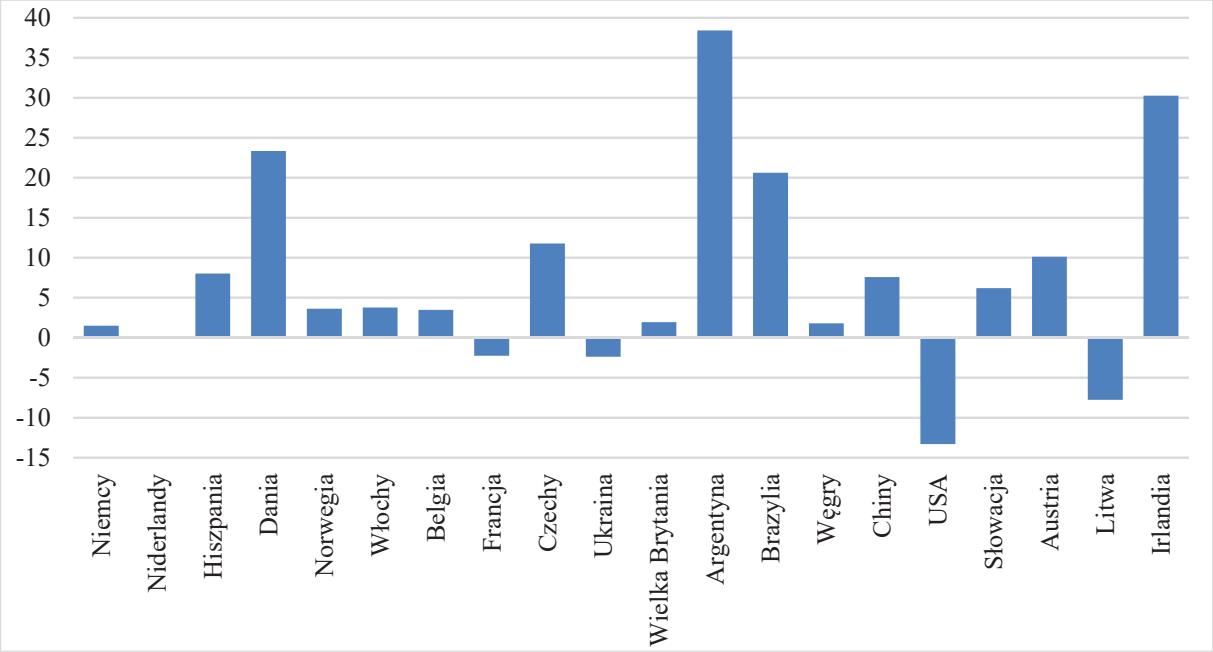
Rys. 3. Zmiany w eksporcie rolno-spożywczym Polski (wyrażonym w euro) do najważniejszych odbiorców w pierwszym półroczu 2020 r., w % w porównaniu z analogicznym okresem roku poprzedniego

Fig. 3. Changes in Polish agri-food exports (denominated in euro) to the main recipient in the first half of 2020, in percent compared with the same period last year

Źródło: Opracowanie własne na podstawie niepublikowanych danych Ministerstwa Finansów.

Wśród dwudziestu największych polskich odbiorców produktów rolno-spożywczych (według danych za pierwsze półrocze 2020 r.), wyraźne spadki eksportu zanotowano w zasadzie tylko w odniesieniu do trzech rynków – Stanów Zjednoczonych (spadek

o 17,9%[3] w porównaniu z analogicznym okresem roku poprzedniego), Austrii (o 17%) oraz Niderlandów (o 8,4%) – rysunek 3. O blisko 5% zmniejszyła się wartość dostaw produktów rolno-spożywczych do Włoch, a o mniej niż 2% do Czech, Rosji i Belgii.



Rys. 4. Zmiany w imporcie rolno-spożywczym Polski (wyrażonym w euro) od najważniejszych dostawców w pierwszym półroczu 2020 r., w % w porównaniu z analogicznym okresem roku poprzedniego

Fig. 4. Changes in Polish agri-food imports (denominated in euro) from the main suppliers in the first half of 2020, in percent compared with the same period last year

Źródło: Opracowanie własne na podstawie niepublikowanych danych Ministerstwa Finansów.

Z kolei, o ponad 11% (r/r) wzrósł w pierwszym półroczu 2020 r. eksport rolno-spożywczy Polski do Niemiec – największego odbiorcy polskiej żywności. Było to m.in. wynikiem zwiększonej sprzedaży papierosów (ich eksport w okresie styczeń-czerwiec 2020 r. wyniósł 582 mln euro i był aż o 67% większy niż rok wcześniej), pozostałego przetworzonego tytoniu, pieczywa oraz wyrobów czekoladowych. Aż o 196% zwiększyła się sprzedaż w Arabii Saudyjskiej (efekt m.in. wzrostu eksportu pszenicy i papierosów), a o 192% w Republice Południowej Afryki (efekt m.in. wzrostu eksportu pszenicy), o 33,5% do Ukrainy i o ponad 10% na Litwę, do Danii i Hiszpanii.

Wśród największych dostawców produktów rolno-spożywczych do Polski, zmniejszył się import ze Stanów Zjednoczonych (o 13,3% w porównaniu z pierwszym półroczem 2019 r.), Litwy (o 7,8%) oraz Francji i Ukrainy (o około 2%) – rysunek 4. Wyraźnie wzrósł zaś import z Argentyny i Brazylii – odpowiednio o 38% i 21% (zwiększone dostawy śruty sojowej), Irlandii – o 30% (m.in. ryb świeżych i schłodzonych) oraz Danii – o 23% (m.in. żywych świń).

[3] Spadek był efektem zmniejszenia dostaw wieprzowiny oraz soków i koncentratów owocowych, co jednak nie miało bezpośredniego związku z wybuchem pandemii.

Zmiany w handlu w ujęciu towarowym

Wśród dwudziestu najważniejszych grup produktów (według pozycji CN), w okresie styczeń-czerwiec 2020 r. zmniejszył się eksport produktów tylko czterech grup – soków owocowych (o 12,2%, r/r), mięsa drobiowego (o 9,1%), mięsa wieprzowego (o 10,7%), oraz pozostałych przetworów spożywczych (o 2,7%) – tabela 1. Mimo załamania sprzedaży wołowiny w okresie marzec-kwiecień 2020 r., udało się po sześciu miesiącach odrobić straty w eksporcie wołowiny świeżej i schłodzonej, osiągając sprzedaż większą niż rok wcześniej.

Tabela 1. Główne grupy produktów (według pozycji CN) w polskim eksporcie rolno-spożywczym w pierwszym półroczu 2020 r.

Table 1. The main product groups (by four-digit CN code) in Polish agri-food exports in the first half of 2020

Pozycja CN	Opis pozycji	Zmiana wartości eksportu, w % rok do roku	Udział w eksporcie rol.-spoż., w %
2402	Papierosy	15,4	12,4
0207	Mięso drobiowe	-9,1	8,2
1905	Pieczywo (w tym cukiernicze)	2,9	6,0
1806	Czekolada i wyroby czekoladowe	3,9	5,6
2309	Karma dla zwierząt	13,9	4,4
1001	Pszenica	266,7	3,8
2106	Pozostałe przetwory spożywcze	-2,7	3,6
0201	Wołowina, świeża lub schłodzona	0,6	3,4
1602	Przetwory mięsne	6,4	3,3
0305	Filety rybne, suszone lub solone	1,2	2,9
0406	Sery	1,9	2,9
0203	Mięso wieprzowe	-10,7	2,7
0304	Filety rybne, świeże lub zamrożone	2,0	2,4
1901	Przetwory z mąki, kasz, skrobi itp.	18,2	2,3
2403	Pozostały przetworzony tytoń	47,4	2,3
1604	Przetwory rybne	8,9	2,1
2202	Napoje bezalkoholowe	9,8	2,0
2009	Soki owocowe	-12,2	1,9
0811	Mrożonki owocowe	2,0	1,7
0808	Pozostałe warzywa	2,7	1,5

Źródło: Opracowanie własne na podstawie niepublikowanych danych Ministerstwa Finansów.

Ponad trzykrotnie wyższy niż przed rokiem był w pierwszych sześciu miesiącach 2020 r. eksport pszenicy, a o blisko 48% eksport pozostałego przetworzonego tytoniu. Dwucyfrowe wzrosty eksportu odnotowano w takich grupach produktów, jak: przetwory z mąki, kasz i skrobi (o 18,2% r/r), papierosy (o 15,4%) i karma dla zwierząt (o 13,9%).

W imporcie zmniejszyła się w okresie styczeń-czerwiec 2020 r. wartość przywozu produktów siedmiu grup, przy czym spadki te były co najwyżej kilkuprocentowe. Zmalały dostawy pozostałych przetworów spożywczych, filetów rybnych, ryb (świeżych i zamrożonych), pieczywa, wina i serów (tabela 2). Blisko dwukrotnie zwiększył się natomiast import pozostałego przetworzonego tytoniu, a o ponad 30% - świń żywych. Dwucyfrowe wzrosty importu odnotowano w takich grupach, jak: karma dla zwierząt, owoce cytrusowe, banany i pozostałe warzywa.

Tabela 2. Główne grupy produktów (według pozycji CN) w polskim imporcie rolno-spożywczym w pierwszym półroczu 2020 r.

Table 2. The main product groups (by four-digit CN code) in Polish agri-food imports in the first half of 2020

Pozycja CN	Opis pozycji	Zmiana wartości importu, w % rok do roku	Udział w imporcie rol.-spoż., w %
0203	Mięso wieprzowe	7,0	6,9
2309	Karma dla zwierząt	18,8	5,0
0302	Ryby świeże lub schłodzone	-2,4	4,8
2304	Makuchy sojowe	10,7	3,9
1806	Czekolada i wyroby czekoladowe	4,0	3,2
2401	Tytoń	4,1	2,8
0103	Świnie żywe	30,7	2,7
2106	Pozostałe przetwory spożywcze	-5,9	2,7
0304	Filety rybne, świeże lub zamrożone	-5,0	2,6
0901	Kawa	1,8	2,3
0805	Owoce cytrusowe	15,6	2,2
2403	Pozostały przetworzony tytoń	97,7	1,9
1905	Pieczywo (w tym cukiernicze)	-3,2	1,7
0406	Sery	-1,5	1,6
0803	Banany	19,7	1,5
1901	Przetwory z mąki, kasz, skrobii itp.	5,7	1,5
0709	Pozostałe warzywa	13,1	1,4
0702	Pomidory	7,2	1,4
2204	Wino	-1,2	1,3
0303	Ryby zamrożone	-3,1	1,3

Źródło: Opracowanie własne na podstawie niepublikowanych danych Ministerstwa Finansów.

Dyskusja

Z wstępnych danych handlowych wynikało, że polski eksport rolno-spożywczy relatywnie dobrze radził sobie w okresie największych ograniczeń związanych z przemieszczaniem się ludności wprowadzonych wskutek pandemii COVID-19. Występowało jednak wyraźne zróżnicowanie sytuacji pomiędzy poszczególnymi branżami. W największym stopniu ucierpiała branża mięsna, a w dalszej kolejności także mleczarska. Wiązałoby się to w dużym stopniu z ograniczeniem działalności sektora hotelarskiego i gastronomicznego (HoReCa) w okresie *lockdownu*.

Ogólnie względnie dobre wyniki eksportu można tłumaczyć następująco:

Po pierwsze, żywność jest produktem pierwszej potrzeby (tak, jak np. leki) i cechuje ją niższa elastyczność dochodowa popytu. Oznacza to, że jednostkowy spadek dochodów konsumenta powoduje relatywnie niewielki spadek popytu na żywność w porównaniu z chociażby dobrami trwałego użytku. Mogą świadczyć o tym dane Eurostatu o sprzedaży detalicznej żywności w UE, będącej kluczowym jej rynkiem zbytu dla polskich producentów. W żadnym z miesięcy pierwszego półrocza 2020 r. sprzedaż detaliczna w krajach UE nie była niższa niż w analogicznym okresie roku poprzedniego (Eurostat, 2020). Ponadto, mechanizm reakcji konsumentów na środki zastosowane w celu przeciwdziałania rozprzestrzeniania się pandemii COVID-19 w większości krajów był podobny. Informacje o mających nastąpić ograniczeniach w przemieszczaniu się mieszkańców skutkowały gwałtownym wzrostem popytu na niektóre wyroby o przedłużonej trwałości. Dotyczyło to kasz, ryżu, makaronów, konserw, zup, żywności mrożonej i gotowej, mąki, czy drożdży. Stąd też można tłumaczyć zwiększone zakupy żywności w marcu 2020 r. Sprzedaż detaliczna w tym miesiącu była o ponad 8% wyższa niż rok wcześniej (Eurostat, 2020).

Po drugie, w porównaniu z innymi działami przetwórstwa przemysłowego łańcuchy dostaw w sektorze rolno-spożywczym są o wiele krótsze. Większość branż przemysłu spożywczego, w tym te, w ramach których wytwarzane są podstawowe rodzaje żywności (m.in. pieczywo, mięso i jego przetwory, produkty mleczarskie), ma łańcuchy dostaw zlokalizowane w kraju. Istnieje zatem relatywnie niewielkie ryzyko ich zerwania. Nawet w tych branżach, w których produkcja jest w dużym stopniu uzależniona od zagranicznych dostaw surowców rolnych i półproduktów (m.in. branża rybna, tytoniowa) zakłócenia ich dostaw do polskich zakładów były sporadyczne.

Po trzecie, polscy producenci i eksporterzy żywności konkurują na zagranicznych rynkach głównie ceną. W okresie zmniejszonych dochodów zagranicznych konsumentów, większa część z nich jest skłonna zastąpić produkty droższe tańszymi, pochodzącymi z importu. Dodatkowo do poprawy konkurencyjności cenowej polskich produktów za granicą przyczyniło się wyraźne osłabienie złotego wobec głównych walut w marcu 2020 r. (o blisko 7% w stosunku do dolara amerykańskiego i o blisko 6% w stosunku do euro).

Wirus SARS-CoV-2, wywołując silne perturbacje na rynkach żywnościowych w krajach Azji Wschodniej i Południowo-Wschodniej i skutkując pozrywaniem dotychczasowych łańcuchów dostaw wielu produktów żywnościowych, stworzył polskim firmom możliwość zapełnienia tych miejsc. Z informacji Polskiej Agencji Inwestycji i Handlu (PAIiH), bazującej na doniesieniach z zagranicznych biur handlowych (ZBH), wynika, że na początku kwietnia br. Singapur poszukiwał dodatkowych źródeł dostaw wielu produktów rolno-spożywczych, m.in. produktów mleczarskich, warzyw, mrożonek,

makaronów i dań gotowych. Zainteresowanie polską żywnością przejawiali także importerzy z Korei Południowej, Indonezji, Filipin, Wietnamu, Japonii i Maroka. W dniu 27.03.2020 r. Ministerstwo Rolnictwa i Rozwoju Wsi uruchomiło na swojej stronie internetowej podstronę „Możliwości eksportowe", na której publikowane są informacje z zagranicznych biur handlowych dotyczące zapotrzebowania niektórych krajów na produkty rolno-spożywcze.

Podsumowanie

Chociaż wstępne dane handlowe za pierwszych sześć miesięcy 2020 r. wskazują, że polski eksport rolno-spożywczy relatywnie dobrze poradził sobie w okresie *lockdownu*, to w kolejnych miesiącach nie należy wykluczyć wyraźnego spowolnienia dynamiki wzrostu sprzedaży zagranicznej, a być może nawet jej spadku. Największym zagrożeniem wydaje się być obecnie możliwość ponownego wprowadzenia ograniczeń w przemieszczaniu się ludności w związku z rosnąca liczbą zakażonych w wielu krajach. Na spadki sprzedaży na rynkach zagranicznych mogliby być narażeni, przede wszystkim, eksporterzy mięsa i serów, co wiązałoby się z ograniczeniem działalności sektora hotelarskiego i gastronomicznego (HoReCa). W mniejszym stopniu można natomiast liczyć się z zakłóceniami po stronie podaży, gdyż stosowanie ścisłego reżimu sanitarnego w zakładach produkujących żywność pozwala do minimum ograniczyć transmisję wirusa.

Największych spadków należałoby się spodziewać w krajach, w których sytuacja epidemiczna będzie najgorsza, a co za tym idzie, wprowadzone zostaną najszersze ograniczenia działalności gospodarczej. Wspomnianą zależność potwierdzają doświadczenia z pierwszej fazy pandemii, kiedy to najbardziej załamał się polski eksport żywności m.in. do Włoch, podczas gdy eksport do Niemiec zanotował tylko niewielki spadek. Ponadto, należy podkreślić, że z punktu widzenia możliwości zbytu polskich produktów za granicą niekorzystne może być także zjawisko patriotyzmu gospodarczego, które odradza się z każdym kryzysem gospodarczym, a ten będzie należeć niewątpliwie do najgłębszych od dziesięcioleci.

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Heorhiy Cherevko[1], Iryna Cherevko[2]
Lviv National Agrarian University, Ukraine

Efficiency of Niche Agriculture in Ukraine

Abstract. The deepening of the dualization of Ukraine's agriculture into "large" and "small" producers force the latters to search opportunities for competitive opposition to the firsts by intensive development of niche agriculture. The purpose of the study is to present the efficiency of niche agriculture in Ukraine, describing the main features of this branch and anticipating prospects and barriers to stable development. There are few scientific publications on this topic so far, so their use in the study was quite limited. Materials of specialized scientific conferences and publications of materials of practitioners are more widely used. The research methodology includes general methods (monographic, induction and deduction, analysis and synthesis, scientific generalization and abstraction) as well as economic research methods (comparisons, indexes). The results show, that niche agriculture in Ukraine is especially relevant for small farms, which can increase profitability not because of the number of products, but because of its niche character. Niche agriculture has advantages and disadvantages, so there is no reason to absolutize it as a panacea for all the problems of the small producers. The barriers to develop niche agriculture in Ukraine: the lack of the culture of consumption, of technology and of knowledge of niche products marketing.

Keywords: niche agriculture, efficiency, prospects and barriers to development

JEL Clasification: Q01; Q12; Q18

Introduction

In recent years, small producers in Ukraine are developing a new direction of agricultural production, which is called niche and which meets the capabilities of producers in this sector and has appropriate prospects for development, as currently there is no competition from large farms in the niche market, because they do not deal with them due to problems with scaling this type of production. And cooperating in the field of material-technical supplying and of sales of niche products, small farms can have their effective niches in the market of agricultural products and even export it, what, on the one hand, is an advantage, on the other - a forced solution of the existing situation. As this direction of development of agrarian economy for Ukraine is still relatively new, it forms a high level of relevance and an interesting field for scientific research in this direction. Therefore, the aim of the study is to present the effectiveness of niche agriculture on the basis of existing experience in Ukraine with a description of the main features of niche production and niche products and anticipating possible prospects and existing barriers to its rapid development.

[1] prof., dr hab., e-mail: gcherevko@ukr.net, https://orcid.org/0000-0002-0072-5816
[2] PhD, associate prof., e-mail: irener@ukr.net, https://orcid.org/0000-0002-8411-6136

Literature review

Niche agriculture in Ukraine deserves for special attention as a way of economic survival of small producers under conditions of dualization and polarization of agricultural economy. E.Malyshko points out, that the optimal size of a farm, engaged in growing traditional grain crops, is 300-400 ha, but the average size of land share in Ukraine is much smaller - about 4 ha, so small landowners are forced to look for alternatives to traditional cultures with the hope of making a profit not so much from the quantity, as from the quality and exclusivity of the product (Malyshko 2016). According to B. Shapoval, a niche is where you, as a businessman, see opportunities, because the final definition of what exactly are" niche cultures ", as well as their exact list, does not exist (Shapoval, 2018). L. Udova and K. Prokopenko point out, that in agricultural production niche crops are crops, that are used in crop rotation as precursors for major crops, as well as crops-substitutes for reseeding dead crops. They are not exchange-traded and are not designed for the mass consumer, so they have low price elasticity of demand (Udova and Prokopenko 2018). According to S. Pospelov, the concept of "niche crops" includes all crops, that can be grown in our country and for which there is demand on the market, but their production volume is small (*Small*… 2020). In the market, niche crops are those, that are in high demand, or products, intended for a narrow segment of consumers (Volodin 2017). V. Aristov notes, that niche products and crops are inherent just for small agricultural producers, such as most of farmers (Aristov, 2017). Such crops often do not require significant investment in the organization of production, but provide a high level of profitability (*Well-considered* …, 2017). Niche crops are quite labor- and resource-intensive and its production is difficult to scaling (Udova and Prokopenko 2018). National Research Center "Institute of Agrarian Economics" advises small agricultural businesses to focus on growing crops with steadily growing demand and the greatest return - from ₴ 30,000 to ₴ 100,000. per 1 ha (*Higher*…, 2017). As alternative sphere of agricultural production in small areas, experts suggest the cultivation of crayfish, vermiculture and beekeeping (*Well-considered* …, 2017), breeding of snails (Petryk 2018), snakes and frogs (Kapustina 2020) and oysters (*Oysters*… 2017). Great lack of knowledge, low productivity and still insufficient quality of the products do not allow realize the potential of niche agriculture (*Lack*…, 2018). All this determines determine the presence of a fairly wide field to initiate the continuation of research in this area.

Materials and methods of research

The problem of production of niche agricultural products in Ukraine is relatively new, so special comprehensive research on the development of this area of agricultural production and the relevant sector of agribusiness is not enough today. In this regard, fundamental scientific publications were used as a source of information in the study as they appear and become available. Materials of highly specialized scientific conferences, infographic collections of information and publications of materials of practitioners engaged in the production of niche agricultural products and already have relevant experience in this field are used much more widely. The situation is significantly

complicated by the lack of special separate accounting in Ukraine for data related to the actual niche sector of agriculture.

The general approach to the study of the problem of forming a niche direction of agricultural development and the agribusiness sector is basing on the application of a dialectical approach to the study of available information and materials of publications related to the studied problem. The methodology of the study includes both general scientific methods (induction and deduction, analysis and synthesis, scientific generalization, scientific abstraction), which allowed to process existing information on the concept and specifics of niche agriculture and its role in diversifying of directions of agricultural activity of small and medium enterprises in rural areas, and also methods of economic research (economic and statistical comparisons, dynamics, calculating and constructive) to study the comparative advantages and disadvantages of the niche direction of agriculture. The monographic method of research allowed to study some aspects of the problems of production of specific types of niche products in real enterprises.

Results of the research

The existing criteria under the conditions of Ukraine determine the grounds for classification as niche crops such as: amaranth, certain berries (bigblueberries, blueberries, cranberries, raspberries, honeysuckle, dogwood, yurga, yoshta, goji, blackberries, sea buckthorn and strawberries), musk pumpkin, saffron and other spices, fresh herbs (microgreens), flax, cereals (millet, sorghum, rye, oats etc.), exotic cereals (spelta, quinoa), vegetables - asparagus, shallots, leeks, sweet potatoes, pumpkin and garlic, fruit crops - plums, apricots, nuts walnuts, hazelnuts, peanuts and others; exotic mushrooms, exotic crops (pao-pao, okra etc.), sainfoin, coriander, cumin, medicinal and essential oil crops, almost all legumes - lentils, chickpeas, mung beans, beans and even peas and others. Effective areas of niche agribusiness today are vermiculture, beekeeping, snail farming, oysters breeding, frogs and snakes breeding, production of cheese (from the milk of goats, mares, buffaloes), processing of niche agricultural products into finished food.

The sown area under the main niche (accounted) crops in Ukraine in 2018 reached 252.6 th ha - almost 1% in the structure of all sown areas, but even this small share indicates the need to develop the cultivation of niche crops as a profitable alternative to highly profitable grain and oil cultures by small or medium farmers, which, in the case of compliance with the relevant technology and a proper understanding of market conditions, can give no less profit than sunflower or rapeseed (Kernasyuk, 2018). For example, according to the analytical company Pro-Consulting, the cultivation of chickpeas can pay off in less than 2 years (*Growing*…, 2018). Hazelnuts yield up to 2 t/ha, and 1 ton of purified kernels is produced with worth almost $ 6,000 on the wholesale market (*Named*… 2019).

All niche crops in Ukraine, except peas (in 2018 - 435.5 th ha, what is 82.4% more than in 2016) occupy insignificant sown areas, compared to traditional cultures (SSSU 2019). However, this is just what makes them unique or niche. In 2017, among the analyzed niche crops, the most expensive was the production of buckwheat and legumes, the least expensive - rye and oats production (SSSU 2018).

One of the most popular niche legumes is beans, which are considered as heat-resistant crops. It is grown in Ukraine mainly by small or medium-sized farms and households (about 75% of the total). Demand for this crop is stable, and the quality of Ukrainian beans satisfies consumers. And another popular drought-resistant niche crop is sorghum, which is often grown in Ukraine instead of the more moisture-loving corn, that dies from drought. The nutritional value of corn and sorghum is very similar, but the latter crop has a lower cost. Sorghum is an alternative also to barley (*Markets*… 2017).

So far, not very popular in Ukraine among both producers and consumers, there is chickpeas (*Growing*…, 2018). This is a purely food crop, which is used to make dishes such as hummus and falafel. Some farms achieve a yield of 2.5 t/ha, with a national average of 0.92 t / ha (*Growing*… 2018). Demand on this crop will grow in the near future due to the migration of people from Central Asia, Southern Europe and the Arab countries to the European continent and the corresponding expansion of the market.

Experts from Pro-Consulting suggest to pay attention to the existence of a niche for blackberries, which are 2-3 times more productive than raspberries (*Free*…, 2018). The funds invested in the project ($ 312 th - equipment, 10 ha of land, storage space of 400 m2 and 4.2 km of fence) will return to the investor in more than three years (40.7 months) (*Free*…, 2018)

Cranberries are considered to be the most profitable crop in the world after marijuana. If Ukraine harvests only about 400 tons/year of cranberries (*Red* …, 2018). But the most marginal berry among niche cultures is honeysuckle, although so far its domestic market size is very limited, so this berry is cultivated on an area of only about 100 ha (*The grace* …, 2018). About half of production is concentrated in three farms (*Honeysuckle*…, 2018).

Sea buckthorn in Ukraine is a niche berry, which is still grown by few farmers, so access to this market in our country is currently not burdened by a high level of competition. If sea buckthorn lives up to 30 years, and gives maximum yields for 10-15 years, then investing in its cultivation is a very profitable long-term investment (*Gardeners*… 2020).

In Ukraine, small landowners and single peasants in their backyards are increasingly planting elderberry as a business crop, mainly on plantations of 5-10 acres, as the cultivation of this crop occurred also quite profitable, and the niche - unfilled. Purchase prices range from ₴ 10/kg in the west to ₴ 2/kg in Vinnytsia region (*In Ukraine... elderberry...* 2020).

Investments in the first dogwood garden in Ukraine, including planting material, irrigation, well drilling, amounted to about ₴ 2 mln per ha. The dogwood bush yields from 15 to 80 kg of berries per year, which provides 30 tons of berries/ha. The payback period of such a project is approximately 10 years (*Dogwood*…, 2018).

Oil flax (curly flax) is a technical crop, which is grown mainly for the needs of industry (manufacture of varnishes, paints, drying oils). Flaxseed oil is used in food and has medicinal properties. And as a result of the requirement for EU countries from 2015, according to which car manufacturers are obliged to use only natural materials (including flax-based) for interior upholstery and trunks, the demand for flax fiber will grow even more (Udova and Prokopenko 2018).

Oats are also considered as a niche crop, because they occupy small sown areas. It is used mainly as fodder in animal husbandry. The average profitability in 2017 is 20%.

Another promising crop is spelta, what is in high demand in the United States and Europe, where about 30% of the population follows a gluten-free diet (*Spelta*…2020).

More and more Ukrainian farmers are interested in amaranth, because the profitability of its cultivation is quite high, and demand far exceeds the existing supply. Processing companies are already concluding agreements to buy 100% of the future harvest. With an average yield of 2 t/ha and the price of marketable seeds ₴ 25 th / t (organic - ₴ 35 th /t.) per ha can be obtained from ₴ 50 th. revenue (*Shchyritsa*…, 2018).

The profitability of nuts growing is estimated at 400-450%. Return on investment in processing is 299%. Investments per 1 ha of walnut orchard range from $ 10 th (*They hit*… 2018).

Asparagus has one of the highest export potentials of the niche industry and the main advantage of Ukraine in this case is a relatively cheaper labor force. Crops can be harvested up to 8 years. In the third year, the crop yield reaches 5-6 t/ha, and 1 kg of asparagus costs more than ₴ 200 (*Named*… 2019). That is, 1 ha of asparagus gives at least ₴ 100 th (1 ha of corn - up to ₴ 10 th). Imported asparagus costs today ₴ 350-380 /kg, but the term of sale of asparagus is five days, so in most cases imported asparagus is no longer asparagus (*The farmer*…, 2017).

In Ukraine, there is a growing interest in the production of saffron and other unusual spices (*The second*… 2017). In 2016, saffron was sold in Ukraine at a price of $ 5/g. It can be received 10 kg of spices from 1 ha starting from the 4th year and for 5-6 years. You can also sell bulbs (*Ukraine…,* 2017). The payback period of saffron is 2 years (*The second*... 2017). Wholesale batch is already 5 g. (*The world's most*…, 2016).

Vanilla can earn $ 6 th per meter, $ 60 mln/ha. World prices for vanilla reach $ 500-600 per 1 kg. Thanks to new technologies, vanilla can be grown in Ukraine, because the niche is almost empty (*Per hectare*… 2018).

One of the most promising niche crops for growing in Ukraine is chufa – land almonds or tiger nut, which is three times more nutritious than peanuts. The cost of tubers for planting by private producers varies from ₴ 30 for 100 g. Chufa for consumption is sold for ₴ 85 for a package of 200 g (*Russian*…, 2018).

The south of Ukraine may soon become a producer of exotic pao-pao fruit (or azimine). Plant extracts are used to improve the state of the immune system and nervous systems. Industrial cultivation of azimine is cost-effective - 1.4 kg of fresh fruit costs from $ 45, and frozen - from $ 15 per 900 g (*All*…, 2018).

Beginners can try themselves in such an unconventional direction for Ukrainian agribusiness as growing sweet potatoes. In Belgium, the yield of sweet potatoes is 20-50 t / ha, and in the southern regions of Ukraine - up to 100 t / ha. Profitability of 180% can be achieved throughout the country (*Named*… 2019). Growing 1 kg of sweet potatoes costs $ 0.3, and the price is 9 times higher (*Sweet potatoes*… 2018).

In Ukraine, they began to grow exotic okra, what is facilitated by climate change. Currently canned okra weighing 280 grams is offered at a price of about ₴ 120, and fresh - at ₴ 370 per kg. The price of seeds in Ukraine ranges from ₴ 3 to 9 (*Ukrainian*… 2020).

European buyers pay € 50-60 for 1 ton of miscanthus - energetical grass. It can give 15-20 t/ha where corn gives only 3-4 t (*They fed*…, 2018). The level of profitability is $700/ha. The investment in 1 ha is $ 2,500. You can get 20 tons of biomass per ha per year *(Grass*…, 2017).

It may be profitable for small farms in Ukraine to grow stevia. Liquid stevia extract from Ukrainian producer is selling at a price of ₴ 211 for 100 ml, and 300 pcs. stevia tablets - for ₴ 102.50, the cost of 7-20 pcs. stevia seeds range from ₴ 10 to ₴ 45 (*Step by*…, 2018).

It makes sense for very small farms (up to 0.5 ha) to grow microgreens, the income from which is four th times higher than the income from wheat growing on the same area (*Named*… 2019).

In Ukraine, a very narrow niche is the cultivation of medicinal herbs and essential oils. Most popular - echinacea purpurea, medicinal sage plant, peppermint and lavender, chamomile and valerian (*Blue-grass* …, 2018). In the beginning it is necessary to invest about $ 50-100 th. Such business will pay off in two years (*Medicinal*… 2020). Already for the 5th year from 25 ha it is possible to receive a net profit at the level of $ 105.7 th (*The expert...*2020). A valuable medicinal plant, which contains almost the entire periodic table - is a five-toed or white foxglove. It is practically absent on the market, because it is a "wild plant", which is already listed in the Red Book, so the demand for this plant is high. About 3 years ago it began to be cultivated in Ukraine (Gerasimenko 2020).

Nigella can become a promising niche crop for agricultural producers in the south of Ukraine. Usually this plant is grown as a spice, although in addition the plant has medicinal, decorative and essential oil properties and many kinds of use (*Agrarians….nigella*… 2019).

Dandelion cultivation in two years can give a gross profit of € 8340 per ha, and the annual profitability will be 121%. This requires a minimum investment of € 5,100 / ha, or € 47,850/5 ha. In the EU, dry raw dandelions are ready to buy at € 1.5-1.9 per kg of leaves, the price of dried root is € 3-4 per kg (*Coolbaba*…, 2018).

In Ukraine, coriander is grown to produce seeds, from which the essential oil for the cosmetic, pharmaceutical and confectionery industries is obtained. The yield of honey from coriander is in the range of 145-150 k /ha (*In Ukraine... coriander* … 2020). The average yield of coriander is 1.2-1.5 t / ha. Coriander is currently offered on the stock exchanges of Ukraine at an average price of ₴ 20,000 / t. (*Ukraine*… 2020).

According to the calculations of the analytical company Pro-Consulting, investments in the production of essential oils in Ukraine are very promising, because this niche is still poorly filled. The volume of domestic production is about 500 tons, and it is unstable over the years. Production of such products will pay off in Ukraine in 20 months (*Etheric*... 2018).

Good climatic conditions in the southern regions of Ukraine contribute to the cultivation of lavender (Blue-grass … 2018). The launch of project in this area per 1 ha requires only $ 70 th and will pay off in two years (Lavandos…, 2018). The profit per ha reaches €8,000 (Blue-grass…, 2018). If you make oil, sell a by-product - hydrolate and make some additional souvenirs, the gross profit from 1 ha will fluctuate within ₴1 mln (Gerasimenko 2020).

In Western Ukraine, truffles have been harvested for a long time and successfully, which is to some extent illegal. But the "golden" mushroom can be grown legally in your own garden. The price of the Piedmontese truffle increased to € 5.5 th/kg. Mushrooms can be harvested for 4-5 years after planting, and in 10 years - up to 80 kg of truffles / ha / year (*Agrarians... truffles*… 2019).

The specificity of erings growing - a fleshy mushroom - is connected with sterility. The price on erings in supermarkets is about ₴ 140 /kg. The only industrial producer of erings in Ukraine and the owner of the company PE "Aesthetic Foods" Kirill Vetryakov works on Kiev and the Dnieper, and also sells mushrooms to restaurants (*Mushroom*… 2018).

The "Western Snail" farm was the first in Ukraine, which started to breed snakes for meat. A snake dish is expensive - approximately ₴ 3-4 th per serving (Lebid 2019). The snail business is developing intensively on the same farm (Petryk 2018). It takes at least €75-100 th to run a snail per 1 ha and grow 25-30 t of these animals (Dmytriv, 2018). In Ukraine, HoReCA buys these mollusks at ₴ 250-450/kg, and menu prices start at ₴ 300 per serving of 12-15 snails. Europeans pay € 8-12 / kg for wholesale party. Snail caviar is the most expensive: 50 g costs ₴ 1,850. In Europe, the price for 50 g is from € 60 to € 350 depending on the type of snail (Kapustina, 2018). And not far from Lviv there is the farm "Tante Snails" for growing snails and frogs for meat, and its products are partly exporting and partly selling in the restaurant "Tante Sophie" (Lviv). The price of a portion weighing 200 g starts from ₴ 240 (Kapustina 2020).

Quail in Ukraine are raised by 560 farms, 10 of which number up to 150,000 birds each. Annual egg production exceeds 600 mln. The quail grows in 40 days and can lay 280 eggs/year. The organization of a quail farm for 10,000 birds will cost up to €60 mln (*The state*… 2017).

Only a few years ago, Ukrainian farmers near the Black Sea began building oyster farms. This business pays off in the first season (3 years until the mollusk grows). In Ukraine, the price starts from ₴ 100 / kg and up to several th (*Oysters*…2017).

Ukraine has mastered the production of about ten types of alternative flour and baking of finished products. About 50% is corn flour. On the second place - (10%) oatmeal. Little-known emmer flour in Ukraine on the European market costs € 3.5/kg. At the same time, it is unprofitable for large processors to restructure production for processing niche grains (*Ukraine* … 2019).

Certain changes in climate cause the emergence of interest in niche agriculture by large enterprises. Since 2017, in addition to the main crops, flax, coriander, spelta, emmer, lentils and mustard have been sown in the fields of LNZ GROUP (Lutytska, 2017). Harv East Holding allocates up to 10% of sown areas for niche crops - peas, lentils and chickpeas (*HarvEast*… 2020). Its profitability is higher than in the case of sunflower - ₴ 18.2 th of income/ha of lentil crops, and of sunflower - only ₴ 15.6 th/ha (*Above*…, 2017). The Olvia group of companies (Zaporizhzhya region) is starting to export coriander, mustard and flax under direct contracts to Poland, and these cultures are also in stable demand in the Czech Republic, Germany and the Netherlands (*News*… 2018).

Conclusions

The cultivation of niche crops and the production of niche products under conditions of dualization of agriculture in Ukraine are especially relevant for farms with small land areas, because small farms competition with large farms in the field of traditional crops growing or in the production of traditional livestock products due to obvious reasons undoubtedly makes no sense. The main criteria for classifying crops as niche are:

underdevelopment of particular markets, excess of demand over supply, low competition in the production sector, high purchase prices and a high level of profitability per unit of used area with relatively minimal demand for this area, high share of intellectual component in value added and in selling price. Niche crops are quite resource-intensive (especially labor-intensive) and their production is quite difficult or impossible to scale, because a large number of products is to the detriment of quality. Small farms can increase profitability not because of the number of products, but because of its niche character.

The advantages of niche crops are: high profitability; the ability to diversify crop rotation and, as a consequence, to improve soil condition; promoting the diversification of production as a way to reduce the financial risks of the enterprise. The main disadvantages: high cost of seeds and technologies; instability of demand; the difficulty of finding a market for products, price instability, the temporary nature of niche. The transition to niche production requires a non-profit period of time. To maintain a position in the niche market, several crops should be grown. Of course, the production and sale of niche products require additional efforts, knowledge of technology and market conditions, the establishment of information and advisory support and state support. However, in general, their economic potential is very high, although the development of this branch in Ukraine is constrained by the lack of a culture of consumption, lack of technology and knowledge of the nuances of its marketing. Practice also shows that there is no reason to absolutize niche agriculture as a panacea for all the problems of the small agricultural producers sector. Planning your investment, you should carefully consider all alternatives - maybe it could be more effective to invest in something timelonger, such as traditional berry, as return on time from such investments may be more remote in time, but - relatively more reliable, long-lasting and stable.

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Yuriy Hubeni[1], Volodymyr Krupa[2], Oksana Krupa[3], Sofiia Tsiolkovska[4]
Lviv National Agrarian University, Ukraine

The Foreign Economic Vector of Agribusiness Activity in the Western Region of Ukraine

Abstract. The article is devoted to researching peculiarities and trends of foreign economic activity of agribusinesses in the Western region of Ukraine according to the terms of the Ukraine-European Union Association Agreement. The authors discuss the theoretical essence of agribusiness, as a kind of entrepreneurship, and the nature of foreign economic activity of enterprises. The main conditions of free trade in agricultural products introduced by the terms of the Agreement are determined and their influence on agribusiness export-import operation dynamics in the Western economic region is analyzed. The contribution of certain regions to forming agrarian product export and import volume and structure is considered and the reasons for the considerable advantages of the Lviv region in foreign trade turnover of the Western region are elucidated. It was found that agribusiness cooperation with foreign partners is mainly realized by indirect methods through trade agency organizations or agrarian holding companies. The structure dynamics of production goods for export and import by agribusinesses was studied. Based on the results, some negative tendencies for the Ukrainian economy were noted. They include the preservation of raw exports with a high share of plant origin products and timber, and the predominance of ready-made products with high added value in the import structure. It was established that the Agreement and social political events in Ukraine changed the direction of some export-import flows of agribusiness from CIS countries towards the markets of the European Union and Asian countries. According to the scale of external trade operations with enterprises of the Western region of Ukraine, in general, and within certain trade groups, in particular, country-leaders are defined. Some positive and negative consequences of changes in the foreign economic activity vector are described. And finally, measures which will ensure an expansion and strengthening of Ukraine's agribusiness presence on international market, are suggested.

Key words: foreign economic activity, agribusiness, international trade, export and import of agricultural products, Western region of Ukraine

JEL Classification: F14; O19; Q17

Introduction

Forming a chain of relationships between enterprises is an integral component of the agrarian economy sector. Such a system of relationships, embracing the entire cycle of production manufacturing – from the provision of resources by agro-producers to the processing and selling of goods to consumers, is called agribusiness.

The peculiarity of agribusiness development in Ukraine is the rapid spread of big agro-industrial enterprises that combine production, processing, logistics and sales. The activities

[1] Dr. Scs., professor, Lviv National Agrarian University, V. Velykyi str, 1, Dubliany, Zhovkva district, Lviv region, 80381, Ukraine, e-mail: hubeni@ukr.net; https://orcid.org/0000-0002-1842-8975
[2] PhD, associate professor, Lviv National Agrarian University, e-mail: v_krupa@ukr.net; https://orcid.org/0000-0001-8658-7735
[3] PhD, associate professor, Lviv National Agrarian University, e-mail: o_krupa@ukr.net; https://orcid.org/0000-0003-3512-6925
[4] PhD, inspector of the Galician Customs of the State Customs Service of Ukraine, e-mail: Sophia-04.02@ukr.net; https://orcid.org/0000-0002-7515-1474

of many enterprises are focused not only on the domestic market, but directly on the export market, as well. They also often act as trade intermediaries for other manufacturers who have not managed to organize international cooperation for themselves. Some holding companies which import agricultural products for their own production needs, also distribute them around the territory of Ukraine.

The foreign economic vector of agribusiness activity in Ukraine is characterized by a number of peculiarities and tendencies that determine key aspects of the agrarian production structure, and considerably influence food security, levels of competition between branches, the direction of investment streams, and other economic processes in the country. Regional factors play a special role in influencing foreign economic activity, and are connected with market place, main transport routes and other elements of international trade infrastructure. Regional factors determine the level of concentration of agro-business enterprises, their production specializations, and their strategic and tactical planning. This shows that there is a need to clarify the stream of foreign economic activity for Ukrainian agribusinesses under present conditions, and to identify regularities in how export-import operations are carried out and the conditions necessary to expand their presence on international markets. There is also a need to solve problems in the organizational structure of production for agricultural exports and imports.

The purpose of this research is to study the peculiarities of the foreign economic activity of Ukrainian agribusinesses and to elaborate approaches that would help to intensify this activity.

The main tasks of the research are as follows:

- To study the prerequisites, and the stimulating and inhibitory factors of foreign economic activity development;
- To analyze the volume and structure of export-import operations of agribusinesses at a regional level;
- To define means and methods for domestic agribusinesses to enter the international market.

Materials and Methods

The analysis of foreign economic activity of agribusinesses was conducted on the basis of enterprises in the Western region of Ukraine. Historically and geographically, it is composed of seven regions: Lviv, Volyn, Transcarpathian, Ternopil, Ivano-Frankivsk, Rivne, Chernivtsi (Vermenych, 2005). However, authoritative scientists (Bashtannyk, 2000; Shablii, 1995) also recently tend to include an eighth region, Khmelnytsk, in this list. Therefore, Western Ukraine, as a separate macro-region, is presented in our research as consisting of eight regions.

The database that was compiled for foreign economic agribusiness activity is based on official statistics from the Main Statistics departments in these regions, the State Statistics Service of Ukraine, and from the authors' own research materials.

The scale of foreign economic agribusiness activity in the Western region of Ukraine depends on logistic cooperation within the entire production chain. Each region, due to its specific natural economic conditions and to the set of enterprise branches that are available – as objects of foreign economic activity – directly or indirectly formulates the commodity structure of international trade in the region and the country.

Substantiating the export-import structure of agribusiness commodities, we first considered the commodity groups and types established by the nomenclature of statistics for foreign economic activity. The commodity structure first of all included agriculture branches (crop production, animal production, fish farming) and its processing products (finished food industry products). According to economic activity classification, forestry is added to agriculture. Therefore, timber and wood products and also paper bulk from wood or other vegetable fibres were included in the foreign trade commodity structure. In addition, the separate groups and types of products of other activities from within the agribusiness food chain component, were taken into consideration. They are, specifically, chemical industry products (fertilizers, essential oils, albuments), raw leather and cured leather, natural textile materials (wool, cotton).

General scientific methods of economic research formed the basis of our research, including the economic, political and social factors that ensure the conditions for agribusiness enterprises to function in Ukraine and to enter the international market. The methods of induction and deduction, analysis and synthesis, comparison, average and relative values, visual-graphic ones were widely used in the research. These methods enabled us to study the present situation and the results of foreign economic relations of agribusinesses in the Western region of Ukraine, to systematize statistical information on export-import volume within separate regions and agrarian production groups, and to establish cause-and-effect relationships between changes in foreign economic activity and social economic processes in the country.

With the help of absolute and relative indicators and by using the comparison method for export-import production value dynamics and commodity flow direction and intensity, other quantitative and qualitative changes in foreign economic activity of the analyzed subject group are also described. The received data formed the basis of recommendations concerning improvements in the strategic orientation of foreign economic agribusiness activity and for minimizing the economic risks connected with it.

Considering the great amount of information on production export-import volume and direction, in the framework of the present research objective, the set of statistical data was reduced, and the most essential data needed for the study was selected and aggregated. This allowed us to highlight the key foreign economic agribusiness results out of the general data, correct their assessment, and formulate conclusions about the development of corresponding phenomena.

Assessing agribusiness foreign activity at the regional level and comparing export-import correlations was done using differentiation coefficients. They are as follows: the export/import comparative advantage index, the foreign trade coverage ratio, export concentration index, Grubel-Lloyd index. These indicators enabled us to better characterize the specializations of agribusiness foreign activity in the Western area of Ukraine, to estimate their significance in the export-import structure, and to find any disproportion in foreign trade in agrarian products.

Literature Review

The term “agribusiness”, established long ago in more developed countries, has only recently come into use in Ukrainian economic science and practice. Therefore, the scientific study of agribusiness, as a particular sphere of research, is still developing. Accordingly,

interpreting the essence of agribusiness in Ukraine is rather ambiguous. National scientists often identify this term with agrarian entrepreneurship in the sphere of production, processing and realization of agricultural goods (Buhil, 2004), or with the notion of the "agro-industrial complex" (Abramovych, 2011). For all that, agriculture is considered a central link of the agribusiness system. Such an understanding of this category follows from the general concept of agribusiness formulated by American scientists G. Davis and R. Goldberg. They defined it as: the total amount of all operations connected with supply production and distribution; production operations at an agrarian enterprise; storage, processing and distribution of agricultural goods and products from them (Davis, Goldberg, 1957). According to these researchers, agro-business embraces the functions that are traditional for agriculture.

At the same time, the encyclopedia Britannica interprets "agribusiness" as a part of modern national economics, aimed at producing, processing and distributing food, fiber and by-products. It is also mentioned that many types of activity necessary for agriculture are carried out separately from agro-enterprises, especially developing and producing equipment, fertilizers and seeds; in some countries processing, warehousing, storage and delivery are also separated from main agriculture (Agribusiness, 1998).

Certainly, with the development of market relations, agriculture evolved from a means of providing the population with food into a rather profitable kind of entrepreneurial activity. Deepening the division of labour led to its separation from other branches. However, due to its fundamental role in food production, "agribusiness" has become the key link in the interrelated system between enterprises.

There is an oft-made comparison between agribusiness and the agro-industrial complex (AIC), though "agro-industrial complex" is wider in structure than "agribusiness" (Hubeni, Tsiolkovska, 2019). AIC includes a set of enterprises of specialized industrial branches, agriculture, agrarian product processing, services and departmental state administration bodies. According to Yu Hubeni, agribusiness is not a simple set of entrepreneurship subjects, but a peculiar type of partner relations, of cooperation organization that creates favourable conditions for participants. Agribusiness is functionally a new type of economic relations for agrarian market participants, characterized by cooperation and mutual support, considering the economic interests of all "food chain" participants (Hubeni, 2012). M. Shelman gives an analogical interpretation of agro-business as an interconnected and interdependent raw and food movement chain, beginning from supplying an enterprise with material and technical means and ending with the last consumer (Shelman, 1991).

From the viewpoints of Yu Hubeni and S. Tsiolkovska, it is expedient to distinguish several functioning levels in the agribusiness system: local, regional, national and international (Hubeni, Tsiolkovska, 2019). Such a division reflects the territorial and geographical involvement of agribusiness relationships and the scope of its chain of participants.

In our research the combination of two agribusiness expansion levels is considered – regional (within several regions due to determined geographical features) and international (based on foreign economic cooperation of enterprises with foreign partners – relationship system participants). Along with this, primary attention was given to the international level, particularly to the peculiarities and orientation of foreign economic activity from enterprises in the Western region of Ukraine, their search for new segments in the international agro-food market and ways to strengthen their positions in those segments,

expand their range of business-partners and consumers, and gain additional competitive advantages.

Foreign economic agribusiness activity is a way that enterprises realize their foreign economic relations. Based on legislation in Ukraine, foreign economic activity is between Ukrainian and foreign firms, built on relationships between them both within and beyond the territory of Ukraine (Law of Ukraine, 1991). According to I. Kaytanskyi, foreign economic activity (FEA) is an activity of FEA subjects of Ukraine and FEA subjects of other countries, occurring in the process of producing, realizing, distributing and consuming products on the basis of mutual benefit for all participants (Kaytanskyi, 2010).

Foreign economic agribusiness activity includes functions connected with ensuring their entrance to the international market and with participation in foreign trade operations. As a separate part of enterprise activity, foreign economic activity is at the same time a component of their economic system, which is conducted at the international level and stipulates relationships with foreign economic subjects.

Forming the foreign economic agribusiness activity vector and its strategies must be aimed first of all at developing new markets, maximizing economic effects, liberalizing economic relations and ensuring the ability to meet the requirements of the international market or of an individual country where economic relationships take place.

Results

From a territorial point of view the Western region is the largest area of Ukraine. It occupies 131,3 thousand square kilometers (21,7% of Ukraine's territory), its population makes up 10,5 million people (25,1% of the total number). Along with this, the region's share in forming GDP made up 16,4% in 2018. The Western region has exact agrarian specialization: in 2019 it provided 21,9% of agricultural production and only 14,0% of industrial production of the country. It accounted for 14,1% of commodity exports and 13,8% of imports, and 14,9% of capital investments.

In spite of relatively low economic indicators, the Western region plays a special role in the system of foreign economic relations in Ukraine. Its geopolitical situation, transport and customs infrastructure and a number of other important factors form favourable conditions for Ukraine to join various European economic, social and political structures. Thus, the region has common borders with four countries of the European Union: Poland, Hungary, Slovakia and Romania. It also borders on Belarus and Moldova. Cargo turnover with EU countries is carried out through 23 international checkpoints (11 automobile and 12 railway checkpoints).

Implementing the Agreement on association between Ukraine and the EU opened new possibilities for developing Ukrainian foreign economic agribusiness activity. In 2016 foreign economic processes became more active, as the regime of a deep and universal zone of free trade with the EU began to operate and import duties in the EU on 82,2% of agricultural products and 83,4% of foodstuffs were abolished. It was possible to sell live animals, fish, cheese, nuts, most fruit and oil crops, and confectionery duty-free. The EU also set duty-free tariff quotas for 36 kinds of agricultural and food products of the so-called group of "sensitive goods". They are: beef, pork, lamb, poultry, milk, cream, yogurt, butter, cereals, bran, honey, sugar, starch, mushrooms, garlic, malt, grape and apple juices,

cigarettes, ethanol and others. Along with this, Ukraine set quotas for three kinds of sensitive goods (pork, poultry, sugar).

Due to the free trade zone regime, the tariffs on Ukrainian exports to the EU decreased from 19,8% to 0,6% in groups of agricultural raw products, and from 3,9% to 0,5% in groups of processed products. The procedures for export operations while passing customs, phyto-sanitary and other controls was simplified. Ukrainian companies got the opportunity to provide services to European consumers and to open subsidiaries in the EU. Receiving permission for export to the EU simplified Ukrainian producers' access to third-country markets. It is interesting also to note that within the framework of tariff liberalization, the European Union refused to apply export subsidies on agricultural commodities in the trade with Ukraine.

The Agreement on association considerably influences first of all the product export dynamics of agribusiness enterprises of the Western region (Figure 1). In total, during the period of 2014-2019 agrarian product exports increased by 48,9%, imports – by 31,6%. Some decline in foreign trade turnover of agrarian products in 2015 was noticed as a consequence of the crisis caused by social and political events in Ukraine at that time. These events also caused considerable changes in the foreign economic relationship vector of agribusinesses and started a new stage in their development.

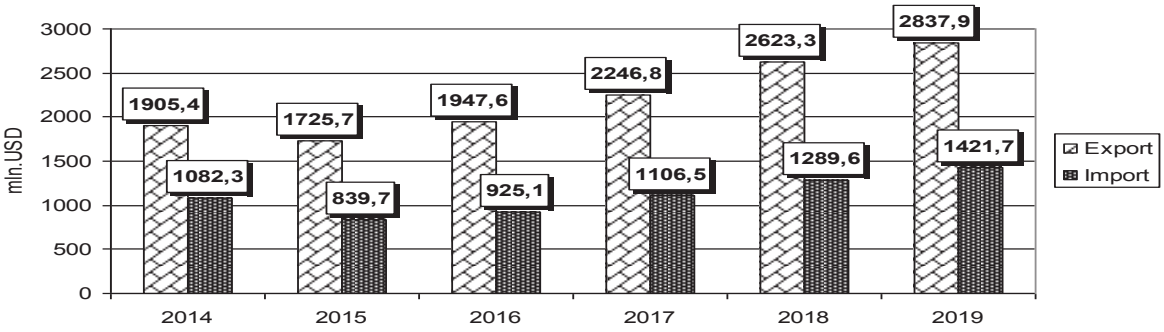

Figure 1. Dynamics of production export and import by agribusinesses of the Western region of Ukraine, mln. USD

Source: State Statistics Service of Ukraine.

In 2019 the share of agribusiness production in the Western region of Ukraine made up 40,4% of the total exports, which is 4,6 points more than in 2014. The corresponding share of agrarian production imports during the analyzed period didn't change and made up 16,8%. It proves that there is an increase in the role of agribusiness in foreign economic activity of the region and a strengthening in national producers' position on international markets.

In the Western region of Ukraine, the Lviv region plays the leading role on export-import operation volume (Figure 2). In 2019 the share of agribusiness production exports amounted to 35,4%, imports – 61,3%. Such a great difference in this region from other regions is caused by several factors: the high economic potential of Lviv region, its convenient geographic position (at the crossing of main transport flows), the availability of a developed customs infrastructure (transport, logistics, distribution companies), and the use of indirect methods of conducting foreign trade by most Ukrainian agricultural commodity producers. In 2018, only 311 companies in Ukraine had the right to export

products to EU countries; in 2019 that number was 333. A considerable number of those enterprises are both producers and exporters (importers); others perform only trade-intermediary functions. The facilities of most companies are located in direct proximity to customs terminals and logistics bases. The presence of foreign economic infrastructure and development also partly influences the production concentration of export commodities.

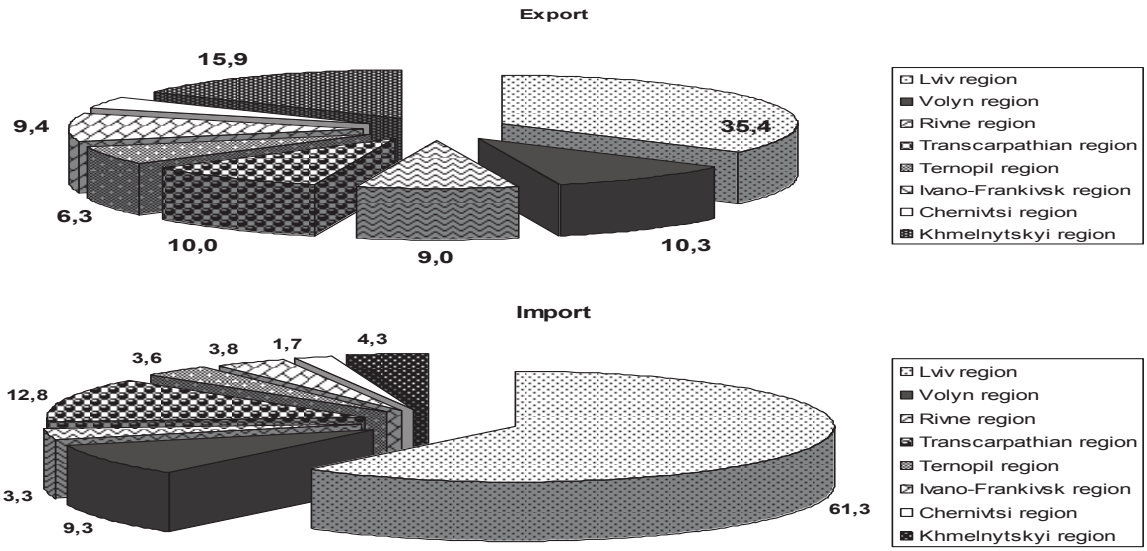

Figure 2. The share of regions in total export-import production structure of agribusiness enterprises in the Western region of Ukraine, 2019 (%)

Source: State Statistics Service of Ukraine.

The indirect method of conducting foreign trade enables agricultural export-oriented enterprises to focus on solving organizational and technological production problems and to facilitate sales activity. Trade intermediary firms perform all the processes connected with commodity transporting, storage and packing, forming optimal commodity consignments, documentation, passing customs procedures, and adapting to the requirements of an importer's country of origin. They usually have their own material and technical base, stable business relations with foreign partners and financial companies, established market channels, open access to certain commodity markets, and the ability to provide proper informational sales support.

Agribusiness enterprises of the Khmelnytskyi region take second place in production export structure with a share of 15,9%. Their export potential is based on agricultural raw materials and foodstuffs – which is 22,8% of its sales within the Western region. Such results are provided by several of the biggest agro-holding companies in Ukraine (Kernel, EpicentrK, Continental Farmers Group) and also rather favorable natural conditions for growing crops.

As far as import flows are concerned, besides the Lviv region the bulk of foodstuff imports go through agribusiness enterprises of the Transcarpathian (12,8%) and Volyn (9,3%) regions. The factors of geographic position and customs checkpoint capacity again play a considerable role.

In the structure of production exports by agribusinesses in the Western region of Ukraine, the share of agricultural production increased by 13,9 points during the analyzed six-year period and amounted to 67,2% in 2019 (Table 1).

Table 1. Structural dynamics of production export and import by agribusinesses in the Western region of Ukraine

Product groups	2014	2015	2016	2017	2018	2019	Difference (+; -)
Export							
I. Live animals and livestock products	9,9	10,6	7,9	8,8	7,7	7,7	-2,2
II. Plant products	27,4	31,8	32,5	33,5	36,2	40,4	+13,0
III. Animal or plant fats and oils	3,9	7,1	8,8	6,7	5,7	8,0	+4,1
IV. Finished food industry products	12,2	10,4	11,3	12,0	11,1	11,1	-1,1
Total agricultural products	**53,3**	**59,8**	**60,5**	**61,1**	**60,8**	**67,2**	**+13,9**
VIII. Raw leather and cured leather	4,5	4,2	4,2	4,3	4,0	3,2	-1,3
IX. Wood and articles of wood	31,3	28,6	30,6	29,5	30,3	25,7	-5,6
X. Paper bulk from wood or other vegetable fibres	5,9	4,0	3,1	3,3	3,4	2,6	-3,3
Other products	5,0	3,4	1,6	1,8	1,5	1,3	-3,7
Total products of agribusiness enterprises	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	×
Import							
I. Live animals and livestock products	13,2	10,7	11,2	12,4	14,3	13,5	+0,3
II. Plant products	17,1	17,4	18,1	15,6	15,6	22,1	+5,0
III. Animal or plant fats and oils	0,5	0,8	0,9	0,4	0,4	0,7	+0,2
IV. Finished food industry products	21,8	20,6	18,9	20,8	22,9	22,2	+0,4
Total agricultural products	**52,6**	**49,6**	**49,1**	**49,1**	**53,3**	**58,5**	**+5,9**
VIII. Raw leather and cured leather	7,3	9,1	11,2	12,6	11,6	9,7	+2,4
IX. Wood and articles of wood	5,3	4,9	6,3	6,7	6,2	5,8	+0,5
X. Paper bulk from wood or other vegetable fibres	17,3	15,7	15,0	13,9	14,4	11,6	-5,7
Other products	17,6	20,7	18,4	17,7	14,5	14,4	-3,2
Total products of agribusiness enterprises	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	×

Source: State Statistics Service of Ukraine.

There is a natural tendency to see increases in exports of crop production, especially for grain and oilseeds. This is caused by growth in global food market conditions and a considerable increase in production for these kinds of goods in Ukraine. But the share of live animals and livestock products is decreasing, as a result of reductions in production and many obstacles in the path for such products to access international markets. During the analyzed six-year period, the share of finished food industry product exports remained relatively stable. The Western region of Ukraine maintained its position on the market of animal or plant fats and oils.

The indicators for exports of wood and wood products from the Western region of Ukraine are consistently high. From 2014 to 2019, its export value increased from 596,1 to 728,9 thousand USD. For all that, timber makes up 11-13% of total region export value, and 26-31% of agribusiness production value. It is worth mentioning that in 2019 the

Western region's share in total Ukrainian national timber export amounted to 42,6%. The main export flows go to EU countries, in particular: Poland, Hungary, Germany and Romania. The agribusiness export share of cellulose materials, and also other kinds of products, for example, essential oils, proteins, wool, and fertilizers is steadily decreasing.

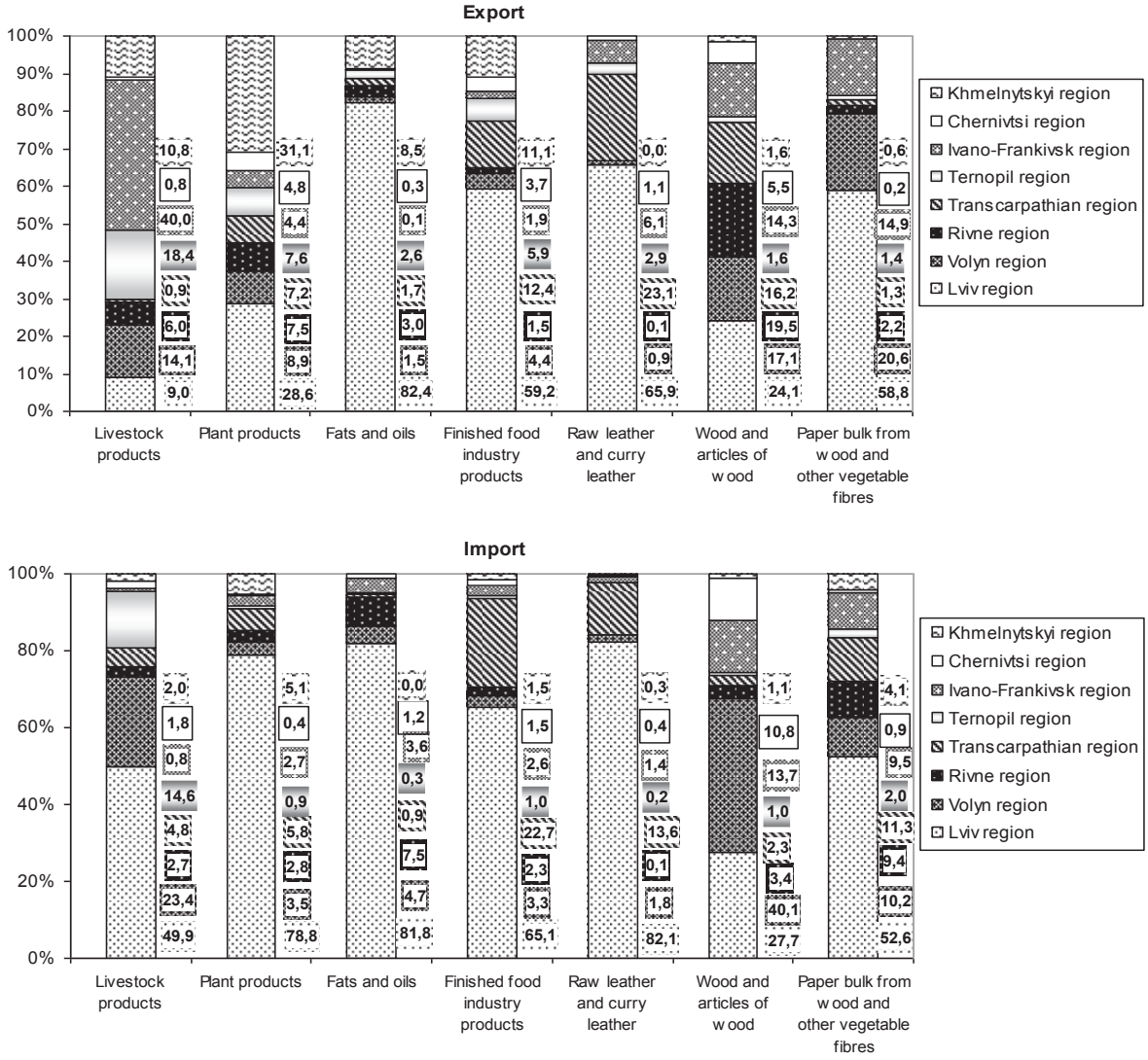

Figure 3. The share of regions of the Western region of Ukraine in the export and import according to main groups of agro-industrial products, 2019.

Source: State Statistics Service of Ukraine.

The tendencies described show the mainly raw export character of Ukrainian agribusiness enterprises, and this situation hasn't changed for many years. It influences negatively on Ukraine's balance of payments and the long-term development perspectives of its agro-industrial complex. Instead, finished products with considerably higher added value are imported into Ukraine. Thus, during the period under review the share of finished food industry products in the Western region's import value ranged from 18,9% to 22,9%. The share of animal and plant production imports is also rather high. Reducing the share of importing vegetable fibres and some other kinds of agricultural products is a positive tendency.

As far as distribution of some production flows within the Western region is concerned, 72,5% of animal product exports is provided by enterprises of the Ivano-Frankivsk, Ternopil and Volyn regions (Figure 3).

Almost a third of plant product exports belong to the Khmelnytskyi region, and 28,6% – to the Lviv region. Lviv region enterprises dominate in providing for export animal and plant fats and oils (82,4%); finished food industry products (59,2%), raw leather (65,9%) and paper bulk and other vegetable fibres (58,8%). This is the result of a high concentration of industrial facilities for processing agrarian products in the region.

It is quite understandable that exports of wood and wood products are centered around regions of the Carpathian area (Lviv, Transcarpathian and Ivano-Frankivsk regions) and Polissia (Rivne and Volyn regions), where the bulk of the country's forests are located. However, due to the presence of several enterprises that produce furniture, fiberboards and other wood products in the Lviv region (including those built with the help of foreign partners), its share in national export value is also the highest – 24,1%.

Table 2. The share of the Western region in total Ukrainian export and import value according to main groups of agro-industrial products

Product groups	2014	2015	2016	2017	2018	2019	Difference (+; -)
Share in the total exports of Ukraine							
Live animals and livestock products	18,6	22,3	19,8	17,8	16,7	17,1	-1,5
Plant products	6,0	6,9	7,8	8,2	9,6	8,9	2,9
Animal or plant fats and oils	1,9	3,7	4,3	3,3	3,3	4,8	2,9
Finished food industry products	7,5	7,2	8,9	9,6	9,7	9,8	2,3
Raw leather and cured leather	54,3	63,0	66,5	63,3	63,2	60,9	6,6
Wood and articles of wood	47,2	44,6	52,7	54,9	53,2	52,1	4,9
Paper bulk from wood or other vegetable fibres	11,4	11,1	11,1	14,2	16,2	17,1	5,7
Share in the total imports of Ukraine							
Live animals and livestock products	12,7	16,4	16,5	18,8	20,1	17,9	5,2
Plant products	9,1	12,8	13,1	12,7	13,2	17,5	8,4
Animal or plant fats and oils	1,7	3,6	3,4	1,9	1,9	3,8	2,1
Finished food industry products	9,1	10,8	10,1	12,0	12,6	12,0	2,9
Raw leather and cured leather	35,4	45,6	49,7	55,8	52,3	48,6	13,2
Wood and articles of wood	19,6	27,7	29,4	29,6	26,2	26,7	7,1
Paper bulk from wood or other vegetable fibres	14,5	15,0	15,2	16,3	17,1	16,5	2,0

Source: State Statistics Service of Ukraine.

On the whole, the Western region's share in timber exports made up 52,1% in 2019, which is 4,9 points higher in comparison with 2014. The Western region of Ukraine also plays a key role in leather and leather product turnover. Regional enterprises provide 60,9% of exports and bring in 48,6% of imports. At the same time, the specific weight of agribusinesses within the nationwide structure of Ukrainian exports of crop production, oil and finished food products is relatively small. However, as seen in Table 2, the role of the Western region of Ukraine in forming agrarian export and import flows for Ukraine has

increased considerably, which proves again the positive influence of the Ukraine-EU Agreement on the development of foreign activity for agribusinesses.

Accepting the Agreement on association with the EU, as well as the political and economic confrontation with Russia over the Donbas annexation in Crimea changed considerably the direction of export flows of the Western region of Ukraine (Figure 4).

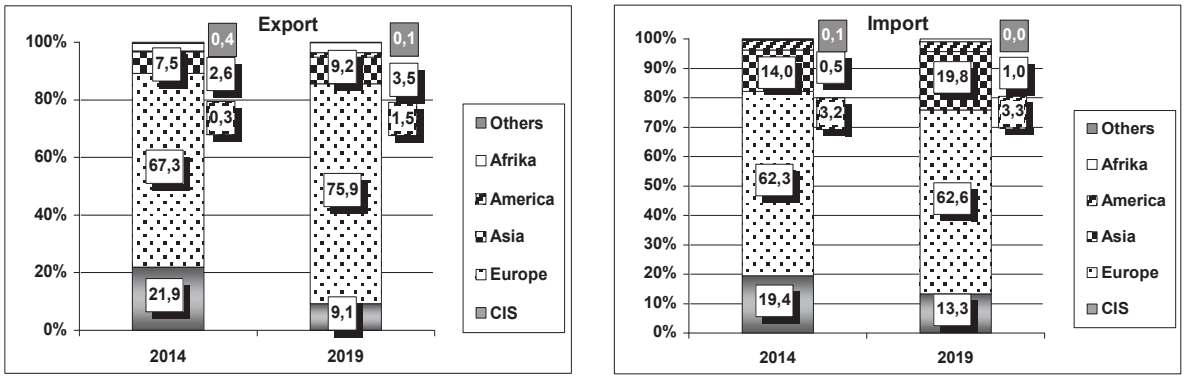

Figure 4. Geographic structure of exports and imports of the Western region of Ukraine

Source: State Statistics Service of Ukraine.

Until 2014, 21,4% of the Western region's exports went to Commonwealth of Independent States (CIS) countries, while 14,3% went to Russia. In 2019, the export share to the countries of this bloc decreased to 9,1%. Instead, the export value share in EU countries for this period increased from 67,3% to 75,9%. As mentioned above, the Agreement on association made Ukraine's access to third-country markets easier. Owing to this, export share to Asian countries increased by 1,7 points, to America – 1,2 points, and to Africa – 0,9 points.

The level of agribusiness export activity to EU countries is the highest in comparison with enterprises of other branches. At the same time, the export share to Russia and countries of the Eurasian Economic Union – one of the lowest.

Along with this, the import structure did not change too much. The import value share from CIS countries decreased by 6,1 points, while the import value share from Asian countries increased by 5,8 points. The share of imports from Europe and America actually remained at the same level.

In terms of individual countries, the main foreign economic activity vector of agribusinesses in the Western region of Ukraine is connected mostly with Poland. During the 2014-2019 period, commodity export value to Poland increased by 46%, and the share in its structure ranged from 15,5% to 17,3%. The import value Poland makes up about 15%. In 2014, Russia was Ukraine's second largest export country. But this sharply decreased in significance due to a number of government restrictions and increasing resistance to trade with Russia from Ukrainian society. In 2019, Russia took only the 10th position in exports, which fell from 762,1 to 174,5 million USD in six years. However, Russia continues to keep its positions for commodity imports. But, according to the results of a survey conducted among Ukrainian importers by a public organization called the Institute of Economic Research and Political Situations, agricultural enterprises don't in practice import raw materials and supplies from Russia (Simplification of Trade

Procedures, 2019). However, certain types of agrarian products are imported through companies in Belarus.

Table 3. Key directions of production exports and imports by agribusiness enterprises of the Lviv region according to main commodity groups, 2019

Commodity groups	Export		Import	
	thous. USD.	Share of leading export countries (%)	thous. USD	Share of leading import countries (%)
Meat and meat preparations	10561,2	Georgia (27,7), Vietnam (20,2), Azerbaijan (10,0).	35986,9	Poland (55,8), France (7,6), Germany (7,1)
Fish and crustacea	268,0	Lithuania (98,9), France (1,1)	30712,3	Norway (23,5); Island (18,6); Great Britain (16,0)
Milk and milk products; eggs; honey	2812,4	Moldova (34,0); Poland (15,9); Denmark (12,4)	14931,1	Poland (55,8); Germany (26,7); Netherlands (8,9)
Other animal products	5822,4	Poland (46,8); Ghana (14,6); Vietnam (14,6)	2538,5	Poland (78,7); Brazil (14,9); Germany (6,2)
Seedlings and other trees	1236,9	Poland (56,2); Georgia (37,5); Germany (6,3)	4543,8	Netherlands (63,3); Poland (13,7); Ecuador (7,6)
Vegetables	2628,7	Spain (42,9); Poland (19,2); Belarus (16,6)	62758,2	Turkey (36,2); Poland (18,6); Netherlands (11,9)
Eatable fruits and nuts	16330,6	Poland (26,9); Lithuania (21,6); Italy (12,9)	142699,2	Spain (17,4); Turkey (15,3); Ecuador (13,6)
Coffee, tea, spices	387,8	Belarus (39,5); Poland (24,2); Turkey (10,0)	30301,4	Poland (23,4); India (14,3); Brazil (14,0)
Cereals	214458,2	EU (19,6); Egypt (16,5); China (7,2)	166,6	Pakistan (64,5), India (14,3); Italy (10,8)
Oil seeds and fruits	91900,5	Belgium (17,3); Netherlands (16,0); France (15,9)	3860,2	Poland (34,9); Germany (17,1); Belarus (11,7)
Animal or plant fats and oils	186211,1	Poland (27,4); India (27,3); China (8,8)	7876,8	Sweden (61,1); Malaysia (14,7); Belgium (8,2)
Sugar and sugar confectionery	34862,1	Azerbaijan (21,3); Great Britain (13,4); Russia (11,2)	3791,6	Poland (38,7); Austria (22,0); Spain (9,1)
Preparations of grain, flour, milk	15953,2	Romania (36,2); Poland (27,5); Hungary (11,0)	9151,6	Poland (58,6); Italy (17,0); Spain (9,3)
Products of vegetable, fruit and nut processing	39906,9	USA (62,4); Poland (17,2); Canada (16,1)	8877,5	Poland (38,8); China (16,9); Bulgaria (11,3)
Other mixed foodstuffs	15347,3	Poland (23,9); Bulgaria (16,6); Czech Republic (9,8)	39988,6	Switzerland (29,7); Spain (23,7); Poland (12,9)
Remains and waste of food industry, feed	61464,9	Poland (24,8); Belarus (23,4); Israel (7,6)	39880,5	Poland (37,2); Germany (20,8); Denmark (16,7)
Fertilizers	148,6	Spain (41,9), Moldova (23,8), Poland (12,7)	46935,1	Poland (49,3); Russia (33,1), Belarus (10,6)
Wood and wood products	175205,0	Poland (27,8); Austria (13,0); Germany (6,9)	22508,1	Poland (37,6); Belarus (20,4); Romania (12,9)
Raw leather and cured leather	47663,5	Poland (94,6); Italy (3,6)	103884,5	Poland (60,2); South Africa (25,8)

Source: Main Statistic office in Lviv region.

As for countries in Asia and Africa, mostly China, India, Turkey, Saudi Arabia and Egypt have opened their markets for Ukrainian agrarian products. Among post-Soviet countries, Belarus also remains a strategic partner of the Western region in the agribusiness sphere. But its role, as also of other countries of the so called "Eurasian Economic Union" has recently significantly decreased.

Agrarian export and import structure, unlike general economic tendencies, has a slightly different direction. The data of the Lviv region, where the level of foreign economic agribusiness activity is the highest, gives some idea of this difference (Table 3). The Table 3 data affirm the dominant role of Poland in trade relations with enterprises of the Western region of Ukraine. The main export flows of plant and animal fats, eatable fruits and nuts, other mixed foodstuff, food industry waste, raw and cured leather are directed to Poland. At the same time, Poland is also the leader in terms of volume in supplying meat, dairy and other animal products; preparations of grain, flour and milk; leather and leather products (over 50% of the total import value); animal feed; wood products; and fertilizers to the Lviv region.

As far as grain – the main product of agrarian exports in the Lviv region – is concerned, it is necessary to note that the EU market is of secondary importance for its sale. In 2019, the European share of grain amounted only to 19,6% of its total export value. Instead, 38,4% of grain was exported to Asia (main purchasers – China, Indonesia, Saudi Arabia, Turkey), 36,4% of grain was sold to African countries (mostly to Egypt – 16,5%). On the European market, Ukrainian grain is not competitive enough due to qualitative parameters.

But timber and oil seeds are in great demand on the European market due to high ecological standards. Almost 62% of industrial crop production exports from the Lviv region go to four countries (Belgium, Netherlands, France and Germany), where it is used as a raw material for producing bio-ethanol. For agro-enterprises of the Lviv region, China and India are an important fats and vegetable oils market (36,1% of export value). These countries have also actively expanded purchases of other kinds of production. CIS markets mostly purchase sugar and confectionery; the North American market mainly purchases processed vegetables, fruits and nuts.

Table 4. Indicators of foreign economic activity evaluation of agribusinesses in the Western region of Ukraine

Indicator	2014	2015	2016	2017	2018	2019	Difference (+; -)
Exports comparative advantage index	0,96	0,86	0,86	0,85	0,86	0,82	-0,14
Imports comparative advantage index	1,00	1,07	1,00	1,06	1,09	1,06	+0,06
Foreign trade coverage ratio	1,76	2,06	2,11	2,03	2,03	2,00	+0,24
Export concentration index	0,348	0,322	0,288	0,308	0,301	0,281	-0,067
Grubel-Lloyd's index	72,45	65,46	64,41	65,99	65,92	66,75	-5,70

Source: calculated by the authors on data from State Statistics Service of Ukraine.

As for agrarian production imports to the Lviv region, they come mainly from EU countries. Vegetable imports are an exception, as Turkey is in the lead (36,2%). The share of Turkey and Latin-American countries (Ecuador, Costa Rica) in the fruit market is also significant. In addition, countries of Latin America and Asia supply the main share of tea

and coffee imports. The significant role of CIS countries (Russia and Belarus, in particular) in supplying fertilizers should also be mentioned (43,6% of imports).

An estimation of agribusiness foreign activity results using differentiation factors shows comparative advantages in agrarian production imports (Table 4).

At the same time, production exports by agribusinesses at the regional level have no advantages in comparison with agricultural production exports of Ukraine. In addition, the export comparative advantage index in 2019 decreased by 0,14 points compared to 2014. Against a background of agrarian production increase in scale, it proves that a lot of Western region enterprises fail to realize their export potential and limit themselves to meeting home demand for food. This is partly due to the peculiarity of production specializations of agribusinesses in the Western region of Ukraine, especially a lower volume of producing the main export product – grain – in comparison with other regions.

During 2014-2016, a positive dynamic of the foreign trade coverage ratio was observed. In the following years this index somewhat decreased, but the value of agribusiness production exports was twice as high as that of imports. Taking the export orientation of agrarian production in Ukraine into consideration, the probability of keeping the mentioned proportion in the near future is rather high.

Commodity export concentration is an important indicator of regional foreign activity commodity specialization. Changes in foreign trade structure because of international competition on foreign markets influences a region's export concentration and directly affects the expected export income of agrarian enterprises (Vitko, 2017).

The export concentration index meaning that is received after estimation proves the relatively narrow structure of agribusiness production exports. The bulk of exports include some key products (grain, oil seeds, milk products, oil, edible fruit and nuts, wood and wood products). Along with this, a lot of commodity positions are not competitive enough, so they are promoted in foreign markets with difficulty (or are displaced from them). However, considerable reduction of the export concentration index for the last few years is a positive phenomenon, which proves the range of expansion of the products exported by agribusinesses in the Western region of Ukraine.

The Grubel-Lloyd factor is one more indicator of the level of foreign activity development for enterprises. It enables to estimate the balance of inter-branch trade in mentioned goods, services or commodity groups. The dynamics of this factor aimed mainly at agribusiness production in the Western region of Ukraine, proves some reduction of inter-branch trade. But, in spite of this, for the agrarian branch the G-L factor value remains higher than an average level.

This index analysis in terms of individual agrarian production groups shows that in 2019 commodities with the highest value of Grubel-Lloyd included finished food industry products (99,84), products of animal origin (93,68), raw leather and leather products (79,46). In the year under review, fat and oils (8,17); wood and wood products (20,27) had the lowest index value. It should be noted that the level of inter-branch trade in the majority of main agribusiness commodity groups during the analyzed period decreased.

In spite of increasing the scale of foreign economic agribusiness activity, a great number of agro-producers remain outside the sphere of international commodity, capital and technology markets and don't consider the possibility of accessing them. The present foreign economic activity participants also face a number of obstacles in organizing export-import operations.

Among the positive consequences of the changing foreign economic agribusiness activity vector within the framework of realizing the Agreement on association with the EU, the following can be noted:

- Access to new capacious markets for selling agrarian products, first of all, in Europe and Asia;
- Increasing producers' income due to higher prices on the European market and exchange rate differences;
- Deepening inter-economic relations with foreign partners through realization of joint projects;
- Increasing investment inflow into enterprise branch;
- Latest technology transfers;
- Production quality improvement (including for domestic market) according to international standards requirements;
- Developing new directions of agrarian production.

At the same time, there are a number of negative consequences, namely:

- Tough competitive conditions on foreign markets and additional exporter expenses for adapting to them;
- Considerable reduction in export product prices because of differences in quality standards;
- Barriers to exporting certain kinds of products, especially finished food products;
- Deterioration of conditions for agro-producer activity on the domestic market because of lifting restrictions on food imports;
- Duration of customs clearance and lack of logistics, which increases losses from product transport and storage;
- Large organizational, sale and marketing costs.

There are also considerable limiting factors for export, such as: unpredictability in the trade policy of Ukraine; non-transparent conditions of reimbursing VAT to exporters; a high level of customs bureaucratization; difficulty observing technical, sanitary and phyto-sanitary requirements; and also quotas for "sensible" kinds of products that are much lower than Ukrainian exporters' opportunities. Quotas for certain kinds of products are used in the first 2-3 months of a year.

For efficient foreign economic agribusiness activity, enterprises must gradually move beyond the existing export range and increase the share of finished products with high added value. After all, nowadays there are quite wide opportunities in Ukraine for creating longer production chains in the agro-industrial complex.

When entering the international market, Ukrainian producers of agrarian goods have to predict and take into consideration any possible problems and obstacles they may encounter. Such obstacles include: oversaturation of the market with export goods; import quotas and restrictions set by countries; requirements for quality/safety; price and transport risks; actions of competitors. First of all, it is necessary for agribusinesses to increase quality and price competitiveness, to research market conditions and to search for available segments in the product market, not limited by quotas. Apart from this, it also is necessary for enterprise-exporters to exactly determine basic marketing activity strategies, develop marketing tools for their realization, and form the principles of market behavior for achieving competitive advantages and for strengthening integration with other food chain

participants. Such an approach will enable agribusiness enterprises to choose optimal vectors for their foreign activity and ensure that their goals are in line with the opportunities, resources and strategic directions of their development.

It is expedient for agribusiness enterprises providing agro-food products for export to reorient their production in Ukraine by joint investment with foreign partners or by, franchising. At present, some enterprises of the Western region that were created with the help of foreign capital, work with imported loaned raw materials. After all, processing products in Ukraine is more profitable due to the lower cost of labour and energy compared to countries in the European Union. Thusly, products can be manufactured which correspond to international quality standards, possesses high export competitiveness and are more accessible for domestic consumers than similar imported goods.

This is why forming an internal competitive environment for agrarian businesses is a priority stage for preparing Ukrainian agro-enterprises to enter international markets and to comply with international requirements. Support from state institutions must be aimed directly at this goal. State assistance is also important in helping to mitigate the risks of foreign economic activity, and in developing an effective agrarian production distribution system, trade and transport infrastructure, and legal protections of exporters' interests.

Ukrainian agro-producers, in cooperation with the Ministry of Foreign Affairs and organizations of commerce and industry, have to expand the network of countries with whom they can conduct business. In addition, one of the future strategic elements of foreign economic activity for Ukraine should be concluding agreements not only with certain prospective countries, but also with international economic subunits. Apart from the EU, this could include: ASEAN, NAFTA, African Continental Free Trade Area, MERCOSUR, European Free Trade Association, Eurasian Economic Union, Trans-Pacific Partnership and others.

Coordinating actions of state institutions and large agro-corporations is necessary for helping small agribusiness enterprises, especially in the sphere of introducing innovational technologies, increasing production productivity, product quality, branding, and entering international markets. Coordination will help to diversify exports, extend the added value chain in the agrarian sphere, and ensure its development and reliability.

Conclusion

The conducted research of the foreign economic activity vector of agribusinesses in the Western region of Ukraine allowed us to draw the following conclusions:

- Ukraine's signing of the Ukraine-EU Association Agreement and the liberalization of international trade conditions that resulted from it, served to intensify foreign economic agribusiness activity. This factor, together with the social, economic and political changes in the country in 2014, considerably influenced the direction of export-import flows of the Western region of Ukraine – one of its largest regions. During the period of 2014–2019, the foreign trade agribusiness turnover in this region increased by 42,6%. It had a positive impact on the national trade balance, which increased by 593,1 million USD. For all the analyzed period, export value exceeded import value.
- The Lviv region has the biggest share in agricultural product exports and imports among the regions of the Western region. This is due to its geographical position,

developed customs infrastructure, and concentration of export-oriented companies. In export and import value the share of the Volyn and Transcarpathian regions is also considerable, as powerful customs checkpoints are also located there. Export concentration in border regions is promoted by an indirect method of agribusiness trade relations with foreign partners, which are carried out through trade intermediaries. Only individual large agrarian enterprises perform foreign economic activity through direct connections.

- The analyses of dynamic changes in the agribusiness foreign trade structure proved that enterprises continue to adhere to the raw material export model, thus offering products with low added value. In particular, plant products (cereals, oil seeds, etc.) and wood dominates the export structure. Instead, mainly finished food products and other processed products are imported. Such an activity model is unfavourable not only in terms of economic expediency, but also when considering structural and ecological threats.
- The Ukraine-EU Association Agreement increased the role of agribusiness from the Western region of Ukraine in forming nation-wide export-import flows of agrarian production. The share of regional enterprises in providing foreign trade from Ukraine with leather, wood and wood products, and products of animal origin are the most considerable. Despite this, agribusinesses of the Western region have no advantages in agrarian product exports for the time being, in comparison with exports from around Ukraine, in general; however, they have advantage in imports. The situation with exports is due to the region lagging behind in producing the main export-oriented products (grain, oil seeds) as compared to the Central and Southern regions of the country. At the same time, increasing the assortment of exported products is a positive phenomenon enabling expansion of export geography, to occupy new market niches and diversify export risks.
- Reorientation and diversification of commodity flows from CIS markets, Russia in particular, to EU countries and other markets (China, Turkey, Egypt, India) are the positive results of agribusiness activities from the Western region of Ukraine over the last few years. Simplifying access for Ukrainian producers to third-country markets became possible once Ukraine received permission to export to the European Union. The markets of Europe and Asia are more capacious, liberalized, and their prices provide higher incomes for exporters. Poland is an important partner of the Western region, taking the leading positions in export and import of most kinds of agrarian production.
- Expanding the presence and strengthening the position of Ukrainian agribusinesses on the international market requires first increasing product quality and competitiveness; more geographical and commodity diversification of exports; a search for new market segments not limited by quotas; improvement in marketing strategies; establishing inter-economic cooperation aimed at forming integral “production-processing-sale” chains and increasing the share of ready-made products for export. Coordinating with state institutions to overcome or mitigate the risks of foreign economic activity, to develop international cooperation, to improve product marketing and to protect national producers’ interests is also extremely important.

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Yılmaz Toktaş[1], Agnieszka Parlińska[2]
[1] Amasya University, Turkey
[2] Warsaw University of Life Sciences – SGGW, Poland

The Impact of the Real Effective Exchange Rate on Poland's Food and Live Animal Exports

Abstract. In this study, for the 2012M1-2020M1 period, the relationship between Poland's real effective exchange rate and its food and animal exports were examined by the bounds test. The stationary analyses of variables were examined by the ADF and PP tests. According to the results of a cointegration test, a cointegration relation among the real effective exchange rate, food and live animal exports, as well as industrial production was determined. It was also concluded that the real effective exchange rate has a long-term negative impact on Poland's food and live animal exports. This research also established that a 1% increase in the real effective exchange rate in the long-term would decrease Poland's food and animal exports by 3.091%. Also, industrial production has a positive impact on Poland's food and animal exports, as expected. It was determined that a 1% increase in industrial production would increase Poland's food and animal exports by 2.803%. On the other hand, the error correction term coefficient was found to be -0.119, indicating that 11% of the imbalance in the short-term will be recovered in the next period.

Key words: exchange rate, ARDL bounds test analysis, time series analysis, food and live animal exports, cointegration

JEL Classification: F1, F14, C58

Introduction

Movement in the exchange rate is one of the most important factors causing uncertainties in commodity prices. This causes a major problem in determining the scope and volume of trading behaviour. However, the effect of exchange rate movement on exports, especially agricultural exports, is difficult to predict. With the collapse of the Bretton Woods Agreement in the 1970's, and with the adoption of a floating exchange rate regime, economists have given higher importance to examining the exchange rate and the effects of exchange rate volatility on import and export. Devaluation of local currency is expected to increase agricultural export. However, one of the important conclusions of the financial crises determined that large depreciation in the exchange rate has had little impact on exports.

Fluctuations in exchange rates lead to uncertainties in global commodity prices, which in the end results in a significant problem in estimating the extent and nature of commercial behaviors between exporting and importing countries (Orden, 2002). The unpredictable nature of the exchange rate always forces risk-avoiding traders to reduce their commercial activities carried out in foreign countries, and this collective risk avoidance of traders

[1] PhD, Department of Economics, Merzifon Faculty of Economics and Administrative Sciences, Amasya University, Amasya, Turkey, e-mail address: toktasyilmaz@gmail.com, https://orcid.org/0000-0002-6996-7987
[2] PhD, Department of Finance, Division of Public Finance, Banking and Law, Warsaw University of Life Sciences – SGGW, Warsaw, Poland, e-mail: agnieszka_parlinska@sggw.edu.pl, https://orcid.org/0000-0001-6640-3097

negatively affects the total trade of the country by reducing export and import volumes. However, it should be noted that exchange rate fluctuations may also have a positive or negative impact on the economy, especially with respect to agricultural sectors.

The Polish exchange regime has recently been converted to a floating regime from a fixed exchange rate. After the accession of Poland into the European Union, exchange rate has become more important for the Polish economy than ever before (Bańbuła, Koziński, Rubaszek, 2011). Ozturk and Kalyoncu (2009) found that the real effective exchange rate has had a negative impact on Poland's exports.

Agricultural exports include various food products. Through the period of this study, an average of 11% of Poland's total exports were food and animal exports. In fact, Poland is a major regional exporter of fruit, some types of vegetables, and mushrooms (FAO, 2020).

The primary objective of this study is to determine the impact of the real effective exchange rate on food and live animal exports, one of Poland's major export groups.

The objective of this study is to determine whether exchange rate fluctuations have a significant impact on agricultural products export of Poland in the period 2012-2020, and to examine whether policies focusing on reducing exchange rate fluctuation will expand export markets of Poland. In order to achieve the set objective the following variables were used, ie: Real Effective Exchange Rate, Advanced Economies Industrial Production, Poland's Food and Live Animal Exports, respectively from BIS, OECD and Eurostat databases. The study also assesses the behavioral coverage of trade flow settings in response to exchange rates within a cointegration framework. The framework developed in this study enables the characterization of adjustment towards equilibrium when deviations from predicted actual trade flows take place while allowing determinants of trade flows.

Literature Review

For quite some time, the importance of the exchange rate on agricultural exports has been overlooked in the literature of agricultural exports. Schuh (1974) states in his pioneering study that the exchange rate is an important variable affecting trade, demonstrating the importance of the exchange rate on agricultural exports.

Vellianitis-Fidas (1976) have tested the hypothesis that changes in exchange rates had a significant effect on the agricultural export demands of the United States. As a result of the analysis conducted using the OLS method in the study, they concluded that the exchange rate change in the US dollar does not significantly affect agricultural trade.

Pick (1990) analyzed the impact of exchange rate risk on U.S. agricultural trade flows with regards to ten countries with data covering 1978-1987 years. While the results of the study support that the real exchange rate is significant in determining U.S. agricultural export rates, the said data indicates that they do not show that exchange rate risk is always significant.

Cho, Sheldon, and McCorriston (2002) studied the effect of medium-and long-term exchange rate uncertainty on agricultural trade, which had not been evaluated beforehand by using bilateral trade flow data from 10 developed countries between 1974 and 1995 years and compared the impact on agricultural trade, which is associated with other sectors. In accordance with finding of the study agricultural trade is more negatively affected by

medium-and long-term uncertainty with respect to real exchange rate compared to other sectors. It has been suggested that exchange rate uncertainty in agricultural trade is more fragile than the level indicated by total data and the negative impact of trade growth on agricultural goods is greater compared to other sectors. Kandilov (2008) expanded the 2002 study conducted by Cho, Sheldon and McCorriston et. al., and concluded that exchange rate volatility has a negative impact on agricultural trade carried out between G-10 countries. Kandilov also obtained findings in his study that reached the same conclusion as Cho and et. al.

Buguk, Işık, Dellal, and Allen (2003) examined the effects of exchange rate and volatility on the basis of Turkey's agricultural exports regarding dried fig and grape rates between 1982-1998 and tobacco export data between 1986-1995 years by using Johansen cointegration and Granger causality tests. The authors conclude that changes in exchange rate value directly affect prices for consumers and producers. Although there are methods of hedging against exchange rate risk, they noted that high exchange rate risk is an important factor in reducing exporters' export supplies. They also specified that the effects of the exchange rate on trade depend on various exporter characteristics and secondary effects such as the discount rate, amount of money farmers receive to fund their activities.

Fidan (2006) examined the dynamics of agricultural exports, imports and real effective exchange rates in his study covering 1974-2004 years by using the techniques of Granger causality and Johansen cointegration tests. The results of the study indicated that there is a relationship between the foreign market and the real effective exchange rate. According to the results of the Granger causality test, it was determined that the export is REER's Granger causality, but the opposite is not valid. The coefficient of REER calculated in the export model was calculated as positive.

Baek and Koo (2009) expanded the number of studies in this field by examining the short-and long-term effects of exchange rate changes with respect to the U.S. agricultural trade balance. Within the framework of the ARDL approach, it was aimed to measure the impact of exchange rate changes on agricultural exports and imports at the bilateral level that took place between the United States and its 10 major trading partners for the period of 1975-2004 years. The study indicated that in the long run, U.S. agricultural exports are highly sensitive to bilateral exchange rates and foreign income, while U.S. agricultural imports are mostly sensitive to U.S. domestic income. On the other hand, in the short term, both bilateral exchange rates and revenues in the U.S. and its trading partners were found to have significant effects on U.S. agricultural exports and imports.

Erdem, Nazlıoğlu, and Erdem (2010) analyzed the effects of exchange rate level and uncertainty on bilateral agricultural trade with Turkey's 20 major trading partners on the basis of annual data for the period of 1980-2005 years with panel cointegration. Experimental findings of the study indicated that the exchange rate level was less associated with trading volume than exchange rate uncertainty. In addition, exchange rate uncertainty is associated with both imports and exports for small trade volumes, but this relationship is stronger in imports than in exports. They concluded that income growth in Turkey is related to imports and income growth in trading partners is related to exports.

In his study regarding relationship between exchange rate and dried apricot trade using the VAR method with monthly time series covering the period 2003-2008 years, Gündüz (2010) concluded that the exchange rate had a significant effect on dried apricot exports and that 20% of the total change in dried apricot exports was explained by the change in

exchange rate. It was determined that applying a standard faulty shock to exports and exchange rates, respectively caused instability in export values and exchange rate until the 11th period, and in the long term it was concluded that instability was eliminated.

Erdal, Erdal, and Esengün (2012) examined the effects of real effective exchange rate fluctuation on Turkey's agricultural exports and imports using Johansen cointegration and Granger causality tests on the basis of data from 1995-2007 years. According to the results of empiric analyses, they concluded that in the long term, there is only causation from REERV towards agricultural exports. Increases in exchange rates increase agricultural exports, meaning that Turkey's agricultural exports are significantly affected by movements in real effective exchange rates.

Mao (2019) examined China's food industry using panel data analysis techniques for 1998-2017 years and as a result of the study they have found that there is a positive relationship between real exchange rates and agricultural exports at firm-product-country level.

In his study covering the period of 1980-2017 years Ng'ong'ola (2020) examined the effect of exchange rate movements on agricultural products trade in Malawi using the ARDL bounds test. As a result of the study, no long-term relationship was found between the exchange rate and the export of agricultural products.

Model and Data

The variables used in this study are Poland's food and live animal exports, real effective exchange rates, and advanced economies industrial production. The monthly data covers the period between the first month of 2012 and the first month of 2020. Series are adjusted for seasonality through the Census X-13 approach.

Table 1. Variables Used in Analyses

Abbreviation	Period	Explanation	Source
LNREER	2012M1-2020M1	Real Effective Exchange Rate	BIS
LNIP	2012M1-2020M1	Advanced Economies Industrial Production	OECD
LNEXP	2012M1-2020M1	Poland's Food and Live Animal Exports	Eurostat

Sources: Authors own study.

The following specification was used in the empirical model to examine the relationship among Poland's food and animal exports, real effective exchange rate, and industrial production by using time series approach.

$$LNEXP_t = \alpha_0 + \alpha_1 LNREER_t + \alpha_2 LNIP_t + e_t \quad (1)$$

LNEXP represents the natural logarithm of Poland's food and live animal exports while LNREER and LNIP represent the natural logarithm of Poland's real effective exchange rate obtained from the Bank of International Settlements (BIS) and advanced economies industrial production which is used for the world income obtained from the OECD database, respectively.

Methodology and Empirical Results

First of all, for the empirical analysis, stationarity levels of the variables were examined by applying the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. After determining the stationary levels of the variables, the cointegration relationship among the variables was investigated through the bounds testing approach developed by Pesaran, Shin, and Smith (2001).

Stationary Tests

In the study, the ADP and PP unit root tests were used for the stationarity analysis. The results of these tests for LNEXP, LNREER, and LNIP are presented in Table 2. According to the test results, variables of the study have unit root by both the ADF and PP tests. However, when the first difference of the variables is taken, the stationary hypothesis is accepted.

Table 2. Results of Stationarity Tests

ADF				
At Level				
		LNEXP	LNIP	LNREER
With Constant	t-Statistic	-0.663	-0.963	-1.796
	Prob.	0.850	0.764	0.381
With Constant & Trend	t-Statistic	-3.123	-1.381	-2.188
	Prob.	0.107	0.861	0.490
Without Constant & Trend	t-Statistic	3.374	2.002	0.182
	Prob.	1.000	0.989	0.737
At First Difference				
		d(LNEXP)	d(LNIP)	d(LNREER)
With Constant	t-Statistic	-15.804	-9.147	-9.742
	Prob.	0.000	0.000	0.000
With Constant & Trend	t-Statistic	-15.707	-9.100	-9.697
	Prob.	0.000	0.000	0.000
Without Constant & Trend	t-Statistic	-14.632	-8.860	-9.794
	Prob.	0.000	0.000	0.000
PP				
At Level				
		LNEXP	LNIP	LNREER
With Constant	t-Statistic	-1.322	-1.019	-1.808
	Prob.	0.617	0.744	0.375
With Constant & Trend	t-Statistic	-10.241	-1.532	-2.239
	Prob.	0.000***	0.812	0.463
At First Difference				
		d(LNEXP)	d(LNIP)	d(LNREER)
With Constant	t-Statistic	-26.213	-9.183	-9.910
	Prob.	0.000****	0.000	0.000
With Constant & Trend	t-Statistic	-	-9.138	-9.881
	Prob.	-	0.000	0.000

a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant
b: Lag Length based on SIC
c: Probability based on MacKinnon (1996) one-sided p-values.
Sources: Authors own estimation.

Cointegration Test

In this study, the relationships among Poland's food and live animal exports, the real effective exchange rate, and industrial production were analysed with the Autoregressive Distributed Lag (ARDL) bounds test, which was developed by Pesaran et al. (2001).

An advantage of this approach is that classical cointegration techniques is that while Engle and Granger (1987); Johansen (1995), require that all variables be stationary at the same level, it can be applied regardless of the levels of stationary at first order I(1). Thus, it eliminates the pre-test problems associated with standard cointegration tests. In addition, ARDL is more robust, effective and performs better for smaller or finite sample sizes than other co-integration techniques (Narayan, Narayan, 2006; Pesaran et al., 2001).

For the bounds test, the unlimited error correction model (UECM) should be used initially. The version of the UECM modified to present model is presented in Equation 2 below.

$$\Delta LNREXP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i}\, \Delta LNREXP_{t-i} + \sum_{i=1}^{p} \alpha_{2i} \Delta LNREER_{t-i} + \sum_{i=1}^{p} \alpha_{3i} \Delta LNIP_{t-i} + \alpha_4 LNREXP_{t-1} + \alpha_5 LNREER_{t-1} + \alpha_6 LNRIP_{t-1} + \epsilon_t \quad (2)$$

In the model, t represents the trend variable, and p the lag value. In the study, the Schwarz information criterion was used to determine the optimal lag value for the bounds test. The null hypothesis formed for the existence of a cointegration relation can be expressed as: H_0:α4=α5=α6=0. The calculated F-statistic values are compared to the upper and bottom limits at the table in Pesaran et al. (2001) in order to either reject or accept the null hypothesis. If the calculated F-statistic is lower than the critical bottom limit in the table, a cointegration relation does not exist. If it is between the bottom and upper critical limits, no exact interpretation regarding the cointegration relationship can be made. However, if the calculated F-statistic value is greater than the upper critical limit in the table, a cointegration relation exists.

Table 3. ARDL Bounds Test Results

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significance Level	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	4.836	10%	2.63	3.35
k	2	5%	3.1	3.87
		2.50%	3.55	4.38
		1%	4.13	5
Actual Sample Size	94		Finite Sample: n=80	
		10%	2.713	3.453
		5%	3.235	4.053
		1%	4.358	5.393

Sources: Authors own estimation.

According to the results indicated in Table 3, since the calculated F-statistic value of 4.836 is greater than the upper critical value at 5% significance level, a conclusive long-term relationship among variables can be seen.

Autoregressive Distributed Lag Model

After a cointegration relation was determined among the variables, short-term and long-term relations between the real exchange rate and food and live animal exports were examined using the (ARDL) model. The ARDL model used in this study is given below in Equation 3.

$$LNEXP_t=\alpha_0+\sum_{i=1}^{k}\alpha_{1t}LNEXP_{t-i}+\sum_{i=1}^{l}\alpha_{2t}LNREER_{t-i}+\sum_{i=1}^{m}\alpha_{3t}LNIP_{t-i}+\varepsilon_t \quad (3)$$

In Equation 3; k, l, and n indicate the lag values. The optimal lag lengths for the ARDL model were determined by the Schwarz information criterion. The ARDL model results are given below in Table 4.

Table 4. ARDL Model Estimation Results

Selected Model: ARDL(3, 0, 1)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNEXP(-1)	-0.004	0.087	-0.051	0.960
LNEXP(-2)	0.330	0.078	4.221	0.000
LNEXP(-3)	0.555	0.086	6.468	0.000
LNIP	0.335	0.257	1.305	0.195
LNREER	0.832	0.351	2.369	0.020
LNREER(-1)	-1.201	0.372	-3.229	0.002
C	2.621	1.118	2.345	0.021
Diagnostic Tests				
Autocorrelation			1.54[0.21]	
Normality			1.37[0.50]	
Heteroskedasticity			1.34[0.24]	
Ramsey			0.15[0.69]	

Sources: Authors own estimation.

Lon-term Relationship

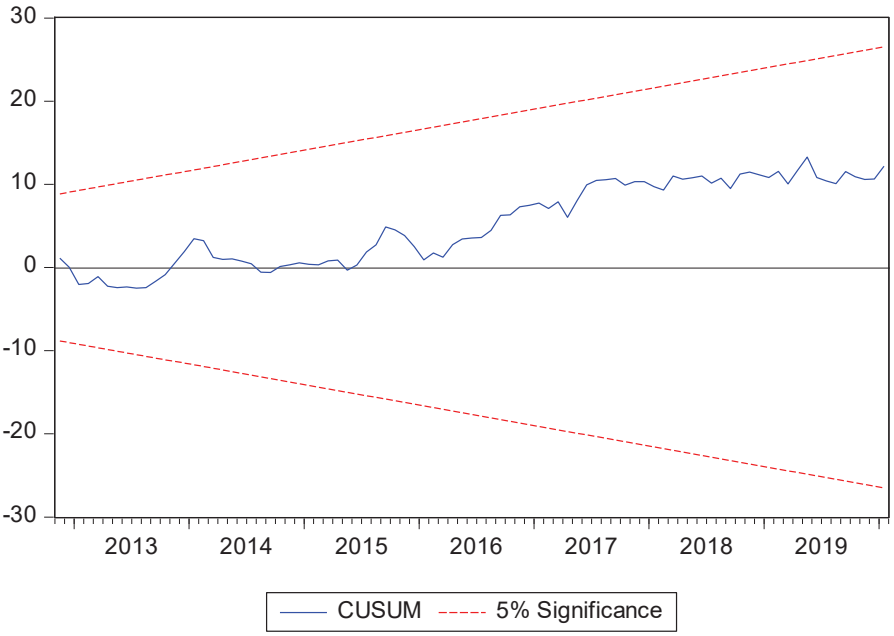
After determining the relationship among the variables, long-term coefficients of the ARDL model were estimated. Table 5 presents the long-term coefficients of the variables.

Table 5. Long Term Estimation Results of the ARDL Model

Variable	Coefficient	t-Statistic	Prob.
LNIP	2.803	2.413	0.018
LNREER	-3.091	-2.795	0.006
C	21.925	2.620	0.010

Sources: Authors own estimation.

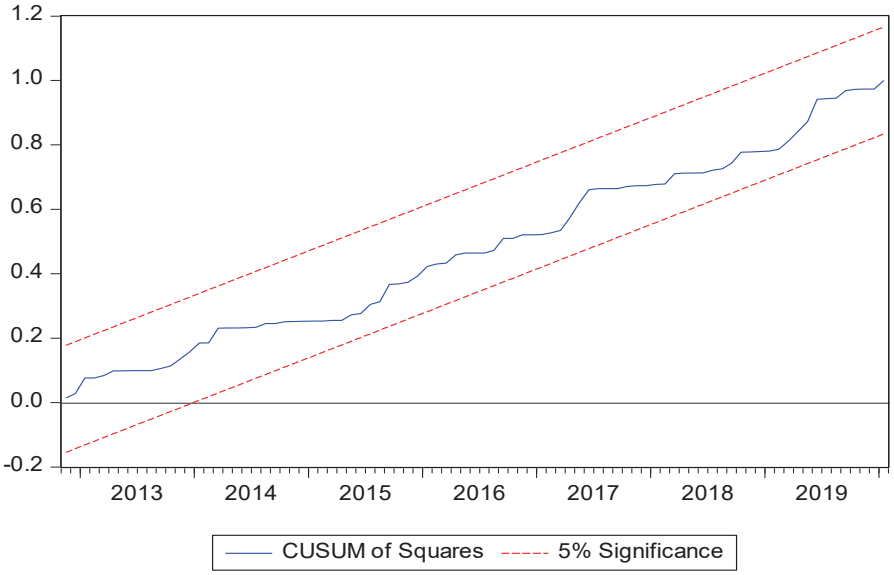
The long-term results reported in Table 5 show that the real effective exchange rate has a negative impact on Poland's food and live animal exports. For instance, it was found that a 1% increase in the real effective exchange rate would decrease Poland's food and live animal exports by 3.091%, whereas a 1% increase in industrial production would increase Poland's food and animal exports by 2.803%.



The straight lines represent critical bounds at 5% significance level.

Fig. 1. Plot of Cumulative Sum of Recursive Residuals

Sources: Authors own estimation.



The straight lines represent critical bounds at 5% significance level.

Fig. 2. Plot of Cumulative Sum of Squares of Recursive Residuals

Sources: Authors own estimation.

Figure 1 and 2 show the CUSUM and CUSUMSQ plots. CUSUM and CUSUMSQ plots do not exceed critical limits, meaning that there is no evidence of any significant structural instability in the model.

Short-Term Relationship

In the study, the relationship between the variables was examined by the error correction model, which is based on the ARDL model. The error correction model which was adapted to this study is presented in Equation 4.

$$\Delta LNEXP_t=\alpha_0+\alpha_1 EC_{t-1} + \sum_{i=1}^{k} \alpha_{2i}\Delta LNEXP_{t-i} + \sum_{i=1}^{l} \alpha_{3i}\Delta LNREER_{t-i} + \sum_{i=1}^{m} \alpha_{4i}\Delta LNIP_{t-i} + \varepsilon_t \quad (4)$$

Table 6. Estimation Results of the Error Correction Model Based on the ARDL

Variable	Coefficient	Std. Error	Prob.
D(LNEXP(-1))	-0.884	0.080	0.00
D(LNEXP(-2))	-0.554	0.082	0.00
D(LNREER)	0.831	0.338	0.02
ECT(-1)	-0.119	0.026	0.00

Sources: Authors own estimation.

The coefficient of error correction term indicates the degree to which the short-term imbalance is corrected in the long term. Given that the error correction term coefficient is negative and significant as expected, there is an indication that 11% of an imbalance in the short-term will be recovered in the next period.

Conclusion

The relationship between Poland's food and animal exports and the real effective exchange rate was examined by using monthly data for the period of 2012-2020. First of all, the stationarity of the series was examined by the ADF and PP tests. The short- and long-term relationships between Poland's food and animal exports and the real effective exchange rate was examined by ARDL model. According to the results of ARDL model, as expected, real effective exchange rate negatively and significantly affects Poland's food and animal exports in the long-term. The long-term coefficient of the real effective exchange rate was found to be -3.091, indicating that a 1% increase in real effective exchange rate in the long-term would decrease Poland's food and live animal exports by 3.091%. A strong PLN increases the relative price of the product in the rest of the world, which reduces both the quantity of the exported product and the demand. However, a 1% increase in industrial production would increase Poland's food and animal exports by 2.803%.

The results of the study indicate findings supporting Baek and Koo (2009); Erdal et al. (2012); Erdem et al. (2010); Fidan (2006); Gündüz (2010); Mao (2019); Pick (1990) who concluded that the real effective exchange rate had an effect on agricultural export in parallel with the expectations in the literature. However about whether the effect is positive or negative it has been identified that increases in the real effective exchange rate reached

in the work of Cho et al. (2002); Kandilov (2008) to support the negative impact on agricultural exports, decreased Poland's food and live animal exports.

Also it should be pointed out that Poland, similar to other emerging market countries, often specializes in the production and export of raw materials and agricultural products as well as labour and material-consuming processed goods. Prices of these products are often shaped in organized markets, therefore producing and exporting countries have limited influence on the level of foreign exchange prices. On the other hand, the currencies of these countries are more often than the currencies of highly developed countries the object of speculative attacks, which may result in unpredictable changes in their rates (Gryczka, 2018).

While Poland is a member state of the European Union, it is not a part of the monetary union. Some countries have had dramatic negative experiences being part of the monetary union in times of financial crisis. This study has determined that the exchange rate does indeed have a significant effect on exports of agricultural products in Poland, an EU country which uses its own local currency.

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Ogheneruemu Obi-Egbedi[1], Isaac B. Oluwatayo[2], Omowunmi Ogungbite[3]
[1,3] University of Ibadan, Nigeria
[2] University of Venda, South Africa

Genetically Modified Crops' Technology and its Awareness among Smallholder Farmers in Nigeria

Abstract. Genetically Modified (GM) crops are crops modified through genetic engineering to improve their quality. Although safety concerns about genetically modified organisms (GMOs) are still being debated, the food security benefits have led to adoption by many counties. In Nigeria, where most farmers are uneducated and likely unaware of the agricultural technology, the government approved its first biotechnology crop for commercialization in 2018. Level of farmers' awareness is crucial to acceptance of GM crops, although; this has not been fully explored in the literature. Therefore, this study aimed to assess farmers' awareness for GM crops and the factors that determine their awareness in Oyo state, Nigeria, using primary data collected in 2018 with the aid of well-structured questionnaires from 242 smallholder farmers. Principal component analysis and Tobit regression model were used for data analysis. Results showed that farmers were aged 43 years with farm size of 3.57 ha, farming experience of 14 years and 11 years of education. Most farmers were male (71.90%), married (67.36%), not members of farmer groups (64.46%) and sourced their seeds from non-credible sources (85.12%). Most farmers (52.07%) had either not heard of or did not know of any benefits/costs of GM crops, hence; were not aware of GM crops. Factors that influenced awareness of GM crops were being a male farmer, years of education and source of seeds. The study concluded that increasing years of education and ensuring use of credible seed sources will increase awareness of the costs and benefits of GM crops among farmers.

Keywords: GMOs, smallholder farmers, awareness for GM crops, Credible seed sources, Agricultural technology

JEL Classification: O13, O30, O31, O33, O55

Introduction

Genetically Modified Organisms (GMOs) are organisms that have been modified by the application of recombinant Deoxyribo-Nucleic Acid (DNA) technology or genetic engineering which alters a living animal or plant genetic material (Yasin and Mulugeta, 2015). Hence, Genetically Modified (GM) crops have their genetic material, that is, DNA modified through non-natural means such as through the introduction of a gene from a different plant. Agricultural biotechnology is the foundation for conventional breeding, tissue culture and GM crops. Its history can be traced to the mid-1980s, with the initiation of China's National High-Tech program. Currently, more than 200 different GM crop varieties had been created worldwide (Fernandez-Cornejo *et al*, 2014). Commercial

[1] Department of Agricultural Economics, University of Ibadan, Nigeria, e-mail: gheneobi@gmail.com; https://orcid.org/0000-0002-0778-7251
[2] Department of Agricultural Economics and Agribusiness, University of Venda, South Africa, e-mail: isaacoluwatayo@yahoo.com; https://orcid.org/0000-0002-8649-2557
[3] Department of Agricultural Economics, University of Ibadan, Nigeria, e-mail: ogungbitetinuola@gmail.com

planting of GM crops started in the United States of America (USA) in 1996 and the adoption rate of GM has been the fastest in the history of agricultural technology (James, 2008). About 40% share in the global area planted to GM crops is in the USA and the largest proportion of GM crops with respect to soybeans, cotton, and corn are produced in the United States (USDA, 2016; Fernandez-Cornejo *et al*, 2014 and James, 2014).

The spread of GM crops has also been rapid and wide in the Americas and Asia (Bett *et al*; 2010). In 2012, GM crops were planted on 170 million hectares of arable land worldwide, with a global value of $15 billion for GM seeds (Fernandez-Cornejo *et al*, 2014). In 2016, the total acreage of genetically modified crops worldwide increased to about 185.1 million hectares (The Statistics Portal, 2017). Further, assessment of the global benefits from the cultivation of GM crops showed yield impacts in the direct farm income benefit calculations and also cost savings of reduced fuel use from less frequent herbicide or insecticide applications and a reduction in the energy use in soil cultivation (Brookes and Barfoot, 2018). Biotechnology has been widely acknowledged as a modern tool that holds the potential to improve agricultural production (Kagai, 2011). Global food security and nutrition is at the heart of GM crop development in addition to income generation and environmental protection for resource poor farmers (Eric *et al.,* 2014). It is widely considered globally, that GM crops are also one of the potential tools for increasing agricultural productivity.

In Africa, benefits from biotechnology and GM crops are expected to be large, especially given stagnating economies and food production, decreasing per capita food production and an expected increase in the number of poor people over the foreseeable future (Rosegrant *et al.,* 2001). The use of genetically modified (GM) crop technology in solving food security challenges and poverty reduction is an ongoing global debate, acceptance has been slow relative to other developing continents like South America and Asia. There is still concern on both the health benefits and problems of consuming GM crops. According to Medical News Today (2019), GM crops are believed to have a higher potential of triggering allergic reaction because they may contain genes from an allergen although, no such reports have been received by health authorities. Further, consumption of GM crops is believed to contribute to cancer development since the disease is caused by mutations in DNA, although the evidence to prove this claim is yet to be seen. There are also concerns that disease-resistance genes in food can transfer to cells in the body and make human beings resistant to drugs such as antibiotics, although, the risk is very low. The several health concerns of GM crops require more research to reach a conclusion. Hence, most African nations have ongoing research activities, particularly on staple foods. Only Burkina Faso, Egypt, and South Africa use commercialized GM crops, while Kenya, Nigeria, and Uganda have been slow in adopting the technology (Racovita*.,* 2013; Karembu *et al*., 2009). South Africa was the first country in Africa to release commercial GM crops (Eicher *et al*., 2006). The country's acreage cultivated to GM crops has been increasing by 2.6% while total acreage stands at about 2.73 million ha; mostly maize, cotton and soybean (Agaba, 2019 and Adenle*,* 2011). Farm income benefits of GM HT soybeans in 2016 accruing to South Africa was about $38.4 million while farm income benefits of GM IR cotton accruing to Burkina Faso was $204.6 (Brookes and Barfoot, 2018). These income gains are expected to have significant impacts on poverty and food security of farmers.

In Nigeria, there are no genetically modified organisms officially grown but with the new National Biosafety law enacted in 2015, Nigerian government officials publicly noted their interests in the commercialization of certain products such as cotton, maize and

herbicide-tolerant soybeans (USDA, 2016). Nigeria has adopted a National Biotechnology Policy designed to take advantage of the potential benefit impact in agriculture, industry, healthcare delivery and the environment (National Biosafety Management Agency, 2018). This policy instrument is proposed to give authority to the National Executive Organization to establish the necessary legal instrument and procedure to guide the implementation of the protocol, based on sound scientific, economic, social, cultural and ethical considerations. All the officially approved GM crops in Nigeria are under experimental fields. Another source of potential introduction of GM foods is through commercial importation of food containing ingredients from corn and soy (Subulade *et al*., 2007).

Adoption of genetically modified (GM) crops could contribute toward alleviating food insecurity in Nigeria (Yasin and Mulugeta, 2015), however, the preference of the farmers which are crucial to the acceptance of GM products have not been fully explored. The other subject for consideration include low awareness and a lack of information on GM crops. Many farmers are either not aware or less informed about GM crops (Oladele and Akinsorotan, 2007). Tegegne *et al.* (2013) affirmed that the information reaching the end users and producers of GM crops should be informative, easy to understand and user-friendly. Several reasons have been advanced for the reluctant and skeptical attitudes towards GMO-based technology, including a lack of public understanding of the science, difficulties in defining what GMOs are exactly, ethical or religious beliefs and little or no perception of the benefits that GMOs can bring (Comstock, 2002). People tend to fear what they don't understand and biotechnology is something a lot of people assume is too technical or too complicated to comprehend (Mahaletchumy and Brian, 2015). The importance of farmers acceptance in the deployment of GM technology is now widely accepted, and documented in a large body of research in many countries, although few in Africa (Kagai, 2011). Farmers are caught in the middle, they would like to use GM products, which are often cheaper and have other desirable traits, but they cannot do this if there is no substantial information about the price, dissemination and accessibility of the seeds in addition to other necessary information (Bett *et al*., 2010).

Although the debate is ongoing over the cultivation of genetically modified crops in Nigeria the opinion of the farmers seems to be lost in the debate; even though they are in a unique position to assess the product quality, viability and desirability. Farmers' opinions are not often considered when formulating policies related to agriculture in Nigeria and this has made many policies to fail even at inception (Ademola *et al.,* 2014). According to Bett *et al.* (2010), farmers are considered to be consumers of seed as a production input hence, their preference of one variety over another will be based on the utility they obtain from its attributes and this depends on their own socioeconomic characteristics, among others. Consumers' opinion is the key element of the GM debate. It is no use developing crop technologies if the consumers are not interested in the food that they produce (Kimenju *et al.*, 2011). Their first-hand knowledge could be useful in adapting the new technology to their real needs and could help to resolve the disputes between defenders and critics of GM crops more objectively (Tegegne *et al.,* 2013).

Although many studies (Ademola *et al.,* 2014; Okigbo *et al.,* 2011; Subulade *et al*., 2007) have been done on genetically modified crops in Nigeria, in the areas of food security, health and benefits. Similarly, several studies exist on the awareness of farmers in Nigeria on areas of innovative farmer-facilitations such as crop insurance and other agricultural technology (Kumar *et al.,* 2011, Ogwuche *et al*., 2016; Duhan and Singh,

2017). However; there is a dearth of research on the farmers' awareness about GM crops. The importance of farmers' awareness is critical to the assessment of agricultural seeds and crops. Hence, this study aimed to assess farmers' awareness of GM crops and the factors that determine their awareness in Oyo State, Nigeria.

Materials and methods

The study was conducted in Oyo state, southwestern Nigeria. It is one of the most populous states in the country with a population of 5,580,894 (NBS, 2012) and coordinates 8°00′N 4°00′E. It is an inland state with its capital city, Ibadan being the largest city in West Africa. Oyo state is bounded in the north by Kwara State, in the east by Osun State, in the south by Ogun State and in the west partly by Ogun State and partly by the Republic of Benin. The state covers approximately an area of 28,454 square kilometers. The dry season lasts from November to March while the wet season starts from April and ends in October. Average daily temperature ranges between 25 °C (77.0 °F) and 35 °C (95.0 °F), almost throughout the year. There are thirty-three (33) Local Government Areas in the state of which only six are urban. The major occupation of the people is farming particularly those in the rural areas. Some of the crops cultivated are cassava, yam, maize, plantain, cocoa, oil palm and orange trees.

Primary data was collected for this study with the aid of well-constructed questionnaires from small holder farmers in Oyo state. Data collection was carried out in 2018. Information was collected on the farmers' socio economics characteristics and their awareness on GM crops. A multi-stage sampling technique was adopted for this study. Firstly, the six urban local government areas (LGAs) in the state were screened out of the 33 local government areas since most small holder farmers are found in the rural areas. The second stage was the random selection of 5 local government areas (LGAs) from the rural local governments namely Kajola, Oluyole, Lagelu, Ido and Olorunsogo local government areas. The third stage involve the random selection of 5 wards from each of the selected LGAs. The fourth stage was the selection of one village out of each of the 5 wards selected. The last stage was the selection of maize farmers which was proportionate to the size of the villages selected. Although 250 respondents were surveyed only 242 maize farmers were used for the analysis due to incomplete questionnaires.

The data collected was analyzed using principal component analysis and tobit regression model. Principal component analysis was employed to identify the level of awareness for genetically modified crops among farmers in Oyo state. The evaluation of awareness was relative since it was based on the mean value of the number of farmers who were aware of GM crops. A question was asked if the farmers were aware of GM crops and whether they could state some benefits and/or costs of the agricultural technology. The study termed farmers that said they were aware and could also state at least one benefit and/or cost of GM crops as the farmers who were aware while others who had not heard of or did not know any benefit/cost as not aware.

$^2/_3$ of the mean of index was used to determine the level of awareness of the farmers

$$\geq {}^2/_3 \; of \; mean \; = 1 \text{(high awareness level)}$$

$$\leq {}^2/_3 of \; mean = 0 \text{ (low awareness level)}$$

The factors that determine the level of farmers' awareness for genetically modified crops in Oyo state was achieved through the use of tobit regression model. Following Kumar (2011), the model is specified thus:

$$T_i = w_0 + w_1 s_1 + w_2 s_2 + w_3 s_3 + w_4 s_4 + w_5 s_5 + w_6 s_6 + w_7 s_7 + w_8 s_8 + w_9 s_9 + \varepsilon_i$$

Where T_1= the level of farmers' awareness for genetically modified crops,
w_0 = intercept,
w_1... w_7 =parameters to be estimated,
s_1= years of education (years),
s_2= Marital status (married=1, otherwise=0),
s_3= Farm size (in ha),
s_4 = Farming experience (years),
s_5= income of the farmers (in naira),
s_6= gender of the farmers (male =1, female =0),
s_7= membership to farmers' group (Yes=1, No=0),
s_8=source of seed (credible source; ADP, research institution and other government agencies=1, non- credible source; market, friends, personal plot and others=0),
s_9=age of the farmers (years).

Table 1. A priori expectation for determinants of farmers' awareness for GM crops

S/N	Variables	Expected signs
1	Years of education	+
2	Marital status	+
3	Farm size	+
4	Years of farming experience	+
5	Gender	+/-
6	Membership to group	+
7	Source of seeds	+
8	Age of the farmer	-

Source: Authors' own research.

Results and Discussion

The description of the farmers' socioeconomic characteristics is presented on Table 2. The result reveals that most of the farmers (39.67%) were within the age range of 41-50 years while the mean age was about 43 years. This suggests that most of the farmers were still in their active ages and may be open to the new innovation of GM crops. This agrees with the result of Bayissa (2014) that most small holder famers are between 41-50 years of age. Moreover, over 70% of the farmers were male. This implied that farming was a male dominated activity in the rural area and agrees with the result of Aromolaran *et al*, (2017) that most farmers are male. Majority were also married (67.36%), indicating that they may have information of GM crops since most couples discuss and share new ideas with one another. Further, more than half (55.37%) of the farmers had farm sizes of between 1-5 ha while the mean farm size was 3.57 ha, showing that most farmers were small holders. With respect to the farm experience, however; the results showed that most farmers (44.21%) had over 10 years of experience, implying that they can make informed decisions about quality

of planting material and produce. The mean years of farming experience was about 14 years. This result is not close to Ojeleye (2018) that found farming experience to be about 20 years for small holder farmers. Furthermore, half of the farmers had between 7-12 years of formal education with the mean years of formal education being about 11 years. This suggests that majority of the farmers have above mere basic education and may therefore have a good understanding of the innovation and be disposed to GM crops. Further, most of the farmers (64.46%) did not belong to any farmer group. This may have negative implications for awareness of GM crops as farmers often get information on innovations from farmers groups. Finally, most farmers (85.12%) purchase their seeds from non-credible sources. These include seeds sales points that are not from the Agricultural Development Project (ADP), research institutions and other government agencies but rather from the open market, friends, farmers' personal plot and other of such sources. This may also have negative implications for the farmers' awareness of GM crops.

Table 2. Socioeconomics characteristics of farmers by GM crop awareness status

Variables	Frequency	Percentage	Mean	SD
Age (years)				
< 30	24	9.92		
31 – 40	79	32.64		
41 – 50	96	39.67		
>50	43	17.77	42.89	9.38
Gender				
Male	174	71.90		
Female	68	28.10		
Marital status				
Married	163	67.36		
Unmarried	79	32.64		
Farm size(ha)				
<1	68	28.1		
1 – 5	134	55.37		
6– 10	32	13.22		
Above 10	8	3.31	3.57	4.19
Years of farming experience				
<5	70	28.93		
5-10	65	26.86		
>10	107	44.21	13.72	10.83
Years of education				
0-6	48	19.83		
7-12	121	50.00		
>12	73	30.17	11.32	3.92
Membership of farmers' group				
Yes	86	35.54		
No	156	64.46		
Source of seeds				
Credible source	36	14.88		
Non-Credible source	206	85.12		

Source: field survey, 2018.

The awareness level of the farmers for GM crops is shown on Table 3. The results reveal that most farmers (52.07%) are not aware of GM crops. This could be due to the fact that most of the farmers do not source their seeds from credible sources where information on GM crops could be obtained. This agrees with Oladele and Akinsorotan (2007) that most farmers do not have information on GM crops.

Table 3. Awareness of GM crops among farmers

Awareness of GM crops	Frequency	Percentage
Aware	116	47.93
Not aware	126	52.07

Source: field survey, 2018.

The probit regression estimates for the determinants of farmers' awareness for genetically modified crops in Oyo state are presented on Table 4. The Log likelihood value is 57.18, LR chi2 (9) is 43.34 and Prob.>chi square is 0.00 which indicate that the model is statistically significant in explaining the independent variables, hence; the model fits the data. Gender was significant at 10% having a positive relationship with awareness of the farmers. This implies that the awareness of the farmers for GM crops increases with being a male farmer by 0.05%. This could be due to the fact that male farmers are usually more interested in new technologies than female farmers (Shauri *et al.* 2009). Hence the male farmers are more likely to make enquiries about new innovations and technologies in farming. They are also more likely to listen to news than their female counterparts. This result is in accordance with Xun *et al.* (2017) that being a male positively influence awareness level. Similarly, years of formal educational was significant at 1% and had a positive relationship with farmers' awareness for GM crops. Hence, the awareness of the farmers for genetically modified crops increases with an additional year of farmers' formal education by 0.07%. This is expected and is consistent with Erkie (2016).

Membership of farmers' group was significant at 10% and had a negative relationship with the awareness of genetically modified crops. This indicates awareness to GM crops increases with non-membership of a farmers' group by 0.07%. This is contrary to expectation as found by Kumar (2011) and Tanko and Opara, (2010) that membership of farmers' group has a positive relationship with the awareness for GM crops. However, the negative relationship could be as a result of most farmers not belonging to farmers' groups and hence relying on other sources for information on innovations. Finally, source of seeds shows a positive relationship with awareness level for the genetically modified crops. The result is significant at 5% and shows that as farmers get seeds from a credible source such as research institute, ADP and government agencies, probability of being aware of GM crops increases by 0.08%. This is expected as most credible seed sources share information and ideas about innovations and even organize trainings and meetings with the farmers. This is consistent with Tanko and Opara, (2010) that level of awareness for innovation increases as farmers' source planting material from credible sources.

Table 4. Tobit regression of awareness level for genetically modified crops

Variables	Coefficient	Std. Err.	T	P>t	dy/dx
Gender	0.05*	0.03	1.66	0.10	0.05
Age	0.00	0.00	1.58	0.12	0.00
Years of education	0.07***	0.02	3.92	0	0.07
Marital status	-0.02	0.03	-0.83	0.4	-0.02
Farmer experience	0.00	0.00	0.87	0.39	0.00
Farm size	-0.01	0.00	-1.46	0.15	-0.01
Farmers group	-0.07**	0.03	-2.51	0.01	-0.07
Source of seeds	0.08**	0.04	2.35	0.02	0.08
_cons	0.53	0.08	6.97	0	
/sigma	0.19	0.01			
LR chi2(9) = 43.34					
Prob > chi2 = 0.00					
Log likelihood = 57.18					

.***,**, * imply statistical significance at 1%, 5% and 10% levels, respectively.

Source: field survey, 2018.

Conclusion

The modification of crops through genetic engineering to enhance their value gave rise to Genetically Modified (GM) crops. The benefits of GM crops for food security have increased the adoption of the agricultural technology across many countries, although; safety concerns still abound in the literature. Nigeria approved its first biotechnology crop for commercialization in 2018 whereas most farmers are uneducated and may not be aware of the agricultural technology and consequently, may not be disposed to adoption. Hence, the aim of this paper was to assess farmers' awareness for genetically modified crops and the factors that determine their awareness in Oyo state, Nigeria. The study concluded that most of the farmers are not aware of genetically modified (GM) crops. It was established that the factors influencing awareness for genetically modified crops are gender (being a male), years of education, membership of farmers' group and source of seeds. Hence, awareness for genetically modified crops can be increased effectively by targeting male farmers who are educated while farmers should be encouraged to purchase their planting materials from credible sources such as the Agricultural Development Project (ADP), research institutions and other government agencies. Future research could also look into farmers' preferences for GM crops and their willingness to pay for the seeds.

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Problemy Rolnictwa Światowego
Szkoła Główna Gospodarstwa Wiejskiego w Warszawie
Instytut Ekonomii i Finansów
Katedra Ekonomii Międzynarodowej i Agrobiznesu
ul. Nowoursynowska 166, 02-787 Warszawa
tel. (22) 5934103, 5934102, fax. 5934101
e-mail: problemy_rs@sggw.pl

prs.wne.sggw.pl

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Warsaw University of Life Sciences-SGGW
Institute of Economics and Finance
Department of International Economics and Agribusiness
166 Nowoursynowska St.
02-787 Warsaw, Poland
Phone: +48 22 5934103, +48 22 5934102, fax.: +48 22 5934101
e-mail: problemy_rs@sggw.pl

prs.wne.sggw.pl