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ALTERNATIVE AGRICULTURAL INSURANCE MODEL FOR CANOLA PRODUCERS (*BRASSICA NAPUS*) OF LOW INCOME

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Abstract: Canola cultivation is recently introduced in Mexico. The National Institute of Forestry, Agricultural and Livestock Research (INIFAP) released the Testigo Hyola-401 variety with average yields of 2.5-3.0 tons/ha, lower than those produced by Canada. This crop is planted in the State of Mexico, Jalisco and Tamaulipas, and is an economic alternative for small producers, therefore, production and market must be ensured through agricultural insurance that offers protection against climatic risks and possible contingencies of the market. The present work proposed the calculation of a risk premium through the ordinary least squares methodology in canola cultivation, using the variables yield (REND) and Average Rural Price (PMR) in each producing area in the period 2000- 2019. It is reported that the cost of the national premium projected for 2021 would be $3,503/ha with a yield of 1.5 ton/ha., for the State of Tamaulipas $2,070.82/ha with a yield of 0.8 t/ha; for the state of Hidalgo of $1,941.57/ha with a yield of 1.5 t/ha; for the State of Mexico of $1,499.63/ha with a yield of 2.3 t/ha; and, for the state of Jalisco, $1,486.90/ha with a yield of 1.6 t/ha.
Keywords: performance, risk, oilseeds.

INTRODUCTION

The weak integration of national Canola producers in the agribusiness is due to the fact that the crop is little known by financial institutions, which is why they do not offer credits and insurance in line with their needs. Therefore, it is necessary to improve the market and production services aspects (Cerero, 2015).

Agricultural insurance acts as a compensatory mechanism for the transfer of losses and risks between the insured and the insurer in an uncertain environment such as agriculture (Vidal et al., 2009).

In Mexico, these are administered by the Ministry of Finance and Public Credit (SHCP) through AgroAsemex S.A. The programs to promote agriculture and agri-food productivity include the use of market risk and shared risk instruments. Since 2017, federal programs only cover 30% of the insured premium, plus an amount of $550/ha as a maximum limit on basic crops (DOF, 2019; Ramírez et al., 2017; PEF, 2019).

The insured crops are basic grains (corn, beans, sorghum and wheat), canola and amaranth, fall into the category of "others" with an insured area of 472.9 thousand hectares (AGROASEMEX and SHCP, 2019; Ramírez et al., 2017).

In Mexico, 1,513.5 Mt of canola are imported to Canada; with a value of 617.38 million dollars, which represents 0.003% GDP-National (WATTAGNET.COM, 2013; Jowlett, 2013; FAOSTAT, 2016; Agricultural Planning 2017-2030, 2017).

An estimate of canola consumption for the year 2030 would be 1,703.1 Mt and production of 7.77 Mt (INIFAP 2008; Oilseed product system, 2019: Agricultural planning 2017-2030, 2017; SAGARPA, 2020; SIAP, 2021).

Canola is considered a potential crop because it is supported by contract farming, agreeing with industrialists on the price and quantity of delivery, but not the insurance of the crop. The cost of an agricultural insurance premium must be affordable for the small producer. (SPO, 2019, Zavala, 2010; Hatch, 2008; IICA, 2007; Ayvar, 2018).

The objective of this work was to generate an alternative insurance model for canola cultivation. Allowing the canola producer to pay a lower insurance premium to protect themselves in the event of an accident and an improvement in the trade balance, since import costs will be reduced.

CANOLA CULTIVATION

Starting with the 2005-2006 cycle, the genetic improvement program began at the National Institute of Forestry, Agricultural and Livestock Research (INIFAP, 2008), in Mexico, with the objective of developing Mexican varieties adapted to the agroclimatic conditions of the country, releasing the Testigo Hyola-401 variety (Oleaginous Product System, 2019). The seeds intended for production are imported from Canada at a rate of 1.4 million tons, the cultivated area is 8 million hectares, with Sonora being the first producing state, followed by Tamaulipas, Tlaxcala, Nuevo León, State of Mexico, Jalisco, Querétaro, Michoacán, Veracruz, San Luis Potosí, Hidalgo, Guanajuato, Chihuahua, Aguascalientes and Puebla. This crop has the capacity to develop in temperate to cold temperate climates and an average yield of 1.3 tons/ha (SIAP, 2015). However, in Alberta-Canada, the yields of this crop have a range of 7.9-8.9 tons/ha (INIFAP, 2008). The crop lasts 125-135 days from sowing to maturity, it is considered a good reconversion alternative, since it breaks pest reproduction cycles. Oil and crude fiber (10-12%) and protein (36-38%) are obtained from canola for balanced feed. Canola oil has important properties, it prevents heart problems due to the amount of saturated fats, it is rich in Omega 3, vitamins E and K. (SIAP, 2015). It is marketed with 2% euricic acid and 30 mmoles of glucosinates/gram of pulp (Oleaginosa Product System, 2019; INIFAP, 2008).

Canola oil has a price between $23-28 pesos/liter, which is lower compared to other edible oils, which are between $25-$45 pesos/liter (Jowett, 2015). To supply the internal demand for canola, it would be necessary to plant 600,000 hectares, considering an average yield of 2.0 tons/ha. In 2006, the planted area was 4,359 hectares with a yield between 0.5-3.5 ton/ha, highlighting the states of Tlaxcala (1,179 hectares), Tamaulipas (1,000 hectares), State of Mexico (930 hectares), and Hidalgo (780 hectares)., Michoacán (180 has), Sonora (100 has), Puebla (130 has) (ANIME, 2013).

It is supported by the minimum target income of $4,515/ton, above the target income of corn $2,100, wheat $2,415, sorghum $1,785 and oats $2,520 (Oleaginous product system, 2013).

CANOLA AGRICULTURAL INSURANCE

Thus, a technological package is required that undoubtedly includes insurance in canola production. In 2015, the State of Hidalgo was one of the states insured by the SHCP, through SEDAGRO, securing 398,577 hectares, among which were basic grains, citrus fruits, coffee and canola, the investment was 44 million pesos, against climatic risks.

The SHCP published in the Official Gazette of the Federation the Operating Rules of the Agricultural Insurance Program, which establish the types of beneficiaries such as: agricultural insurance for climatological risks (drought, frost, flood, fire, hurricane), biological risks (pests and predators) or related to the variation in the marketing price of the production.

The insurance consists of a subsidy for the insurance premium and support for agricultural insurance funds, and for weather contingencies.

Agricultural insurance has the purpose of reducing economic losses and taking care of the producer's assets (Hatch, 2008). The advantages are: personal protection, for the producer; generates internal savings, providing stability in the country's sector. This is why some state governments have decided to acquire agricultural insurance to avoid the decapitalization of producers and farmers in the event of an accident (Altamirano, 2009).

The Secretary of Agriculture, Livestock

Resources, Fisheries and Food (SAGARPA), promotes crop production under the financing scheme in the National Crusade Against Hunger Program, among the crops with insurance coverage are basic grains, fruit and "Others." " like canola and amaranth. The financing is integrated into the subsidy in the Agricultural Insurance Premium, under the Federal Budget and Fiscal Responsibility Law, whose authorized budget for the fiscal year 2014-2015 was 1,611.6 MP, of which 384.7 MP corresponds to the agricultural branch, in a surface of 769.7 thousand hectares (DOF, December 28, 2014).

In Mexico, agricultural insurance is administered by the SHCP and SAGARPA and AGROASEMEX A.C. The surface area insured by the Insurance Funds is 56.2% and 43.8%, respectively. To identify potential areas with high accident rates, the national territory has been divided into three regions: Region 1; Made up of the states of Veracruz, Campeche, Yucatán, Chiapas, Tabasco, Guerrero, Oaxaca and Quintana Roo. Whose insured amount was 19.8% with an area of 343,400 hectares. In region 2: State of Mexico, Querétaro, Tlaxcala, Puebla, CDMX, Aguascalientes, Guanajuato, Hidalgo and Michoacán, Morelos, San Luis Potosí and Zacatecas, whose insured amount was 19.5%, with an area of 345,000 hectares. In Region 3: Chihuahua, Coahuila, Nuevo León, Tamaulipas, Durango. Jalisco, Colima and Nayarit, whose insured sum was 36.1%, with an area of 187,300 hectares. In Region 4: Baja California Sur, Baja California Norte, Sinaloa and Sonora, whose insured sum is 24.8%, with a surface area of 443,200 hectares. The crops that are most assured are basic grains, sugar cane, cotton, fruit trees and currently crops such as canola and amaranth, with an area of 472,900 hectares (AGROASEMEX,2015).

The adoption of agricultural insurance is contemplated in the government programs of SAGARPA, in the operating rules of the Undersecretary of Rural Development, in the General Directorate of Climate Change in the Agricultural Sector and in the National Development Plan 2013-2018. Likewise, the SHCP grants the subsidy to the agricultural insurance premium and support the Insurance funds. Through the Funds Law, the aim is to expand the protection coverage, to reduce the cost of the premiums paid for agricultural insurance. hire

The subsidy is granted to producers of less than 20 hectares, who contribute 30%, SAGARPA 60% and only 10% corresponds to the producer. In addition, properties of less than 5 hectares are insured (85% are in this situation), which are small landowners with seasonal crops and self-consumption.

The government contributions allocate $1,700 million from the SHCP and $2,662 million from SAGARPA from the Expenditure Budget of the federation allocated year after year to the Chamber of Deputies of the National Congress on November 15 of each year.

There are 14 insurance companies in Mexico, four are concessioned by SAGARPA, three are private capital and one is government capital. (Interview Toro, Director of Climate Change of SAGARPA)

The premium paid by the Insurance Funds is $1,245.8 pesos/hectare, while Private insurers pay approximately $1,062.8 pesos/ha. The most assured crop is corn, followed by wheat, cane, sorghum, beans, barley, cotton, soybeans, chickpeas, rice and others. The risks produced in agricultural activity are classified into three types; Climatological Risks, which are characterized by drought, fire, strong winds, hail, flooding, frost, lack of soil, excess humidity, low temperatures and warm waves; Biological Risks, which include diseases and pests and predators; other risks related to emergence and sowing: inability to sow, non-emergence, clogging, low

population; Risks covered under greenhouse conditions: rain, hail, snow and greenhouse explosion. Generally, insurers exclude risks that are not carried out due to the producer's negligence, such as bad agricultural practices, earthquakes, volcanic eruptions, river overflows not attributable to excessive rain. Coverage can be granted through: Investment insurance: guarantees the recovery of the cost of the crop in the event of a protected dyearso event, when the value of the production obtained is lower than the investment made by the farmer. Insurance for the expected harvest and Guaranteed production insurance: cover the dyears against the risks that are indicated as covered and covers the expected production and a percentage of the agreed production at an agreed price, taking as a reference the farmer's average production, or If this is lacking, the average for the region. Plant insurance: covers the total loss of the plant at production cost, or its rehabilitation when feasible. To have access to compensation, the incidents must be made known to the insurer by the insured farmer, and upon acceptance of the occurrence of the incident, the insurer must cover the compensation, which will not exceed the value of the insured sum (System oilseed product, 2014).

MATERIALS AND METHODS

Historical data on production, yield (REND) and Average Rural Price (PMR) of sown, harvested and damaged canola were used in the production states obtained from SIAP/SAGARPA, taking a period from 2000-2019 (SIAP/SAGARPA, 2020). Average rural prices were deflated in the indicated period with the national producer price index (INEGI, 2020). Linear regression was used as a statistical methodology to identify and estimate the functional relationship between two or more variables. (Ayvar, 2018; Ponce, 2018; Vidal et al., 2009; Gujarati, 2010).

The cost of the insurance premium was obtained by applying the price of the product in question to the average of the variations with respect to its trend line, and the insured amount was obtained by valuing the estimated performance of the immediately subsequent cycle at the same price. The insurance premium was equal to the average of the differences between the returns obtained and their corresponding returns on the trend line, multiplied by the price of the product in force at the time of the insurance payment. (Pérez et al., 2016; Ayvar, 2018; Ponce, 2018). This is how the accident rate of the plot was calculated, regardless of whether the risk was climatological, biological or market (Castañeda-Vera et. al., 2017).

Different econometric models (1,2,3) were run, both nationally and by federal entity, to find out which one was the best fit; using the SPSS® v.2018 statistical package.

Proposed models:

$$REND = \alpha_0 + \alpha_1 \, year + \mu \ldots\ldots \text{ Lineal} \quad (1)$$

$$REND = \alpha_0 + \alpha_1 \, year + \alpha_2 \, year^2 + \mu \ldots\ldots\ldots\ldots \text{ Quadratic} \quad (2)$$

$$REND = \alpha_0 + \alpha_1 \, year + \alpha_2 \, year^2 + \alpha_3 \, year^3 + \mu \text{ Cubic} \quad (3)$$

RESULTS

The significance of the correlation coefficients of the different analyzes were close to zero, both for the performance variable and for the price variable. The results are consistent with the statistics, with R2 being 92.6% for the Average Rural Price (PMR) variable in the data analyzed at the national level and 71% for the performance variable, which indicates the close relationship between the variables. In the case of the State of Tlaxcala, the R2 was 35% in terms of Price and for Yield (REND) there was no correlation. For the other states analyzed, the indicators are acceptable and their significance is less than 5% (Table 1).

Indicator			Indicator		
PMR	**R^2**	**Sig**	**REND**	**R^2**	**Sig**
Nacional	0.926	0.000b	Nacional	0.710	0.000
EdoMéx.	0.47	0.005b	EdoMex	0.552	0.001b
Jalisco	0.879	0.000	Jalisco	0.457	0.026
Hidalgo	0.484	0.075b	Hidalgo	0.484	0.026b
Tamaulipas	0.809	0.000	Tamaulipas	0.424	0.097
Tlaxcala	0.35	0.176	Tlaxcala		

Table 1. Indicators of the model with the variables Average Rural Price (PMR) and year

Source: Own elaboration with data from the SIAP-SAGARPA 2000-2019

Table 2 shows the model coefficients for each state and for each variable, and Table 3 shows the equations per state, for REND and PMR.

Grade	Performance equations by state
Cubic	RENDNAL=1.90-0.29year+0.043year-^{2}-0.002year^3
Lineal	RENDMEX=3.10764286-0.06378571year
Cubic	RENDJAL=2.46503357-0.02285009ye-ar^2+0.0010863year^3
Cubic	RENDTAMPS= 4.02-0.951772016ye-ar+0.08710012year2-0.0025155year^3
Quadratic	RENDHGO= 4.666-0.608year+0.025year^2

Grade	Rural average price equations by state
Quadratic	PMRNAL=1722.581+374.939year-5.319year^2
Quadratic	PMRMEX= 3199.63+383.1year-15.335year^2
Cubic	PMRJAL= 1693.17365+60.8600668year-^{2}-2.5514148year^3
Cubic	PMRTAMPS= 2034.07939+54.035757 year-^{2}-2.15542995year^3
Cubic	PMRHGO= 2034.07939+54.035757year-^{2}-2.15542995year^3

Table 3: Model equations

Source: Own elaboration with data from SIAP-SAGARPA 2000-2019.

DISCUSSION

Table 4 shows the projection of the premium calculation by state, as well as its expected performance, observing that the PMR will be according to the production area and the yield obtained, EdoMéx had the best performance, with 2.5 t/ ha and an amount of the premium to be paid of $1,499.63 pesos/ha, the state of Tamaulipas was $2,070.57 pesos/ ha and a yield of 0.8 t/ha.

2021	Performance (t/ha)	Prima ($/t)
Nacional	1.5	3,503.95
Edo.Méx.	2.5	1,499.63
Jalisco	1.6	1,486.90
Tamaulipas	0.8	2,070.82
Hidalgo	1.5	1,941.57

Table 4: Obtaining the farm insurance premium for canola and yield projections

Source: Own elaboration with outputs from the model and its estimators in the SPSS® program.

Castañeda et al. (2017) evaluated the suitability to estimate the real risk in four types of wheat varieties in the region of Spain when historical data are not available. They point out that, "the insured yield is decisive for farmers to be willing to take out crop insurance under broader coverage."

Ramírez (2013) compared catastrophic and non-catastrophic insurance in the period 2008 to 2011 with the variables Loss rate, Loss rate, premium amount and premium auction. The parameters analyzed from his research were: insured surface, planted surface, irrigated and rainfed. He found that the accident rate remained stable in the analyzed period. The compensation per hectare was $127.90/ha in 2008 and $131.58/ha in 2011. The remaining premiums fell from $55.63 in 2008 to $3.68 in 2011.

Díaz and Garrido (2009), using farmers' records of three crops in Spain during 1993-

RENDNAL	coefficient	error tip	Sig	PMRNAL	coefficient	error tip	Sig
(Constant)	1.905	0.188	0.000	(Constant)	1722.581	293.668	0.000
year	-0.29	0.093	0.007	year	374.939	75.638	0.000
year2	0.043	0.012	0.003	year2	-5.319	4.056	0.208
year3	-0.002	0	0.001				
RENDMEX	**coefficient**	error tip	Sig	**PMRMEX**	**coefficient**	error tip	Sig
(Constant)	3.108	0.188	0.000	(Constant)	3199.63	488.897	0.000
year	-0.064	0.016	0.001	year	383.1	119.269	0.005
				year2	-15.335	6.06	0.022
RENDJAL	**coefficient**	error tip	Sig	**PMRJAL**	**coefficient**	error tip	Sig
(Constant)	2.465	0.37	0.00	(Constant)	1693.174	505.28	0.006
year	-0.023	0.009	0.025	year	60.86	12.474	0.000
year2	0.001	0	0.043	year2	-2.551	0.672	0.003
RENTAMPS	**coefficient**	error tip	Sig	**PMRTAMPS**	**coefficient**	error tip	Sig
(Constant)	4.018	1.319	0.011	(Constant)	2034.079	633.72	0.007
year	0.087	0.042	0.061	year	54.026	15.307	0.004
year2	-0.003	0.001	0.071	year2	-2.155	0.821	0.022
year3	-0.952	0.427	0.048				
RENDHGO	**coefficient**	error tip	Sig	**PMRHGO**	**coefficient**	error tip	Sig
(Constant)	4.666	1.223	0.003	(Constant)	-40190.857	17307.778	0.043
year	-0.608	0.209	0.014	year	11528.626	4645.371	0.032
year2	0.025	0.008	0.011	year2	-898.335	390.21	0.044
					22.298	10.361	0.057

Table 2: Canola model estimators for Average Rural Price ($/t) and Yield (t/ha)

Source: Own elaboration with data from SIAP-SAGARPA 2000-2019. Using the SPSS statistical package, V.21, where: RENDNAL=national performance; RENDMEX=performance of the State of Mexico; RENDJAL=performance of the state of Jalisco; RENDTAMPS=performance of the state of Tamaulipas; RENDHGO= performance of the state of Hidalgo: PMRNAL=national average price; PMRMEX= average rural price of the State of Mexico; PMRJAL=average rural price of the State of Jalisco; PMRTAMPS=average rural price in the state of Tamaulipas; PMRHGO=average rural price in the state of Hidalgo.

2004, showed that premiums are reduced by 20% and farmer certainty equivalents are slightly higher. Farmers would benefit from the policy and governments would improve the efficiency of their insurance subsidies.

Vidal et al. (2009) carried out work calculating the agricultural insurance premium for the citrus producer in Spain, using the variability in the averages of the calculated and expected yields. The suitability for estimating actual risk when historical data is not available was assessed.

CONCLUSIONS

This model provides a more solid technical basis for evaluating and calibrating insurance parameters and allowing historical price and yield data to be taken by canola production zone.

The Mexican government must consider, in the canola-agroindustria chain, technological packages with the inclusion of agricultural insurance whose primary value is a lot more affordable for the producer.

REFERENCES

AGROASEMEX. Condiciones generales del seguro agrícola catastrófico con evaluación de campo. https://www.gob.mx/cms/uploads/attachment/file/470911/DC-S0074-ECAMPO19.pdf. Consultada 11 enero de 2020

AYVAR, V. M. R; PÉREZ, Z.A.; PORTILLO, V.M. Seguro para pequeños productores de maíz en el estado de Puebla. Revista Mexicana de las Ciencias Agricolas.V9.num 4. 16 de mayo de 2018, pp 761-772, 2018

CASTAÑEDA-VERA, A.; SAA-REQUEJO, A.; MÍNGUEZ. I; GARRIDO. A. Crop insurance demand in wheat production: Focusing on yield gaps and asymmetric information Spanish Journal of Agricultural Research 15 (4), e0119, 12 pages eISSN: 2171-9292. https://www.researchgate.net/publication/321253766, 2017

CERERO, H. N.; Factibilidad de la integración de los productores de la región Valle Altos de México como proveedores en la Red de Valor de Canola. Tesis de maestría. Centro de Investigaciones Económicas Sociales y Tecnológicas de la Agroindustria y la Agricultura mundial. Universidad Autónoma Chapingo. 2015

DÍAZ-CANEJA, M.; GARRIDO, A. Evaluating the potential of whole-farm insurance over crop-specific insurance policies. Spanish Journal of Agricultural Research 7(1), 3-11 Available online at www.inia.es/sjar ISSN: 1695-971-X, 2009

DOF, 2019. ACUERDO por el que la Secretaría de Hacienda y Crédito Público emite las Reglas de Operación del Programa de aseguramiento agropecuario. Dof.gob.mx/nota_detalle.php?codigo=5551434&fecha=28/02/2019.

FAOSTAT,2021.https://www.gob.mx/cms/uploads/attachment/file/654302/2021_07_07_Comercio_Exterior_Agroalimentario_de_Mexico_Reporte_semanal.pdf,

GUJARATI. D.N, PORTER. D.C. Econometría. McGraw Hill 5ª. Edición en espyearl. 946pp. Capítulos I y III (pp 61,97 y147). 2010

HATCH, DAVID. El seguro agropecuario, poderosa herramienta para gobiernos y agricultores. COMUNIICA. Year 4, SEGUNDA ETAPA, mayo-agosto 2008.

IICA. Memorias agropecuarias y gestión del riesgo, tendencias y experiencias internacionales, Costa Rica. Seminario 20-21 de febrero, 2007

INEGI, 2020 www.inegi.org.mx/temas/inpp. Consulta INPP histórico 2000-2020.

INIFAP. Cultivos alternativos con potencial de uso forrajero en la comarca lagunera. Libro técnico No.3 18 nov 2008. INIFAP ISBN 978-607-425-042-8, 2008

JOWETT, BRUCE. Canola Representa una alternativa saludable para los mexicanos. El Financiero 2010. Entrevista con el representante del Consejo Canadiense de la canola, 2013

PLANEACIÓN AGRÍCOLA NACIONAL 2017-2030., 2017. Oleaginosas Canola, Cártamo, girasol y soya mexicanas. SAGARPA. https://www.gob.mx/cms/uploads/attachment/file/256431/B_sico-Oleaginosas-parte_una.pdf

PEF (Presupuesto de Egresos de la Federación),. pef.hacienda.gob.mx/work/models/PEF2019/docs/08/r08.ep.pdf, 2019

PÉREZ. S.F, FIGUEROA.H.E, GODÍNEZ. M.L, RAMOS. E.M. 2. Matemáticas aplicadas a la economía. UAEMEX. 2016 http://ri.uaemex.mx/bitstream/handle/20.500.11799/65441/Matem%c3%a1_Aplicadas_Econom%c3%ada.pdf?sequence=1&isAllowed=y

PONCE G.B.E; PORTILLO.V.M. Modelo de seguro agrícola aplicado al distrito de desarrollo rural de Guasave, Sinaloa. Revista eseconomía. Vol. XII, 46. Primer semestre de 2017, pp 81-88, 2018

RAMÍREZ.H.M; JUÁREZ. S.J.P; RAMÍREZ. V.B; FIGUEROA.S. (2017). Política agrícola y desastres agrícolas: Análisis del impacto de siniestros en la producción de maíz de temporal en el municipio de Tlachichuca, Puebla, México. Revista El colegio de San Luis. Nueva época. Year VII, nO14 julio-diciembre de 2017, 2017

SISTEMA PRODUCTO OLEAGINOSA, 2019 http://www.oleaginosas.org/art_196.shtml

SIAP Sistema de Información Agropecuaria SIAP, 2021. https://www.gob.mx/cms/uploads/attachment/file/654302/2021_07_07_Comercio_Exterior_Agroalimentario_de_Mexico_Reporte_semanal.pdf

SIAP/SAGARPA https://nube.siap.gob.mx/cierreagricola/ datos históricos de Canola 2000-2018 Base consultada enero 2020.

VIDAL.F, PARRA.G, LOPEZ.D.B. Is there a relation between risk rate and the insurance premium in agricultural insurances?: An application to the citrus sector. Spanish Joural of agricultural Research, Nov 2009 7(4): 770-778.

WATTAGNET.COM, 2013. México es el cuarto importador de canola canadiense. https://www.wattagnet.com/articles/17685mexico-es-el-cuarto-importador-de-canola-canadiense

ZAVALA PONCE. F.J, 2010. La importancia del Seguro Agrícola Revista Proteja su dinero. CONDUSEF Aug 31,2010.