Article

# Distribution of profits in temporary associations of investors of land capital and machinery in agriculture

Marcos Portillo Vázquez[1]
Dora Ma. Sangerman-Jarquín[2§]
Rocío Ramírez Jaspeado[1]

[1]Postgraduate in Agricultural Economics-Chapingo Autonomous University. Mexico-Texcoco Highway km 38.5, Chapingo, State of Mexico. Mexico. CP. 56230. (mportillo49@yahoo.com.mx; ramirezrocio67@hotmail.com). [2]Valle de México Experimental Field-INIFAP. Los Reyes-Texcoco Highway km 13.5, Coatlinchan, Texcoco, State of Mexico, Mexico. CP. 56250. Tel. 01 800 0882222, ext. 85353.

[§]Corresponding author: sangerman.dora@inifap.gob.mx.

## Abstract

In rural areas there are the necessary and sufficient resources to obtain much higher yields than those currently obtained. The great problem that potentialities are not exploited is that the main productive resources are found separately in the possession of different people. The objective of the manuscript is to suggest a mathematical procedure to identify the contribution that each of the productive resources that it generates in the value of the production of the agricultural goods obtained, the study was carried out in 2018. The distribution procedure of profits is based on a linear programming method that, in addition to accurately calculating the appropriate amounts of the value of the product among the holders of productive resources, previously makes a recommendation to indicate to what extent each of the possible crops should be programmed to be carried out. In conclusion, knowing the magnitude of each of the resources is required to cultivate one hectare in each of the feasible crops and considering the total amount of each of the resources that are available. The results found are that they favor the distribution of what is generated, turning out to be the fair and appropriate distribution of profits. The data conclusions to be processed are the prices of each of the products in the market and their monetary value generated in one hectare of crop; as well as, this model constitutes a good way out to activate in the best conditions the Federal Government programs for mechanization of rural fields that have not yielded the expected results because the machinery belongs to a small group of producers and they have serious difficulties to use all their capacity because they have little land and the rest of the producers do not have the resources to rent them.

**Keywords:** agricultural goods, mathematical procedure, prices, resources.

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## Introduction

In many agricultural areas of the country there are situations where agricultural producers have land, but do not have enough machinery or capital to explore it with high-yield technologies (Romero, 1982). There are also producers who have agricultural machinery and very little land in such a way that to take advantage of the machinery that they have they try to take advantage of it by renting the service of labor with machinery to try to cover the high cost invested to take advantage of the idle capacity, this situation it is truly worrying when it is seen that the existence of tractors in the field is much greater than necessary as revealed by censuses of agricultural machinery, but these are in the hands of few people than in relation to the land owned by each of these producers, this is much too small for them to exploit the capacity of the machinery they possess (Guerrero, 2011).

In not very few cases there is the situation that the agricultural exploitation even among those who have machinery, the sowings are carried out with inputs that are not the most productive and modern due to lack of capital to invest in the amounts necessary to increase the productivity of the land resource and obtain better benefits from the financial point of view (Vilca and González, 2011). A third group of potential investors are those who live in rural areas, have financial resources to invest in high-performance, high-tech agriculture but do not own land or machinery. In this last situation, people with financial capacity and interest to invest in the countryside also remain in the urban environment.

The statement that there are producers who have land, but do not have machinery or financial resources to rent it, are totally true, there are others who have machinery, but do not have enough land or capital, and a third case of possessors of financial resources but who have little or no land and no machinery. That they have neither land nor machinery.

It can be affirmed with very good support that the integration of the three productive resources would lead to an agricultural exploitation with better results for each of the participants because it would be an agricultural activity with the use of greater and better productive inputs on the land resource (Portillo *et al*., 2020).

Each of the three sectors can be at the same time a group of participants as would be the case of the landowners, since that of one would only be very small, at the same time the capital section can be divided into capital and labor if this is found, as is frequently the case, abundant among the landowners (González *et al*., 2014).

Faced with this situation, it is proposed to form temporary associations of participating investors of their resources in the same agricultural exploitation that would benefit the holders of these resources. This is an alternative to forming agricultural cooperatives of producers in which the experiences in Mexico are of no good results, among others, a current resistance of producers to participate in cooperatives.

Research such as those of Guerrero (1989, 1998) refers to the fact that the proposal to form investor associations entails additional benefits such as improving the conditions of sale of the products if the capital partners participate directly in this part of the business, who surely have better conditions

to negotiate the sale price, transport the product to the closest places to the consumer market and even incorporate additionally and as part of the business, the addition of agricultural insurance or value added to the merchandise by processing the product in agro-industrial facilities in the periphery of the productive lands.

In this way, the large price margin that currently exists between the price paid to the producer and the price paid to the final consumer would be avoided, a price of which only a small proportion reaches the producer and the rest remains in the hands of those who carry out field purchases, storage, transport and industrialization of the product and in much less time than what it takes to the producer from sowing to harvest (Guerrero, 1993a). The participation of capital partners surely provides better negotiating conditions to avoid the historical abuses that are carried out against small producers.

These and other advantages would be improving the situation of all the participants in the agricultural pool association or whatever you want to call this type of association, as it refers (Beneke, 1991). Experiences in other countries such as Argentina where these eventual groups and of times of duration of a single agricultural cycle and with repetitions with changes in the following sowing seasons. In this country it is known as agricultural pool (Súper Campo, 2012).

**Problem to solve**

The main purpose of this document is to provide an acceptable procedure on how to distribute the benefit of the product that is generated in an agricultural holding in which more than one source of investment in the process participate as partners, but it is an issue closely linked to the solution of the problem of low profitability production of small agricultural producers producing with their scarce resources. The main objective is how to solve the profit sharing problem in a satisfactory way to solve the following problems.

In a production in society, which already represents a significant advance and improvement for production in the field, a situation may arise in which each participant argues that the resource that he contributes is the most important and therefore should receive the best remuneration, the owners of the land resource can affirm that without land there is no business, on the other hand the owner of machinery will affirm that without the use of machinery and with only traditional inputs, a harvest with sufficient value is not obtained to pay the costs and provide a profit, while the owner of capital will say that without capital to invest in improved inputs, production cannot report the necessary gains to justify the investment, as observes Cañas (1991).

This document presents a way to distribute the value of production among the different participants fairly and based on a solution obtained by technical administration procedures, it is calculated what quantity or part of the value of production corresponds to each of the participants Romero (1998). The procedure consists of identifying what contribution each of the resources used makes to the physical and monetary production of the crops. For which it is used specifically, linear programming.

In the same area sown with the participation of partners who have the resources to produce with better investment efficiency, better results are obtained than working as it is currently being done. This way of practicing agriculture favors not only greater amounts of benefits for producers but

also greater amounts of food products that will be available in the market. With linear programming methodology, it is possible to identify precisely what proportion of the production and its commercial value corresponds to each of the participants in the production of an agricultural pool (Buongiernos and Gilless, 2003).

The objectives were to elaborate a profit-sharing procedure in which information and data processing, to avoid prejudices and personal influence of the participants; through discussion interventions to distribute the product that is generated in the association.

Explain in an easy and operative way, how to obtain the data of the quantity of product that corresponds to each of the participating groups or persons by means of an applied linear programming procedure. Procedure of this discipline to which an adjustment has been added that means contribution to the management of linear programming, to achieve the mentioned purpose. Combine crop selection procedures and their respective areas to be sown to obtain the maximum possible benefits, using the amounts of resources provided by the participating investor groups and the identification of product quantities or production value corresponding to each of these partners (Bishop and Toussaint, 1996).

## Background

Noting other forms that are currently used and comparing procedures. In the absence of knowledge of procedures supported by econometric theory and procedures applicable to the income distribution problem in a collective enterprise, the income of each of the participants is often decided by imposing each of them on how much they want to obtain as return on your investment.

In this way, for example, the owners of the land can claim a fixed income from this resource, to be paid in advance and are not interested in what is obtained from the income. In these cases, they eliminate risks, but renounce additional benefits of profit in the distribution of profits and the rest of the participants cancel the security of continuing to have the land at a reasonable cost in future years (Clop and Juárez, 2003).

The same can happen with holders of monetary resources without having enough land to invest their financial potential who are only willing to invest as a loan with interest and ensure their expected profit amount at the level they decide through the interest rate. Owners of machinery with sufficient capacity to exploit their own land, may have the position that they provide their mechanization services and that they are paying them a payment as soon as each of the agricultural activities in which they are required is carried out (Romero, 1989; 1998).

For the three cases mentioned, it may be attractive that by working in partnership the three productive resources increase the production potential that means converting, by this means, towards a technified production of greater product results to be distributed, the owners of machinery will have the effective possibility to recover in less time and with better remuneration the cost of their machinery and additionally the advantage that they would have when facing the sale price conditions of the product that the producers who own the land do not have by themselves.

This model presented with only three sectors of participants can be modified in such a way that a labor factor is considered separately if it so agrees and the labor provided by landowners is counted separately (Romero, 1993a).

It is also possible that in an irrigation unit, the agent that controls the use of water can participate as a member of society and agree that their remuneration will be given to them at the end of the activities when the product is sold. It is also possible that one of the members mentioned as the owners of machinery, do not agree to wait until the end of the cycle to obtain their income, in this case this service would become part of the capital and it would be the capital factor that contributes these payments thus increasing their participation and their income at the end of the production process (Cartier and Cartier, 2003).

All these variants and others can occur and it is important to mention them because it represents a flexibility of the model. In another way of mentioning it, this model presented in a simplified way for its better understanding can be modified in its number of participating groups as investors, which gives it greater possibilities of being applied, keeping as constant that the distribution of profits will be given according to the contribution that they do, to the product generation, each one of the resources used.

## Materials and methods

### The procedure to be used

A simplified example prepared with the purpose of easy understanding of the procedure to be followed is the model with the following characteristics: using hypothetical, small values and in round numbers to easily follow the exposition and not get lost in complex operations that affect understanding.

To keep the characteristic of the procedure simple for its easy understanding, one is developed where only three productive factors appear which can, in a real case, be divided into more factors, for example: if the owners of the land mention that they would contribute the labor, this would be treated as another factor to be paid, otherwise if it is agreed that those who contribute labor are paid directly with the salary in force in the place, the item will become part of the invested capital and its remuneration among the participants will be for the one that contributes the capital. It may be that the pool takes place in an area under the domain of an irrigation system and the one who owns the water rights contributes them to the pool and claims their corresponding remuneration. An alternative option would be for the one who provides the capital to be in charge of paying for this service and becomes part of the capital investment and therefore becomes a creditor of what results in the distribution of the value of production.

Explanatory model with three agricultural activities, three resources or inputs to be used and their available quantities. It has: 12 ha of arable land; 48 h machine; 24 monetary units of capital. Possible crops are corn, wheat and sorghum that generate 400, 300 and 200 monetary units per hectare, respectively. If it is planned how many hectares of each crop should be planted knowing the income generated by each hectare of each crop -net prices- using the available resources and

knowing how much of each of the resources is required for each of the hectares to be cultivated -technical coefficients- and pursuing that the value of the crops is the maximum possible, the procedure is used as indicated in Table 1.

**Table 1. Net prices, technical coefficients and available resources.**

| Culture (ha) | Net prices ($ ha$^{-1}$) | Technical coefficients | | |
|---|---|---|---|---|
| | | Land (ha) | Machinery (h) | Capital ($ ha$^{-1}$) |
| Corn (X1) | 400.00 | 1 | 6 | 36.00 |
| Wheat (X2) | 300.00 | 1 | 6 | 24.00 |
| Sorghum (X3) | 200.00 | 1 | 2 | 18.00 |
| Available resources | | 12 | 48 | 324.00 |

Beneke (1991) with modified data. Where: X1, X2 and X3 are hectares to be sown of each crop 1, 2 and 3 respectively.

For processing, these data are entered into a linear programming computer program. Requesting the solution of how many hectares should be planted with each of the feasible crops to obtain the maximum benefit. In the LINDO program (1996) they are arranged and incorporated into the page that appears when this computational package is opened in this way.

MAX 400X1+300X2+200X3
SUBJEC TO
X1+X2+X3<=12
6X1+6X2+2X3<=48
36X1+24X2+18X3<=324

Where it is requested to maximize the value of production knowing that each hectare of X1, X2 and X3 generates 400, 300 and 200 units of money for each hectare planted respectively. Subject to the following restrictions.

That the programmed area is equal to or less than the available quantity of 12 ha; that the machine hours used are equal to or less than the 48 hours available; that the total capital to be applied is less than or equal to the amount available 324.

The coefficients that appear in this inequality are the amount of resource used by each hectare of each of the crops to be sown. The results are obtained in an information table as follows: where the most important generated results for the purpose pursued in this case are: the data that appears as OBJECTIVE FUNCTION VALUE 3600 corresponds to the total value of the production that is generated.

Then there are three columns of which the first two named VARIABLE and VALUE indicate that 6 hectares of corn, zero of wheat and 6 of sorghum should be cultivated to obtain the highest value of production. In the next block of data, the shadow price column that appears as DUAL PRICES. These last data indicate the value generated by each unit of resource used to obtain the total value of production. The shadow prices are: 25, 12.5 and 8.333333 for land, machinery and capital respectively.

If each of these shadow prices is multiplied by the number of units of its respective resource that entered the production process, the value generated by each resource is obtained. resource land= 25X12, machinery= 12.5X48 and capital= 8.333333X324. The result is the part of the total value of the production that corresponds to each participant for the use of their contributed resource. Adding the contributions of each resource, it can be verified that the total value of the production to be distributed = 3 600 is obtained. The results are presented in Table 2.

**Table 2. Contribution to the value of production by each resource used.**

| Resource | Amount used (a) | Shadow price (b) | Contribution to the value of production (axb) |
|---|---|---|---|
| Land | 12 ha | 25 | 300 |
| Machinery | 48 h | 12.5 | 600 |
| Capital | 324 units of $ | 8.333333 | 2 700 |
| Total value | | | 3 600 |

**Exit sheet of the computation process**

LP optimum found at step 3
Objective function value
1) 3600.000

VARIABLE, VALUE, REDUCED COST
X1 6.0 0.0
X2 0.0 0.0
X3 6.0 0.0

ROW SLACK OR SURPLUS DUAL PRICES
2) 0.0 25.00
3) 0.0 12.50
4) 0.0 8.33
No. Iterations = 3
Ranges in which the basis is unchanged:
Ranges in which the basic solution does not change
Coefficients of the Objective function
Variable, Current, Allowable, Allowable
Coef, Increase, Decrease
X1 400 20.00 99.99
X2 300 99.9 33.33
X3 200 50.00 16.66

Righthand Side Ranges
Row current allowable allowable
Rhs, Increase, Decrease
2 12.000000 4.800000 0.000000
3 48.000000 24.000000 0.000000
4 324.000000 0.000000 72.000000

# Results and discussion

## Warning of first importance

The previous results are obtained in two executions of the computer program, the first model that is tested is using the data of total amounts of resources that each participant is willing to contribute.

Obtaining the results of the program, it is highly probable that the combination of amounts of resources available to employ and obtain the maximum income, some of these resources are not fully consumed due to lack of other resources that complement them (Beneke, 1992). In these cases, in the surplus prices of the resources that do not fully enter the solution, the program assigns them a surplus price of zero.

The theoretical principle that is manifested is that a resource that is surplus is not scarce and therefore the program assigns a value of zero to the shadow price. The process to fix this detail is to rerun the program reducing the excess amount of each of the resources that have this excess and that appear in the results table. In such a way, the program is run again with the amounts that entered the solution as if they were the totality of the resource available and in this way all resources are converted into scarce resources and the program assigns them the corresponding value of shadow price to be used in the distribution of the value of the production that is generated (Arzeno and Ponce, 2014; Romero, 1993a).

The explanation for this detail is that the shadow price is also used for other purposes, among which the shadow price is identified as the value that would be willing to acquire and add one more unit of resource to be incorporated into production. If the shadow price is zero, it is because that resource is not limiting in the program, therefore, if it is a single company that invests all the resources, it would not be willing to pay to add one more unit of resource to incorporate it into its production if that resource turns out to be abundant with respect to the rest of the production factors included in the model (Maiztegui, 2009).

If one of your resources enters in its entirety in the cultivation program and therefore a shadow price of a higher value appears than you would pay to incorporate one more unit of that resource that you can acquire, you can choose to take that unit of resources to incorporate them to exploitation with the assurance that the value of production would increase by the magnitude indicated by the shadow price.

The shadow price in the basic model possessed by the LINDO computer program (1996) indicates how much the value of production would increase if one more unit of the resource in question is incorporated. It is obvious that if the shadow price is zero it is because that resource is surplus in the amount available and it would not be willing to acquire it outside the company in additional units to incorporate it into the production plan (Manzanal, 2014).

What is mentioned in the previous paragraph can be verified, running the designed model substituting the value of available capital of 234 for that of 360, as shown (Tourer, 1986; Romero, 1993b). The solution of how many hectares of each crop should be planted will be the same as in

the current model tested, but of the capital of 360 the results table will indicate that this resource has a shadow price of zero that indicates that there is a certain amount of capital left over and it would not be wise to pay for an additional resource unit.

It is important to mention, what in the case of different owners of the participatory resources, what if in the first run of the program some resources 'leave excess' and therefore their shadow prices are zero, whoever invests them would not agree to invest them if they did not no value corresponds to the distribution of profits. Hence the importance of running the model for a second time, programming with amounts of available resources in the amounts that enter the first solution and not in the available amounts (Davis and Johnson, 1987). In other words, the program is run for the first time with all the amounts of each resource made available to the business and in a second run they are applied as maximum resource amounts, in the amount in which they entered the optimization process to generate the maximum value of production.

The second computer program is executed by reducing the available amounts of resources by subtracting the surplus obtained in the first solution. The results output from the first trial also contains data on how much is left of each of the resources available for each of the resources. In the column of SLACK OR SURPLUS.

This mechanism is the contribution of this document, which until now is not found in any linear programming document, without ignoring that the package provides many more indicators that allow decisions to be made about modifications in the investment plan, as can be seen in the sheet output of the computer presented in previous pages (Manzanal, 2014; Ballesteros, 1992). The treatment of the program is therefore exclusive for a management problem in which several investors participate and that it is required to know how much of the income generated corresponds to it without resorting to discussions where each investor considers that their contributed resource is the most important and that therefore it corresponds to a greater amount of resource (Castillo, 2013).

See the following computer output sheet for the results of 'shadow prices' (DUAL PRICES) and amounts of surface to be planted from the model in the VARIABLE and VALUE columns that indicate X1= 6 hectares of the first crop, zero of the second (X2= 0) and the third (X3= 6) the same results and for the shadow price of the capital resource considering 360 units available, its shadow price is zero.

Lp optimum found at step 2
Objective function value
Production value to be generated
1) 3600.000

Variable, Value, Reduced cost
X1 6.000000 0.000000
X2 0.000000 100.000000
X3 6.000000 0.000000

Surplus resources Shadow prices
Row slack or surplus dual prices

2) 0.000000 100.000000
3) 0.000000 50.000000
4) 36.000000 0.000000

Ranges in which the basis is unchanged:
Ranges in net prices (income per hectare) where the basic solution does not change.
OBJ Coefficient ranges
Variab current, Allowable, Allowable
Coef, Increase, Decrease
X1 400 200 100
X2 300 100 Infinity
X3 200 200 66.6

Righthand side ranges
ROW Current Allowable Allowable
RHS, Increase, Decrease
2 12 4 4
3 48 8 24
4 360 INFINITY 36

## Conclusions

Linear programming applied to groups of investors in agricultural production, applying this procedure, avoids discussions in making agreements on how to distribute the value of the production generated in the investment that is made. The distribution of profits following this procedure is defined by the contribution made by each resource in generating the value of the product. This model constitutes a good way out to activate in the best conditions the programs of the Federal Government for the mechanization of rural fields that have not yielded the expected results because the machinery belongs to a small group of producers and they have serious difficulties to use all their capacity because they have little land and the rest of the producers do not have the resources to rent them.

The procedure applied in practice is adequate to avoid the violation of agrarian laws such as the rent of common land for a long time, which can remain in the hands of its owners and exploit it in better conditions than in its usual way. The mechanism of production in groups of investors in shares agreed for a single harvest separately, gives the opportunity to the owners of machinery to recover the amortization of their investment in this area, which they cannot obtain by sowing the small area of their property or by rent of the machinery before land holders who do not have the resources to rent it. This type of organization for production considerably reduces the fear and mistrust that small producers have emanating from other types of organizations such as agricultural cooperatives.

The present suggestion of formation of associations for production is applicable to a large number of geographic areas of the country where the situations described exist between producers and holders of other productive resources for agriculture. The intervention of the Federal or State Government is not claimed since normally in each situation of traditional agriculture or of very

limited technology there are in that same area or in nearby places, technological resources, capital and administrative capacity that only have to be integrated to generate with better technology, greater and better quantities of products from the field. Therefore, government participation would be marginal. In the exposition of this proposal, the participation of the government is not mentioned, at least not of direct participation, but only of promoter and diffuser through its representative instances in the agricultural producing areas.

## Recommendations

Disseminate this procedure in the rural sector to adopt the procedure of distribution of the product that is generated through associations of investors in the rural sector of the country.

Promote these associations as a measure to complement the agricultural mechanization programs that have not had a very positive effect so far, but can be reactivated with better prospects of success if the participation of machinery owners in these groups of investors is considered. Assign the name of the planting pool, so that those interested in reviewing the background can find bibliographic references on these partner groups. Of which they can take advantage of experiences and details that can be adapted and added to the groups proposed in this writing. Each agricultural pool that is formed will surely be interested in knowing the operating mechanisms of the groups that already act in other areas of production and in other countries.

It is suggested that government entities promote this type of association in the field, mainly in areas with large numbers of producers, each with small areas of land. As an element of conviction, affirm and ensure that the distribution of profits between participants is the fairest and recommendable thing to do to solve the problem of distribution of income generated in production. Promote these associations by echoing that they differ significantly from those that preceded such as agricultural cooperatives that are remembered with not pleasant results. That it be the investor participants who decide the management activities and preferably the investor members of the group.

## Cited literature

Arzeno, M. y Ponce, M. 2014. Las contradicciones de las políticas públicas: desarrollo territorial rural en la provincia de Misiones, Argentina. Cuadernos del Cendes. 31(85):69-93.

Ballestero, E. 1992. Principios de economía de la empresa. Alianza Universidad Textos, Madrid, España. 644-651 pp.

Beneke, R. R. 1991. Programación lineal aplicada a la agricultura. Iowa State University. ISBN: 9788470032646. (Ed.) Aedo. USA. 222 p.

Bishop, C. y Toussaint, W. 1966. Introducción al análisis de economía agraria. Limusawiley. (Ed.). México, DF. 262 p.

Buongiorno, J. and Gilless, J. K. 2003. Decision methods for forest resource management. Academic Press, San Diego. 439 p.

Cañas, J. A. 1991. Programación líneal: determinación de coeficientes de la submatriz de sucesión, cuando intervienen cultivos plurianuales. Investigación Agraria. 6(1):5-17.

Cartier, E y Cartier, J. 2003. Tambos-análisis de sus procesos de producción con fines de costeo. *In*: XXVII Congreso Argentino de Profesores Universitarios de Costos. Tandil, Argentina. 27 p.

Castillo, Y. 2013. Adaptación de un modelo para caracterizar los procesos de gestión de la innovación en las empresas del sector de las TIC de la ciudad de Popayán. Rev. Electrónica Gestión de las Personas y Tecnología. Universidad de Santiago de Chile. Santiago de Chile.

Clop, M. M. and Juárez, F. 2003. Programació lineal per a l'enginyeria agrària. Casos pràctics. Edicions de la Universitat de Lleida. 220 p.

Davies, L. and Johnson, K. N. 1987. Forest management. (Ed.). McGraw Hill, New York. 790 p.

González, C. J.; Coliñanco, G. L.; Caro, C. L. y Romero, H. N. 2014. Estrategia y cultura de innovación, gestión de los recursos y generación de ideas: prácticas para gestionar la innovación en empresas. Universidad del Norte. Rev. Pensamiento y Gestión. 36:109-135.

Guerrero, A. 2011. Innovación: clave para el éxito de la gestión empresarial, en la micro, pequeña y mediana empresa. Rev. Nacional de Administración. 74 edición julio-diciembre. Costa Rica. Universidad Estatal a Distancia. 2(2):61-80.

Portillo, V. M.; Sangerman-Jarquín, D. Ma.; Ayvar, V. Ma. del R. y Ramírez, J. R. 2020. Modelo de aseguramiento agrícola privado para pequeños productores agrícolas en México. Rev. Mex. Cienc. Agric. 11(6):13889-1402.

LINDO. 1996. Paquete computacional Linear, Integer, Nolineasr and O. USA.

Maiztegui, M. H. 2009. Una nueva modalidad asociativa en Argentina: el pool de siembra, Argentina. Revista Estudios Agrarios. 15(41):149-172.

Manzanal, M. 2014. Crisis, especulacion y desigualdad en América Latina. Las nuevas formas de valoración del capital y de producción del territorio frente a la problemática del hambre y la desnutrición. Revista de Ciencias Sociales. Segunda época. Primer semestre núm. 25.

Romero, C. 1982. Modelos económicos en la empresa. (Ed.). Mundi-Prensa. 25(2):157-315.

Romero, C. 1989. Modelos de planificación forestal: una aproximación al análisis multicriterio. Revista de Estudios Agrosociales. 147:71-92.

Romero, C. 1993a. Técnicas de gestión de empresas. Ed. Mundi Prensa, Madrid. España. 306 p.

Romero, C. 1993b. Teoría de la decisión multicriterio: conceptos, técnicas y aplicaciones. Ed. Alianza Universidad Textos, Madrid. 341 p.

Romero. C. 1998. Evaluación financiera de inversiones agrarias. Ediciones Mundi Prensa. 78 p.

Súper Campo. 2012. Cómo elegir un fideicomiso agropecuario. Debido a la rentabilidad del negocio agropecuario ha crecido la oferta de pools de siembra. Economía y Mercados. 2 p.

Tourer, L. 1986. Risk preferences of dairy farmers. North Central. J. Agric. Econ. 8(1):7-15.

Vilca, G. y González, J. 2011. Centro de política y gestión de la innovación y el emprendimiento tecnológico, un espacio de desarrollo transversal en la Facultad Tecnológica de la USACH. Rev. Electrónica Gestión de las Personas y Tecnología, 12. Universidad de Santiago de Chile.