

# Determining factors in rural property appraisal processes in Santander –Colombia-

## Factores Incidentes en Procesos de Avalúos de Predios Rurales en Santander-Colombia-

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**Abstract**— Research developments are presented in this paper with respect to a study of determining factors in rural property appraisal, and things to take into account when deciding to invest in this kind of asset. The main thrust of the research upon which this article is based is ascertaining the degree of importance of the factors laid out in the Land-use Plan (POT for the acronym in Colombia) for rural property appraisal: soil, buildings, crops, machinery and equipment, intangibles, and the socio-political environment of the business. Important findings include identifying variables for each factor (soil type, building materials, type of crop, efficiency of machinery and equipment, the value assigned to intangibles, and the socio-political stability of the zone where the land is located), the use of mathematical calculations of levels of importance, and exemplifying the levels of importance in rural property appraisal in the department of Santander-Colombia. Lastly, the corresponding conclusions are presented thus furthering the research work on this topic.

**Key Words**— appraisal, rural property, calculations, financial estimation, estimation factors.

**Resumen**—Este artículo presenta avances de una investigación que viene realizando el autor, sobre factores que inciden de forma determinante durante el proceso de avalúo de un predio rural y que se deben tener en cuenta en la toma de decisiones de inversión de capital en este tipo de bienes. El objetivo principal de la investigación que fundamenta el artículo es determinar la incidencia de los factores suelo, construcciones, cultivos, maquinaria y equipo, intangibles y ambiente sociopolítico del negocio, en la estimación del valor comercial que según el POT se trate

de un predio rural. Entre los hallazgos sobresale la identificación de variables en cada factor- tipo de suelo, materiales de construcción, clase de cultivo, eficiencia de maquinaria y equipos, valor de intangibles y estabilidad sociopolítica de la zona donde se ubica el terreno -, el uso de cálculos matemáticos de niveles de incidencia y la ejemplificación de tales grados incidentales en casos de avalúo en predios rurales en el departamento de Santander-Colombia-. Finalmente se exponen las conclusiones correspondientes al avance aquí divulgado y que permitirán continuar con mayor certeza el trabajo investigativo en torno al tema.

**Palabras Clave**— avalúo, predio rural, cálculos, estimación financiera y factores de estimación

### I. INTRODUCTION

History shows that humans, and especially contemporary man, have based their existence on the accumulation of capital; primarily via land valuation as the main axis of the economic cycle, beginning with exploitation and finally resulting in financial capital which is then reinvested [1].

In addition, within the capitalist society in which we now live, priority is given to land valuation as a tool of trade to be bought and sold. Bearing this in mind, then, the capital investment goals and targets over the short- and medium-term need to be clear, based on whether one is making a conservative or high-return investment [1].

Specifically, with respect to rural property appraisal, it is important first to be clear that the basic concept behind this is estimating the commercial value of a fixed or tangible asset at

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any given moment in time [2]. Secondly, by rural property is meant any fixed asset outside of the urban perimeter as defined by the Land Use Plan (POT for the acronym in Spanish) of the relevant municipality in accordance with the law 330 of 1997 [3] and the national Decree 3600 of 2010 [4].

Given the above, the initial results of ongoing research are presented taking into account the most significant factors that lead to changes in the valuation of a rural property. So far these factors have been found to be the following:

- Soil type
- Buildings
- Crops
- Machinery and Equipment
- Intangibles
- The marketing factor

## II. SOIL TYPE

### A. Variables Related to Soil Type

Soil is the top layer of the earth's crust and should be analyzed according to color, particle distribution, consistency, texture, density, pH, organic matter, and soluble salts and oxides, since these characteristics define how viable good soil is for planting crops [2].

### B. Calculating the soil factor value

#### Soil Color

Dark= high fertility index

Red soils= high iron oxide index. Moisture content= low fertility.

Yellow soils= low fertility, poor drainage

Gray soils= high in salts, not fit for raising crops.

Black soils= excessive moisture.

**Texture and density:** using physics calculations such as Stokes' Law [5]:

$$Fr = 6\tau\eta r \quad (1)$$

Where  $r$  is the spherical radius

This law defines the frictional force acting on the interface between particles and a viscous liquid; and allows for calculating which particles are less dense and take longer to compact as compared to a fertile field where the most fertile particles compact the slowest. In this way soil can be classified as clayey, sandy, loamy or whether a balance exists, meaning that it has the most potential for being categorized as good soil. The physics formula is specified as follows [5]:

$$V_s = \frac{2r^2g(\rho_p - \rho_f)}{9\eta} \quad (2)$$

Where:

$V_s$  is settling velocity (terminal velocity)

$g$  is gravitational acceleration,

$\rho_p$  is the mass density of the particles and

$\rho_f$  is the mass density of the fluid.

$\eta$  is dynamic viscosity.

$r$  is the radius of the spherical object.

### C. A Soil Valuation Case

An example of a soil valuation carried out on March 11, 2011 in the Rionegro municipality located in the Department of Santander-Colombia is discussed below. The soil was drastically affected by a river changing its course, becoming muddy and wet thus altering the homogeneity criteria of the soil. (See Figure 1).



Fig. 1 Photo of muddy and wet soil appraised in the Rionegro Municipality(Santander-Colombia-).

Source: photographer Jhon Moreno.

As can be observed in Figure 1, soil, which had once been fit for agricultural production, became wet with next to no chance of continuing to cultivate it, leading to a reduction in the commercial value of the land.

In addition to the soil problem shown in this example, eight hectares of crops were lost (sapota, orange, mandarin, passion fruit, avocado, among others) due to a tributary of the Rionegro river changing course. The loss of these preexisting crops also negatively affected the appraisal of the property in question. (See Figure 2).



Fig. 2. Photograph of affected crops on the farm under appraisal in the Rionegro municipality (Santander-Colombia-).

Source: Photographer Jhon Moreno.

### III. BUILDINGS

#### A. Variables related to the Buildings factor

Buildings are understood to mean any man-made construction put there for the purpose of improving survival and the habitat. The type of building materials, their state, and their aesthetics should be taken into account for this factor. [5]. (See Figure 6.).



Fig. 6. Construction features of a rural home

Source:

<http://agenciadenoticias.unal.edu.co/detalle/articulo/sistema-estructural-de-vivienda-rural-para-cualquier-territorio.html>

#### B. Calculating the building valuation factor

A very effective method for finding the value of buildings and their commercial value is described in Resolution 762 of 1998 Article 3, called: The Replacement Cost Method. With this method, the commercial value of the asset being appraised is established by estimating the total cost, at today's prices, of

building a similar building to the one being appraised, and then subtracting accumulated depreciation. Lastly, operational utility is added to the above value.

$$V_c = \{(C_t - D) + U\} + V_t$$

Where:

$V_c$  = Commercial value

$C_t$  = Total cost

$D$  = Depreciation

$U$  = Utility

$V_t$  = Land value

(3)

#### C. A Building valuation case study

The applicability of this factor was analyzed using an appraisal report for a farm located along the road to Matanza (Santander-Colombia), where the replacement cost method was used to determine the value of the house. The degree of decay, building materials and the state of repair were all taken into account [6]. (See Figure 7).



Fig. 7. Photograph of the rural building appraised.

Source: Photographer Jhon Moreno.

### IV. CROP FACTOR

#### A. Variables Related to the Crop Factor

Crops can be temporary, permanent or semi-permanent in nature. When appraising a rural property, crops are appraised proportionately according to their age, yield and total production costs [2].



Fig. 8. Colombian crops.

Source: [http://www.cafedecolombia.com/bb-fnc-es/index.php/comments/colombia\\_mejor\\_preparada\\_contra\\_la\\_roya\\_que\\_sus\\_vecinos\\_de\\_centroamerica](http://www.cafedecolombia.com/bb-fnc-es/index.php/comments/colombia_mejor_preparada_contra_la_roya_que_sus_vecinos_de_centroamerica)

**B. Calculating the Crop Valuation Factor**

In order to find the return on investment for crops, the expected future revenue from them can be defined as follows [7]:

$$VF = VP(1+tc)^n$$

Vf= Value of future revenue from crops.

Vp= Today's purchase price for the fruit of the crops.

TC= market inflation

N= Time until crop maturity in the future.

(4)

**C. A Crop Valuation Case Study**

Losses for each crop were calculated in accordance with "Expected Production" [8] shown in Table 1 (below) found in the appraisal report:

TABLE 1  
CROP LOSS DATA FOR FINCA SANTANDEREA

DATOS BANCO AGRARIO VS FINCA VILLA MONICA									
tipo de cultivo		semipermanente							
PRODUCCION POR ARBOL: 125KG									
		COPONCA	VILLA MONICA	ECTAREAS REALES DE SIEM					
		PROMEDIADO/ARBOL		VILLA MONICA					
ZAPOTE		80	500	6,3					
TOTAL				8					
NIVEL DE PRODUCCION		ZAPOTE		PRODUCCION N POR KILOS		PRECIO/ARBOLO POR AÑO/FINCA VILLA MONICA			
		TONELADAS PRODUCIDAS		N POR KILOS		N POR AÑO FINCA VILLA MONICA			
		DATOS BANCO AGRARIO		FINCA VILLA MONICA					
0	0	0	0	0	0	\$ 800	\$ 0		
1	0	0	0	0	0	\$ 800	\$ 0		
2	0	0	0	0	0	\$ 800	\$ 0		
3	0	0	0,00000	0	0	\$ 800	\$ 0		
4	0	0	0,00000	0	0	\$ 800	\$ 0		
5	0	0	0,00000	0	0	\$ 800	\$ 0		
6	0	0	0,00000	0	0	\$ 800	\$ 0		
7	0	0	0,00000	0	0	\$ 800	\$ 0		
8	75	191,32653	191327	191327	\$ 800	\$ 150,00	\$ 0		
9	75	191,32653	191327	191327	\$ 800	\$ 150,00	\$ 0		
10	75	191,32653	191327	191327	\$ 800	\$ 150,00	\$ 0		
FLUJO DE CAJA									
	1	2	3	4	5	6	7	8	9
INGRESOS	0	0	0	0	0	0	0	0	0
EGRESOS	13.632.500	7.505.000	7.676.000	8.075.000	9.196.000	7.847.000	9.433.500	9.728.000	10.197.500
UTILIDAD	-13.632.500	-7.505.000	-7.676.000	-8.075.000	-9.196.000	-7.847.000	-9.433.500	-9.728.000	-10.197.500
IPC	7,942554745								
ITO	6,36								
VPN	\$ 1.297.399,520								
VALOR DE INCERTIDUMBRA	90%								
VALOR FINAL DEL CULTIVO	\$ 129.739,952								

Source: Banco Agrario (Land Bank), 2011.

**V. THE MACHINERY AND EQUIPMENT**

**A. Variables related to the Machinery and Equipment Factor**

These are the basic tools needed to be able to satisfactorily distribute working capital in the service of property improvement. Here, number of hours worked and the mechanical efficiency of each asset play a role [9] [2].

**B. Calculating the Machinery and Equipment Factor**

A suitable way of appraising machinery and equipment is to calculate mechanical efficiency, where input and output force (both measured in Jules) are compared thus:

$$Efficiency = Input Force Jules / Output Force Jules$$

(5)

**C. A Machinery and Equipment Valuation Case Study**

Even though this example does not occur on a rural property, it does allow the appraisal of this asset to be observed. In this case the appraisal was on behalf of the Industry and Commerce Superintendency for the liquidation of a steel workshop. The efficiency of a sheet-iron cutting machine was compared to that of a new machine with an efficiency of 100%. The appraised machine was found to have an efficiency of 70%.



Fig. 9. Machine that was appraised  
Source: photographer John Moreno, 2011

**VI. INTANGIBLES FACTOR**

**A. Variables Related to the Intangibles Factor**

Intangibles are understood to be assets that lack physical substance but have a tacit economic value due to recognition or "know-how". The most relevant elements found among the intangibles for the appraisal of a farm were *good will* and *know how* [8].

**B. Calculating the Intangible Factor**

To find the value of Good Will, it is necessary to take the

present net worth from the budgeted income statements (expectation of future economic benefits) and express it in current value by applying a discount rate. This result is compared with the agricultural start-up costs and the difference is equal to Good Will [7].

The applied mathematical formula for this factor is:

$$VP = Vf / (1+i)^n$$

*VP = Present net worth*

*VF = Expected net worth*

*I = Discount rate.*

*N = Number of periods*

*VPN = Sum of all net worths adjusted to period zero. (5)*

### C. An Intangible Valuation Case

A clear example is a study carried out by the engineer Carlos Alberto Rincón Rojas in his rent appraisal report for a chain of stores in Bucaramanga [10]. In this case the appraiser looked at the rental amount charged by premises owners as a way to define the prestige and national positioning of the company being appraised.

## VII. THE SOCIO-POLITICAL ENVIRONMENT AS A FACTOR

### A. Variables Related to the Socio-political Factor

The investment potential of all Colombian rural properties is definitively affected by this factor. Stability and socio-political security, as well as the backing of the State, serve as guarantees for the investment and influence the variation in prices [2].

### B. Calculating the Socio-political Factor

Calculating the socio-political value can be done by looking at the risk index for a country. This is simply an index measuring the degree of foreign investment security in a country [11]. Moody's, Standard & Poor's, and J.P. Morgan are among the most relevant agencies that carry out these studies. When the weighting is negative, a negative investment environment characterizes rural and urban areas for said country [12].

Other determining factors for appraising the location of the property include proximity to roads, incline, and distance to collection and storage points. This last aspect has direct bearing on the calculation of total production costs for the product at the time of sale. In order to determine the viability of a rural property given its location, reference is made to Herweert's Table since it mathematically defines the nearest average value of the samples analyzed, as can be seen here [13]:

TABLE 2.  
HERWEET

Condición de Oferta	Coef. Oferta	Condición de Demanda	Coef. Demanda
Exigua	1.65832	Excesiva	1.65832
Escasa	1.44224	Considerable	1.44224
Baja	1.26493	Alta	1.26493
Moderada	1.11804	Regular	1.11804
Balanceada	1.00000	Balanceada	1.00000
Regular	0.8944	Moderada	0.8944
Alta	0.79056	Baja	0.79056
Considerable	0.69337	Escasa	0.69337
Excesiva	0.60302	Exigua	0.60302

Source: Blanco y Muñoz, 2004

### C. A Case Study of the Socio-Political Environment Factor:

LOCATION FACTORS

SUPPLY DEMAND

NORMAL 0.89443

MODERATE 0,89443

COMMERCIALIZATION FACTOR 0.80005025

The value per square meter is multiplied by this coefficient thus: assuming an average value per square meter of \$700,000 and multiplying it by the commercialization factor, gives the result of \$560,036. This is how the commercialization factor allows for adjusting the value of the rural property under appraisal.

## VIII. CONCLUSIONS

Soil type and texture can be defined through the use of mathematical and physics formulae, while always keeping in mind the homogeneity principle.

The replacement cost method lends itself to defining variables such as total costs, decay and state of repair, all of which help to arrive at an adequate value for the buildings on a rural property.

Financial mathematics and crop maturity provide the horizon for estimating the future economic benefits that can be accrued on the property being appraised.

Key tools for the valuation of a rural property have to do with calculating intangibles. These provide the foundation for analyzing profitability and liquidity.

The socio-political factor and its impact on the commercialization of a rural property contribute to adjusting the value of the site, leading to a more accurate value per square meter by so doing.

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