

Land Capability, Suitability and Vocation in Venezuela

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Abstract

In Venezuela, the terms Land Capability, Suitability and Vocation, have been used indistinctly to recommend the most appropriate land use for a given soil. Nevertheless, each term has and should play a clear role in land use planning. Land Capability shows the limitations and potentials for a general agricultural land use, going from a very ample to a limited number of uses, and may serve as a nationwide indicator of land quality. On the other hand, Suitability, especially with the scheme of Land Evaluation of FAO, has been used to ascertain the degree of agroecological and socioeconomic adequacy of a specific use, or land utilization type, for each land unit. Finally, Vocation is being defined as the selection of the most appropriate use, among the suitable ones, fitting the present conditions of development. For that, we combine the suitability with other political, social, economical and infrastructural variables. In this paper a proposal for its determination is presented.

Key Words

Soil interpretation, land evaluation, land use planning

Introduction: Concepts and Experiences on Capability and Suitability

The term Land Use Capability, introduced in 1960 by the Soil Conservation Service in USA, (Klingebiel and Montgomery 1961), has been widely used specially in the American Continent. In Venezuela, it was adapted to the national conditions (Comerma and Arias 1971), introducing among other things: a semi quantification of the parameters used for Topography (T), Erosion (E), Soil (S) and Drainage (D), within each Bioclimatic area of the country, as well as within certain levels of technology. The result was a system that can be used and correlated at national level. These improvements have been applied and adjusted, and offer an adequate comparison of the quality and limitations of our agricultural lands. Table 1, shows an example taken for the Tropical Dry Forest, one out of 22 bioclimates present in the country, and at a common technological level. In there, we can see the combination of parameters of T, E, S and D established for each Class (I to VIII). For a more detailed level, parameters like slope (p), micro relief (m), grain size distribution (g), rockiness (r), depth (h), salinity (s), fertility (f), hydraulic conductivity (c), internal drainage (n), external drainage or water logging (a) and flooding (i), are used. The values assigned or permitted in each class for each parameter and reflecting ranges of slope, erosion, texture, fertility, etc. can be consulted in the original paper (Comerma and Arias 1971).

Table 1. Example of Land Capability used in Venezuela for the Tropical Dry Forest.

Bioclimate	Rainfall (mm)	Temperature (°C)	ETP/P	Altitude m
Dry Tropical Forest	1.000 - 1.800	22 - 29	0,9 - 2,0	400 - 1.000

Class	T		E	S						D		
	p	m	e	g	r	h	s	f	c	n	a	i
I	1	1	1	2 - 4	1	1	1	1	3	3, 4	3 - 5	1
II	1	1	1	2 - 4	1	1	1	2	3	3, 4	3 - 5	1
III	2	2	2	1 - 4	1	2	2	3	2 - 4	2 - 4	3 - 5	1
IV	3	2	2	1 - 4	2	2	2	3	2 - 4	2 - 4	2 - 5	2
V	3	2	2	1 - 4	2	2	2	4	1 - 4	2 - 4	2 - 5	3
VI	4	3	3	1 - 4	3	3	3	4	1 - 4	1 - 4	1 - 5	4
VII	5	3	4	1 - 5	4	4	3	5	1 - 5	1 - 4	1 - 5	4
VIII	6	4	4	1 - 5	4	4	4	5	1 - 5	1 - 4	1 - 5	4

The idea being that each combination of parameters is done as a function of the specific climatic condition, with special consideration of its interactions with soil and topographical conditions. Like that Table, other

sixteen Tables were constructed, representing the main bioclimatic regions of the country. The Classes show the amplitude of crops, i.e. Class I can be used for many cash crops, pastures and forest plantations. Going to higher classes, the limitations increase, and consequently the number of options decreases. The Subclasses, whether general (T,E,S,D) or specific (p, m, e, g, f, etc) indicate the main limitations, serving in this way as an indicator of the quality of the land, and allowing a national comparison of agricultural lands in the Country. This system has been applied in Venezuela since 1971 covering over 90% of our territory.

Nevertheless, this type of interpretations does not offer the necessary specificity to know if a given area is adequate for Corn or Sugar Cane, or a given pasture or a forest plantation, and this is required to be known when a given agricultural development plan for a region or a farm is studied. For these last requirements, the FAO offered a Framework of Land Evaluation (FAO 1976) and later on more specific schemes for rainfed, irrigated forestry and pastures, to establish the degree of agroecological and socioeconomic suitability for each Land Utilization Type (LUT or a given crop with a certain technological combination) for each land unit. The result of this kind of land evaluation provides, for each land unit, a menu of options of different uses with its degree of suitability. The application of these procedures has been applied to over 60 million hectares in Venezuela, offering precise criteria to decide, on a quantitative basis, about which uses are more appropriate and which ones should be discarded.

But recently, in Venezuela with the new Law of Land and Agricultural Development (Venezuela 2001), the term Vocation was introduced, pretending to assign the best specific crop for each land class and consequently, to determine if the present land use is adequate or if the land could be taxed or even expropriated. But to establish the Land Vocation there does not exist a precise methodology, and for this purpose a proposal is presented here trying to use a scheme as close as possible to the new Law.

Proposal of land use Vocation.

After examining the last modifications of the Regulations of the Law (Venezuela 2005), a definition of Vocation is found, stating as follows: "Vocation results from the interaction of physical factors (soil, climate, topography and erosion), technological, socioeconomic, cultural, and the agroecological requirements of the crops, that determine the assignment of the agricultural uses (vegetables, fisheries, husbandry and forestry) under sustainable conditions for the production units " The assignment is done after presenting a Table in which for each Class of Land (I to VIII) correspond specific uses. For example, for Class I Vegetable crops and legumes are noted; additionally, for class II are mentioned cereals, bananas, roots and tubers and certain tropical plantations.

In article 4 of this Regulation, more details are given, pointing out that the classification of Vocation results from the combination of: "Land Capability of the land; Agroclimatic characteristics, Agroecological requirements of the crops; Availability of inputs (labor, mechanization, seeds and agrochemicals); Infrastructure and supporting services as roads, irrigation and drainage facilities, technical assistance and centers for storage and processing; availability of hidrological resources; importance of the crops in the National and Regional agricultural Plan."

This proposal can be improved in the following items: 1) when proposing to use VIII Classes confusion is created with the Land Capability Classification that also uses VIII classes, and as was explained was not designed to assign specific uses as is required in this Regulation. The recommendation is to use a different number of classes and not use roman numbers. 2) Land uses, only characterized as given crops, and not as land utilization types, do not have enough elements to establish the degree of suitability. For example, the requirements for corn, whether it is used with mechanization or not, will have very different requirements, and consequently suitabilities for a given soil; 3) The intention of the Regulations to assign more intensive uses as Horticultural crops in the best lands, and more extensive use in lower classes seems adequate. However, the pertinence of land use is not only a matter of agroecological suitability, but also of socioeconomic aspect as well as the context of agricultural development of each area; therefore each zone will have pertinent land uses that have to be identified previously. The concept of land utilization types seems adequate for this end. 4) The factors mentioned in the Regulations for the Classification of Vocation, must be integrated, weighed and valued in order to assure a more objective and consistant classification.; 5) Consequently, in this proposal for the use of Vocation, there has to be a selection of the most suitable uses, that in a short term, can be best harmonized in the region under study, with the other socioeconomic, and infrastructural conditions presently available.

In order to operationalize the proposed concept, Table 2 shows an example of a Decision Table.

Table 2. Example of analysis of Vocation for a land unit with six Land Utilization Types (LUT).

LUT	Suitability	Plan	Infrastructure	Services	Markets	Inputs	Results	Vocation
	25	25	25	10	10	5	100	
Htb	1	1	1	1	1	0,5	97,5	High
Ftb	1	0,5	1	1	1	0,5	85	High
Cme	0,5	0,5	1	1	1	1	75	Moderate
Pla	0,5	0	0,5	0,5	0,5	0,5	37,5	Low
Gsi	0	0	0	0,5	0,5	1	15	No Vocation
Tab	N						0	No Vocation

Table 2, taken from a previous proposal (Comerma *et al.* 2005), shows an example applied to a land unit, whose Land Capability Class, only as a reference, is Class II. On the other hand, according to present land uses and some others uses that the Government prioritizes, six types of LUT have been preselected: Low tropic vegetables under irrigation, –Htb- (tomatoes and peppers), Low tropic Fruits-Ftb- (guava, citrus); mechanized and fertilized cereals-Cme- (corn and sorghum), Forest Plantations for Wood –Pla-; semi-intensive livestock- Gsi- (double purpose), and Flue cured Tobacco-Tab-..

Table 2 shows the different variables used with different weights as: Suitability according to FAO 25%; Importance of the Government Plan in the region 25%; Existing infrastructures as roads and irrigation facilities, considering the difficulties for its establishment 25%; Services as centers of storage, processing, and technical assistance 10%; Markets or population with demands of fresh products, 10%, and inputs like fertilizers, seeds, mechanization and agrochemicals 10%. Each variable in that area and for each use is classified as high with a value of 1; moderate as 0.5 and low as 0. In the case of suitability if not suitable will classify as N. These variables can be complemented with others and the weight can also vary according to the region. The final result is on a 100% basis, and it can be classified as high Vocation if the final value is between 80 and 100%, moderate between 40 and 80%, low between 20 and 40% and without Vocation lower than 20%.

Conclusion

Land Capability plays an important role in the qualification of the limitations and establishing the quality of the agricultural lands of a region and/or a country, but does not have sufficient specificity to value which particular uses could be recommended for a given development Project. To fill that gap, the criteria used by the schemes of land evaluation of FAO, establishing the agroecological and socioeconomic suitability of given land utilization types, are considered very adequate as they furnish a menu of options for each land unit, with their different degrees of suitability. But, if there is a need to determine which of these uses is the most appropriate at a given moment in that region, like the one suggested by the Vocation proposed in the new Law in Venezuela, then other factors like the political priority, infrastructures, services, markets and the availability of inputs required for its productions among others should be considered. A simple methodology is proposed including these factors and weighing values to obtain more precise and consistent results.

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