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Evaluation of the Risk of Epidemiology against Leafspot in Some Farmers Traditional Systems on Groundnut (*Arachis hypogaea* L.) Conservation in Cameroon Using Cramer's Modified Test

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Abstract

Purpose: The main objective of this study is to evaluate the epidemiology risk of cercospora leaf spot in groundnut's protection into some farmers in Cameroon,

Methodology: The research adopted new approches like Cramer's modified test after the factorial analysis of components (fac). 224 farmers were investigated during this experimentation by answers to 8 questions about methods of protection against cercospora. Globally the test shows that the impact of this pathology is moderated and the value is 0.86, finding value after the use twice Cramer's modified test and a modified scale.

Findings: This result explain why farmers in Cameroon continue to produce in spite of the encrease of this pathology around the word. And we observe that the variables of production in zone 1 and zone 2 are very different.

Recommendations: The factorial analyses components of 224 groundnut's farmers show the presence of and the different models of in situ conservation in the north and south region in Cameroon. These two agro-ecological area are differed by variables which characterizes every location. The V' epidemiological risk test shows that leaf spot risk is moderated (0.86) because the Cramer's test who represents the intensity of knowledge about these diseases is weak (0.14). This reason explains why groundnut production is also sustainable in regard of the lost of yields by these pathologies around the world. Cameroon cannot use or import in high quantities chemical products to manage this disease, because his armful for the moment is very weak.

Keywords: *Groundnut, Leaf Spot, Cramer Modified Test, Protection.*

1.0 INTRODUCTION

Groundnut or peanuts (*Arachis hypogaea* L.) is one of the main production in Cameroon after maize and cocoyam (DSCE, 2009). Two big systems constitute the principal models of in situ conservation and production (Essomba and *al.*, 1990) for sustaining his biodiversity. Ranking 4th among world oilseed crops and 13th among food crops, groundnut is an important cash crop currently grown in over eighty countries/regions from 40°N to 40°S across tropical and warm temperate regions (McGill, 1973). Its seeds contain about 50% oil and 25% protein, and the crop is thus deemed as a rich source of edible oil and dietary protein. In developing countries, a large portion of peanuts are crushed for edible oil (Wang et *al.*, 2011) and the area where oil palm cannot grow (Iroume, 2004). Food uses of peanut are predominant in developed nations, where high oleate, high protein and reduced fat peanuts are most preferred, as high oleate not only means better keeping quality, but also brings about multiple health benefits, for example, reduced risk of cardiovascular disease, increased sensitivity to insulin, preventative effects on tumorigenesis, and amelioration of some inflammatory diseases (Wang et *al.*, 2011, Fang et *al.*, 2012). Any breeding program exist for this speculation in this country (Iroume, 2004), but since 1928 (Hamasselbe, 2006) new varieties of groundnut have been introduced and define a livelihoods (Yébi-Mandjek & Seignobos, 2010; Gerei et *al.*, 2013), and also alimentation and nutrition (Nwaga et *al.*, 2000; Briend and *al.*, 2001, Griel and *al.*, 2004), for the poor layer. During these periods of time, some traditional models of conservation rise in the five agro ecological area around this country (DSCE, 2009). The type of conservation depend mainly of geographical situation (NPCCA, 2015), and these differences could explain the small impact of leaf spot disaster (Ouedraogo et *al.*, 1994) in this country in comparison of his negative impact around the world (Sankara, 1997). The aims of this article is to know about the frame of conservation into villages and towns agriculture, and to explain the epidemiological risk into farmers groundnut protection using modified V test of Cramer (1946). The risk of epidemiology in plant, is not identify or calculate in spite of the Cramer's which show the intensity of relation between the variables and individuals, and the gap or difference between the value can explain the risk of event in a scale observations. The value of risk can explain logically why disease is present or absent and whether it is necessary to prevent or to manage it.

2.0 METHODOLOGY

Survey Sheet

Some 15 questions were related to peanuts production conservation's models: Question 1 (Q1) Do you market the peanuts that you produce? Question 2 (Q2). Besides groundnuts, do you grow anything else? Question 3 (Q3) Do you feed the animals the groundnuts tops? Question 4 (Q4) Are groundnuts grown twice a year in your home? Question 5 (Q5) Do you eat the peanuts you harvest? Question 6 (Q6) do you have two rain cycles? Question 7 (Q7) is your parcel ten years old? Question 8 (Q8) Does this parcel belong to you? Question 9 (Q9) Have you received training for this crop? Question 10 (Q10) Are the crops grown in the off-season? Question 11 (Q11) Do you use the same varieties? Question 12 (Q12) Are you satisfied with the returns? Question 13 (Q13) Do you use an herbicide? Question 14 (Q14) Do you enrich your parcels with NPK? Question 15 (Q15) Do you use sulphide as an input? (Essomba and *al.*, 1990; Hamasselbe, 2006; Ibrahim, 2010). 08 questions related to peanut's techniques of protection against their leafspot disease: Question 1 (Q1) Are your peanut crops still sick? Question 2 (Q2) Do you have training on peanut diseases? Question 3 (Q3) When your parcels are sick do you treat them? Question 4 (Q4) do you practice fallow? Question 5 (Q5) Do you make associations of cultures? Question 6 (Q6) Do you use (bio) pesticides? Question 7 (Q7) Do you use seeds

from elsewhere? Question 8 (Q8) Do the public authorities help you in the event of yield losses due to disease?

Choice of Individuals Towns and Villages

A sample of 224 peanut farmers in towns and villages, broken down as follows: Northern localities: 30 farmers' towns; 81 farmers' villages; Southern localities: 50 farmers' towns; 63 farmers' villages using the map of agro ecological area (figure 1). The first selection criterion concerned knowledge of groundnut cultivation and its major issues. The second criterion related to the possession of a parcel and / or its development for the last four years.

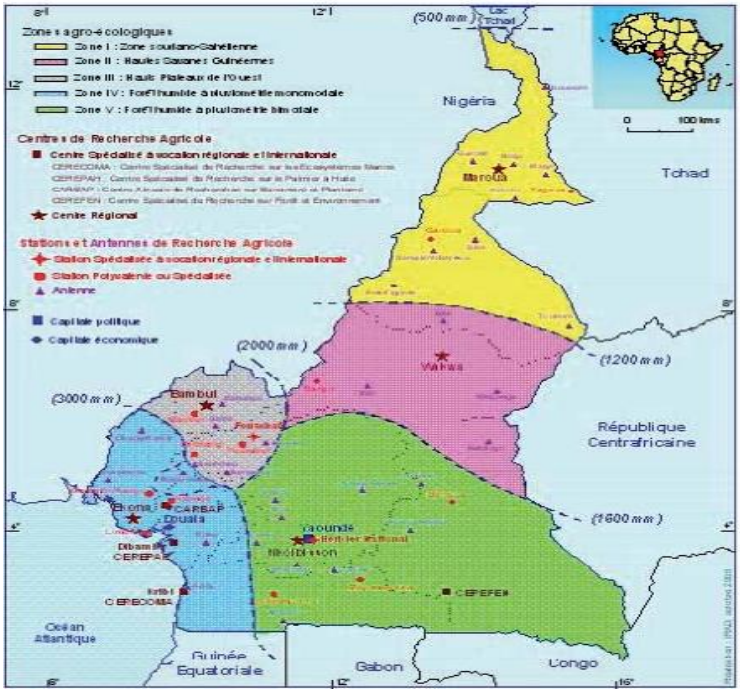

Figure 1: Agro Ecological Area of Cameroon (DSCE, 2009)

The period of 04 years being the minimum fallow time for two passages of peanut cultivation in the same parcel, according to the agricultural research institute for development (ARID) technical sheet (Hamasselbe and *al.*, 2003). The choice of the designation of a parcel as a town parcel was made on the basis of the evaluation of a cultivated area ranging from 10 m^2 to 500 m^2, and the choice of a village parcel being greater than 500 m^2 or located in remote or isolated areas, sparsely populated contrarily to methodology (Khalil and *al.*, 2017; Akhere & Ndzifon, 2020).

File Development

Zone 1 is north's zone of Cameroon constituted by three regions: Adamawa, north and far north. Zone 2 is south zone constituted by seven regions such as center, east, west, littoral, south, south west, north west (NPCCA, 2015).

Data Analyses

A factorial analyzes of components (fac) by (Pressac & Mell, 2017) is used for drawing the existence of farmer's *in situ* conservation with 15 questions. The epidemiology risk (V') is evaluated by modifying a Cramer (1946) test of factorial analyses of components for 8 questions in Software R is used for all analyses.

(i) $V = \sqrt{\Phi^2/\min(k-1, r-1)}$

Φ^2: coefficient phi; K: number of raw; r: number of lignes

(ii) V'= 1-V

3.0 FINDINGS

General Model of Groundnut Farmers' Conservation

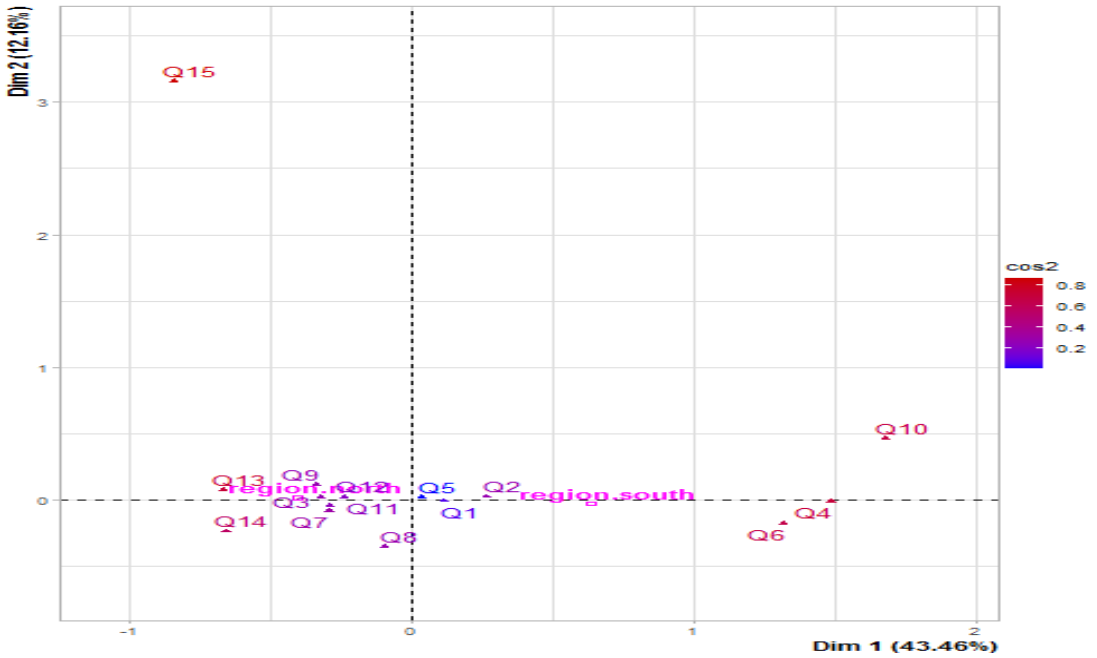

Figure 2: In Situ Conservation of the Inhabitants of Zone 1 And 2

The overall model of in situ conservation of peanuts from zones 1 and 2 is represented at 55.62% in the fac. The different colors represent the levels of representations with respect to the square cosine (cos2) of the variables (Figure 1).

Region North

The North region has nine variables (Q3, Q7, Q8, Q9, Q11, Q12, Q15, Q13, Q14) which defines particularly the agriculture in situ conservation. Variables Q13, Q14, are referred to groundnut treatments against soil poverty and insects attack. These variables mean that in the north's region intensity of agriculture has impoverished soil during the last century, because the lands are used continually without rest or culture rotation (Hamasselbe, 2006). This region is the main basin of groundnuts production in Cameroon, and all of poorest population is dependent of this culture and livestock in a dry season. All programs of legume production and research is concentrated in this agro-ecological area because of good climates conditions (Rao, 1988).

Region South

Region south has six variables (Q1, Q2, Q4, Q5, Q6, Q10). These variables refer to sell and consummation and production of groundnuts. Variable Q2 is highly correlated at this area and refers to cultural association. This region is characterized by two rain seasons and groundnut is not the main production, this result is confirmed by Iroume (2004) and DSCE (2009).

Variables

The fifteen variables (Figure 1) express differently groundnuts conservation in Cameroon the north has much that south because of the importance of problematic and the good conditions of

production, these representation is agreed with Yébi-Mandjek & Seignobos, (2010) for groundnut's production which covers all area of Cameroon with different needs. The north's variables refer many for the protection and soil nutrition and production, and the south refer to production and consumption the same results are exposed by Hamasselbe (2006).

Epidemiological Risk

Cramer's Modified Test (V')

The test of Cramer (V) shows the intensity of bondage or knwolegde between variables and individuals, and the absence of bondage or knowlegde is a risk (V') (table I). The Cramer test begins to zero and ends, and it varies between 0-1. Concrately his interpretation has six levels, and every level is the difference between two decimal numbers. The modified Cramer test V'= 1-V begins simply with difference between the top percentage result of Cramer's test (1 or 100) and the result of V test. When this difference is situated between 0.2 and 0 we have an absence of risk and in the scale of this indice is 0 (table I).

Table 1: Scale of Epidemiological Risk by Cramer Modified Test

Cramer's test (V)	Modified Cramer's test (V'=1-V)	Epidemiological risk	Scale of the risk
between 0 et 0,05	between 100-0,95	Very high	5
between 0,05 et 0,1	between 0,95-0,9	High	4
between 0,1 et 0,2	between 0,9-0,8	Moderate	3
between 0,2 et 0,4	between 0,8-0,6	Weak	2
between 0,4 et 0,8	between 0,6-0,2	Very weak	1
between 0,8 et 1	between 0,2-0	Absent	0

Epidemiology Risk Evaluation

The eigenvalue shows seven dimensions, and the representation for the first and second dimension are 60.74%. In regard of V Cramer test show the weak (0.14) bondage between groundnut's producer and knowlegde of protection's technique. V' is moderated (0.86) in a scale of epidemiology risk (table I), because the impact of leaf spot is very small (table II). This result explain why during 1928 poor population in this country continue to produce groundnut (Yébi-Mandjek & Seignobos, 2010; Nwaga et *al.*, 2000).

Table 2: Epidemiology Risk Evaluation

	Eigenvalue	% of Variance	Cumulative % of Variance
dim1	0.1	34.85	34.85
dim2	0.07	25.89	60.74
dim3	0.04	13.95	74.69
dim4	0.03	10.89	85.58
dim5	0.02	5.66	91.29
dim6	0.01	5.04	96.29
dim7	0.01	3.71	100
V	0.14 (Weak)		
V'	0.86 (Moderate)		

Dim= dimension

CONCLUSION AND RECOMMENDATIONS

The factorial analyses components of 224 groundnut's farmers show the presence of and the different models of in situ conservation in the north and south region in Cameroon. These two

agro-ecological area are differed by variables which characterizes every location. The V' epidemiological risk test shows that leaf spot risk is moderated (0.86) because the Cramer's test who represents the intensity of knowledge about these diseases is weak (0.14). This reason explains why groundnut production is also sustainable in regard of the lost of yields by these pathologies around the world. Cameroon cannot use or import in high quantities chemical products to manage this disease, because his armful for the moment is very weak.

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