

## **CATTLE FARMERS' DECISION-MAKING PROCESS REGARDING HERBICIDE FOR GRAZING IN BRAZIL**

### **O PROCESSO DECISÓRIO DO PECUARISTA QUANTO AO HERBICIDA PARA PASTAGEM NO BRASIL**

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#### **ABSTRACT**

This article aims to characterize cattle farmers' decision-making towards herbicide for grazing in Brazil. The study is based on three fundamentals: attributes through the utility function that have an economic approach with emphasis on the country-of-origin attribute; heuristics and biases that have a psychological approach; and values that are predominant in cattle farmers, also with a psychological approach (HOMER; KAHLE, 1988; GUTMAN, 1982). The research adopted a mixed method applying qualitative and quantitative approaches for collecting and analyzing data. In the qualitative phase, three data collection techniques were applied: Products Image Configuration (PICT), Laddering and Conjoint Analysis. The subsequent quantitative stage consisted on online survey with 75 cattle farmers. The results evidenced a cattle farmers' decision-making model regarding herbicide for grazing in Brazil including: values; heuristics and biases prevalent; attributes that make up the image of the herbicide; set of preferred attributes and their corresponding levels; resulting factors of decision-making; and segments of cattle farmers.

**Keywords:** Agribusiness. Famer's purchase behavior. International marketing. Heuristics.

#### **RESUMO**

Este artigo tem como objetivo caracterizar a tomada de decisão do pecuarista quanto ao herbicida para pastagem no Brasil. O estudo se baseia em três fundamentos: atributos por meio da função utilidade, que possui uma abordagem econômica com ênfase no atributo país de origem; as heurísticas e vieses, que possuem uma abordagem psicológica; e os valores predominantes nos pecuaristas, também com uma abordagem psicológica (HOMER; KAHLE, 1988; GUTMAN, 1982). A pesquisa utilizou método misto aplicando abordagens tanto

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qualitativas quanto quantitativas para coleta e análise dos dados. Na etapa qualitativa, foram utilizadas três técnicas de coleta: TCIP, *Laddering* e Análise conjunta. A segunda etapa subsequente, quantitativa, foi realizada por meio de uma *survey online*, com 75 pecuaristas. Os resultados permitiram evidenciar um modelo de tomada de decisão do pecuarista quanto ao herbicida para pastagem no Brasil que contempla: valores; heurísticas e vieses predominantes; atributos que configuram a imagem do herbicida; conjunto dos atributos preferenciais e seus respectivos níveis; os consequentes fatores da tomada de decisão; assim como os segmentos de pecuaristas.

**Palavras-chave:** Agronegócio. Comportamento de compra do fazendeiro. Marketing internacional. Heurística.

## 1 INTRODUCTION

Market demands increasingly rapid and consistent decision-making. Technology has connected the world in real time: people, markets, stock exchanges and information. In agricultural business, these decisions depend on uncontrollable variables such as exchange rate, price, climate and environmental conditions. According to Spers (2010), in this context of pressure and agility, the individual uses a simplification process in decision-making, using shortcuts to simplify the cognitive process, which can lead to errors. People's decision processes are not purely rational and based on pure logical thinking, which Simon (1957) denominates as bounded rationality. In the hedonic approach, the decision-making to buy a product is based on the attributes it can offer (LANCASTER, 1971). Attributes are seen as properties or intrinsic characteristics of the product (measurable and observable) that can be tangible or intangible (ESPARTEL, SLONGO, 1999). They are relevant for being a way to obtain desirable consequences from observable aspects of the world evidenced by consumer beliefs about a particular product or brand and its values (ASSAEL, 1998). People realize the benefits if the products have attributes that can provide these benefits (GUTMAN, 1982). Therefore, each product is seen as a set of attributes with different capacities to provide the stated benefits and fulfill a need.

Hedonism and utilitarianism present dichotomy, but have been studied complementarily by many specialists who propose to analyze the consumption through a rational overview, utilitarian as well as a hedonic and emotional overview of shopping for pleasure (HOLBROOK; HIRSCHMAN, 1982; BABIN; DARDEN; GRIFFIN, 1994; D'ANGELO, 2004; ANDERSSON; ENGELBERG, 2006).

In this sense, the research herein presented aimed to characterize cattle farmers' decision-making towards the herbicide for grazing in Brazil. To this end, the attributes from the central and peripheral image of a herbicide for grazing, the exchanges (trade offs) of the most important attributes and the biases of the predominant heuristics in cattle farmers' decision-making process regarding herbicide for grazing were identified. Also, a decision-making hierarchical map for herbicide purchasing was proposed.

The study is based on three fundamentals: attributes through the utility function that have a more economic approach (LANCASTER, 1971); the heuristics and biases that have a psychological approach (HASTIE; DAWES, 2001); and the predominant values in cattle farmers, also with a psychological approach (HOMER; KAHLE, 1988; GUTMAN, 1982).

## 2 DECISION-MAKING PROCESS

The ability to make choices is seen as an essential element of human action (DONAGAN, 1987) and modern life, whether in its individual, collective and corporate aspects (CROZIER; RANYARD, 1997).

Decision-making process presents central features involving thoughts and behaviors about the external world, about which events will occur or not, and about the internal consequences of these events. According to Hastie and Dawes (2001, p. 29) "this integration of beliefs about objective events and our subjective reactions to these events that are the essence of the decision-making process."

Some factors are crucial in preference formation, assessments and purchase decisions of an individual such as affective factors, emotions, feelings, imagination and fantasies aroused by products.

According to Nunes and Cespedes (2003), there are four types of purchases due to complexity and differences between brands. The purchase of a herbicide can be classified as complex, in which buyers are highly involved, occurring when the product is expensive, risky and typically when the consumer does not know much about the product category and has much to learn about it.

### 2.1 Hedonic Approach: Attributes And Country-Of-Origin Attribute

The concept of hedonism used in this study takes as its premise behavioral economics in which the consumption of individuals is guided by the maximization of pleasure and satisfaction, minimizing monetary expenditure (BABIN, DARDEN, GRIFFIN, 1994). However, utilitarian purchase is characterized by rationality which includes factors such as utility, convenience, price and efficiency LOPES *et. al.*, 2010; ALLEN; NG, 1999).

In general, hedonic benefits are related to the satisfaction of consumer's search for multi-sensory experiences and pleasure. On the other hand, utilitarian benefits are related to satisfaction of a sole purchase purpose of specific products (GERTNER, DIAZ; 1999). To Moresino (2019), the hedonic approach permits, among other things, estimating the value of each single characteristic of the product, or, in other words, each single attribute. Additionally, according to Lisi (2019) the hedonic approach is the most object method for estimating the market value of a property.

In this context, products are seen as an attribute package by buyers (PETER; OLSON, 1999). These attributes are features or aspects of products that can be classified in intrinsic. For instance, in the case of herbicide, active ingredient, formulation and toxicity (intrinsic); and brand, price, warranty and packaging (extrinsic) (VALETTE-FLORENCE; RAPACCHI, 1991). Assael (1998) states that the study and measurement of attributes are fundamental to understand consumers' beliefs about a product or brand. Product attributes are important elements for consumer decision-making in the model proposed by Lancaster (1971). In this model, buyers choose products based on the attributes they offer. In this sense, separating the attribute at different levels can be useful. For this, there are important techniques that evaluate exchanges (trade-offs) between product attributes such as conjoint analysis, which is used to determine how people value different characteristics that make up a product or an individual service.

In the hedonic model, products have a set of attributes directly relevant to the consumer. In this formulation, the utility function derives from the set of attributes ( $A_j = \sum a_i$ ) or characteristics obtained through a series of products (LANCASTER, 1971). According to the example of Spers (2003), assuming that a “product  $i$ ” is derived from a combination of 13 attributes  $A_j = (a_i + a_{i+1} + \dots + a_{i+n})$  and has a certain technological structure of “production  $T$ ”. A “company  $E$ ”, in certain “market  $j$ ” can offer the same “product  $i$ ” with a combination of different attributes that varies from  $A_j$  with low quality to  $A_j$  with high quality. As the value chain follows, “product  $i$ ” undergoes transformations at a “cost  $Z_i$ ” until it is offered to end users, who realizes a certain benefit or “value  $V_i$ ” in “product  $i$ ” (BESANKO et. al., 2000).

If there is technological possibility of different combinations of “production  $T$ ”, which are different combinations of  $A_j$  attributes, “product  $i$ ” will provide distinct benefits to the “consumer  $C$ ”, varying from a “value  $V_i$ ”, which is considered greater, to a “value  $v_i$ ” considered lower ( $V_i > v_i$ ).

This study shows the country-of-origin attribute of a herbicide due to the agricultural sector situation with the entry of new pesticide companies (Chinese and American) (KLEFFMANN, 2011). Then it is intended to highlight the importance of the country-of-origin attribute and the influence on product evaluation.

The country-of-origin effect has received many definitions in the literature and, in general, refers to the influence of information about the country on attitudes and behavior with respect to a product or a brand. For Wang and Lamb (1983) and Agbonifoh and Elimimian (1999) this effect can be considered an intangible barrier to enter new markets in the form of negative biases that consumers have with regard to imported products. For Papadopoulos (1993), “image of a country” is defined based on thoughts created by these images in consumers’ minds. From this perspective, the image of the country can also be defined as a sum of attributes where  $I = A_1 + A_2 + \dots + A_n$ .

Studies have shown that the magnitudes of the country-of-origin effect on quality perceptions have been consistently higher than those for purchase intention (PETERSON; JOLIBERT, 1995; VERLEGH; STEENKAMP, 1999).

## 2.2 Bounded Rationality And Heuristics

This article considers the individual in the decision-making process from the perspective of bounded rationality proposed by Simon (1957). The heuristic (or heuristics) is the set of strategies adopted by a cognitive individual to come up with solutions or decisions by a product from predetermined goals and values (MISKULIN, 1998). In agricultural business, these decisions depend on uncontrollable variables such as exchange rate, climatic and environmental conditions. According to Spers (2010), in this context of pressure and agility, individuals use a simplification process of decision-making, which can lead to errors thus enabling the existence of heuristics and biases.

Emotional reasons of decision involve the selection of the objective according to personal or subjective criteria such as individuality, pride, fear, affection and status (SCHIFFMAN; KANUK, 2000). Even if individuals receive identical information, depending on the interest, the relation with the attribute can vary, which may be partial according to the attribute assessed (DIEKMANN; SAMUELS; ROSS; BAZERMAN, 1997). In addition to this self-interest,

individuals can simplify their cognitive process to save time and resources in their decision-making or judgment of value.

People developed faster intuitive ways (and more fallible on many occasions) with the use of emotion as a more urgent way to solve decision-making problems. These decisions ignore the laws of probability and statistics (KAHNEMAN; TVERSKY, 1974) and in many moments people appeal to representativeness, availability, anchoring and setting as a way of saving effort when making decisions in scenarios or moments of uncertainty.

Biases of the representativeness heuristic are those that somehow have the common feature of suffering influences in the characterization of frequency by similarity, as in the case of stereotypes. From the availability heuristic, there are the biases: remembrance ease and resilience. (BAZERMAN, 2004; KAHNEMAN; TVERSKY, 1974).

There are five biases from the representativeness heuristic: lack of sensitivity to base proportions; insensitivity to sample size; misconceptions about chance; regression to the mean; and the conjunction fallacy. The biases of the representativeness heuristic are insufficient anchor adjustment; conjunctive and disjunctive events. (BAZERMAN, 2004; KAHNEMAN; TVERSKY, 1974).

Finally, some bias from more than one heuristic are: confirmation traps; retrospect.

### 2.3 Value And Means-End Chain

Reynolds and Gutman (1988) developed the means-end chain theory to understand the cognition in consumer behavior. According to this model, the "means" are products or activities in which people are involved (A or C) and the "end" is the value or state of existence (V). These elements are linked in such a way that the "means" lead to an "end", that is, the attributes of the products (A) lead to consequences or benefits from product use (C) which help the individual to achieve states or personal values (V). Product features become more important to consumers since they make associations with consequences arising from the use, and thus achieve their values (IKEDA; OLIVEIRA, 2006).

Concrete attributes are defined as physical characteristics directly observable in a product such as price, color, weight, etc. (VRIENS; HOFSTEDE, 2000). Abstract attributes refer to relatively intangible characteristics such as brand and style or perceived quality (LIN, 2002).

The means-end chain approach conveniently leads individuals to express and explain their attribute-benefit-value relations and how they utilize them in decision making (LIN; FU, 2018).

Functional consequences act directly on consumers from product consumption (VALETTE-FLORENCE; RAPACCHI, 1991) such as ease-of-use, comfort and convenience. Terminal values represent the final states of existence, that is, the objectives we seek in life such as peace, self-fulfillment and prosperity. Instrumental values are behavior patterns that lead to terminal values such as ambition and the resourcefulness that may be necessary for achieving prosperity, for instance (IKEDA; OLIVEIRA, 2006).

The concept of value for customers was explained by Woodruff and Gardial (1996) as the preference and assessment that a customer makes in relation to the attributes of a product, the performance of these attributes and the consequences arising from its use that facilitate or hinder the task of achieving the desired objectives and purposes with situations of use. It is noticed



that the value is linked to product attributes and performance, to consequences and the intended objectives with the use (IKEDA; OLIVEIRA, 2006).

Human values can help to explain behavioral phenomena through causality relation established with it (CLAWSON; VINSON, 1978). For Rokeach (1973, p. 65) "value is an enduring belief that a specific behavior pattern (instrumental value) or final state of existence (terminal value) is personally and socially preferable to an opposite or different behavior pattern or final state of existence". This perspective is supported by the concept that there are constant values that transcend individuals and situations and that values are cognitive representations of universal human needs.

Solomon (2002, p.123) states that "consumption options simply can not be understood without the cultural context in which they are made. Culture is the 'lens' through which people see the consumption". Kamakura and Novak (1992) compared values and attitudes and conclude that the values are determinants of attitudes and behavior and thus provide an understanding of consumer in a more stable and self-oriented way. For Porter (1992), the consumer will not pay for a value that he does not realize, no matter how real it is. Value perceptions are situational and depend on the context in which evaluation and judgment occur.

As a result of these arguments, an option for the treatment of values is the List of Values (LOV) proposed by Kahle and Kennedy (1988) and developed in the Survey Research Center of the University of Michigan.

## 2.4 Segmentation

Gardener and Thomas (1985) believe that a marketing strategy has two main components: target market selection, for which marketing effort will be directed; and marketing mix development. According to Toledo, Gouvêa and Rodrigues Filho (1998) segmentation concept points to a process that is developed from a phase called market partition, that is, survey of the segmentation variables and profile design of market segments which could be achieved by specific marketing compounds; progressing to the prioritization phase, in which strategic segment choice is sought in order to obtain competitive advantage, culminating in the positioning stage.

Henderson (1981) reinforces the role of market segmentation in marketing strategies stating that "market strategies are all based on segmentation and concentration of resources". Biggadike (1981) points out that market segmentation and positioning would be the most important contributions of marketing to strategic management.

From marketing perspective, one can understand market segmentation as a strategic marketing tool for resource allocation that seeks to increase customer satisfaction and improve profitability of the organization (MURPHY; DALEY, 1994).

Engel, Fiorillo and Cayley (1972) gave broader dimension to the role of market segmentation. For these authors, the segmentation process relates to both a marketing strategy, which develops within the functional area, and a competitive strategy, which contributes to the formulation of the company's business strategy as a whole.

Accordingly to Palmatier and Crecelius (2019) several trends magnify the importance of a first principles approach to marketing strategy. First, to differentiate themselves in the face of increasing competition, firms target smaller and smaller segments and lend greater importance to the notion that all customers differ.

From an economic perspective, Smith (1956) recognizes the existence of the heterogeneity for goods and services demand as a set of small homogeneous markets with different preferences and desires based on the imperfect competition theory by Joan Robinson (1932) (WEDEL; KAMAKURA, 2000).

For Hofstede *et al* (1999) the hierarchy of attributes can reveal consumer segments. Buyers who first decide on the price are adept the hierarchy dominated by price; those who decide first on the brand are adept the hierarchy dominated by brand and so forth. So, the combination of hierarchical attributes constitutes a segment. Each segment has distinct demographic and psychographic characteristics.

Toledo (1972) proposes a treatment integrated to segmentation, highlighting its operating and auxiliary features in decision-making process and also explaining that a company needs to segment the market because consumers are different in terms of tastes, interests, desire and personal preferences, and physical, emotional and psychological needs.

Through agribusiness features such as an organizational market where decisions are generally based on the farmer as an individual, there is the need to segment this audience according to elements such as values, behavior and heuristics, and hierarchy of attributes in order to represent a life pattern translated into their activities, interests and opinions in an attempt to portray farmers interacting with their environment. (HABERLI JÚNIOR; SPERS, 2006).

### 3 METHODOLOGY

In order to achieve the objectives that were stipulated, the present research adopted mixed method combining qualitative and quantitative approach. As defined by Creswell and Clark (2015) mixed method are justified when there is a need to understand a research objective through various stages of research.

In this sense, the research was conducted into two stages. In the first, throughout a qualitative approach, the indicators and proposals of farmers' decision-making, as well as the image and attributes of a herbicide for grazing were raised. The second quantitative stage consists of the collection through a survey applied to the target audience of the research.

Three different methods were used in the first stage: Products Image Configuration (PICT), Laddering and Conjoint Analysis.

The sample was comprised of 10 cattle farmers in the states RJ, SP, TO, MT, and PA who work with beef cattle in free pasture. They are medium to large size, with at least 500 hectares of pasture and make use of herbicides for weed control. The sample selection was intentional through the snowball method (MARSHAL, 1996). According to Marshall (1996), an appropriate sample size for a qualitative study is the one that adequately responds to the research question. In practice, the number of individuals required generally becomes obvious as soon as the study progresses, when new categories, themes or explanations stop emerging from data (data saturation). In the case of this research, data from ten cattle farmers were consistent and repetitive. The average age of respondents was 44 years; the size of the farms was medium to large with an average of 2200 heads in an area of 3400 hectares of pasture. The biggest cattle farmer managed three farms which together totaled 20,000 heads of cattle in 12,000 hectares of pasture, which were located in the state of TO and MT.

Data were collected from two sources: personal interviews and research reports provided by a chemical company in the sector. The collection technique adopted was personal in-depth interview with script structured according to the criteria of the methods adopted in this research.

For the second quantitative stage, the survey sample consisted of 75 cattle farmers, in which 94% were male and 41 years-old, in average. Also, 77% of the respondents had at least higher education, and 43% had a degree in agronomy. Of the total, 13% only had a high school degree and 10% represented those with incomplete elementary or lesser degree. Regarding the title or position that the respondent exerts on the farm, 50% were owners, 17% were farm managers and 33% were consultants or agricultural technicians. They all state to exert medium or high influence on herbicide purchase decision. By respecting the established filter criteria, respondents who have little or no influence were discarded. As for the farms, 65% are large-sized with over 1000 acres of pasture. Regarding proportion of cattle number, 39% had more than 5000.

After that, the triangulation is done due to the limitations of qualitative research and in order to control the biases establishing valid propositions (MATHINSON, 1998; PATTON, 2001). In this study, the triangulation was done through data source (personal interviews, newspaper article and magazines of the sector and research papers of a company in the sector); methods (PICT, Laddering and Conjoint Analysis); and approach (two qualitative and one quantitative).

## 4 RESULTS AND DISCUSSIONS

### 4.1 Herbicide Attributes

From the interviews with cattle farmers, attributes related to the image of an herbicide for grazing were raised using PICT method. Then the repeated questions were gathered up and organized from the order of appearance in every interview. Weights were assigned to the seven most frequently cited attributes. The ones mentioned first received weight 7, the second received 6, the third obtained 5, the fourth place received 4, the fifth was assigned weight 3, the sixth 2, and seventh 1. This sorting of weights was made for each of the 10 interviews. These attributes were also classified according to the citation frequency, that is the number of times they were cited in the interviews.

The results of the conjoint analysis allow to evaluate cattle farmers' preference for attributes related to herbicide for grazing. Nine cards were presented with hypothetical products to cattle farmers interviewed and it was asked them to put in order according to their purchase preference. An important observation to be described here is regarding to the default behavior that all cattle farmers presented when organizing themselves to decide the order of preference of the nine hypothetical products. The first attitude of all cattle farmers was to organize the hypothetical products into three groups related to country-of-origin.

The hypothetical products consisted of three variables: country-of-origin, technical assistance and price. The price is presented as the most important variable in cattle farmers' decision-making process, followed by technical assistance and country-of-origin. In the study by Rocha (2007) with Brazilian farmers, service and price also stand out as important factors in the purchase decision of a crop protection product.

It was noticed the difference of importance between the attribute price, and service is less accentuated compared to the country-of-origin variable.



The hypothetical products presented to cattle farmers varied according to the country-of-origin on three levels: China, USA and Brazil. They have declared preference for Brazilian products, mainly in their speech during the activity of ordering the hypothetical products. The United States is the second most important and China is the third one.

The estimated utility is the average importance of the attributes in cattle farmer's purchase decision. The hypothetical products considered three levels of technical assistance: high, medium and low. Finally, concerning the preference for herbicide price level, high prices have a markedly lower estimated utility than lower and middle prices.

Thus, in hedonic terms, the ideal product according to respondents' preference would be herbicide from Brazil, which would provide high technical assistance, and medium and low price.

#### 4.2 Hierarchical Map Of Value

The attributes consequences and values of cattle farmers' hierarchical map of value are: concern about the environment; high price; efficiency; lack of knowledge/uncertainty; and difficulty of application. The consequences of the attributes are: lower toxicity; tradition of the manufacturer; high tech; productivity; higher profit; disqualified manpower; need for technical assistance; and solution of problem. The values are: safety; self-fulfillment; and more time to enjoy life.

The attribute that represents the central image of the herbicide "Concern about environmental impact," is becoming crucial to ensure the sustainability of cattle raising business. It is observed that most advanced and capitalized cattle farmers have already incorporated this vision. Therefore, as a result, they refer the need to have a "low toxicity" product.

On the other hand, "lower toxicity" is directly linked to "high tech". Drawing a parallel with agriculture and lower toxicity of crop protection is important due to strict international certifications for product export. Cattle farmers who have environmental contamination concern seek products with less toxicity.

Cattle farmers do not have specific agronomic knowledge and because of handling complexity they assign "lack of knowledge/uncertainty" as a first image periphery of herbicide for grazing. Hence they assigned as a consequence "need for technical assistance" to guide them and provide information on handling and choosing the appropriate chemical formulation for controlling unwanted weeds in the pasture.

Application technology is one of the most important factors in determining the efficiency of herbicides. Up to 70% of products sprayed in crops may be lost due to runoff, uncontrolled drift and incorrect application (Application technology manual/Andef, 2004). In this aspect, cattle farmers assigned difficulty of application as one of the product's periphery image since there are many factors regarding the application of a herbicide. In the study by Spers and Lima (2009) the ease of application of an agricultural product is relevant to producer's choice.

The relation made by cattle farmers in the hierarchical map of value through E1, which presents "difficulty of application" and "disqualification of labor" as consequences, implies the need of companies to provide technical assistance to monitor this application in order to ensure the result of the product. As in the study by Rocha (2007), Haberli Junior and Spers (2006) technical

assistance was identified as an important attribute in cattle farmers' decision. In conjoint analysis, technical assistance proved to be the second most important attribute.

Cattle farmers expect the "solution of problem" when the herbicide is applied properly, that is, nothing more than weed control. When they were asked about the evaluation criteria with respect to the result of the herbicide, all respondents claimed that just the infestation of resistant weeds and grass volume (pasture) increased. They do not have a more detailed assessment of color, vigor or pasture quality (amount of protein available).

The value that triggers as a consequence of "solution of problem" is "enjoy life". Once the issue of invasive weeds in the pasture is solved, the cattle farmer can worry about what he likes to do, which is enjoy the farm and the family. Thompson (2009) states that this value is related to searching for a pleasant and happy life, valuing situations such as entertainment and leisure.

After the choices of hypothetical products, the respondents were asked about the order chosen. They all claimed it was based on price information to infer the technology and efficiency of the product.

Respondents consider the herbicide an effective tool compared to other methods to control weeds that require more time and manpower such as fire, manual and mechanical.

On the other hand, "high-tech" is strongly associated with "productivity", that is, more weight gain of the cattle leads to an "increased profit" for cattle farmers.

### 4.3 Heuristics And Biases

Bounded rationality is justified by mental shortcuts used to assess the attributes that imply in heuristics and biases (SIMON, 1957). Based on the results of the first and second stages, it was identified the presence of the following heuristics and biases which are discussed below:

#### *Representativeness heuristic with bias of illusion in relation to American and Chinese herbicide for grazing*

In the context purchase decision of herbicide for pasture, cattle farmers use this bias when evaluating American products as technological. This assumption is based on the results of interviews. In one of the questions, three hypothetical herbicides were presented and participants were asked to attribute the origin of the country of each product. 100% of respondents assigned the product that had high technology description to the United States and the justification was the trust and technology that products from this country have.

The same bias exists in the evaluation of Chinese products. Cattle ranchers assess the herbicides of this country by making use of judgments that correspond to stereotypes previously formed about the product. 60% of cattle farmers assigned to China the hypothetical product with the following description: "The herbicide Q is produced by a large company. The product does not have an innovative technology. However, it has a lower price compared to other products on the market". In conjoint analysis, the first attitude when organizing the cards was to separate them by country. During the process, all participants left the cards of Chinese goods as a last option. In addition, in order to be better understand the bias of illusion, the validity of cattle ranchers' perceptions in relation to American or Chinese herbicide for grazing (propositions 1 and 2), it was elaborated the statements below. Three hypothetical products

were presented in the form of cards containing the following descriptions about the size of the company, technology and price:

- The herbicide X is produced by a large company with a tradition on the market. It has an innovative technology and its price is higher considering other products on the market.
- The herbicide Y is produced by a smaller company and has a close relationship with its customers. It does not have a new technology on the market and has average price compared to other products on the market.
- The Herbicide Z is produced by a large company. The product does not have an innovative technology. However, it has lower price compared to other products on the market.

After that, cattle farmers were asked to relate each hypothetical product with a country using only the options: China, USA and Brazil.

All cattle farmers associated the product X with the United States. To solve this problem, cattle farmers used the representativeness heuristic, relating Americans herbicides as more technological. Brazilian products were more associated with the description Y, with new technology and average price. China was more related to the product Z, which describes a product with technology but with price below the market price.

Briefly, more than 60% of cattle farmers do not have the presence of heuristic since they disagree with the proposed statements. On the other hand, 20% agree in parts or strongly with the statements which would indicate the presence of the availability heuristic and its bias. For this reason, factor analysis and cluster were used to better understand this portion.

#### *Availability heuristic with bias of the presupposed associations regarding the choice of herbicide based on the recommendation of other cattle farmers*

In the interview, three hypothetical situations were presented in which each herbicide was recommended by: other cattle farmers, media specialized in the sector and resale technical assistant. As a result, 100% of cattle farmers stated purchase preference according to the herbicide that had been recommended by a cattle farmer.

For herbicide application, expertise and agronomical technical training are required. In the configuration image of the product, ignorance prevails in the first quartile. However, even if these cattle farmers do not have knowledge in this area, they prefer the recommendation of another cattle farmer rather than the resale technical assistant.

It was also elaborated a question in order to better understand the existence of the availability heuristic with bias of the presupposed associations regarding the perceptions of cattle farmers about the choice of herbicide based on recommendations of other influencing farmers. Three cards were introduced and each one described the only source of information that the cattle farmer had about the herbicide. Then respondents were asked to put their cards according to purchase preference order.

The average order that cattle farmers assigned to each product was calculated, and the less average, the more cattle farmers selected the product first.

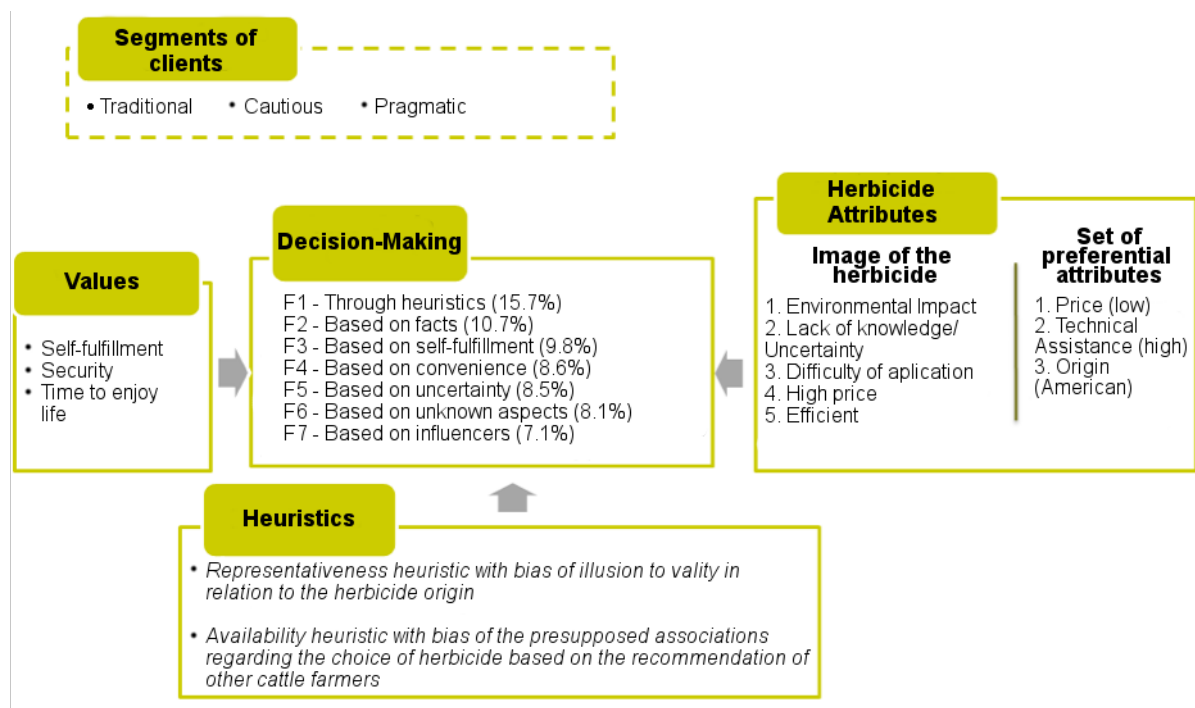
In this way, cattle farmers prefer herbicides that are recommended by another cattle farmer (product Z). And the recommendation of the resale technical assistant (product K) is more important than the recommendation from industry magazines (product W).

In short, by analyzing the survey results, it can be seen that 36% say they would change herbicide based on the recommendation of a friend from another region, which indicates the presence of the availability heuristic with bias of the presupposed associations in relation to the cattle farmer. A smaller portion also has this association but related to industry magazines.

#### 4.4 Decision-Making Model Proposal

Based on all the results, cattle farmers' decision-making model regarding herbicide for grazing is structured in figure 1.

**Figure 1** - Cattle farmers' decision-making model proposal regarding herbicide for grazing



Source: Research Data

The heuristics and biases prevalent in cattle farmers' decision-making regarding herbicide for grazing were identified as: representativeness heuristic - which is the judgment by stereotype - with bias of illusion and validity of the origin being American and Chinese; and the availability heuristic that is the assessment frequency of occurrence chances due to the ease in which they are readily available in memory. As a consequence, the bias of presupposed association regarding other herbicide recommendations.

From the MCIP, the attributes that make up the image of a herbicide for grazing were identified and confirmed by the survey: environmental impact; lack of knowledge/uncertainty; difficulty of application; high price; and efficient.

Also for herbicides, the set of preferred attributes and their levels were identified: low price levels; high level technical assistance; and American origin.

Finally, through factor analysis, the variables were grouped into seven factors that characterize cattle farmers' decision-making, with the respective percentages variance: F1- through heuristics (15.7%); F2 - based on facts (10.7%); F3 - based on self-fulfillment (9.8%); F4 - based on convenience (8.6%); F5 - based on uncertainty (8.5%); F6 - based on unknown aspects (8.1%); and F7 - based on influencers (7.1%).

Additionally, the three segments of customers identified according to the presence of decision-making factors were also presented: traditional (factors 1, 3 and 4), cautious (factor 5) and pragmatic (factors 6 and 7).

## 5 FINAL CONSIDERATIONS

According to the general objective to characterize cattle farmers' decision-making process regarding herbicide for grazing, the decision-making model was presented in Figure 1. Besides that, 7 factors that characterize cattle farmers' decision-making were presented, which together explain 68% of the variance. The attributes of central and peripheral image of the herbicide, with respect to the specific objective established, are also presented in the model. The central image is related to environmental impact, peripheral images towards lack of knowledge/uncertainty, followed by difficulty of application, high price and efficiency. Since the objective was to identify the exchanges (trade-offs) of the most important attributes, the preferential attributes were also identified: low price was the most important, followed by high technical assistance and American origin. Through a laddering technique, which was confirmed in the survey, the prevailing heuristics in this decision-making process were identified, meeting the specific objective that was initially established. Finally, cattle farmers were segmented according to the decision-making factors, which were characterized in three major groups: cautious, traditional and pragmatic.

The predominant values identified must help chemical companies of the sector in their value proposal construction and therefore in their communication. Thus the security value is a consequence that cattle farmers search from the purchase of the herbicide for grazing, that is, they want to feel secure about the profit and their equity; the health of livestock and employees; and environmental impacts. The value enjoy life indicates that cattle farmers want to solve the problem to enjoy other more enjoyable things such as family, farm and other activity they like doing. Last but not least, the value self-fulfillment indicates that cattle farmers feel fulfilled when the problem of weeds is solved due to cattle fattening consequences and increased profit.

The attributes that characterize the herbicide image are important tools in the communication campaigns of companies. Therefore, knowing that the environmental impact is the central image, as well as lack of knowledge and uncertainty are in the first periphery, companies should invest in training and actions in the field concerning information on implementation and care of herbicide. The importance of this recommendation is strengthened according to results from the hierarchical map of value wherein the attributes environmental impact and lack of knowledge/uncertainty relate to the need for technical assistance.



The availability heuristic with bias of presupposed association indicates cattle farmers are strongly influenced by other cattle farmers and believe that the results of herbicides applied in other farms, regardless of location, will be the same in his property if he uses the same herbicide. Therefore, buzz marketing actions and campaigns with an emphasis on results from other cattle farmers are recommended. The representativeness heuristic with the bias of validity illusion indicates a pre-established stereotype of Chinese and American companies. American and Chinese companies that are aware of this stereotype should direct actions to enhance positive aspects and reduce the negative ones.

Investment in technical assistance strongly influences purchase decision-making. According to the conjoint analysis result, cattle farmers consider price the most important attribute. However, they are willing to pay more if high technical assistance is provided.

Market segmentation is a strategic marketing tool. From the 7 factors and clusters identified, it is recommended that companies target their marketing actions, discourse and tone of the communication campaign for each segment.

It is important to highlight the limitations concerning the extrapolation of these final considerations according to the type of study and analysis. At the end, the studied factors could answer 68% of the variance, though 22% of the variance was not explained. This suggests the inclusion of new factors and a larger number of samples. The homogeneity of the sample also has been mentioned as a limitation especially in cluster analysis. New studies to deepen this research are suggested, such as making the data collection from other research, as well as applications of this model to other problems involving approaches about cattle farmers' decision-making studied in this work.

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