Competencies of work in agriculture units of support for the teaching and research: case study in Brazil.

Maria de Lourdes S. Luz*, João Alberto Camarotto+

* PhD Student Post-Graduate Course of Production Engineering, Department of Production Engineering, Federal University of Sao Carlos-S.P, Brazil
+ Associate Professor, Department of Production Engineering , Federal University of São Carlos, São Carlos- S.P., Brazil

Email: santluz@ibest.com.br, camarotto@dep.ufscar.br

Abstract

This paper aims to investigate and discuss the concepts constituted by the competencies deriving from tacit and explicit knowledge of the operational work, a critical factor in the transfer and retention of knowledge in an organization of agricultural activities, as well as their relationships. Thus, this article contains a study through literature research to understand the relationship between worker's competencies and work in agricultural units linked to teaching and research institutes in Brazil. It is understood by agricultural units, the experimental farms belonging to the Higher Education Institutions, which are intended to serve as a work for teaching, research and extension activities. This research is also based on the specific characteristics of work in an organization that fits in situations of high variability. The final product of an experimental farm includes not only research results and generated knowledge, but also the development of operational activities. In terms of achieving an outcome (product), it is emphasized that the processes in the execution of activities related to the set of operation procedures, control and data collection, as well as the results of research, teaching and extension and knowledge production are the final product of an organization linked to the research and development. This paper, finally discusses the relationship of competencies necessary to develop this kind of agricultural unit of teaching and research.

Keywords: competencies; work; experimental farm; agricultural activities; knowledge production.

1 Introduction

Studies about the work on farms in the agriculture sector are scarce. The researches done about this sector focus on cases of private properties intended for the market, unlike experimental farms linked to teaching and research institutions. The themes covered over and developed in a research of this nature, are linked to workplace safety and accident risks, toxicology, projects, design and, evaluation of agricultural equipment, agricultural work processes, work organization and development of new technologies (Montedo, 2001; Guimarães, 2007 & Gemma, 2008).

Guimarães (2007) was concerned on investigating the context of agricultural production, with its demands and effect on rural workers. The author emphasizes that in this context, the human being is an integral factor in the production process, being overlooked as a subject, and has rarely been the object of analysis and the central focus in researches.

By identifying the existence of gaps regarding the study of the human being in agricultural organizations, it is proposed to study about the competence of the worker, having as a focus the crowed operational agent in agricultural units, particularly chosen, the experimental farm of a higher education institution.

Thus this paper aims to discuss through a literature review, although limited, the concepts constituted by the operational competence at work, arising out tacit and explicit knowledge. Still in this context, a unique characteristic was searched for, where the operational competence needs to be investigated so that we can understand the relationship between the competence of workers and the work in units of agriculture, where the organization's characteristic's main objective is the work directly related to teaching and research.

Magnani (2004) highlights that studies and researches concerning the loss of organizational competencies established in companies that produce knowledge are still little discussed and explored by researchers from different countries. In the academic literature such thing is seen considering the fact that the majority of studies are oriented towards the "knowledge management", and attempts at characterization and evaluation of the produced knowledge, the so called "intangible assets" (Magnani, 2004).

This study also finds support in specific working patterns in an organization that fits in situations of high variability. The final product of an experimental farm comprises not only research and knowledge generated results, but also the development of operational activities. In terms of achieving an outcome (product), it is emphasized that the processes in the execution of activities related to the set of operating procedures, control and data collection, as well as, to results of research, teaching and extension activities and knowledge production, represent the final product of an organization linked to the research and development.

At the end, this work discusses this relationship of competencies necessary to develop this type of agricultural unit of teaching and research, also distinguished as an organizational generator of knowledge and with specific management needs on such knowledge.

2 Competency at Work – theoretical contribution

When searching with theorist the meaning and sense that is outlined by competence, Resende (2000 cited by Magnani, 2004) characterizes it, as the one that deals with the transformation of knowledge, skills, abilities, interest and willingness to achieve practical results. The concept of competence is closely related to the tasks performed by the individual and the concept of qualification. The author proposes a very broad classification of competence, which refers to the individual and organizational competence where there are all the attributes, requirements and factors namely: technical, intellectual, cognitive, relational, social and political, educational teaching, methodological and leadership. The author adds that the development of competencies occurs through individual and collective learning, involving three dimensions of the model: by assimilating knowledge, integrating skills and by the adoption of attitudes relevant to a particular organizational context.

Fleury and Fleury (2010) reinforces that the notion of competence was associated with verbs and expressions such as knowing how to act, mobilize resources, integrate multiple and complex knowledge, know how to learn and engage, take responsibility and have a strategic vision, whose concepts are stratified in Table 1. Within the context of the organization, competencies must add economic value to the organization and social value to the individual as outlined in Figure 1.

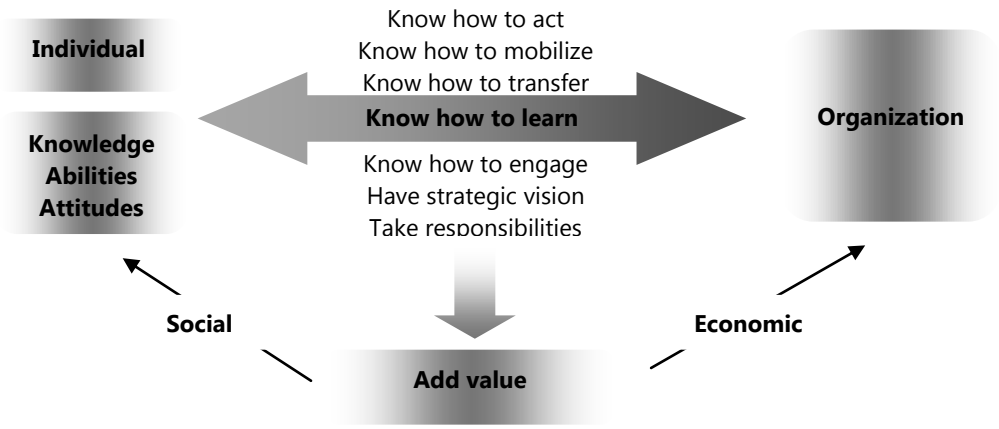

Figure 1: Competencies as a source of value for the individual and for the organization (Fleury & Fleury, 2010.).

Table 1: Competencies for the professional

Know how to act	Know what to do and why Know how to judge, choose, decide
Know how to mobilize resources	Create sinergy and mobilize resources and competencies
Know how to communicate	Understand, work, and transmit informations, knowledge
Know how to learn	Work with the knowledge and experience, review mental models, know how to develop
Know how to engage and commit	Know how to understand, take risks, commit
Know how to take responsibilities	Be responsible, taking risks and assume the consequences of his actions and being recognized for this
Have strategic vision	Know and understand the organizations "business", its environment, identifying opportunities and alternatives

Source: Adapted from Fleury & Fleury (2010)

According to Zarifian (2001) competence is the practical intelligence for situations that rely on the acquired knowledge, and transform them with as much more strength, as the longer increases the complexity of the situations. The author focuses on three main changes in the workplace, which justify the emergence of the competence model for the management of organizations:

- The concept of event – is what occurs in a partly unexpected not programmed way, exceeding the routine ability to ensure its self-regulation, this means that the competence cannot be contained in the pre-settings of the task. The professional competencies consist in confronting the event in a relevant way and knowingly, mobilize resources to address the new work situations.
- Communication: the central organizational issue requires understanding the other and oneself; means to agree on organizational goals, and share common standards for its management.
- Service: the concept of service of attending an internal or external client of the organization must be central and be present in all activities, for such, communication is essential. The work is no longer the set of tasks associated with the descriptive title, but it becomes a direct extension of the competence that the individual mobilizes in the face of a professional situation more and more mutable and complex. This complexity of situations makes the unexpected increasingly more of an everyday life and a routine.

Magnani (2004) when researching and discussing the critical success factors and formulating strategies aiming to minimize the effect of circumvention of competencies in a public agricultural organization of PD&I, investigated the identification of the problem, analyzing documental the quo status of the organization under the point of view of its competencies, organizational memory, vision, structure, relationships, policies and management system.

According to Magnani (2004) there is a consensus in the contemporary organizational literature that, in the knowledge age, critical factors are the competency of employees, internal and external relationships, and no longer the capital, the natural resources, nor labor. The literature has also highlighted that the competence as an intangible asset, cannot be stored by the organization, it lies in people's head and leaves the company after working hours. When people leave an organization is not only their skills that are lost, it includes elements such as intuition, commitment, image, experience and formal and informal relationships with internal and external clients. Just as management tools were developed suitable to the context of the industrial age, new tools and procedures are being developed to meet the particularities of the assets of the knowledge age.

3 Competency at work – epistemological contribution of ergonomics

Falzon (2007) clarifies that the specificity of ergonomics lies in its tension between two goals: focusing on organizations and their performance (seized under different aspects: efficiency, productivity, reliability, etc...), and focused on people (unfolded in different dimensions: health, safety, ease of use, interest in work, etc...). The way in which these goals are expressed evolved over time, with regards to the physical health it has gone from a palliative preventive vision to a constructive one. On the other hand, the idea of a cognitive health was proposed by Montmollin (1993 apud Falzon, 2007), in a development perspective, where the issue is not only the need to design a job that allows a fruitful exercise of the thought, but also that favours the development of competencies.

This duality of purpose is illustrated in the ergonomics of the activity, which requires two previously integrated elements: the difference between task and activity, and the concept of regulation. The task is what one should do, which is prescribed by the organization. The activity is what is done, which mobilizes the individual to perform the task. The activity is completed by the goal the individual sets to himself, starting from the goal of the task (know how to mobilize).

Regarding the concept of regulation, Falzon (2007) defines it as a control mechanism that compares results of a production process with a required production, and sets this process in relation to the difference. The concept of regulation in ergonomics is used in two ways, depending on the object on which the regulation relates to: the regulation of a system and the regulation of the human activity itself (know how to act).

The activity produces effects related to the operator and related to the task. Falzon (2007) highlights that the effects of the activity on the operator concern to: health (fatigue, wear and tear over time, accidents at work) and competencies (learning, consciously or not, more or less easy and possible under constrains coming from the task) (know how to learn).

Garrigou et al. (2007) highlights that in work situations there are different forms of variability, whose ergonomic approach distinguishes the variability in individual, organizational and contextual. The individual ones are: intraindividual (changes in the psycho physiological functioning of a person) and interindividual (diversity in characteristics of a population of operators). The contextual variability, according to the authors, may be related to variations in raw materials, products, procedures, environmental variations, etc. Regarding organizational variability there are: absences for various reasons, variation in the composition of the staff, different schedules, seasonal, etc. Under these conditions, the actual organization needs to constantly replenish, rebuild, relying on professional competencies both individually and collectively, which can fluctuate greatly.

Under the terms of ergonomics, Weill-Fassina and Pastre (2007) discuss the competencies in their relations to the activity. Competencies are stabilized sets of knowledge and know-how, standard of conduct, standard of procedures, types of reasoning that can be implemented without the use of new learning, and which consolidate and structure the acquisition of a professional history: they allow the antecipation of the phenomena, the implicit in the instructions, the variability in the tasks (to have strategic vision) (Montmollin, 1984 cited by Weill-Fassina & Pastré, 2007). The authors show how the ergonomical analysis of competencies methodologically take place in several stages, such as: task analysis, a description of the operational modes of the behavioural kind, first inference in terms of representations and strategies put into action and a second inference based on an assessment of the characteristics of those representations and strategies.

Daniellou (2004) proposes a reflection on the statutes of knowledge in ergonomics, to know whether scientific knowledge might be produced about human's functioning at work, about the work, or that if they are useful for its positive transformation. The author mentions that the practice of ergonomic work analysis and the confrontation with other disciplines has led ergonomists from the French school to a set of realizations, whose focus is in the discovery of work, such as: the difference between work assigned and real work, to show cognitive activity and competence of workers, the complexity of reasoning in many situations, the size of the grading of activity – shown mainly by the anthropo-technology, the complexity

of the commitments established by the workers and their effect in terms of performance and cost, the complexity of the factors of collective nature that come into play when developing strategies for workers: production of collective rules, ethical dimensions, collective ideologies of defense, the complexity of the mechanisms of harm to the health and the positive role, which work can have in the construction of health.

Thus, the interpretation of competence takes distance from functionalistic and contingent currents and seeks approach from the analysis on work processes, which favour the time dimension of such action processes, as well as, the relative contribution to decisions of individuals and social connotations of individual action (Maggi, 2006).

When entering the understanding of the agricultural work, the tasks are poorly structured in most cases they request considerable physical effort, awkward postures, work under unfavourable environmental conditions, exposure to chemicals (phytosanitary), seasonality, etc. The variety of classes of risk present in agricultural work settings appear compatible with the high degree of diversity of tasks and workstations in those activities, where many accidents occur on the harvesting fronts, in the maintenance of ballots of hay, in the ensilage of corn, etc (Abrahão, 20--; Sagory & Cerf, 2007).

Sagory and Cerf (2007) quote that the work in agriculture takes place frequently in an area of large extension and that this implies the need to think besides the time organization of tasks, but also in their spatial distribution. This is the case for activities conducting the crops and livestock breeding (different lots of animal must be allocated to the adequate locations and confinements).

4 Competencies in the organization of knowledge

The organizations of knowledge are basically comprised of knowledge structures, not capital. Therefore they have the potential to create new knowledge structures based on their staff/personnel (Kaplan & Norton, 1997 cited by Magnani, 2004).

The tacit knowledge is considered in the management of knowledge as the most important one for the competitiveness of organizations and the basis of all knowledge where companies should operate in the creation of organizational memory from established organizational competencies.

For Starbuck (1992 cited by Magnani, 2004) on knowledge organizations, knowledge is a supply of competencies. In intensive knowledge organizations the bureaucratic model does not prevail, yielding to a flexible model, where relationships are valued. There the managers, researchers, and consultants professional knowledge is deeply permeated by a common process of socialization, in which these professionals and their clients create final solutions together (Magnani, 2004).

In these companies also called organizations of intensive knowledge, the struggle for power takes place between the representatives of two traditions in knowledge: professional and organizational. Within these structures, the organization employs four major participants: the professional, manager, support staff and the leader, as shown in Figure 2.

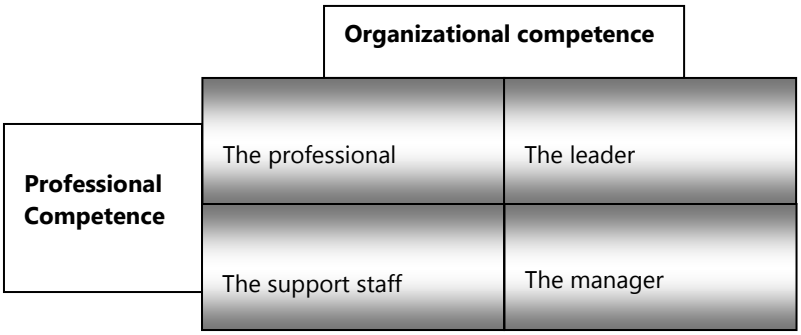

Figure 2: Personnel categories in the organizations of knowledge. Source: Sveiby (1998 cited by Magnani, 2004)

Durand (1998), in turn has built a concept of competence based on three dimensions – knowledge, skills and attitudes – encompassing not only technical questions, but also the cognition and attitudes related to work, as shown in Figure 3.

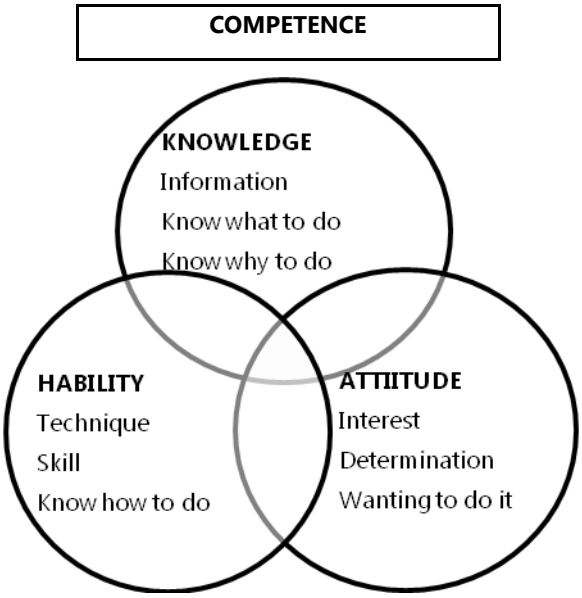

Figure 3: Dimensions of competence. Source: Adapted from Durand (1998)

In this case, competence is the range of knowledge, skills and attitudes needed to achieve a given purpose. The author also adds that the development of competencies occurs through individual and collective apprenticeship, involving the three dimensions of the model, i.e., by the assimilation of knowledge by integrating skills and by adopting attitudes relevant to a particular organizational context.

Magnani (2004) considers that the qualification comprises the formal study, postgraduate studies, master's and doctoral degrees as basic attributes of competence for a professional from an institution for P&D Agriculture (intensive organization in knowledge generation), mainly directed to researchers (main focus of their studies). However, the author concludes that this attribute is revealed as necessary but not sufficient. Other attributes, such as the ability to "read" the reality, know how to identify the demands of society, commitment, perseverance, relationship skills and social responsibility, were consistently perceived as essential attributes for a researcher to be considered competent. It is observed therefore, also in this level, the dichotomy in the qualification (formal and informal) of professionals in the technical-scientific area. It is here ratified that the notion of theorists of the area, as shown in the reasoning that: the individual competence is necessary but not sufficient for the organization to be competent, since personal qualities, individual attitudes, values and peculiarities of social relations within the organization and its surroundings are crucial for the real sense of competence. It is noteworthy, however, that in this study the operating agent is not at the center of its analysis, nominated by Sveiby (1998 cited by Magnani, 2004) as support staff.

5 Experimental Farm (EF) – Organizational Characterization

To achieve its purposes and goals EF relies primarily in education and training for students attending undergraduate and graduate courses connected to the Center of agricultural, biological and technological sciences, provides infrastructure and existing personel/staff to support the teaching, research and extension activities; acts as a center for disseminating technologies for the region covered by Higher Education Institution (HEI), gets revenues from the surplus of agricultural production of research and / or extension, as well as the other activities developed, fosters scientific activities in the area of Agricultural

Sciences, aimed at achieving integration with other Educational, Research and Extension Institutions (FEI, 2010; Gralha Azul, 2011; Ressacada, 2011; UFAM, 2011).

The agricultural industry or vegetable production is responsible for planting many annual crops, orchards, coffee plantations, forestry, grazing and soil conservation, Also in this sector, EF generally relies on the Seed Analysis Laboratory, Centre for Agricultural Mechanization Training, Laboratory of Entomology, besides providing support and developing along with the research departments in different areas of Agronomy (FEI, 2010; Gralha Azul, 2011; Ressacada, 2011; UFAM, 2011).

The zootechnical sector (livestock production) is divided and structured according to the specialties of the course. For that, usually with the area of Apiculture, Poultry – white and red lineage, Dairy Cattle, Cutting Cattle, Goat Husbandry, Cotorni-Culture, Rabbit Breeding, Equine Breeding, Sheep and Swine Production. It also has an Embryo Transfer Laboratory, Forage Production, Pisciculture, Aquaculture, Rations Mill that complement the activities developed in the Head office Campus with reference to teaching and research (FEI, 2010, Gralha Azul, 2011; Ressacada, 2011; UFAM, 2011).

5.1 Methods

The present study is characterized by a qualitative approach, supported by the activity analysis, with the investigative focus on operational competences inserted in a context of high variability.The research method used as investigative proposal, in organization specified below, is the case study. Yin (2010) defines the case study research method "as an empirical inquiry that investigates a contemporary phenomenon in depth, within its real-life context; especially when the boundaries between phenomenon and context are not clearly evident" (p. 39). The research techniques used were multiple sources of evidence (data triangulation) and the Ergonomics Work Analysis (EWA) gave support to this research. According Guérin et al. (2008) the understanding of the work begins construction of ergonomic action from of point of view of activity, to identify their differences on the work and in favor of confrontation between them. The data coming from documents, semi-structured interviews, tape recorded, systematic observations and later transcribed and analyzed. The work ergonomics analysis is restricted to understanding and analysis of the environment surrounding the task, with a focus on operators, who work in the care, management animal and agricultural experiments.

5.2 Organizational Structure

For the purpose of achieving its goal the EF is characterized with a structure in three organizational levels with positions and functions assigned to: Board / advisory Services (Executive), Advisory Council (Deliberative), Technical Coordinator (Coordinator of Crop Production and Coordination of Animal Production), the Administrative Secretariat and support units (Maintenance, General Warehouse, Mechanization, Rations Mill, Transport and Surveillance) (Figure 4) (FEI, 2010). In this organization, which serves as an example, it identifies the figure of the professional (researcher), the manager (director / advisor), the leader (coordinator) and the operating agent (allocated to the sector and support units) nominated by Sveiby (1998 cited by Magnani, 2004) as support personnel.

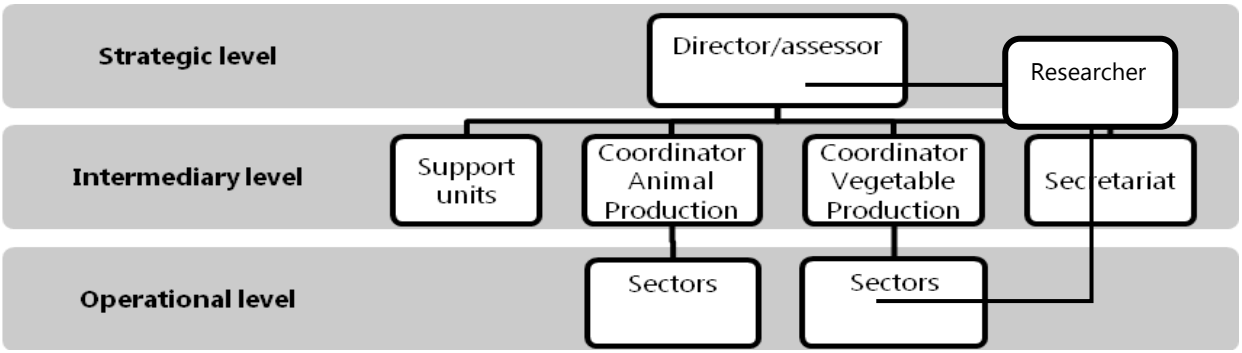

Figure 4 – Functional Organogram - The work and profile of the operational characteristics

The work at the experimental farm is characterized by a scattered work and has a great diversity of operations, its activities are not constant and in most cases there is no defined order of execution. Operations are performed according to the need of the experiment, with cases in which the activities of handling and control are performed daily varying from short, medium and long term in accordance to the establishment or research. It is also characterized by being a work of the non-structured, where the operating agents do not have just one activity demanding regular displacement during the execution of the tasks.

The organogram outlined in Figure 4 shows the organization being stratified in three levels and it shows the operational staff as an active and very influential participant in the activities included in the operational level, relating to both a formal and informal way at the experimental farm. This employee hierarchically responds directly to a technical coordinating body and simultaneously deals in a direct link with the researcher (Students and Faculty of HEI) (knowing how to communicate).

At the operational level the operator is the executor of the farm routine tasks, as well as, the individual who is in charge of (implied and explicit competence) the trust in the process of performing a search (know how to act, engage and take responsibility). At times he is inserted in a process with direct contact with the researcher, established through formal and informal communication (being able to communicate), sometimes he is found in routine tasks and acts without intensive monitoring, making decisions by himself (Know how to engage and commit), despite the setting established by the organizational structure in terms of hierarchy, position and tasks. It was found between the activities of the operating employee some flexibility in conducting wearing daily routines (know how to mobilize resources, know how to act). When a sector is crowded, he becomes at times a specialist in specific chores or not (know how to learn). There are features that refer to the intrafunctional variability, which requests a participatory contribution in conducting a project, or even in understanding the stage of implementation, for what purpose and importance is a specific research (have strategic vision, know how to take responsibility).

Guimarães (2007) reinforces that the operating agent performed activities that require techniques domains and imposes, for several moments, a wearing daily routine; extremely strict schedules, long working hours, discipline in the performance of tasks; accuracy and attention to protocols according to the research or work safety, work outdoors subject to weather changes and go through long distances during a working day.

6 Considerations

The description and characterization of this scenario (experimental farm) and the operating agent, common to different farms surveyed, it is essential to understanding the experiences and job demands of workers who perform this activity. Such activities require effort, postures and demands, regulations, and variability similar to those found in other types of organizations of agricultural activities and identified also as unhealthy and harmful, yet still raises no interest for discussion in the area of ergonomics. Specifically on an experimental farm, the operating agents carry demands that go beyond a routine, in which new technologies, procedures in accordance to research, demand new knowledges (new learning, new forms of work and tasks organization, Know how to perform, know how to engage and commit themselves, take responsibilities), and a new form of organization. Guimaraes (2007) states that for the operating agent, his knowledge is called into question, at the same time that requires new qualifications and being often exposed to risks of accidents and occupational disorders.

References

Abrahão, R. F. (20--). A contribuição da Ergonomia para o trabalho agrícola. Obtido em 10 de 08 de 2010, de Faculdade de Engenharia Agrícola, UNICAMP: http://www.feagri.unicamp.br/tomates/pdfs/wrktom033.

Cerf, M. & Sagory, P. (2007). Agricultura e desenvolvimento agrícola. In P. Falzon (Ed.), Ergonomia (pp. 535-544). São Paulo: Edgard Blucher.

Daniellou, F. (2004). Questões epistemológicas levantadas pela ergonomia de projeto. In F. Daniellou (Coord.), Ergonomia em busca de seus princípios: debates epistemológicos (pp. 181-198). São Paulo: Edgard Blücher.

Durand, T. (1998). Forms of incompetence. In International Conference on Competence-based Management. Anais… Oslo: [s.n.].

Falzon, P. (2007). Natureza, objetivos e conhecimentos da ergonomia – Elementos de uma análise cognitiva da prática. In P. Falzon (Ed.), Ergonomia (pp. 3-19). São Paulo: Edgard Blucher.

FEI – Fazenda Experimental de Iguatemi. (2010). Fazenda. Obtidol em 21 de 05 de 2010, de Universidade Estadual de Maringá: http://www.fei.uem.br/.

Fleury, A., & Fleury, M. T. L. (2001). Estratégias empresariais e formação de competências : um quebra-cabeça caleidoscópico da indústria brasileira. São Paulo: Atlas.

Garrigou et al. (2007). Contribuições da ergonomia à prevenção dos riscos profissionais. In P. Falzon (Ed.), Ergonomia (pp. 423-439). São Paulo: Edgard Blucher.

Gemma, S. F. B. (2008). Complexidade e agricultura: organização e análise ergonômica do trabalho na agricultura orgânica (Tese). Faculdade de Engenharia Agrícola, UNICAMP.

Gralha Azul – Fazenda Experimental Gralha Azul. (2011). Obtido em 07 de 01 de 2012, de Pontifícia Universidade Católica/PR: http://www.pucpr.br/fazendagralhaazul/.

Guérin, F. et al. (2008). Compreender o trabalho para transformá-lo. São Paulo: Ed. Edgar Blücher.

Guimarães, M. C. (2007). "Sé se eu arrumasse uma coluna de ferro pra agüentar mais..." – Contexto de Produção Agrícola, Custo Humano do Trabalho e Vivências de Bemestar e Mal-estar entre Trabalhadores Rurais (Tese). Instituto de Psicologia, Universidade de Brasília (UnB), Brasília- DF.

Maggi, B. (2006). Do agir organizacional: Um ponto de vista sobre o trabalho, o bem estar, a aprendizagem. São Paulo: Edgard Blücher.

Magnani, M. (2004). Identificação de fatores críticos de sucesso para formulação de estratégias que minimizem a perda de competência organizacional de um centro de P&D agropecuário (Tese). Universidade Federal de Santa Catarina, Florianópolis. Obtido em 27 de 04 de 2010, de EMBRAPA: http://www.cpact.embrapa.br/teses/tese_marcio.pdf.

Montedo, U. B. (2001). O trabalho na unidade de produção agrícola familiar segundo a teoria da complexidade. (Tese). Faculdade de Engenharia de Produção, Universidade Federal de Santa Catarina, Florianópolis.

Ressacada – Fazenda Experimental da Ressacada. (2011). Obtido em 15 de 05 de 2011, de Universidade Federal de Santa Catarina: www.fazenda.ufsc.br.

UFAM – Fazenda Experimental. (2011). Obtido em 17 de 12 de 2011, de Universidade Federal do Amazonas: www.portal.ufam.edu.br/.

Weill-Fassina, A. & Pastré, P. (2007). As competências profissionais e seu desenvolvimento. In P. Falzon (Ed.), Ergonomia (pp. 175-191). São Paulo: Edgard Blucher.

Yin, R. K. (2010). Estudo de caso: planejamento e métodos. Porto Alegre: Bookman, 2010.

Zarifian, P. (2001). Objetivo competência: por uma nova lógica. São Paulo: Atlas.