Certification, agricultural waste, organic production, herbal medicine and biotechnology in the conception of farmers of the State of Goiás[1]

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ABSTRACT

The organic production system aims not at the intensive exploitation of resources, but the correct management of waste, the use of alternative treatments of animal diseases, and the utilization of some biotechnologies to assist in production. This is an exploratory study to evaluate the way farmers perceive the certification of their farms, the organic agricultural production, waste control, and the use of herbal medicine and biotechnologies in their properties. Fifteen farmers from the Dom Fernando Gomes dos Santos (GI) settlement, in Itaberaí, participated in the study, besides 15 farmers (GII) who are not participants in agrarian reform programs from different municipalities in the state of Goiás. Information was collected using questionnaires that addressed issues related to certification of farms, production of waste, organic agricultural production, herbal medicine, and biotechnology. Most farmers of GI and GII were unfamiliar with farm certification. Most GII farmers knew about agricultural waste, but few GI farmers knew its meaning. Most farmers of the two groups were familiar with the term organic agricultural production. More GII farmers were familiar with herbal medicines than GI. In both groups the term biotechnology was unknown to most people. It was concluded that this lack of knowledge by the majority of farmers about most topics presented shows the need to plan and execute actions to assist in the dissemination of information among farmers, settlers or not, using practical and functional strategies.

Key words: settlement; farms; production system; sustainability.

RESUMO

Certificação, resíduos agropecuários, produção orgânica, fitoterapia e biotecnologia na concepção de produtores rurais do Estado de Goiás

O sistema orgânico de produção visa à não exploração intensiva dos recursos, ao manejo correto dos resíduos, ao uso de tratamentos alternativos das enfermidades dos animais e à aplicação de algumas biotecnologias que auxiliem na produção. Este trabalho objetivou avaliar, de modo exploratório, a maneira como produtores rurais percebem a certificação de suas propriedades, a produção agropecuária orgânica, o controle de resíduos e o uso de fitoterápicos e de biotecnologias nos seus estabelecimentos. Participaram do estudo 15 produtores do assentamento Dom Fernando Gomes dos Santos (GI), em Itaberaí, e 15 produtores rurais (GII) que não pertencem a programas de reforma agrária, em diferentes municípios do Estado de Goiás. As informações foram coletadas, empregando-se questionários que trataram de assuntos relacionadas com a certificação de propriedades rurais, com a produção de resíduos, com a produção agropecuária orgânica, com a fitoterapia e com a biotecnologia. A maioria dos produtores, de GI e GII, não sabia o

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significado da certificação das propriedades rurais. Sobre resíduos agropecuários, a maior parte de GII sabia o significado e, de GI, poucos tinham conhecimentos. O termo produção agropecuária orgânica era conhecido pela maioria dos produtores dos dois grupos. Um número maior de produtores do GII tinha conhecimento sobre o que eram fitoterápicos em comparação com os do GI. Em ambos os grupos avaliados o termo biotecnologia era desconhecido para maioria das pessoas. Concluiu-se que essa falta de conhecimento por grande parte dos produtores em relação à maioria dos temas expostos mostra a necessidade de planejar e executar ações que auxiliem na difusão da informação entre produtores rurais, assentados ou não, por meio de estratégias práticas e funcionais.

Palavras-chave: assentamento; propriedades rurais; sistema produtivo; sustentabilidade.

INTRODUCTION

Crop farming and raising of livestock are specialized practices performed by an increasingly smaller number of people who have sought, at the same time, the intensive exploitation of resources. Conventional production, using fertilizers and chemicals for pest control, with no concern with environmental degradation, food contamination and poisoning of the farmers, is giving way to a sustainable production system, which seeks to give a correct final destination to agricultural waste. This alternative model of production prioritizes some principles over others such as the recycling of natural resources on the farm, composting and transformation of plant residues, the use of crushed rock for soil fertility correction and diversification and integration between vegetable farming and raising of animals (Campanhola & Valarini, 2001; Spadotto, 2006; Sá *et al*., 2014.).

The modern consumer of agricultural products has been concerned with environmental preservation and the acquisition of these products, valuing characteristics such as quality and origin (Figueiredo & Soares, 2012). In this context, the organic market shows strong growth in the industry of food products (Willer, 2011). In Brazil, 41.7% of farms intended for organic production have their economic activity based on raising cattle and other animals, 33.5% utilize the area for temporary crops, 10.4% for permanent crops, 9.9% for horticultural and floricultural crops, and finally organic forest products account for 3.8% of all organic products produced in the country (IBGE, 2006; Figueiredo & Soares, 2012).

Although organic agriculture has grown, the small number of companies fully certified for the supply of certain raw materials has slowed somewhat the growth of this production system (Zibetti *et al*., 2011). According to the Brazilian legislation, a product can only be named "organic" if it has been originated from a system that meets organic standards, considering the previous condition of the production unit and its currently ecological situation, which must be confirmed by certifiers. These certifications are essential for those who want to produce organically, since they provide consumer confidence in the quality and reliability of products, ensuring transparency of principles and practices governing the activity (Campanhola & Valarini, 2001; Darolt & Neto, 2002).

The transformation of conventional agriculture also involves different political and economic aspects, and some of the difficulties faced by farmers are the costs of implementation of the organic system, because of initial losses during the soil reconditioning and the uncertainties of the trade arising from the existing structural adversites (Assis & Romeiro, 2007). In addition, the small-scale production, the instabilities resulting from low managerial capacity, the lack of scientific research on family agriculture, the greater demand of labor, and the difficult access to bank credit also limit the changes in the conventional agriculture model (Campanhola & Valarini, 2001).

In the organic livestock production systems, one must seek the preservation of health and hygiene throughout the raising process, which must be consistent with the current health legislation. For immediate treatment and prevention of diseases of organic animals, it is preferable the use of some specific classes of drugs, among them herbal medicines (Brazil, 2014). These drugs derive from plant raw materials, have proven effectiveness, known potential risks, and reproducibility and consistency of quality (Brazil, 2004). There are several studies and reports on the applicability and feasibility of such drugs for different animal species, and their use in rural properties is done recurrently (Almeida *et al*., 2006; Sobral *et al*., 2010; Frison & Rover, 2014).

With the advance of science, different biotechnological methods have been systematized, with increasing social, economic and environmental benefits. There is a revolution in many sectors such as diagnosis and treatment of diseases, development and use of drugs in humans and animals, control of pests and diseases in plants and animals, and improving of food quality. These and other applications create opportunities to leverage the national development based on knowledge and innovation (MAPA, 2010; Faleiro & Andrade, 2011).

The aim of this exploratory study was to evaluate the way farmers settled in agrarian reform projects and farmers who are not participants in agrarian reform programs see the certification of their farms, the organic agricultural production, waste control, and the use of herbal medicine and biotechnologies.

MATERIAL AND METHODS

The participants in this study were farmers of Dom Fernando Gomes dos Santos settlement in the municipality of Itaberaí - Goiás, and farmers who are not participants in agrarian reform federal programs in the municipalities of Jataí, São Francisco de Goiás, Serranópolis, Bela Vista de Goiás, Jaraguá, Niquelândia and Pirenópolis, in Goiás. All participants had less than or more than 20 years farming experience, according to the assessment parameters adopted by Freitas *et al*. (2014). Data were collected between February and December 2013, using questionnaires during field practical classes in the disciplines of Large Animal Clinic and Surgery and execution of extension projects, with the participation of undergraduate, post-graduate and residency students of the Veterinary Hospital of the School of Veterinary and Animal Science of the Federal University of Goiás HV/EVZ/UFG. The activities were approved by the Ethics Committee of the Federal University of Goiás, with protocol No. 150/2010.

The farmers were divided into two groups with 15 individuals each: G1 with settled farmers participating in agrarian reform federal programs; and G2 with farmers not participating in agrarian reform federal programs. All participants, over a two-year period, were assisted by projects of extension and rural labor training conducted by the School of Veterinary and Animal Science of the Federal University of Goiás. The length of farming experience has not been a criterion for the division of the groups.

Questionnaires were applied randomly, in 15 of the 58 quotas existing in the Dom Fernando Gomes dos Santos settlement and farms located in the municipalities of Jataí, São Francisco de Goiás, Serranópolis, Bela Vista de Goiás, Jaraguá, Niquelândia and Pirenópolis . The 30 farmers addressed in this study correspond to 0.0051% of the total number of farmers in the State of Goiás, which is 582,786 people (IBGE, 2010), considering both groups of settled and non-settled farmers. The sample of 15 people in GI represents 0.11% of the total number of settled farmers in the State of Goiás, which is 13,231 settlers (INCRA, 2015). Therefore, the study was considered exploratory and the data obtained may be used by the same team to guide further studies involving other settlements and farms that are not included in the agrarian reform program.

Each questionnaire was divided into two parts: the first with seven questions, and the second with eight, totaling 15 questions. The farmers were guided to answer only the questions contained in the script applied. In the first stage of questionnaire application, questions were asked regarding farm certification programs and agricultural waste control. The questions on these topics referred to the knowledge of the owners about what is a farm certification program, activities necessary to obtain certification, interest in participating in certification programs, the need for proper guidelines to certify the farm, notions on agricultural waste and which type of waste were produced in their farms, destination of the waste produced in each farm and negative implications of agricultural waste production. The second part of the questionnaire focused on questions about organic agricultural production, herbal medicine and biotechnology. Questions on these topics were about the meaning of organic agricultural production, the importance of this production system and its greatest benefits, concept of herbal medicine, use of herbal medicines for treating animals, biotechnology, use of biotechnology in the farms, use of the advantages of biotechnologies and access to biotechnology.

The data were grouped by question and the percentage of responses calculated according to the alternatives chosen. Later, the data were analyzed descriptively and compared between the two groups (GI and GII), according to Sampaio (2010).

RESULTS

In GI, all (100%) farmers had less than 20 years farming experience. In GII, 26.7% of farmers had less than 20 years farming experience, and 73.3% had more than 20 years farming experience.

In GI, 80% of the participants did not known anything about farm certification programs while 20% had heard about them. In GII, 26.7% knew what they were about, 60% did not know anything about them, and 13.3% had heard about them. Participants in GII who said they knew the meaning of a certification program gave as examples artificial insemination and embryo transfer.

In GI, 6.7% of the farmers mentioned residue control in milk as one of the measures to be adopted to achieve farm certification and 93.3% did not know what to do. In GII, 26.7% of the farms said they were aware of the necessary actions to ensure the certification of their farms, which included sanitary control of the herd and waste management in the farm, but 73.3% of farms in this group were not sure what should be done.

In GI, although many participants did not know anything about certification, after a brief explanation, all (100%) settled farms have expressed interest in participating

in a certification program. Of these, 33.3% reported interest in adding more quality to their products, 6.7% stated that this would be the correct way of working and 60% could not explain. However, in GII, 46.7% of the farmers wished to participate in these programs, but 23.35% of this total did not explain the reason for their interest, and 23.35% sought to improve the quality of their products, thus increasing the profitability of the business. In addition, in GII, 53.3% of the farmers said they had no interest in participating in these programs.

When asked about the need for trained professionals and proper guidance for the acquisition of certification for their farms, 100% of the producers in GI and 73.3% in GII said that such assistance would be important. However, 26.7% of farmers in GII can do without this guidance and instructors. In GI, 46.6% of the farmers would prefer to receive information through technical visits, 13.3% through technical visits and lectures, and 40%, technical visits, distance learning courses, lectures and field days. However, in GII, 45.45% chose all these forms; 27.27% chose technical visits, lectures and field days; 9.1% preferred field days; 9.1% chose lectures and 9.1% chose only technical visits.

Regarding agricultural waste, 33.3% of the farmers in GI knew the meaning; 20% did not know and 46.7% only heard about it. In GII, 60% of the farmers said they were aware of the subject, while 40% merely heard about it. In GI, among those who said they knew about agricultural waste, 40% reported to produce residues of antibiotic, pesticides, faeces and urine of animals in their farms; 40% produced residues of faeces and urine, and 20% produced antibiotic residues. In GII, 88.9% of the farmers said to produce residues of antibiotic, pesticides, faeces and urine of animals, while 11.1% said they produce residues of antibiotics and pesticides. Following, after explaining the meaning of agricultural waste to those who were not aware of the subject, all participants of both groups reported the different destinations of the waste produced in their farms (Figure 1, A and B).

When the theme approached was the different sectors that the production of agricultural waste could harm, 13.3% of the farmers of GI responded that the environment was the most affected, 6.7% pointed out human health and the environment, concurrently, and 80% reported that both human health and animal and the environment were compromised. In GII, 100% of the farmers responded that the last three sectors mentioned are at the same time the most damaged by the production of agricultural waste.

As for organic agriculture, 53.3% of farmers in GI said to be aware of it; 6.7% said they were not and 40% only heard about it. However, in GII, 60% said they knew what organic agricultural production is about, while 6.7% reported they did not know about it, and 33.3% only heard about it. After debating with those who had not yet knowledge on the subject, in GI, 100% of the participants confirmed the importance of organic agricultural production. In GII, 93.3% agreed that this is an important production system, but 6.7% of the farmers in the same group said that the agricultural production model is dispensable.

All participants of GI described as the greatest benefits of implementing the organic model of production the reduction of agricultural waste, sustainable development, adding value to the product, increased profitability, as well as health benefits. But in GII, the responses were more segmented: 80% cited the same benefits above mentioned, 6.7% pointing out the reduction of agricultural waste, and 6.7% highlighting only the health benefits.

When questioning about herbal medicines, 20% of farmers in GI knew how to define them, 53.3% did not know to describe what they necessarily were, and 26.6% heard about the subject. In GII, 60% of the farmers knew the meaning, while 40% did not express an opinion. For the settled farmers, herbal medicines would be an alternative form of treatment for their sick animals, since 100% of the participants of this group reported that they would use them if necessary. In GII, 33.3% of the farmers said they did not use them and 66.7% defended their use and application in the farm routine.

The term biotechnology was known by 46.7% and unknown by 20% of the farmers in GII. Also, in this group, 33.3% of farmers said they only heard about the theme. Opposite result was found in GI because 13.3% of the settled farmers did not know what biotechnology meant, and 86.7% only heard about it. After further explanations on the subject for those who still did not know about it, or had only a superficial view of it, it was found that 53.3% of non-settled farmers of GII and 100% of the settled farmers of GI were using biotechnologies in their farms. Figure 2, A and B, shows the distribution of the biotechnologies used by farmers of both groups.

As for the advantages of using biotechnologies, 66.7% of settled farmers in GI believe that they contribute to a greater gain in production, prompt the development of new biotechnologies and the adoption by the community, promote better health of livestock and raise the genetic quality of the animals. To 13.3% of the farmers, the application of these tools leads to higher production gains, more incentives for the development of new biotechnologies, health improvement of the herd and increase the genetic quality of animals. The greater gain in production, encouraging the adoption by the community and better genetic quality of animals were the opinion of 6.7% of the settled farmers. The incentive for the creation of new biotechnologies and the better genetic quality of the animals were the advantages mentioned by 6.7% of the participants of this group. Finally, 6.7% of the settled

farmers believed that the biotechnologies only added benefits in improving the herd health.

Analyzing GII data on the benefits of using biotechnology, 6.7% of non-settled farmers claimed to improve production and profit, prompt the development of new biotechnologies, encourage the community to also resort to the use of these tools, improve herd health and the genetic quality of the animals. Other 6.7% of the farmers reported as advantages the increase in production and profitability, the development of new biotechnologies, and the improvement in health and genetic of animals. The greater gain in production and income, improved health and genetic quality of the herd were mentioned by 20% of farmers in GII. In addition, in this group, 6.7% of the farmers stated as unique advantages the improved health and genetic quality of the herd, while 13.3% said that the increase in production, profitability and gains in genetic quality were the only advantages observed. The greater gain in production and profit and better genetic quality were listed by, respectively, 13.3 and 6.7% of the farmers. The improvement in quality of life was mentioned by 6.7% of non-settled farmers, while 20% could not give an opinion about the advantages.

Access to biotechnology was appointed as difficult by 66.7% and easy by 33.3% of the settled farmers of GI. Different results were recorded for GII, where 13.3% of the farmers stated that access to biotechnology is easy and 86.7% reported having difficulties in acquiring these tools. Farmers in GI mentioned as major obstacles to the acquisition of biotechnology the policy issues of prioritization, lack of monitoring and search by the settler, lack of knowledge of where to find these technological

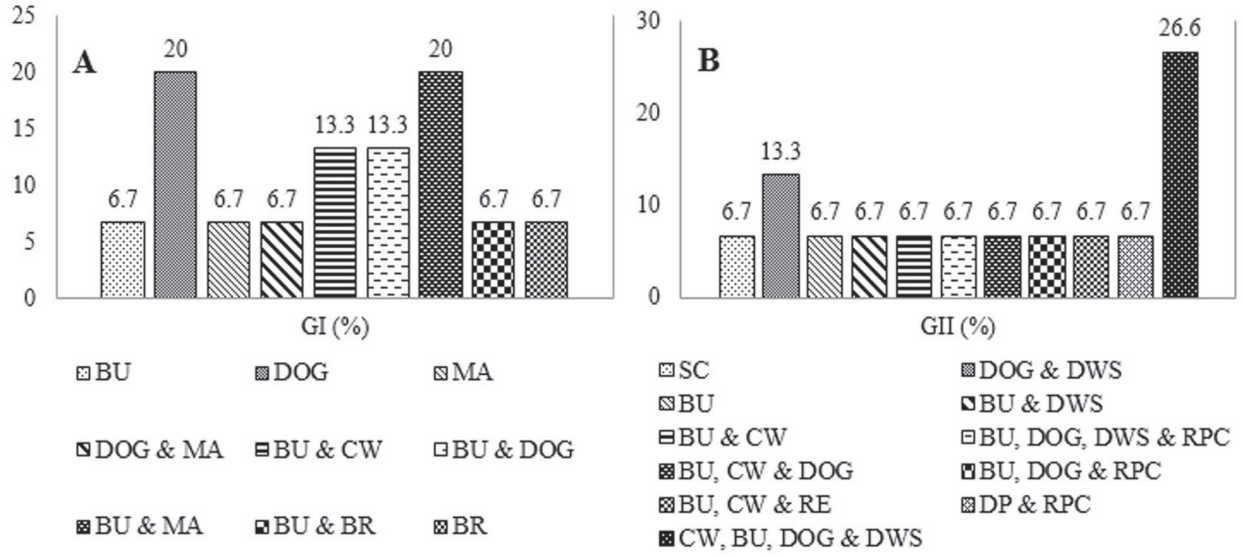

Figure 1: Destiny of agricultural waste produced in the farms of settled (GI) and non-settled farmers (GII). **BU**: Burning; **DOG**: Dumping waste on open ground; **MA**: Manuring; **CW**: Common waste; **BR**: Burying; **SC**: Selective collection; **DWS**: Disposal in water sources; **RPC**: Return of pesticide containers; **RE**: Recycling; **DP**: Decanting pools.

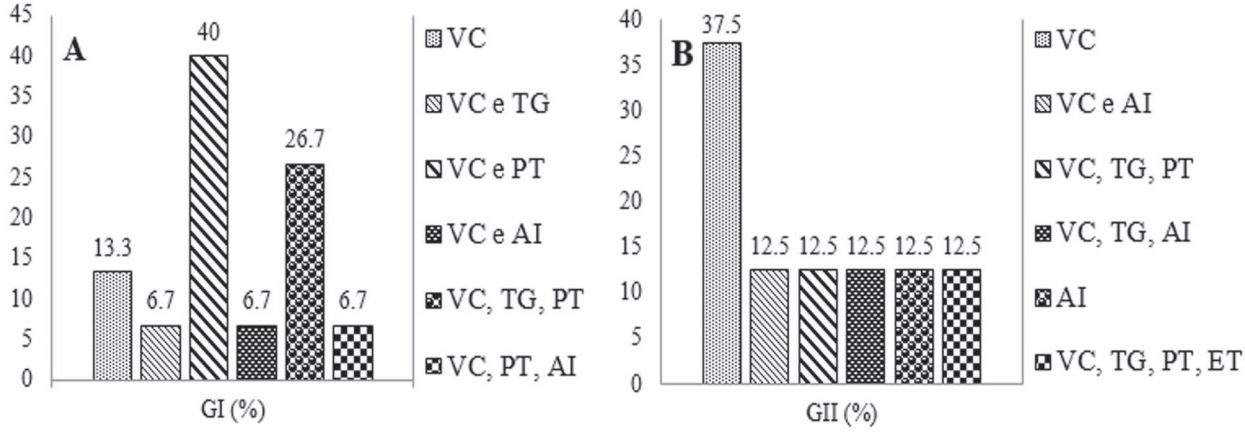

Figure 2: Distribution of different biotechnologies used by settled (GI) and non-settled farmers (GII). **VC**: Vaccination; **TG**: Transgenic; **PT**: Phytotherapy; **AI**: Artificial insemination; **ET**: Embryo transfer.

resources, bureaucracy, lack of information on the subject, inadequate infrastructure, inadequate financial conditions and the low incentive of the government. Participants in GII mentioned as major barriers to obtaining biotechnologies the poor quality technical assistance, high financial cost and the lack of knowledge by the farmers. Even those farmers of GII who claimed easiness of acquiring biotechnologies commented that the high costs of these resources make it difficult to purchase.

DISCUSSION

It was evident among farmers of both groups certain lack of knowledge on farm certification programs. However, the results showed that more non-settled farmers than the settled ones know what farm certification means. According to Almeida *et al*. (2010), the experience of land reform in Brazil and the technical assistance provided to this area is recent and marked by weak structure and service delivery. Therefore, the poor quality of the technical assistance and the consequent poor transmission of information to those who live in the settlements hinder the dissemination of knowledge on farm certification. The lack of external monitoring can derail the formation and continuation of certain groups (Silva, 2011).

The full operation of an information system in rural settlements is an achievement that will be acquired in a long-term process dependent on the advances and setbacks in the struggle for affirmation of the agrarian reform. However, decisive factors are the vitality and creativity of the movement as a whole, diverse and also plural, involving at the same time, different classes, such as students, advisory institutions and social movements to build platforms and actions that will win various sectors of society. In social pressure lies the power to convince the government to carry out popular policies, which have been secularly denied (Silva & Araujo, 2008).

Even those who have shown to know the subject gave as examples of certification programs activities that are not compatible with these programs, such as artificial insemination and embryo transfer. This finding indicates the need to implement bold policies for dissemination of information about certification in rural areas. Martins *et al*. (2006) reported that despite the gained prominence of organic products in sales in large supermarket chains, it is appropriate to expand the information about the certification process, as this will give more security to the consumer. Therefore, it is argued that the government and the certifying companies should also create effective strategies for farmers to increase their interest in the certification of their farms, or recognize that this attitude can be a viable alternative to add greater value to their products.

Although a small percentage of farmers in both groups has declared to know what activities should be performed to obtain certification, no one has demonstrated knowledge of the need for certifying companies to implement the actions. As it is known, certification is issued by different institutions in the country, which have their own requirements for the provision of a quality mark, and organic products may be traded only if duly certified by an officially recognized body, in accordance with criteria established by regulation (Campanhola & Valarini, 2001; Brazil, 2003). Pinheiro and Bittencourt (2012) reported that there are several reasons for the low number of certified agricultural establishments in Brazil, however, this study indicates, primarily, the existence of failures in the dissemination of farm certification programs, for both the settled and non-settled farmers. As a result, this situation limits the adhesion of farmers to organic certification, since they have no knowledge of the main agencies that provide and guarantee the quality stamp.

Although most producers of both groups showed no immediate knowledge of farm certification programs, after a brief explanation of the theme, all those belonging to GI (100%) and part of GII (46.7%) expressed interest in participate in these programs. According to Honorato *et al*. (2014), the farmer, even smallholder, has been motivated by the demand of organic products and their higher added value, which is an opportunity to improve the economic reality of their farms and, consequently, their families' quality of life. Analyzing the lack of interest of many non-settled farmers to convert to the organic system in this study, it can be inferred, in part, that the long time in the conventional system may have influenced their decisions. Probably the historical roots generated by the long period of rural family activity within the traditional agricultural production system make non-settled farmers believe that this system provides financial returns and stability necessary for their survival.

The level of education of all settled and non-settled farmers who have expressed interest in participating in farm certification programs was low. Similarly, Assis & Romeiro (2007) and Mazzoleni & Nogueira (2006) found that the number of family farmers who did not complete even the elementary school was high. This factor can limit the implementation and execution of actions in order to certify the farms. It is assumed that low educational level is translated directly into difficulties to have access to information, thus restricting the demand for the implementation of other productive models. This condition can limit access to knowledge, which would reduce the potential resilience of farmers (Andrade *et al*. 2013).

Okuyama *et al*. (2011) reported that preparatory courses have been successful among settlers, leveling, through dialogues and workshops, knowledge about the legislation

required for certification. It is also thought that the preference of the settlers for technical visits can be linked to the greater effectiveness this type of assistance promotes. In the settlement, the establishments are situated in the same locality, which allows the evaluation of multiple areas at the same time and the adoption group certification systems, which, according to Okuyama *et al*. (2011), contribute to reduction of costs and a consequent increase in product marketing value.

Most non-settled farmers probably chose the technical visits, distance learning courses, lectures, and field days, all at same time, because the needed information is commonly obtained through one or more of these means. In addition, for certification purposes, the means of assistance should necessarily focus on the requirements for the acquisition of this document. Campanhola & Valarini (2001) pointed out that farmers interested in having their farms certified face some difficulties in relation to technical assistance because of the lack of professionals that provide expert assistance to organic production in the public sector. Thus, the farmers have to use the assistance of certifying companies and other institutions, making the process of certification and the conversion to other production systems highly costly.

Farm size, type of operation and large herds in farms that do not belong to agrarian reform programs tend to produce larger quantities of waste, making farmers in GII more aware on the issue. Another aspect that may explain the higher percentage of waste produced by non-settled farmers is related to the longer time in conventional farming. Gebler *et al*. (2007) claimed that conventional agricultural production has also been widely practiced since the demand for cheap food is greater than the environmental pressure. This fact has led to the economic maximization of agricultural production, despite leading to environmental imbalance.

With respect to the destiny of agricultural waste produced in the settled farms, it was found that most farms used more common forms of disposal, dumping waste on open ground and burning, in association with the use of animal manure for fertilization. Similarly, Nogueira *et al*. (2013) reported that most settled farmers destined their organic waste for composting to be used in vegetable gardens, orchards and flower beds, besides burning in containers or disposing wastes that could not be used or recycled in dumping holes. Because these measures are practical and easy to perform, they are the most used by both settled and non-settled farmers, as they provide a quick means of disposal and avoid waste accumulation in the farms.

Outside the settlement, many farmers also opted for common means of waste disposal, with a portion of farmers sought to discard their farm waste in an alternative way, carrying out the selective collection, return of empty pesticide containers to stores and the use of decanting pools. However, it is still a small number of farmers who adopt this type of management. Kuns & Encarnação (2007) stated that the critical situation that is experienced in several producing regions reflects the need to consider carefully waste handling. The fact that a small percentage of farmers look for alternative methods of waste disposal suggests that people involved in agricultural production have been concerned with degradation and generation of pollutants, since residue accumulation may affect different sectors of agribusiness and society. Albuquerque (2005) discussed that waste control could be carried out more effectively by implementing sanitary education projects, such as pesticide handling, human health and the environment.

Many farmers of the two groups said that both human and animal health and the environment are harmed by the production of waste, indicating that some landowners are aware of the actual situation. Still, even knowing the negative consequences of the improper farm waste management, many farmers neglect the fact, as this study verified, and waste disposal is most often performed incorrectly. The agricultural production model based on the green revolution, with significant social and environmental impacts, has been increasingly questioned, making room for alternative ways such as agro-ecological production, which goes far beyond simply replacing chemical inputs by natural ones. This kind of production system is on the rise, aiming to work within the different agro-ecosystems in an economically and ecologically sustainable way (Rosset, 2006).

A number of farmers belonging to both groups claimed to have knowledge of organic agricultural production and that this practice is important. Queiroz *et al*. (2014), surveying farmers about organic products, found that more than half of respondents held knowledge of the subject, highlighting its relevance. Martins *et al*. (2006) also reported the importance of organic food production, since it is a production system that aims at economic and ecological sustainability, adding social benefits and contributing to supplying and widening the range of export commodities. A feature that gives credit to agrarian reform and permanence of farmers on the land is the growing concern about environmental factors and quality of life. Image, taste, origin and quality have demanded a greater concern of world society, especially by those who have better acquisitive and educational conditions. Its objective is based on the purchase of food produced according to techniques that respect the environment and processes that contribute to the welfare of those who produce it. In this context, movements such as the solidarity economy propose closeness and complicity between production and consumption (Silva & Araujo, 2008).

Greater knowledge of farmers on organic agricultural production can be attributed to the wide dissemination of information about the type of food produced in this production model. However, to the authors of this study, the information should go beyond the simple definition of what organic food is. It should also include the methods for the insertion in this market, so that those who have interest in producing in this system can know where to start and what steps they must follow so the product reaches the consumer's table. According to Campanhola & Valarini (2001), organic farming is a viable means for insertion of small farmers in the market.

Farmers in the group of settlers have shown little knowledge about herbal medicines, while more than half of the non-settlers showed knowledge on the subject. It is suggested that the long farming experience of non-settlers and their higher level of education may have influenced a more comprehensive knowledge about these medicines. However, our findings differed from those reported by Almeida *et al*. (2006), in which 73.9% of respondents have demonstrated knowledge of herbal medicine. It is worth noting, that the questions were addressed to Veterinary Medicine students, differing from the public analyzed in this study. Even not having information on the subject, most settlers and large part of non-settled farmers, after having been informed, said that, if necessary, they would use herbal medicines to treat their animals, suggesting that they accept an alternative method of treatment with medicinal plants. Frison & Rover (2014) stated that major advances have been recorded in farms specialized in organic livestock when a significant number of these establishments started to use herbal medicine as an alternative method of treating sick animals.

Although most of the settlers do not know or have only heard about biotechnology, all in this group, after discussing the subject, affirmed to make use of these technological tools in their farms. Contrary to this finding, a significant number of non-settled farmers said to know the meaning of biotechnology, but few said they make use of some of these tools, indicating a certain lack of information on the subject. Therefore, it is clear that many farmers use something innovative in their properties, but do not know its origin, meaning, how it is manufactured, what the possible outcomes and adverse effects, or how and where to use. However, one cannot overlook the fact that the use of these innovative technologies has contributed to enhance the quality of life and open new avenues for economic, social and environmental development (MAPA, 2010). Furthermore, the fact that the settled farmers increasingly use vaccination and herbal medicine, and the non-settled farmers use more vaccination may be justified by the particular productive reality of each of these farms.

After getting knowledge of the subject, the settled farmers and most non-settled farmers listed many advantages to the use of biotechnologies, thus confirming the benefits of its application in different production levels. Some of the specific objectives for the development of agricultural biotechnology in Brazil are strengthening and improving the national production bases and the competitiveness of the agricultural sector, incentives for creating innovative products, development of new production technologies, and increase of productivity and quality through the use of new products, processes and services (MAPA, 2010).

Several difficulties to acquire biotechnologies were reported by farmers in GI and GII, however, it appears that the solutions depend on a number of factors and parties, involving the farmer, the government and funding institutions so that these difficulties are overcome and access to information, technical assistance and credit can be facilitated. The data analyzed here suggest that these three pillars are essential to ensure access to biotechnologies, with greater clarity and ease.

The paradigm of agricultural modernization, which held practices, policies and theories as the main tool to generate income and development in rural communities, can and has been replaced by a new paradigm, the rural development. In this case, the goal is the adoption of an innovative model for the agricultural sector, considering certain aspects such as the search for synergies with local ecosystems, the appreciation of economy of scope at the expense of large-scale economy, and pluriactivity of rural families. Thus, rural development seeks to create new products and services in union with new markets, reducing costs through innovative technological trajectories and rebuilding agriculture in terms of rural economy and regionally. The new practices, such as landscape management, nature conservation, agro-tourism, organic farming, production and regional specialties, direct sales, among others, make rural development one process consisting of different angles, in which features that would be considered as expendable in the modernization paradigm take other positions, establishing new relationships with different companies and urban sectors (Van der Ploeg *et al*., 2000).

CONCLUSIONS

The lack of information on farm certification programs by settled and non-settled farmers is evident, indicating the need for the government and certifying companies to adopt bolder, more effective and more permanent strategies for dissemination of information about certification, including permannet technical assistance to farms.

The longer time spent in the conventional production system tended to increase the production of farm waste, and its improper disposal is still a reality experienced in several farms. Many farmers had knowledge on organic agricultural production, but were unaware of the needed guidance for those interested in participating in the activity to be able to initiate, adopt and pursue this productive system.

The favorable position of farmers of both groups in the use of herbal medicines reflects the trust and reliability that these medications achieved. But the lack of knowledge about biotechnologies shows how the benefits of these tools to the agricultural production system still need to be disseminated, and the access to information, technical assistance and credit is the most promising way for their successful adoption in farms.

Finally, although the sample is small compared to the number of settled farmers in the State of Goiás, and considering only the Dom Fernando Gomes dos Santos settlement, the total of 15 settlers is a representative number, because among the 58 plots existing in the settlement, only these settlers had already participated in some extension project or training of rural labor conducted by the EVZ/UFG, being on hand to answer the questions. With regard to the non-settled farmers, the sample used was consistent with the sample of settled farmers, as one of the inclusion criteria was the participation in any extension project and training of rural labor conducted by the same institution.

Although the data represent, in part, the thought of some settled and non-settled farmers, it is recommended, for a better demonstration of the reality of the state of Goiás, further studies involving a larger number of farmers with the same profile of those included in this study. Thus, the mapping can be performed with greater efficiency so that resources and incentive policies for rural development may be better allocated and applied.

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