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ORGANIZATION OF LEAFY VEGETABLE CULTIVATION SYSTEMS IN NEW MUTUM-MT

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ABSTRACT

The objective of this study was to find out a manner of conducting systems of leafy greens crops in the gardens of Nova Mutum - MT. Seven farmers who produce and sell leafy greens were identified, interviews with semi-structured application forms were used. The areas of the interviewees are small and located close to grain crops. The lettuce is cultivated in a conventionally system is the most found in the productive units, according to the farmers' report, the main pest for lettuce cultivation is the soybean looper *(Chrysodeixis includes*) and in the cabbage the diamondback moth (*Plutella xylostella*). The chemical control is the main method used in phytosanitary control. Farmers do not use standards practices that can optimize the organization and management. The cultivation of leafy greens is based on the intensive system with the use of fertilizers, the accentuated use of the soil and the lack of adoption of conservation practices, which, together with the strong pressure of the pests of this region, and the lack of technical support, makes the farmer more and more dependent on the use of pesticides.

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INTRODUCTION

In the mid-northern region of the state of Mato Grosso, the colonization process occurred in the 1970s leveraged by the construction of BR 163 from Cuiabá - MT to Santarém - PA. This provided the expansion of the agricultural frontier, especially in grain production, currently primarily responsible for moving the state economy. This condition has been responsible for the migration of people from the most diverse states, for the occupation of the space considered "demographic void" (MARGARET, 2013). The municipality of Nova Mutum is located in this region, 240 km from the state capital. The economy is based on the provision of services, agroindustry and agriculture, with emphasis on soybean and corn production, producing 1,181,830 tons of soybean crop 2014/2015. It is considered a municipality with one of the largest Human Development Index (HDI-M) in the State, of 0.758 (IBGE, 2016). In 2010, the population of Nova Mutum was 31,649 inhabitants, currently estimated 41,178 inhabitants in the municipality, an increase of 23% in six years (IBGE, 2016). This population growth increased food demand, especially leaf vegetables such as lettuce, mortar, parsley, chives, coriander, arugula, cabbage, cabbage leaf, among others. Leafy vegetables are important in human food, because they are rich in vitamins and food fibers (CARVALHO*et al*., 2006). However, the form of cultivation of these vegetables is intensive, with the use of pesticides, and can cause food insecurity (ANVISA, 2014). This is due to the simplified management of cultivation systems, intensifying the use of irrigation, fertilizers, pesticides and the preparation of mechanized soil (FILGUEIRA, 2013), in addition to production systems with the purpose of supplying the constant market demand . In this context, the farmer often carries out the consecutive cultivation of a single species (SEABRA JUNIOR *et al*. 2012), consequently higher occurrence of pests and diseases. Another problem in regions such as the middle north of Mato Grosso, where patron farming predominates, is the pressure of pests from crops, which can cause damage in the production of vegetables, in addition to intensifying the use of pesticides, the increasing the cost of production and imbalance in agroecosystems. Thus, the use of conservation practices such as crop rotation, consortia, no-tillage or minimal cultivation, green fertilisers and the use of surrounding band (plant barrier) can minimize the problems arising from this production system, making agroecosystems more complex,

favoring functional biodiversity and promoting a balance between pests and natural enemies (MICHEREFF FILHO *et al*., 2013). Therefore, the present study aimed to diagnose the way of conducting hard-leaf vegetable cultivation systems in the gardens of the municipality of Nova Mutum, Mato Grosso.

MATERIAL AND METHODS

The survey was conducted between January 2015 and March 2016. The interviews conducted with family farmers who grow and commercialize leafy vegetables in the municipality of Nova Mutum - MT, from January to February 2015, months of high rainfall in the region (NOGUEIRA *et al*., 2010). To identify farmers and locate the production units, consultations were held to the Union of Rural Producers, agricultural stores, Mato Grosso Research, Assistance and Rural Extension Company (EMPAER), Secretariat of Municipal Agriculture, markets and free fair of the municipality. Nine farmers who produce leafy vegetables were identified, seven of whom consented to participate in the research, which respected the necessary ethical precepts, opinion no. 1,362,082 CEP-UNEMAT. The interviews were directed to the responsible for the cultivation, for this, a semi-structured form was applied, containing 43 open and closed questions, which dealt with data on the property, organization of production systems, cultivation structure and phytosanitary management. The information collected in the research was tabulated in an spreadsheet and descriptive statistics (absolute frequency - Fa and relative frequency - Fr) was performed in the OfficeExcel 2010 program (Microsoft).

The production units were carried out, with the help of the Global Navigation Positioning System (GPS), to obtain the geographic coordinates of reference of the production area, associated with the digital photographic record. After collection all information was stored and processed, then creating a Geographic Database (BDG). Spatial data allowed the elaboration of thematic maps of production systems, according to a methodology proposed by Cochev *et al*.(2014). For the elaboration of the sketch of the production units, each farmer presented an image of the cultivation area obtained in Google Earth (2014), requesting that they carry out the design of the production units. All drawings were digitized and analyzed, aiming at understanding the limits of vegetable cultivation areas.

RESULTS AND DISCUSSION

Structure of the production units (UP) of leafy vegetables in Nova Mutum – MT

Vegetable production activities are recent in the municipality of Nova Mutum, ranging from 1 to 12 years, with cultivation areas close to the consumer center, 1 to 16 km. that the total area ranges from 2 to 25 ha (Table 01). However, the areas destined for cultivation do not exceed 30% of the total area of production units. The areas destined for the cultivation of vegetables in Nova Mutum are small, currently used to meet the demand of the local market. Nespoli *et al*. (2015) also found that vegetable production units in Alta

Table 1. Total size of the units, with cultivation of vegetables, in summer, and percentage of the area with cultivation of lettuce, broccoli, cauliflower and other vegetables, Nova Mutum – MT

	Total property area (ha)	Area with vegetables (ha)	Area with lettuce	Area with broccoli	Area with cauliflower	Other vegetables
1	6,5	0,2	16,6	26,7	6,7	50,0
2	25,0	4,0	-	1,5	1,5	97,0
3	2,0	0,5	50,0	20,0	20,0	10,0
4	4,0	0,5	4,0	2,0		94,0
5	3,0	0,3	3,0	-	3,0	94,0
6	16,9	4,0	17,7	-	11,1	71,2
7	10,0	2,0	10,0	2,5	25,0	62,5

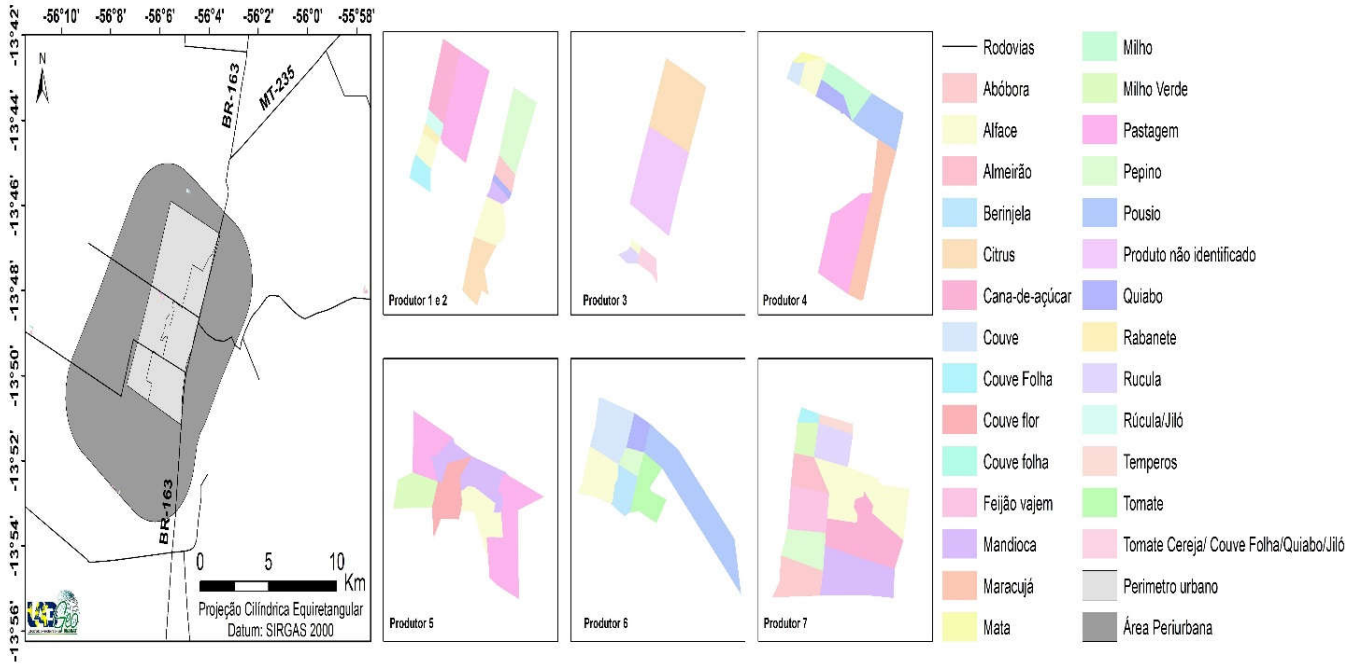

Figure 1. Thematic map of production units with leafy vegetables, fruits, tuberous and flowers species in vegetable production systems in Nova Mutum - MT

Floresta – MT are small and ranged from 1 to 50 ha and the areas destined for cultivation range from 0.3 to 2 ha.Inagaki *et al*. (2011) reported that the size of vegetable production units mapped in Cáceres - MT ranged from 0.03 to 1.5 ha, an average of 0.7 ha. This is a common feature of diversified farmers located near urban areas. The growth of municipalities makes producers have a competition for the use of the area with the real estate market (FILGUEIRA, 2013). Among the interviewees, five farmers had lettuce as the main crop produced and the growing time of this species from 3 to 12 years. The other two, although cultured lettuce, reported having as main source of income the fruit vegetables, such as okra and cherry tomato. The production of these vegetables is carried out throughout the year due to the need for supply of the local market. This reality coincides with the results found by Cochev *et al*. (2014), when studying commercial oil production systems in Alta Floresta-MT, where farmers reported that they grow hardwood vegetables also by the demand of the local market, among other characteristics, such as agricultural fitness, self consumption, production cost and rapid return on investment value. Among the species are lettuce, arugula, parsley, coriander and chives. Twenty-five species of commercially grown vegetables were found in the production units (PU) located in Nova Mutum – MT, 32% of which were leafy vegetables, 40% fruit vegetables, 20% tuberous vegetables and 8% vegetable flowers (Figure 01). In the production of vegetables it is common for farmers to continuously grow a large number of species grown simultaneously in the vegetable garden. This form of diversification does not always follow a planning aimed at improving cultivation, and cannot be considered crop rotation, because the realization of crop rotation, in vegetables, has as its criterion the non-cultivation of vegetables of the same family and area in the 12 months (MICHEREFF FILHO *et al*., 2013).

Mota *et al*. (2010) found that the municipality of Campo Verde/MT produced 28 different species of vegetables, the most produced being cassava, chuchu, lettuce, zucchini, green corn, cucumber, okra, sweet potatoes, tomatoes and beans pod. Nespoli *et al*. (2015) found that, in vegetable production systems in the municipality of Alta Floresta - MT, 52.9% of farmers produce leafy vegetables, fruits and tuberous; 26.5% produce only hard-to-let vegetables, as it has a rapid return economic; 11.9% only fruit vegetables and 8.7% only tuberous vegetables. As for the adopted cultivation system, all farmers use the conventional system and one interviewee also uses the hydroponic cultivation system. In general, seeds are acquired in agricultural companies in the region and seedlings are produced in a protected environment installed near the cultivation areas. The production of leafy vegetable seedlings is performed using substrate and expanded polyethylene trays and 128-cell polyethylene. Five of the interviewees use commercial substrate based on pine bark and two formulate their own substrate, using cotton residue, earth and laying hen manure. By formulating the substrate, farmers do not pay attention to the need for substrate sterilization, observing weed stems in trays with vegetable seedlings. Seedling irrigation is carried out manually (watering) in two periods, morning from 7 am to 8:00 am and afternoon from 16 to 5 pm. The height of the protected environments used for seedling production ranged from 2 to 4m and the countertops have height, ranging from 0.30 to 1.00m. This can impair the quality of seedlings, since for tropical regions it is recommended height of right foot above 3.0m (REIS, 2005; PURQUERIO and TIVELLI, 2009) and benches about 0.3 m high. The coverage of the protected environments is carried out with plastics, thicknesses ranging from 100 to 200 microns, the most used being 150 microns. Regarding the positioning of seedling nurseries, six were positioned in the East/West orientation and one in the North/South position. It is recommended that the positioning of the protected environment be oriented in the East/West direction, a position with a greater number of hours of light and adequate ventilation for the development of plants (NUNES and SANTOS, 2011). Purquerio and Tivelli (2009) reported that in places of high temperatures the slope of the terrain should be observed to facilitate the passage of hot air through the structure, due to the air outlet by the side, at the highest part of the terrain. Another means of reducing the temperature of the interior of the environment is by positioning the structure so that it favors natural ventilation. This occurs when the environment is installed with the smaller dimension (front) in the direction of the predominant wind current. In general, it was observed that seedling production nurseries were installed improperly, close to vegetable cultivation areas, which favors the migration of pests and pathogens from cultivation to seedlings, increasing the spread of diseases. This generates additional costs with pesticides, hinders the management of pests and diseases, besides causing great loss of production. The cultivation of vegetables is more complex of this compared to perennial and annual species, because they are short-cycle and present specific limitations regarding the growing season (SANTOS *et al*., 2007). To grow leafy vegetables all year round, it is necessary to use techniques that allow production in the period of high precipitation and high temperatures.

Thus, the cultivation of vegetables in the period of high precipitation is carried out in a protected environment, and six of the interviewees used protected environment with zenital opening (rectilinear convective ceiling model), a farmer among the six uses also the low tunnel. A farmer who produces in the hydroponic cultivation system and uses protected environment (arch ceiling model), but also by cultivating in the soil, uses the low tunnel for this purpose. The protected environments with zenital opening were built in the production units by agreement between SEDRAF (Secretariat of State for Sustainable Rural Development of Family Agriculture) and the City Hall of Nova Mutum, through the project entitled "Olericulture Project", with the objective of improving the production of vegetables for commercialization via CONAB (National Supply Company) for school meals, especially in the period of high precipitation, between harvest of leafy vegetables in the region. Which would also contribute to income generation farmers. To benefit from the "Olericulture Project" and receive a material "kit" for irrigation and construction of the protected environment, farmers needed to meet some requirements: to be a small producer of vegetables; be located around the city; not have financial conditions to implement protected environment and have low investment for irrigation installation; be fairer with box at the Municipal Fair; produce for school meals and CONAB (municipality and state); take on the reponsability by the labor force in the construction of the protected environment and assembly of irrigation. All interviewees reported that in the period of high precipitation (October to March) the cultivation of some

species of leafy vegetables such as lettuce, chives, arugula, almeirão, parsley and coriander is carried out under protected environment and in the dry season (April to September) in the open. The reason why farmers invest in a protected environment for the cultivation of hardwood vegetables is high rainfall, as this makes it difficult to develop some species, increasing the amount of inputs and the incidence of diseases and pests, consequently increases the production cost (PEGADO *et al*., 2004). Silva *et al*. (2015) by growing lettuce in the municipality of Tangará da Serra - MT, where climatic conditions resemble those of the municipality of Nova Mutum - MT, found that in the period of high precipitation production was better under protected environment if compared to open pit cultivation. The difficulty in organizing cultivation systems is related to the adopted (conventional) crop model and restricted access to appropriate agricultural techniques (crop rotation, green fertilizer, crop range, consortium and no-tillage) that can be intensive agricultural systems in the case of vegetables. Often the infrastructure of the production unit is inadequate, the cultivation area is small, which forces the farmer to repeat several cycles in the same construction site. The diversity of species produced in the production unit influences the organization of the cultivation area, since several species with different cycles are produced simultaneously, as is the case of leafy vegetables that have the cycle, ranging from 30 to 60 days in the field and vegetables fruits from 90 to 130 days (FILGUEIRA, 2013). In the production units analyzed it was found that the cultivation of leafy vegetable species, such as lettuce, leaf cabbage, arugula, almeirão, chives, coriander and parsley are produced in consecutive cycles, in the same area. This is due to the use of irrigation, protected environment and soil fertility that causes farmers to choose not to expand or change the cultivation area. However, if the cultivation system were planned in a perspective to prioritize crop rotation, division of plots and green fertilization, irrigation systems could be resized.

When asked if culture rotation is performed, farmers reported performing only when there is a high incidence of diseases associated with the inefficiency of chemical control. This evidences the lack of knowledge about the benefits of crop rotation in vegetable cultivation, by promoting improvement in the organization of the production system and, at the same time, potentiating pest and disease management. According to Filgueira (2013) crop rotation is an important technique in the cultivation of vegetables, since these species are attacked by a multitude of pests and diseases. This practice consists of alternating species of different families in an area over time, which reduces the cycle of pests or pathogens of certain species, increasing phytosanitary control (AMARO *et al*., 2007). The use of root-system species that explores different soil depths contributes to nutrient cycling and soil structuring, as well as in the use of species that produce a large amount of biomass improving the replacement of organic matter in the soil (ÂNCANTARA and MADEIRA, 2008). However, organizing production units in crop rotation systems is another problem due to the demand of the local market, which drives the farmer to intensify the production of few species. Thus, the farmer produces from one to two species of the same botanical family, in the same area all year round, to meet local demand. However, cultivating species from the same botanical family, in the same area, in repeated cycles, inserting consecutive cycles, contributes to the imbalance of systems (FILGUEIRA, 2013). In all production units the cultivation is carried out on coated (conventional) soil, with the aid of grid, rotary hoe and plumber. In the conventional vegetable cultivation system, soil management is usually quite intensive, can negatively affect the chemical, physical and biological properties of the soil, by reducing aggregates and loss of organic matter (ÂLCANTARA and MADEIRA, 2008; VALARINE *et al*., 2011). According to the reports of farmers, conservation practices such as no-tillage, the use of green fertilizers and minimal cultivation are not carried out due to their little access to cultivation techniques. These practices, which are the basic principles of agroecology, can be adopted for management by reducing soil and nutrient loss by surface erosion, conserving the structures of the flower beds, which are usually dismantled when there are high rains. Thus, when using no-tillage, the maintenance of straw is an alternative that improves the chemical, physical and biological attributes of the soil (ÂNCANTARA and MADEIRA, 2008). Regarding fertilization, all interviewees use organic fertilization associated with chemical fertilizers. Among the organic fertilizers used the chicken bed is the predominant. According to Finatto *et al*. (2013), with the use of organic fertilizers, soils become more fertile and productive, in addition, organic sources increase soil biodiversity contributing to increased production. The influence of organic fertilization on physicochemical attributes is related to increased cation exchange capacity, reduced leaching caused by rain or irrigation and the benefit of nutrient adsorption (TRANI *et al*., 2013).

Phytosanitary problems in hard-leaf vegetable production units (PU)

The phytosanitary management of production units is influenced by the way farmers organize cultivation systems, surrounding production systems, control methods adopted, the incidence of diseases and pest and plant infestations weeds in the area. One problem that has influenced pest infestation in the production units in Nova Mutum –MT is the fact that there are large tracts of land in the world for the cultivation of annual crops (intensive agriculture), mainly soybeanand corn. It was observed that the productive units of leafy vegetables are inserted in the vicinity of these crops (Figure 02). According to the interviewees this influences the infestation of insects at certain times, causing harm to farmers. Farmers report an increase in white fly infestations (Figure 03 A and B) and false media in times that coincide with the end of the soybean cycle. These migrate cause damage in the production of leafy vegetables in the soybean harvest period, from November to March. Ferreira *et al*. (2011) observed greater white fly migration in vegetable production units near soybean crops. According to Moscardi *et al*. (2012) in recent years white fly populations and false mediar have been growing gradually in soybean crops. In addition to these pests, farmers have reported that for lettuce they are: the guts, the bread crumbling, the slug, the snail, the bedbug stinks. However, they emphasized that the false medium is considered the key pest. In leaf cabbage and other brássics, the most common pests reported were aphid, curuquerê of cabbage, white fly and the moth of cruciferous, the key pest of culture (Figure 02C). The damage caused is defoliation, when uncontrolled can lead to the complete destruction of cultivation areas (CARDOSO *et al*., 2010; GUIMARÃES *et al*., 2011; FILGUEIRA, 2013).

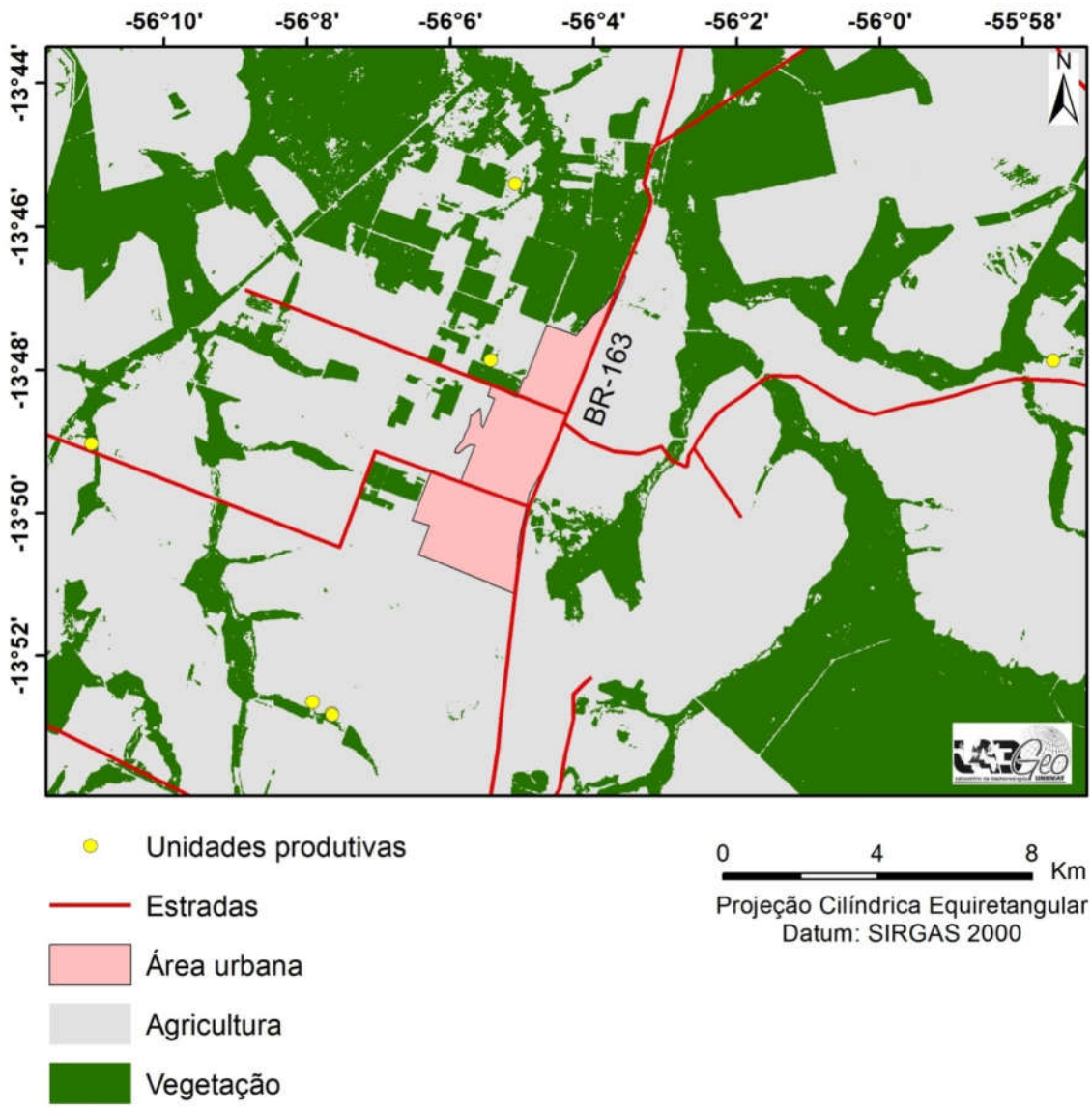

Figure 2. Thematic map of the municipality of Nova Mutum - MT and the geographic coordinates of reference of the production units studied. UNEMAT, 2016

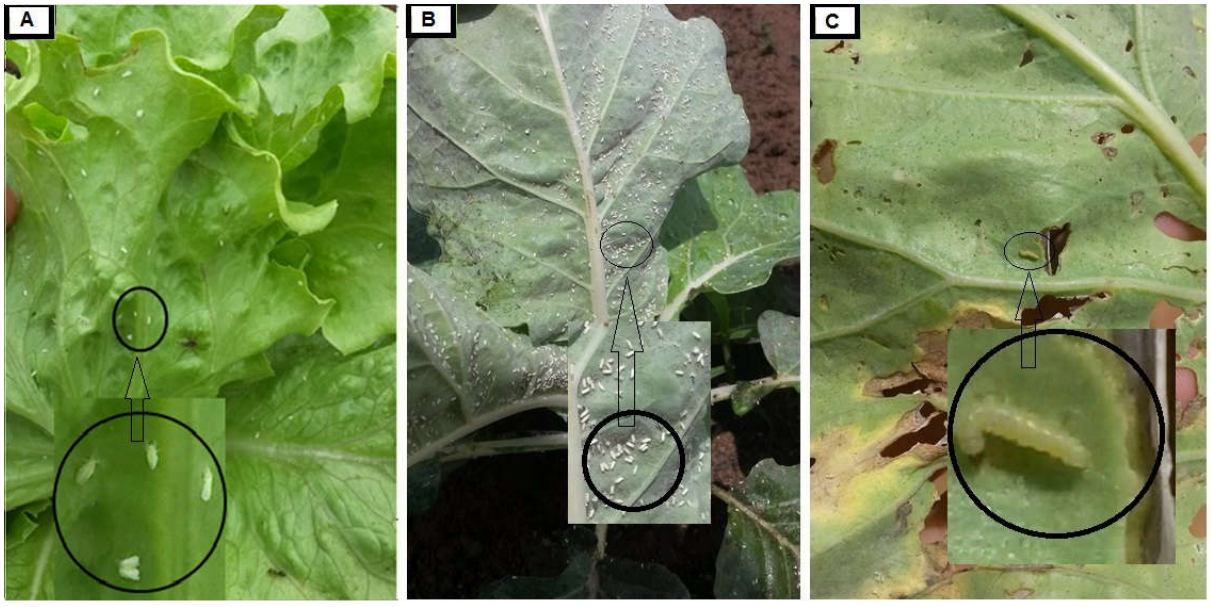

Figure 3. Pests in hard-wooded vegetable production systems in New Mutum-MT.A- White fly in lettuce, B-White fly andC-moth of cruciferous in cabbage leaf

As for decision-making to control these pests, the producer usually evaluates due to the presence or absence of insects in the area. The weeds reported by farmers as the most incidents were trapoeraba, the crow's foot grass, the caruru, the tiririca, the carrapicho grass, the dairy, the minhã,the beldroega and the viola rope. When asked about which weed represents greater difficulty in control, the unanimous response was trapoeraba. Trapoeraba is an efficient species in reproducing, because in addition to the seeds, it also propagates by rhizomes, becoming a kind of difficult control in agriculture (TUFFI SANTOS *et al*., 2004). According to Zannata *et al*. (2006), the existence of weeds in the cultivation of vegetables can interfere in productivity, competitiveness, mainly by water, light and nutrients, to interfere through substances all elopathic and act as a host of pests and diseases, besides hindering harvesting. Most farmers (five) stated that the most used herbicides are those that have glyphosate as an active ingredient, because they are non-selective products, that is, they control weeds in general (broad and narrow leaves). Thus, weed management with herbicide is carried out before the implantation of vegetables and management after the plant of the crop is carried out with manual weeds. The other farmers (two) reported not using chemical control, only mechanical. If farmers adhered to no-tillage in weed management, they would reduce the use of chemicals and manual weeds, because cover plants work in the suppression of several weeds, since they act as a physical barrier reducing thermal amplitude and light intake, preventing weed germination (GOMES *et al*., 2014).
Farmers have reported that the most frequent diseases in lettuce are soft rot, turnaround, cercospore stain and galls caused by nematodes; in cabbage the main was soft rot. The control methods, adopted by farmers when there is an incidence of diseases in the area, are the destruction of cultural remains, curative chemical control (pesticides) and fallow, adopted when the high incidence of a given disease makes it impossible to cultivation in the area. In the fallow, the area is left without cultivation and without weed control, for a period ranging from 3 to 6 months.

Although all farmers use chemical control to fight pests, some adopt alternative practices, such as the use of light traps (two farmers), biological control with *Bacillus thuringiensis* (three farmers) and the vegetable barrier with elephant grass (a farmer), which also serves for division of areas and for animal feed. The use of the plant barrier is a viable technique to assist in the organization of the system, facilitates the division of areas into plots, hinders the infestation of pests such as guts (MICHEREFF *et al*., 2013) and protection adrift of pesticide properties surrounding areas that grow grains. In the production systems, dependence on chemical control (fungicide, insecticide and herbicide) was evidenced for phytosanitary control, adopted by all farmers. The intensive use of agrochemicals results in contamination of the farmer, the consumer and the imbalance of the ecosystem (SHENEIDER and COSTA, 2013). With regard to the means of application, all farmers use the costal pump. According to a report, this is performed from 7 am to 9:00 am and from 17 am to 6 pm, considering the times with milder temperatures. The acquisition of pesticides for phytosanitary control is made in the region, in the municipalities of Sinop, Sorriso, Nova Mutum and Cuiabá. All farmers said they received the guidelines regarding the application of pesticides from agricultural workers. According to Brazil (1998) and Mato Grosso (2009) the sale of pesticides and the like to users will be made through their own prescription, prescribed by professionals (agronomists) legally qualified Regional Engineering Council and Architecture of the State of Mato Grosso - CREA/MT. The problem of the guidelines to be made in the marketing process is that sellers are not always agronomists to recommend this type of product. Inadequate adoption of pesticides can cause damage to the environment, to the farmer and consumer (SCHNEIDER andCOSTA, 2013). This is because in Brazil there is no efficient supervision, resulting in a product with a high residue index of pesticides or even in use molecules not recommended for crops (ANVISA, 2014). Regarding the use of the Personal Protective Equipment (PPE) five interviewees reported using and two did not use in the applications. The use of PPE is fundamental to ensure safety, avoiding the poisoning of the farmer. Texeira *et al*. (2014) verified in the research of pesticide poisoning, conducted in northeastern Brazil from 1999 to 2009, which recorded 9,669 cases of poisoning due to the use of agricultural pesticides. The problem of poisoning of farmers is due to exposure to products, related to the lack of knowledge, of farmers who grow vegetables, the use of pesticides and protective equipment. It was observed that one of the reasons for the low adoption of conservation practices for the organization of vegetable production systems and phytosanitary control is the lack of technical assistance. According to farmers, only three receive technical assistance from EMPAER every six months and one receives private company assistance every 15 days. However, it is noted that care is not being effective for farmers to rethink their cultivation systems, as problems are often treated punctually and not holistically. In southeastern Goiás, the Center for Study, Research and Extension in Agroecology (NEPEA), when developing projects in the Madre Cristina settlement, obtained results that improved the production of vegetables. Through the popularization of technologies for the elaboration of biofertilizers and composting, among other forms of use of organic waste for soil management, in addition to methods of natural pest control (BERTAZZO and ALVES, 2015). Thus, there is a need for technical assistance in production units, aiming to strengthen farmers. According to Freire el al. (2015), so that farmers can have autonomy it is necessary to promote training courses, lectures, planning meetings and access to new technologies, in addition to technical monitoring, generating new knowledge, so that agricultural activities are profitable and more sustainable. In view of this, the systems of cultivation of leafy vegetables in the citizen of Nova Mutum - MT are still incipient. Therefore, production units should be rethought to minimize the use of intensive agriculture through conservation practices such as crop rotation, crop range, no-tillage, consortium, among others, with higher economic and lower return problems with pests to meet the constant demand of the market. There is a need for specialized and continuous technical assistance to foster an agroecological production system of vegetables in the municipality.

Conclusions

New Mutum -MT's hardwood vegetable cultivation systems have lettuce as the main species produced due to local market demand. The intensive system is the basis of the cultivation system, with use of fertilizer, intensive land use and lack of conservation practices, which associated with the strong

pressure of pests in that region and the lack of technical monitoring makes the farmer increasingly dependent on the use of pesticides.

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REFERENCES

ÂLCANTARA, F.A.; MADEIRA, N.R. Soil management in the organic production system in vegetables. Brasília, DF:EMBRAPA,2008. (Circular Technique 64)

AMARO, G.B. *et al*. Technical recommendations for the cultivation of vegetables in family farming. Brasília, DF:EMBRAPA. p. 16, 2007. (Circular Technique, 47)

ANVISA (National Health Surveillance Agency). Complementary report on the second stage of sample analyses collected in 2012. Brasília-DF., p.1-33, 2014.

BERTAZZO, C.J.; ALVES, D. Research and agroecological rural extension in southeastern Goiás conducted by Nepea. In: SILVA, H.B. C; CAVALCANTI, D.C. PEDROSO, A, P. *Research and Extension for Family Agriculture*, Brasília-DF, 403 p., 2015.

Brazil. Law No. 7,802 of July 11, 1989. Brasilia. Federative Republic of Brazil. Ten, ten. 1989.

CARDOSO, M.O. *et al*. Technical recommendations for the control of lepidopteros-pest in cabbage and cabbage in Amazonas. Manaus - AM. Embrapa 2010, (Circular technique 35)

COCHEV, J. S. *et al*. Commercial Olerícola Production Systems of mato-grossense municipality of Alta Floresta, Brazil. RA'E GA: Geographic Space under Analysis,v. 32, p. 240-266, 2014.

FILGUEIRA, F. A. R. New olericulture manual: modern agrotechnology in the production and commercialization of vegetables.3. ed. rev. ampl. Viçosa: UFV, 2013. 421 p.

FINATTO,J. *et al*. The importance of using organic fertilization in agriculture. Revista Highlights Acadêmicos, v.5,n.4, 2013.

FREIRE, A.P. *et al*. Technical assistance and rural extension-ATER and rural family farming. Univasf extension journal, V. 3, n. 2, 2015.

GOMES.D.S. *et al*. Suppression of spontaneous plants by the use of vegetable cover of crotalaria and sorgo. *Brazilian journal of agroecology,* p-206-213, 2014.

GUIMARANHÃES, J.A.; MICHEREFF SON, M.LIZ, R.S. Pest management in vegetable seed production fields. Brasília, DF: EMBRAPA Vegetable (Circular Técnica 94), 2011.

Ibge. Brazilian Institute of Geography and Statistics. Complete information. 2016. Available at <http://cidades.ibge.gov.br/xtras/temas.php?lang=&codmun=510622&idtema=16&search=mato-grosso|nova-mutum|sintese-das-informacoes>. Access 04 Aug. 2016.

INAGAKI, A.M *et al*. Identification, mapping and marketing of lettuce in Cáceres, Mato Grosso. Brazilian Horticulture 29: S353-S361, 2011.

MARGARET, E.The process of occupation of space along the BR-163: a reading from the strategic regional planning of the Amazon during the military government1. 2013.Available: <http://www.trabalhosfeitos. com/ensaios/a-Politica/64337830.html>. Access on: 10 Feb. 2015.

MICHEREFF SON, M. et. al. Pest management in vegetables during the agroecological transition. Brasília-DF, EMBRAPA Vegetable, 2013. (Circular technique 119)

MOSCARDI, F *et al*. Arthropods that attack soybean leaves. In: HOFFMANCAMPO, C.B.; CORRÊA-FERREIRA, B.S.; MOSCARDI, F. (Ed.). Soybean: integrated management of insects and other pest arthropods. Brasilia: Embrapa, p.213-309, 2012.

MOTA, J.H *et al*.Characterization of vegetable production in Campo Verde, Mato Grosso.Brazilian Horticulture 28: S510-S516, 2010.

NESPOLI, A. *et al*. Production of vegetables by the family agriculture of Alta Floresta, Mato Grosso Amazon. CAMPO-TERRITORY: *journal of agrarian geography*, v. 10, n. 21, p. 159-191, 2015.

NUNES, M.U.C; SANTOS, J.R.l. Technology for production of seedlings of vegetables and medicinal plants in organicsystem. ARACAJU, SE, EMBRAPA Vegetable, p.8, 2007. (Technical Circular 48)

OAK, P. G.B.*et al*. Vegetables as functional food. Brazilian horticulture. Brasilia, V.24,n.4, p-397-404, 2006.

PURQUERIO, L.F.V; TIVELLI, S.W. Environmental management in protected cultivation. 2009. Available in <https://portais.ufg.br/up/68/o/ambiente_protegido.pdf>. Access 23 May 2016.

REIS, N.V. Construction of greenhouses for vegetable production in the North, Northeast and Midwestregions. EMBRAPA HORTALIÇAS, Brasília, 2005. (Circular technique 38)

SCHNEIDER,F.; COSTA, M.B.B. Socioeconomic, productive and environmental diagnosis of agroecosystems in the pirapora-municipality of Piedade/SPhydrobasin. Revista Brasileira de Agroecology, v8, p.217-231,2013.

SEABRA JÚNIOR, S *et al*. Lettuce cultivation in Cáceres MT: perspectives and challenges. UEPG connection. Cáceres – MT, p.132 -137, 2012.

SILVA,K. D.P *et al*. Lettuce cultivation submitted to different cultivation environments and soil coverings. Tangará da Serra-MT. Revista MT Horticultura,v.01, p.01-37, 2015.

TAKING IT, D.S. *et al*. Rucula Planting Density, in Protected Cultivation Systems.2004. Available in <http://www.abhorticultura.com.br/biblioteca/arquivos/Download/Biblioteca/44_304.pdf>. Access 13 Apr. 2016.

TEXEIRA *et al*. Pesticide poisoning so-made in northeastern Brazilian states, 1999-2009.Epidemiol. Serv. Saúde, Brasília, v.23 p497-508, 2014.

THICK BUSH. Decree No. 2,283 of December 9, 2009. Official Gazette of the state of Mato Grosso. Cuiabá-MT, p.03, 2009.

TRANI *et al*. Organic fertilization of vegetables and fruit trees. 2013. Available in <http://www.iac.sp.gov.br/imagem_informacoes tecnologicas/83.pdf>.Access 23 augst. 2016.

TUFFI SANTOS, L.D *et al*. Effect of glyphosate on the morphanatomy of commelina diffusa and C leaves and stem. benghalensis. Weed, Viçosa, v.22,p.101-107, 2004.

VALARINI, P.J *et al*. Soil quality in organic and conventional vegetable production systems. Brazilian Horticulture ,V.29,p. 485-491,2011.

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