International Journal of Agriculture and Environmental Research

ISSN: 2455-6939

Volume:03, Issue:04 "July-August 2017"

PERSPECTIVES TO THE EXPLOITATION OF PEANUT PLANTS BY FARMERS: A STATE-OF-THE-ART IN BRAZIL

Felipe Fernando da Silva Siqueira

Programa de Pós-Graduação em Produção Vegetal, Universidade Federal Rural de Pernambuco, Universidade Federal Rural de Pernambuco, Unidade Acadêmica de Serra Talhada. Fazenda Saco, s/n, Caixa Postal 063, Serra Talhada – PE. CEP 56900-000.

ABSTRACT

The peanut has its center of origin in South America. It is known that the peanut crop is of great importance in Brazilian agribusiness and in other areas of the world. Mainly due the economic importance, the revenue generated for the producing regions, and with an impact on the trade balance. In this context the objective of this work is to carry out a literature review on the alternatives for the exploitation of the peanut crop in Brazil. Based on the results found, it can be extrapolated to other peanut crop areas in other countries. We results demonstrate that the peanuts plants can be exploited for various purposes. For example, human feed being a highly protein food rich in vitamins and minerals. Production of biodiesel that is in high rise in the world and receiving many investments from the Brazilian government and from big companies. The use of agricultural consortia promotes greater moisture retention. In this way the peanut goals as an alternative, go beyond being an important nutritive source for human society, a legume, alternative fodder plant, but is possible the peanut plants increases the establishment of bacteria fixing of nitrogen and assists in the recovery of degraded areas. Considering that the area planted in Brazil increased by 74% and with the establishment of modern agricultural the industries, the agribusiness of this oilseed tends to be quite widespread for small, medium and large rural farmers.

Keywords: Agribusiness, *Arachis hypogea*, *A. pintoi* and peanut farmers.

1. INTRODUCTION

The plants of the genus *Arachis* L. (Fabaceae) known as peanuts originate in South America, and have been used as a plant domesticated by the indigenous American people for more than 3800 years (Freitas *et al.*, 2005; Nogueira and Távora, 2005). Of these, two species deserve attention mainly due the greatest economic interest, the common peanuts (*Arachis hypogaea* L.) to be used

ISSN: 2455-6939

Volume:03, Issue:04 "July-August 2017"

by feeding human and the fodder peanuts (*Arachis pintoi* K.). In terms of nutritional value and the various forms of consumption, peanuts are an oil crop grown in Brazil in many developing countries (Silva and Beltrão, 1998). Its high adapted to the most varied conditions also contributes to its great distribution in the Brazil (Araújo *et al*., 2008). The peanuts business in Brazil had great importance until the early 1970s, playing a prominent role in the domestic supply of vegetable oil and the export of by-products. The prosperity of the crop was affected by several political, technological and market factors, leading to the reduction of the national crop and modification of the producer profile (Freitas *et al*., 2005).

In addition to the Brazilian agricultural policy and the resources grants invested in the peanut crop, other factors contributed to the decline such as, aflatoxin contamination, competition with other crops (e.g. soybean plantations), low yield per area, susceptibility to climatic variations and intense variations in production costs during marketing. However, small and medium-sized farmers continued to produce peanuts because of the low level of technology demanded (Freitas *et al*., 2005; Lourezani and Lourezani, 2006).

The cultivation of peanuts is divided into two harvests, the water harvests and drought harvests: the first represents 75% of the volume produced annually, and the second complements the amount. The cultivars used are “ground-level” and “upright” (rasteiro and ereto, popular names in Brazil respectively). The upright cultivars present a cycle between 100 and 120 days, being more suitable for the summer, and also for farmers that do not have mechanization, since it presents a shorter cycle (Filho, 1985). Ground-level peanuts are more adaptable to mechanization, being selected by the import markets and reach average productivity around 4000 kg/ha, surpassing the productivity of upright cultivars by 30%. The disadvantage is its late cycle, taking between 130 and 145 days (Freitas *et al*., 2005). The peanut crop prefers textured soils varying between sandy and loamy sand, these being the most indicated; avoiding clay and heavy soils because the soil where the peanut will be grown is of great importance for its success, because it is the place where not only the roots but also the fruits develop. In relation to the pH considered optimal, it is between 6.0 and 6.5; lower values indicate calcium deficiency (Nogueira and Távora, 2005).

It is known that the peanut crop is of great importance in Brazilian agribusiness. Due to its economic importance, as a base in the revenue generated for the producing and processing regions, and with an impact on the trade balance, when it comes to exports. Without forgetting the social importance, from the direct and indirect jobs generated in all the links of its production chain (Lourezani and Lourezani, 2006). In this context the objective of this work is to carry out a literature review on the alternatives for the exploitation of the peanut crop in Brazil. Based on the results found here we can be extrapolated to other peanut producing areas in other countries.

ISSN: 2455-6939

Volume:03, Issue:04 "July-August 2017"

Thus, it is expected that this work will serve as an object of study for farmers, students and people interested in agricultural science.

2. MATERIAL AND METHODS

2.1 RESEARCH SOURCE

Initially, we performed a literature search of scientific published articles found in the databases: Scopus (https://www.scopus.com), Google Scholar (http://scholar.google .com.br), Scielo: (http://www.scielo.org), Periódicos da capes (http://www.periodicos.capes.gov.br), thesis and books; Where they served as the basis for the preparation of this review. Minor revisions were made within each topic covered. I used the following keywords as research source: feeding human, aflatoxin, biodiesel use, plant consortium cotton*peanut, coffee*peanut, grasses*peanut, green manure fertilizing, fodder crops, silvipastoral system and phytoremediation. All found articles were analyzed in order to evaluate if they really address to propose of this review.

3. RESULTS

3.1 Feeding human

As for nutritional resources, peanuts are rich in oil, protein, vitamins E, B and mineral complexes. Being cultivated in semi-arid climate it has reduces oil content, high protein content and sweet seeds. The defatted flour can be used in the manufacture of food by-products, constituting a nutritionally rich food (Freire *et al*., 2005). The main form of consumption of peanut is through its grains that present high values minerals (calcium 48mg/100g, potassium 687mg/100g and magnesium 157mg/100g, see more details in Freire *et al*., 2005), which can be consumed roasted or cooked. It is high protein flour, serving as raw material for its by-products (Freire et al., 2005; Embrapa, 2006). Freire et al., (1997) determined the centesimal composition in seeds of nine peanut genotypes, belonging to three botanical types, in order to indicate the most promising ones to be used as a supplement to the regional diet. The genotypes studied were: TATU, BR-1 and L-7, of the Valencia type; CNPA HAVANA, CNPA NIGERIA and CNPA 106 AM, of type Spanish and CNPA 52 AM, CNPA 125 AM and CNPA 129 AM, of the Virginia type. The genotypes of the botanical type Valencia presented higher protein content, both in the whole meal (30.11%) and in the defatted flour (53.43%). While BR-1 and L-7 genotypes are the most recommended for enrichment of diet due to sensory and market characteristics and regional adaptation (Freire *et al*., 1997).

In another work by Freire et al., (2000), a study of

ISSN: 2455-6939

Volume:03, Issue:04 "July-August 2017"

The protein in the defatted peanut flour (*Arachis hypogea* L.) of three genotypes (CNPA 75 AM, CNPA 76 AM and CNPA 106 AM) of the Spanish botanical type, comparing with the standard established by FAO (Food and Agriculture Organization of the United Nations). It was observed that among the genotypes studied, the essential amino acids were higher than the FAO standard, with the exception of lysine. The genotype CNPA 75 AM has been shown to be more complete, especially in relation to tryptophan, which is most indicated for food purposes. Granato *et al*., (2009) determined the mineral composition of biscuits made from almond (*Prunus dulcis*) or peanut flours added with iron. For adults older than or equal to 19 years, almond biscuit can be considered a source of copper and iron and rich in phosphorus and peanut biscuit can be considered rich in phosphorus, magnesium and iron. The two biscuit formulations can be considered rich in copper, magnesium, phosphorus and iron, when the values are directed to the consumption of children from 4 to 6 years of age, showing nutritional potential for consumption, both children and adults, or those who require supplementation of minerals in the conventional diet. In this way the peanut appears as a source of protein and minerals for human consumption.

3.1.1. Aflatoxin

Aflatoxins are products of the metabolism of fungi *Aspergilus flavus* and *A. parasiticus*, these fungi are widespread in nature, contaminating various types of agricultural crops including peanuts. Aflatoxin has hepatotoxic, carcinogenic and teratogenic potential in both men and animals (Ritter *et al*., 2008). Because of this some practices should be taken up to decrease the contamination of peanuts, such as: temperature control, water content, relative humidity, water activity, pH use of resistant varieties. The temperature, the humidity and the type of substrate are the most important factors (Calori-Domingues *et al*., 2010; Pereira *et al*., 2010).

Currently, peanut genotypes have been selected to avoid or inhibit seed contamination by these fungi. According to Pereira *et al*., (2010) the genotype IAC 22, produced in an area with liming, promotes a lower percentage of contaminated seedlings and seed water contents close to 5.6%, during storage, do not contribute to contamination of seeds.

3.2. Biodiesel use

Biodiesel is mainly obtained from vegetable and animal fats and oils, also known as vegetable diesel. It acquires more and more importance when used pure or mixed with petroleum diesel, in the generation of electric energy or in vehicular transport. Biodiesel has a long history both in the world and in Brazil. In the year 1893, the world's first diesel engine was fueled with peanut oil (Abishek *et al*., 2014).

The peanut crop is one of the crops that can be used for the biodiesel industry, which is on the rise in the world and receiving many investments from the Brazilian government and large

ISSN: 2455-6939

Volume:03, Issue:04 "July-August 2017"

companies such as Petrobras (e.g. a publicly-held corporation that operates in an integrated and specialized manner in the oil, natural gas and energy industry) (Karmakar *et al*., 2010). The Embrapa (e.g. Brazilian Company of Agricultural Research), in 2010 launched a variety of peanuts BRS White ground-level (Branco rasteiro, common name) is the newest technology of the agroenergy segment. BRS White ground-level has 50% crude oil and a yield of up to 73% of its seeds, with an average yield of three thousand kilos per hectare in the cultivation of the water, a cycle of 100 to 115 days, being tolerant to water stress.

In a review elaborated by MAPA (Ministry of Agriculture, Livestock and Food Supply of Brazil) that showed the importance of biodiesel in modifying the Brazilian energy matrix as a source of clean and renewable energy highlighting the environmental, social and economic benefits deriving from its use. Where he presented the main oilseeds used as raw material for biodiesel production: soy (*Glycine max*), castor bean (*Ricinus communis*), sunflower (*Helianthus annuus)*, peanut (*A. hypogea*), cotton (*Gossypium hirsutum)*, palm oil (*Elaeis guineensis)*, canola (*Brassica napus)* and *Jatropha*. Some palms such as macaúba (*Acrocomia aculeate)*, inajá (*Maximiliana maripa*), tucumã (*Astrocaryum aculeatum*), babassu (*Attalea speciose*) have a potential of production of 2 to 5 thousand kilos of oil per hectare, but still do not have technological dominion. The problem is that the conventional oleaginous species of which soybean, sunflower, cotton, peanut and canola have a yield potential of 500 kg/ha to 1,500 kg/ha of oil and are producing between 400 kg/ha and 800 kg/ha oil, and these values are considered low. The peanut oil has an average productivity 2,400 kg/ha and average oil yield 788 kg/ha (MAPA, 2007).

Santos *et al*., (2010) carried out a study whose objective was to evaluate the productivity of pods, seeds and oil of different peanut genotypes of low size with potential for agribusiness. Seven stratum genotypes, consisting of three white peanut lines, two cultivars (IAC Caiapó and Forunner) and two extra-large grain strains (LViPe-06 and LGoPe-06) were evaluated in Tropical climate and semi-arid regions The most promising material was the strains of peanut ground-level LVIPE-06 and White 1/08 with oil contents, respectively 51.81% and 51.20%, with yield of 1121.48 kg ha^{-1} and 812.34 Kg ha^{-1} are the most indicated genotypes for the agroenergy segment, considering seed, oil and cycle productivity. Already in a study developed by Santos *et al*., (2012) where they evaluated ground-level peanut cultivars. Where these were evaluated for their grain and oil productivities, aiming at a later indication to the market of edible oil or fuel. The genotypes were cultivated in the water period for two years. The most promising genotypes for the oleo chemical market, considering the seed and oil yields were BRS Pérola Branca (cultivar type) and LViPE-06. There are other crops with higher potential, the oleaginous that are now used for the production of biodiesel, for example Dendê (*Elaeis guineensis*) and Pinhão manso (*Jatropha curcas*), with an average oil yield of around 4000 and 1900 kg/ha respectively.

ISSN: 2455-6939

Volume:03, Issue:04 "July-August 2017"

3.3. Consortium plants

In general, consortia, especially oilseeds with food crops, are widely used, mainly by small and medium-sized farmers, so as to benefit not only the family food but also the producer's economic income, since it is less subject to losses (Portes, 1996). In the production, due to the attack of pests and the water stress or losses due to the variation of the price in the market (Oben *et al*., 2015). The use of consortia provides some benefits, such as higher retention of moisture, increase of inorganic nutrients content, decomposition of organic compounds and, also, increase of the activity of microorganisms in the soil (Raposo, 1967). In order to increase the microbiological activity in the soil, peanut points as an alternative, since besides being an important nutritive source for man, being a legume, establishes a symbiotic relationship with nitrogen fixing bacteria (Araujo *et al*., 2008).

In Brazil, attention has been paid by research institutions, such as EMBRAPA, to consorted agrosystems, due to the greater use of natural resources, the reduction of environmental disturbance and the reduction of production costs for the farmers (Beltrão *et al*., 1984; Azevedo *et al*., 1998).

3.3.1. Cotton and Peanut

Both cotton (*Gossypium hirsutum*) and peanut (*Arachis hypogaea*) are already cultivated in a consortium with several crops, but there are few works in the literature involving the association between these two plants, being almost nonexistent in Brazil (Araújo *et al*., 2006). The cotton crop shows some resistance to drought; (Ullah *et al*., 2017), for the man, being a legume, which establishes a symbiotic relation with nitrogen-fixing bacteria, being of fundamental importance, since which help to replenish the nitrogen required for plant development (Portes, 1996).

Araújo *et al*., (2006) and (2008) studying the influence of cotton cultivars and peanut in relative seasons of planting in a consortium, verifying the components of production, plant productivity and product quality. Where the peanut was planted between the rows of cotton, within a distance of 0.5 m from cotton, enough for a population of 75,000 ha-1 peanut plants and 50,000 ha-1 cotton plants. The cultivars used for the consortium species were BRS 186-Precoce 3 and BRS 201 for cotton and L7 and BR-1 for peanut. In this work the cotton and peanut consortium in the tested configuration was not satisfactory for cotton in terms of productivity. There was no economic advantage for the farmers when the cotton was sown in consortium with the peanut, since the values referring to the consortium were smaller than the isolated crops. However, the consortium between cotton and peanut needs to be better studied, since there is a possibility of a satisfactory production for both crops when associated (see more details in, Beltrão *et al*., 1984; Portes, 1996).

ISSN: 2455-6939

Volume:03, Issue:04 "July-August 2017"

3.3.2. Coffee and Peanut

Small and medium-sized farmers usually grow annuals between the rows of the coffee crop with low planting density, obtaining greater use of the soil during the cropping phase and an extra yield. Among the positive aspects resulting from the adoption of this practice are the reduction of costs, the fixation of the workforce in the rural property, the conservation of the soil, the reduction of weeds (Rezende *et al*., 2006; Gama-Rodrigues *et al*., 2007).

Paulo *et al*., (2004) investigating the behavior of the cultivar Apoatã IAC 2258, submitted to intercropping with summer: cotton (*G. hirsutum*) var. IAC 20; peanut (*A. hypogaea*) var. Armadillo; rice (*Oryza sativa*) var. IAC 165; castor bean (*Ricinus communis*) var. Guarani and maize (*Zea mays*) var. IAC 100-B, seeded at 50 cm from the crown of the coffee plants. The results showed that the coffee consortium with castor bean, maize, cotton and peanut plants significantly decreased coffee production. In the consortium with peanuts, coffee showed the second highest productivity (3,527.4 Kg.ha^{-1}) and did not differ statistically from the consortium with rice (4,539.9 kg.ha^{-1}).

The difficulties of cultural treatments in intercropping, competition for water, nutrients and light, with the consequent reduction in the growth and production of coffee trees (Paulo *et al*., 2004), make controversial the recommendation of crops in coffee plantations. Further studies are needed to improve the consortium of plants with coffee. Regarding peanuts can become a viable crop for the consortium with the coffee.

3.3.3. Grasses and Peanut

The use of consortium between grasses and legume intercropping can be seen as an option to increase fodder productivity, profitability and sustainability of the nitrogen supply and production system (Valentim and Andrade, 2004; Miranda *et al*., 2003). Think about that, the main way of supplying nitrogen to the fodder plants is through chemical fertilization and nitrogen fertilization at great cost (Portes *et al*., 1996). However, the use of intercropped legumes with grasses can contribute to the nitrogen supply to the system.

Barbero *et al*., (2009) evaluating the fodder production and morphological composition of a coastcross pasture (*Cynodon dactylon*) intercropped with fodder peanut (*Arachis pintoi* cv Amarillo), with and without nitrogen fertilization, and submitted to grazing with continuous stocking. The experiment was carried out in a soil classified as Dystrophic Yellow Latosol. Where the results showed that the use of consortia allows an increase in fodder productivity, but does not allow high production rates compared to well fertilized pastures. The peanut presented higher biomass in the absence of nitrogen fertilization.

ISSN: 2455-6939

Volume:03, Issue:04 "July-August 2017"

In another work by Barbero *et al*., (2010), it determined the fodder nutritive value and the animal production in coastcross pasture, intercropped with forage peanut, in the same area. They reported that the nutritive value of intercropped pasture without the addition of nitrogen fertilization is lower than that of pasture fertilized, but is satisfactory for good animal performance. The use of the consortium is an alternative for the production of meat, as it promotes a decrease in the use of external inputs and decreases the costs of production. However, in the present study, they observed that the fodder plants consorted in the pasture presented chemical composition and in vitro digestibility adequate to meet the nutritional requirements of the animals, especially in the seasons of better climatic conditions, demonstrating that the plant height management is a good tool to maintain their quality throughout of the year. The fodder peanut intercropped with grasses presents excellent results in this type of consortium, both in fodder production and in its digestibility.

3.4. Green manure fertilizing

The no-tillage cropping system on the cultural remains promotes innumerable benefits to the soil, such as: protection against the impact of rainfall on the soil, favoring infiltration, reduction of water loss through runoff and loss of soil and nutrients due to erosion, humidity, and decrease in the use of fertilizers at sowing (Hermani *et al*., 1999).

The legumes are the most used in green fertilization, because their roots fix atmospheric N2, in association with diazo-trophic bacteria, enriching the soil. In addition to N, biomass production is generally rich in P, K and Ca due to its well branched and deep root system, which provides the recycling of nutrients in the soil that will be assimilated by the plant, becoming available for economic crops (Costa, 1993). Some authors have been working on the use of peanuts as green manure in several crops of agricultural importance and their capacity to produce biomass. Among these works, Gama-Rodrigues et al., (2007) evaluating the rates of decomposition and nutrient release of cultural residues from cover crops in the passion fruit crop. The evaluated species were: *Canavalia ensiformis*, fodder peanut cultivars CIAT 1734, siratro (*Macroptilium atropurpureum*), tropical cudzu (*Pueraria phaseoloides*) and *Brachiaria brizantha*. The *C. ensiformis* and fodder peanuts presented the highest rates of dry matter decomposition, differing significantly from the other vegetation cover. Fodder peanuts presented the highest rate of release of K, P and Mg (0.0670, 0.0101 and 0.0130 k day^{-1} respectively).

Assis *et al*., (2008) estimated genetic parameters to select fodder peanut genotypes with greater soil cover and aerial biomass production during the establishment period, through the use of seedlings. Where used 21 genotypes of forage peanut, including three cultivars (Amarillo, Alqueire 1 and Belmonte).The best genotypes evaluated on the basis of soil cover and dry matter production were Belmonte, Amarillo, BRA 040550, BRA 039187, Alqueire 1, BRA 039799 and

ISSN: 2455-6939

Volume:03, Issue:04 "July-August 2017"

BRA 035033. Thus, between the species of fodder peanut (*A. pintoi* and *A. repens*) that are used for the green manure that stands out is the species *A. pintoi*.

3.5. Fodder

Fodder plants production depends on factors intrinsic to the environment, such as temperature and radiation, and factors that can be altered by human, such as availability of water and nutrients. In addition, the management techniques employed can influence the dynamics of production and use of this fodder (Cecato *et al*., 2006). Brazilian cultivated pastures are little diversified and are mainly made up of *Brachiaria* species (Assis *et al*., 2008). *A. pintoi* has been standing out and has been stable, consorting with grasses with aggressive vegetative behavior under intense grazing (Barbero *et al*., 2009, 2010).

Rego *et al*., (2006) studying the digestibility of the steer feeding in pastures of Marandu-grass (*Brachiaria brizantha*), Tanzanian grass (*Panicum maximum*) and fooder peanut (cv. Amarillo) and on intercropping pasture of Marandu-grass and fodder peanut, in response to lawn height . They found that the characteristics of the animal mouth are influenced by the different pasture structures: the pasture structure of the fodder peanut provides an increase in the bit rate and decrease in the bit manipulation time, while the exclusive tropical grasses and the consortium favor the increase in intake per mouthful. Olivo *et al*., (2008) studying the ingestive behavior of lactating cows in elephantgrass (*Pennisetum purpureum*) and ryegrass (*Lolium multiflorum*) pastures, intercropped with white clover or forage peanut. They found that the fodder mass of elephantgrass was higher in the system with fodder peanuts. Even among the fodder systems evaluated, the average time spent by the cows on the grazing of the fodder material present is higher in fodder system composed of elephantgrass in consortium with white clover, ryegrass and spontaneous species. The elephantgrass consortium with forage peanut was presented an elevation in elephantgrass digestibility. Qualitatively forage systems consisting of elephantgrass and fodder peanut are more feasible (Olivo *et al*., 2009).

Morgado *et al*., (2009) carried an experiment to evaluate the digestibility of equinins in different hay sources. The first with seven treatments: alfalfa hay (*Medicago sativa*); fodder peanuts (*A. pintoi*); desmodium (*Desmodium ovalifolium*); guandu (*Cajanus cajan*); macrotiloma (*Macrotyloma axillare*); *Stylosanthes guianensis* and coastcross (*Cynodon dactylon*). Their results indicate that fodder peanut hay presented better digestibility of the analyzed nutrients, which confirms its potential for use in equine diets.

The fodder peanut consorted with pasture provide a great alternative for animal feed. These results suggest that the high digestibility of these nutrients may be due to the fact that the nutrient content of the nutrients is higher than that of other nutrients (Morgado *et al*., 2009; Olivo *et al*., 2008, 2009;).

3.6. Silvipastoral system

The silvipastoral system is a type of agroforestry system, composed of trees, fodder plants and herbivorous animals in the same area (Garcia and Couto, 1997), with structure and planned interactions. These systems offer as advantages such as: crop diversification, wood and food production, erosion control, increased soil fertility and fixation of large amounts of atmospheric carbon, pasture for animals (McGREGOR *et al*., 1999). In silvopastoral systems, the shade created by the trees is one of the main factors that can interfere in the cultures present in the system, since it significantly modifies the sub-forest microclimate. Thus, the success of these systems depends on the choice of species capable of acclimatizing to the shading conditions, it is also necessary that they have good productive capacity and are adapted to the edaphoclimatic conditions of the region and the management of the crops used (Garcia and Andrade, 2001; Gobbi *et al*., 2009).

Some studies have studied this interaction between fodder plants and shade plants (Gobbi *et al*., 2009), where the morphological and structural characteristics and the dry matter production of fodder plants *Brachiaria decumbens* (cv. Basilisk) and *Arachis pintoi* (cv. Amarillo) submitted to different levels of artificial shading (0% (e.g. full sun), 50% and 70%). They concluded that *A. pintoi* and *B. decumbens* exhibit a great potential for evaluation in silvopastoral systems with light transmission level around 50% of the photosynthetically active radiation. In another study evaluating the specific leaf area and the quantitative anatomical characteristics of the leaves of *B. decumbens* and *A. pintoi* in the same conditions of the study above. *A. pintoi* and *B. decumbens* present shifts in the specific foliar area and in the quantitative foliar anatomy when submitted to shading, proving the anatomical plasticity and acclimatization of these species to the variations in the luminous intensity (Gobbi et al., 2011). Thus the peanut is good plant for use in silvipastoral system. Manly due the great capacity in tolerate luminous intensity and whiteout interference in the crop production.

3.7 Phytoremediation

Removal of vegetation cover in areas contaminated by toxic elements accelerates soil degradation, promoting water and wind erosion and the leaching of contaminants into the water table, triggering a progressive increase in contamination of other areas. For the recovery of these environments requires studies on the soil, vegetation and water, in the case of re-vegetation, the identification of species tolerant or with capacity to accumulate the contaminants is fundamental for the success of the process (Pires *et al*., 2003). Melo *et al*., (2009) in order to evaluate the

ISSN: 2455-6939

Volume:03, Issue:04 "July-August 2017"

potential of four herbaceous fodder species (*Stylosanthes humilis*), peanut (*Arachis pintoi*), oats (*Avena strigosa*) and ryegrass (*Lolium multiflorum*), to be used as phytoremediation species for use in a contaminated soil by As. According to their results the ryegrass, peanut and *Stylosanthes humilis* have potential for phytoremediation of areas contaminated by As, mainly for phytostabilization, since they did not present foliar lesions.

4. CONCLUSIONS

Peanut agribusiness is still small when compared to major Brazilian agricultural crops, but not least. From the information generated in this review it is possible to imply the immense potential of this sector, which has already proved to be very promising.

- The consumption of peanut, either in natura or its peanut processed is satisfactory, as it meets the needs of an individual of amino acids being higher than the FAO standard.

- Although there are other crops with higher yields of oil (e.g. *Elaeis guineensis* and *Jatropha curcas*) and the competition in the market with the soybean crop. Peanut can be exploited in the vegetable oil market because its yield meets the requirements of the market, with potential to increase in the coming years.

- The peanut shows potential of consortium with the coffee and cotton(in this case more studies needs be made) culture. The peanut consortium with grasses proves to be quite promising for both crops.

- Fodder peanut in addition to good biomass production, presents an excellent release rate of K, P, Ca, Mg, C, N respectively.

- The hay provided by the peanut shows excellent digestibility for equines and cattle, in the consortium improves the digestibility of the intercropped grass. Not only the dry matter of the peanut can be used as well as the pie produced oil production, being highly protein.

- The silvopastoral system composed of fodder peanuts is very promising because it is a crop that is adapted to the shading conditions provided by the agroecosystem.

- Due to the large number of areas contaminated by toxic products, peanuts as a promising species for phytoremediation programs mainly in areas contaminated with arsenic.

Considering that the area under cultivation in Brazil increased by 74% in 2004 (Freire et al., 2005) and the establishment of agricultural standards by the industries, the agribusiness of this oilseed tends to be quite widespread for small, medium and large farmers. Taking into account

ISSN: 2455-6939

Volume:03, Issue:04 "July-August 2017"

their socioeconomic value and the various segments of their productive chain put the peanut one the most important crop plants.

REFERENCES

Araújo, A. C., Beltrão, N. E. M., Bruno, G. B. & Morais, M. S. (2006). Cultivares, épocas de plantio e componentes da produção no consórcio de algodão e amendoim. *Revista Brasileira de* Engenharia Agrícola e Ambiental,10, 357–363.

Araújo, A. C., Beltrão, N. E. M., Morais, M. S., Araújo, J. L. O., Cunha, J. L. X. L. &Paixão, S. L. (2008) Indicadores agro econômicos na avaliação do consórcio algodão herbáceo + amendoim. Ciênc. agrotec., 32, 1467-1472.

Assis, G. L. M., Valentim, J. F. Carneiro-Junior, J. M. C., Azevedo, J. M. A. & Ferreira, A. S. (2008). Seleção de genótipos de amendoim forrageiro para a cobertura do solo e produção de biomassa aérea no período de estabelecimento utilizando-se metodologia de modelos mistos. R. Bras. Zootec., 37, 1905-1911.

Azevedo, D. M. P., Santos, J. W. Beltrão, N. E. M. & Leão A. B. (1998). População de plantas no consórcio mamoneira/milho. I. Produção e componentes da produção. Revista de Oleaginosas e Fibrosas, 2, 141-146.

Barbero, L. M., Cecato, U., Bernardo, S. M., Gomes, J. A. N., Limão, V. A. & Basso, K. C. (2009). Produção de forragem e componentes morfológicos em pastagens de *coastcross* consorciada com amendoim forrageiro. R. Bras. Zootec., 38, 788-795.

Barbero, L. M., Cecato, U., Lugão, S. M. B., Gomes, J. A. N., Limão, V. A., Abrahão, J. J. S. & Roma,C. F. C. (2010). Produção animal e valor nutritivo da forragem de pastagem *coastcross* consorciada com amendoim forrageiro. Arq. Bras. Med. Vet. Zootec., 62, 645-653.

Beltrão, N. E. de M., Nobrega, L. B., Azevedo, D. M. P. & Vieira, D. J. (1984). Comparação entre indicadores agroeconômicos de avaliação de agroecossistemas consorciados e solteiros envolvendo algodão "upland" e feijão "caupi". Campina Grande: EMBRAPA – CNPA.

Calori-Domingues, Maria Antonia, Rechdan, Rafael Condino, Moretti, Ademar, Gloria, Eduardo Micotti da, Zambello, Ivani Valarini, Corrente, José Eduardo, & Dias, Carlos Tadeu dos Santos. (2010). Avaliação de procedimentos de preparo de amostra de amendoim in natura para análise de aflatoxinas. *Química Nova, 33*(7), 1409-1495.

Cecato, U., Galbeiro, S., & Gomes, J. A. N. (2006). Utilização e manejo de pastos de *Panicum* e *Brachiaria* em sistemas pecuários. In: A. F. Branco, G. T. Santos, & C. C. Jobim (Eds.),

ISSN: 2455-6939

Volume:03, Issue:04 "July-August 2017"

Sustentabilidade em sistemas pecuários (pp.147-178.). Maringá: Universidade Estadual de Maringá.

Costa, M. B. B. (1993). Adubação verde no sul do Brasil. Rio de Janeiro, AS-PTA, 346p.

Embrapa. (2006). Cultivo do amendoim. Available in: < http://sistemasdeproducao.cnptia.embrapa.br/FontesHTML/Amendoim/CultivodoAmendoim/index.html>. Acesso em: 20 out. 2016.

Filho, C. V. (1985). Amendoim da seca: épocas do plantio. Bragantia, 14, no number.

Freire, R. M. M., Narain, J. N., Santos, R. C. Farias, C. R., & Queiroz, M. S. R. (1997). Composição centesimal de sementes de amendoim de três tipos botânicos. Ver. Oleag. Fibr. 1, 135-142.

Freire, R. M. M., Narain, N., Azevedo, R., & Queiroz, M. S. R. (200); Avaliação protéica da farinha desengordurada de genótipos de amendoim. Rev. ol. fibros. 4, 193-199.

Freire, R. M. M., Narain, N., Miguel, A. M. R. O., & Santos, R. C. (2005) Aspectos nutricionais de amendoim e seus derivados. In: R. C. Santos, (Ed). O agronegócio do amendoim no Brasil (pp. 391 – 395). Campina Grande: Embrapa Algodão.

Freitas, S. M., Martins, S. S., Nomi, A. K., & Campos, A. F. (2005). Evolução do Mercado brasileiro de amendoim. In: R. C. Santos. (Ed). O agronegócio do amendoim no Brasil (pp. 17-44). Campina Grande: Embrapa Algodão.

Gama-Rodrigues, A. C.; Gama-Rodrigues, A. F.; Brito, E. C. (2007) Resíduos culturais de plantas de cobertura em argissolo vermelho-amarelona região noroeste fluminense. R. Bras. Ci. Solo, 31, 1421-1428.

Garcia, R., & Andrade, C. M. S. (2001). Sistemas silvipastoris na região sudeste. In: Sistemas Agroflorestais Pecuários: Opções De Sustentabilidade Para Áreas Tropicais E Subtropicais, Juiz de Fora. Annals...

Garcia, R., & Couto, L. (1997) Silvopastoral systems: emergent technology of sustainability. In: International Symposium On Animal Production Under Grazing (pp. 281-302), Viçosa, MG. Annls.....

Gobbi, K. F. (2009). Características morfológicas, estruturais e produtividade do capim-braquiária e do amendoim forrageiro submetidos a sombreamento. R. Bras. Zootec., 38, 1645-1654.

ISSN: 2455-6939

Volume:03, Issue:04 "July-August 2017"

Gobbi, K. F., Garcia, Rasmo, V., Marília, C., Neto, A. F. G., & Rocha, G. C. (2011). Área foliar específica e anatomia foliar quantitativa do capim-braquiária e do amendoim-forrageiro submetidos a sombreamento. Revista Brasileira de Zootecnia, 40, 1436-1444.

Granato, D., Pierkarski, F. V. B. W., & Ribani, R. F. (2009). Composição mineral de biscoitos elaborados a partir de farinhas de amêndoas ou amendoim adicionadas de ferro. Pesquisa Agropecuária Tropical, 39, 92-97

Hernani, L. C., Kurihara, C. H., & Silva, W. M. (1999). Sistema de manejo do solo e perdas de nutrientes e matéria orgânica por erosão. Revista Brasileira de Ciência do Solo, 23, 145-154.

Lourezani, W. L., & Lourezani, A. E. B. S. (2006) Potencialidades do agronegócio brasileiro de amendoim. In: XLIV Congresso Da Sober., Fortaleza: Abstracts...

Karmakar, A., Karmakar, S., & Mukherjee, S. (2010) Properties of various plants and animals feedstocks for biodiesel production. Bioresource Technology, 101, 7201-7210

McGregor, E., Macky, A., & Dodd, M. (1999). Silvopastoralism using tended poplars on New Zealand hill country: In: Proceedings Of The New Zealand Grassland Association, Hawkes Bay. Proceedings...

Melo, R. F., Dias, L. E., Mello, J. W. V., & Oliveira, J. A. (2009). Potencial de quatro espécies herbáceas forrageiras para fitorremediação de solo contaminado por arsênio. Revista Brasileira de Ciência do Solo, 33, 455-465.

Ministério da Agricultura, Pecuária e Abastecimento- MAPA. (2007). Balanço Nacional da Cana-de-açúcar e Agroenergia; 2007. Edição Especial de Lançamento. Ministério da Agricultura, Pecuária e Abastecimento- MAPA. Brasília.

Miranda, C. H., Vieira, A., & Cadisch, G. (2003) Determinação da fixação biológica de nitrogênio no amendoim forrageiro (*Arachis* spp.) por intermédio da abundância natural de 15N. Revista Brasileira de Zootecnia, 32, 1859-1865.

Morgado, E. S., Almeida, F. Q., Silva, V. P., Gomes, A. V. C., Galzerano, L., Ventura, H. T., & Rodrigues, L. M. (2009). Digestão dos carboidratos de alimentos volumosos em eqüinos. Revista Brasileira de Zootecnia, 38, 75-81.

Nogueira, R. J. M. C., & Távora, F. J. A. F. (2005). Ecofisiologia do amendoim (*Arachis hypogaea* L.). In: R. C. Santos, (Ed). O agronegócio do amendoim no Brasil (pp. 73 – 99). Campina Grande: Embrapa.

ISSN: 2455-6939

Volume:03, Issue:04 "July-August 2017"

Oben, E. O., Ntonifor, N. N., Kekeunou, S., & Abbeytakor, M. N. (2015). Farmers knowledge and perception on maize stem borers and their indigenous control methods in south western region of Cameroon. Journal of Ethnobiology and Ethnomedicine, 11, 77.

Olivo, C. J., Ziech, M. F., Meinerz, G. R., Both, J. F., Agnolin, C. A., & Vendrame, T. (2008). Comportamento ingestivo de vacas em lactação em diferentes sistemas forrageiros. Revista Brasileira de Zootecnia, 37, 2017-2030.

Olivo, C. J., Ziech, M. F., Meinerz, G. R., Agnolin, C. A., Tyska, D., & Both, J. F. (2009). Valor nutritivo de pastagens consorciadas com diferentes espécies de leguminosas. Revista Brasileira de Zootecnia, 38, 1532-1542.

Paul Abishek, M., Patel, J., & Prem Rajan, A. (2014). Algae Oil: A Sustainable Renewable Fuel of Future. Biotechnology Research International, 272814. http://doi.org/10.1155/2014/272814

Paulo, E. M., Berton, R. S., Cavichioli, J. C., & Kasai, F. S. (2004). Comportamento do cafeeiro Apoatã em consórcio com culturas anuais. Bragantia, 63, 275-281.

Pereira, E. L., Barros, C. S., Rossetto, C. A. V. (2010). Contaminação de sementes de amendoim, inoculadas por *Aspergillus* secção Flavi, influenciada pelo genótipo, pela área de cultivo e pelos isolados. Ciênc. agrotec., 34, 853-859.

Pires, F. R., Souza, C. M., Silva, A. A., Procópio, S. O., & Ferreira, L.R.. (2003). Fitorremediação de solos contaminados com herbicidas. Planta Daninha, 21, 335-341

Portes, T.. (1996) Produção de feijão nos sistemas consorciados. Goiânia: EMBRAPA – CNPAF, Documents...

Raposo, P. A. (1967). A agricultura de sequeiro no Nordeste. Recife: Universidade Federal de Pernambuco.

Rego, F. C. A., Damasceno, J. C., Fukumoto, N. M., Côrtes, C., Hoeshi, L., Martins, E. N., & Cecato, U.. (2006). Comportamento ingestivo de novilhos mestiços em pastagens tropicais manejadas em diferentes alturas. Revista Brasileira de Zootecnia, 35, 1611-1620.

Rezende, B. L. A., Cecilia-Filho, A. M., Feltrim, A. L., Costa, C. C., & Barbosa, J. C. (2006). Viabilidade da consorciação de pimentão com repolho, rúcula, alface e rabanete. Hortic. Bras., 24, 36-41.

Ritter, A. C., & Noll, I. B. (2008) Diferentes pré-inóculos, temperaturas e tempos de incubação na produção aflatoxina B1 em arroz. Cienc. Rural, 38, 2552-2556.

Santos, R. C., Melo-Filho, P. A., Silva, A. F., Gondim, T. M. S., Oliveira-Júnior, J. O. L., Araújo-Neto, R. B., Sagrilo, E., Ariel, N. H., Vasconcelos, R. A., Oliveira, A. P. D., & Freire, R. M. M. (2010) Produtividade de amendoim rasteiro em cinco estados do nordeste. In: Congresso Brasileiro de Mamona & Simpósio Internacional de Oleaginosas Energéticas (pp. 1751-1755), João Pessoa, Annals...

Santos, R. C., Freire, R. M. M., Lima, L. M., Zagonel, G. F., & Costa, B. J. (2012). Produtividade de grãos e óleo de genótipos de amendoim para o mercado oleoquímico. Revista Ciência Agronômica, 43, 72-77.

Silva, M. B., Beltrão, N. E. M. (1998). Níveis populacionais e configurações de plantio na cultura do amendoim, em regime de sequeiro na mesorregião do agreste da Borborema do Estado da Paraíba. Revista de Oleaginosas e Fibrosas, 4, 23- 34.

Ullah, A., Sun, H., Yang, X., & Zhang, X. (2017). Drought coping strategies in cotton: increased crop per drop. Plant Biotechnology Journal,15, 271–284.

Valentim, J. F., & Andrade, C. M. S. (2004). Perspectives of grass-legume pastures for sustainable animal production in the tropics. In: Reunião Annual da Sociedade Brasileira de Zootecnia (pp.142-154), Campo Grande. Annals...

