Expansion of sunflower crop production in Brazil: a survey of future trends

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ABSTRACT

The sunflower-cropped area in Brazil has been showing potential possibilities for being increased within a short period of time for biofuel production. Planning the activities is one of the requirements for the success of future cropped area expansion. This requires a previous survey that identifies future trends in the transformation and rearrangement of the sunflower agro-industry sector and also identifies technological needs that may affect this process. With the objectives of identifying future trends and technological needs, a value production chain was built and a questionnaire was distributed to agents of all the sectors participating at the V National Brazilian Symposium of Sunflower and at the XVII Sunflower National Research Meeting Network. The results pointed to a strong tendency for area expansion in the next two to five years (75%); this being as a secondary follow-up crop (83%), especially after soybean, and to be used for biofuel (77%). The main research needs were linked to disease control, crop zoning and varietal improvement for disease resistance and high oleic oil content. Also, when considering the vision of and concerns regarding the future expansion and transformation of the sunflower production complex, it is believed that this expansion is a consolidated trend, requiring a strategic sector planning associated with an economic and technological policy for its success within Brazilian agribusiness.

Key-words: agroenergy – biodiesel – Brazil – *Helianthus annuus* L. – planning.

INTRODUCTION

The sunflower (*Helianthus annuus* L.) cropped area in Brazil is incipient (110 thousand ha) when compared to the main world producers such as Russia, the European Union, Ukraine and Argentina, which sum up 19.9 million hectares of the world's cropped area. As it is incipient, the Brazilian yield production represents only 0.4% of the world production when compared with those countries which represent 72% (FAO, 2007). However, there is an enormous potential for expansion if sunflower is planted in rotation after soybean, which occupies an area of 21 million hectares (CONAB, 2007). The potential for area expansion is also driven by the Brazilian government's demand for biofuel and for high oleic oil for human consumption.

The use of vegetable oil, as a biofuel or for energy generation, has been known for long time in Brazil (França, 2005). However, there is a current debate in relation to its viability for being used as a biofuel or for human consumption.

The sunflower crop has shown advantages for possible biofuel use such as: high oil content (40%), also allowing cold extraction (Gazzoni, 2005), low production costs and a high positive energy balance (unit of energy produced as biodiesel/unit of energy used for crop production) when compared with other oil crops (Ungaro, 2006), particularly when it is used as a secondary follow-up crop after soybean (Lazzarotto et al., 2005). These facts reduce the demand for fossil fuel and optimize the use of fertilizer, water, land and other inputs, therefore producing environmental benefits due to the reduction of fertilizer and the maintenance of the soil productivity capacity.

Considering the fact that the economic and environmental benefits (except for fossil fuel use in reducing greenhouse gas emissions) of the sunflower for biofuel production are exactly the same as those for food production, there is a current debate regarding its destiny. Some authors (Mandarino, 2005) advocate that such a high quality and noble oil, with a high content of unsaturated fatty acids, the presence of vitamin E, β-caroten and phospholipids should be used for human consumption rather than for biodiesel production. Moreover, there is an increased demand in South America for sunflower genotypes with high oleic oil for frying purposes.

Despite the debate, the demand for an increase in Brazilian sunflower production on a short and medium term is evident. However, there are many doubts about the future, since on many occasions in the past, the market signaled an increase in the demand for sunflower production, but this did not happen.

These facts decreased the confidence of the producers in investing capital, financial and human resources in the sunflower crop area expansion.

In this context, the use of strategic planning tools is appropriate in order to minimize future risks and opportunities to the sunflower production complex. Identifying consolidated future trends and uncertainties, and rapid diagnoses involving all the agents of a given sector are necessary to the construction of future scenarios that could support a more rational decision-making process (Godet, 2000). So, the objective of this study was to identify future trends and technological needs of the sunflower value chain in order to subsidize the formulation of future public policies.

MATERIALS AND METHODS

This research was done in two phases; first a bibliographical review allowed to identify agents of the sunflower agro-industry value chain and to gather sunflower production data from Brazil and from the world since 1997. The second phase was the elaboration of a semi-structured questionnaire directed towards the future expansion, transformation and technological needs of the sunflower value chain. This questionnaire was distributed to agents of all the sectors participating in the V National Brazilian Symposium of Sunflower and in the XVII Sunflower National Research Meeting Network in Uberlândia/MG/Brazil in October 2007. These meetings are very important for the Brazilian sunflower agro-industry complex, due to the intense participation of the representatives of the whole value chain. It is also a forum to show the latest research achievements, identifying research needs, exchanging experience, practical knowledge and identifying policy needs.

The questionnaire was given to 89 participants, with a return of 59 respondents (55%). At the moment of the delivery the research objectives, the filling-in process and the importance of the participation of each respondent were explained. Also expressed was the commitment of the researchers to return the compiled results to the respondents.

The Gil's (1995) recommendations were used in the drafting, application and analysis of the questionnaire. Statistical descriptive analyses (frequency distribution) were made following Pimentel-Gomes (1985).

RESULTS AND DISCUSSION

Analysing the past 10 years of world sunflower production (Fig. 1A), it could be seen that there had been a relatively constant volume of seed and oil production, 27.148 and 9.211 thousand tons year^{-1}, respectively, reflecting a stable market, except for in 2001, when very low volumes of seed and oil production were observed. However, the Brazilian data (Fig. 1B) did not follow this tendency. They showed an increasing tendency from 1997 to 2000, then leveling off and peaking in 2003, followed by a period of accentuated decrease 2004-2005, and showing another increasing tendency in 2006. It is expected that this trend will continue in 2007, with a higher increment in 2008 due to the Brazilian requirement of a 2% mixture of biodiesel in common diesel (Law 11.0097, January 13th, 2005).

Vieira (2001) also observed a great variability during the 1980s and concluded that this was due to the low yielding varieties, the scant volume of technologies available to farmers, the lack of tradition and knowledge of the farmers for planting sunflower, besides the inexistence of defined market and commercialization channels. This situation seems to have stayed the same up to today.

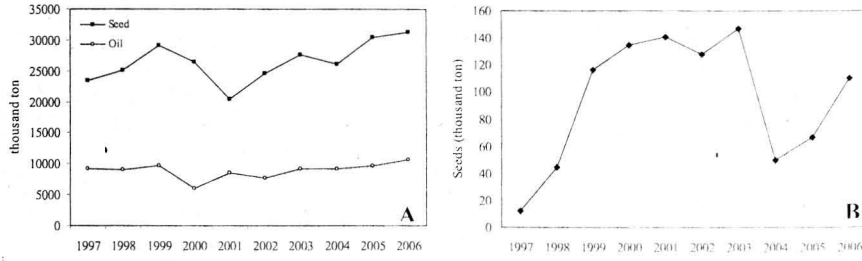

Fig 1. Historical series of world sunflower seed and oil production (A), Brazilian seed production (B). *Source*: FAO (2007).

The increasing demand for biofuels has been causing a drastic transformation in the Brazilian oil seed processing sector. Approximately 13 new plants have come into operation, i.e, 33% from the 45 constructed in 2007 for processing biodiesel (http//www.biodieselbr.com.br). Also, traditional plant mills have changed their focus into processing high oleic sunflower genotypes. Therefore, biodiesel and high oleic are playing an important role in motivating the expansion and transformation of the sunflower value chain.

Lazzaroto et al. (2005) built a schema of this new sunflower volume chain involving the main players, from the input suppliers to the final consumer (Fig. 2). It can be seen that each segment is responsible for a great number of activities generating employment and income, and that that segment is interconnected to the others, forming a long, complex value producing chain.

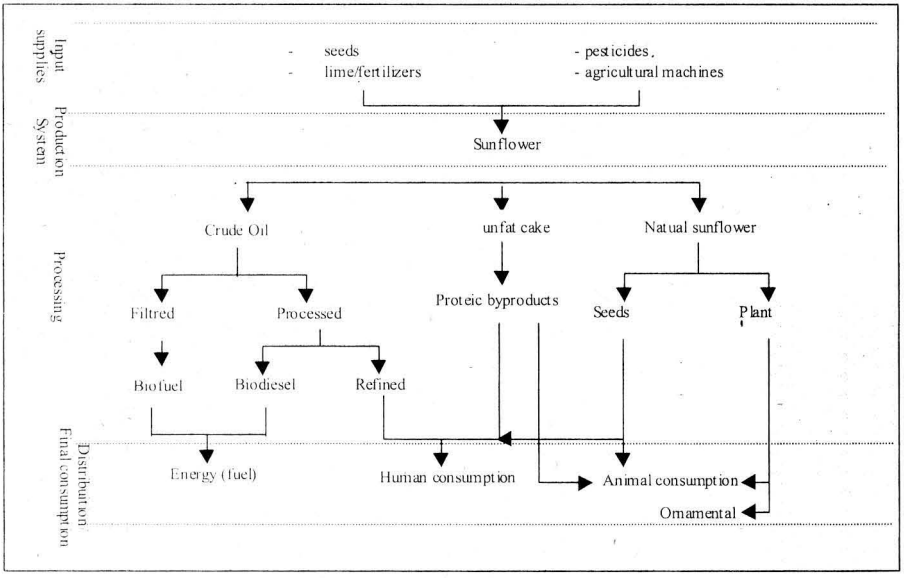

Fig 2. Schematic representation of the Brazilian sunflower agro-industy chain. (*Adapted from* Lazzarotto et al., 2005)

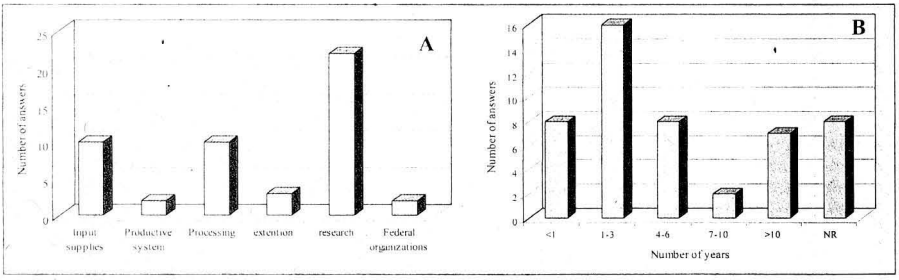

Fig. 3. Number of representatives per segment of the sunflower value chain (A) and period of time dealing with the crop (B). (Obs: NR - blank answers).

The experience in dealing with the sunflower crop was an important point for the persons surveyed. Thus, the time period in dealing with the sunflower was the parameter selected and it is shown in Fig. 3B. It can be observed that 16% had less than 1 year of sunflower management, 33% had from 1 to 3 years, 16% from 4 to 6 years and 16% had more than 10 years of experience with the crop.

The fact that 51% of the respondents had been working with sunflower for more than 4 years, besides ensuring the knowledge of the sector in the answers, also indicated that sunflower has been commercially produced for more than a decade in Brazil, although on a small scale. On the other hand, the high percentage (49%) of professionals with less than three years' experience coincides with the time period in which the Brazilian Government officially initiated the biodiesel national program (2005). This indicated a tendency of a growing crescent sunflower sector, with the interest of trained and specialized professionals. This information corroborated the expectations of crop expansion (Fig. 4A), to which 75% answered that a large expansion was expected in the next 2 to 5 years. In this way, the professionals, at the moment with less than 3 years' sunflower management experience, would be adequately trained for the expected period of high and rapid expansion.

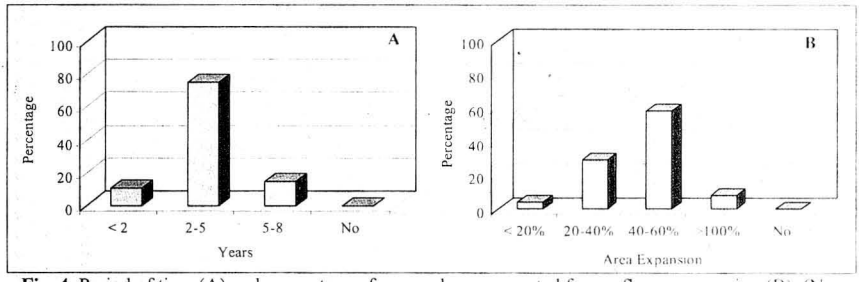

Fig. 4. Period of time (A) and percentage of cropped area expected for sunflower expansion (B). (No – agents who did not expect expansion)

In relation to the expected increment in the cropped area expansion (Fig. 4B), 58% of the professionals estimated that this increment would be between 40 to 60%. So, in the next 2 to 5 years the planted area of 110 thousands ha (2005) would be in a range of 154-176 thousand ha. It becomes clear that, even with this expansion, Brazilian participation in the international sunflower market will be insignificant. However, it represented a decrease in the importation of sunflower flour, crude and refined oil that reached in 2004 2.000, 10.065 and 7.454 tons, respectively (Lazzarotto et al., 2005). In addition, 29% of the professionals expected an area expansion ranging between 20-40% and the most optimistic ones (8%) had an expectation of 100% or more.

The survey also indicated that 83% of the professionals believed that increments varying from 40 to 100% are expected for sunflower as a secondary follow-up crop, especially after soybean, mainly concentrated in the Brazilian Savannas, which have the highest percentage of the soybean 21 million ha planted area (CONAB, 2007). This tendency indicated that the sector seems to be focused towards a more rational use of the areas under no-till. It permits the lowering of production costs due to the use of residual fertilizer and less energy while also maintaining the soil production potential by increasing the water holding capacity and infiltration rate, the organic matter content and by reducing compaction.

Considering that sunflower is one of the oil seed crops included in the Brazilian National Program for Production and Use of Biodiesel (PNPB) launched in 2005, a question on the expectations of the use of sunflower for biodiesel production within the PNPB was asked (Fig. 5A). As a result, 75% of the respondents answered positively. However, this expectation level depended on the degree of success of the PNPB expected by the agents, since 49% believed in total success, 47% in moderate success and 4% in failure (Fig. 5B).

The PNPB was drawn up with the purpose of substituting fossil fuel by renewable and efficient sources of biofuel, in order to achieve the sustainability of the energy matrix in the economic, social, and environmental spheres (MAPA, 2006).

In order to identify technological gaps and other barriers that may affect the expected area expansion rates, open questions were asked in which the professionals had to cite the five most relevant needs. However, some confusion was shown up in their answers and only two main research needs could be identified.

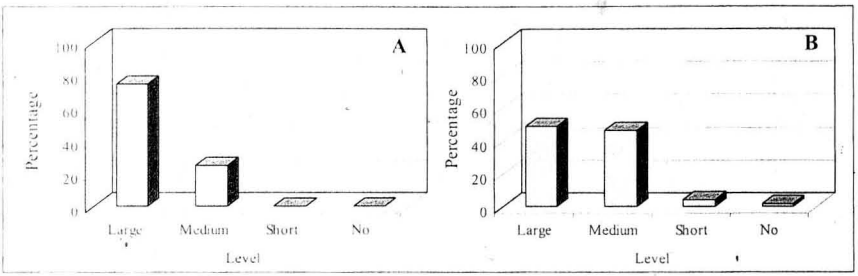

Fig. 5. Expectation of sunflower use as a source for biodiesel production (A) and of success of PNPB (B).

In the open questions, resistant/tolerant high yielding sunflower genotypes and disease control methods and products were cited by 61% of the specialists. In relation to diseases, the sector's main concern was with *Sclerotinia sclerotiorum*, one of the worldwide sunflower's most devastating pathogen, although still with a very low incidence in Brazil (Gulya et al., 1997). A second research need was the crop agro-climatic zoning (39%). Besides focussing on the determination of the best planting date for maximizing yields and reducing the incidence of diseases, agro-climatic zoning is the official instrument required by the government to be used for rural credit and crop insurance purposes.

Another concern was related to the official recommendation and registration of fungicides, insecticides and herbicides for the crop (35%). Although some experimental tests were required, this subject could be seen to be more of a policy need. The sector was concerned with the small number of agrochemical products, registered by the Brazilian Ministry of Agriculture to be used in the sunflower cropping system. As an example, alachlor and trifluralin are the only two herbicides registered (Briguenti et al., 2005). Thus, the sector requires registration measures in emergency cases.

With regard to public policies, an agricultural policy was clearly necessary including price guarantee, rural credit, crop insurance and commercialization measures for the sunflower sector. According to CEPEA, 2007, the whole Brazilian agribusiness has been suffering from the inexistence of a public policy directed towards favoring the competitiveness and development of this sector, which represents 29% of the Brazilian Gross Product.

CONCLUSIONS

When considering the vision of and concerns regarding the future expansion and transformation of the sunflower production complex, it is believed that the expansion is a consolidated trend, requiring a strategic sector planning associated with economic and technological policies for its success within the Brazilian agribusiness.

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