

## CHARACTERIZATION OF A FOREST INCENTIVE PROGRAM IN MINAS GERAIS STATE

José Luiz Pereira de Rezende<sup>1</sup>, Cláudio Túlio Jorge de Pádua<sup>2</sup>, Antônio Donizette de Oliveira<sup>1</sup>,  
Jose Roberto Soares Scolforo<sup>1</sup>, Luiz Moreira Coelho Junior<sup>3</sup>

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**ABSTRACT:** The IEF-Asiflor forest incentive program is the result of a joint endeavor that channeled forest restoration funds to promote, according to effective legislation, silvicultural activity in Minas Gerais state. The above partnership was implemented in 2003. This work aimed to outline the incentive program per participating IEF administrative region, and to georeference and quantify implemented forest stands according to property size class. It was searched data records of all producers benefiting from the program. It was compiled and processed the data, using ArcMap® application to georeference the rural properties making up the sample. The observations concerning number of assisted properties and area reforested in each property per administrative region was based on seven property size classes, according to the 1996 agricultural census classification of the Brazilian Institute of Geography and Statistics (IBGE). The administrative unit showing the largest assisted area was Centro Norte regional office, with 3,872.25 ha, although Zona da Mata regional office had the largest number of benefiting producers, with 449 producers. Featured among the steel producing hubs concentrating the largest number of Asiflor member plants, Sete Lagoas had the largest reforested area, being closer to the actual plants. The most assisted property size class, both in quantity and in area reforested, was class B, except in Centro Norte regional office where Class E showed a larger area reforested.

Key words: Reforestation, forest incentive, forest restoration.

## CARACTERIZAÇÃO DE UM PROGRAMA DE FOMENTO FLORESTAL NO ESTADO DE MINAS GERAIS

**RESUMO:** O programa de fomento florestal IEF-Asiflor é fruto de um convênio que direcionou os recursos provenientes da reposição florestal, para, de acordo com a legislação vigente, promover a atividade silvicultural em Minas Gerais. O convênio foi implementado em 2003. Neste trabalho objetivou-se caracterizar o programa de fomento por escritório regional do IEF abrangido pelo programa, bem como georeferenciar e quantificar os povoamentos florestais implantados por diferentes classes de tamanho de propriedades rurais. Para tanto, foram levantados os dados cadastrais de todos os produtores fomentados. Esses dados foram, posteriormente, compilados e trabalhados. Utilizou-se o software ArcMap® para referenciar as propriedades rurais componentes da amostra. A observação do número de propriedades contempladas bem como da área reflorestada por propriedades, nas diferentes regiões administrativas, levou em consideração sete diferentes classes de tamanho, em acordo com a classificação do censo agropecuário de 1996 do IBGE. O escritório regional que teve a maior área fomentada foi o Escritório Regional Centro Norte, com 3.872,25 ha, embora o maior número de produtores contemplados tenha ocorrido no Escritório Regional da Zona da Mata com 449 produtores. Dentre os pólos siderúrgicos que concentram o maior número de siderúrgicas componentes da Asiflor, o pólo de Sete Lagoas apresentou a maior área reflorestada e se localiza mais próximo das siderúrgicas. A classe de tamanho de propriedade mais contemplada, em número e área reflorestada, foi a classe B, apenas no Escritório Regional Centro Norte a Classe E apresentou maior área reflorestada.

Palavras-chave: Reflorestamento, fomento florestal, reposição florestal.

### 1 INTRODUCTION

The forest incentive program between IEF (state forest institute) and Asiflor (steelmakers association for forest incentive) meets legal and normative requirements of both federal and state legislation for the channeling of forest restoration funds to promote silvicultural activity (PÁDUA 2006).

The main purpose of the program was to seek alternatives for easing the pressure on native remnants in Minas Gerais state and ensuring sustainable supply of fuelwood to the steel producing industry (COELHO JUNIOR et al. 2008).

Asiflor was created in March 1997 by an association of 27 small and midsize steel producing companies that sought to foment forest restoration. They established a

<sup>1</sup>Forest Engineer, Lecturer at Departamento de Ciências Florestais of Universidade Federal de Lavras/UFLA – Cx. P. 3037 – 37200-000 – Lavras, MG – jlprezen@dcf.ufla.br, donizete@dcf.ufla.br, jscolforo@dcf.ufla.br

<sup>2</sup>Forest Engineer – Departamento de Ciências Florestais of Universidade Federal de Lavras/UFLA – Cx. P. 3037 – 37200-000 – Lavras, MG – cladiotulio@yahoo.com.br

<sup>3</sup>Economist, PhD candidate in Forest Engineering at Universidade Federal de Lavras/UFLA – Cx. P. 3037 – 37200-000 – Lavras, MG – lmcjunior@hotmail.com

fund for the carrying out of forest incentive programs in Bahia, Mato Grosso do Sul and Goiás states (CORDEIRO 2008, PÁDUA 2006).

In 2003 an investment fund was created in Minas Gerais via a mutual cooperation agreement between IEF and Asiflor. The agreement was grounded on Federal Law 8666 of June 1993 (BRAZIL 1993), Federal Decree 43710 of October 2003, and State Law 14309 of June 2002 (MINAS GERAIS 2002, 2005).

Forest restoration, under the 1965 Forest Code, is an important tool of the national environmental policy to supply raw material to the timber industry. It is estimated that approximately 10% of the timber used in the cellulose and paper industry and by the steel industry are obtained via forest incentive (CORDEIRO 2008, REZENDE et al. 2006).

The design of a study to explore the above incentive program, determining volume planted and number of benefiting producers per IEF administrative region is thus an important tool for future consultation and analysis (REZENDE et al. 2008).

This study aimed to outline the IEF/Asiflor incentive program, to identify and analyze eucalyptus plantations participating in the IEF-Asiflor program per administrative region, to identify the number of producers per property size class, to georeference properties and to define distance classes from reforested properties to two major industrial consumers of fuelwood: Sete Lagoas and Divinópolis.

## 2 MATERIAL AND METHODS

### 2.1 Study site

The study was performed in properties within the scope of IEF/MG administrative regions and assisted by the IEF/Asiflor forest incentive program in the crop years of 2003/2004 and 2004/2005.

The IEF operates in thirteen administrative regions of Minas Gerais which are also referred to as 'regional offices', though only the following six were targeted by the incentive program: Centro Oeste regional office (ERCO), Centro Sul regional office (ERCS), Zona da Mata regional office (ERZM), Rio Doce regional office (ERDC), Centro Norte regional office (ERCN) and Alto Paranaíba regional office (ERAP). The remaining regional offices were ignored because their reforested area is unsubstantial. Table 1 illustrates the number of municipalities and average altitude of each regional office.

The local climate is influenced by considerable variation in altitude (300–1,500m), as illustrated in Table 1, with mild winters and occurrence of frost in altitudes above 850m, and hot or mild summers. The occurrence of rainy summers and dry winters indicates a tropical climate, although as temperatures drop due to the high altitude it can be said that a 'tropical climate of higher altitudes' predominates in the region (IBGE 1996).

The IEF administrative regions benefiting from the incentive program fall under Cerrado and Mata Atlântica biome categories and originally are representative of the entire flora peculiar to these biomes "from open fields to riparian forests and palm marshes in the Cerrado biome, and from deciduous to ombrophilous and semi-deciduous forests in the Atlantic Forest biome.

All types of soil and relief can be found in the relevant area of the program.

### 2.2 Initial data search and program outline per region

Data records of the population benefiting from the program were compiled so as to have means to measure the area assisted per administrative region, and to fit these areas into property size classes and different producer profiles.

**Table 1** – Average altitude and number of municipalities per administrative region.

**Tabela 1** – *Altitude média e número de municípios por região administrativa.*

Regional office	No. of municipalities	Average altitude (m)
Centro Oeste (ERCO)	51	810.7
Centro Sul (ERCS)	96	824.8
Centro Norte (ERCN)	48	694.0
Alto Paranaíba (ERAP)	35	915.0
Zona da Mata (ERZM)	142	526.5
Rio Doce (ERRD)	91	398.0

Program reports included the following information: name of landowner, area of property, contract, UTM coordinate of property, access route, georeferenced reforested area, amount of seedlings and inputs used, municipality, regional office, producer details, etc.

After compiling and processing the information, a diagnosis was developed of the sum of areas reforested, property size class, sum of areas of assisted properties, number of benefiting producers per administrative region and crop year, drawing parallels between these factors.

The observation on number of benefiting properties and area reforested per property in each administrative region was based on seven property size classes, according to the 1996 agricultural census classification of the Brazilian Institute of Geography and Statistics (IBGE), which are as follows:

Class A – Properties less than 10 hectares in size

Class B – Properties 10 to 100 hectares in size

Class C – Properties 100 to 200 hectares in size

Class D – Properties 200 to 500 hectares in size

Class E – Properties more than 500 hectares in size

### 2.3 Georeferencing data

All properties were georeferenced in UTM coordinates and plotted on the map of Minas Gerais state to determine their distance from steel producing centers and fuelwood consumers Divinópolis and Sete Lagoas. For that, ArcMap® application was used. Georeferencing was based on two crop years and four distance classes from the above fuelwood consumers: less than 100 km radius, 100 to 200 km radius, 200 to 300 km radius and more than 300 km radius.

In doing so it was possible to identify the area reforested each year per distance class from the target fuelwood consumers.

### 2.4 Obligations of the parties under the agreement

The delimitation of competencies as to the channeling of forest restoration funds are defined via an agreement that sets out the relevant obligations and budgetary provisions to be followed by each party in order to implement the incentive program.

Selected landowners enter into an agreement with the IEF to ensure that program inputs and funds are indeed channeled to the cultivation of eucalyptus as opposed to other purposes. The program funds are planned and distributed equally between IEF and Asiflor.

The obligations of IEF include provisioning of technical assistance, inputs (ant killer, fertilizers and

seedlings) and nursery infrastructure, seedling production, registration, and also supervision of the implementation and maintenance of tree stands.

The obligations of Asiflor include provisioning of nursery infrastructure, vehicles, seeds and substratum, hiring labor for the nurseries, hiring engineers and/or technicians to implement the project, developing transition nurseries and the Centro Norte nursery.

The obligations of benefiting landowners include abiding by the partnership agreement, the IEF technical guidelines and the implementation and maintenance schedules, preparing the soil to receive seeds, eliminating ants and ensuring the forest is free of pests and noxious weeds, maintenance fertilization with NPK 0-0-60 or KCl at the rate of 200 kg/ha and Boron at 16 kg/ha, with two applications (first and second year) in the case of Cerrado.

### 2.5 Seedling nurseries

Seedling production includes three species: *Eucalyptus urophylla*; *Eucalyptus grandis* and *Eucalyptus cloeziana*. The focus of the incentive program was to produce sufficient seedlings to cover 4,600 hectares in 2003, 8,500 hectares in 2004, and 11,500 hectares in 2005. A total of 25 nurseries were used, some owned by Minas Gerais state, others owned by local government agencies but temporarily assigned to IEF, aside from Asiflor's own nursery.

## 3 RESULTS AND DISCUSSION

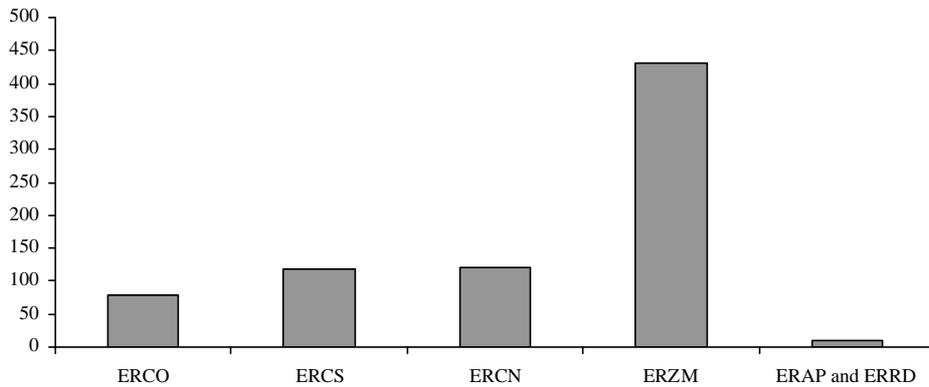
A total of 813 rural properties were included in the study in two crop years, 338 in 2003/2004 and 475 in 2004/2005. A total of 8,473.71 hectares were planted, including 14,024.713 eucalyptus seedlings, 1,127.272 tons of fertilizers [NPK(0-0-60)] and 42.8 tons of ant killer bait (Mirex-S).

### 3.1 Characterization of the incentive program

The administrative region showing the largest number of benefiting producers was ERZM, with 432 landowners, representing more than half the total (Figure 1). By the same token, the administrative region showing the smallest number of benefiting producers was ERRD, with only 10.

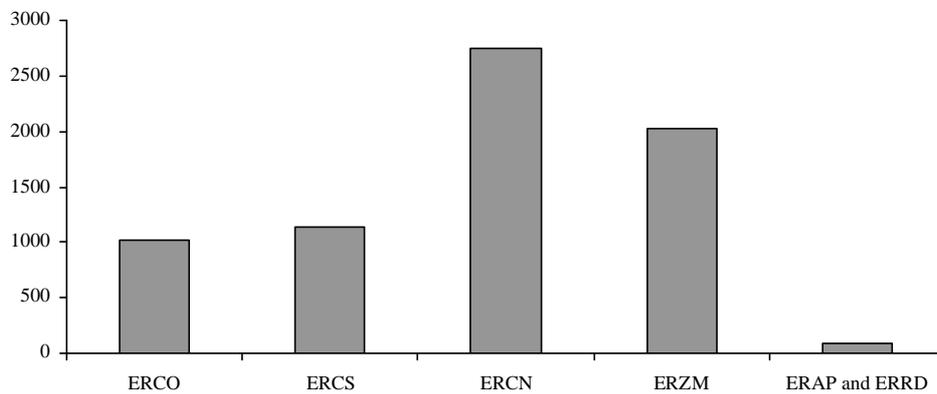
Considering the area assisted per each IEF administrative region, however, the picture is reversed, with ERCN region featuring as the largest planted area (2,753.3 ha), according to Figure 2.

In considering the number of producers and reforested area per administrative region, based on property



**Figure 1** – Number of properties assisted per IEF administrative region.

*Figura 1* – Número de propriedades contempladas por escritório regional do IEF.



**Figure 2** – Area reforested per IEF administrative region.

*Figura 2* – Área reforestada por escritório regional do IEF.

size class, it is noted some peculiarities in producers from one region to the next, though due to space constraints will not explore them in this work.

Table 2 illustrates area reforested and number of participating producers per property area class, per crop year and per administrative region.

It was noted an increase in area reforested and number of reforested properties by confronting crop year 2004/2005 with crop year 2003/2004, indicating an expansion in forest incentive. Table 2 also illustrates that properties with the most reforestation are 10 to 200 hectares in size.

Table 2 characterizes producers benefiting from the IEF/Asiflor incentive program in the ERAP and ERRD regional offices, based on area planted, municipality, number of benefiting producers, crop year and property size class.

In ERCO regional office, the property size class benefiting the most from the incentive program was class B, representing 68% of the total. As for area planted per property size class, Class B represents 49% of the total area reforested within ERCO unit.

In ERCS regional office, the property size class benefiting the most from the incentive program was class B, representing 79% of the total assisted properties and 49% of the total area reforested within ERCS unit.

In ERCN regional office, the property size class benefiting the most from the incentive program in number of producers was class B, representing 31% of the total. As for area planted per property size class, Class E had the most reforestations, representing 30% of the total reforested area.

In ERZM regional office, the property size class benefiting the most from the incentive program was also class B, representing 59% of the total. As for area planted per property size class, class B accounted for 66% of the total reforested area within ERZM unit. Although size class B was the most assisted in number of producers, class A was representative in Zona da Mata.

Zona da Mata regional office fomented the most areas in class A – less than 10 ha in size – in crop years 03/04 and 04/05, with 117.6 ha reforested and 61 benefiting producers in 03/04, and with 199.9 ha reforested and 62 benefiting producers in 04/05.

In ERRD regional office, the property size class benefiting the most from the incentive program was class B, representing 60% of all assisted properties, with only six benefiting producers. As for area planted per property size class, class B accounts for 56% of the total reforested area within ERRD unit.

In ERAP regional office, 18 producers were assisted in what amounts to 250 ha of planted area. However, it was not possible to determine property size classes in this instance due to form completion inconsistencies.

### 3.2 Georeferencing

All participating rural properties were georeferenced so as to identify the area reforested in each distance class from targeted consumers of fuelwood.

Taking steel producing hub Divinópolis as a reference, it was found 1,354 hectares of planted area within a 100 km radius, 3,872 hectares in a 100 to 200 km radius, 2,438 hectares in a 200 to 300 km radius and 337 hectares beyond a 300 km radius (Table 3).

Taking steel producing hub Sete Lagoas as a reference, it was found 2,705 hectares of planted area within a 100 km radius, 3,171 hectares in a 100 to 200 km radius, 2,040 hectares in a 200 to 300 km radius and 85 hectares beyond a 300 km radius, as illustrated in Figures 3 and 4.

Less than 3% of the reforested area is more than 300 km away from the steel producing centers, meaning that more 97% of the area assisted by the program is less than 300 km away from Sete Lagoas and Divinópolis and therefore within an economically feasible transportation distance.

**Table 2** – Area reforested and number of benefiting producers, in different crop years and property size classes, per regional office.

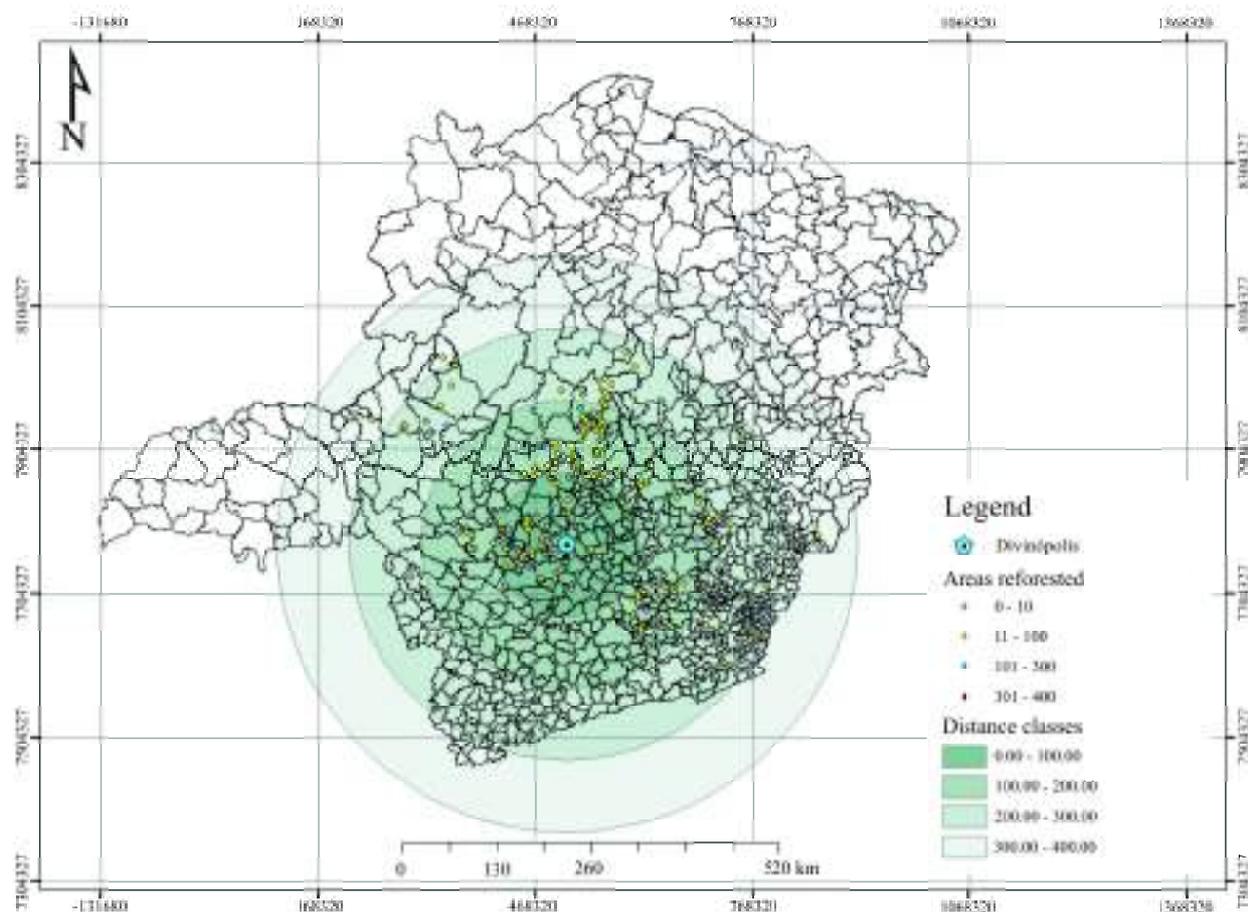
*Tabela 2* – Área reforestada e número de produtores contemplados, em diferentes anos de plantios e classe de tamanho de propriedade, por Escritório Regional.

Regional office	< 100 ha		100 – 200 ha				200 – 500 ha				>500				Total			
	03 / 04		04 / 05		03 / 04		04 / 05		03 / 04		04 / 05		03 / 04		04 / 05		AR	NP
	AR	NP	AR	NP	AR	NP	AR	NP	AR	NP	AR	NP	AR	NP				
ERCO	281	32	239	24	98	8	91	7	48	3	164	5			100	1	1022	80
ERCs	15	4	290	27	625	71	44	3	136	11	8	1			20	2	1136	119
ERCN	167	16	378	27	242	9	495	19	274	11	433	19	437	9	764	10	3191	120
ERZM	693	176	996	210	145	15	120	18	47	8	15	4	3	1			2018	432
ERAP and ERRD			53	6			20	2			10	1			10	1	93	10
Total	1156	228	1955	294	1110	103	770	49	505	33	630	30	440	10	894	14	7459.4	761

**Table 3** – Area planted, in ha, at various distances from steel producing centers.

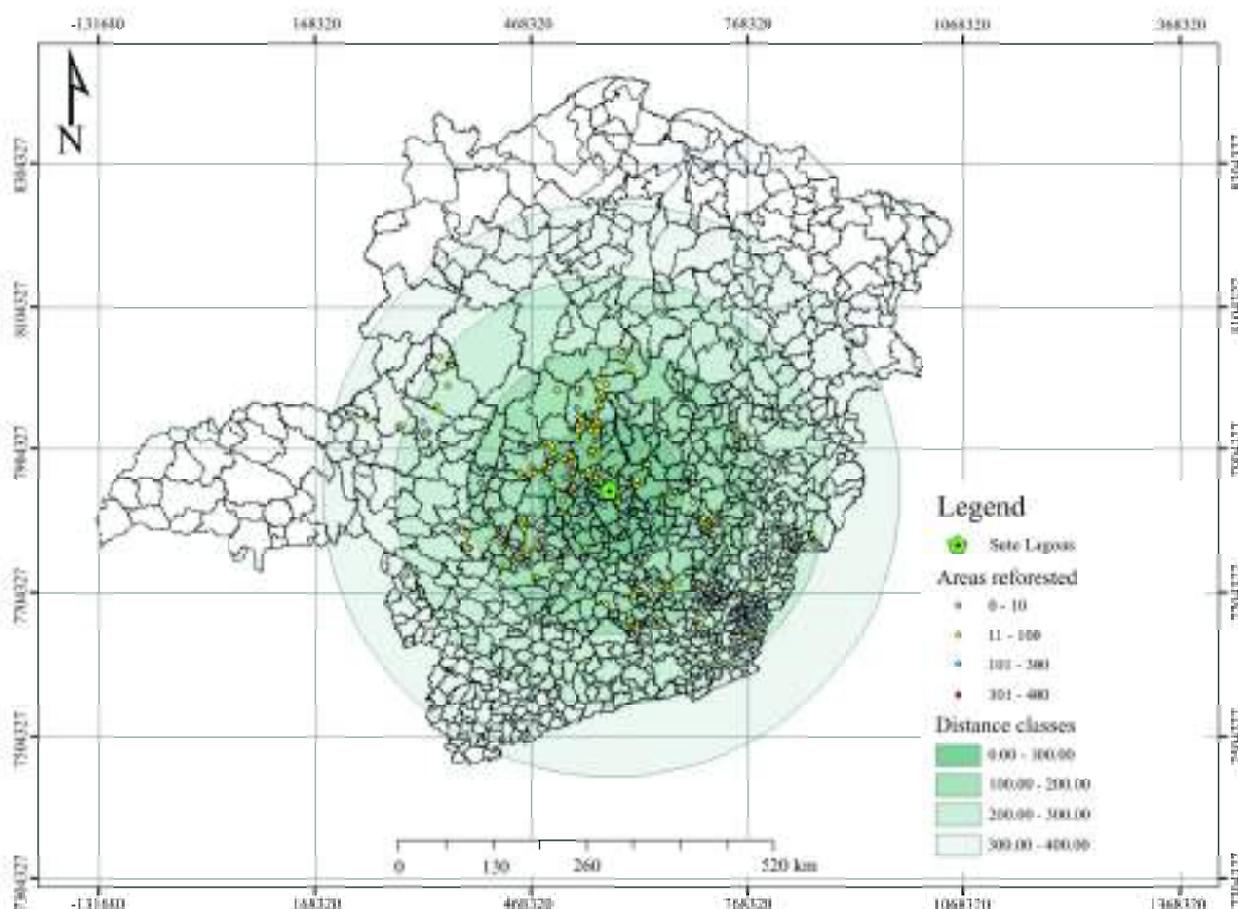
*Tabela 3* – Área plantada, em ha, em diferentes distâncias dos pólos siderúrgicos estudados.

Steel producing centers	< 100km	100-200km	200-300km	>300km	Total
Sete Lagoas	2,705	3,171	2,040	85	8,001
Divinópolis	1,354	3,872	2,438	337	8,001
Total	4,059	7,043	4,478	422	16,002



**Figure 3** – Rural properties benefiting from the IEF/Asiflor forest incentive program.

*Figura 3* – Propriedades rurais contempladas pelo programa de fomento florestal IEF/Asiflor.



**Figure 4** – Rural properties benefiting from the IEF/Asiflor forest incentive program.

*Figura 4* – Propriedades rurais contempladas pelo programa de fomento florestal IEF/Asiflor.

Due to shortcomings found by field people while collecting coordinates data of rural properties, a number of ‘outliers’ occurred that were disregarded.

#### 4 CONCLUSIONS

Analyses of the available material allowed the following conclusions:

- ERCN was the regional office showing the largest reforested area, an average 29 hectares per producer.
- Despite having the largest number of participating producers, the ERZM regional office had the smallest reforested area per producer.
- An increase in the number of producers between crop year 2003/2004 and crop year 2004/2005 demonstrates that the incentive program is expanding.

- The property size class benefiting the most from the incentive program was class B – properties 10 to 100 ha in size –, which translates as small and midsize producers.

-The steel producing hub Sete Lagoas concentrates the largest sum of areas reforested by the program in its proximity, in comparison to counterpart Divinópolis.

- Over 97% of the area reforested by the incentive program is less than 300 km away from the two major steel producing centers, meaning they are within an economically feasible transportation radius.

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