

Fruit plants registration and protection in Brazil from 1998 to 2015: a review

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ABSTRACT

In order to develop mechanisms for the organization, systematization and control of seeds and seedlings production and commercialization, the Ministry of Agriculture, Livestock and Supply (MAPA) created the National Register of Cultivars (RNC). In turn, the objective of the National Service for Plant Variety Protection (SNPC) is to protect intellectual property, guaranteeing commercial exploration rights exclusivity and the use of royalties. Therefore, the aim of this work is to carry out an survey on the number of registrations and protections of different fruit species listed by the MAPA and investigate the participation of private (IPR) and public institutions (IPU). Therefore, 33 fruiters species of economic and social relevance were selected and divided into tempered, subtropical and tropical. Data for the study were obtained from the RNC and SNPC data bank, available in real time at the MAPA website. The research was carried out from 1998 to July 15, 2015. Results showed 2,227 registrations and 88 protections, where the cultures of watermelon, melon, grapes and orange showed a higher number of registration and the grapes, strawberry and apple showed a higher number of protection. With the exception of some annual fruiters, there was greater IPU participation in the number of registrations, while SNPC were found in 54, 55 and 45, 45% of protections for IPR and IPU, respectively. Among the IPUs, Embrapa stands out with the highest number of registrations and protection, followed by IAC, EPAGRI and IAPAR. The public-private partnerships made a slight contribution to the generation of new cultivars.

Key words: Plants breeding, national registry of plant varieties – RNC, national service for plant variety protection – SNPC.

INTRODUCTION

Among the several Brazilian agricultural segments, the cultivation of fruit trees species stands out for their social, economic and food aspects, and for the relevant role it plays in maintaining workers in the fields, constituting a strong job generator source in production as well as in fruit warehousing, breeding and commercialization. According to a survey carried out by the Brazilian Institute for Geography and Statistics (IBGE), The Brazilian production of fruit in 2013 added to 41.6 million tons, holding a third place in the world production of fruit (IBGE 2014).

With its great territory expansion, climate and soil diversity, Brazil has all the conditions to produce fruit of good quality and a wide variety of species. Among the main species, the orange stands out with the total volume of 17.34 million of tons, followed by the banana, pineapple, coconut, grape and apple with 7,18, 3,34, 1,93, 1,42 and 1.38 million tons, respectively (Brazilian Anuário brasileiro de fruticultura 2015). The state of São Paulo, the country's main citrus center, is considered the greatest grower, representing 39% of the total production of all Brazilian fruit. Other states also play an important role in the national production such as Bahia, Rio Grande do Sul, Santa Catarina, Minas Gerais, Paraná and Pará (IBRAF 2013).

The introduction of new technological products as, for instance, new cultivars in the Brazilian agriculture, has contributed to the improvement of product quality and to the reduction of production costs. Several breeding fruit tree programs are being developed with different approaches as, for instance, those reported on the papaya (Ruggiero et al., 2011), banana (Silva et al., 2013) and citrus (Oliveira et al., 2014). Silva et al. (2013) state that for the banana tree culture, the key objectives are related to the increase in productivity and resistance to several diseases such as Yellow Sigatoka (*Mycosphaerella musicola*, Leach), Black Sigatoka (*Mycosphaerella fijiensis*, Morelet) and the Panama disease (*Fusarium oxysporum* f. sp. *cubense*).

Oliveira et al. (2014) described that, for citrus, breeding is focused on both rootstock and scion cultivars and their interactions. For rootstocks, the following characteristics have been searched for: *i*) compatibility with scion cultivars, *ii*) high productivity and fruit quality induction, *iii*) size reduction and *iv*) tolerance to abiotic and biotic factors. As for scion cultivars, the program can be directed to the production of table fruit in which tasty, easy to set apart, seedless and with an intense peel, pulp and juice coloration genotypes are desired added to early and late production with high soluble solids content (SSC) and balanced acidity; while, for the industry, focus has been on greater production of SST per cultivated area, higher percentage of juice per fruit and on the expansion of the harvest period.

In order to create mechanisms to organize, systematize and control the production and commercialization of seeds and seedlings, the Ministry of Agriculture, Livestock and Supply (MAPA) instituted through Ordinance 527 of December 30, 1997, the National Register of Plant Varieties). Currently, the RNC is governed by the Seeds Law number 10.711/03 and one of the cultivar registration requirements is its VCU (Value for Cultivation and Use),

identified and attested by experiments according to the minimum criteria established for each species. The VCU can be determined by the registry applicant or by a public or private research and development institution through a contract or agreement (Brasil 2015).

On the other hand, the objective of the National Service for Plant Variety Protection (SNPC) is to protect intellectual property, guaranteeing commercial exploration rights exclusivity and the use of royalties. The SNPC acts according to its own law (Law n. 9.456/97), connected to international intellectual protection rules and governed by the International Union of Protection of Plant Varieties (UPOV). Cultivar intellectual rights protection is guaranteed through the granting of a cultivar protection certificate, being considered a movable asset and the only way to protect superior plants species. Cultivar protection is in effect from the date the Temporary Protection Certificate is granted and lasts for 15 years, with the exception of grapevines and trees (fruit, forest and ornamental), including, in each case, its rootstock, for which the duration will be of 18 years (Brasil 2015).

Among the cultivar protection requirements, the most important is the realization of Distinguishability, Homogeneity and Stability (DHS) trials to verify whether the candidate cultivar meets all the technical requirements, according to the criteria established by the SNPC. DHS trials can only be carried out for species with morphological descriptors published in the MAPA Official Gazette. Currently, the descriptors published for fruit trees are for the following species: avocado (*Persea americana* Mill.), pineapple, (*Ananas comosus* (L.) Merrill), Barbado cherry (*Malpighia emarginata* DC.), Japanese plum (*Prunus salicina* Lindl.), black mulberry (*Rubus* subg. *Eubatus* sect.. Moriferi et Ursini e híbridos), banana (*Musa* spp.), cacao (*Theobroma cacao* L.) persimmon (*Diospyros kaki* L.), raspberry (*Rubus idaeus* L.), hill guava (*Acca sellowiana* (O. Berg) Burret), guarana (*Paullinia cupana* var. *Scorbilis*), kiwi (*Actinidia* Lindl.), orange (*Citrus* L.), apple (*Malus* spp.), papaya (*Carica papaya* L.), mango (*Mangifera indica* L.), passion fruit (*Passiflora* sp.), watermelon (*Citrullus lanatus*), melon (*Cucumis melo* L.) bilberry, strawberry (*Fragaria* spp.) nectarine (*Prunus pérsica* (L.) Batsch), olive (*Olea europaea* L.), pear (*Pyrus* L.), peach (*Prunus persica* (L.) Batsch), poncirus (*Poncirus* L.), prunus (*Prunus* L.), pomegranate (*Punica granatum* L.), tangerine (*Citrus* L.) and grape (*Vitis* spp.) (Brasil 2015).

The objective of this work was to carry out an extensive survey on the number of different fruit trees protection registries in the MAPA and verify the participation of private and public companies.

MATERIAL AND METHODS

Data for the study were collected from the National Register for Plant Varieties (RNC) data bank and from the National Service for Plant Variety Protection (SNPC), available in real time at the Ministry of Agriculture, Livestock and Supply (MAPA) website (<http://www.agricultura.gov.br>).

Applications and protections were grouped according to the nature of the requesting institutions: private institution (including individuals), public institutions, public/private partnerships, and unidentified. Information were included in tables and analyzed by the Microsoft Office Excel 2007, and data were presented using descriptive statistics. Data were divided according to cultivar name, maintainer and date.

To be included in this study, fruit tree species were selected according to their economic and social importance. Thirty-three fruit trees were selected and divided according to climate: temperate, subtropical and tropical. Thus, the following species were considered: (1) **Temperate**: black plum (*Prunus domestica* L.), black mulberry (*Rufus* spp.), fig (*Ficus carica* L.), kiwi (*Actinidia chinensis* Planch), apple (*Malus domestica* Borkh. = *Pyrus malus* L. and *Malus domoestica* Borkh x *Malus robusta* (Carière) Rehder), pear (*Pyrus communis* L.), peach (*Prunus persica* (L.) Batsch) and grape (*Vitis* spp.). (2) **Subtropical**: avocado (*Persea americana* Mill.), jaboticaba (*Myrciaria jaboticaba* (Vell.) O. Berg), orange (*Citrus sinensis* (L.) Osbeck), lychee (*Litchi chinensis* Sonn), lime (*Citrus meyeri* Yu. Tanaka, *Citrus limonia* Osbeck, *Citrus jambhiri* Lush, *Citrus limon* (L.) Burm. f., and *Citrus volkameriana* Tenn et Pasq.), mandarin (*Citrus deliciosa* Ten.), strawberry (*Fragaria* × *ananassa* Duchesne ex Rozier), medlar (*Eriobotrya japonica* (Thunb.) Lindl.) tangerine (*Citrus sunki* (Hayata) hort. Ex. Tanaka, *Citrus unshiu* Marcow, and *Citrus reticulata* Blanco = *Citrus tangerina* Tanaka) and persimmon (*Diospyros kaki* L.). (3) **Tropical**: pineapple (*Ananas comosus* (L.) Merr.), acai (*Euterpe oleracea*), Barbados cherry (*Malpighia emarginata* DC.), banana (*Musa* spp.), cacao (*Theobroma cacao* L.), cashew (*Anacardium occidentale* L.), coconut (*Cocos nucifera*), cupuacu (*Theobroma grandiflorum*), guava (*Psidium guajava* L.), guarana (*Paullinia cupana* Kunth var. *sorbilis*), papaya (*Carica papaya* L.), mango (*Mangifera indica* L.), passion fruit (*Passiflora edulis* Sims f. *flavicarpa* O. Deg.), watermelon (*Citrullus lanatus* (Thunb.) Matsum. et Nakai) and melon (*Cucumis melo* L.). The research period in the MAPA CultivarWeb virtual page was from 1998 to July 15, 2015.

RESULTS AND DISCUSSION

Registries

A total of 2227 registries was found in the National Register for Plant Varieties (RNC) for the 33 species of fruit trees studied, most of them for the melon culture, with 27.17% of registries followed by the watermelon, grape and

orange with 15.67; 10.69 and 7.72% respectively. The lowest number was recorded for acai with only two registries.

As for the participation of public and private institutions in the RNC, 56.85% of the registries came from private companies while 31.39% (Table 1) came from public institutions. Partnerships between public and private institutions were responsible for 17 registries only, while unidentified registries (cultivars with registries by with unidentified maintainer) were responsible for 11.00%, i.e., 245 registries.

In the present work, species were divided by type of climate: temperate, subtropical or tropical. A total of 587 registries were observed for the temperate species, with the predominance of public institutions (43.61% of the registries). Private institutions, unidentified registries and public and private partnerships were responsible for 29.81, 24.87 and 1.70%, respectively (Table 1).

Table 1. Proportions of fruit plants registries (Temperate, Subtropical and Tropical climates) at the Ministry of Agriculture, Livestock and Supply (MAPA), according to the obtainer nature in the period from 1998 to 2015.

Obtainer ¹	Total		Temperate		Subtropical		Tropical	
	N°	%	N°	%	N°	%	N°	%
IPR	1266	56,85	175	29,81	83	21,39	1008	80,51
IPU	699	31,39	256	43,61	240	61,86	203	16,21
IPR/IPU	17	0,76	10	1,70	3	0,77	4	0,32
NI	245	11,00	146	24,87	62	15,98	37	2,96
Total	2227	100	587	100	388	100	1252	100

¹IPR: Private institution/individual personal, IPU: Public institution, IPR/IPU: public-private partnerships, and NI: unidentified.

Among the temperate climate species, the grapevine corresponds to the largest number of registries, a total of 238 registries (Table 2). The vitiviculture has high social, economic and cultural importance for the Brazilian agribusiness since it adds value to the production chain and furthers the development of other branches of the economy such as tourism and gastronomy (Brazilian Fruit Yearbook 2015). According to the IBGES, production in 2013 was of 1.42 million ton, being 733.06 and 679.79 thousand tons destined to consumption *in natura* and processing, respectively (IBGE 2014).

Most grape tree registry applications were submitted by private institutions, with a total of 142 registries. From these registries, 65 and 24 registries originated from the agricultural companies VIRUS ISENTI and BRASILUVAS, respectively, which are companies related to the importation of seedlings. As for the public sector, five institutions obtained grape trees registries: IAC, Embrapa, Universidade Federal de Santa Catarina (UFSC), Empresa de Pesquisa Agropecuária e Extensão Rural de Santa Catarina (EPAGRI) and Empresa de Pesquisa Agropecuária de Minas Gerais (EPAMIG), with 20, 16, 8, 4 and 3 registries, respectively. The partnership between Embrapa and IAC presented 4 registries and the public/private partnership only 10, being 6 the result of the EPAMIG partnership with Vinícola Miolo ('Petit Verdot N' e 'Viognier'), Virus Isenti ('Moscato Bianco'), Vitiplant ('Marselon N'), Chandom do Brasil ('Pinot Meunier') and Bat Vinhas e Vinhos ('Merlot'); and 4 of the Embrapa partnership with Petrolina Produção de Mudanças ('Benitaka' e 'Brasil'), Biolab ('Sugraone') and Virus Isenti ('Sultonina').

The culture of peach showed the second largest number of fruit trees from the temperate climate, a total of 156 registries, most of them originated from public institutions (Table 2). Among the public institutions, it is important to highlight the IAC and Embrapa with 55 and 47 registries, respectively. The 10 peach tree registries originated from a private institution were requested by 2 companies only: Clones Viveiros and Flávio Gilberto Herter, with 7 and 3 registries, respectively. A total of 88 registries were observed for apple trees, being 35, 18 and 35 originated from public, private and unidentified institutions, respectively. Four out of all public institutions were involved in the registries: EPAGRI, IAC, Instituto Agrônomico do Paraná (IAPAR) and Embrapa with 17, 13, 4 and 1 registries, respectively.

For the black plum, pear, kiwi, black mulberry and fig trees, a total of 43, 41, 7, 5 and 4 registries were obtained, respectively, most of them belonging to public or unidentified institutions (Table 2). The IAC has most registries for pear and black plum trees, with 19 and 14 registries, respectively, while for the black mulberry tree, the five identified registries belong to Embrapa ('Ébano', 'Negrita', 'BRS Tupy', 'BRS Xavante' and 'BRS Xingu'). The origin of the registries for the kiwi and fig trees, realized in 1999, was not identified.

In the subtropical category, 44.33% of the registries were for orange trees, i.e., 172 from a total of 388 registries (Table 2). The orange is the most produced fruit tree culture in Brazil, with a production of 17.34 million of tons of fruit in 2013 (IBGE 2014), corresponding approximately to one quarter of the world production (CITRUS BR, 2015). Most registries were granted to public institutions, being 60, 52, 11, 4 and 1 to Embrapa, IAC, IAPAR,

EPAGRI and Embrapa/IAC, respectively. The public/private interaction was found in two registries only - 'Cara Cara' and 'Nevalina' – which were granted to Carlos Van Parys de Wit, Christiano César Dibbern Graf and Embrapa. Next, the tangerine had 54 registries, most of them belonging to public institutions, with 20, 11 and 3 registries granted to IAC, Embrapa and IAPAR, respectively. The private institutions had only 4 registries and unidentified institutions had 16 registries.

As for strawberry, on the other hand, 51 registries were identified, most of them originating from private institutions (Table 3). The public institutions had seven registries, being four from Embrapa ('Burkley', 'Konvoi-Cascata', 'Santa Clara' and 'Vila Nova' – registered in 1999) and 3 from IAC ('Guarani', 'Monte Alegre' and 'Princesa Isabel' – registered in 1999). The private/public partnership was verified only for the registry of the 'Campinas' cultivar (IAC/Multiplanta partnership).

A total of 31, 26, 19, 16, 8, 7 and 4 registries were obtained for lime, persimmon, medlar, mandarin, lychee and jaboticaba, respectively, most of them belonging to public institutions, except for the lychee, obtained exclusively by private institutions (Table 2). Among the public institutions, the IAC had the largest number of registries (55) followed by Embrapa, IAPAR and Instituto Agronômico de Pernambuco, with 10, 8 and 1 registries, respectively.

A total of 1252 registries were identified for the group of tropical fruit trees, being the watermelon with largest number, 605 and 349 registries, respectively (Table 2). The melon was considered the main exported fresh fruit with

Table 2. Registry of fruit plants from temperate, subtropical and tropical climate at the Ministry of Agriculture, Livestock and Supply (MAPA) according to the nature of the obtainer nature in the period from 1998 to 2015.

Fruiter	Obtainer – Institutions				Total
	Private	Public	Private/Public	Unidentified	
Temperate					
Black plum	0	17	0	26	43
Mulberry	0	5	0	5	10
Fig	0	0	0	4	4
Kiwi	0	0	0	7	7
Apple	18	35	0	35	88
Pear	5	20	0	16	41
Peach	10	124	0	22	156
Grape	142	55	10	31	238
Subtropical					
Avocado	0	9	0	7	16
Persimmon	1	18	0	7	26
Jaboticaba	0	0	0	4	4
Orange	30	128	2	12	172
Lychee	1	6	0	0	7
Lime	4	26	0	1	31
Mandarin	8	0	0	0	8
Strawberry	35	7	1	8	51
Medlar	0	12	0	7	19
Tangerine	4	34	0	16	54
Tropical					
Pineapple	2	7	0	3	12
Barbados cherry	2	8	0	0	10
Acai	0	2	0	0	2
Banana	7	16	4	9	36
Cacao	6	60	0	1	67
Cashew	2	12	0	0	14
Coconut	2	4	0	4	10
Cupuacu	0	24	0	0	24
Guava	11	2	0	2	15
Guarana	0	16	0	3	19
Papaya	30	14	0	0	44
Mango	5	17	0	4	26
Passion fruit	6	13	0	0	19
Watermelon	349	0	0	0	349
Melon	586	8	0	11	605

a volume of 196.8 thousand tons and a revenue of US\$ 151 million, while the watermelon was in the seventh place with an export volume of 30.6 thousand tons and a revenue of US\$ 16,5 million (Brazilian Fruit Yearbook 2015). From the registries obtained for the melon, only 8 were realized by public institutions, being 4 by Embrapa ('BRS Araguaia', 'EHMEL 200910', 'EHMEL 20095' and 'Eldorado') and 4 by Epagri ('Epagri 357', 'Epagri 358', 'Epagri 359' and 'Epagri 360'). Registries by public institutions were not identified for watermelon (Table 3). Among the private institutions, Sakata, Monsoy and Syngenta Syngenta have the largest number of registries, with 165, 73 and 64, respectively, while for watermelon, Monsoy has the largest number of registries, followed by Agristar and Sakata with 61, 43 and 43 registries, respectively.

Cacao obtained 67 registries, most of them registered by the Executive Commission for the Recuperation Plan of Cacao (CEPLAC), with 49 registries, followed by Ceplac/Instituto Biofábrica de Cacau, Wanilson de Oliveira Serra and Instituto Biofábrica de Cacau with 9, 6 and 2 registries, respectively. A total of 44 registries were identified for the papaya, being 30 originated from private institutions and 15 from public institutions. Among the public institutions, the Universidade Estadual do Norte Fluminense (UENF) breeding program stands out with 13 registries.

The banana, the second most produced fruit plant in Brazil, with a production of 7.18 million tons, has only 35 registries, out of which 16 were requested by public institutions, being 13 by Embrapa, two by EPAGRI and one by IAC. The public/private partnership requested four registries: 'BRS Tropical' - Embrapa/Multiplanta, 'Pacovan' - Embrapa/BR Genética, 'Prata anã' - Embrapa/BR Genética/Multiplanta, and 'Prata Graúda MG - EPAMIG/Multiplanta'. The private companies requested 6 registries and 9 were not identified.

The mango, another important fruit plant for the Brazilian trade balance, with an export volume of 133.03 thousand tons and a revenue of US\$ 163,73 million (Brazilian Fruit Yearbook 2015) has only 26 registries (Table 2). Public institutions hold 17 registries (Embrapa, IAC, IPA and Universidade Federal de Viçosa (UFV) with 10, 3, 3 and 1, respectively), while the private and unidentified institutions hold 5 and 4 registries, respectively.

The cupuacu, guarana and acaí, from the Northern region Brazil have 24, 19 and 2 registries, respectively, being all registered by Embrapa, except for 3 unidentified registries for guarana. Passion fruit, guava, cashew, pineapple, coconut and Barbados cherry have 19, 15, 14, 12, 10 and 10 registries, respectively, most of them from public institutions, except the guava with most of the registries obtained by private institutions. Among the public institutions, Embrapa holds the largest number of registries, with 36, being 12, 7, 9, 4, 3 and 1 for cashew, Barbados cherry, passion fruit, pineapple, coconut and guava, respectively. The IAC comes next with four registries for passion fruit, the IPA with one registry for guava and the Agriculture and Livestock Research Company of Rio Grande do Norte (EMPARN) with 1 registry for coconut.

An analysis of all fruit tree groups shows the inexistence of plant breeding programs in private companies, except for some annual fruit trees. Most registries were realized by private seedling production companies or by individuals. So, in this matter, public research institutions, especially Embrapa, IAC, EPAGRI and IAPAR have played an important role in developing new cultivars, contributing to the improvement of the quality of the product and reducing productions costs.

Table 3. Number of protection of Fruit Plants protections at the Ministry of Agriculture, Livestock and Supply (MAPA) in the period from 1998-2015.

Species	Years																	Total	
	98	99	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14		15
Pineapple	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1	0	0	0	4
Guarana	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	6
Kiwi	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Apple	0	0	0	2	1	0	2	0	0	2	0	2	2	0	0	1	0	1	13
Mango	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
Passion fruit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	9
Melon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3
Strawberry	0	0	0	0	0	0	2	1	0	1	1	0	1	4	2	1	1	0	14
Pear	0	0	0	0	0	1	0	0	0	0	1	1	2	0	0	0	0	0	5
Peach	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	2	1	6
Mandarin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1	4
Grape	0	0	0	0	1	0	5	2	3	1	1	1	0	1	3	2	1	0	21

Protection

The National Service for Plant Varieties Protection (SNPC) has 88 protected cultivars for 12 fruit tree species (Table 2), out of which 40 were protected by public institutions, 28 belonging exclusively to Embrapa, 7 to the Embrapa/Fundação Universidade de Brasília partnership and 5 to EPAGRI.

From the exclusive protections realized by Embrapa, 11 were for grape ('BRS Carmem', 'BRS Clara', 'BRS Cora', 'BRS Isis', 'BRS Linda', 'BRS Magna', 'BRS Margot', 'BRS Morena', 'BRS Núbia', 'BRS Violeta' and 'BRS Vitória'), 6 for guarana ('BRS Andirá', 'BRS Cereçaporanga', 'BRS Luzéia', 'BRS Marabitaná', 'BRS Mundurucânia' and 'BRS Saterê'), 5 for peach ('BRS Fascínio', 'BRS Kampai', 'BRS Libra', 'BRS Mandinho' and 'BRS Regalo'), 2 for pineapple ('BRS Ajubá' and 'BRS Imperial'), 2 for passion fruit ('BRS RC' e 'BRS PC') and 2 for melon ('EHMEL 20095' and 'EHMEL 200910'). The Embrapa/Fundação Universidade de Brasília partnership has 7 protections for passion fruit ('BRS GA1', 'BRS MR1', 'BRS OV1', 'BRS SC1', 'CPF1SSBR', 'CPGA1' and 'CPMSC1') and EPAGRI 4 protection for apple ('Daiane', 'Joaquina', 'SCS416 Kinkas' and 'SCS417 Monalisa) and 1 for peach ('Zili').

The other protections are divided into international research institutions the United States Department of Agriculture (USDA), University of California, Institute National de la Recherche Agronomique (INRA) and the New Zealand Institute, as well the private sector.

CONCLUSIONS

Except for some annual fruit plants, the participation of public institution in the national registry for plant varieties was higher. The national service for plant variety protection showed 48 and 40 protections for private and public institutions, respectively.

Among the public institutions, Embrapa stands out with the largest number of registries and protections, followed by IAC, EPAGRI and IAPAR. The public/private partnerships contributed slightly with the generation of new cultivars.

REFERENCES

- Brazilian Fruit Yearbook 2015- Anuário brasileiro de fruticultura (2015) Editora Gazeta, Santa Cruz do Sul, 104p.
- Brasil Ministério da Agricultura, Pecuária e Abastecimento (2015) Registros e autorizações. <http://www.agricultura.gov.br/vegetal/registros-autorizacoes/> Accessed 22 April 2015.
- IBGE (2015) Censo agropecuário 2014: levantamento sistemático da produção [ftp://ftp.ibge.gov.br/Producao_Agricola/Levantamento_Sistematico_da_Producao_Agricola_\[mensal\]/Fasciculo/lspa_201503.pdf](ftp://ftp.ibge.gov.br/Producao_Agricola/Levantamento_Sistematico_da_Producao_Agricola_[mensal]/Fasciculo/lspa_201503.pdf) Accessed 6 June 2015.
- IBRAF - Instituto Brasileiro de Frutas (2013) Panorama da cadeia produtiva das frutas em 2012 e projeções para 2013, São Paulo, 127p.
- Oliveira RP de, Soares Filho W dos S, Machado MA, Ferreira EA, Scivittaro WB and Gesteira A da S (2014) Melhoramento genético de plantas cítricas. Informe Agropecuário 35, 281: 22-29.
- Ruggiero C, Marin SLD and Durigan JF (2011) Mamão, uma história de sucesso. Revista Brasileira de Fruticultura 1: 76-82.
- Silva S de O, Amorim EP, Serejo JA dos S, Ferreira CF and Rodriguez MAD (2013) Melhoramento genético da bananeira: estratégias e tecnologias disponíveis. Revista Brasileira de Fruticultura 35, 3: 919-931.

Received: June 08, 2015.

Accepted: August 05, 2015.

Published: November 19, 2015.