Current Situations of Competitive Scientific Research Projects for Agri-scientific Research Institutions: A Case Study of Tropical Crops Genetic Resources Institute of Chinese Academy of Tropical Agricultural Sciences

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Abstract This paper collected and arranged competitive scientific research projects undertaken by Tropical Crops Genetic Resources Institute of Chinese Academy of Tropical Agricultural Sciences in 2003-2014. Through statistical analysis on quantity of projects, funded amount, age of person responsible, professional title of person responsible, academic degree of person responsible, research object, it discussed relevant characteristics and rules. Finally, it came up with pertinent measures and recommendations, in the hope of providing services for decision-making and scientific and technological management.

Key words Competitive scientific research projects, Current situations and analysis, Tropical Crops Genetic Resources Institute of Chinese Academy of Tropical Agricultural Sciences

1 Introduction

Scientific research activities of scientific research institutions are mainly manifested with scientific research projects as objects[1]. Scientific research projects are center of scientific researches, embodiment of vitality of scientific research institutions[2], and also important sources of scientific research funds. Competitive scientific research projects of the Tropical Crops Genetic Resources Institute (TCGRI) of Chinese Academy of Tropical Agricultural Sciences (CATAS) mainly come from foundation committees, Ministry of Science and Technology, Ministry of Agriculture, and Hainan Province, accounting for more than 80% of total scientific research funds. We collected and arranged competitive scientific research projects undertaken by Tropical Crops Genetic Resources Institute of Chinese Academy of Tropical Agricultural Sciences in 2003 - 2014. Through statistical analysis on quantity of projects, funded amount, age of person responsible, professional title of person responsible, academic degree of person responsible, research object, we discussed relevant characteristics and rules. Finally, we came up with pertinent measures and recommendations, in the hope of providing services for decision-making and scientific and technological management.

2 Data source

Through consulting electronic data and science and technology files of the Department of Science and Technology of TCGRI, we collected 552 competitive scientific research projects approved by Ministry of Science and Technology, Ministry of Agriculture, and Hainan Province and horizontal projects. We made a statistical analysis on quantity of projects, funded amount, age of person responsible, professional title of person responsible, academic degree of person responsible, research object.

3 Results and analyses

3.1 Statistics of general data of project funding In 2003 - 2014, TCGRI obtained 552 competitive scientific research projects, the funding amount reached 248.321 million yuan, including 42 projects from Ministry of Science and Technology, accounting for 7.61% of total projects, obtained funding amount of 63.2378 million yuan, accounting for 25.47% of total funding amount; 248 projects from Ministry of Agriculture, accounting for 44.9% of total projects, obtained funding amount of 118.939 million yuan, accounting for 47.9% of total funding amount, and 103 horizontal projects, accounting for 18.66% of total projects and obtained funding amount of 38.6043 million yuan, accounting for 15.55% of total funding amount; obtained 131 provincial level projects, accounting for 23.73% of total projects, funding amount of 18.5087 million yuan, accounting for 7.45% of total funding amount, as shown in Fig. 1 and Fig. 2.

Generally, most projects of TCGRI come from Ministry of Agriculture, Hainan Province, and horizontal projects, few projects come from Ministry of Science and Technology, foundation committee, and other ministries and committees. As to funding amount, the funding amount was mainly from Ministry of Agriculture and Ministry of Science and Technology, 44.9% and 47.9% respectively. It is to be specially noted that the quantity of projects from Ministry of Science and Technology accounts only for 7.61% of total projects, while the funding amount accounts for 25.47% of total funding amount, the funds of Hainan Province and horizontal projects are relatively separate.

Received: August 15, 2015 Accepted: September 20, 2015
Supported by Special Project for Reform of Non-profit Scientific Research Institution "Study on Whole Process Management of Agricultural Scientific and Technological Projects".
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Table 1 Quantity of projects and funding amount put in place in 2003 – 2014 (10^4 Yuan)

Project source	Quantity of projects	Percentage %	Total funds	Percentage %
Foundation Committee	24	4.35	668.38	2.68
Ministry of Science and Technology	42	7.61	6323.78	25.47
Ministry of Agriculture	248	44.93	11893.9	47.90
Other Ministries and Committees	4	0.72	234.78	0.95
Provincial and city level	131	23.73	1850.87	7.45
Horizontal	103	18.66	3860.43	15.55
Total	552	100	24832.1	100

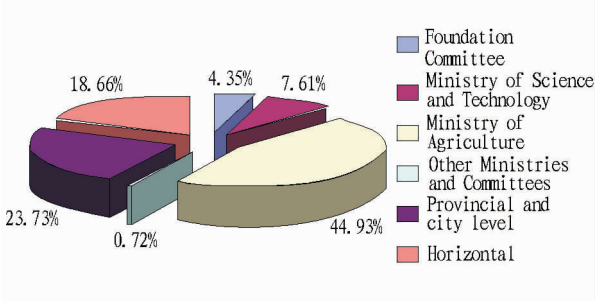

Fig. 1 Source of projects established in 2003 – 2014

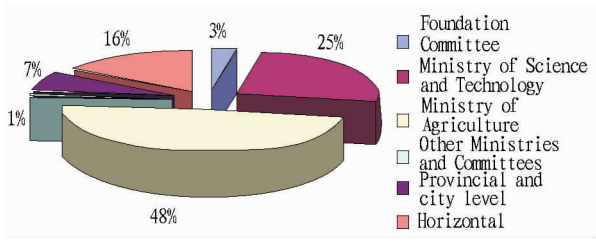

Fig. 2 Amount of funding put in place in 2003 – 2014

From Fig. 3, it can be known that the quantity of projects and funding amount put in place in TCGRI since 2003 take on a rising trend. The quantity of projects increased from 25 in 2003 to 88 in 2014, and the funding amount rose from 10.703 million yuan to 34.0182 million yuan, showing great improvement of both scientific research level and scientific research competitive power of TCGRI. In the beginning and end year of every Five Year Plan period, both the quantity of projects and funding amount put in place are relatively low, mainly because many projects remain closing and acceptance stage and new projects remain at the stage of application. For example in 2010 and 2011, scientific and technological support plan, special scientific research projects for public welfare industry, and 948 program of the Eleventh Five-Year Plan remained closing and acceptance stages and the projects of Twelfth Five-Year Plan were not launched yet, so both the quantity of projects and funding amount declined slightly.

Table 2 Quantity of projects and funding amount put in place in 2003 – 2014 (10^4 Yuan)

Year	Foundation Committee		Ministry of Science and Technology		Ministry of Agriculture		Provincial level		Horizontal		Total	
	Quantity of projects	Total funds	Quantity of projects	Funding amount put in place	Quantity of projects	Funding amount put in place	Quantity of projects	Funding amount put in place	Quantity of projects	Funding amount put in place	Quantity of projects	Funding amount put in place
2003	–	–	6	603	11	431	5	18.6	2	23.5	25	1070.3
2004	–	–	7	505	11	239	5	17.9	6	49.5	29	947.7
2005	1	18	7	2590	9	160	16	66.1	13	141.6	46	1220.7
2006			4	268.8	13	885	8	26.69	9	115.44	34	923.33
2007	1	33.85	4	1062.8	16	2907	1	10	4	403.12	26	2178.6
2008	1	43	–	–	16	587.3	11	19	6	234.96	35	2949.85
2009	1	10	–	–	25	741.27	13	67	10	291.59	49	2334.18
2010	1	23	3	637	27	809.08	9	217.58	4	118.39	45	2343.78
2011	3	71	1	30	24	1116	8	92	4	593.9	40	1483.87
2012	3	127	1	120	32	1883.76	13	235	11	899.5	61	2408.87
2013	8	542	4	378	32	1069.88	13	573	17	642.32	74	3569.13
2014	5	233	5	129.18	32	1064.6	29	508	17	346.61	88	3401.82
Total	24	1100.85	42	6323.78	248	11893.89	131	1850.87	60	1647.66	552	24832.13

3.2 Academic degree of person responsible for projects

From Fig. 4, from 2003 to 2014, scientific research personnel in TCGRI hold higher and higher academic degrees, especially scientific research personnel with doctorate are becoming major scientific research force of TCGRI. In all projects, the quantity of projects obtained by researchers with doctorate increased from 8.00% to 42.05%, while that obtained by bachelor degree or below dropped from 88% to 23.86%. From Fig. 5, it can be known that for different projects, the person responsible holds different academic degrees, and the person with bachelor degree takes up a larger portion in project source (43.12%). In the project approved by foundation committee, only one person with bachelor degree obtained funding, while researchers with doctorate take up certain portion in all projects. Changes in academic degree of person responsible are closely related to rapid development of education of postgraduates in recent years.

Table 3 Academic degree of person responsible for projects 10^4 Yuan

Project source	Bachelor degree and below		Master degree		Doctorate	
	Quantity of projects	Funding amount	Quantity of projects	Funding amount	Quantity of projects	Funding amount
Foundation Committee	1	82	3	90	20	928.85
Ministry of Science and Technology	31	5816.6	1	50	10	457.18
Ministry of Agriculture	115	6760.79	66	1501.95	67	3631.15
Provincial level	41	870.07	47	432.73	43	548.07
Horizontal	50	2103.19	28	597.98	25	1159.26
Total	238	15632.65	145	2672.66	165	6724.51
Proportion //%	43.12	62.95	26.27	10.76	29.89	27.08

Remarks: the academic degree refers to the academic degree obtained when the projects were approved.

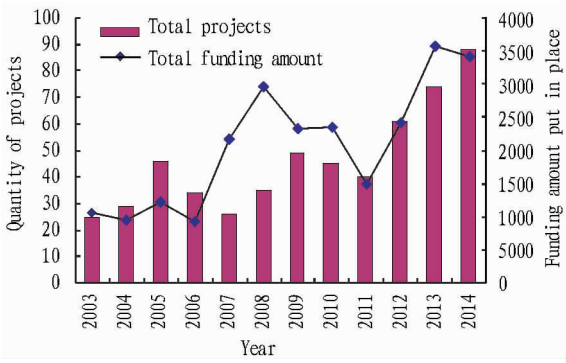

Fig. 3 Quantity of projects and funding amount put in place in 2003 – 2014

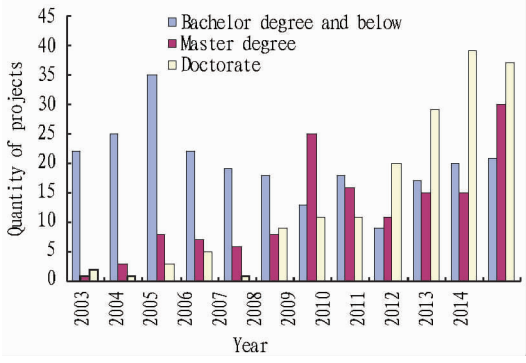

Fig. 4 Academic degree of the person responsible for projects in 2003 – 2014

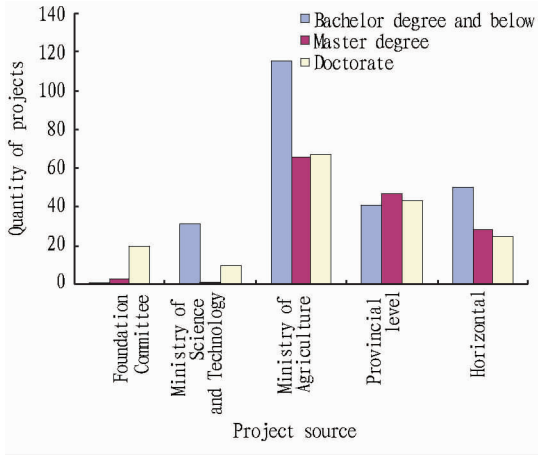

Fig. 5 Academic degree of the person responsible for different sources of projects

3.3 Professional title of person responsible for projects Researchers with senior professional title are the largest group obtaining projects, accounting for 42.03% of total projects, researchers with intermediate and below professional title account for 20.11% of total projects. As shown in Table 4, researchers with senior professional title obtain projects mainly from Ministry of Science and Technology and Ministry of Agriculture, and the proportion of funding amount reached 93.43%; researchers with intermediate professional title obtain projects mainly from provincial level, and funding is relatively separate and the proportion of funding amount is only 6.57%.

Table 4 Professional title of person responsible for projects 10^4 Yuan

Project source	Bachelor degree and below		Master degree		Doctorate	
	Quantity of projects	Funding amount	Quantity of projects	Funding amount	Quantity of projects	Funding amount
Foundation Committee	10	261.85	10	437	4	402
Ministry of Science and Technology	3	132	15	3911	24	2280.78
Ministry of Agriculture	22	606.53	90	2423.11	136	8864.25
Provincial level	52	237.23	56	666.19	23	947.45
Horizontal	24	405.72	34	818.64	45	2636.07
Total	111	1643.33	205	8255.94	232	15130.6
Proportion //%	20.11	6.57	37.14	32.98	42.03	60.45

Remarks: the professional title refers to the professional title obtained when the projects were approved.

As shown in Fig. 6 and Fig. 7, person responsible for different sources of projects is mainly researcher with senior professional

title, because those researchers with intermediate or below professional title do not have practical experience and it is difficult for them to undertake scientific research projects independently; statistics of different years indicate that most researchers responsible for projects hold senior and associate senior professional title.

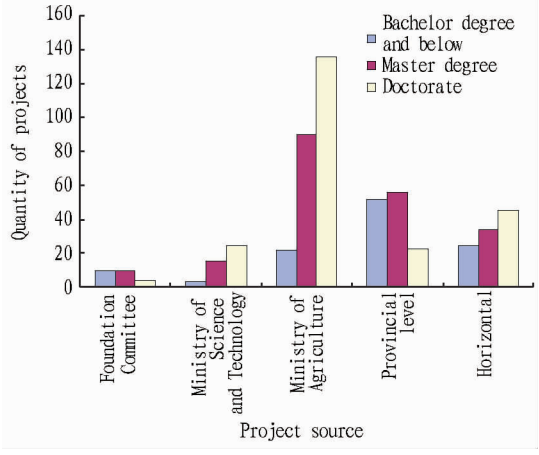

Fig. 6 Professional title of the person responsible for different sources of projects

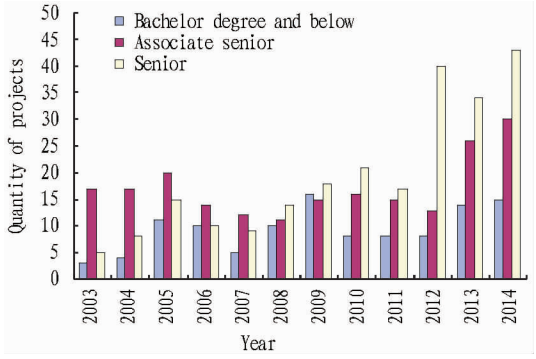

Fig. 7 Professional title of the person responsible for projects in 2003 – 2014

3.4 Age of person responsible for projects Researchers of TCGRI become younger and younger. This can be reflected in projects of recent years. As shown in Fig. 8 and Fig. 9, in both project sources and different years, age of person responsible for projects approved for TCGRI is mainly 31 – 40 and 41 – 50, accounting for 86.52%, and 30 years old person responsible for projects takes up 9.55%, and 51 years old person responsible for projects accounts for 3.92%.

Table 5 Age of person responsible for projects 10^4 Yuan

Project source	Younger than 30		31 – 40		41 – 50		Older than 50	
	Quantity of projects	Funding amount	Quantity of projects	Funding amount	Quantity of projects	Funding amount	Quantity of projects	Funding amount
Foundation Committee	3	68	17	630.85	4	402	–	–
Ministry of Science and Technology	1	50	13	1344	27	4841.78	1	88
Ministry of Agriculture	2	37	67	1669.99	159	9583.4	20	603.5
Provincial level	18	68.05	74	674.17	36	1086.7	3	21.5
Horizontal	11	143.93	33	777.22	54	2550.08	5	389.2
Total	35	366.98	204	5096.23	280	18463.96	29	1102.2
Proportion //%	6.34	1.48	36.96	20.52	50.72	74.36	5.25	4.44

Remarks: the age refers to the age of the person responsible for projects when the projects were approved.

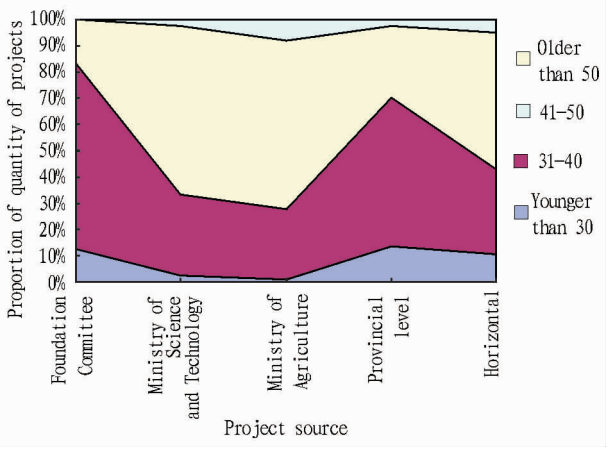

Fig. 8 Age distribution of the person responsible for projects

3.5 Research objects and funds The TCGRI is mainly engaged in researches of tropical fruit tree, cassava, tropical forage grass, tropical flower, and south China medicine, and other tropical industrial crops. These fields take up majority part. Tropical livestock and poultry and tropical winter melons and vegetables start late, so there are few projects. Other projects are common researches of collection, storage and breeding of tropical crop germplasm resources. As shown in Fig. 10, research objects are mainly projects of Ministry of Agriculture, while flowers and vegetable projects are mainly provincial level projects.

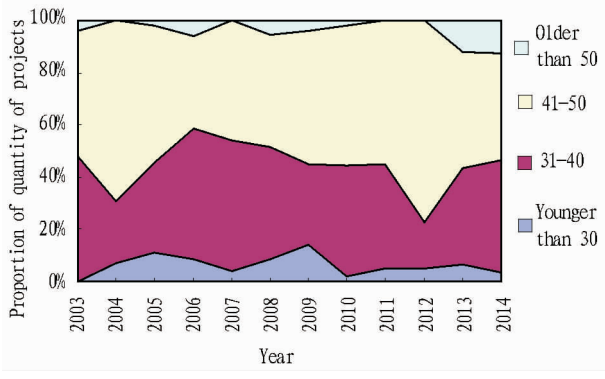

Fig. 9 Age of the person responsible for projects in 2009 – 2013

Table 10 Quantity of projects of research objects and funds 10^4 Yuan

Research objects	Project/ funds	Project source					
		Foundation Committee	Ministry of Science and Technology	Ministry of Agriculture	Provincial and city level	Horizontal	Total
Tropical fruit tree	Q'ty of projects	3	6	58	21	13	101
	Funds	136.85	495.8	4188.6	76.65	327.24	5225.14
Cassava	Q'ty of projects	3	9	57	9	9	87
	Funds	380	804.18	3640.11	140.2	599.34	5563.83
Tropical forage grass	Q'ty of projects	5	11	42	17	17	92
	Funds	101	1122.8	1778.4	90.71	495.45	3588.36
Tropical flower	Q'ty of projects	4	2	6	22	12	46
	Funds	205	550	90	924.68	331.63	2101.31
South China medicine	Q'ty of projects	7	3	22	24	13	69
	Funds	232	193	543.8	243.93	474.93	1687.66
Tropical livestock and poultry	Q'ty of projects	1	1	9	7	12	30
	Funds	23	50	204	71.5	290.43	638.93
Winter melon and vegetable	Q'ty of projects		3	1	18	9	31
	Funds		62	3.18	244.3	104.58	414.06
Others	Q'ty of projects	1	7	53	14	18	93
	Funds	23	3046	1445.8	58.9	1236.83	5810.53

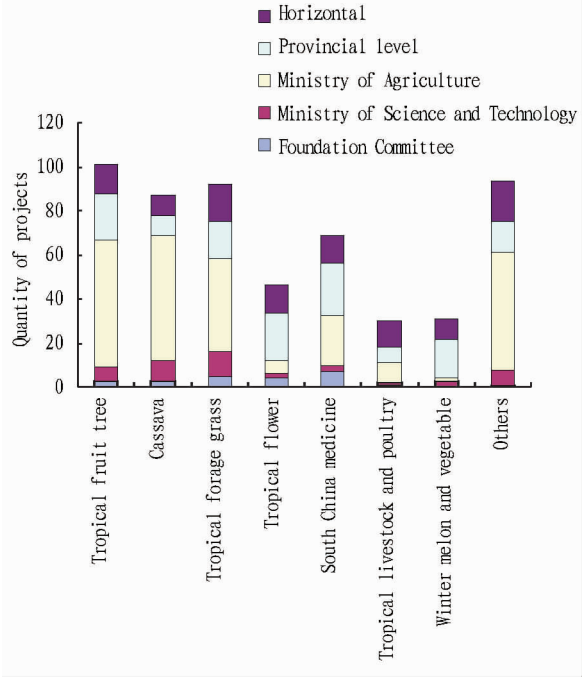

Fig. 10 Projects for research objects in 2003 – 2014

4 Discussions and recommendations

Both the quantity and quality of scientific research projects are essential indicators for measuring comprehensive strength, activeness, and overall science and technology level of a scientific research institution[3]. Since 2003, both quantity and funds of scientific research projects in TCGRI take on wavy growth, reflecting fluctuation of scientific research activeness which basically conforms to periodical rules of scientific researches of tropical crops. It also reflects that the inclined policies of the state towards agricultural researches. In recent years, TCGRI recruited a lot of young talents with high academic degrees, realizing constant optimization of academic degree and age structure of the entire research team, and constant increase of scientific research strength of TCGRI. Nevertheless, there are still some problems. Especially, in the context of new scientific research system reform, scientific research projects are different in application, establishment and closing. On the basis of the above analysis, we came up with following recommendations:

4.1 Strengthening communication and cooperation, and actively applying projects A distinctive characteristic of scientific and technological development is cross of disciplines and rapid change of science and technology[4]. These require scientific and technological communication and cooperation of different disciplines, fields and objects, to improve scientific and technological strength jointly. After reform of new scientific research system, various projects will be consolidated and project sources will become less. Therefore, it is recommended to strengthen communication and cooperation between committees and ministries, scientific research management departments of nine provinces in South China and scientific education institutions of each province, to participate in more competitive scientific and technological projects, to strive for project establishment and funding.

4.2 Strengthening project process management and ensuring completion of projects in high quality and on time Whether projects can be completed in high quality and on time will exert influence on person responsible for projects, but also influence reputation of the institution[5]. Therefore, after the project is approved and established, it is recommended to reinforce project implementation, implement the project from person responsible for the project, project team, and research institute, to guar-

antee completion of projects in time and in high quality, and ensure reputation and credit of the research institute, to lay solid foundation for future project application.

4.3 Improving personnel quality and optimizing personnel structure The key of scientific and technological innovation lies in cultivation and containment of talents. Without well structured innovation team and without excellent discipline leaders, achievement will be an empty talk. Therefore, the primary task at present is to strengthen talent cultivation, formulate a set of feasible and practical measure and method, stabilize scientific and technological innovation team, create atmosphere favorable for talent growth, and hold existing talents. In the meantime, it is recommended to create conditions to introduce, cultivate and use high level leaders. Besides, it is recommended to change tendency towards stressing things but neglecting people in scientific and technological management, and take finding, cultivation, and holding of excellent scientific and technological talents as primary tasks of scientific and technological works.

4.4 Combining research objects and implementing frontier fundamental researches The TCGRI is engaged in application and fundamental researches of tropical crops for a long term. Few researches involve frontier fundamental application, while fundamental application is the basis of application research. Both complement each other and rapidly generate scientific research achievements. In recent years, introduction of high academic degree young talents greatly improves strength of TCGRI in fundamental researches. It is recommended to widen research fields, extend vertical research chain, such as proteome, bioinformatics, and cytology, to make them become cooperative power of application researches[4].

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open field cultivation, when field plants growth close to ridge closing, use plow to earth up between two rows of peanuts, to make more pegs insert into soils for pod setting.

4.5.3 Later stage management.

(i) Slightly water in case of drought, and promptly drain water in the event of flooding.

(ii) For spring sowing land parcels, when there are only 3 – 4 green leaves left in major stem of plant, and more than 70% pods become mature, it is required to harvest peanuts in time. For peanuts intercropping with wheat and direct summer sowing peanuts, the harvest time can be extended to the beginning of October, but it should not delay sowing of the following crops.

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