

The role of academy in relation to the agricultural research development in Parana State, Brazil

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Abstract

Compared to the American system, where agricultural research, extension and education are offered by the same institutions, the Universities in Brazil in these fields are organised differently. At federal level higher education and research development in agriculture belong to different Ministries, Ministry of Education and Culture and Ministry of Agriculture and Food Supply, respectively. Each Ministry has its own budget and is independent of the other. Higher education in Agricultural Sciences in Brazil is offered in the main areas of Agronomy and General Agriculture, Veterinary Medicine and Forestry. Other related areas are Agricultural Engineering and Animal Husbandry. Among the three main Agricultural Sciences, 391 courses are offered in the whole country, by federal, state and private universities. Most of the agricultural development in Brazil is a joint effort of the university, training people, the government research institutions and the private sector, such as big cooperatives with their needed on farm applied research. Parana represents 2.7 % of the total country area but is responsible for 25 % of grain production. Big enterprises produce most of commodities but 60 % of food consumed in the country comes from subsistence agriculture.

Key words: Applied research, Brazilian agriculture, private sector research, subsistence agriculture

Résumé

Par rapport au système Américain où la recherche agricole, la vulgarisation et l'éducation sont dispensées par les mêmes institutions qui sont les universités, au Brésil, ces domaines sont organisés différemment. Au niveau fédéral, l'enseignement supérieur et le développement de la recherche en agriculture appartiennent à différents ministères : le ministère de l'Éducation et de la Culture et celui de l'Agriculture et de l'Alimentation, respectivement. Chaque ministère a son propre budget et son indépendance vis-à-vis de l'autre. L'enseignement

supérieur en sciences agronomiques du Brésil est dispensé dans les principaux domaines d'Agronomie et d'Agriculture Générale, de Médecine Vétérinaire et de la Foresterie. D'autres domaines connexes sont le Génie Agricole et l'Agriculture orientée vers l'Élevage. Parmi les 3 principales sciences agronomiques, 391 cours sont dispensés dans l'ensemble du pays, par les universités fédérales, publiques et privées. La plupart du développement agricole au Brésil est un effort conjoint de l'université formant les individus, les institutions publiques de recherche et le secteur privé, comme les grandes coopératives avec leur besoin sur la recherche appliquée en agriculture. Paraná représente 2,7% de la superficie totale du pays, mais est responsable de 25% de la production céréalière. Les grandes entreprises produisent la plupart des produits, mais 60% de la nourriture consommée dans le pays provient de l'agriculture de subsistance.

Mots clés: Recherche appliquée, agriculture brésilienne, recherche dans le secteur privé, agriculture de subsistance

Background

Paraná State in relation to Brazil. With almost 200 thousand square kilometers, Paraná represents 2.7 % of the total country area and is in charge of near 25 % of the total grain production, and so, it is considered the bread basket of the country. Figure 1 shows the map of Brazil and the division in States. Table 1



Figure 1. Insertion of Brazil and its States within South America.

Table 1. Area, production, productivity, State participation and ranking of the main commodities produced in Brazil and Parana State, as of 2010 fiscal year.

Crop	Brazil			Parana			PR/BR%	Rank
	Area	Ton	t/ha	Area	Ton	t/ha		
Soybean	23,327,296	68,756,343	2.95	4,478,234	14,095,253	3.15	20.50	2
Beans	3,423,646	3,158,905	0.92	521,673	815,092	1.56	25.80	1
Corn	12,683,415	55,394,801	4.37	2,264,754	13,662,056	6.03	24.66	1
Wheat	2,232,220	6,295,527	2.82	1,203,141	3,535,596	2.94	56.2	1
Barley	84,118	278,558	3.31	47,754	183,718	3.85	65.95	1
Oats	2,343	3,165	1.35	511	1,092	2.14	34.51	2
Cassava	1,787,467	24,524,318	13.72	170,652	4,074,528	23.88	16.61	2
Potatoes	137,044	3,547,510	25.89	29,600	735,663	24.85	20.74	2
Sugarcane	9,076,706	717,462,101	79.04	632,109	49,384,643	78.13	6.88	3
Tobacco	449,629	787,617	1.75	79,266	161,137	2.03	20.46	3
Coffee	2,158,564	2,906,315	1.35	94,062	138,694	1.47	4.77	6

Source: Parana Secretariat of Agriculture and Food Supply, 2012.

presents some of the main commodities produced in Parana in comparison with the national production (www.seab.pr.gov.br, access on Sept 01, 2012).

Paraná belongs to the South region and is located between parallels 22° 33' S and 26° 25' S, and meridians 48° 02' W and 54° 38' W. With low and high altitudes, there is a wide range of agricultural and animal husbandry production in the State. There is, also, a wide range of soil types, with extremely good, deep fertile, to shallow, poor acidic soils. However, combination of available technologies and farmer organisation in strong cooperatives allows for high productivities in the developed sector of the Parana State entrepreneur agriculture. Nonetheless, small family farm subsistent agriculture is also very relevant and important for the overall turnover of the State.

According to the official agricultural survey, nearly 38 % of gross value in Brazil comes from family agricultural production (Fig. 2). Ca. 60 % of food consumed in Brazil comes from subsistence agriculture. For instance, small farm agriculture is responsible for 87 % of cassava production, 70 % of field beans (*Phaseolus vulgaris* L.), 46 % of maize, 38 % of coffee, 34 % of rice, 21 % of wheat, 60% of milk, 59 % of swine, 50 % of hens and 30 % of bovine production. As of 2006 agricultural survey, 84.4 % of the total Brazilian farms belonged to the small subsistence family sector. There were 4.4 million productive units in the country, of which nearly 50 % in the northeast region. These establishments represent 84.4 % of



Figure 2. Typical work done by small farmers in subsistence agriculture – horse traction no till planter.

the total number, but used only 24.3 % (or 80.25 million hectares) of the production area in the country. On the contrary, the enterprise establishments represented 15.6 % of the total number with 75.7 % of the land use (http://pt.wikipedia.org/wiki/Agricultura_familiar, access on Sept 7, 2012). In the State of Paraná, the agricultural production profile is not much different from the national.

Agricultural Set up in Brazil

Development and adaptation of technologies for agriculture in Paraná State, Brazil. Compared to the American system, where agricultural research, extension and education are offered by the same institutions, the Universities in Brazil in these fields are organised differently. At federal level, higher education (the University system) and research development in agriculture belong to different Ministries, Ministry of Education and Culture and Ministry of Agriculture and Food Supply, respectively. Each Ministry has its own budget and is independent of the other.

Higher education in Agricultural Sciences in Brazil is offered in the main areas of Agronomy and General Agriculture, Veterinary Medicine and Forestry. Other related areas are Agricultural Engineering and Zootechny (Animal Husbandry). In total, among the three main Agricultural Sciences, 391 courses are offered in the whole country (Table 2), according to the Ministry of Education and Culture information (www.emec.mec.gov.br,

access on Sept 7, 2012). These are courses offered by federal, state and private universities, of which, nearly 63 % is concentrated in the South and Southeaster regions of the country.

In the State of Parana the system is similar to the federal, i.e., five State Universities in higher education in Agricultural

Table 2. Regional distribution in number of Agricultural Science Courses in Brazil, 2012.

Region	States	Agronomy and General Agriculture	Veterinary Medicine	Forestry	Total
South	RS, SC, PR	48	40	11	99
Southeast	SP, RJ, ES, MG	55	77	13	145
Northeast	BA, SE, AL, PE, PB, RN, CE, PI, MA	26	19	9	54
North	AM, PA, AP, RR, AC, RO	16	10	11	37
Central-East	GO,MT, MS, TO, DF	32	15	9	56
Total	Brazil	177	161	53	391
State of Paraná		21	20	5	49

Source: Ministry of Education and Culture, 2012.

Sciences is set under the Secretariat of Science and Technology, three Federal Universities, one Pontifical Catholic University and 13 colleges of the private sector. Most of the universities in Brazil have also graduate programmes in all areas of expertise in agriculture and animal husbandry. Several of them started in the 1960's oriented by American university programmes. For instance, the Plant Pathology graduate programme of the Sao Paulo State University, Piracicaba campus, was fully oriented by the Ohio State University Plant Pathology Department from 1966 to early 70's. Professors from The OSU came to help establish the courses as well as faculty members from Piracicaba went for their masters and doctorate degree work.

From the mid 1970's onwards not only faculty members of universities but from research and development institution from all Brazil left their institutions for graduate work both in the country and abroad. Therefore, most of faculty members at universities and research institutions are well trained at masters and doctorate levels nowadays, and many higher education programs in Agriculture and Animal Husbandry are available in Brazil for continued education of young people.

Partnerships to integrate higher education and production. The Agriculture and Animal Production in Brazil

is a joint effort of the university system, through higher education, research and development institutions at federal and state levels, and the private sector. The university system is involved most with the academic studies, whereas research institutions are in charge of the applied research, development and innovation studies at field level.

At federal level Embrapa – Brazilian Enterprise for Agricultural Research – is the most important research and development institution, with centers deployed in all regions of the country. Embrapa is affiliated to the Ministry of Agriculture and Food Supply with the mission of coordinating applied research programmes around the country, offering partnership to work with State Government based institutions such as IAPAR, the State of Parana Research and Development Institute.

Embrapa has more than 9.5 thousands employees of whom, 2,392 are researchers, 18 % with masters, 73 % with doctorate degrees, and 7 % of whom have completed post doc sabbatical leave. Embrapa budget for 2012 runs a little over one billion American dollars (www.embrapa.br, access on Sept 8, 2012).

At the state level, there are research and development institutions affiliated to the State Government Secretariat of Agriculture and Food Supply in almost all states of the country. These are known as OEPAs – State Organizations for Agricultural and Animal Husbandry Research. IAPAR – Agricultural Research and Development Institute is one example in the State of Paraná. IAPAR, founded in 1972, has the mission of offering innovative solutions to the agricultural systems and agribusiness for the State of Parana. With over 750 employees, more than 110 research specialists, most of them with masters and doctorate degrees and post doc sabbaticals, IAPAR performs more than 220 big projects (over 560 experiments) in crops and animal breeds economically and socially important to the State. IAPAR counts with 16 experimental stations, 23 climatological stations, all deployed in the main producing areas, and 25 research laboratories of different fields of expertise (www.iapar.br, access on Sept 8, 2012).

Research programmes at IAPAR are in constant evaluations in order to be updated according to the agricultural needs. In its 40 years of existence, IAPAR has released more than 150 new cultivars of several crops, pioneered in the research and

adaptation of the no till farming since mid 1970's, headed a project for sustainable soil and water management based on regional micro basins, an international model for FAO, developed and evaluated systems and equipment for soil tillage for big and small farm agriculture, created a new bovine breed and helped the development of integrated crop-animal production systems, and so forth.

While IAPAR develops and adapts new technologies focused on sustainable agriculture for the State of Parana, another institution also affiliated to the Secretariat of Agriculture and Food Supply, Emater/PR – Parana Institute for Technical Assistance and Rural Extension is in charge of bringing to the farmers all new technologies to help solving their problems. Emater/Pr's mission is to promote sustainable rural development in the State, and it is deployed in almost all the 299 counties (municipalities) of Parana (www.emater.pr.gov.br, access on Sept 8, 2012). Even though IAPAR and Emater/PR are separate institutions, there is a close partnership connection in several action fronts.

At federal level, the OEPAs are organised into a national council – CONSEPA. In this council there are 18 affiliated OEPAs (www.consepa.org.br, access on Sept 08, 2012). The main goal of the council is to articulate the state agricultural research systems to attend their demands and to warrant the agribusiness sustainability. Figure 3 presents the present OEPAs in Brazil.

The OEPAs are very important to the regional development of the agriculture. There are 11,000 employees in the 18 institutions, being 2,032 researchers (408 graduated, 706 masters and 918 doctors), 250 experiment stations, 230 laboratories and nearly 2,000 on going projects.

Another important factor closely related to the agricultural development of the State of Parana and Brazil is the private sector. Of utmost importance are the agro industrial cooperatives such as COAMO (www.coamo.com.br, access on Sept 8, 2012) and Cooperativa Castrolanda (www.castrolanda.coop.br, access on Sept 8, 2012). COAMO is the largest cooperative in all Latin America, founded in late 1960's and Castrolanda, of Dutch immigrants, in early 1950's are good examples of agricultural development through farmer association. Besides the goals of improving technologies to foster yield levels (high quality seed production, soil management

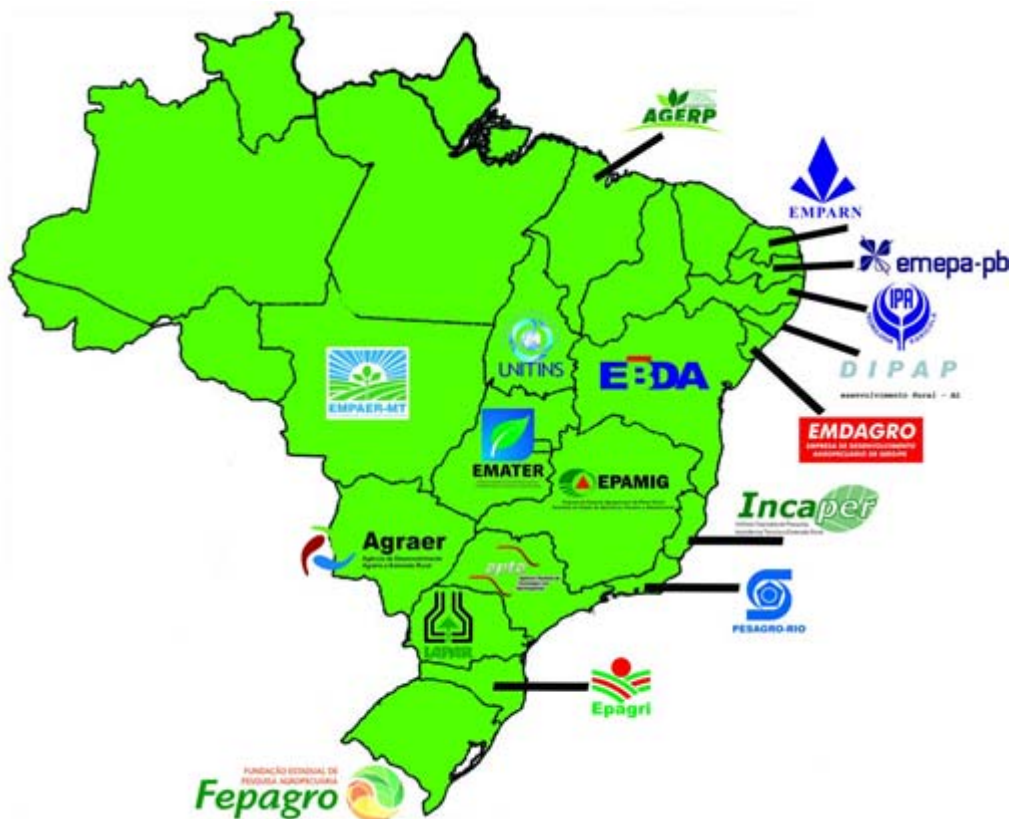


Figure 3. Deployment of Agricultural State Research Organizations in Brazil, 2012.

technologies, etc), and develop lines to transform their gross harvest into industrial products (animal rations, oil extractions, wheat and corn flours, rough milk, yogurts, butter, margarine, potato chips, etc), these large cooperatives have their own departments of applied on farm research to fulfill the needs of their associates.

With the aim of coordinating and integrate the cooperatives actions an association was created in early 1970's, the OCEPAR, with its mission to represent and defend Parana cooperatives and cooperative unions interests, in the various bylaw constituted organisations and the society, as well as to offer adequate services to ample development of the cooperatives and their associates (www.paranacooperativo.coop.br, access on Sept 8, 2012). Collecting 0.5 % of each 50 kg wheat bag harvested in the State of Parana, OCEPAR created in early 1970's a fund to install a breeding programme, beginning with wheat, followed by soybean and maize, to fulfill

the cooperatives special needs in addition to the official breeding programmes of the government institutions.

It can be pointed out in conclusion that the agricultural development in Brazil, both for national consumption and for exportation of food and derivatives around the world, there is a complex system: the universities, the government and the private sector research and extension institutions, all playing their roles individually and in joint action. Brazilian biodiversity and agricultural vocation regionally are so large requiring a complex organisation to handle the challenges of human and animal feed requirements.

Possibilities to integrate African and Brazilian actions in agriculture. Certainly, there are many similarities between climate and natural resources in Brazil and Central and Southern African countries. These offer several possibilities especially for collaboration to be worked out in order to enhance agriculture in both continents. FAO as an international organisation and source of funds and Embrapa with its international actions via the Labex in several countries in Africa can help channeling many opportunities of exchanges with several institutions in Brazil:

- Technical and scientific exchange between African and Brazilian institutions in order to plan joint projects, both with government and private sector;
- Promotion of sabbatical leave of agricultural scientists from African and Brazilian institutions to enhance cooperation among institutions;
- Exchange of genetic materials for breeding purposes to foster genetic variability and improvement;
- Enrollment of young African people in undergraduate and/or graduate studies in key universities with agricultural science programmes.

Acknowledgement

We appreciate the opportunity provided by the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM - www.ruforum.org) to enable us present this paper at a Conference on Partnership and Networking for Strengthening Agricultural Innovation and Higher Education in Africa held in Entebbe, Uganda, 24-28 September 2012).

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