

# Annual REPORT 2018

**Embrapa**

Swine & Poultry



BIOMETANO

**BIOGÁSFORT**  
COMBUSTÍVEL SUSTENTÁVEL

# PRESENTATION

2018 was a year of important achievements by Embrapa Swine and Poultry. And this should come to the knowledge of society, especially to show our efforts and research results in favor of the swine and poultry productive chains. This report, annually produced, is one of the ways to highlight the main results that occur through projects, activities, initiatives and actions.

The reduction of the annual budget and many other difficulties faced were overcome with creativity and dedication by each one of Embrapa employees and collaborators. The search for partnerships was strengthened and brought us very promising scenarios.

The technical team made an important contribution to the implementation of public policies, highlighting the work to support the new regulations for sanitary inspection in pig slaughterhouses, an intense partnership with the Ministry of Agriculture, Livestock and Supply (MAPA) and agroindustry. The disposal of dead animals continued to be one of the top priorities and resulted in important contribution to build up legislation on this theme.

The implementation of the Suruvi Experimental Station, which has concentrated many administrative efforts in recent years, began operating in early 2018 in order to house the Avian Genetic Conservation Center, providing new opportunities to the experimental area. Environment management got a lot of attention from the Unit. We launched a Biomethane Production Unit this year, generating vehicular energy from the treatment and purification of the residues of swine.

There were several products offered to the society and we invite you to know some results from the great effort of the team of Embrapa Swine and Poultry. Our commitment is to contribute to the evolution of swine and poultry farming, ensuring that the final product meets the needs of the whole society.

Good reading!

**Janice Reis Ciacci Zanella**

Director-General of Embrapa Suínos e Aves



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*\*US\$ 1 = R\$ 3.98, May 2019 average value*

Embroid



Embrapa

**Research** with  
quality and **commitment**

**Embrapa**

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*Swine & Poultry*

## Analysis | 2018 Production Performance

**12.86**  
million 

Brazil produced 12.86 million tons of poultry meat in 2018, second largest production in the world. Exports reached 4.101 million tons, the highest of the world. Domestic production decreased by 1.46% compared to the figures for 2017.

**3.97**  
million 

Domestic production reached 3.97 million tons of pork in 2018, fourth largest in the world. Exports were 646 thousand tons, also the fourth largest in the world. Compared to 2017, Brazil's exports fell by 7.32%.

**44.49**  
billion 

Brazil produced 44.49 billion egg units, a result 11.5% higher than 2017. Exports were approximately 11.67 thousand tons, 92.9% higher than in 2017. Per capita consumption in the country reached 212 units and reached a level 10.4% higher compared to 2017.

**182.2**  
thousand 

The Brazilian production was 182.25 thousand tons. Production, in comparison with 2017, decreased by 53.6%. The export of turkey meat reached 74 thousand tons, 32.7% lower than in 2017.

## Scenario

# OPTIMISM IN THE SWINE AND POULTRY MARKET

Higher corn production may reduce production costs



In 2018, the main factors that affected the performance of Brazilian pig farms were the blockade of the Russian market, the rise in production costs and the economic recession.

Losses from the blockade were partly offset by increased exports to China, which increased US import tariffs in the face of US trade retaliation.

Until the middle of 2018, the difficulties faced in the foreign market and the high costs of production drew a pessimistic scenario for the Brazilian export market. Some forecasts pointed to a reduction of up to 20% in relation to the total volumes shipped in 2017. However, exports of 2018 approached the volume sold abroad in 2017. But revenues did not show same trend. Average prices were lower than in 2017 in the main markets, going from US\$ 2.36/kg to US\$ 1.88. Export revenues are expected to fall by 19%, in dollars, compared to 2017. On the other hand, these losses are due to the shift of

larger volumes to countries that historically pay lower prices than those practiced by Russia. Besides, the fall in prices also reflects a loss of image of the meat produced in Brazil as a result of the scandals revealed in the "Carne Fraca" operation in 2017.

But there are reasons to outline a more optimistic scenario for 2019. In addition to good perspective in the foreign market, the increase in corn harvest may favor a reduction in production costs. This coupled with the stability of the stockholding matrix and production, along with increased exports, creates conditions for the economic recovery of the sector.

In poultry production, Brazil is facing enormous resistance to grow its share in the international market. There was a large reduction in Brazilian exports to Saudi Arabia (-28%) and European Union (-29%). Other major buyers such as Hong Kong (-12%), Kuwait (-11%) and Japan (-8%) also

reduced their purchases. On the other hand, Mexico (+46%), South Korea (+20%) and China (+13%) provided the good news and showed significant growth in imports. However, growth in shipments to these countries was insufficient to make Brazil's total exports higher than the previous year.

Some problems faced by poultry production were more punctual, but of great negative impact for the sector. The main ones were the US-China trade war which also involved Russia and the European Union; the suspension by the European Union of Brazilian poultry meat exporting plants; the application by China of anti-dumping measures on Brazilian exports of poultry; and the truck drivers' strike, with the consequent creation of the "National Freight Price Table", with a strong increase in freight costs, ranging from transportation of the ration in rural areas to transportation of product to ports and export.

## Infrastructure management

# NEW FACILITIES IN OPERATION

### Suruvi hosts NCGA and Labina starts working

The year 2018 was marked by the reactivation of the Suruvi Experimental Station (CES). It took around four years to adjust and adapt the area of Suruvi, ensuring for Embrapa Swine and Poultry the conservation of genetics and experiments in the area of poultry, meeting the official regulations of the Ministry of Agriculture, Livestock and Supply (MAPA).

With the official approval of CES operation by MAPA to house the Poultry Genetic Conservation Center (NCGA), the Unit reinforces the biosafety

of herds, reducing health risks, maintaining a replica of the genetic material, and enabling the unrestricted use of the experimental area in the current poultry farm. With these changes, the NCGA was able to become a pure line and great grandparent genetic farm allowing the sales of grandparent chicken stock. For the next year, the challenge will be to define a new model of genetic licensing, which will allow greater contribution of private resources to the maintenance of the NCGA.

Another research facility that came into operation in 2018 was the Laboratory of Biotechnology and Nanotechnology Applied to Animal Nutrition (LABINA). In this space, researchers and support team work on in vitro system studies to characterize raw materials and biotechnology assets such as enzymes and probiotics. Also in 2018, a study was begun to transfer the research structure of the poultry metabolism to the old hatchery, allowing extending the experimentation in this area.

### Cooperation

## The partnership is guaranteed

The year 2018 was also marked by the effort and renewal of an important partnership with the Center for Diagnosis in Animal Health (Cedisa). This cooperation proposed through a public notice is intended for the installation and operation of an animal health diagnostic laboratory, which makes it possible to carry out diagnoses and monitoring of animal diseases of swine and poultry, within the scope of the National Poultry Health Program and the National Swine Health Program (PNSS). It will also meet demands related to emerging and reemerging production diseases, developing research activities in line with the projects registered in the Embrapa Research Management System (SEG).



Suruvi  
Experimental  
Station

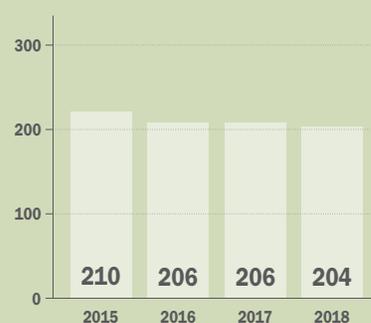
#### Total cost in US\$ million



#### Investment in US\$ million



#### Employees in December 31



## Production

### Results available to producers

There forty-one final results offered by the Embrapa Swine and Poultry in 2018. Considering Advancement of Knowledge, sixteen results were delivered, followed by Agricultural Practice/ Processes, Technical Scientific Methodology, Training, Socio-economic Studies, Management Processes, Technological Product and Information System.

## Research management Changes in project administration

In 2018, Embrapa changed the way research projects are approved and administrated. With the changes in the Embrapa Management System (SEG), the institution leaves the model focused on production to embrace the concept of innovation. The objective is to bring Embrapa closer to the production chains, strengthening its commitment to providing solutions for Brazilian agriculture.

The types of projects planned in the SEG are connected to a methodology used since the 1970s by the US space agency, NASA, known as Technology Readiness Level (TRL). By this methodology, it is possible to evaluate the level of maturity of a technology throughout its development. Most institutions in Brazil and abroad already use this methodology, which facilitates the consolidation of partnerships and dialogue with productive agents.

The scale, from 1 (initial idea) to 9 (technology adopted by the productive or social environment), will be used to classify and frame the types of results produced by the institution, such as cultivar, breed or genetic group, agricultural process, agricultural input, industrial process, industrial product, machinery and implement and software for external customers, foreseen in SEG.

## Research

# TECHNICAL TEAM WORKS IN 66 PROJECTS

### They are demands from productive chains

The Embrapa Swine and Poultry technical team worked on 41 research projects under its leadership and in 25 under other Embrapa's Units, at an annual budget of US\$ 547,276.17. Compared to the previous year, the Unit's project leadership continued, with an increase of 39% in projects led by partners.

Of the projects underway, nine were concluded in 2018, bringing results in the research areas of environment, good production practices, genetic, nutrition and food safety.

One of the finished projects was "Development of nanostructured coating on commercial eggs - Nanoovo". Through the project, which studied different coatings to

improve the safety of table eggs, a partnership is being established to bring the product to market.

Hatching hen production was also the subject of research on two other projects concluded in 2018. One of them has focused on the elaboration and dissemination of Good Production Practices in Colonial Egg Production - BPP Eggs. The project worked with cooperatives, producers and official control institutions. The other was the development of a PCR technique for the rapid detection of Salmonella.

In nutrition, two projects studied the effect of pelletizing, enzymes and nutrients on the performance and bone

composition of broilers. Still in poultry, en-closed the poultry bed reuse project, which evaluated pathogens relevant to poultry health protection. This project was technically supported MAPA in the establishment of regulations. Genetics was another highlight of the Embrapa research agenda, since researchers have performed the identification of genes associated with the formation of hernias in pigs.

The delivery of environmental management software and the modeling of carbon sequestration in the recycling of organic fertilizers in agriculture were the results of some projects in the environmental area.

## Numbers of 2018

The Unit published **44 articles** in peer viewed journals with **level A**, the highest quality possible.

The total number of **scientific papers** published in indexed journals reached **60**.

**22 media articles** and **54 articles** were published in scientific meetings.

The number of **edited books** reached **8**.

**26 chapters** were published in **technical-scientific books** last year.

**5 folders/leaflets/booklets** and **17 Series Documents** were edited by the technical staff.

# Ongoing and approved projects in 2018

Projects under Embrapa Swine and Poultry direct coordination	Research Funding		
Model of environmental management for areas of intensive animal production in southern Brazil	SEG 03/2018	Thermal insulation assessment for poultry house covers	Multinova
Development and evaluation of nanomedicine for the treatment of coccidiosis in broiler chickens	SEG 03/2018	Evaluation of different doses and types of enzymes in performance, nutrient digestibility and bone composition in broilers	BASF
Improvement of bacteriophages for salmonellosis control in poultry	SEG 03/2018	Evaluation of the benefits of using xylanase in nutrient digestibility in pigs	Ilender
Integration of technologies for the treatment and agronomic use of piggery wastes to mitigate the global warming potential of swine production chain	SEG 03/2018	Effect of pelleting temperature and an enzymatic blend on performance of broiler chickens	Novus
Wild Boar – Part 2	SEG 03/2018	Organic acids associated with surfactants in pelleted feed for swine and poultry	Laza
Swine, poultry and caimitus in situ conservation	Embrapa MP1	Thermoprocessed cassava fiber as pellet enhancer for laying breeders diet	Fibervita
Wild Boar – Part 1	Embrapa MP2	Prospecting technologies for the production chain of broilers	Fund. Araucária
Review and modernization of <i>ante</i> and <i>post mortem</i> inspection applied to pig's slaughterhouse with federal inspection	Embrapa MP2	Support to the poultry and pig production chains to access the drawback system benefit	ABPA
Development of a new virosomal antigen delivery system and its effectiveness in the local and systemic immune response	Embrapa MP2	Welfare in laying production	Mapa
Technologies for destination of dead animals	Embrapa MP2	Dynamics of the Animal Genetic Resources Curatorship	Embrapa MP1
Methods of cell immortalization for the establishment of new cell cultures applied to the diagnosis and synthesis of reagents for animal pathogens research	Embrapa MP2		
Review and modernization of the inspection system applied to avian's slaughterhouse with federal inspection	Embrapa MP2	<b>Projects which had other research center leadership</b>	<b>Research Funding</b>
Evaluation of indicators and strategies for valuing environmental services in watersheds with intensive livestock production	Embrapa MP2	Ex situ conservation of animal genetics resources	Embrapa MP1
Genetic and antigenic diversity of influenza A viruses and efficacy of diagnostic methods and nanotechnological vaccine for the control of influenza in swine	Embrapa MP2	Management and digital curatorship of Animal GRIN (Alelo Animal) Database	Embrapa MP1
Swine and poultry genetic modification methodologies improvement platform	Embrapa MP2	Technological basis for development and agronomic evaluation of organic mineral fertilizers based on agricultural residues in Brazil	Embrapa MP2
Development of a real-time PCR for rapid multidetection of <i>Salmonella</i> and evaluation of the infection dynamics under controlled conditions	Embrapa MP3	Evaluation of risk factors for specific pathogens and ripening time in Brazilian artisanal cheeses to ensure their safety	Embrapa MP2
Evaluation of recycled broiler litter with reference to the survival and infectivity of pathogens	Embrapa MP3	Modulation of the immune system to control haemoncosis in sheep	Embrapa MP2
Development of nanostructured coating for table eggs	Embrapa MP3	Breeding oats, rye, triticale and dual purpose wheat for agricultural systems in southern Brazil	Embrapa MP2
Development of software for environmental management of swine farms	Embrapa MP3	Technological solutions to optimize the use of waste and biomass as source of agricultural inputs in organic production systems	Embrapa MP2
Calcium, phosphorus, and vitamin D levels in laying hen diets to improve productivity and reduce pollutant impact on the environment	Embrapa MP3	Technological and incremental development of sheep meat products as opportunity of adding value	Embrapa MP2
Nicarbazin residues in chicken meat raised on reused litter	Embrapa MP3	Multidiagnostic strategy evaluation for sanitation of farms with bovine tuberculosis	Embrapa MP2
Evaluation of the immunological components of swine fresh and frozen colostrum	Embrapa MP3	Standardization of Methodologies and of New Approaches to Economic Evaluation of Crop-Livestock-Forest Integration Systems	Embrapa MP2
Modeling of carbon sequestration and greenhouse gas emissions through the recycling of organic fertilizers in agriculture (Visiting Scientist)	Embrapa MP3	Structuring of an expert team to apply vertebrate studies on sustained development of Mato Grosso do Sul state	Embrapa MP2
Transference of technology supporting ATER net involved in production, processing and marketing of meat, milk and eggs in ecological based family agriculture	Embrapa MP4	Development of liposomal immunomodulatory nanosystem with active guidance to hepatocytes as a future alternative tool for R. microplus cattle tick control	Embrapa MP3
Good management practices in commercial egg production	Embrapa MP4	Development, standardization, and validation of a multiplex PCR-based method for monitoring of clinically relevant antibiotic resistance genes for the control of mastitis in dairy cattle	Embrapa MP3
Technology transfer for production and use of biogas and fertilizers from pig and poultry manure treatment under the ABC Plan	Embrapa MP4	Genomic methylation profile variations related to meat tenderness and feed intake in Nelore cattle	Embrapa MP3
Cooperation, communication and technology transfer for the production of safe pork without the use of antimicrobials	Embrapa MP4	Genomics of anthelmintic resistance in <i>Haemonchus contortus</i> and evidences for DNA methylation	Embrapa MP3
Technological platform for swine breeding programs	BNDES/BRF	Machines and equipment for family farming	Embrapa MP4
Identification of genes and polymorphisms associated with hernias in pigs using the combination of exomic and RNA sequencing	CNPq	Development and implementation of strategies for managing the Animal Health Portfolio	Embrapa MP5
Gene expression and epigenetics on the manifestation of osteochondrosis in swine	CNPq	Method validation on fatty acid profile and CLA from milk fat	Embrapa MP5
Effect of different levels of dietary selenium on quality in gene expression and fertility in roosters	CNPq	Restructuring of archival document management oriented to the implementation of the Electronic Information System	Embrapa MP5
Development of a low-density SNP panel for swine traceability	Fapesc	Embrapa Net in Near Infrared Spectroscopy - Phase II	Embrapa MP5
Good practices for migration of housing systems from swine to gestation cells for collective bays	Mapa	Management of the Agricultural, Livestock and Forestry Automation Portfolio	Embrapa MP5
Effect of a pellet quality improver (Bredol) on nutrient digestibility and performance of broiler chickens	Akzonobel	Development and implementation of strategies for managing the Genetic Engineering in Agribusiness portfolio	Embrapa MP5
Biotechnological process for swine wastewater treatment - Sistrates	BNDES	Embrapa's Strategic Intelligence System Strengthening	Embrapa MP5
Evaluation of dietary antioxidant ingredients to prevent lipid oxidation in pork and processed pork products enriched with omega-3 fatty acids	Gran Cru/Cargill/Pepinão/Unicamp	Characterization of handmade cheese produced in municipalities within the Green Corridor Mantiqueira - generating income to family farmers and safe food for consumers	Embrapa MP6
Greenhouse gases mitigation on swine slurry treatment and use as organic fertilizer	CNPq	Metaproteomics of ignocellulolytic enzymes from ruminal microbiota of Morada Nova sheep	CNPq
		Dissemination, expansion and applicability of the Biodigester Septic Tank as social technology for rural basic sanitation	Fundação Banco do Brasil
		Implementation of SiExp at Embrapa	Projeto Especial SEG
		Development of production systems and technological packages for making feasible sustainable production of microalgae biomass in biorrefineries for different Brazilian regions	SEG 03/2018
		Cleaning technology suitable for the processing of quality shell eggs from small scale farming	SEG 03/2018

## Water reuse Focus on the use of cisterns

One of the themes that Embrapa Swine and Poultry and its partners have been working on is the use of rainwater in the production of pigs and poultry. In 2018, about 320 technical personnel and producers participated in the seminar "Management and maintenance of tanks in the Jacutinga River Basin and contiguous sub-basins". The event presented results from the Cisternas Project, to the Jacutinga Committee, as well as lectures on water consumption in rural property and rainwater harvesting systems: alternative materials and components. They also participated in a field day at the Embrapa headquarters, where models of cisterns and their components were discussed, handling, maintenance and treatment of water. The dynamic was organized by companies that provide these services.

The main objective of the event was to facilitate the access of producers with local and regional service providers, as well as agroindustry personnel and agricultural extension institutions, facilitating dialogue under a technical environment.



## Research

# ORGANIC FERTILIZER IMPROVES SOIL FERTILITY

## Study demonstrates the sustainability of the organic product

Researchers at Embrapa have evaluated alternatives for the treatment and recycling of animal waste in terms of the potential for mitigation of  $N_2O$  emissions and accumulation of carbon in agricultural soils fertilized with these organic fertilizers. The results showed that animal waste can replace the use of mineral fertilizers without loss of productivity of agricultural crops. The use of manure treated by anaerobic biodigestion reduced up to 70% the  $N_2O$  emissions of the soil under no-tillage in relation to the

manure applied without treatment. Compost-treated wastes showed a high potential for recovery of degraded soils, recovering soil organic matter (OM) up to seven times faster than soils fertilized with mineral fertilizers.

The results were used to feed a mathematical model in order to predict future scenarios regarding the persistence of OM accumulated in soils fertilized with organic fertilizers due to changes in soil management practices. In an unprecedented way, the scenarios tested

indicate that soils fertilized with organic fertilizers are more stable and resilient carbon reservoirs than fertilized soils with mineral fertilizers, thus contributing to the environmental and economic sustainability of Brazilian agriculture.

In addition to consolidating Embrapa's partnership with national and international institutions, the work showed the potential for greater competitiveness and reduction of the cost of production in agriculture by replacing mineral fertilizers with organic-based fertilizers.



## Environmental management

# SGAS assists in operation licensing

In order to support the environmental licensing of pig farms, Embrapa Swine and Poultry developed the Environmental Management Software for Swine (SGAS). It is a set of applications that include calculation routines and technical subsidies needed for environmental management of pig farms and can be used as a tool for swine licensing in accordance with state environmental laws. The SGAS will be customized according to

the laws of each Brazilian state.

In Rio Grande do Sul (RS), technical cooperation with the State Foundation for Environmental Protection of RS (FEPAM) will enable the use of the SGAS to seek environmental management solutions and the articulation of the environmental management system of swine, increasing the integration between State, municipalities and productive sector. SGAS was also presented to the Secretariat of

Agriculture, Livestock and Irrigation of RS, in Porto Alegre.

In Santa Catarina, technical personnel from companies and environmental agencies are being trained to use this software. In Paraná, through Frimesa Cooperative, and in Mato Grosso, through Acrismat Producer Association, training actions have already begun with the objective of encouraging the adoption of the SGAS. Both institutions are funders of the project.

## Research

# BACTERIA-BASED FILTER CAN PURIFY BIOGAS

## Technology is used to generate vehicular energy

Researchers at Embrapa Swine and Poultry have developed a biofilter, which uses bacteria to purify the biogas generated from pig manure from farms. The product is in line with the concept of renewable energy and uses waste from animal production. The result is a low-sulfur biogas that can be used to generate heat, electric power or even vehicular fuel to replace gasoline or diesel oil.

The process was the result of researches of the project "Biofiltration, water quality and post-biodigestion treatments for the technical and commercial arrangement for electricity generation connected to the grid, from biogas produced from swine manure in the municipality of Itapiranga", which had the financial support of private companies Eletrosul and Uirapuru Transmissora de Energia.

The biogas generated from



swine manure has a high concentration of hydrogen sulphide, or hydrogen sulphide ( $H_2S$ ), which is responsible for the corrosion of metals and motors. This gas reduces the life of electricity generators, deteriorates burners and prevents vehicular use.

The biofilter promotes the reduction in the concentration of this component in more than 90% and allows its direct use,

both for boiler heating and for electric power generation. It also favors the purification of biomethane and vehicular use.

The equipment is being validated in production scale and is part of the Biomethane Production Unit, BiogasFort. The objective is to demonstrate the technological route and the opportunity to use biogas generated from swine residues to produce vehicular fuel.

## Protagonism

# Car powered by biomethane gas



The Embrapa Swine and Poultry Biomethane Production Unit is the pioneer in Santa

Catarina and one of the first in Brazil on this scale for use as a vehicular fuel.

After going through the process of desulphurisation and purification, the biomethane is used to supply one of the vehicles of the Unit's fleet.

The technology is similar to that used in vehicles powered by NGV and follows regulations such as ANP Resolutions No. 8, dated 01.30.2015 (DOU 02.02.2015) and ANP N° 685, of 06.29.2017 (DOU 06.06.2017). In addition, it fulfills several

commitments to the production of energy from renewable sources. One of these commitments is linked to the Strategic Development Objective - ODS 7 - Clean and Affordable Energy.

The differential of the Biomethane Production Unit is precisely the possibility of using the biofilter, which performs the initial process of gas purification, using the treated pig waste itself, and ensures compliance for the purification step produced by the biomethane.

## Operation

# Purification by biological process

The advantage of the technology of Embrapa is that the purification process is biological, that is, the removal of  $H_2S$  occurs through the action of sulfide oxidizing bacteria, without the use of other inputs. The process uses the swine's own effluent and generates elemental sulfur, which can be used as fertilizer.

The second step of the Biomethane Production Unit for the generation of vehicular fuel is the purification of the desulphurized biogas. The system has the ability to produce 9 to 12  $Nm^3/h$  of biomethane. The executive project of Embrapa Swine and Poultry Biomethane Production Unit has a partnership with Janus & Perguer and Kemia.



## Differential

# Sustainability and autonomy

In a research scale with 15  $m^3$  of biomethane it is possible to estimate a range of 230 to 300 km run by a vehicle with this system. Therefore, about 300 sow production system is required to generate this amount of gas already purified, which is the capacity and operability of Embrapa Swine and Poultry.

Sustainability is another advantage of biomethane. It is a fuel produced from a renewable source, replacing the fossil source with no impact on the environment.



To have access to the project page on internet, access: [www.embrapa.br/suinos-e-aves/projetos](http://www.embrapa.br/suinos-e-aves/projetos)

## Public policies

# RESEARCH SERVES AS T NEW SANITARY INSPECT

Scientists have helped legislation to update the new real

The results of a research project carried out by Embrapa in collaboration with experts from universities were used to subsidize the modernization of sanitary inspection procedures in the Brazilian swine slaughterhouses. The work demanded by the Department of Inspection of Products of Animal Origin (DIPOA), of the Ministry of Agriculture, Livestock and Supply (MAPA), supported scientifically the new Normative Instruction number 79, which came into force in December 2018.

The new regulation directs

the focus of sanitary inspection to public health problems and addresses official animal health programs, sharing with industry the responsibility to disqualify raw materials unfit for consumption by process problems, without risk to consumer health.

The research project carried out by Embrapa Swine and Poultry in partnership with DIPOA had the objective of evaluating the impacts of changes in pig rearing systems and sanitary controls on ante and post-mortem inspection procedures. The publication of these standards allows the

modernization of inspection of pig slaughter on the basis of risk analysis. It represents the practical application of the scientific knowledge obtained from the research to improve the Federal Inspection Service.

The intensification of swine farming, based on confinement, adoption of technologies and advances in sanitary control, modified the risk profile attributed to meat as a carrier of zoonosis.

Currently, most of the injuries observed in post-mortem inspection do not pose a risk to human health and



# THE BASIS TO INSPECTION REGULATION

## Quality of swine production and health risks

demand a large number of procedures performed by the Federal Inspection Service (SIF) for detection. On the other hand, the major consumer health hazards listed in risk assessments do not cause observable injury on inspection lines such as salmonella. It was this scenario change that prompted the need for a scientifically based review and modernization of the meat inspection system, directing its focus to the risks that effectively threaten food safety.

Another highlight is that the work done by the team was aligned with what happens internationally, but based on the Brazilian reality. The strategy pleased regulators because it offers the risk manager the opportunity to optimize official resources by improving the controls that really matter to public health.

In addition to IN of the inspection at risk, on December

20, 2018 was published IN 60, which establishes the microbiological control in swine carcasses. This regulation, in addition to positively impacting consumer health, will help Brazil maintain and access markets, which today is critical in the country.

### Three regulations subsidized by science

The research effort in this area resulted in the technical and scientific basis for three regulations. The first of these, the elimination of the restriction on exports of carcasses submitted to the Department of Final Inspection (DIF) established by Ordinance 1,304, was published on October 7, 2018. The economic impact of this action contributes to Brazilian competitiveness, as it reduces by approximately 80% the disqualification of the raw material to better remunerated external markets. Besides the industry, the consumer of Brazilian pork is also benefited, since the new rules will result in the reduction of the risks of food contamination.

Another regulation based on scientific research is the Normative Instruction that defines microbiological criteria for self-control and official

control of pig carcasses, published in IN 60, of December 20, 2018. This regulation was based on a technical note that presented the results of the qualitative risk assessment, which indicates Salmonella as the main danger attributed to pork among other risks related to fecal contamination. It was also considered the occurrence of pathogens in swine carcasses in Brazil. Therefore, the regulation deals with the control of Salmonella and enterobacteria.

The third document supported by the research was precisely the risk-based inspection system for swine, regulated by Normative Instruction No. 79. The document "Scientific Opinion - Modernization of Sanitary Inspection in Swine Slaughter: Risk Based Inspection", by Embrapa, was based scientifically the draft standard.

It is important to mention that in addition to the gains for industry and consumers, the new regulations also benefit the Federal Inspection Service, which can rationalize their teams more strategically. There are also advantages for agroindustries, cooperatives and slaughterhouses that slaughter pigs under SIF throughout the country by direct reduction of labor, information qualification and raw material.

Modernization in the federal sanitary inspection rules results in gains for the entire production chain, since the risk-based system, supported by a program of self-control of the major zoonotic risks attributed to pork, has a positive impact on trade in products.

## The research Model for poultry and cattle



The strategy used by the researchers in this project was the construction of a decision matrix. Each procedure foreseen in the current legislation was evaluated considering the data of the Federal Inspection Service, the prioritization of biological hazards to public health in the chain of production of industrial pigs and the complementary data produced by the project to characterize the Brazilian situation. From this, the new proposal was built, defining what should be the responsibility of the official service and what can be shared with the industry.

The effort reinforced the strategy of risk assessment as a tool to support public policies and positioned scientific research as the protagonist of the modernization of the meat sanitary inspection system of in Brazil. After the swine production chain, the proposal is already being applied to poultry, and recently the project for cattle was also approved.

The work of the researchers has taken into account the recommendations of international risk management bodies, in which the roles of the manager and the analysts are well defined. In Brazil, the risk manager is DIPOA and the analysts are the researchers from Embrapa and universities. This clear definition of each institution role allowed the team to carry out a work that combines risk assessment and science. All steps were conducted with great transparency and safety, without influence of the regulatory sector and based on the definition of hazards.

## Nanovo Coating maintains egg quality

Through the project "Development of nanostructured coating in commercial eggs - Nanovo", bromatological evaluation tests were carried out and proved the quality of the coated eggs. The objective was to verify if there is alteration in the nutritional values of the eggs with the application of the nanostructure. The conclusion was positive, since the values of protein, lipids and energy did not change compared to fresh eggs. The test was applied to coated eggs at the end of eight weeks. In 2019 the product will be validated on a commercial scale.



## Genetics Gene identification for selection

The deposition of fat in the chicken carcass is a negative factor in the production, since it affects feed efficiency. Through the genomic association, conducted in a pure poultry line of Embrapa, researchers identified nine regions associated with fat deposition. Therefore, in addition to improving the understanding of this problem in production, the identified genes are potential markers to be used in the selection of animals with lower fat accumulation and, consequently, more efficient. This work was carried out in partnership with Esalq/USP, Iowa State University, USA, School of Agriculture from Massey University, Ruakura, Hamilton, New Zealand, and FMVZ/Unesp Botucatu.

## Nutrition

# WINTER CEREALS AS AN ALTERNATIVE

## Embrapa promotes wheat and triticale production

The production of winter cereals for feeding pigs and poultry is one of the themes that the MAPRIM Arrangement has been working with, aiming to point out alternatives for producers and to diversify the feed ingredients for animal nutrition complementing the binomial corn and soybean meal.

Embrapa Swine and Poultry and Embrapa Wheat have been to point out solutions to a problem that affects the competitiveness of the two meat production chains in the Southern Region due to the deficit of traditional raw materials for feed, especially maize.

The year of 2018 was a

technical articulation with the institutions and referral of partnerships. One of the actions was the realization, together with the Union of the Swine Industries of the state of Rio Grande do Sul (SIPS-RS) and Fecoagro, of the Workshop "Potential production of winter grains for feeding pigs and poultry in the Region South of Brazil", at the headquarters of BRDE, in Porto Alegre / RS.

A similar action occurred in Santa Catarina, when the Embrapa team coordinated, together with the Secretariat of Agriculture and the Organization of Cooperatives of the State of Santa Catarina - OCESC, the technical meeting on "Produc-

tion of winter cereals in Santa Catarina for food pigs and birds" in Chapecó / SC. Embrapa participated in discussions at the Mais Milho Forum and in technical meetings with cooperatives in Santa Catarina and Rio Grande do Sul, such as Aurora, Coopercampos and Fecoagro.

The articulation along the productive chains of meats resulted in a technical cooperation with the companies Seara Alimentos and Danisco Brasil Ltda. In Santa Catarina, the Government is analyzing the "State plan to promote the production of wheat and triticale for use in the feeding of pigs and birds.



## Food safety

# Heat treatment reduces nicarbazin

A survey by Embrapa Swine and Poultry showed that proper heat processing of poultry meat reduces the residues of nicarbazin. This compound is used to prevent coccidiosis, a disease that causes damage to the intestines of poultry and entails economic damage to production. The main concern is in the presence of residues in meat products. Thus, the research of Embrapa had the objective of identifying and verifying if thermal procedures that are normally applied by the population at the moment of consuming the meat are efficient. The results showed that there was a reduction of 52% to 69% in the amount of nicarbazin after cooking when compared to raw meat, contributing to food safety. According to the researchers, these results provide subsidies for decision-making for possible international inquiries, offering greater security to the markets. Another factor is that these results subsidize public policies with the argument that, even if there is residue detection in the meat, the effect of thermal processing should be considered.

## Destination of dead animals

# REMOVAL INCREASES INDUSTRIAL SOLUTIONS

## Embrapa assessed scenarios and risks of collection and treatment

Disposal of dead animals may no longer be a problem to become an alternative of industrial recycling, with flour production, use in biogas plants and incineration plants. This is possible when the carcasses are removed by collection and treatment plants which meet the criteria laid down by regulations. This is the conclusion of Embrapa researchers after studying the whole process of collecting, transporting and heat treatment of the carcasses,

based on the risk analysis. At this stage, they had the partnership of the Veterinary Epidemiology Laboratory of UFRGS and the Federal University of Pampa. The team identified hazards that may be associated with transport and disease of pigs and assessed scenarios. The analysis showed that the risk of transmission of pathogens by transport is low in multiple collections (the carcasses are kept at room temperature or stored in a

warehouse with freezing chamber). And the risk is insignificant in individual collection with freezing chamber storage. Concerning the rendered meals and fats, this risk assessment did not focus on this subject. The recommendation is that those by-products should be destined to biodiesel and fertilizer, once such ingredients are not adequate for animal consumption, according the IN - Mapa Nº 34, form 05.28.08, that regulates this subject.



## Biosecurity

# Establishing actions to be taken

Embrapa Swine and Poultry, with the help of a technical panel of 18 experts including researchers, university professors, state associations of pig producers, agroindustries and pig production cooperatives, state health defense and the National Swine Health Program of the MAPA, elaborated a work identifying the most relevant aspects of biosafety to serve as support for companies and producers in mitigating the risks of

introduction and spread of diseases in swine farms.

The procedures were organized and generated a proposal that established minimum biosecurity criteria for swine farms that produce animals for slaughter. The information will be subsidized for the official regulations, benefiting the entire Brazilian swine production chain, as well as consumers, for the possibility of obtaining safer products from the food point of

view and also for reducing the need for antibiotics, reducing the possibility of residues in the meat.

Considering the importance of adopting prevention, some states mobilized and, based on established criteria, regulated ordinances, such as Paraná (Portaria 265, September 17, 2018), Rio Grande do Sul and Santa Catarina, which will publish new laws by the first half of 2019.

## Residues in meat Fast and low cost method

Following international guidelines, Embrapa researchers developed a chromatographic method to detect traces of ractopamine in pork. The new method is extremely sensitive, fast and efficient, with less solvent expenditure than the current ones. The methodology has the potential to be adopted by the productive sector because it will allow greater confidence in the meat products both for the internal and external markets, identifying the quantity of RAC according to international requirements.

## Genomic Research proposes diagnostic test

Hernias and osteochondrosis (OC) in pigs bring economic losses and welfare problems to production. With an innovative approach, involving new genomic technologies such as RNA-Seq, GWAS and DNA methylation, in addition to real-time PCR, researchers have advanced their knowledge of the genetic control of these conditions. The results of the study, carried out in partnership with Udesac Oeste, Esalq/USP, Federal University of Bahia, Cedisa, Ponta Grossa State University, Contestado University and BRF, will support the development of a diagnostic test to identify animals carrying alleles that predispose occurrence of CB in pigs.

## Information

### African swine fever site

A special website was created on the Embrapa Swine and Poultry portal on african swine fever (PSA) with technical notes, frequently asked questions about the disease, videos, articles and useful links. The PSA virus is highly contagious and was detected in subsistence pigs in China and Romania and in wild boars in Belgium in September 2018. The web address is [embrapa.br/suinos-e-aves/psa](http://embrapa.br/suinos-e-aves/psa).

## Evaluation

### MS115 has a good performance

During seven months, the researchers responsible for monitoring and genetic improvement carried out tests to evaluate the performance and quality of carcass of swine produced from Embrapa MS115 genetic - the light pig. The evaluations were in comparison with those produced by breeders of a commercial strain in use in the productive sector. The results of these tests showed that MS115 presented better feed conversion, mainly caused by lower feed intake. Another result was that the genotypes did not present significant differences regarding the zootechnical variables studied and the carcass characteristics were not significantly different among them, except for the percentage of meat and fat thickness, which is better in MS115 offspring.



## Genetics

### Searching for new partnerships

In 2018, after positive evaluation of the colonial line of posture, Embrapa studied the possibilities of new business. One of the possibilities was the opening of a process for selection of companies interested in technical and financial cooperation in the multiplication and commercialization of broiler lines (Embrapa 021) and egg production lines (Embrapa 051) with Embrapa. The purpose of the public notice, published at the end of the year was to select a company interested in acting exclusively in national and international territory, and entitled to use the mixed brand "Embrapa Technology".

## Technology transfer

# PARTNERSHIP FOR THE MARKET AND EXTENSION

### Antimicrobial-free production meets niche market

A model of swine production system without the use of preventive antimicrobials and favoring well-being aspects. This is the proposal that Embrapa Swine and Pork presents as an alternative for producers who wish to guarantee an increasingly demanding market in terms of meat quality and safety. The institution made an articulated effort with different links in the swine production chain and the technical assistance and rural extension to spread the Family Swine Production System in 2018. The articulation took place

through the formalization of a partnership with Emater-RS, publication of the good practices of the production system and the remodeling of the demonstration unit.

With this, multiplier agents were trained in this type of production system in order to adopt it. Small producers of pigs and technical personnel from Emater-RS, Cooperativa Majestade and Cooperativa do Centro de Empreendedores Rurais de Concórdia (Coner) participated. These actions were supported by suppliers of farm management software

(Agriness), feed ingredients (Vitamix), traceability systems (Ceptis), MAPA and a retail company in the value-added food segment (Korin Agropecuária).

Technical agents and producers were trained in the implementation of this system in small producers linked to a cooperative partner, for the subsequent commercialization of safe pork without antimicrobials residues in differentiated products offered to retail stores with the possibility to use the brand "Embrapa Technology".



## Eggs and Good practices

# Booklet for commercial production

One of the differences of the Embrapa Swine and Poultry performance in technology transfer has been the support to innovation. The strategy is to support innovative companies and changes in public policy. For this, the use of a technological inventory of industrial property assets (IP) was used as tools; the qualification of technologies, products, processes and services (TPPS) involving several systems and methodologies of Embrapa; as well as the prospecting and contracting of partnerships. The

partnerships took place in several segments, ranging from the production of inputs and equipment, through the production of software, applications and TICs, to production systems and processes, production of vaccines and methods of diagnosis and genomics, diagnostic methods and collection network of microorganisms with CEDISA, as well as applied

genomics and a platform for genetic improvement in swine and poultry.



## Technology transfer

# ON HAND MANAGEMENT OF FARMS

## Cellular applications and software are proposals for innovation

Developing new technological tools to facilitate and improve the work of swine and poultry farmers has been a challenge and a drive for innovation of the Unit. Applications and software serve a variety of areas, from farm management to disease identification and environmental management.

In 2018, two of these applications have gained new versions and features. One is Custo Fácil, which helps integrated producers of broilers and pigs and technical assistance in the management of the farm. The novelty is the possibility of sending data to Embrapa for the construction of a database on the integrations, something unheard in Brazil. Custo Fácil 2.0, in addition to contribute to the generation of public statistics on production costs, profitability and cash

generation in the integrations, will allow users to access this database to compare their results. It has been listed as one of the 50 most popular free apps for smartphones with Android operating system available in the Google Play Store in the agriculture and livestock management category.

DiagSui - laboratory diagnosis in swine farming is



another application that has gained new functionalities. In version 2.0 guidelines were introduced on tissue sample collection for the main enteric diseases of nursery, growth and termination pigs, in addition to septicemic salmonellosis. The application is directed to Veterinarians from farms and companies working with swine health. The objective is to provide professionals with information that can be accessed when they are confronted with a clinical problem at the farm and needs to collect samples to be sent to the laboratory. The application can be accessed offline. Embrapa also has the ConforCalc, Energy-Calc and GranuCalc applications, as well as software such as Environmental Management SGAS, SIMAF and the EcoGranja Challenge.

### Technology Transfer Revenue - 2018

Technology Transfer - US\$ 41,515.07  
 Foundations of Research Support - US\$ 937,220.60  
 Contract Copórdia Swine and Poultry - US\$ 417,876.13  
**Total TT Contracts - US\$ 1,396,611.80**

### TT Actions - 2018

Courses ..... 22  
 Booklets..... 4  
 Technical Meetings..... 2  
 Lectures..... 116  
 Seminars.....10

## Open innovation

# Research & production interaction

Embrapa Swine and Poultry worked to stimulate and consolidate the new processes of innovation and management of its assets in 2018. One of the actions was to organize the technological and pre-technological inventory comprising 1996 to 2017. This allowed new opportunities such as the development of vaccines

in conjunction with the Ouro Fino Laboratory and new biologicals for bacterial control in a partnership with Rhea Biotec.

Other innovation actions include the creation of four brands, registration of two softwares and the application for a patent.

The Unit has acted in a constant interaction of the

research and the transfer of technology with the productive chain. As a result of this interaction, in 2018, confidentiality agreements, services, technical-financial cooperation and services of low complexity were signed. New business models in the TT process have been implemented or are under study.

## InovaPork

### Challenges of ideas for 2019

With the objective of fostering innovative impact on pig farming and attracting young innovators with ideas at any stage of maturity, collaborating to become business and solutions for the pork production chain, Embrapa Swine and Poultry will hold InovaPork in Ideas. The event is the first challenge of ideas for swine production, being considered an opportunity for agricultural research, which needs to accompany the technological movement that emerges in society.

## Agreement

### Goat Slaughter delivered

In May, the Minas Gerais Institute of Agriculture (IMA) officially validated the Modular Complex for Goat Slaughter in the State of Minas Gerais. With this approval, the mobile slaughterhouse developed by Embrapa and Engmaq is ready for operation. The goat complex was delivered at the end of 2017 to the company ARG, from Minas Gerais state. The model for poultry is also already finalizing phase by Engmaq and must follow for the regulations next to the MAPA, like the one for swine.

## Genetics Embrapa

### Market share in 2018



**Laying Hen 051**

**2.750 million**  
sold birds

**16.2% of the national market**  
of brown-egg laying hens



**MS115 Boar**

**584**  
sold boars

**6.1% of the national market**  
of terminal males

## 12 external events

The Unit participated of 8 fairs with technical and booth programming in 2018, as well as events organized in partnership and support. In each participation technologies and services were presented to the public, through publications, models, videos and technical presentations.

## 1,586 mentions in the press

Embrapa Swine and Poultry had 1,586 mentions in the press. These include appearances in newspapers, magazines, radio, websites and TV. On average, the Unit is cited more than four times a day in the media.

## 29,663 interactions

Embrapa Swine and Poultry made 202 posts in 2018, for a total of 29,663 interactions. The videos published in the unit profile had 15,974 views.

## 1,573 students

1,573 middle and high school students were attended by the Embrapa & Escola program during the year 2018. Visits take place in the Unit or in schools. The program takes place through lectures and events and counts on the voluntary participation of employees, including the characterization of the characters Fritz and Toni.

## 1,405 calls

The Citizen Assistance Service (SAC) had 1,405 calls in 2018, distributed in consultations by e-mail, telephone, letter and social media.

## Science field day

# FOR THE REDUCTION OF SOCIAL INEQUALITIES

## Stations explore the theme with research and actions

Embrapa Swine and Poultry was once again the place of the adventure of knowledge. The fourth edition of Science Field Day, oriented to students in the fifth and sixth year of elementary schools in Concordia and region, received in three days about 1,000 students and 80 teachers from 25 schools. The theme of the event, presented in a dynamic way in five seasons, was "Science for the reduction of inequalities".

The event will be held by Embrapa Swine and Poultry with the partnership of the Lambari Consortium, Rio Jacutinga and Contiguos Committee, Environmental Disclosure Center Itá - CDA Hydroelectric Power Plant and Co-Management Team of the Fritz Plaumann State Park (Ecopef). The event, this year, was supported by the National Union of Farmworkers Research and Development - Sinpaf (Local Section), Copérdia and Cedisla Laboratories.

### Knowledge stations

The Science in the Laboratory Station, under the responsibility of Embrapa, has shown alternatives to rainwater harvesting and treatment, focusing on laboratory techniques. In Science in Swine

and Poultry, students learned how research work has made it easier for producers to access good genetics at affordable prices.

In the stations of Science in the Environment the approach was divided into three themes. The Lambari Consortium team worked with a dynamic focused on Cooperation to combat inequalities. The CDA - Itá team showed an ecological trail as a space for diversity and Ecopef and the Rio

Jacutinga Committee, with students from the Psychology course at the University of the Constan - UnC, participated in the Dialogue for the reduction of inequality.



### Environment

## Forest symbolizes commitment

Another action that marked this edition of the event was the planting of seedlings in a place that will be the "Forest of Science Field Day". At the end of the event, the teams involved carried out the planting, symbolizing the four editions. Each year, the space will receive one more change. The place houses seedlings donated by CDA - Itá, of grápia, pitiá and imbuia trees.



## Organizational environment

# TV PROGRAM OF 80'S IS SHOW THEME

## Team shows talent and gives a show of joy in internal event

Music, presentations and games marked the VI Talent Show of Embrapa Swine and Poultry. The event took place in August and was part of the closing of the 42nd Week of Prevention of Accidents at Work - Sipat and 17th Week of Quality of Life - SQV. Held every two years, the Talent Show looks to integrate all employees, outsourcers and family through

cultural and artistic activity. In 2018, the theme was the program Viva a Noite, screened in the 1980s on the SBT channel, featuring Gugu Liberato. In the version of the Unit, the presentation was of Gugucas, with participation in the stage of the Paquitas and the group Domino, that formed the teams for the amusement of the afternoon. Besides the

guests, the program counted on the auxiliary "does everything" Azulão and the Gugulícia. There were around 20 presentations, among videos, jokes, dance, music and interpretation, directly showing the talent of about 40 employees. In the hall were still exposed photographs sent by employees.



## Quality of life

# Mindfulness experience encouraged

Investing in improvements and actions of quality of life and organizational climate is a constant in Embrapa Swine and Poultry. In 2018, the focus was on the practice of Mindfulness Meditation, which cultivates the state of (re) knowledge and curiosity based on mindfulness. The first action was a lecture with a specialist to present the

theme to all employees and collaborators. Following that, a team of employees participated in a training, of six hours, to know and deepen about this experience. At the initiative of employees and with the support of the management, a group of study and practice of Mindfulness in the Unit was formed. Practitioners meet once

a week during lunch breaks. The purpose of the meetings is to allow those interested in the practice of mindfulness to have a space and time that allows the learning and cultivation of meditation. The technique presents numerous benefits to its practitioners.

## Campaigns

### Quality of life is the focus

To act in the well-being of employees, Embrapa Swine and Poultry promotes diverse campaigns, health and quality of life. The actions of the Pink October and Blue November took place in a joint initiative, with a health walk. The event was conducted by a physical education professional who talked to everyone about the importance of physical activity focused on disease prevention. Sipat of 2018 addressed topics such as first aid; mental health - anxiety and stress; technological dependence; and prevention of disabilities by stimulating a full life.



## Training

### Communication and engagement

Interpersonal relationship is another concern of the management team of Embrapa Swine and Poultry. And a workshop on Communication, Engagement, Diversity and Ethics was held for all employees in a partnership with Senac. The training covered content as non-verbal language; different channels of communication, language patterns; diversity: the path of innovation in relationships and results; engagement: generating commitment and respect; and ethics in relationships.

#### 2018 Training

87 events

499 participations

4,735 hours of training

US\$ 29,780.32 of investment

# Investment US\$ 30 THOUSAND IN IMPROVEMENTS

## New works in the Suruvi Experimental Station

The year 2018 was another one in which Embrapa Swine and Poultry had to adapt to the economic moment of the country. The Unit was able to apply US\$ 30,237.43 in remodeling work and equipment, a value 1,427% lower than that invested in 2017 (US\$ 461,977.63).

In spite of this, it was possible to make an additive for the work of the Suruvi Experimental Station (in the area of 34.5 hectares the Bird Genetic Conservation Center operates, which reduces sanitary risks and widens the experimental area in the current Unit), in the amount of US\$ 2,310.12, and the reform of the chemical storage room and the appropriateness of the library, which transferred part of its area to reallocate the central archive of the research center, an investment of US\$ 8,516.40.

Among the equipment purchased are shelves, cabinets and an air conditioner to adjust the room to where

the central file of the Unit will be reallocated, in the amount of US\$ 19,410.91.

Despite the contingency of resources, the management of Embrapa Swine and Poultry started a series of efforts on the Genetic Improvement of Swine. The first step involved farrowing facilities and, subsequently, weaneries. The objective is to adapt the farms, using the current structures, but with an eye on the expansion of the production capacity, facilitating the daily work. In addition to improvements in the floor, to facilitate hygiene and handling, were also made changes in the feeders, automating the system and facilitating the workforce.

Another structure that received improvements was the Laboratory of Physical-Chemical Analyzes, which also adapted and expanded research rooms.

2018 STRUCTURE INVESTMENTS	US\$
Reform of room for the deposit of chemical products and suitability of the library	8,516.40
Additive work of the Suruvi Experimental Station	2,310.12
<b>TOTAL</b>	<b>10,826.52</b>

2018 EQUIPMENTS INVESTMENTS	US\$
Acquisition of shelves, cabinets and air conditioning for adjustment of the room to the unit's central file	19,410.91
<b>TOTAL</b>	<b>19,410.91</b>

## International

# SEARCHING FOR NEW PARTNERSHIPS

## Genetics and food production are the lines of interest

Embrapa maintains its policy of encouraging international cooperation for studies, prospecting, events and partnerships. Every year, it receives researchers, representatives of government bodies and companies, teachers and students from abroad.

In March, Dr. Sara Lopes, PhD student at the University of Cambridge (England), was in attendance for an agenda of seminars and training with the project team on "Genetic and antigenic diversity of influenza A viruses and efficacy of diagnostic methods and nanotechnology vaccine for the control of influenza in swine". The agenda was also linked to USDA's work with the Unit, within the scope of the OFFLU (OIE).

In May, researchers were visited by Cargill's additive and

researcher in the Southern Cone, Alessandro Belucio, and Cargill's research coordinator, Daniel Miranda. The agenda covered the presentation on lines of interest to the Unit.

In August there were two international visits. The first was a mission of Alic (Agriculture Livestock Industries Corp.), an agency of the Ministry of Agriculture of Japan. The entourage was interested in poultry farming and discussed animal welfare and organic products, with emphasis on 051 Laying Hen.

The second visit was by researchers from the United States, who presented a seminar on the production of corn and soybeans in the world. The retinue consisted of researcher Michael Jewison (USDA), analyst Yoonhee Mackee (FAS / USDA),

agriculture adida to the US embassy in Brazil, Katherine Woody; and Alfredo Navarro de Andrade, of the US Grains Council.

In December, researchers received a delegation from Africa, organized and accompanied by consultants and representatives from Campo África. The purpose of the delegation was to explore partnerships, especially agriculture, for projects in Zambia. This project is a commitment of the African Development Bank to the "TAAT - Technology for African Agriculture Transformation" program. The idea is to seek productive links to improve the supply of food, especially protein, in countries that have the potential to produce raw materials such as grains.

## Articulation

# Actions in six countries



The International Articulation Center of Embrapa Swine and Poultry has a working agenda with various cooperation actions. Among the main actions of scientific cooperation in 2018, we highlight the submission of the proposal "Use of bacteriophage-based formulation for enhanced oral

therapy against Salmonella in poultry and swine". The format was a consortium with the University of Saskatchewan (Canada), with financial management of Funarbe. The resources requested were approximately US\$ 1,1 million for a 33-month project.

The research center also worked in New Zealand, the United States, Italy, Colombia, Argentina and South Korea in actions structured to meet demands of cooperation of the public sector, in isolation or in association with other foreign governments and / or international organizations; specific actions of cooperation

in private activities, whether in the accomplishment of international technological business or in external credit operations (funding) for the strengthening of the research infrastructure and training of the Company's human resources; and in the public-private articulation, representing the interests of public cooperation (Brazilian government) in private execution arrangements. Several papers were presented at world congresses, services and training, participation in meetings and workshops and lectures.

## World

# Costs fall in swine production

The results of the InterPIG 2018 meeting on global swine production costs in 17 countries showed that half of them reported declines in euro, including Mato Grosso and Santa Catarina in Brazil, and the United States, both world leaders in production costs. The reduction in the price of maize in Brazil brought improved costs, but did not fully offset the increases recorded in the previous year. Santa Catarina still has one of the most expensive rations among the network countries, below only Ireland. In 2018, the meeting was held in Reggio Emilia, Italy. Brazil is represented by Embrapa Swine and Poultry since 2008.

## NAI

# Research with North Americans

Embrapa Pigs and Birds has a researcher, Jalusa Kich, among the four Brazilians from the 89 experts from all countries selected in 2018 for Jemra, an international group administered by the Food and Agriculture Organization of the United Nations (FAO) and the Organization (WHO), which provides scientific advice on microbiological risks, including expert advice on risk management options to improve food safety. Among the actions during the year, Jalusa participated in the 6th Session of the Codex Alimentarius Task Force on Antimicrobial Resistance in Busan (South Korea) and the Codex Alimentarius Committee for Latin America and the Caribbean (CCLAC). Standards and elaborated documents were discussed by representatives (officials and researchers) from the countries involved and defined future actions.

**ALESC****Researcher is honored**

The Legislative Assembly of Santa Catarina (Alesc) held a special session on October 15 in honor of the 50th anniversary of the regulation of the veterinary and zootechnical professions. The solemnity took place in the Plenary Deputy Osni Régis and brought together political leaders, representatives of public bodies and class entities. On the occasion, 12 professionals were honored who contributed to the development of the activities, as well as four representative institutions of the two categories. The researcher Helenice Mazzuco was one of the honorees of the night, in the category Zootecnista.

**International Welfare receives award**


The researcher Osmar Antonio Dalla Costa received on July 18 the Temple Grandin Animal Welfare Medal in the Pig Researcher category. The distinction is offered by researcher and professor at Colorado State University, USA, Mary Temple Grandin.

The American researcher is one of the world's leading animal welfare authorities. The homage ceremony took place during the Temple Grandin Animal Welfare Workshop in São Paulo-SP.

**Recognition****EMBRAPA HONORS PERSONALITIES****Tribute was for swine and poultry industry professionals**

A mention that highlights people whose contributions were decisive for the development of swine and domestic poultry. This is the tribute to the Distinguished Personality of Poultry and Pig Industry, which Embrapa Pigs and Aves has been doing since 1997. In this year of 2018, the honorees were Professor Paulo Lourenço da Silva, linked to the Federal University of Uberlândia, in the

area of Poultry Industry, and Dr. Ildara Nunes Vargas, advisor of the Union of Swine Products Industries (SIPS) of RS, in swine farming. In the event, for health reasons, was represented by Dr. Rogério Kerber, Fundesa-RS.

The employees of the Unit were referred to the Internal Technical Committee (CTI), taking into account the importance of individuals whose contributions were decisive for

the development of swine and domestic poultry.

The homage was delivered at the 43 year anniversary of Embrapa Swine and Poultry, held on October 30.

At the same time, the Honors for Time of Service of employees who completed 20, 25, 30, 35 and 40 years of employment service were recognized.



Use a QRCode reader to view this code and know the timeline of the honorees.



Recognitions were made during birthday ceremony

**Research****Projects are recognized**

The work "Modernization of Sanitary Inspection in pig slaughterhouse: risk-based inspection", conducted by the researcher Jalusa Deon Kich and his team, received the distinction of Best scientific work in the oral presentation modality at the Enepi 2018 - National Meeting of Veterinary Epidemiology. The event took place from August 1 to 3 in Porto Alegre, RS, with an organization from the Federal University of Rio Grande do Sul and Epilab. The main objective of Enepi is to bring together stakeholders in Veterinary Epidemiology,

providing a space for the discussion of the area and the integration between professionals working in animal health and public health.

The second edition of the Aviculture Talents Award RS, held in Gramado-RS, on August 17, highlighted two projects of the Unit. The award is granted by the Association of Poultry Industry (ASGAV) and the Union of Poultry Products Industries in the State of RS (Sipargas) with the objective of recognizing the highlights of the poultry sector through the work of companies, entrepreneurs, producers,

technicians and researchers conducted between June 2016 and December 2017. Researcher Helenice Mazzuco received, on behalf of the project team "Development of Nanostructured Covering in Commercial Eggs - Nanovo", the 1st prize in the category of Innovation and Poultry Research. The project "Reutilization of aviary bed: Evaluation of Feasibility and Infectivity of Pathogens Relevant to Poultry Sanitary Defense", led by researcher Clarissa Vaz, was in 3rd place, also in the category of Innovation and Poultry Research.

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