

Application of Molecular Methods to Increase Productivity and Improve Efficiency of the Philippine Swine Industry

Duration: 3 years (May 2013 to April 2016)



- Proj 1. Development and application of molecular markers in selecting genes for prolificacy and other positive traits of swine/JRV Herrera/PCC
- Proj 2. Development and application of molecular markers in selecting disease resistance genes and screening of genetic defects of swine/CN Mingala/PCC

Cooperating Agencies: PCAARRD, PCC, BAI, ASBAP



General Objective

The R&D program implemented thru private-public partnership aspires to **increase productivity and improve production efficiency of the Philippine swine industry** through the **application of gene marker technology** in breeding and selection.

Specific objectives

Develop and apply **genetic markers associated to prolificacy and other positive production traits.**

Develop and apply **genetic markers for selection of disease resistance and screening of genetic defects.**

In partnership with ASBAP, **establish a private-sector operated swine genomics service laboratory.**

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S&T Interventions and Deliverables

Stage in the Supply Chain	Industry Problem	S&T Gaps	S&T Intervention/s	Deliverables	Potential Impact
a. Breeding herd production and management	<p>Low productivity of sows</p> <p>Low litter size (LSBA= 9.6)</p> <p>Lack of native pig genetic resource conservation</p> <p>No breed registry established for commercial purebreds</p>	<p>Technology to increase litter size</p> <p>Mgt & decision support system</p> <p>Breeding true-to-type native pigs</p> <p>Systems & protocol to facilitate breed registry</p>	<p>Gene marker technology for (litter size, fast growth & disease resistance)</p> <p>Computer assisted remote expert (CARE) system</p> <p>Sustainable native pig breed development</p> <p>Establishment of breed registry for swine purebreds</p>	<p>Increase LSBA to 10.5 and ADG to 600g thru efficient selection & breeding (2016)</p> <p>CARE system for improved mgt & decision in farm (2015)</p> <p>50% phenotypic uniformity (2016)</p> <p>4 signature Phil. Native pig breeds (2019)</p> <p>Breed registry system established (2016)</p>	<p>Genetic improvement to increase efficiency and productivity from 1.6 MT to 2.1MT/sow/year.</p> <p>Increase efficiency of production</p> <p>Increase productivity & efficiency of production thru breeder pigs assured with high performance and consistent product quality</p>

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Target genes....

Meat Quality	Reproduction	Growth Rate
<ul style="list-style-type: none"> • CRC (calcium-release-channel) • CAST (calpastatin gene related to leanness/less fat and moisture in meat) • hfABp (Heart-type fatty acid binding protein, intramuscular fat) • LEPR (leptin receptor, fat deposition) 	<ul style="list-style-type: none"> • ESR (estrogen receptor litter size) • PRLR (prolactin receptor, litter size) • RBP (Retinol-binding protein, litter size, sperm quality) • MYOG (Myogenin, birth weight) 	<ul style="list-style-type: none"> • MYOG (myogenin, growth rate) • MCAR (Murine coxsackievirus and Adenovirus receptor, related to loin meat quality and intramuscular fat)

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Genes Related to Genetic Defects and Disease Resistance

Genetic Defects

- RN Gene (Rendement Napole)
– Acid Meat
- BAX Gene (BLC2-assoc. X Protein) – Scrotal Hernia
- Hal Gene (Halothane) - PSS

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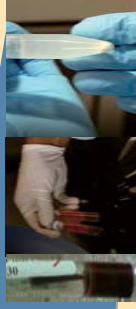
Disease Resistance

- FUT1 (α 1, 2 – fucosyltransferase)- E. coli
- MX1 Gene (Myxovirus resistance protein) - influenza BPI (Bactericidal permeability increasing protein) – resistance to *Salmonella*
- SLA Gene (Swine Leukocyte Antigen)- post weaning diarrhea
- NRAMP 1 (Natural Resistance Association Macrophage Protein)- intracellular pathogen

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Blood Sampling



DNA Extraction



PCR Amplification

Methodology



Gel Electrophoresis



UV Transillumination

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Highlights of Accomplishments

Activities	Output					
	Gene	Associated with	No. of samples	Genotype (%)		
Genetic analysis using optimized primers	ESR PRLR LIF RBP4	litter size litter size Litter size litter size and sperm quality	599 505 462 206	AA	AB	BB
				33.0	67.0	0.0
				12.0	40.0	48.8
				30.0	42.0	28.0
Genetic Defects	MYOG RYR1 RN	ADG and muscle mass PSS Acid meat	593 827 200	AA	AB	BB
				98.0	2.0	0.0
				92.6	4.7	2.7
Disease Resistance Genes	Bax BPI	Scrotal hernia Salmonellosis	200 181	AA	AB	BB
				67.5	21.5	11
				97.2	2.8	0.0

⁷ Note: percentages in blue fonts are of desired genotypes

Highlights of Accomplishments

Activity	Output
Training of staff	4 staff were trained on new techniques of genetic analysis and benchmarking on the application of molecular selection by private swine breeders on 23-29 March 2014 at Taiwan Livestock Research Institute.



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Highlights of Accomplishments

Activities/Target	Output
Promotion and advocacy of genomic technology to swine breeders	<ul style="list-style-type: none"> ✓ Promotion of technology and presentation of initial project outputs during industry group meetings (ie., ASBAP Midyear meeting, VisMin Hog Producers Group, Swine Forum, National Hog Federation meeting, ProPork meeting, PSIRDFI quarterly meeting, Infarmco BOD meeting) ✓ Promotion of technology during farm inspection for accreditation

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The direction is that genetic screening will be done on:

- ✓ All imported animals
- ✓ Animals that will undergo performance testing
- ✓ Animals included in the breed registry

Thank You!

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