QUESTIONS & ANSWERS

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BROWN RICE

Department of Agriculture
Philippine Rice Research Institute

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Brown rice: A healthy food

Before the introduction of commercial milling machines in the early 1950s, brown rice had been the main staple in Filipino households. It is the rice where only the hull is removed from the grain. Its bran remains, thus making it brown. Traditionally, it is prepared by hand-pounding the dried *palay* with a mortar and pestle. Nowadays, only certain communities in the Cordilleras and elsewhere still prepare their rice this way. In other areas, sophisticated rice milling facilities have almost wiped out the tradition of pounding, just as today's glistening white rice is nearly obliterating brown rice.

The 2013 National Year of Rice advocacy that has evolved into the Be RICEponsible campaign, both under the Department of Agriculture, are resuscitating brown rice consumption. Brown rice is being promoted nationwide because of three things – it can add value to rice that could boost farmers' income; simply milling brown rice instead of white can increase the country's rice produce by 10%; and it can help ease our malnutrition problems because of its additional nutrients.

This publication wants to better inform everyone about the benefits of eating brown rice to their bodies, to the farmers, to the environment, and to the country. It aims to teach millers and entrepreneurs how to produce brown rice and make good money out of it while making it affordable for all Filipinos. This is because we want to see more and more Filipinos buying and eating brown rice as though it were white rice.

THINGS YOU SHOULD KNOW ABOUT BROWN RICE

On consumption

1. What is brown rice?

The so-called brown rice is actually not a variety. It is just your paddy or rough rice (*palay*) without the outer covering called hull/husk. It is your white rice that did not go through polishing that is why it still has the bran (*darak*) and germ, making it called unpolished rice also. The bran is responsible for its light brown or tan color, nutty taste, and chewy texture; it also contains the vitamins and minerals. So since brown rice is just your unpolished rice, any kind of rice, whether it be inbred or hybrid, red, purple, or black, can be milled into "brown rice". There is, however, a real variety that is brown even when you polish it. But this is not what we commonly see in the market. And it is not our topic here.

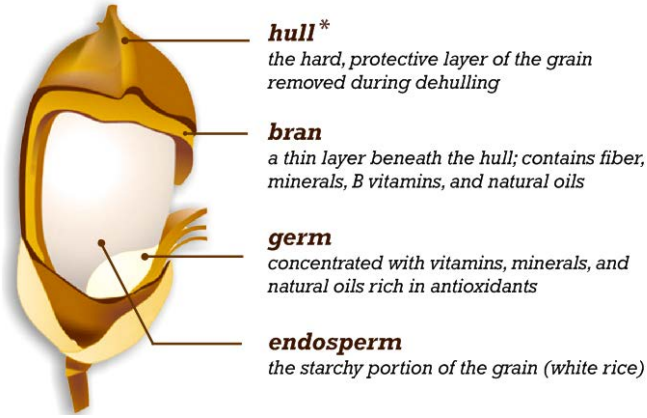

Figure 1. The structure of the rice grain.

* To produce white rice, the hull and the bran are removed; to produce brown (unpolished) rice, only the hull is taken out.

Nutrient	Amount (per 100g at 14% moisture)	
	Brown Rice	White Rice
Energy Content (kcal)	363 - 385	349-373
Crude Protein (g)	7.1-8.3	5.8-7.1
Crude Fat (g)	1.6-2.8	0.3-0.6
Crude Ash (g)	1.0-1.5	0.3-0.8
Total Dietary Fiber (g)	2.9-4.5	0.7-2.7
Crude Fiber (g)	0.6-1.0	0.2-0.5
Available Carbohydrates (g)	73-87	77-89
Sugars (g)	0.8, 1.4	0.1-0.5
Phytic Acid (g)	0.4-0.9	0.1-0.2
Phosphorus (g)	0.17-0.43	0.08-0.15
Iron (mg)	0.2-5.2	0.2-2.8
Zinc (mg)	0.6-2.8	0.6-2.3
Thiamin (mg)	0.3-0.6	0.02-0.17
Riboflavin (mg)	0.04-0.14	0.02-0.06
Niacin (mg)	3.5-6.2	1.3-2.4
Folate (µg)	16-20	6-9
Vitamin E, α-tocopherol (mg)	0.6-2.5	<0.10-0.30

Source: Rice Chemistry and Food Science Division, PhilRice (Adapted from Juliano, 2010)

2. What are the benefits of eating brown rice?

Brown or unpolished rice is good for your health. It is nutritionally superior to white rice in terms of fiber, protein, good fats, vitamins B1, B2, B3, B9, and E, minerals, and antioxidants.

Numerous clinical studies say that regular consumption of whole-grain cereals, including brown or whole rice, may help reduce the risks of cancer, diabetes, and cardiovascular diseases. It also reduces cholesterol; serves as effective laxative for regular bowel movements; decreases urinary calcium that prevents kidney stones; and helps diminish the temptation of over-eating.

Brown rice is also environment-friendly because it is energy-efficient. This is because when producing brown rice, the polishing and whitening steps are eliminated thereby saving 50-65% on fuel.

It is good for the country. Eating brown rice can help achieve rice self-sufficiency since it results in 10% higher milling recovery. For instance, from 10kg of paddy rice, we normally get just around 6.5kg polished white rice. However, when milled into brown or unpolished rice, this would result in 7.5kg.

It is good for the farmers. Brown rice production puts more value to their produce through its heavier weight, higher price. Its additional nutrients could also give their product an edge over cheap imported rice.

3. How do you cook brown rice?

Brown or unpolished rice is normally soaked for 30 minutes in 1:2 ratio (1 cup rice to 2 cups water) if soft and fluffy texture is desired. Soaking reduces the cooking time while not soaking it would give you a nuttier taste.

To fully enjoy brown rice, cook it according to your consistency preference. You may experiment with the following:

- Soaking - Not soaked; or soaked for around 30 minutes.
- Amount of water - 1.5 to 2 times the brown rice volume
- Cooking duration and rate - slow cooking and low heat

You can also acquire brown rice taste gradually by blending it with white rice in decreasing proportions (i.e., BR:WR = 50:50; 75:25; 100:0).

4. How do you store cooked brown rice?

Place the brown or unpolished rice in a covered container and store in the refrigerator for up to 6 days. Storing brown or unpolished rice in the freezer in an airtight container or heavy-duty freezer bag will make it last for 6 months. It is most practical to use the leftover cooked brown rice in stir-fry, fried rice, porridge, champorado, and other recipes.

5. What is the shelf life of uncooked brown rice?

Clean white rice can be stored for an indefinite period of time. However, brown rice is best consumed as soon as possible since it has a best-before date because of its oil-rich bran that turns rancid over time. When stored in an airtight container at room temperature, brown rice can last for around 3 to 6 months depending on the packaging or container. Storing it in a refrigerator, however, will make it last for up to 12 months.

6. Where can you buy brown (unpolished) rice?

You can buy brown rice from major supermarkets such as, but not limited to, the following:

- Bios Dynamis Outlet
- Citimart
- Coconut House
- CVC

- Gaisano Malls
- Hi-Top
- Jojiberry
- Metro Gaisano
- NCCC Malls
- Pioneer Centre
- Puregold
- Robinsons Supermarket
- Savemore

* For brown rice producers and wholesalers, see annex.

7. Why is brown rice more expensive than white rice?

Despite the lower energy cost in producing brown or unpolished rice and its higher milling recovery, it is priced higher than white rice for a number of reasons.

One, there are recommended varieties for brown or unpolished rice production – the soft rice varieties, which are usually premium ones to ensure palatability. These varieties command a higher selling price in the market even when produced as white or polished rice.

Two, brown rice has shorter shelf life - only about 3 to 6 months. This would cause no problem if there is high market demand. But because there is low demand as of yet, producers pull out unsold products from grocery shelves that obviously translate into added cost and losses. Thus, they put a price on these matters that add up to the production cost of brown rice. Sometimes, additional cost also comes from the special packaging to prolong its shelf life.

Three, because of the low demand for brown rice, large-scale rice millers, who are readily capable of producing brown rice cost-effectively, are unwilling to produce brown rice yet. Smaller rice millers without color sorter may put additional costs as they would need to sort the dehulled (unpolished) and paddy rice manually.

Finally, present producers are putting a price for the health benefits of brown (unpolished) rice. They know that health-conscious people are willing to pay more for healthy food.

All these factors contributing to the high price of brown rice would be solved by higher demand. A higher demand would solve shelf-life issues and would encourage more producers, which would result in better competition and lead to a more affordable brown rice price.

On production

8. What rice varieties are best for brown rice production?

Best-tasting brown (unpolished) rice can be produced from varieties that have low to intermediate amylose content to ensure that the rice is soft and appetizing. These include premium rice varieties such as Jasmine, Burdagol, Japonica, and upland heirloom rice varieties.

Rice varieties with low amylose content

Irrigated lowland (inbred)

MS6
MS8
NSIC Rc128 (Mabango 1)
NSIC Rc130 (Tubigan 1)
NSIC Rc160 (Tubigan 14)
NSIC Rc170 (MS 11/Tropical Japonica)
NSIC Rc172 (MS 13/High-Iron Rice)
NSIC 2015 Rc396 (Tubigan 33)
NSIC 2015 Rc400 (Tubigan 35)
NSIC 2016 Rc436 (Tubigan 37)

Irrigated lowland (special rice)

NSIC Rc218 SR (Mabango 3)
NSIC Rc220 SR (Japonica 1)
NSIC 2011 Rc242 SR (Japonica 2)
NSIC 2012 Rc304 SR (Japonica 3)

Irrigated lowland (hybrid)

NSIC Rc176H (Mestiso 13)
NSIC Rc178H (Mestiso 14)
NSIC Rc196H (mestizo 16)
NSIC Rc2018H (Mestiso 22)
NSIC Rc210H (Mestiso 23)
NSIC 2010 Rc234H (Mestiso 27)
NSIC 2011 Rc246H (Mestiso 30)
NSIC 2011 Rc260H (Mestiso 37)
NSIC 2011 Rc262H (Mestiso 38)
NSIC 2011 Rc266H (Mestiso 40)
NSIC 2011 Rc268H (Mestiso 41)
NSIC 2013 Rc320H (Mestiso 49)
NSIC 2015 Rc404H (Mestiso 66)
NSIC 2016 Rc456H (Mestiso 78)

Rainfed lowland (dry-seeded)

NSIC 2011 Rc274 (Sahod Ulan 3)
NSIC 2011 Rc288 (Sahod Ulan 10)
NSIC 2016 Rc480 (GSR 8)

Saline

NSIC Rc108 (ANAHAWAN)
NSIC Rc184 (Salinas 2)
NSIC Rc188 (Salinas 4)
NSIC Rc190 (Salinas 5)
NSIC 2011 Rc290 (Salinas 6)
NSIC 2011 Rc292 (Salinas 7)
NSIC 2016 Rc468 (Salinas 24)

Cool elevated

NSIC c104 (BALILI)

Rice varieties with intermediate amylose content

Irrigated lowland (inbred)

IR 64
PSB Rc28 (AGNO)
NSIC 2012 Rc298 (Tubigan 23)
NSIC 2012 Rc300 (Tubigan 24)
NSIC 2014 Rc352 (Tubigan 27)
NSIC 2014 Rc356 (Tubigan 29)
NSIC 2014 Rc358 (Tubigan 30)
NSIC 2014 Rc360 (Tubigan 31)
NSIC 2015 Rc394 (Tubigan 32)

NSIC 2015 Rc398 (Tubigan 34)
NSIC 2015 Rc402 (Tubigan 36)
NSIC 2016 Rc438 (Tubigan 38)
NSIC 2016 Rc440 (Tubigan 39)
NSIC 2016 Rc442 (Tubigan 40)

Irrigated lowland (special rice)
NSIC 2015 Rc414SR (Japonica 4)
NSIC 2016 Rc460 (Zinc Rice 1)

Irrigated lowland (hybrid)
NSIC 2011 Rc256H (Mestiso 35)
NSIC 2011 Rc264H (Mestiso 39)
NSIC 2012 Rc306H (Mestiso 43)
NSIC 2013 Rc310H (Mestiso 44)
NSIC 2013 Rc312H (Mestiso 45)
NSIC 2013 Rc314H (Mestiso 46)
NSIC 2013 Rc322H (Mestiso 50)
NSIC 2013 Rc350H (Mestiso 51)
NSIC 2014 Rc362H (Mestiso 52)
NSIC 2014 Rc368H (Mestiso 55)
NSIC 2014 Rc378H (Mestiso 60)
NSIC 2014 Rc380H (Mestiso 61)
NSIC 2014 Rc382H (Mestiso 62)
NSIC 2014 Rc384H (Mestiso 63)
NSIC 2015 Rc406H (Mestiso 67)
NSIC 2015 Rc408H (Mestiso 68)
NSIC 2015 Rc410H (Mestiso 69)
NSIC 2015 Rc412H (Mestiso 70)
NSIC 2016 Rc448H (Mestiso 74)
NSIC 2016 Rc452H (Mestiso 76)
NSIC 2016 Rc458H (Mestiso 79)

Rainfed lowland (dry-seeded)
NSIC 2011 Rc278 (Sahod Ulan 5)
NSIC 2015 Rc416 (Sahod Ulan 13)
NSIC 2015 Rc422 (Sahod Ulan 16)
NSIC 2015 Rc426 (Sahod Ulan 18)
NSIC 2015 Rc428 (Sahod Ulan 19)
NSIC 2015 Rc430 (Sahod Ulan 20)
NSIC 2016 Rc434 (Sahod Ulan 21)
NSIC 2016 Rc476 (Sahod Ulan 24)
NSIC 2016 Rc478 (Sahod Ulan 25)

Upland
NSIC 2014 Rc25 (Katihan 2)
NSIC 2014 Rc27 (Katihan 3)
NSIC 2014 Rc29 (Katihan 4)

Saline
NSIC 2013 Rc324 (Salinas 10)
NSIC 2014 Rc392 (Salinas 20)
NSIC 2016 Rc462 (Salinas 21)
NSIC 2016 Rc464 (Salinas 22)
NSIC 2016 Rc466 (Salinas 23)

Aside from the variety, properly drying the paddy for brown rice production would guarantee good taste.

9. How is brown rice produced?

Brown (unpolished) rice is produced through the process called dehulling, where only the hull or husk from the rough or paddy rice is removed (see Figure 2).

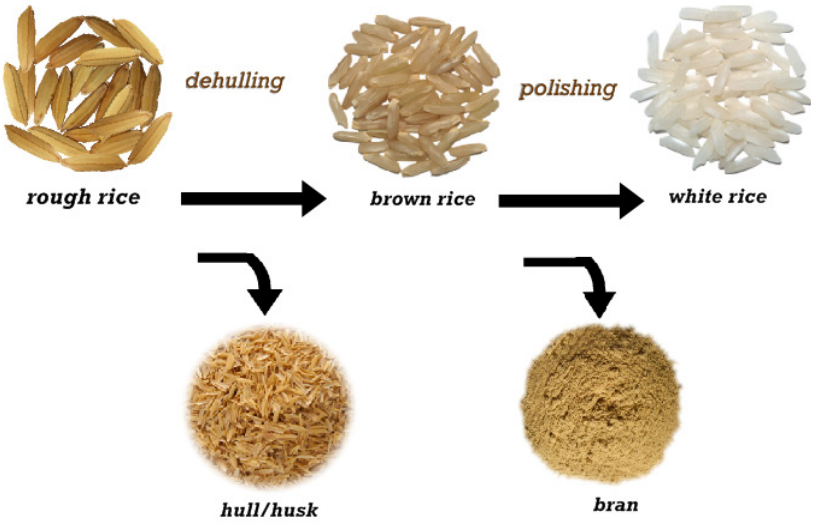

Figure 2. The process of producing brown (unpolished) rice.

Dehulling can be done by hand or machine. By hand, rough rice is grinded between two slabs of stones, or pounded using the mortar and pestle. The husk is then separated from the brown rice grains by winnowing. By machine, the brown rice mill or single/multiple-pass milling machines are used.

10. Can any rice mill produce brown rice?

Technically, yes, but with modifications.

For single-pass or two-staged mills, install a simple diversion chute between the rubber roll and the whitener to prevent the dehulled/unpolished grains from proceeding to the polishing section. Additional paddy separators that separate unhulled grains from the brown or unpolished rice would also help.

The unhulled grains can be collected or diverted back to the dehuller either manually or mechanically through a bucket elevator. The resulting brown rice can then be collected in the separator for packaging. Note, however, that this modified single-pass milling machine cannot be used to simultaneously produce brown and white rices.

For multi-staged or multi-pass mills, the milling process involves pre-cleaning, removing the husk (dehulling), paddy and brown or unpolished rice separation, series of whitening or polishing (removing the bran layer), separating the broken from the whole grains, and bagging. No modifications are needed since the dehuller and paddy separator that brown rice milling requires are already in place. To produce brown rice, the whitening and polishing components must be simply turned off.

Made-to-order brown rice mills are also available. A compact impeller huller for brown rice production has also been developed at PHilMech.

11. How is brown (unpolished) rice graded?

Just as with white rice, grading is based on National Food Authority (NFA) standards.

GRADE	(% BY WEIGHT) HEAD RICE, MIN.	(% BY WEIGHT) BROKENS INCLUDING BREWERS, MAX.
Premium	95	5
Grade No. 1	90	10
Grade No. 2	85	15
Grade No. 3	75	25
Grade No. 4	65	35
Grade No. 5	55	45

Table 2. NFA grading standards for white rice.
Source: AO-2013-04-003, NFA

12. How should brown (unpolished) rice be packaged?

Brown rice must be packaged in a sealed plastic bag to ensure that the aroma is preserved. It should be stored in a cool dry place.

To further prolong the shelf life, store the package in the coldest compartment of the refrigerator, but not in the freezer, to slow down the action of free fatty acids that cause rancidity after some time.

13. How do you store brown (unpolished) rice in rice mills?

Store it in sealed bags or containers under ideal storage conditions. It must be kept in a clean, cool, and dry place that is free of contaminants to maintain its quality.

14. Why is brown rice production a good business?

Income from brown (unpolished) rice production is bigger because it has lower energy requirement but with higher milling recovery and price than white rice. At equal prices, brown rice will still earn a higher profit than white rice as shown in the following:

PARTICULARS	WHITE RICE	BROWN RICE
Cost		
Palay (50kg @ P17/kg)	P850.00	P850.00
Energy cost (in milling)	P20.00	P10.00
Packaging	P20.00	P20.00
Labor (milling and packaging)	P10.00	P10.00
Storing	P10.00	P10.00
Other costs (admin, selling, etc.)	P50.00	P50.00
Total Cost	P960.00	P950.00
Value/ Sales		
Milling recovery	65%	75%
Volume of Rice (in kg)	32.50	37.50
Equal price (P/kg)	P40.00	P40.00
Total Value @ equal price of P40/kg	P1,300.00	P1,500.00
Prevailing Price (P/kg)	P40.00	P50.00
Total Value @ prevailing price	P1,300.00	P1,875.00
Income		
@ Equal price	P340.00	P550.00
@ Prevailing price	P340.00	P925.00

Note: Energy savings for brown rice is computed at 50%.

ANNEX: BROWN RICE PRODUCERS AND WHOLESALERS

Metro Manila

Bios Dynamis (Organic)
Matino cor. Malumanay Sts., Sikatuna Village, Quezon City

Department of Agriculture Agribusiness Showroom
Elliptical Road, Quezon City
(02) 928-8741 loc. 2173-2175
(02) 929-1718
agri.adc@gmail.com

Global Organic & Wellness Corporation (GLOWCORP)
13 A Judge Jimenez St., Kristong Hari, Quezon City
glowcorp@yahoo.com
(02) 414-4252

Got Heart Shop
#69 Esteban Abada St., Katipunan, Quezon City
(02) 577-9138
shop@gotheartfoundation.org

RR Trade (Organic)
PRRM Building, 56 Mother Ignacia Ave., Quezon City
(02) 372-4991 loc. 55;(02) 414-7826

Cordillera Administrative Region

Tierra Madre Organica
102 Abanao St., Baguio City
Contact Person: Maria Romero
0932-739-2561; 0906-371-3111
tierramadreorganica@gmail.com

Region I

Pangasinan Rice Processing Complex
Tebag East, Sta. Barbara, Pangasinan
(075) 529-1393
pangasinanrpc@yahoo.com
Contact Person: Mac Jesson V. Tucay
0915-987-5360;0929-749-4052
jes.mjt@yahoo.com

Region III

MN Aquino Palay Trading
Carillo Subdivision,
Brgy. Mangino, Gapan City

Oliver Ricemill (bulk orders only)
Bacal 2, Talavera, Nueva Ecija
Telefax no. (044) 456-0508

Philippine Rice Research Institute
Business Development Division
Maligaya, Science City of Muñoz, Nueva Ecija
(044) 456-0258 loc. 601
bdd@philrice.gov.ph

Region IV-B

Farmers Bigasan
Mabuhay Multi-Purpose Cooperative
National Highway, Brgy. Sta. Monica (beside MRM Construction Supply),
Puerto Prinsesa City
Contact Person: Felino Tumalac
0939-915-4669; 0917-884-2204
felinotumalac@yahoo.com
mabuhaymultipurposecooperative@yahoo.com

Liwanag Rice
Llanzanas Bldg., National Highway, San Pedro,
Puerto Prinsesa City
Contact Person: Ronel M. David
0917-852-5542

Region V

Pecuaria (Organic Only)
Contact Person: Mr. Miller Bicaldo
Bula, Camarines Sur
0917-552-5340
miller.bicaldo@pecuariacoop.com/
miller_bicaldo@yahoo.com

"Cheetah Rice"
E. G. Lupenario Rice Mill
Del Pilar, Bulan, Sorsogon
Contact Person: Bernardo Lupenario
0949-371-3007

Region VI

Iloilo Rice Processing Complex
Amamaros, Pototan, Iloilo
(033) 529-8780
0916-636-2117/0948-350-6300
Contact Person: Jo Melocoton
0917-342-5779;0907-665-9637

PhilRice Negros
Cansilayan, Murcia
6129 Negros Occidental
0928-520-4585

Region VII

Bohol RPC Outlet Store
Groundfloor, Marbella Hostel
Gallarez St., Tagbilaran City
0948-879-3817

Bohol Rice Processing Complex
Poblacion, Pilar, Bohol
0910-124-5115
riceprocessingcomplexbohol@yahoo.com
Contact Person: Mr. Alvin A. Mante (Plant Manager)
0999-581-2023

EG Agro-eco Ventures (available for shipping to Cebu at cost)
Dumaguete City, Negros Oriental
Contact Person : Mr. Ernesto Quijano
0906-872-5282
quijanestor194@yahoo.com

LT Trading Rice and Corn Mill
414 Rizal St., Hi-way Paknaan, Mandaue City, Cebu
Contact Person: Glenn Besañes
(032) 346-1071;(032) 420-4123
0922-878-8216

Randel Store
Emilio Jacinto St., Tagbilaran City
Contact Person: Adelaida Iyog
(038) 411-3711

Region X

LT Trading Milling
Pandan, Sta. Filomena, Iligan City
Contact Person: Miko G. Besañes
(063) 225-1557;(063) 225-1846
0917-301-0990

Region XI

Davao Rice Processing Complex
Sinaragan, Matanao, Davao del Sur
rpcdavao@gmail.com
Contact Person: Engr. Leonaveta L. Nedarao (Plant Manager)
0946-588-2762

"MAGRICE"
Magsaysay Organic Farmers Marketing Cooperative
Poblacion, Magsaysay, Davao del Sur

Region XII

PHL Trading
Poblacion 8, Midsayap, North Cotabato
Contact Person: Arcon T. Florendo
0922-888-7300

Mall of Alnor
Alnor Complex, Sinsuat Ave.,
RH 9, Cotabato City

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Subject Matter Specialists
Marissa V. Romero, PhD (PhilRice)
Henry M. Corpuz (PhilRice)
Hazel V. Antonio (PhilRice)
Engr. Harvey V. Valdez (PhilRice)
Engr. Reynaldo Gregorio, PhD (PHilMech)

Managing Editor
Adeline P. Gomez

Graphic Artist
John Glen S. Sarol

Writers / Editors
Hazel V. Antonio
Catalina K. Acpal

Editorial Advisers
Constante T. Briones
Calixto M. Protacio

For further information, contact:

Be RICEponsible Secretariat
Philippine Rice Research Institute
Maligaya, Science City of Muñoz, 3119 Nueva Ecija
Tel. No. (044) 456-5390; (044) 456-0277 loc. 520;
0947-996-2556
www.bericeponsible.com
http://www.facebook.com/riceponsableako

We are a chartered government corporate entity under the Department of Agriculture. We were created through Executive Order 1061 on 5 November 1985 (as amended) to help develop high-yielding, cost-reducing, and environment- friendly technologies so farmers can produce enough rice for all Filipinos. We accomplish this mission through research and development work in our central and seven branch stations, coordinating with a network that comprises 58 agencies and 70 seed centers strategically located nationwide. To help farmers achieve holistic development, we will pursue the following goals in 2010-2020: attaining and sustaining rice self-sufficiency; reducing poverty and malnutrition; and achieving competitiveness through agricultural science and technology. We have the following certifications: ISO 9001:2008 (Quality Management), ISO 14001:2004 (Environmental Management), and OHSAS 18001:2007 (Occupational Health and Safety Assessment Series).

CONTACT US

www.philrice.gov.ph
www.pinoyrice.com

prri.mail@philrice.gov.ph

facebook.com/rice.matters

@rice_matters

PhilRice Central Experiment Station
Maligaya, Science City of Muñoz, 3119 Nueva Ecija
Tel: (44) 456-0277 • Direct line/Telefax: (44) 456-0112
PhilRice Text Center: 0920-911-1398

BRANCH STATIONS:

PhilRice Agusan, Basilisa, RTRomualdez, 8611 Agusan del Norte
Telefax: 343-0768; Tel: (85) 343-0778; Email: agusan.station@philrice.gov.ph

PhilRice Batac, MMSU Campus, Batac City, 2906 Ilocos Norte
Telefax: (77) 772- 0654; 670-1867; Email: batac.station@philrice.gov.ph

PhilRice Bicol, Batang, Ligao City, 4504 Albay
Tel: (52) 284-4860; Mobile: 0918-946-7439 ; Email: bicol.station@philrice.gov.ph

PhilRice Isabela, Malasin, San Mateo, 3318 Isabela
Mobile: 0908-895-7796; 0915-765-2105; Email: isabela.station@philrice.gov.ph

PhilRice Los Baños, UPLB Campus, Los Baños, 4030 Laguna
Tel: (49) 536-8620; 501-1917; Mobile: 0920-911-1420; Email: losbanos@philrice.gov.ph

PhilRice Midsayap, Bual Norte, Midsayap, 9410 North Cotabato
Tel: (64) 229-8178; 229-7241 to 43; Email: midsayap.station@philrice.gov.ph

PhilRice Negros, Cansilayan, Murcia, 6129 Negros Occidental
Mobile: 0928-520-4585; Email: negros.station@philrice.gov.ph

PhilRice Field Office, CMU Campus, Maramag, 8714 Bukidnon
Mobile: 0917-615-8710

Liaison Office, 3rd Floor, ATI Bldg, Elliptical Road, Diliman, Quezon City
Tel: (02) 920-5129; Mobile:0920-906-9052

Samar Satellite Station, UEP Campus, Catarman, 6400 Northern Samar
Mobile: 0948-800-5284

Mindoro Satellite Station, Alacaak, Santa Cruz, 2015 Occidental Mindoro
Mobile: 0908-104-0855