

# Farmer-led breeding of climate-resilient rice

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## Introduction

In many communities in the Philippines, farmers face increasing levels of climate-related unpredictability aggravated by economic and political risks that further heighten farmers' vulnerability. For the farmer organisation MASIPAG, resiliency is a long-term process that builds on the interdependence of technical, social, and political realities on the ground. Since 1988, MASIPAG has collected and maintained more than 1,000 old traditional rice varieties; an additional 1,085 improved varieties have been bred by farmers and by staff of the back-up farms.

Among the farmer breeders, Pepito B. Babasa (PBB) was one of the most popular, living near Lake Bato in Camarines Sur. The area has highly variable rainfall ranging from 1900 to 3800mm that is mainly



Pepito Babasa taught rice breeding to other farmers. He was also elected as chairperson of the board of MASIPAG for two terms, from 2010 to 2016. He passed away on October 6, 2022 from illness at the age of 73.

caused by an average of 10 typhoons that cross the area annually. These storms cause strong levels of flooding with a high risk of total crop failure. Several of the PBB varieties can cope with these exorbitant stresses. In his lifetime, Pepito Babasa produced 33 farmer-bred lines and out of these he made more than 150 selections for a multitude of different needs based on the discussions within his farmer community and the wider MASIPAG network. For example, one of his top varieties, PBB 401, was found drought-resistant in 3 provinces, and additionally lodging- and pest-resistant in another province outside his own farm. Other PBB lines were identified to be drought and saltwater-tolerant, especially in Negros Occidental. Furthermore, Mr. Babasa conserved seeds by hanging them near his cooking area to prevent pests and to maintain the right moisture content that allowed him to have rice seeds available anytime.

Through the practice of sharing, farmers no longer need to worry about seed availability after typhoons, since more seed is available. The system of seed distribution from MASIPAG regional and provincial backup farms helps to provide seed in case of extreme weather calamities.

Table 1. Performance of PBB varieties in several Philippine provinces.

Province	Variety	Adaptation
La Union	PBB 401	Drought tolerant
Nueva Ecija	PBB 401	Locally adapted
Nueva Ecija	PBB 437-6, PBB 415-1	Locally adapted
Occidental Mindoro	PBB 403, PBB 414	Locally adapted
Camarines Sur	PBB 417, PBB 407, PBB 401	Flood tolerant
	PBB 401 (Buh)	Drought tolerant
	PBB 407-2 (Pamplona)	Drought tolerant, pest resistant
Quezon	PBB 403, PBB 438, PBB 410	Locally adapted
Negros Occidental	PBB 401 (Kabanakan)	Flood tolerant
	PBB 401 (Cauayan)	Drought tolerant
	PBB 401-1 (Cauayan)	Locally adapted
	PBB 401, PBB 402 (Hinoba-an)	Drought tolerant, pest resistant
South Cotabato	PBB 415-1-1, PBB 437-1	Locally adapted

## MASIPAG Farmer Rice Breeding methods

As preparation for breeding, the farmer-breeder first identifies the breeding objectives - which characteristics s/he wants to develop. Some of the most chosen traits are pest and disease tolerance, good eating quality, height, milling recovery, lodging-resistance, drought tolerance, etc. These traits would have been observed and recorded from the varieties in their adaptability trial farms. The breeder then determines the parent materials, and analyses their characteristics. The seeds of the parent materials are then selected and prepared. The seeds are then grouped according to the duration of the seedling until its flowering. (E.g., if the cultivar is behind by 30 days of flowering then it must be planted earlier by 30 days.)

The breeding process involves:

1. **Emasculation** - the process of removing the stamen or the male part.

2. **Pollination** - refers to the transferring of pollen from the male part to the female part.

3. **Selection** - is when individual plants are selected according to the objectives of the breeding process. It is important to learn about selection since 90% of the breeding process is spent on it. MASIPAG farmers use a modified bulk selection method.

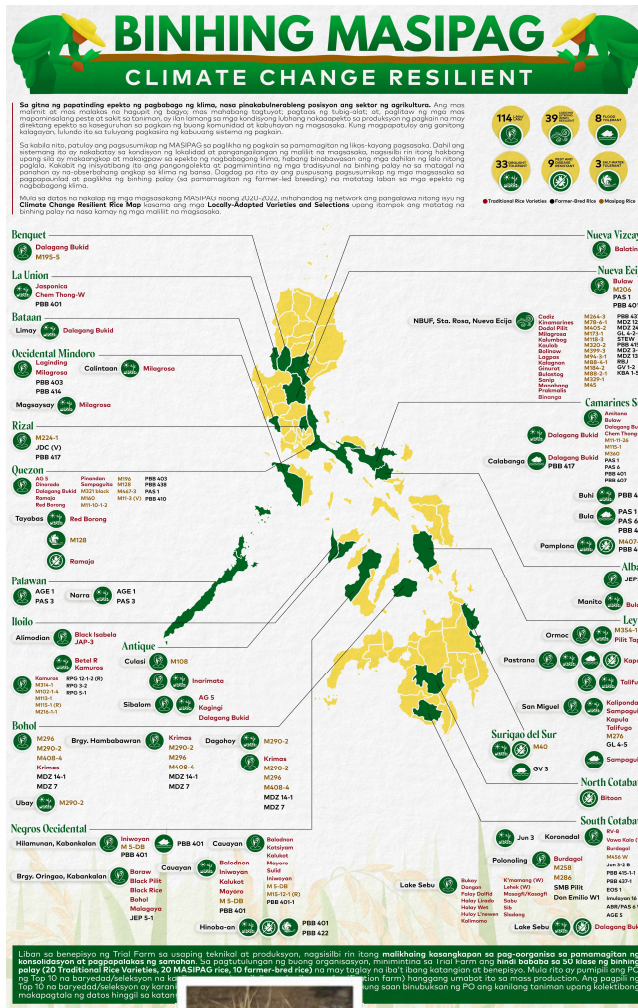
After harvesting and sowing the seeds of first generation (F1), several varieties will grow from crossing the mother and father plants. These will be segregated according to different characteristics of the breed: differences in height, maturity, panicle length, size, shape, color of the grains and leaves and others. A breeder can select what cultivar to use according to his needs or objectives. A variety is considered stable at F4. However, farmer-breeders distribute the selections as early as F4 to involve other farmers in the process of selecting the best ones for their agro-ecosystems.

This poster is a tribute to Tay Peiping, as Mr. Babasa is fondly called, and to all the farmers who are committed to conserve and improve Philippine rice varieties for the benefit of small farmers.

## References

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MASIPAG, National Back-Up Farm records, 2022.  
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Figure 1. The Climate Change Resiliency Map of MASIPAG



The map shows how different varieties of rice, both farmer-bred, traditional and MASIPAG rice are performing under different climatic stresses.

MASIPAG farmers observe their trial farms and have identified a total of 114 local rice varieties with specific climate related resilience properties in 2020-2022. They found the following number of varieties are resilient: to lodging and wind (39), flood tolerance (8), drought tolerance (33), pest and disease resistance (9) and salt water tolerance (3).

Of these varieties, there are 16 crosses developed by Mr. Pepito Babasa. The PBB 401 is most popular, being both flood- and drought-tolerant at the same time.

MASIPAG has trained 113 farmer-breeders. 2,132 Traditional and Cross-Bred Rice varieties are maintained in 275 trial and back-up farms in 42 provinces in the Philippines.

A panicle of the PBB 401.



Name of Variety: PBB 401  
Maturity (Days after sowing): 105 days  
Plant height: 90-100 cm  
Panicle length: 28 cm  
No. of grains/panicle: 350  
Milling Recovery 65 %  
Parent Materials: MT15-IR X Balala  
Farmers' observations: Good tillering capacity, Good eating quality, Drought tolerance, Flood tolerance

## Farmers' feedback



"PBB 401 is flood resistant. My farm has been flooded twice but PBB 401 wasn't affected at all. I also noticed that it is better than HYVs planted by my neighbors during drought. It has a high tillering capacity, like the lemon grass. PBB 418 is comparable to PBB 401, only taller."

Mamerto Pado, Chairperson  
BAYANIHAN Farmers Organization  
Bayanihan, Pamplona, Camarines Sur



"Salt water is coming into our farms (we live near the sea). However, we observed that PBB 418 is salt water tolerant and has good eating quality that is why we keep planting it in our trial farm to secure our seed supply."

Alfredo Manimba, Chairperson  
Belen Upland Organic Farmers Association  
Belen, Calabanga, Camarines Sur

**Acknowledgment** MASIPAG is supported by: Misereor, Germany; Swedish Society for Nature Conservation, Sweden; ASTM, Luxembourg; and SOLIDAGRO, Belgium.

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