

A GCP Community of Practice: Marker-Assisted Selection of Rice in the Mekong Basin

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Project Rationale:

Mekong Region – includes Thailand, Laos, Myanmar, Cambodia

Rainfed Lowland – Main food production ecosystem and 48% - 85% of total rice production in Mekong Region

Rice suffers from drought, flooding, salinity and diseases.

Biotechnology in Thailand started since 1991 under BIOTEC and supports from Rockefeller Foundation.

- rice improvement programs for famous KDML105 and RD6 using biotechnology

In 2004, RF funded a two-year training on MAS to transfer knowledge and technology to Cambodia (CARDI), Laos (NAFRI) and Myanmar (DAR) – products half way in development.

In 2006-07, GCP funded the continuation of unfinished products useful in the improvement of rice production in the Mekong Region.

Activities:

1) First MAS workshop at RGDU (May 21-30, 2007)

Participating Institutes and Representatives

Cambodian Agricultural and
Research Development Institute
(CARDI)



National Agricultural and
Forestry Research Institute
(NAFRI)



Department of Agricultural
Research (DAR)



Ubon Ratchatani University,
Thailand (UBU)

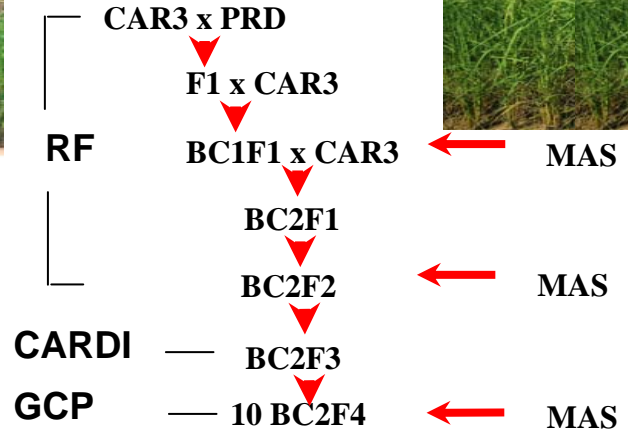


Activities and Results:

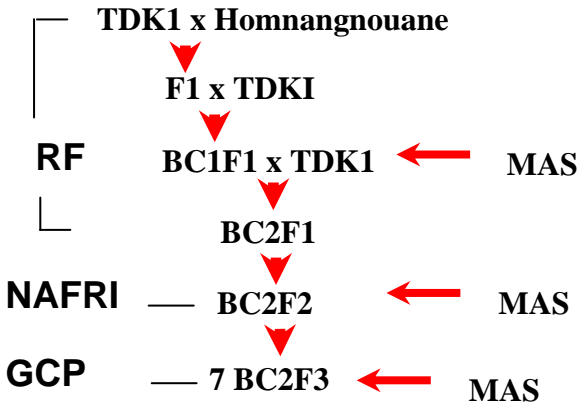
1) First MAS workshop at RGDU (May 21-30, 2007)



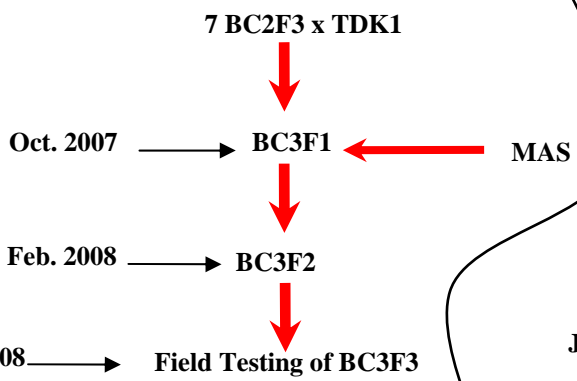
Breeding Scheme and MAS selection in improving cooking quality of a drought resistant rice variety CAR3



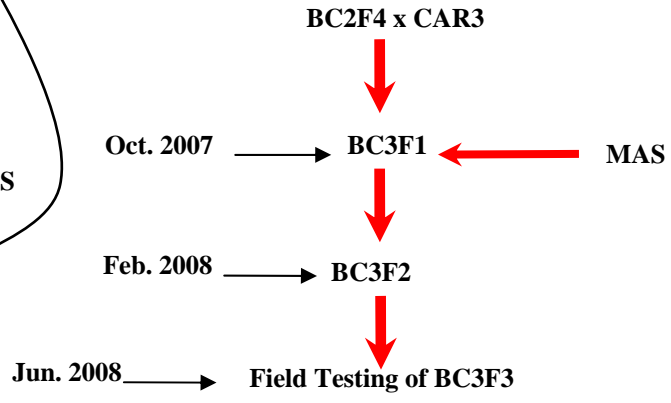
Breeding Scheme and MAS selection in improving cooking quality of a glutinous rice variety TDK1



Future Plan



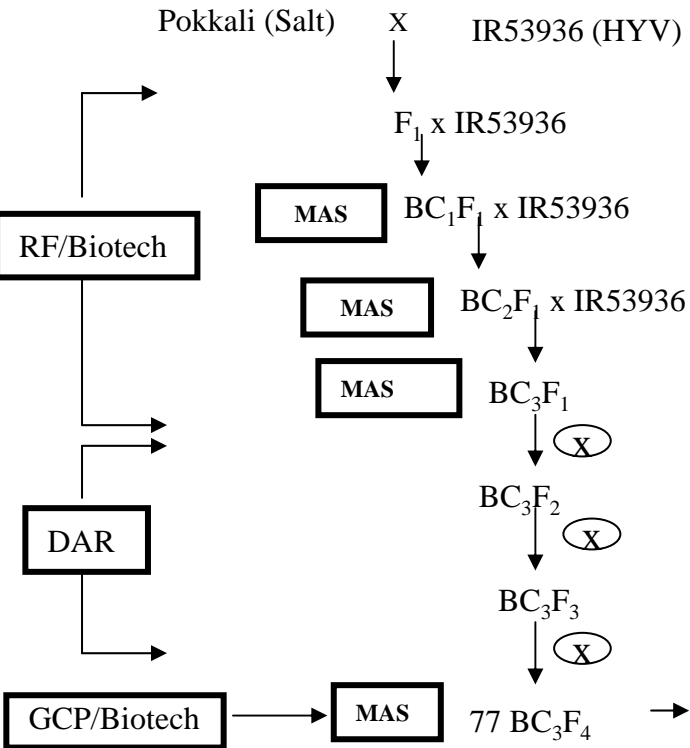
Future Plan



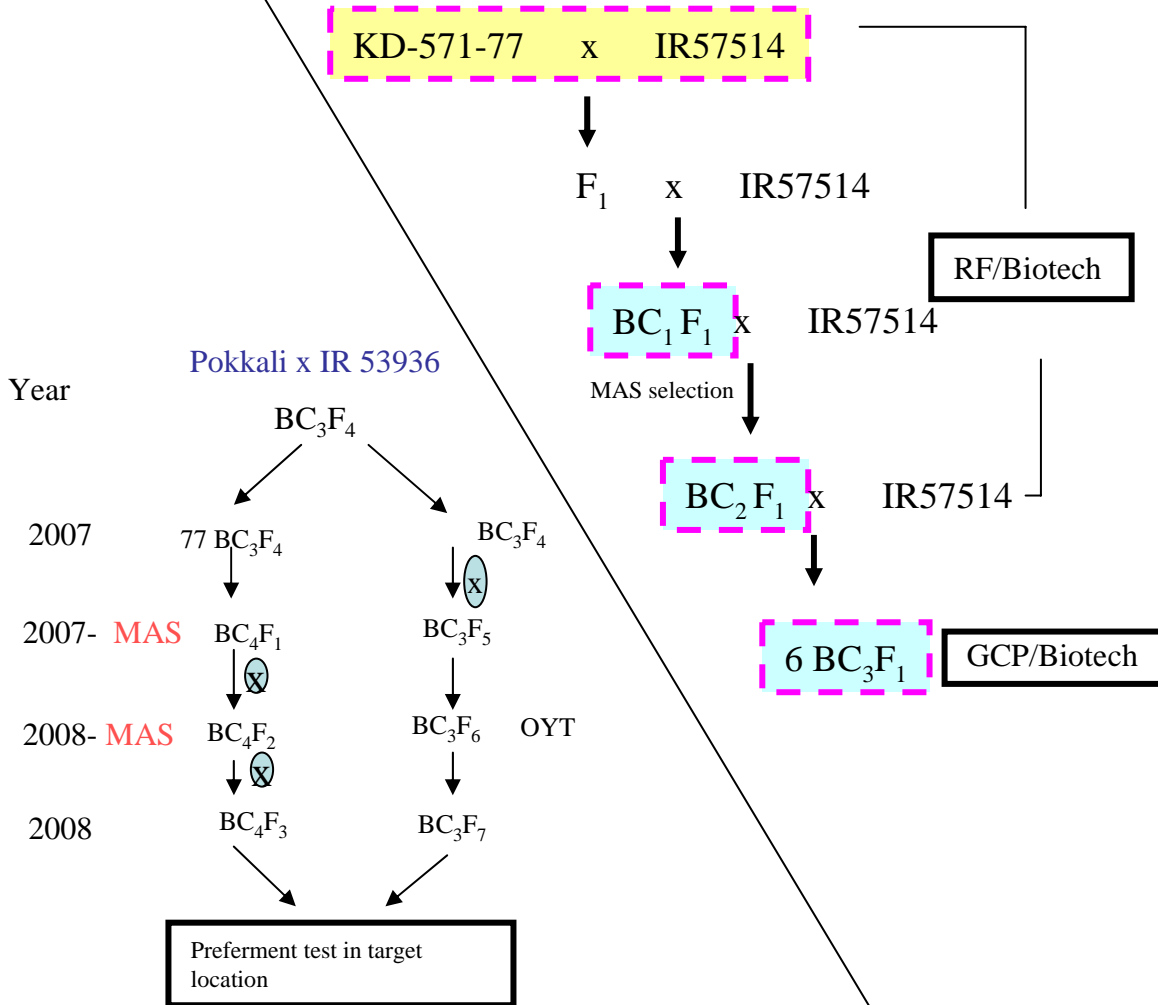
Results:

First MAS workshop at RGDU (May 21-30, 2007)

Breeding program of Salt Tolerance Rice



Breeding Scheme for Cooking Qualities



Activities:

2) Workshop on site: Workshop on QTL and MAS for Plant Breeding



July 3-4, 2007



June 19-20, 2007



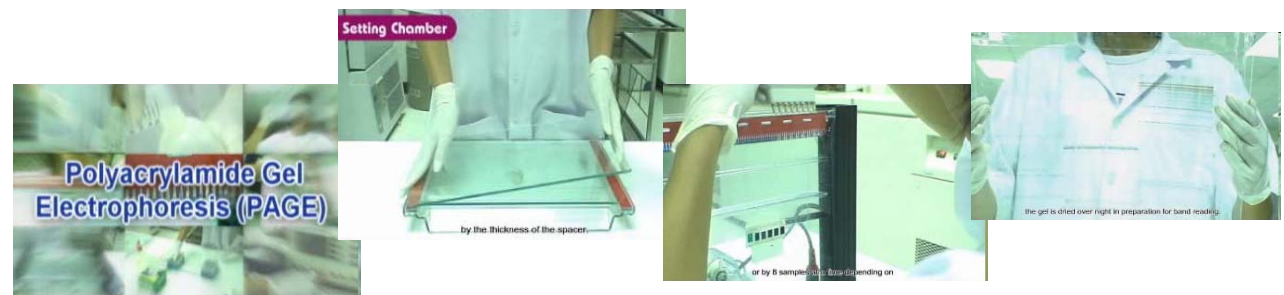
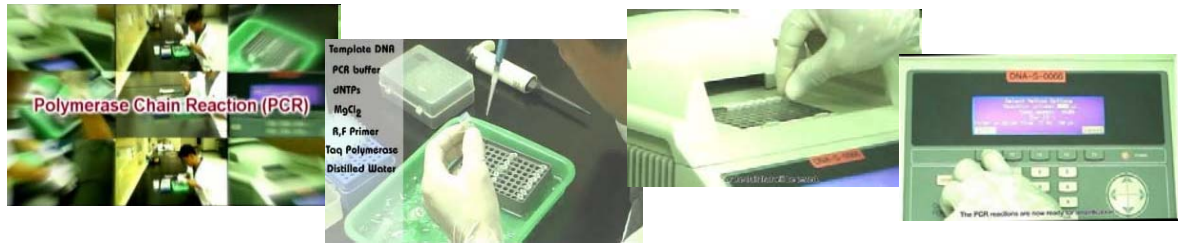
August 20-21, 2007

Activities:

2.) Workshop on site



RGDU production on laboratory techniques needed in MAS program in plant breeding. This video comes in four different languages with English subtitle which was used in the on site workshop.



Results:

2) Workshop on site:

- Participants in three institutes appreciated biotechnology and its potential in plant breeding and in other applications
 - Educators used the information they learned in teaching through our teaching materials and video on laboratory techniques.
 - Institute personnel are asking for more scholarships
- CARDI and NAFRI started developing their molecular lab but they lacked skilled people.
- DAR needs funding in developing molecular lab.
 - Need for more workshop/training to train their personnel to help start the molecular lab.
- The three institutes are asking for more collaborations specifically on breeding programs.

Data format and release:

http://dna.kps.ku.ac.th/mas_gcp

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- Organizing Unit
- Participating Institutes

COMMUNITY OF PRACTICES

Written by Jonaliza Siangliw
weyknul, 08 February 2007

Community of Practices

ORGANIZING UNIT

Rice Gene Discovery Unit (RGDU) was established in 2001 through the close collaboration between the National Center for Genetic Engineering and Biotechnology (BIOTEC) and Kasetsart University's Amphangsan Campus. The RGDU aims to develop important genetic tools for accessing genes underlying economic traits. Discovering genes underlying 16 target traits are on going project. In particular, two important QTLs, submergence tolerance and grain aroma, are used as model for positional cloning. Two BAC clones from RM125 and F133 have been developed for physical mapping and large-scale sequencing. These clones are being used under functional investigation. The new way of breeding called 'marker-assisted selection' is the best example of how genomic technologies may contribute to improve rice yield and qualities. One success example is the new breed of the 'Thai Jasmine rice namely 'Jasdo''. This is the jasmine rice which combined three new traits, submergence tolerance, backward leaf light, and post-harvest aroma. The gene for its genome by the using molecular markers in the backcross breeding. He is employed in rice breeding routinely in RGDU.

PARTICIPATING INSTITUTES

Ubon Ratchathani University (UBU): UBU is a university situated in Ubon Ratchathani province in the northeastern part of Thailand. Under the Faculty of Agriculture, Department of Agronomy, a laboratory under this faculty intended for Agricultural biotechnology has been established in 1996 funded by ADB. This laboratory became functional in 2002. At present, 2 faculty members are involved in biotechnology research and 2 more are practicing biotechnology. Since 2002, more than 10 students had their special research on biotechnology and the number is continuously increasing. The laboratory had done several projects involving studies on genetic diversity of Thai landrace along Mekong river basin, oilseed sesame and papaya using several DNA markers. A project on identification of genes underlying economically important traits from Thai Landrace is currently ongoing. This laboratory is capable of supporting future endeavors in molecular plant breeding.

National Agricultural and Forestry Research Institute (NAFRI): The National Agriculture and Forestry Research Institute was established in 1999 in order to consolidate agriculture and forestry research activities within Laos and develop a coordinated National Agriculture and Forestry Research System. Research programs in agriculture include plant breeding and collection and management of indigenous plant genetic resources. Agriculture Research Center (ARC) is one of the centers under NAFRI that implements National Agriculture Research Programs on food crops. The participants from NAFRI are shown below (Left: Mr. Souvann Thadavong, Right: Mr. Khemham Honghokdy).

Cambodia Agricultural Research and Development Institute (CARDI): In August 1999, CARDI was officially established as a semi-autonomous institute. Under sub-decree 74 it became a fully-fledged legal entity under the management of a director who reports to a government-appointed board of directors. CARDI was designed to be autonomous in relation to its personnel, physical and financial management. CARDI aims to conserve plant genetic materials, improve yield and quality of plant, develop plants resistant to abiotic and biotic stresses and maintain purity and quality of released plant varieties. The participants from NAFRI are shown below (Left: Dr. Khun Leang Hak, Right: Mr. Chou Vichet).

Department of Agricultural Research (DAR): DAR, formerly Central Agricultural Research Institute was established in 1960 and was changed to DAR in 2004. DAR conducts research on food and industrial crops including rice. Rice breeding is one of the tasks of DAR which include breeding partitioned based on ecological type like rainfed upland, rainfed lowland, irrigated, deep water and salinity. The participants from NAFRI are shown below (Left: Daw Tin Tin Myint, Right: Daw Thi Dar).

Home Workshop Workshop in RGDU May 21-31, 2007 Result Result

MENU

- Workshop
- Workshop in RGDU
 - May 21-31, 2007
 - October 2007
 - April 2008
- Workshop onsite
 - On Target Field Evaluation

RESULT

By Jonaliza Siangliw, on weyknul, 08 February 2007 **NEW**

Views: 10

Published in: **May 21-31, 2007, Result**

Result 1
CARDI's Result

Result 2
NAFRI's Result

Result 3
DAR's Result

HOME

Workshop

- Workshop in RGDU
 - June 2007 at CARDI
 - July 2007 at NAFRI
 - August 2007 at DAR
- On Target Field Evaluation

VIDEO

DATE	ITEM TITLE	AUTHOR	HITS
weyknul, 08 February 2007	DNA Isolation-mya	Administrator	1
weyknul, 08 February 2007	band reading-eng	Administrator	1
weyknul, 08 February 2007	PAGE-mya	Administrator	1
weyknul, 08 February 2007	PAGE-eng	Administrator	1
weyknul, 08 February 2007	PCR-eng	Administrator	1
weyknul, 08 February 2007	PCR-mya	Administrator	1
weyknul, 08 February 2007	Agarose Gel-mya	Administrator	1
weyknul, 08 February 2007	Agarose Gel-eng	Administrator	1
weyknul, 08 February 2007	Crossing-eng	Administrator	1
weyknul, 08 February 2007	Crossing-mya	Administrator	1
weyknul, 08 February 2007	DNA Isolation-eng	Administrator	1
weyknul, 08 February 2007	band reading-mya	Administrator	1

Lab (1 items)
Lectures (1 items)

DNA ISOLATION-MYA

by Administrator, on weyknul, 08 February 2007 **NEW**

Views: 1

Published in: **August 2007 at DAR, Video**

The Community of Practices
Concept Applied to Rice Production
in the Mekong Region: Quick
Conversion of Popular Rice Varieties
with Emphasis on Drought, Salinity
and Grain Quality Improvement

Breeding Program of
Salt Tolerance Rice using Marker
Assisted Selection in Myanmar

Tin Tin Myint & Thida
Department of Agricultural Research (DAR)
Myanmar
21-30 May 2007

The community of practices
concept applied to rice production in the Mekong
region: Quick conversion of popular rice varieties with
emphasis on drought, salinity and grain quality
improvement

Report
Improvement of TDK-1 for Aroma and Cooking Quality
Traits using Marker-assisted Selection

Ms. Sornvath Phonsing and Mr. Khemkham Honghokdy
National Research Center (ARC), National Agriculture and Forestry Research
Institute (NAFRI), Ministry of Agriculture and Forestry, Vientiane, Lao PDR



Data format and release: Data release:

http://dna.kps.ku.ac.th/mas_gcp

Genotype data – Sept. 2007
 - Dec. 2007
 - March 2008

Trait Validation – May 2008
 Observe Trials – Nov. 2008

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COMMUNITY OF PRACTICES

Written by Janessa Sangthai
 on 09/01/08 08:42:00 AM

Rationale

Countries in Mekong Region share similar rice planting ecosystems and constraints in rice production. Application of biotechnology like marker-assisted selection (MAS) in rice breeding had been proven effective in Thailand. Rice Gene Discovery Unit (RGDU), BIOT had the opportunity to convey knowledge to its neighboring countries through trainings thus molecular breeding of rice in Mekong Region begun when long term training on MAS was initiated in 2004 as sponsored by Rockefeller Foundation. This training aims to develop popular rice varieties like CAR3, TDK1 and IR53936 from Cambodia, Laos and Myanmar, respectively which lack traits that may improve quality and adaptation in the local area. During the RF training, a variety, IR57514 was improved to be aromatic and with resistance gene *Xa21* against bacterial leaf blight. IR57514 is submergence and drought tolerant variety with wide adaptation in the Mekong Region since this variety has been used as regional check in drought resistance experiments conducted under RF.

The successfully concluded training under RF made the participating institutes realize the potential of biotechnology, thus under the GCP project, the lines initially developed can be continued until target location testing. In the new project, molecular techniques on QTL/gene identification and MAS must be introduced to participants from CARD1 (Cambodia), NAFRI (Laos) and DAR (Myanmar) inside and outside RGDU. On site workshops will be conducted to introduce the technology to each institute. The developed materials will be tested in each country particularly intended for its improvement.

Table 2. MAS selection of BC2F4 plants derived from the cross between CAR3 and PRD

No.	Designatn/Parent	Marker		
		BADH	RM587	RM589
1	PRD	1	1	1
2	CAR3	3	3	3
4	CIR 808-1-2	1	2	2
5	CIR 808-1-3	1	3	3
6	CIR 808-2-2	1	3	2
10	CIR 808-2-3	1	3	2
11	CIR 808-2-4	1	3	1
13	CIR 808-3-1	1	1	1
20	CIR 808-4-3	1	3	3
29	CIR 808-6-2	1	2	2
30	CIR 808-6-3	1	1	1
31	CIR 808-6-4	1	1	1
33	CIR 808-7-1	1	2	3
38	CIR 808-8-1	1	1	1
39	CIR 808-8-2	1	3	3
42	CIR 808-8-5	1	2	1
45	CIR 808-9-3	1	1	2
51	CIR 808-10-4	1	3	3
53	CIR 808-11-1	1	2	2
54	CIR 808-11-2	1	2	3
60	CIR 808-12-3	1	2	3
65	CIR 808-13-3	1	1	1
66	CIR 808-13-4	1	1	1
67	CIR 808-13-5	1	3	3
70	CIR 808-14-3	1	1	1
71	CIR 808-14-4	1	2	2
73	CIR 808-15-1	1	3	3
74	CIR 808-15-2	1	1	1
80	CIR 808-16-3	1	3	3
84	CIR 808-17-2	1	1	1
89	CIR 808-18-2	1	1	3
90	CIR 808-18-3	1	3	3
91	CIR 808-18-4	1	2	2
95	CIR 808-19-3	1	1	1
119	CIR 808-24-2	1	3	3
120	CIR 808-24-3	1	3	3
121	CIR 808-24-4	1	3	3
124	CIR 808-25-2	1	2	1
126	CIR 808-25-4	1	3	3
17	CIR 808-3-5	2	2	2
18	CIR 808-4-1	2	1	1

Selected progenies

Link with other projects:

Rainfed Lowland Project (RLP):

- Project collaboration between BIOTEC and Rice Department
- Improving KDML105 and RD6
 - resistance to blast, bacterial leaf blight and brown plant hopper
 - tolerance to flooding, drought and salinity
- Using information from (RLP) to be applied on GCP-MAS project.

Product delivery:

- 1) Building effective team and network.
- 2) GCP web on MAS with information on markers, genotyping and phenotyping protocols and other training materials.

Impact on users:

- 1) Fast line conversion of elite varieties.
- 2) Materials will be planted in the target location/s in each country to observe the adaptation of the newly developed.
- 3) Plants with good quality and adaptation.

The 6th Asian Crop Science Association Conference The 2nd International Conference on Rice for the Future

5-9 November 2007, Bangkok, Thailand



BIOTEC
a member of NSTDA



日本作物学会
Crop Science Society of Japan

Local organizers:

BIOTEC, Kasetsart University, Department of Agriculture and Rice Department

In partnership with:

Generation Challenge Programme, Harvest Plus, Japan Society of Breeding and Crop Science Society of Japan

<http://www.biotec.or.th/BioAsia2007>

The 6th Asian Crop Science Association Conference The 2nd International Conference on Rice for the Future 5-9 November 2007, Bangkok, Thailand

CONFIRMED SPEAKERS



<http://www.biotec.or.th/BioAsia2007>