

Policy Brief (DANIDA Project DFC 09-P01-VIE)

Hydrological impact assessment

The model used validated hydraulic models to assess the impact of 5 SLR scenarios (SLR = 12, 17, 30, 54 and 75 cm) on salinity and flooding in two target coastal provinces, Nam Dinh in the Red River Delta and Bac Lieu in the Mekong River Delta.

For Nam Dinh

SLR increases salinity intrusion into the rivers flowing through the province. Under the worst combination of the highest SLR (75 cm) and low upstream flow, the 1‰ salinity boundary would move upstream 35 km. SLR also increases water level in the rivers and canals, aggravating the inundation risks in Song So catchment areas. With SLR = 75 cm, the flooding area with flood depth <1 m reaches 18202 ha (60 % of total area),

Adaptive strategies for Nam Dinh may include:

- Deployment of rice varieties with enhanced tolerance to submergence to be grown in the rainy season to low lying areas such as Xuan Bac, Xuan Phuong, Xuan Ngoc, Xuan Tien, Xuan Hung communes of Xuan Truong district; Giao Long, Bach Long communes of Giao Thuy district; and Hai Loc, Hai Ha, Hai Quang communes of Hai Hau district.
- Deployment of rice varieties with enhanced tolerance to salinity to be grown in the winter spring season in the southern part of the province, such as in areas served by Ngo Dong, Chua and Con Nhat sluices.
- Reduce the duration of sluices opening to ensure that only good quality water (when salinity < 1 g L⁻¹) is used for irrigation of the winter-spring crop. This will result in water scarcity in the southern part of Nam Dinh. Thus, there is a need to
 - o change wet land rice to non-rice crops in parts of the area
 - o Deploy drought tolerance rice varieties in winter spring rice crop.
- Investment in water management infrastructures
 - o to enhance the drainage capacity of the water management system of Song So catchment.
 - o to bring fresh water from upstream parts of the river Red River systems to the southern parts of Nam Dinh province.
 - o To increase the storage capacity of the canals, ponds....

In Bac Lieu

SLR aggravates the risk of prolonged inundation, especially in Hong Dan district when SLR ≥ 30 cm. SLR < 30 cm reduces the maximum salinity in Phuoc Long, Gia Rai districts (shrimp and shrimp-rice areas) by 4 -8 g L⁻¹, and SLRs ≥ 30 cm by 8 - 16 g L⁻¹. SLR ≥ 30 cm, however, increases salinity in Hong Dan, Hoa Binh and part of Gia Rai districts (agricultural lands) by 4 - 8 g L⁻¹ compared to the present sea level condition.

The adaptive strategies for Bac Lieu may change with the degree with SLR

With SLR <30 cm. Some adjustments are needed may be needed on the management and cropping calendars.

- Investment in on-farm drainage to reduce the depth and duration of inundation during autumn–winter rice season in year-round agricultural areas (Hong Dan, Hoa Binh, and part of Gia Rai) and in shrimp-rice zone (Phuoc Long).
- Deployment of rice varieties with enhanced tolerance to stagnation flooding in the autumn–winter season in the districts mentioned above.

When SLR \geq 30 cm

- Major upgrades of hydraulic structures and canal systems are needed to cope with SLRs. Embankments and levees must be raised to avoid overtopping. Pumps are needed for drainage purposes during the rainy season
- Avoid rice growing at the peak of rainy season (September to November) in Hong Dan due to prolonged and deep inundation.
- Deployment of varieties with enhanced tolerance to submergence to Hong Dan, Phuoc Long (autumn–winter season) and to stagnation flooding to Hoa Binh, Gia Rai (summer-autumn and autumn–winter seasons).
- Deployment of rice varieties with enhanced tolerance to salinity to all rice areas for winter-spring season.
- Replace rice with upland crops with less water requirement than rice.

Rice breeding for salinity and submergence tolerance

For salinity tolerance

The project has succeeded in introgression of Saltol QTL (for salinity tolerance) from the FL478 donor into popular varieties AS996, OM6976 (Mekong River Delta) and BT7, KD, TL6 (Red River Delta).

The new developed Saltol-incorporated lines retaining most of the preeminent agronomical traits of recipient varieties are the following:

- **BT7/Saltol:** D10, D63; D70
- **OM6976/Saltol:** F44, F77, F69
- **AS996/Saltol:** B190, B291, B198
- **Q5DB/Saltol:** QF3-2

The yields of these lines range from 6.5-7.0 t/ha, while the salinity tolerance trait is similar to FL478 donor's level. At the end of the year 2012, two elite varieties named OM224 (F198) and OM225 (F72), selected from the OM6976/Saltol backcross hybrids, were sent for the national testing in 13 provinces of Mekong River Delta.

For submergence tolerance

The project has succeeded in introgression of Sub1 QTL (for submergence tolerance) from the IR64-Sub1 donor into popular varieties AS996, OM6976 (Mekong River Delta) and BT7, KD, TL6 (Red River Delta).

The new developed Sub1-incorporated lines retaining most of the preeminent agronomical traits of recipient varieties are the following:

- **BT7/Sub1:** 25A, 10A
- **OM6976/Sub1:** E73

- **AS996/Sub1:** C214, C209, C214
- **KDDB/Sub1:** KI44-1-3
- **Q5DB/Sub1:** QI3 and QI6

The yields of these lines ranging from 5.6-7.0 t/ha, while the submergence tolerance trait is similar to IR64-Sub1 donor's level.

On-farm trials of new rice lines developed by the Project and stakeholders' feedbacks from the project sites

All perspective rice lines developed by the Danida Project have been grown in farmers' fields in Bac Lieu province (in Mekong River Delta), and Hanoi, Nam Dinh, Thai Binh and Hai Phong provinces (in Red River Delta).

The areas of growing the project's rice lines (in 2012):

- Bac Lieu: 3,000 m²
- Hanoi: 4,000 m²
- Nam Dinh: 35,000 m²
- Thai Binh: 3,000 m²
- Hai Phong: 3,000 m²

The farmers and local organizations highly appreciated the adaptation of new developed varieties and waiting for those varieties to be released in large scale. Positive feedbacks (to project's rice varieties) were received from the following farmers, local committees, local organizations:

- In Bac Lieu: Phan Van Liem (Director of Bac Lieu Plant Crop Varieties Company), Ha Thanh Thao (Head of Hoa Binh Agricultural Extension Station), Tran Van Ngo (Director of Hoa Binh Cooperative), and representatives of 40 households.
- In Thai Binh: households Pham Ngoc Thach, Pham Ngoc Van, Do Thi Huong (Hop Chau and Nam Thinh communes, Tien Hai district).
- In Hai Phong: household Pham Van Nut and Nguyen Thi Mat (Chien Thang commune, An Lao district).
- In Nam Dinh: the Local Committee of Giao Chau Commune, Giao Thuy district.