



# COMMUNITY-BASED SUSTAINABLE AGRICULTURE





GLOBAL ENVIRONMENT FACILITY

## COMMUNITY-BASED SUSTAINABLE AGRICULTURE

- to abate damages caused by floods and sea level rise and contribute to the people's livelihood stabilization
- CODE: VNM/SGP/OP5/Y4/STAR/2014/07
- LOCATION: Four communes of Phu Cat and Tuy Phuoc districts, Binh Dinh province
- IMPLEMENTATION DURATION: September 2014 April 2017
- EXECUTING AGENCY: The Binh Dinh's Union of Science and Technology Associations

### CONTEXT

- The Dong dyke area of Binh Dinh Province is located at the end of the Kon River, which is adjacent to the estuarine; hence, for nearly four months in a year it is widely affected by floods, inundation and waterlogging, including sea surge and seawater intrusion damaging the rice production. As the water volume of the Kon River flows downstream it becomes more and more intensified, and with the rainfall increased, expands the area of deep submerged land and sea level rise, causing saltwater intrusion into the inland and affecting agricultural production and people's lives. When sea surges happen, waterlogging increases, the rice production cannot be practised in many lowland areas and they might be abandoned. In addition, saline intrusion due to the sea surge causes the soil to gain salinity, the soil is quickly degraded, becomes compact, and is fallow.
- The two districts of Tuy Phuoc and Phu Cat have areas of over 12,000 hectares of rice annually, of which 690 hectares of rice production is heavily flooded and suffers from salinity intrusion, namely: Phuoc Son commune (140 ha), Phuoc Thuan commune (80 ha), Phuoc Hoa commune (90 ha), Phuoc Thang commune (110 ha) of Tuy Phuoc District; and Cat Chanh commune (120 ha) and Cat Tien commune (150 ha) of Phu Cat district. These areas are located at the end of the Kon River, adjacent to the sea mouth; thus during the rainy season from October to November, there is widespread flooding, and in the dry season (April - August) it is heavily salinated due to seawater penetrating deeply into the fields. Due to the low-lying terrain of the rice fields, inundation, salinity and alum conditions, most of the land areas along the Dong dyke of Tuy Phuoc and Phu Cat districts are unsuitable for the development of shallow plants and vegetables. Rice is the main plant. Four villages: Phu Hau (Cat Chanh commune); Phu Hau (Cat Tien commune); Kim Dong (Phuoc Hoa

commune); and Vinh Quang 2 (Phuoc Son commune) are the most heavily submerged and saline-intruded areas, where rice is a mono-cropping plant, and there are no secondary occupations for the people. Therefore, the number of poor households in these villages is very high. At present, rainfall, floods, inundations and sea surge are increasing in an abnormal direction, causing increasingly serious salinisation and flooding; the local people have not been able to adapt to these conditions, leading to declines in productivity; there is no productivity at all in some areas. As a result, part of the rice cultivation land may be abandoned due to increasing saltwater intrusion and flooding. The livelihoods of the local communities would be severely affected if no support to sustain the rice production is provided.

- According to statistics on poor households from the Commune People's Committees: Cat Chanh has 350 households/1,850 households (7,660 people) - accounting for 19.27%; Cat Tien has 341 households/3,804 households (13,200 people) - accounting for 11.57%; Phuoc Son has 431 households/6,472 households (23,500 people) accounting for 10.6%; Phuoc Hoa has 275 households/4100 households (15,500 people) - accounting for 6.6%. Addressing community-based sustainable food security for these localities is a challenge for the people and the governments at all levels.
- According to a scenario of the sea level rising by 30 centimeters by the middle of the century and 75 centimeters by the end of the 21st century, or even by one meter, the entire area of rice cultivation in Phuoc Hoa commune would be severely affected, to the point of complete depletion if no reasonable protection measures are provided. Part of the paddy land area, particularly the area near the lagoon of Phuoc Hoa commune, could be abandoned if saltwater intrusion from the sea surge makes the land more salty, quickly making the soil degraded, compact, and uncultivable. Food security will be severely affected.

In order to cultivate effectively climate change-adapted and sustainable rice production, UNDP/GEF SGP has supported the Binh Dinh's Union of Sciences and Technologies Associations since 2009 to implement the project entitled **"Contribution to the abatement of damages caused by waterlogging and seawater intrusion due to sea level rise for sustainable development of agricultural production and food security in Phuoc Hoa commune, Tuy Phuoc district, Binh Dinh province".** This is the first project to support capacity building for CC adaptation in Kim Dong and Tan Gian villages.



Effective application of the adaptation measures has helped to limit the paddy field abandonment by farmers due to delayed crop seasons as has occurred in the past (due to the prolonged waterlogging, irregular rains, sea water intrusion into the fields, etc.), hence ensuring stable income for farmers. Therefore, it is confirmed that because of the application of appropriate technical solutions, in combination with the community capacity building and awareness raising in climate change adaptation efforts and minimizing impacts on rice production, it should have ensured a target of stabilising rice production, maintaining good productivity in adverse weather conditions, ensuring profitability and food security, and stabilizing the lives of the people in disadvantaged areas due to increasingly abnormal floods, sea surges, and saline intrusion.

#### ADAPTIVE SOLUTIONS INCLUDE:

- Selection of CC adaptive rice varieties based on community (PVS -Participatory Variety Selection).
- Shift the crop calendar to avoid impacts of flooding/saline intrusion on the sensitive rice growth stages (young seedlings, panicle initiation period (PI), flowering period).
- Application of Integrated Cultivating Technology for Sparsely Sowing (Reduction of Seedings/Reservation of Seeds for Re-Transplanting), Integrated Nutrition Management

   INM, Integrated Water Management - IWM, Integrated Pest Management - IPM, to increase adaptability of the varieties and ability to recover from damages.
- Successful results of the adaptive technical solutions obtained from the project models were summarised/compiled into technical documents. The project technical documents were appraised and approved for transfer by the Binh Dinh Provincial Science Council.

- In order to improve the rice productivity in the Dong dyke, the Department of Science and Technology and Department of Agriculture and Rural Development of Binh Dinh province approved the funds for the implementation of a project entitled "Reinvigorating the rice variety DV 108", a scientific project at the provincial level, which was implemented for three years (2013-2015) to improve the genetic stability of the variety...
- Based on the above achieved results, together with the predictions of climate change scenarios in Central Viet Nam in the coming years, there is a need for measures to adjust the rice cultivation to limit impacts of inundation and seawater intrusion, the two immediate and long-term risks, to ensure people's livelihoods and life, especially stabilising rice production to ensure food security and incomes of people in the project area. Lessons learned from the pilot project are the basis for local climate change response plans, applied in the communes in the Dong dyke of Tuy Phuoc District (Phuoc Thang, Phuoc Thuan, Phuoc Son, Phuoc Nghia communes) and of Phu Cat District (Cat Chanh, Cat Tien, Cat Tai and Cat Thang communes), where the terrains are similar to the one of Phuoc Hoa commune.
- The rice monoculture area along the Dong dyke of Binh Dinh Province is located at the end of the Kon river system that flows into Thi Nai Lagoon, adjacent to the estuary. Due to the low-lying terrain, it frequently suffers waterlogging caused by sea surge and floods in the winter-spring crop (October and December) and alum and saline intrusion in the autumn crop (June - August). The rice production is unstable—sometimes it has to be sown 3-4 times—causing delays in the crop seasons, unstable productivity, low efficiency, and hence affecting people's livelihoods, and soil degradation after long fallow (sometimes reaching up to 50 hectares). Therefore, the Binh Dinh's Union of Science and Technology Associations has selected paddy fields along the Dong dyke of Tuy Phuoc and Phu Cat districts to implement the project in four communes of two districts of Tuy Phuoc and Phu Cat to solve the above-mentioned problems.

**Lessons learned from the pilot project** are the basis for local climate change response plans, applied in the communes in the Dong dyke of Tuy Phuoc District (*Phuoc Thang, Phuoc Thuan, Phuoc Son, Phuoc Nghia communes*) and of Phu Cat District (*Cat Chanh, Cat Tien, Cat Tai and Cat Thang communes*), where the terrains are similar to the one of Phuoc Hoa commune.



### 1. REMARKABLE INNOVATION/ IMPROVEMENT PILOTED BY THE PROJECT

- .....• Coordinating to establish large paddy field in the villages, each village 20ha.
- Adjusting the sustainable and effective rice cultivation techniques (amount of seeds, amount of fertilizer, its application technique and application period) suitable with the crops and the product targets (rice seed production or commercial rice production).
  - Acquiring indigenous knowledge and on that basis, reviewing the limitations of farmers' rice cultivation techniques adapted to waterlogging, alum and saline intrusion (densely sowing, no fertilizing, lot of nitrogen application, etc.), and then identifying appropriate, simple solutions, suitable with the local conditions that are not too different from the farmers' practices to transfer and build models:
  - » Using rice varieties adapted to the local saline and alum intrusion, and inundation, which are selected by the community: DV108/reinvigorated DDV108;
  - » Adjusting the planting calendar according to the weather changes: sowing 10-15 days after the general seasonal calendar of the province (depending on annual weather conditions) to actively avoid rain and flood;

- Continuing participatory variety selection (PVS) to obtain more varieties adapted to waterlogging and saltwater intrusion (tolerant to longer flooding duration or higher salt concentrations) that can replace the DV108 variety in the future:
- The project has chosen community-based technology transfer. The community has participated in all project activities: contributing indigenous knowledge to the development of technical procedures, participating in rice variety selection, providing labor and agricultural materials ... as counterpart contribution; the community representatives (village leaders, key farmers, women's union) directly involved in technology transfer to farmers. Therefore, the community has mastered the technical solutions to maintain stable rice production under conditions of waterlogging and saltwater and alum intrusion.
- » Farmers actively participated in the selection and testing of rice varieties resistant to submergence and alum and seawater intrusion by PVS method. Therefore, the rice varieties selected by farmers, namely the rice variety 108 (from 2016 will be the 108 reinvigorated varieties) is very suitable.

 Actively organizing in conjunction with the Coastal South Central Agricultural Science and Technology Institute, a scientific research unit to produce/supply the DV108 rice seed certified from the best varieties after reinvigoration.

Main farming activities: In the autumn crop, it is necessary to clean the fields at least twice before sowing. It is necessary to apply basal fertilizer: organic fertilizer, lime, NPK fertilizer; Sowing density: 80-120 kg/ha, combining with sowing for replanting cases 40-80 kg/ha. The top dressing fertilization is adjusted according to specific conditions throughout the production crop, depending on the weather, growth of the crop; use of foliar spray to help the rice recovering after flooding, alum and seawater intrusion, limit of the nitrogen use, application of integrated pest management (IPM), use of pesticides according to the principle of "four rights" (the right pesticide, the right dosage and concentration, the right time, and the right way).

Priority is given to raising awareness and understanding of climate change, building technical capacity for the community through model implementation, training, field trips, workshops and integration in grassroots communication activities, etc. Mobilization of community participation (non-SGP/GEF funding contribution, labor); The consensus in implementing measures to enhance accountability and active role in project implementation.



### **2. HIGHLIGHT RESULTS**

2.1. Results of training on transfer of participatory variety selection (PVS) and rice cultivation techniques to adapt waterlogging and alum and seawater intrusion

• Technical training and field workshops have allowed for transferring appropriate and adaptive rice production techniques to communities in the project area and neighbouring areas with the attendance of a total of 2,077 turns/farmers and the grassroots agriculture staff, of which, there were 698 women, accounting for 34.1%. Specifically:

- One ToT training course with 30 trainees;
- Four PVS training courses with 80 turns/people in which women participants consisted of 30%;
- 28 early season training courses: 1,367 turns/people, and women participants accounted for 35.11%;
- 12 field trips: 600 turns/people, women participants: 32.33%.

Integration of information on climate change, climate change adaptation techniques into communication programs, Binh Dinh's mass media networks, training courses of Youth Union, Women's Union, and Farmer's Union.





Total of **2,077 turns/ farmers** and the grassroots agriculture staff, of which, there were **698 women**, accounting for 34.1%. information on climate change, climate change adaptation techniques into communication programs, Binh Dinh's mass media networks, training courses of Youth Union, Women's Union, and Farmer's Union "



2.2. Results of implementing the model of intensive rice production adapted to waterlogging, and alum and seawater intrusion

• Establishing demonstration models of rice production in response to waterlogging and salinisation with a total area of 147 ha/4 crops/2years. The total number of participating farmers: 764 people. Specifically:

# 04

demonstration models were developed

 Four demonstration models were developed during three crops from winter-spring crop of 2014-2015 to winterspring of 2015-2016 (60ha, 5ha/ model/crop). The number of farmers involved: t

The number of farmers involved:

162 people/ 20 ha/crop

• Four large sample rice fields (87 ha, 20 ga/field/crop) in the 2016 autumn crop.

Although the weather in four production crops (from 2004 to 2016) was abnormal, unpredictable and detrimental to the rice production, thanks to the application of adaptive technical measures and limiting of negative impacts, the yield of the project model was 73.7 quintals/ha/crop, which is 5.2 quintals/ha/crop higher than the yield of non-project models with the more favorable conditions (average 69.5 quintals/ha/crop). The more unfavourable and complex weather conditions, the bigger yield variance of the project models than that of the non-project models with the same conditions.

#### 2.3. Results of the PVS

- The PVS method on the selection of rice varieties adapted to climate change (resilient to waterlogging, alum and seawater intrusion) has been transferred to the community. A production demonstration was conducted to evaluate the agronomic characteristics of six promising rice varieties resilient to alum and seawater intrusion: OM 4900, OM 7747, OM 8017 VN 121, DV 108 and DV 108 PT;
- The community has evaluated and selected rice varieties suitable with the local conditions and preference to maintain effective rice production in difficult conditions of the Dong dyke region. The rice variety 108 and reinvigorated 108 were chosen.

#### 2.4. The development of the disaster recovery support fund

- A management board was established, and regulations on management and operation were developed for the Support Fund for Development of Rice Cultivation Adapted to Waterlogging and Alum and Seawater Intrusion. This fund has been managed by the Phuoc Son commune's Women's Union, and has operated since 2016.
- In 2016, the Fund came into operation and provided loans for women to buy materials for restoration of production after the flooding during the autumn crop of 2016. In May 2016, the Fund Management Board helped farmers to prepare borrowing documents and the loan disbursement was made immediately.
- The number of households applying for loans: 33 households in Vinh Quang 1 hamlet, Phuoc Son commune, Tuy Phuoc district with an area of 42,243 m2 of the model of paddy field in response to submergence and alum and seawater intrusion for the project 2016 autumn crop.
- Thanks to the loans, farmers have bought agriculture materials for production according to the technical procedure, increased productivity and profitability in the autumn crop of 2016. It is now the end of the first round (one year loan cycle). 100% of the capital has been withdrawn and paid into the account of Phuoc Son commune's Women's Union.





### **3. IMPACTS**

#### 3.1 ENVIRONMENTAL IMPACTS

▶ Through the maintenance of rice production in difficult conditions, the project has also helped to limit land degradation as the areas of rice land is more and more penetrated by the seawater, increasingly salinated, gradually degraded, uncultivatable, and abandoned.

Through technical solutions focusing on: nutrition balance management by integrated care management (ICM), integrated pest management to help reduce the use of unsuitable inorganic fertilizers, (reduction in the use of single urea, which is easily evaporated, washed away, ineffective and polluting soil and water environment: enhanced use of bio organic fertilizers, complex slowlydissolved fertilizers, adding mediumand micro-nutrients). With reasonable sowing density and balancing fertilizers, pests and diseases have been limited. use of pesticides on the principle of "four rights" has reduced the number of pesticide spraying times of 2-4 times per crop, thus limiting the pesticide residues which pollute the environment, water sources, and accumulate toxic chemicals in agricultural products, which affect public health.

#### 3.2 SOCIAL IMPACTS:

Stable livelihoods, sustainable rice production with two crops/year

contributing to hunger eradication, achieving on-the-spot food security, poverty reduction towards multi-dimensional poverty eradication; improving community life, creating gender equality, and empowering women are three UN criteria for sustainable development by 2030.

▶ Women's Union and female farmers participated in technical training courses, fieldbased workshops and coordinated to incorporate climate change issues in commune women's meetings and gatherings in order to raise awareness and understanding for women. There were 34.1% female farmers participating in the project activities.

▶ Thanks to the full participation in the project meetings, women have improved their rice production capacity, and gained more knowledge on climate change. Women in the model shared their knowledge with many other women in the same area to apply intensive rice cultivation adaptive to waterlogging, alum and seawater intrusion to maintain effective rice production in difficult conditions, helped maintaining their family livelihood.



• Rural women are trained to be familiar with the application of science and technology to production, creating opportunities for women to be confident in the community and have opportunities to help each other with the household economy.

#### 3.3 ECONOMIC IMPACTS

Although the weather in the crop production was abnormal, adversely affecting rice production, thanks to the application of adaptive technical solutions and abatement of negative impacts, there were achievements as follows:

• Limitation of paddy field being abandoned and unproductive by farmers due to delaying season (because of prolonged flooding, irregular raining, saline intrusion due to sea surge into the field).

▶ The yield of the project area is still higher than that of the neighbouring areas with the same conditions. As the weather conditions are more unfavourable and complex, the yield variance of the project model is higher than that of the non-project fields with the same conditions. The productivity of the project model reached 73.7 quintals/ha/crop, which is

5.2 quintals/ha/crop higher than the productivity of non-project field compared with the more favourable conditions (average 69.5 quintals/ha/crop).

The cost of production has reduced, especially the quantity of seeds, labor and pesticides; although the cost of fertilizer and lime has increased compared to the farmers' traditional production, it still increases farmers' profits and incomes. The average profit of VND 24,895,000/ha/crop is higher compared to outside the project model (average VND 21,8787,000) of VND 3,017,000 /ha/crop.

#### PROFITABILITY OF THE MODELS OF RICE CULTIVATION ADAPTED TO INUNDATION AND SALINE INTRUSION FROM WINTER-SPRING CROP 2014 - 2015 TO AUTUMN CROP 2016

Wtinter-spring crop 2014 - 2016

Unit: Thousand VND

Locati	ion	Winter-spring crop 2014 - 2015			Winter-spring crop 2015 - 2016		
		Model	Non-model	Increase /decrease (+/-)	Model	Non-model	Increase /decrease (+/-)
Tuy Ph	ước	31.890	29.560	+2.330	29.250	27.040	+2.210
Phù C	Cát	30.630	27.500	+ 3.130	27.570	24.620	+2.950

#### Autumn crop 2015 - 2016

Unit: Thousand VND

Location	Autumn crop 2015			Autumn crop 2016		
	Model	Non-model	Increase /decrease (+/-)	Model	Non-model	Increase /decrease (+/-)
Tuy Phước	19.236	15.730	+3.506	21.800	17.020	+4.780
Phù Cát	18.876	15.630	+3.246	19.906	17.920	+1.986

#### 3.4 POLICY - SUSTAINABILITY - REPLICABILITY

- The Department of Agriculture and Rural Development (DARD) has defined that it is necessary to apply rice cultivation methods adaptive to waterlogging and alum and seawater intrusion for the dyke areas of the two districts of Tuy Phuoc and Phu Cat through the large sample fields program of localities.
- The project technical solutions have been demonstrated through the model and were highly appreciated by the local authorities, agricultural sector and community. The solutions are technically simple, based on scientific knowledge and proven in reality, and hence are easy to transfer and widely applicable for areas with similar conditions as the project area, which were identified in the Binh Dinh's climate change impact scenarios (2009); these areas include lowland communes along the Dong dyke of the province.
- The model has received consensus and support of the provincial departments, branches and local governments at all levels from the provincial to district and commune levels, which creates favourable conditions for replication, transfer of the achieved results and integration of the project activities with other programmes to expand and apply in the production areas.
- The lessons learned from the project pilot will be the basis for continuing to look for other adaptive measures that are appropriate for future implementation in order to address more effectively the short-term and long-term adverse impacts of climate change.



### **4. LESSONS LEARNED**

Selection of the project location and problems to be addressed were appropriate with the local reality and urgent requirements of the local administration and community. Good community consultations have created the consensus between the project implementing unit and the local project beneficiaries. This is the decisive factor for the success and replicable ability of the project results.

• GEF/SGP partnership with the locality: the Binh Dinh People's Committee understood and agreed with the GEF/SGP, and provided pertinent resources:

- The local government contribution for two adaptive rice projects in the Dong dyke area was VND 452 million (nearly 50%).
- Personnel involved in the project: Beside leaders of the Binh Dinh Union of Science and Technology Associations there are leaders from the Department of Agriculture and Rural Development (DARD), the leaders of the District People's Committees (DPC)/Heads of Agriculture Sections, the Vice Chairmen of the Commune People's Committees in the project areas. Therefore, the project management has been smoothly carried out from the province to the grassroots level.

• The community in the project area demonstrated fully consensus and actively cooperated in the project implementation, especially the Village and Commune Women's Unions. The enthusiastic participation of the community did not only help the project achieve success, but also created a premise for replication, sustainability and policy formulation enhancement after the project completion.

▶ The project management board is the Provincial Union of Science and Technology Associations and members of the project consultancy team are all prestigious staff and experienced in production management, creating close links with the provincial, district, commune and community leaders, that facilitated the project management and execution.

The project process was built on the basis of scientific and technological advances and inherited indigenous knowledge, is not complicated, has scientific basis, and is proven through modelling practice and the application of technical advances; it is highly appreciated by the agricultural sector, local government and community.

The Binh Dinh Provincial People's Committee has made a decision to provide **a counterpart funding of 20% of all GEF SGP projects** from a scientific non-business budget.

#### UNION OF SCIENCE AND TECHNOLOGY OF BINH DINH PROVINCE

472 Tran Hung Dao, Quy Nhon City, Binh Dinh province, Vietnam DT: 056 382 8598 | Fax: 056 382 8598 | Email: Ihhbdinh@gmail.com Contact person: Dr Nguyen Thi Thanh Binh President: Dr Nguyen Thi To Tran, Team Leader

#### GLOBAL ENVIRONMENT FACILITY -SMALL GRANTS PROGRAMME (SGP)

304 Kim Ma street, Ba Dinh, Hanoi, Vietnam Phone: +84 24 385 00150 | Email: gef-sgp-vietnam@undp.org Website: www.vn.undp.org | www.sgp.undp.org

COMMUNITY PARTICIPATION, OWNERSHIP AND BENEFICIARY