

PROPOSAL SUMMARY

Project Title	<i>Developing a community-based model on onion-based cultivation crops to adapt to climate change impact (droughts and saline intrusion) in Vinh Chau Commune, Vinh Chau District, Soc Trang Province - CBA/VN/SPA/09/07</i>
Project Site	Vinh Chau Commune, Vinh Chau District, Soc Trang Province
Proponent	Women Union of Vinh Chau District Address: 01 Nguyen Hue Street, Vinh Chau District, Soc Trang Province Phone: (0793) 861254
Authorized Representatives	Authorized Representatives: Pham Thi Huong, Chairwoman, Women Union of Vinh Chau District
Cooperating Organizations	Department of Agriculture of Vinh Chau District Women Union of Vinh Chau Commune
Project Dates	from June, 2010 to Sep 2012
Total Project Cost (USD) (local currency)	1.489.500.000 VND (78,395 USD)
Amount Requested from CBA (USD) (local currency)	950,000,000 VND (50,000USD)
Co-financing (USD) (local currency)	539.500.000 VND (28,395 USD)
Project Objective	General objective: Testing models on onion-based cultivation crops to adapt to climate change impact (droughts and saline intrusion) in Vinh Chau Commune, Vinh Chau District, Soc Trang Province
Brief Project	Soc Trang, a province in the Mekong Delta, is one of the poorest

Description	<p>province which will be worst affected by climate change impact of sea level rise and saline water intrusion and droughts. Vinh Chau Commune is a commune in Vinh Chau District where 70% of the population is the Khmer community. In recent years, the commune is heavily affected by saltwater intrusion and droughts, which seriously affects farmers' life in general and cultivation of red onion, a key commodity in the area. Soil become degraded and results in low productivity of farmers' products, including red onion.</p> <p>The main objective of the project is to enhance the local adaptive capacity to minimize the risks and impacts of droughts and saltwater intrusion, and prevent and limit soil degradation by adopting suitable red onion-based cultivation models. The Project's has the specific objectives as below.</p> <p>Raise awareness and knowledge about the impact of climate change, droughts and saltwater intrusion on the local residents' production and life and on the natural resources for agricultural production (i.e. soil, water, and agro biodiversity).</p> <p>Improve the community's technical capacity in sustainable land management, quick assessment of soil degradation and methods of sustainable cultivation in degraded land caused by droughts and saltwater intrusion.</p> <p>Test suitable cultivation models for degraded land by adopting crop rotation models for red onion-based crops in Vinh Chau, applying sustainable land management techniques and drought and salinity tolerant varieties.</p> <p>Draw lessons learned and recommend on the suitable models to adapt to droughts and saline water intrusion for replication.</p>
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1.0 RATIONALE

1.1 Community/Ecosystem context

Soc Trang is a province in Cuu Long Delta with a total area of 3, 223.3 km² and a population of 1,272,200 people, in which the Khmer account for 28.85%. The poverty rate is high, with 30.75% of the whole province and 42.92% being the Khmer. Soc Trang has a town, 8 districts and 105 Communes, with Soc Trang town being the administrative center of the province. Vinh Chau and My Tu are the districts with the highest poverty rate of 52.09% and 36.95% respectively. The main reasons for the poverty are a lack of capital and land for production, a lack of employment and a low level of technology application. Consequently, the local residents still have to sell their land.

Vinh Chau is a coastal district in Soc Trang Province and it is bordered by South China sea in the east and the south, Bac Lieu Province in the west and My Xuyen and Long Phu districts of Soc Trang in the north. Vinh Chau has a total area of 46, 260 hectares and a population of 146, 854 inhabitants, including Kinh, Khmer and Chinese ethnic minorities. Vinh Chau has a district town, called Vinh Chau and 9 Communes: Lai Hoa, Vinh Tan, Vinh Phuoc, Vinh Hiep, Hoa Dong, Khanh Hoa, Vinh Chau, Lac Hoa and Vinh Hai.

Vinh Chau Commune is located in the east of Vinh Chau district and it is 7 km away from the district center. The population in Vinh Chau Commune (2008 statistics) is 22, 814 inhabitants with 4 218 households, in which 77% is the Khmer. Vinh Chau Commune has 11 hamlets. The average income per capita in Vinh Chau is around 10 million VND/a year, the highest being 15.4 million VND/a year (2009). The main source of community income of Vinh Chau Commune is the crop rotation of rice and cereals (red onions, aromatic rice, other cereals, fruit trees,...), which accounts for 50% of the income, while aquaculture (shrimps – rice) accounts for nearly 50%. Vinh Chau has unfavorable natural conditions due to increasing saltwater intrusion. The many surrounding canals have enabled the intrusion of sea water in the fields.

1.1.1 Ecosystem context

i) Natural ecosystem

Soc Trang has a natural land of 322 330.36 hectares. There are 6 types of soil: sandy soil (8 491 hectares), silt soils (6372 hectares), clay soil (1076 hectares), salty soil (158 547 hectares) with many subtypes, i.e. highly salty soil, medium salty soil, less salty soil and mangrove soil, of which highly salty soil accounts for the largest area (75, 016 hectares) and it is suitable for growing rice, vegetables and cereals, fruit trees and short-day and long-day industrial crops, and acidic soil (75 823 hectares). Soc Trang's forest area is 14, 091 hectares, in which natural forests account for 116.86 hectares, planted forests 3, 752 hectares and protective forests 5, 278 hectares with mainly in two districts of Vinh Chau and Long Phu. Also, the province has 4,205 hectares of economic forests which are mainly used to grow cajuput in My Tu and Thanh Tri District.

With a coast of 72 km long and two large estuaries: Hau (from two long rivers of Tran De and Dinh An) and My Thanh, Soc Trang has a considerable source of aquatic products, shrimps and

30,000 hectares of alluvial land. Soc Trang has a low and fairly even terrain, with an absolute altitude of about 0.4 – 1.5m, change of slope around 45cm every km long. In general, the terrain in Soc Trang is hollow and it gets lower from the higher end at Hau river to South China Sea and the lowest being the west and northwest. Small-scale terrain is unevenly wavy with sand dunes in higher places and acidic or salty land in lower places in between. Those are sedimentary traces of the rise and fall of the sea levels, creating sand dunes and hollow areas in My Tu District, Soc Trang town, My Xuyen, Long Phu and Vinh Chau. Acidic soil area with hollow terrain in the south and along Cai Con canal has low, between 0 – 0.5m, therefore it usually gets flooded in rainy season. The islets on Hau River also have low so they get flooded at high tides.

Vinh Chau is a district of Soc Trang Province with a total natural land area of 46,260 hectares and a population of 146,854 people of Kinh, Khmer and Chinese ethnic minorities. Vinh Chau is a coastal district that is bordered by the South China Sea in the east and the south, Bac Lieu province in the west and My Xuyen and Long Phu District of Soc Trang in the north. Vinh Chau has a district town, also called Vinh Chau and 9 Communes: Lai Hoa, Vinh Tan, Vinh Phuoc, Vinh Hiep, Hoa Dong, Khanh Hoa, Vinh Chau, Lac Hoa and Vinh Hai. Vinh Chau District has a coast of 43km long, mostly alluvial sea with the alluvial rate of 50 – 80m per year. The sea is an advantage for Vinh Chau in developing its aquaculture and fishing potentials. However, agricultural has lots of difficulty due to salinised soil and a lack of freshwater for crops. This explains why Vinh Chau's farmers have concentrated on vegetables and cereals like turnips, peanuts, green beans, chili, etc. on sandy soil, mainly red onions, a key commodity, for a long time. Nowadays, red onions are grown mainly in 3 coastal Communes of Vinh Chau, Vinh Hai and Lac Hoa with almost 5,000 hectares of crops a year.

ii) Agricultural ecosystem

Soc Trang is a coastal province with 73.2% of agricultural land being salinised or acidic. However, this is also an advantage for Soc Trang in making use of its soil and ecosystems for developing areas specialized in agricultural products with high economic value. Areas specialized in aromatic rice, fruit trees, rice – shrimp systems are typical agricultural ecosystems in Soc Trang.

Typical agricultural ecosystems of Vinh Chau District are rice – shrimps, crop rotation of red onions – other cereals – red onions; red onions – other cereals – aromatic rice.

Crop rotation models of red onions – other cereals – red onions; red onions – other cereals – aromatic rice.

The crop rotation model of red onions – other cereals – red onions; red onions – other cereals – aromatic rice is popular in Vinh Chau, Lac Hoa and Vinh Hai Commune of Vinh Chau District.

Vinh Chau District has favorable conditions not only for marine economic development, aromatic rice development but also for red onions. Red onions have been grown in sandy soil in this area for over a hundred years, the onion breeds are well kept by the local residents so the quality and aroma is unique and preserved. Every year, Vinh Chau's farmers produce around 4,000 hectares of red onions with the yield of over 80 thousand tons. Despite the constantly fluctuating market, residents in the coastal area of Vinh Chau still maintain the traditional plants – red onions. To maintain the quality of red onions in Vinh Chau, people produce onions in a closed procedure from soil cultivation to the careful selection of breeds to make them develop well. Grown in specific weather conditions, the red onions have a specific shade of red, equal segments and special taste. Customers always think of Vinh Chau red onions as having a pungent odor and a specific taste that cannot be found elsewhere. Vinh Chau red onions are now considered a brand name, which encourages farmers in the production. Despite the occasional price reduction of red due to the import of other kinds of onions, local residents in Vinh Chau keep growing their red onions and improve the productivity, quality and reputation.

Though red onions have greatly improved Vinh Chau residents' standard of living, they still have to face many difficulties due to the unstable prices of this produce. Yet, the local residents still feel it secure to grow red onions because of the great demand for them , especially from Japan and Indonesia.

Apart from red onions, which are already popular on the market, other vegetables and cereals like turnips, Japanese yams, Japanese okras, chili, eggplants and mushrooms ,etc. start being grown in Soc Trang. This year, instead of growing spring-to-summer rice, the co-operative has signed a contract with An San factory to grow 40 hectares of Japanese yams. Although this is the first time they grow it, the average productivity is up to 30 – 35 tons/hectare in a crop thanks to the use of correct technical cultivation procedures. With 3000 – 3200 VND/kg, the co-operative has gained 3 billion VND and made a profit of over 1 billion VND. In that way, every household has earned almost 80 million VND; therefore, rarely will anyone grow rice in the next season because Japanese yams require less effort and generate more profit. In 2009 harvest, farmers in many Communes in Vinh Chau district sowed 3109 hectares of ST5 rice. Vinh Chau has the largest area of ST5 rice (1057 hectares) followed by Vinh Hai (975 hectares), Lac Hoa (604 hectares) and Vinh Phuoc (245 hectares). These Communes have large areas of ST5 rice because their soil structures are suitable for the development of ST5 rice, which yields high-quality and popular rice.

Meanwhile, in Vinh Chau District, companies have imported a Japanese yam breed to provide to the Khmer to experiment on sandy soil. This breed is of high quality , high price and stable outcome; it can also be grown extensively in many areas. In mid-October, 2009, farmers in Vinh Chau had a yam harvest of 370 hectares in Vinh Hai, Lac Hoa, Vinh Chau, Vinh Phuoc and Vinh Chau town. At the same time, throughout the district, people harvested 90 hectares of yams at 10 tons/hectare, providing 900 tons of yams to the demands both in and outside the district.

Experimental growing of Japanese yams in sandy soil in Vinh Chau yields high profit, with an average of 20 tons/hectare at 1,800 VND/kg. Thus, expenses deducted, residents still gain around 25 million VND/hectare/harvest of 3 months. This profit shows that Japanese yams yield much more profit than other vegetables and cereals and therefore, in the coming harvests, residents in Vinh Chau will expand the area for growing these yams to hundreds of hectares.

Rice – shrimp cultivation model:

The rice – shrimp cultivation model is commonly used in Lai Hoa, Vinh Tan, Vinh Phuoc, Vinh Hiep, Hoa Dong, Khanh Hoa and Vinh Chau town of Vinh Chau District. The total shrimp farming area in two harvests in Soc Trang is 3,500 hectares, 3,000 hectares of which is in Vinh Chau.

Agricultural ecosystem in Vinh Chau Commune

Vinh Chau Commune mainly use the cultivation model of rice – shrimp, of red onions – other cereals – red onions, and of red onions – other cereals – aromatic rice. The total land for crop rotation models is 3,200 hectares, 1,000 hectares of which is for rice (70% is aromatic rice), 1,200 hectares for red onions, 400 hectares for turnips, 250 hectares for chili, 300 hectares for Japanese yams and the rest for other vegetables and cereals. The four hamlets involved in farming rice – shrimp are Vinh Trung, Giong Ne, Dai Ruong and Xoai Con and seven hamlets specialised in rotating red onions – other vegetables and cereals – rice are Ca Sang, Ca Lang A, Ca Lang B, Ca Lang A Bien, Vinh Binh, Vinh An and San Chim. The intended locations for the project are the three hamlets involved in rotating red onions – other vegetables and cereals – red onions; red onions – other cereals – aromatic rice (other vegetables and cereals being turnips, chili and Japanese yams), i.e. Ca Sang, Ca Lang A and Vinh Binh.

a) Ca Lang A Hamlet

- Ca Lang A has 203 hectares of natural land and 180 hectares of agricultural land is used for the model of red onions – other vegetables and cereals – red onions, red onions – other cereals – aromatic rice (other vegetables and cereals being turnips, chili and Japanese yams), red onions – rice, etc. The crop that generates the most profit is red onions, followed by Japanese yams while rice crop yields the least profit.
- Model of red onions – turnips – red onions: This is the most effective model with an area of nearly 100 hectares. Red onions are sown in September, October and November (lunar calendar) and can be harvested in November, December and January (lunar calendar). The required time for red onions to develop is 70 – 80 days. In this model, chilies are grown in between, which occupies around 55 hectares; after the red onions and other vegetables are harvested, onions will be grown again. However, this harvest requires more expenses while the prices are unstable and diseases from the previous harvest can be a problem. The price

difference among harvests can be as low as 3,500 VND/kg or as high as 10,000 – 14,000 VND/kg.

- Model of red onions – Japanese yams – aromatic rice: With an area of 42 hectares, this is a stable source of income which requires little investment even though it is not as effective as the model of red onions – turnips – red onions. Yams and other vegetables do not yield as much profit as red onions but they have stable output and are less likely to suffer from crop failure caused by pests, diseases or from low prices due to an imbalance between supply and demand.
- Model of red onions – tomatoes – red onions model: with an area of 37 hectares, this model yields high profit of around 50 million VND/year.

b) Ca Sang Hamlet

- Ca Sang Hamlet has 176 hectares of natural land and 134 hectares of agricultural land is used for the rotation models of red onions – other vegetables and cereals – red onions, red onions – other cereals – aromatic rice (other vegetables and cereals being turnips, chili and Japanese yams), red onions – rice. The sowing time and the effectiveness are the same as those in the models adopted in Ca Lang A. However, due to soil conditions, the total area is about 37 hectares. Red onions are sown in September, October and November (lunar calendar) and will be harvested in November, December and January (lunar calendar). September (lunar calendar) is a favourable time to sow onions as they can grow well; yet, the prices can fluctuate during this time. Therefore, farmers tend to ??? to maintain the quality of the harvested products and to stabilize the prices.
- Model of red onions – aromatic rice – red onions: Thanks to the slightly hollow land, this model accounts for a large area (around 83 hectares). Without the negative impacts of bad weather and unstable prices, a hectare of red onions can yield over 100 million VND, while a hectare of rice can only yield 12 – 15 million VND.
- Model of red onions – turnips – red onions: The total area for this model is 30 hectares. Red onions are sown in September, October and November (lunar calendar) and will be harvested in November, December and January (lunar calendar). The required time for red onions to develop is 70 – 80 days. In this model, chilis are grown in between, which occupies around 22 hectares, after the red onions and other vegetables are harvested, onion will be grown again.
- Model of red onions – tomatoes – red onions: With an area of about 21 hectares, this rotation model also brings stable income to residents in Ca Sang with around 30 – 40 million VND/year.

c) Vinh Binh Hamlet

- Vinh Binh Hamlet has 155 hectares of natural land and 108 hectares of agricultural land is used for the model of red onions – other vegetables and cereals – red onions and the model of red onions – other cereals – aromatic rice (other vegetables and cereals being turnips, chili and Japanese yams), red onions – rice model and other vegetables and cereals. The slightly

hollow land makes it favourable for the development of the model of red onions – rice in 69 hectares and the remaining land is used for other models.

The varieties of rice grown here are mainly of the slightly aromatic varieties that come from ST source in Soc Trang, while vegetables and Japanese yams provide additional source of income to many households. The profit from red onions is high, but the standard of living of the majority of the Khmer is still low due to small cultivating area, low literacy level, infertile land, unfavorable natural conditions and lack of freshwater for daily life and irrigation. Saltwater intrusion in the fields also makes the freshwater source rarer and it seriously affects cultivation and husbandry.

- Model of red onions – turnips - red onions: This is the most effective rotation model with an area of 50 hectares. The annual income is around 40 – 60 million VND/year.
- Model of red onions – Japanese yams – aromatic rice: With an area of 24 hectares, this is a stable source of income which requires little investment but it is not as effective as the model of red onions – turnips – red onions. Yams or other vegetables do not yield as much profit as red onions but they have stable output and are less likely to suffer from a crop failure caused by pests, disease or low prices due to an imbalance between supply and demand. The average profit from this model is around 35 – 50 million VND/year.
- Model of red onions – tomatoes – red onions: With an area of around 18 hectares, this model yields quite high profit of around 40 – 50 million VND/year.
- Model of red onions – chili – red onions: with an area of around 16 hectares, this model generates a stable profit of around 30 – 40 million VND/year.

Relationship between the community, target ecosystem and ecosystem services: In the coastal ecosystem, which is prone to negative effects of droughts and saltwater intrusion in the dry season and salt contamination in rainy season, crop rotation models, i.e. red onions – other vegetables – red onions, red onions – other vegetables – aromatic rice, rice – shrimps should be used. This relationship is suitable to the ecosystem and co-existence. This area can support salt-resistant rice varieties such as ST1, ST3, ST5 and ST10 which require from 100 to 115 days to develop, and they give an average productivity of 5-6 tons/hectare in salt-contaminated land as well as vegetables like red onions, Japanese yams, turnips and chili, etc in sandy land near the coast.

1.2 Current (Baseline) Climate and Risk

Soc Trang lies within the monsoon climate with 2 discrete seasons. The temperature is high, with an average temperature of 26-27 °C. The thermal radiation is also high, with 140-150 kcal/cm² and the average humidity is around 86%. The number of sunny hours is 2 372 hours/a year. The rainy season is from mid-May to November and the dry season from December to the next May.

The average yearly precipitation is 1799.5mm, in which the precipitation in the dry season accounts for only 2 to 6%.

The climate in Vinh Chau District is oceanic climate with two seasons. The rainy season lasts from mid-May to November and the dry season from December to next May. The yearly precipitation is 1 799.5mm, with a precipitation of 548.9mm in the highest month. The total number of sunny hours per year is 2,372hours, the total thermal radiation is 140-150 kcal/cm2 and the average humidity is of 86%.

Located in the monsoon climatic zone, Vinh Chau Commune has two separate seasons: the rainy season from May to October and the dry season from November to April. The average humidity is about 83%, the yearly precipitation is 1,840mm, and the annual number of sunny hours is 2372 hours. Rains and storms mainly occur from July to September, floods in August and tornadoes in July. The average temperature is between 24 and 37oC, with an average temperature of 30oC in three months a year. February is the coldest month and fog can occur in December and January.

The climate in Soc Trang in general, or Vinh Chau District and Vinh Chau Commune in particular, is suitable for agricultural, forestry and aquatic production, especially for red onions, aromatic/seasonal rice, vegetables and cereals. In recent years, however, natural disasters like storms, tornadoes, floods, landslides, droughts and saltwater intrusion occur more frequently, especially droughts and saltwater intrusion.

1.3 Impacts context

Soc Trang is one of the coastal provinces that suffer from climate change most. Unfavorable weather tend to occur more frequently and severely than before. Droughts and saltwater intrusion are considered the two most frequent and destructive disasters by the people in Soc Trang. High tides and subsequent coastal and river erosion and storms happen more often. The storm No. 5 (Durian) attacking Soc Trang in December, 2006 caused a death toll of 11 people, an injury toll of 365 people and a loss of 260 billion VND in property. In Vinh Chau, the second half of June 2009 saw 3 giant tornadoes that blew away 135 houses, with an estimated loss of 450 million VND.

Year	1980	1990	2000	2005	2006	2007	2008
Number of tornadoes	9	14	-	22	39	67	34

Winter monsoons usually bring wind of 7 or 8 force (16-18m/second), waves of 4-6 meters or even 8 meters high for 7- 10 days, causing erosion to riverbanks and coastal areas.

According to the forecast about climate change impacts in Southern Delta, the yearly average temperature can increase up to 1.6oC (in 2050) and 3.7oC (in 2010). While the precipitation decreases in December to May, it is the highest in the March-to-May period (8% in 2050 and 19.6% in 2010). On the contrary, the precipitation decreases from June to November and most

from September to November, 10.6% in 2050 and 26.0% in 2100. The sea level rises to about 330mm in 2050 and to 621mm in 2100. With the current melting rate of ice and glacier at both Poles, the sea level in Vietnam can rise up to 1 meter or more. Unfavorable weather, especially saltwater intrusion and droughts in dry season, can happen more frequently and seriously.

Saltwater intrusion and droughts

Saltwater intrusion and droughts are big issues in the province because the increasing frequency and scale of these disasters is seriously affecting the local people's life and production.

Saltwater intrusion: When coming to the South, especially in the second half of the winter (Jan – Mar) the winter monsoon tends to blow to the east–southeast (also known as “Gio chung”) in the same direction with the rivers. This monsoon blows sea water back into main rivers and canals, contaminating coastal fields with salt. This monsoon, together with high tides, can blow sea water back into the fields. The canal system in Vinh Chau and Soc Trang is affected by the tides twice a day with the average fluctuation of 0.4 to 1 meter. In the rainy season, parts of My Tu and Thanh Tri District are flooded, while in the dry season, runoff water in Thanh Tri, Vinh Chau, My Xuyen Districts and parts of Long Phu and My Tu Districts is salt-contaminated and therefore causes a lot of difficulty to production and life. The attack of monsoon, with the synchronous impacts of high tides, can negatively affect crops and other cereals and vegetables because sea water bubbles brought in by the wind stick to the buds and prevent their development.

Saltwater intrusion is most serious in April and May and gets deeper inside the fields with an average of 50 km. In some years, a salinity of 4‰ covers up to 60km as in 2002, 2005, 2007, 2008 and 2009. According to Scientific and Irrigational Institute of the South, from March to April in 2009, a salinity of 1-4‰ can cover up to 50-65 km and even 70km in May. Therefore, since March 2009, the sea water has intruded further into the land of most coastal provinces in Cuu Long Delta. In the dry season of 2008, Cuu Long Delta was salt-contaminated in 65 km deep. The process is getting more complicated and frequent each year. According to the salinity measurement station in Dai Ngai (near Vinh Chau), in April 2003, the salinity increased by 51%, compared to that in April 2002, and in April 2004 it increased by 82%, compared to April 2003 (Le Sam, 2004). Saltwater intrusion is getting increasingly serious and unstable (Le Sam, 2005).

In the summer-to-fall season of 2009, Soc Trang planned to sow 156,900 hectares from mid-April to the end of May. However, the heat and saltwater intrusion that went deep into the fields affected the sowing plan. The heat and the droughts increased the salinity in rivers and canals so the salt intruded into fields and made it impossible to pump water for sowing. The current salinity is 16.7‰ in Tran De Estuary (Long Phu), 8.3‰ in Nhu Gia River at Thanh Phu (My Xuyen) and 3‰ in Soc Trang City, 40km away from the sea; therefore, the water cannot be used for irrigation. The heat, the droughts and the high salinity affect not only summer-to-fall rice

season, but also the vegetables and cereals grown in the same time. In 2009, tens of hectares of vegetables and cereals in Soc Trang City, Vinh Chau, Long Phu District were dead due to water shortage and saline water intrusion.

Droughts: Vinh Chau, Soc Trang is known as “the desert of Cuu Long River Delta”, as the average precipitation is 100-200 mm lower than that of the whole Delta area. The number of rainy days is small, but the monthly precipitation is really high of up to 548.9 mm, compared to the highest one of 160-260 mm in Cuu Long River Delta. Vinh Chau is of the acidic land with hollow terrain in the west and along Cai Con Canal, low ???, 0- 0.5 m. and is easily flooded in rainy season. Islets in Hau River also have low ??? and therefore they become easily flooded at high tides.

At Vinh Chau weather station, the average precipitation is only 75.6 mm in the dry season and the yearly precipitation is 5.2% while the evaporation rate is 755.2 mm, which is 9.4 times higher than the corresponding precipitation. This is also the driest period of the year with a high temperature (the highest absolute air temperature is 35- 36oC and the highest land temperature is over 60oC), a low precipitation, a high evaporation rate, a low relative air humidity (below 86%) and exhausted river water. Those conditions have exacerbated the droughts in the region. Droughts occur almost every April, July and August, also known as “???” , and they last for 5- 12 days, degrade the soil and reduce productivity.

Impacts of saltwater intrusion and droughts

Grown in 2 million hectares (2 harvests each year making it 4 million hectares) accounting for 53% rice area in Vietnam, rice is the main crop in Cuu Long River Delta and is the main income for the local people. However, 0.7 million hectares of rice is affected by saltwater intrusion, especially in the dry season when saltwater intrusion seriously affects agriculture (Buu and Lang, 2004). According to a recent research by the Ministry of Agriculture and Rural development (MARD), the economic damage due to saltwater intrusion in 2005 was 45 million dollars, accounting for 1.5% of the annual crop yield of Cuu Long River Delta (MARD, 2005). In coastal districts of Soc Trang in general or Vinh Chau in particular, rice can only be grown in rainy season and the rice growth greatly depends on the precipitation. In general, there is not enough freshwater for irrigation in the beginning and in the end of the rainy season when saltwater (concentration of NaCl around 0.3%, 5dS/m) can enter the fields and either directly affect rice yields or increase the amount of salt in soil and affect the next harvests. Therefore, rice cultivation has to be carried out in the rainy season to avoid freshwater shortage and saltwater intrusion. Vegetables like red onions, turnips, chili, Japanese yams, etc are also affected although they are grown in the dry season to reduce the amount of irrigation water in the harsh conditions of droughts and saltwater intrusion in Soc Trang.

Apart from the effects on the freshwater source for life and production, saltwater intrusion also partly erodes the nutrients in the soil, therefore degraded and salt-contaminated soil cannot be cultivated and it leads to desertification. Saltwater intrusion, together with droughts, rapidly degrades the soil, causes the loss of nutrients and damages the underground ecosystem. On the other hand, the high demand for freshwater for irrigation and the low level of water in canals make droughts and saltwater intrusion occur at the same time and exacerbate the situation in the dry season.

Research results in Vinh Chau, Soc Trang show that rotating crops of red onions – red onions, red onions – rice, vegetables – red onions has developed less rapidly and yielded lower productivity. The soil has lower pH and fewer organic nutrients. There has been changes to soil fertility in the area.

The construction of hydro-electricity plants upriver is also a reason for the decreasing water discharge from Mekong River in the dry season (MRC, 2002). The construction of flood dykes also affects the source of silt for the soil. The use of a large number of agricultural chemicals, especially inorganic fertilizers, makes the soil compressible, infertile and nutritionally exhausted. The cultivation habit, which exhaustively exploits the soil potential without proper attention to the improvement and recovery of the soil, making it seriously degraded and impossible to hold water. After the rain, the water is absorbed quickly, therefore the demand for water is higher. Because farmers use salt-contaminated water to water the plants, salt is cumulated in the soil, worsening the degradation. Analysis results of water in canals, shrimp ponds, wells and underground water in Lai Hoa and Vinh Tan Commune of Vinh Chau in 2002 showed that the high salinity in April was caused by the low river level and the saltwater intrusion from the South China Sea. On the other hand, the soil acidity increases in dry seasons because the low level of underground water increases the rate of reduction-oxidation reactions in the soil. These reactions create acidic salt in the soil and it is carried to the soil surface by capillary motion or brought to canals and rivers and acidize the water (Le Sam and Collaborators, 2004).

Signs of climate change in Vinh Chau Commune and their impacts

Data in Appendix 2 show that there are signs of climate change in Vinh Chau Commune. The number of annual sunny hours is 2500 hours and the average daily sunny hours is 9.1- 9.7 in the dry season and 5.8- 7.5 hours in the rainy months. The total number of sunny hours increases by 126 hours in 38 years from 2373 hours (1970) to 2499 hours (2008), while the yearly precipitation decreases by 267 mm (from 2288 mm to 2021 mm) and the temperature increases by 0.31 oC (from 27.02oC to 27.33oC) in the same period.

According to the local people, the most serious issues are droughts and saltwater intrusion. In recent years, the frequent drought spells as well as “Ba Chan Drought” (with a precipitation of less than 5 mm) seriously affect agriculture. The “Ba Chan Drought” which usually comes in

July and in the first half of August is a disadvantage to rice cultivation in summer-to-fall harvest, due to the lack of freshwater and saltwater intrusion. Saltwater intrusion is most severe in April and in early May, with an average depth of 50 km (67 km in 2009).

Other climate phenomena, i.e. the winds, storms and tornadoes, are also noticeable changes in the localities. Tornadoes seriously affect vegetables and cereals, fruit tree and rice production of the area in recent years. Although they do not directly affect aquaculture, tornadoes make seawater rise and bring saltwater into the fields. Storms do not have much impact on Vinh Chau Commune, except for strong winds which blow the seawater into the fields and damage crops and fishing ships. For example, in 1997, the storm No. 5 (Linda) caused lots of property damage to Vinh Chau, including houses, fishing ships, fruit, vegetable, cereal gardens and aquaculture farm. Estimated damage was over 3 billion VND, 5 minor injuries due to housing collapse, but no death (except for those going fishing).

Rain off the season at the end of the year, when farmers harvest red onions, also affect the yields. In 2008, 300 out of 1400 hectares of red onions were rotten.

1.4 Project approach

1.4.1 Design red onion-based cultivation demonstration models to showcase the high quality, productivity and economic values of crops in the rotation models, i.e. the model of red onions – other vegetables – red onions, red onions – other vegetables – aromatic rice in the exacerbating conditions of droughts and saltwater intrusion in Soc Trang.

Basis for selection: Experiments with familiar plants like red onions, rice, vegetables and cereals right on farmers' fields is the most effective and rapid method for farmers, which reduce the experiment time on cultivars that can adapt to droughts and saltwater intrusion.

Solutions: Investigate the application of models, such as those with red onions – other vegetables – red onions, red onions – other vegetables – aromatic rice. At the same time, evaluate productivity and economic effects of experimental plants on degraded soil caused by droughts and saltwater intrusion. Hold discussions in the field for farmers to self-evaluate and select plants and models that suit their local soil conditions.

Research by Dang Thi Cuc (2007) shows that red onions in Vinh Chau are planted in 3 main harvests

- Early onions (breeds and products): usually grown on high land (called ??? for vegetables and cereals) by the 60% of households that have the land. Onions are sown in around October and November (September 15th, lunar calendar) and harvested 55- 60 days after sowing. The products of this harvest can be used for breeding in the next harvests or as products for the Lunar New Year. Early onions are grown 2 months after harvest, when it has and are the main source of breeding for other seasons.

- Seasonal onions: 100% farmers have land for this harvest, and because these onions are mainly grown on fields, they can be sown right after the rice harvest. This is the main commercial source of onions in Vinh Chau District. The sowing time is in November and December, but sometimes because it stops raining later and therefore the water goes down slower, sowing time can be in January. The time for the onions to develop is around 70- 80 days after sowing and the longer the harvest time, the higher the productivity.
- Breeding onions: Vinh Hai is the Commune with the most favorable conditions in the district for breed production, which is from early onions. Onions are sown in February to March and harvested 45- 50 days after growing. The products of this harvest will be stored until October and November for early and seasonal onion harvests.

Expected results: The project expects to select 2- 3 breeds that can be tolerant with droughts and salinisation in Vinh Chau, Soc Trang.

1.4.2 Build the technical capacity to quickly evaluate soil degradation based on signs on fields.

The physical and chemical characteristics found on the fields like underground water salinity, soil density and humidity, etc are used to recognize degraded soil.

+ Soil density determines the sponginess of the soil. Spongy soil tends to have a density of less than 0.8. Soil degradation is usually followed by the decrease in sponginess (due to less humus and broken structure, etc.) Degraded soil has a high density, normally higher than 0.9. Comparing the density of many types of soil with different purposes, i.e intensively growing rice or cereals allows us to evaluate the level of soil degradation.

+ Soil humidity: Researchers have identified figures, such as the humidity of wilt plants, the absorption capacity, the humidity storage capacity, the forms of water in the soil, etc. With degraded coastal sandy soil, the humidity drops to lower than the humidity of wilt plants in the dry season. Therefore, the analysis of soil humidity on degraded soil is quite essential.

+ Chemical soil degradation can most easily be seen in the reduction of humus. Although different types of soil have different amounts of cumulative humus, degradation decreases the percentage of humus to less than 2%. The soil degradation due to intensive farming and the use of only mineral fertilizers as a habit have reduced the active amount of humus and consequently, the amount of water in the soil.

+ Soil and water salinity are measured by the Electric Conductivity Equipment. EC shows the concentration of salts in the soil by measuring the soil solution or the saturated electrolytic dissociated solution (EC_e). The impacts of salinity on plant productivity are also evaluated based on measured EC values.

Solutions

- Train and practise skills for farmers to recognize soil degradation in cultivation models, i.e. with red onions – other vegetables – red onions, red onions – other vegetables – aromatic rice on the fields.
- + The salinity of underground water can be quickly measured by judging the opacity of the AgNo₃ solution when mixed with the sample of underground water. The less clear the solution, the saltier the solution (FAO, 2003).
- + Combine with EC to evaluate the impacts of the salinity on plant productivity.

Expected results: Develop a diagram about drought and saltwater intrusion in sub regions level of hamlets and commune where the project is carried out in order to apply suitable solutions.

1.4.3 Transfer sustainable land management to farmers through demonstration cultivation models to improve fertility, preventing soil degradation and maintaining productivity and economic values of crops by applying advanced technologies and local people's traditional experience.

General application of technical measures in irrigation, techniques to use soil, fertilizer use, cultivation techniques, crop rotations are those that have been confirmed to be useful in soil improvement, sustainable use of land and water for agriculture and risk reduction.

Solutions:

Build demonstration models using sustainable land management techniques to reduce land degradation in the models of red onions – other vegetables – red onions and red onions – other vegetables – aromatic rice. Participating farmers in these models receive the technical and financial support in an area of 200 hectares (90- 100 households per harvest). Based on the results of the models, we will publicize the models with fliers, discussions on the fields and observations of those models. Also, based on the results, general cultivation procedures for each kind of plants in drought and salt- contaminated condition would be created in order to navigate the agricultural development to adapt to climate change and sea level rise.

Cultivation methods

Use rotation models of red onions – other vegetables – red onions and red onions – other vegetables – aromatic rice. Other popular vegetables and cereals are turnips, Japanese yams and chili.

Red onions can be grown in many types of soil but they have to be high, dry, spongy and nutritious. If the soil is near the saltwater source, the onions should be watered with freshwater. In addition, onions cannot be grown in waterlogged conditions, so they should be planted when the rainy season is over to avoid rotten bulbs. Soil treatment: plough the soil 1 month in advance,

then scatter limes 3- 5 days before ploughing beds. If it is clay soil, it is necessary to mix the sand on top of the bed well. Bed preparation: beds can be 20- 30 cm high, 0.7- 0.9 m wide and the distance between 2 beds is 20- 30 cm. Beds need to be even, slightly watered and covered with a thin layer of straw before growing and sprayed with herbicides like Ronstar, Dual (Vietnam Vegetable Information Page, 2007).

Appropriate fertilizers:

- According to the general procedures for intensive farming, fertilizer application based on rice leaf color matching chart, together with the procedure of “3 reductions and 3 increases” recommended by Rice Institute of Cuu Long River Delta, has been acknowledged by the Scientific Council of the Ministry of Agriculture and Rural Development to be an advanced technology. Meanwhile, the procedure of “5 reductions and 1 correct” is applied to the rotation model with rice, as in the one with red onions – other vegetables – aromatic rice. Biological and organic fertilizers are used eliminate the salt. Farmers will be trained in these skills while those who have not been trained will observe the models, attend discussions on the fields and receive materials from the project.
- Soil in which red onions are grown is sandy soil. The results in the application of organic fertilizers with red onions show that 7 and 10 tons of sugar cane refuse fertilizers treated with Trichoderma fungi (BBM – Trico), together with fewer inorganic fertilizers, will increase the organic matters in the soil, the protein supple from mineralization, the soil respiration, the exchange of Calcium, water-holding capacity and remarkably decrease the soil density. Growth characteristics like height, root length, bulb weight and quality improve. The proportion of onions being infected with Collectotrichum sp. Fungi is low (< 1%) in onions with BBM- Trico, compared to those without BBM- Trico (5%). These results show the reduction of damage caused by fungi in the soil. In addition, the balanced use of microorganism organic fertilizers improves the quality of onions in storage. The difference in the loss rates is remarkable, compared to onions grown with inorganic fertilizers (Dang Thi Cuc, 2007).

Nowadays, organic biological fertilizers (grains) made from agricultural by-products like cassava (VEDAGRO), sugar cane refuses (COBANIC)... only require 500 kg/hectare. Liquid ones like biological fertilizers to desalinize the soil, manufactured using the 10% Enzyme technology (BioNAT-Antisalino) only require 1-2 liter/hectare, therefore the amount of chemicals used can be reduced up to 15- 25%, the plant productivity and soil chemical components considerably improves. For example, there is an increase in the amount of protein and phosphate, the quality of agricultural products, local people’s income while there is less harm for the environment. These organic fertilizers can be widely used with many types of crops (Southern Institute of Agricultural Technology, 2008).

Pest management

Apply the IPM (Integrated Pest Management) method, using biological chemicals like green and white fungi,... for each kind of plants: rice, red onions, other vegetables,... to demonstrate models through training sessions and technical staff.

The cultivation of red onions in Vinh Chau in recent years has been declining with unstable productivity and low quality as it is difficult to store and preserve onions after harvest. The main reasons are the expansion, intensive farming, especially the abuse of chemical fertilizers and pesticides. Common pathogens include *Delia platura*, *Spodoptera litura* Fab., *Spodoptera exigua* Hubn, *Erwinia* sp. *Alternaria* sp., *Collectotrichum* sp... have caused considerable damage to the productivity and quality of the onions. In the world, there have been several researches on solutions to control pests, for example: to prevent, instead of growing onions for many harvests in a row, farmers should rotate onions with other crops, bury dead plants after harvest, scatter pepper or ginger around places where flies can lay eggs. Moreover, the Neem's resin can also be used to prevent flies from laying eggs. can be prevented by harvesting when onions have been fully matured and by avoiding scratches when harvesting and packaging. The storage must be well-ventilated so as to avoid humidity cumulated on the surface. Onions should be stored at a temperature of 0oC and in a humidity of 65- 70%. Farmers should plough better, expand the time between harvests, treat seeds, rotate crops, clean up trash and dead plants to ensure ventilation, apply fungicides to prevent by *Alernaria porri*. To reduce the risk of (by *Colletotrichum circinans*), farmers should shorten harvest time and avoid drying in the rain in harvest and storage time (Monique Hunziker et al, 2009).

In Vinh Chau, a general method for pest control has not been applied and farmers tend to abuse chemical pesticides so commercial onions are still of low quality. Therefore, the post-harvest preservation process is costly but ineffective and it affects the economic value and the health of both the farmers and the consumers. Since our economy is being integrated with the global economy, clean and safe production is a criterion we should aim at to allow Vinh Chau's red onions to be exported to bigger markets like Europe and North America.

Expected results

+ Show performance models which involve appropriate technical methods for drought and saltwater intrusion conditions, i.e. covering with straw to avoid evaporation, using organic fertilizers, maintaining soil humidity and fertility and using biological pesticides on 200 hectares (90- 100 households) in 27 months. Construct and maintain a safe and sustainable cultivation model to reduce land and water pollution and land degradation.

+ Increase yield and economic effects; the income of participating households increases by 10-15% thanks to the application of general technical methods, rather than the conventional methods.

1.4.4 Experience from the models will be gathered and shared with the local people to adapt to the unfavorable conditions caused by droughts and saltwater intrusion.

Feasible models out of 2- 3 models of red onions – other vegetables – red onions and red onions – other vegetables – aromatic rice (other vegetables being turnips, chili and Japanese yamss) with high quality and security are chosen for unfavorable conditions and they will adapt better to climate change. They can generate 10- 15% more income thanks to the use of appropriate technical methods and therefore can help improve the standard of living of the local people. Other Communes in Soc Trang will support the project when the models are introduced to them.

The multiplication of these models, which have high economic values and are safe to the ecosystem, will encourage the sustainable agriculture in Vinh Chau, Soc Trang as well as Cuu Long River Delta.

Project beneficiaries

All partners participating in the project will benefit from it, as detailed below.

No.	Partners	Benefits
1	Project participating farmers and households	<ul style="list-style-type: none"> - Receive technical and financial assistance to implement models in red onion-based crops to prevent soil degradation caused by droughts and salt water intrusion, and increase income. - Have better understanding and knowledge on sustainable land management and cultivation of red onions and other agricultural crops. - Have better awareness and knowledge about the impact of climate change issues and importance of environmental protection and sustainable use of natural resources.

2	Women Union of Vinh Chau District and Vinh Chau Commune	<p>Have the opportunity to:</p> <ul style="list-style-type: none"> - assist women members in agricultural production - contribute to the economic development and environmental protection of the district and commune - develop a working relationship with related agencies like local authorities and departments at the provincial and district levels, the research institute CLRRI and GEF SGP. - gain knowledge and experience in donor-funded community project management in the area of CC adaptation.
3	Local authorities and relevant agencies in Vinh Chau District and Commune, and the CLRRI	<ul style="list-style-type: none"> - Have the opportunity to test models in red onion cultivation crops in the CC context so as to identify suitable models to address droughts and salt water intrusion in the area. - Have a better understanding and more information on climate change impact to the area. - Be able to maintain and develop a working partnership with the project partners, i.e. the Women Union of Vinh Chau District, departments, local authorities, experts from CLRRI and GEF SGP.

2.0 COMMUNITY OWNERSHIP

2.1 Project formulation

After attending the training workshop on project design and proposal writing organized by GEF SGP Viet Nam, in cooperation with CLRRI to provide technical assistance, the women union of Vinh Chau District has conducted the following activities in the project design stage:

Organise the meeting with the local authorities of Vinh Chau District and Vinh Chau Commune to discuss about the project ideas. the local authorities confirmed that the project is very necessary and fully supported the project. They requested the relevant agencies to provide information and data requested by the women union and the project design team.

Interview the farmers, both male and female, growing red onions in Vinh Chau commune and seeking their comments on the issues facing as well as suggestions to address these issues. The project design team also visited the fields. All interviewees raised their strong concerns on the issues of extreme weather such as droughts and tornadoes, and salinisation. The farmers seem very difficult in solving their problems as they have very limited understanding and knowledge about climate change impact and technological advances in agriculture in general and in land management techniques in particular. The expressed their wish for assistance in reducing the risks from droughts and unfavourable weather conditions by transferring advanced technologies which can help them to adapt to CC impact.

Project proposed objectives, anticipated results and activities were discussed at a local stakeholder's workshop with the participation of local authorities and community and farmers in the proposed project area. The discussion at the workshop once more confirmed the need for adaptation models in growing red onion and other agriculture products as there are a lot of risks due to significantly increasing saline water intrusion and droughts and soil degradation which have been causing difficulties in community life and agriculture production and might result in poverty. The limitation of Khmer community was also stressed as a challenge in testing the project models. The local stakeholders also had expectation to learn about climate change issues and their impact especially at their local context.

The project has fully involved and mobilized local stakeholders' participation in the project development. Based on the thorough consultation, the project design team drafted the proposal to submit to GEF SGP for funding.

2.1 Project implementation

The project has been developed with the strong involvement and participation of community and farmers in the project area. Therefore, the project will ensure community ownership in the project implementation which is very crucial for project success. In order to do this, the women union of Vinh Chau District as the project grantee organization will invite a commune leader representing the community to serve as a member in the project management team. Khmer people's traditions are fully respected in carrying out project activities. Recognizing the limited capacity of the Khmer community, the project will use the appropriate methods in transferring project techniques as well as maximizing their traditional experience. Capacity building is therefore given priority aiming to ensure project success, sustainability and replicability. The project will organize community meetings for selecting participating households in a transparent

manner. The community and farmers in the project area are the key target groups for such project activities as trainings, workshops, study tours and model building. Community meetings are held during the project implementation for the community to share experience as well as review the project progress and assess the results.

2.3 Phase-Out Mechanism and Sustainability

Results from the project design phase showed that the community and farmers have strong belief that the project will be successful as it meets the farmers' expectations in stabilizing and increasing their income by addressing climate change impacts in growing red onion and other key crops. Red onion is the key traditional crops. Therefore, this will ensure that the farmers will continue with the techniques to be transferred during the model building and therefore promotes the project sustainability and replication.

Experimental models will be evaluated and lessons learned to be drawn to share among the community in the project area and other areas where the community face similar challenges in growing red onions. Technical guidelines on the design and implementation of the models will be compiled based on the results of the models and shared for the purpose of learning and model expansion and replication.

The project will work closely with relevant government agencies, including Provincial and the District Agriculture Departments who will use the results of the project models for expansion and replication in implementing the government-funded programmes and projects.

3.0 PROPONENT DESCRIPTION

Name of the proponent: Women Union of Vinh Chau District

Address: 01 Nguyen Hue Street, Vinh Chau District, Soc Trang Province

Phone: **(0793) 861254**

Representative: Ms Pham Thi Huong – Chairwoman - Mobile phone: 0169 3971 997

There are 5 staff at the Women Union of Vinh Chau District. The Women Union has its strong network with women union at the commune and village levels and there are 8,790 women members.

Working experience: focus on solidarity, democratic and open discussion. Work for the people; understand local residents' wishes and hope, especially women in hamlets; assist farmers and women in economic development, create jobs and increase income.

The Women Union of Vinh Chau District has participated in the projects in the areas of poverty reduction, gender, farmers in production and business, micro credit programmes in cooperation with the banks and therefore has gained substantial experience in poverty and livelihoods projects. The total budget of Women Union, with entrusted management from Vietnam Bank for

Social Policy in 2009 is approximately 50 billion VND. Main sponsors are the Government, Provincial People's Committee of Soc Trang, Ministry of Agriculture and Rural Development, Department of Agriculture, Agriculture Extension Center, Bank of Social Policy and others.

In addition, Women Union also encourages the local residents to participate in many campaigns like education for a clean environment, management of "Clean water project" sponsored by CARE, domestic violence, traffic safety, reproductive health, ...

4.0 PROJECT DESCRIPTION

4.1 Objective, outcomes and planned outputs

General objective: Testing models on *onion-based cultivation crops to adapt to climate change impact (droughts and saline intrusion) in Vinh Chau Commune, Vinh Chau District, Soc Trang Province*

Outcomes

Outcome 1

Raise awareness of and knowledge about climate change, droughts and saltwater intrusion and its impacts on life and production, and the importance of sustainable management of natural resources (water, land and biodiversity) for agriculture development.

Output 1.1

One flier of 300 copies for project contents and 6 panels about the constructed models to raise awareness of impacts of climate change.

Output 1.2

A total number of 3 talks and discussions about the impacts of climate change and ways to adapt to it with the participation of local authorities, related departments and the local people of Vinh Chau Commune (100 people).

Impacts of climate change and adaptation measures are integrated into activities of local organizations of Vinh Chau commune as well as training classes and conferences.

Outcome 2

Improved technical ability of the community in sustainable land use, especially techniques for sustainable land management and degraded land due to droughts and salt water intrusion.

Output 2.1

2 to 4 training workshops and on-the-field practice sessions about quick assessment of soil degradation in cultivation models of red onions – other vegetables – red onion and red onions – other vegetables – aromatic rice.

Output 2.2

A diagram of salinity level in subareas of the commune based on crop rotation model is created.

Outcome 3

From 2 to 3 cultivating models suitable to the degraded, dry and salt-contaminated soil based on the crop rotation models with red onions in Vinh Chau, Soc Trang are chosen and experimented.

Output 3.1

About 3 demonstrating fields of red onions – other vegetables – red onion and red onions – other vegetables – aromatic rice, with a diversity of red onions and other vegetables that can adapt to droughts and salt water intrusion are designed in 3 hamlets of Vinh Chau Commune.

Output 3.2

A total of 200 hectares of intensive farming of red onions – other vegetables – red onion and red onions – other vegetables – aromatic rice (other vegetables being turnips, Japanese yams and chili) is tested.

Output 3.3

About 6-8 training classes on the project models are organized for 400 participants.

Outcome 4

Monitor and assess the results of the project models, draw lessons learned and suggest appropriate and adaptable models in red onion-based cultivation crops in droughts and saltwater intrusion conditions in order to replicate the models in different localities with similar issues.

Output 4.1

Community meetings and conferences on the field are held to summarize, evaluate and draw learning experience from designing and testing models.

Output 4.2

Technical materials on the project models are compiled and reviewed by a technical board.

Output 4.3

About 2 to 3 groups of farmers are formed and trained to produce and provide seeds for the models of red onions – other vegetables – red onion and red onions – other vegetables – aromatic rice models.

4.3 Risks and barriers

Risk description	Likelihood	Solutions
Low literacy rate, especially the Khmer ethnic minorities	Medium	Focus on education, technical support and close scrutiny to help when needed.
Conflicts may arise among participating and non-participating households	Low	<ul style="list-style-type: none">- Community votes for participating households based on project criteria.- Share information about the goals, expected results and benefits of the project.
Risks of technical problems, pests diseases	Medium	Experts and the board have frequent observation and provide timely help with technical problems.
Natural disasters (unpredictable storms, tornadoes, out-of-season rains)	Medium	<p>Carefully observe and take adequate caution.</p> <p>Instruct the community to take caution.</p>

4.4 Monitoring and Evaluation Plan

4.4.1 Initial Vulnerability Reduction Assessment (VRA) Analysis

In order to do the Vulnerability Reduction Assessment (VRA) Analysis, the project design team organized a community meeting. There were the participation of commune leaders and farmers in Vinh Chau Commune, the women union of Vinh Chau District and Vinh Chau commune, and the agriculture development department of Vinh Chau District.

The objectives of the meeting were to discuss about the project models which were proposed by the project design team after their survey and to gather information about the community issues and impact of climate change in Vinh Chau commune, using the VRA questions described below.

In general, the community does not understand the climate change issues, but is particularly concerned about the changes of the climate and weather as it has affected their agriculture production and saline water intrusion impact to their life. Therefore, they fully agreed that there is a real need to take action to adapt to climate change impact in red onion cultivation and other agriculture crops as it is their key income.

Vulnerability Reduction Assessment Reporting Form	
Index 1	3,9
Index 2	4,1
Index 3	3,6
Index 4	4,3
Index 5	4,2
Total VRA	4,2

4.4.2 Project M&E Plan

The Vulnerability Reduction Assessment (VRA) will be measured at the planning stage of the project, at the mid-point, and at the end of project. Given that the VRA is qualitative and is based on the community perceptions, the first VRA was conducted to establish a baseline during the Project planning phase as described above. A second VRA will be done at mid project after all the project model building activities have been completed. A final VRA will be done at the end of the project to assess the overall impact of the project on the community adaptive capacity.

The VRA questions that will be used are as follows:

1. Rate the impact of climate change (droughts, saline water intrusion and land degradation) on your income in agriculture, especially on red onion cultivation
2. Rate your ability to cope with the negative impacts of climate change in your local context
3. Rate the impact on your livelihood if climate change impact doubles
4. Rate how effective you think this project will be in reducing your risks from increasing droughts, saline water intrusion and land degradation
5. Rate your confidence that the project will continue to reduce climate change risks after the project ends.

The Impact Assessment System (IAS) indicator will be measured at the end of the project using the following components:

- (1) The number of hectares applying the project techniques in sustainable land management to adapt to CC impact
- (2) The number of innovations developed/applied under the project
- (3) The number of policy recommendations proposed in environmental protection and sustainable land management for sustainable agriculture in the climate change context

The targets for the above are as follows:

- (1) 200 ha of land protected and prevented from land degradation.
- (2) Two (2) models will be tested by the project.
- (3) Three to four recommendations on policies in sustainable agriculture in the climate change context will be proposed to local authorities

UNDP ADAPTATION INDICATORS:

The project will contribute to the UNDP adaptation indicators adopted by the Viet Nam CBA country programme strategy, namely:

1. The number of measures that address the additional risks posed by climate change deployed as part of sustainable resource management activities;
2. Percentage of area concern in which climate change risk management activities, in the context of sustainable resource management are implemented; and
3. Number of local and national level policy recommendations proposed as a result of lessons from CBA projects

The targets for the UNDP Adaptation indicators are outlined below:

- (1) Three (3) models will be tested as part of the activities for sustainable land management for agriculture development in the project area.
- (2) More than six percent (6.25%) of rice cultivated land and 17% of red onion cultivated land in the project area will be engaged in climate-resilient farming activities.
Three to four policy recommendations proposed as a result of lessons from the project.

4.5 Project Management

4.5.1 Management Structures

The Project Management mechanism:

The Women Union of Vinh Chau District is the grantee and is responsible for the project. In order to manage the project, the Women Union establishes a Project Management Team who

manage the project according to the project objective, outcomes and planned outputs set up in the project's document approved by CBA.

There are 6 members in the Project Management Team, including:

- 3 members (Team leader (the chairwoman of Women Union of Vinh Chau District), Secretary (one staff from the Women Union), and Accountant (the accountant of the Women Union))

- 2 members representing Vinh Chau District and Commune People's Committee

- 1 member representing women and the community in Vinh Chau Commune, coming from the the Women Union of Vinh Chau Commune.

The Project Management Team will work as below.

Making the decision on project issues based on the CBA project management rules.

Project monthly meetings are organised to discuss the project issues and review the progress and use of project budget. The team leader will call for meetings when needed for the project's important issues.

Members of the Project Management Team, besides the meetings, will exchange information and seek agreement in implementing the project through various communication channels.

The project management team will assign the member to be responsible for the following functions:

- Develop project workplans and budget for the project's activities
- Organize activities according to the approved workplans and budget.
- Monitor, evaluate, report on the project's implementation progress and use of resources for CBA, the local authority and local's stakeholders.
- Sign the subcontract with the project's expert group and supervise the work done by the experts.
 - Establish working relationship with local authorities and relevant agencies to seek their supports and mobilize resources for the project.
- Manage the CBA project's resources
- Mobilize and manage co-financing given by local organizations and community, report on the results and use this resource to co-financers and CBA.
- Report and discuss with CBA to find solutions and adjustments to the problems encountered during the implementation of the project when needed
- Keep archives of the project documents.

The project's sub-contracts

The project's purchase sub-contractor

The project will have a sub-contract which provides equipment and materials for the project's demonstration models. The Project Management Team will sign the sub contract with suppliers in Vinh Chau District and Soc Trang Province for purchasing equipment and materials for the project's demonstration models.

The project's sub-contractor of technical assistance

A contract for technical assistance with a group of technical experts will be signed. The main responsibilities of the expert group are:

- Provide technical assistance in implementing the project: provide training and technical support for community to build the project's demonstration models.
- Monitor and evaluate the results of the project, draw lessons learned, and propose recommendations on policies for stakeholders.
- Develop project technical guidelines.

The expert group includes:

- 3 qualified experts (from research institutions) with specialization and experience in the fields of climate change, agriculture, soil science
- 3-4 local technical staff who have specialization and experience in agriculture and community-based projects, responsible for the implementation of activities on the ground under the experts' guidance.

- The consultant services fall under the supervision of The Project Management Team, based on the contract of technical support signed by the Project Management Team and the expert group. The latter makes plans, cost estimate and reports in accordance with to the principles set in the contract. It also has an internal working mechanism agreed by the Project Management Team. During the implementation of the project, the expert group collaborates closely with the Project Management Team to hold a meeting every six months to evaluate the project's progress, draw lessons and suggest necessary adjustments.

Project monitoring and evaluation

In project monitoring and evaluation, the project management team's responsibilities are defined as follow:

The project management team is responsible for monitoring projects in terms of technology and finance in order to gather required information for project management. Besides monthly meetings, the project management team will hold site visits (every 3 months) with aims to:

- Examine the practical situation, checking the rate of projects' activities.
- Solve potential problems during the projects' execution/implementation.
- Gathering information for building action plan, cost estimates and making reports.
- Draw lessons learnt from the project implementation.

The project management team held a meeting every 6 month with the expert group to review the progress and results based on the project workplans and technical assistance contract.

Project evaluation

Project midterm and final evaluation is conducted in the middle and by the end of the project. The purpose of the evaluation is aimed at:

- Evaluating the progress and extent of achieving the project outputs and outcomes and objective
- Evaluating the potential for project expansion and replication, making the recommendation about project sustainability and expansion and replication based on the project's results.
- Revising the project if necessary so as to best achieve the project objective.
- Drawing experience and lessons learned in project management and project models.
- Evaluating the effectiveness of projects design and efficiency and effectiveness of using the project resources.

The content for evaluation is based on the objectives, outcomes and outputs, and success indicators stated in the project document. Participatory methods will be adopted on project monitoring and evaluation. To have information for project monitoring and evaluation, baseline data will be collected during the project inceptions.

VRA meetings will be organized to assess the adaptive capacity as described above.

4.5.2 Relationship and Responsibilities of Proponent and Project Partners

The project will cooperate with the People's Committee of Vinh Chau District, Vinh Chau Commune and relevant departments like Department of Agriculture and Rural Development, Department of Natural Resources and Environment, Department of Science and Technology, etc. to conduct activities of the project, such as:

- Share the project information and lessons learned with local programs and projects with similar objectives.
- Organize communication activities about environmental issues, project models and techniques.

- Establish a working relationship with relevant agencies to mobilize support and financial assistance for implementation of the project models.
- Evaluate and summarize results, draw lessons learned, compile and publicize technical materials.
- Suggest related issues and plans for the replication of the project models.