# INITIAL PROPOSALS OF SCIENCE AND TECHNOLOGY SOLUTIONS FOR DEVELOPMENT OF DRIVING AGRICULTURAL PRODUCTS OF VIETNAM MEKONG DELTA AREA

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***Abstract:***

*Driving agricultural products of Vietnam Mekong Delta Area plays important roles in global picture of socio-economic development of the country as well as of the Area in particular. In practice, the development of agricultural production of Vietnam Mekong Delta Area gets considerable contributions from driving agricultural products. Many of these products such as rice, fruits and aquatic products demonstrated their competitive forces and potentials in international markets and provide contributions to economic development of numerous localities. However, the actual status of production activities with small scales, non-concentrated cultivation, segmented and separated practice lead to wastes of resources, unwanted internal competitions and reduced economic effectiveness. This paper provides some evaluations of existing problems and, on this basis, gives some proposals for focus solutions for further development of production of driving agricultural products of the Area.*

***Keywords:*** *Driving agricultural products, Vietnam Mekong Delta Area.*

***Code:*** *17111301*

## 1. Introduction

Vietnam Mekong Delta Area includes 13 provinces and center-controlled cities with the total superficies of 3.94 million hectares and a population of 17.5 million habitants. It makes 12% of the natural superficies and 20% of the total population of the country. It is a dynamically growing economic region with a high rate of GRDP (Gross Regional Domestic Product) of about 6.88% per year (the national GDP is VND525 thousand of billion). Strong potentials of Vietnam Mekong Delta Area is agricultural sectors which make 32.3% of GRDP by 2016. By April 2017, Vietnam Mekong Delta Area makes contributions of 54% of rice production, 70% of cultivated aquatic products and 36.5% of fruit production of the country.

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The export value of agro-forest-aquatic products of the Area has an annual average growth rate of 7.15% which is higher than the national average figure (of 5.32% per year) where agricultural production has a growth rate of 4.28% per year, aquatic products make 14.33% per year and forest products make 2.44% per year. In national scales, Vietnam Mekong Delta Area keeps the leading position in rice export (making a share of 90% of Vietnam rice export volume and 20% of the world's commercial rice market and the total export value of about USD2 billion, figures by 2016). The shrimp production of the Area makes 80% of the total country volume and gives a contribution of 60% of export values of the whole country (of about USD3.15 billion by 2016). Almost the total export volume of catfishes of Vietnam with the annual production of 1 million tons and the export values of USD1.7 billion (figures by 2016) comes from Vietnam Mekong Delta Area. The export of fruits of the Area experiences also a fast growth rate which made USD1.1 billion of values for 2010-2016 period[2].

The advantageous geological position combined with rich potentials for development of driving agricultural products is highly characteristic for Vietnam Mekong Delta Area. Its position next to the Eastern Area of South Vietnam Region which is a large consumption market and strong processing industrial capacities is also another advantage for agricultural development of the Area. In addition to that, the Area has many research institutes, universities and research centers in agricultural sectors which are the starting point for commercial production of agricultural products and together they provide the Area with growing potentials higher than other areas can do.

In recent times, however, the fixation of focused driving agricultural products and the solutions for their development experienced certain shortages which lead to ineffective exploitation of potentials of the Area and do not exhibit its key roles in national economy within the total picture of agricultural development. The team of authors, with their wishes to give contributions to settlement of the above noted problems, provides the research theme *"Research for proposal of science and technology (S&T) based solutions for exploitation of potentials, advantages and specific conditions for sustainable development of agricultural sectors in economic regions of Vietnam"*. The team had conducted studies in careful and systematic manner to give certain initial proposals of solutions for development of driving agricultural products of Vietnam Mekong Delta Area in context of climate changes for the time up to 2025.

[2] Report by Ministry of Agriculture and Rural Development (MARD), Conference on Sustainable Development of Vietnam Mekong Delta Area in Adaptations to Climate Changes, September 2017.

## 2. Research methodology

In our approach to the problems and subjects of the research, the applied methodology includes various methods such as systematic approach, logical approach, modelization method, statistic method and linear regresion method.

Regarding the primary collection and processing of information, the research team applied some methods: actual survey, team discussion, interviews by questionarries, workshops and round table sessions in local and regional levels.

## 3. Outcomes of research and discussion

### *3.1. Actual status of application of science and technology in production of driving agricultural products in Vietnam Mekong Delta Area*

#### *3.1.1. In sector of production of rice*

*Actual status of development:* Vietnam Mekong Delta Area has 85% of its superficies used for development of agricultural and aquatic productions. In comparison to other economic regions, Vietnam Mekong Delta Area had the largest superficies of rice cultivation making 55% of the total rice cultivation superficies of the country and is 3.3 times bigger than the one of the both Red River Delta Area in North Vietnam and Coastal Area of Central Vietnam together. The Area also holds a high productivity of about 6 tons harvest per hectare which is the leading position in rice production over the whole country and it holds an increasing trend. The production of rice remains a strong strategical potential of Vietnam Mekong Delta Area which gave a contribution of 90% in the total export volume of 116 million of tons and the values of USD39.28 billion of the country during a 15 year period from 1990 to 2016. 11 among 13 provinces and center-controlled cities of the Area have the annual production of rice over 1 million of tons with the leading positions of Kien Giang Province (4.6 million of tons per year) and An Giang Province (4 million of tons per year). Numerous outcomes of scientific research in fields of variety selection, technological procedures and technical advances of production were tranferred and applied in practice which help to reduce investment costs and to increase benefits. The rate of mechanization in agricultural production gets an increasing trend with the rate of growth by 1.5-2.0% per year of use of machines and equipment in production practice[3].

[3] The rate of mechanization: 89% in soil processing works and 82% in harvesting works.

In addition to researches for higher qualities of products, the promotion of trade mark of products is also a key factor to enhance the values of products. The local government of many provinces provide numerous organizations and individuals with supports for registration of trade marks of products such as parfume rice varieties of Song Hau, Can Tho, Dong Van and others.

**Table 1.** Actual status of rice production, 2005-2015 period

| Year | Superficies *(thousand of hectares)* | | | Productivity *(0.1 ton per hectare)* | | | Production *(thousand of tons)* | | |
|---|---|---|---|---|---|---|---|---|---|
| | Area | Country | Share % | Area | Country | Share % | Area | Country | Share % |
| 2005 | 3,826.3 | 7,329.2 | 52.20 | 50.40 | 48.90 | 103.0 | 19,298.5 | 35,832.6 | 53.8 |
| 2010 | 3,823.2 | 7,489.4 | 51.05 | 53.60 | 53.40 | 100.3 | 21,103.0 | 40,005.6 | 52.7 |
| 2011 | 4,094.0 | 7,655.4 | 53.48 | 54.55 | 55.40 | 98.47 | 23,269.3 | 42,398.5 | 54.8 |
| 2012 | 4,184.1 | 7,761.2 | 53.91 | 56.15 | 56.40 | 99.56 | 24,320.8 | 43,737.8 | 55.6 |
| 2013 | 4,340.3 | 7,902.5 | 54.92 | 55.60 | 55.70 | 99.80 | 25,019.7 | 44,039.1 | 56.8 |
| 2015 | 4,304.1 | 7,830.6 | 54.96 | 59.50 | 57.60 | 103.2 | 25,598.2 | 45,105.5 | 56.7 |

*Source: Annual Statistic Book 2016, General Department of Statistics 2017.*

Over the whole Vietnam Mekong Delta Area, however, the production of rice still has many shortages which do not let the Area meet its real potentials. In prevailing pictures of cultivation of rice of the Area the production level remains low scaled, segmented and traditionally heridited which are based on self-generated varieties which result in low production quantity and quality. The losses in harvest and post-harvest procedures remain high (about 14%[4]). The system of rice processing industries is not integrated and the technologies in use remain low. The system of post-preservation operations and warehouses of products remains low effective and cannot meet requirements of storing practice. It is a good practice that the food production-business chains has got socialized (a term used largely in Vietnam to mean the mobilization of social (private) sources for development which is close to PPP concepts) but the system is operating low-effectively without linkage of chains of values.

*Actual status of S&T application in production of rice in some provinces of Vietnam Mekong Delta Area*

- For seed production, many S&T advances are applied in production and preservation activities of selection and restoration of variety seeds and

[4] Report by Ministry of Agriculture and Rural Development (MARD), Conference on Sustainable Development of Vietnam Mekong Delta Area in Adaptations to Climate Changes, September 2017.

cross-breeding for creation of new varieties to be suitable to local conditions and to meet market requirements. By 2015, the structure of high quality rice varieties were used in rate of 80% of cultivated seeds. The high quality varieties including Jasmine 85, OM4218, OM2517, OM5451, OM6976 and etc. helped enhance the quality and the value of produced rice and increase benefits of farmers by more than 30%;

- For higher added values in the chain of production of rice, Vietnam Mekong Delta Area sets up many plants to use by-products from the process of prodution of rice including rice hulls, extraction of rice screening and fabrication of oryzanol, instant steamed rice, nutritious rice flour and others;
- For cultivation practice, research institutes introduce sustainable procedures in cultivation of rice in adaptation to climate changes such as procedures shortly named as "three reductions, three increases", "one need, five reductions", "one need, six reductions", saving techniques AWD (Alternate Wetting and Drying) in watering practice, large application of VietGap and GlobalG.A.P. standards. Many models of large rice fields appeared which help farmers with small scaled and segmented traditional production practice to set up large scale production models in their linkage with business communities on basis of contractual structure. Many models of application of high techs help farmers to reduce production costs by 10-20%, to reduce the use of fertilizers by 40% and to incease the productivity by 0.5 ton per hectare.

### *3.1.2. In sector of production of fruits*

*Actual status of development*: Vietnam Mekong Delta Area has the largest superficies of cultivation of fruit trees with 202.1 thousands hectares and the production of 1.2 million tons of fruits which make 50% of the total cultivated superficies and 60% of the total production of the country[5]. Due to its ecologic diversity, Vietnam Mekong Delta Area is rich in numerous species of fruits with more than 30 species in 3 groups: tropical fruits (banana, pineapple, mango and etc.), sub-tropical fruits (orange, longan, rambutan and etc.) and oil fruits (coconut, cocoa and etc.). The most developed groups of fruit trees include mango, grapefruit, orange and rambutan.

Some varieties of fruits get the code number of production regions (indication of sources) for export purpose and protection of trade marks such as Hoa Loc mango (for export to New Zealand), An Giang dragon

[5] Report "Development potentials and advantages of some main agricultural products of Vietnam Mekong Delta Area", Institute of Regional Research and Development, Workshop of Science and Technology Development of Vietnam Mekong Delta Area, 2015.

fruits, Dong Thap mango and tangerin, Can Tho orange. Some other fruits will get soon trade marks such as Thoi An tangerin and Tien Giang milk fruit. Activity for trade promotion will be pushed up for products with granted trade marks and georaphical indications.

**Table 2.** Cultivation superficies of some driving species of fruits of Vietnam Mekong Delta Area, figures by 2015

| No. | Species | Superficies (hectare) |
|---|---|---|
| 1 | Mango | 39,848 |
| 2 | Banana | 39,386 |
| 3 | Longan | 33,433 |
| 4 | Orange | 29,532 |
| 5 | Grapefruit | 25,374 |
| 6 | Pineapple | 23,924 |
| 7 | Durian | 12,582 |
| 8 | Rambutan | 8,725 |
| 9 | Tangerine | 7,330 |
| 10 | Dragon fruit | 6,242 |

*Source: Department of Crop Production. MARD, 2016.*

*Some S&T advances in production of fuit trees:* Research institutes have transferred many production procedures such as production of disease free citrus trees by grafting growth peaks, production of disease free banana trees by using tissue culture techniques, application of GlobalG.A.P standards for production of fruit trees and vegetables (dragon fruit, Hoa Loc mango, rambutan and etc.) and VietGAP standards (longan, pineapple, grapefruit, orange and etc.). During 2013-2015 period, more than 400 hectares of superficies of cultivation of driving fruit trees in many localities had met GlobalG.A.P and VietGAP standards.

In many province the techniques PCR (Polymerase Chain Reaction) are used to define the genetic purity of fruit trees and to identify the most suitable and effetive technologies which lead to high quality varieties such as Lo Ren milk trees (Can Tho Province), Hoa Loc mango (Dong Thap Province), Lai Vung tangerin (Dong Thap Province) and etc.

*3.1.3. In sector of aquatic production*

*Actual status of development:* The leading position in aquatic production in Vietnam Mekong Delta Area is the production of fish and shrimp which is second to the production of rice. This production is a long traditional cultivation of the Area and then it has a very large and fast increasing superficies for this activity. Averagely for 2006-2015 period, the cultivation

superficies experienced a growth rate of more than 1% per year and the one of production volume is 7.54% per year. The figures of 2015 are higher than the one of 2015 by 1.04 time for cultivation superficies and by 2.14 time for production volume.

The production of catfish is a strong advantage of Vietnam because other ASEAN countries have only this species of fishes from natural sources and Vietnam is the only country to raise them industrially. Actually the cultivation of catfishes develops also in other regions of the country but Vietnam Mekong Delta Area remains the main supply sources for export purpose of the country (making 99.2% of the total export volume). The total water supreficies for cultivation of catfish in Vietnam Mekong Delta Area is 4,552 hectare, the total production is 1.15 million tons and the export values are USD1.71 billion. The largest production sources of catfish include An Giang, Dong Thap and Can Tho Provinces with a share of 75% of the total cultivation superfcies of the Area. Other provinces including Ben Tre, Tien Giang, Soc Trang, Vinh Long, Hau Giang and Tra Vinh, all together, make only 25%. In this sector, the S&T contributions are active in production and selection of fast growing and disease resisting varieties. The selected fishes which were registered as PanGI by Vietnam National Office of Intellectual Property (NOIP) are recognised as the top stud catfishes in Vietnam and in the world with a particular growing rate over 20%. They can satisfy 60% of needs of second generation stud catfishes for the provinces in Vietnam Mekong Delta Area.

**Table 3.** Actual status of aquatic production in Vietnam Mekong Delta Area

| Years | Cultivation superficies *(thousand hectare)* | | | Aquatic production volume *(thousand tons)* | | |
|---|---|---|---|---|---|---|
| | Area | Country | Share % | Area | Country | Share % |
| 2005 | 680.20 | 952.60 | 71.40 | 1,846.27 | 3,466.80 | 53.26 |
| 2010 | 742.70 | 1,052.60 | 70.56 | 2,999.11 | 5,142.75 | 58.32 |
| 2011 | 729.30 | 1,040.50 | 70.09 | 3,169.72 | 5,447.42 | 58.19 |
| 2012 | 734.10 | 1,038.90 | 70.66 | 3,385.99 | 5,820.75 | 58.17 |
| 2013 | 753.50 | 1,046.40 | 72.01 | 3,408.29 | 6,019.73 | 56.62 |
| 2014 | 758.50 | 1,056.30 | 71.80 | 3,604.81 | 6,333.16 | 56.98 |
| 2015 | 757.00 | 1,057.30 | 71.50 | 3,703.44 | 6,582.13 | 56.26 |

*Source: Annual Statistic Book, 2013*

As it is for the whole country, the cultivation of shrimp was practiced since very long years ago and the cultivation was made with fresh water and in natural conditions. Many experiences were accumulated as well as modern raising techniques were applied which lead to a boom of the cultivation of shrimp in brackish water in Vietnam Mekong Delta Area. The cultivation

superficies increased from 552 thousand hectare by 2005 to 633.9 thousand hectares by 2015. By 2016, despite of negative impacts from low sea water and heavy disease and epidemics, the total production of the Area was about 252 thousand tons and the annual growth rate was 2.8%. The highest production comes from Ca Mau, Bac Lieu, Soc Trang, Kien Giang, Ben Tre and Tien Giang Provinces. Among them, only three provinces - Ca Mau, Bac Lieu and Soc Trang - produce 70% of the total volume of the Area. Continuously during many years, producing enterprises in the Area get outcomes from S&T research to gradually master the different stages in shrimp production chains including stud production (Viet-Australia Company), production of food for shrimp cultivation (Tom King Company), models of high tech application for cultivation (Truc Xuan Company, Viet-Australia Company), export processing (Minh Phu Corporation), by-product processing (Vietnam Food Company). Local producers already mastered the technology of production of high growing and disease free stud production and selection (growing rate 28% and surviving rate 17% in comparison to the ones supplied initially by traditional markets). Other techniques were applied such as intensive farming technologies, control of disease and epidemic, initial steps in production of chitin, chitosan and hydrolytic protein flour from wastes in shrimp processing chains.

*Some typical S&T advances are applied in aquatic product cultivation:* In this field, contributions from S&T researches were clearly actual for solving problems such as production of quality standard meeting studs, application of high and advanced technologies for farming procedures. These measures lead to considerable enhancement of values and volumes of products of the Area. In addition, the advanced methods were developed and applied for fast diagnostics of disease and prevention of epidemics in chains of aquatic cultivation such as immunologic diagnostics (ELISA method) and Polymerase Chain Reaction (PCR method).

Many provinces provide supports for enterprises to apply various technologies for more secondary products such as application of cultivation area management methods of Global G.A.P, use of mud for production of microbiologic fertilizers, intensive use of by-products in catfish processing chains for production of functional foods and refined oils and etc.

### *3.2. Some remaining problems in science and technology application for development of driving agricultural products in Vietnam Mekong Delta Area*

During recent years, the Government, authority agencies and local administration issued 8 main line plans, guidelines and policies for socio-economic development in general and agro-forest-aquatic sectors in particular for Vietnam Mekong Delta Area. Most recently, the Prime

Minister issued Decision No. 245/QD-TTg on 12th February 2014 for approval of Master Plan of Socio-Economic Development of Vietnam Mekong Delta Area up to 2020 with visions to 2030. On this basis, Ministry of Agriculture and Rural Development (MARD) approved a series of master plans for development up to 2030 in many aspects such as development of irrigation systems, rural agriculture and fishing ports, cultivation of aquatic products and fruit trees, and shift of crop structure for lands from rice cultivation. However, the development which was conducted in unsustainable manner, exhibited certain existing problems, namely:

*First*, the over-exaggerated concentration of efforts for intensive rice farming, even with the practice of three crops per year, leads to alarming signals for ecology and environment consequences, biodiversity aspects and low effective use of natural resources. Many localities in the Area which were planned for two crops of rice cultivation per year expanded the third crop during recent years and then this move leads to serious impacts to environment and fertility of cultivation lands.

*Second*, the superficies of cultivation of shrimp and catfish in aquatic production increased fast without adequate control of environment lead to heavy epidemics and many diseases. Farmers also abuse the use of fertilizers and agricultural chemicals, even some prohibited chemicals and anti-biotics in aquatic cultivation. In addition, the system of control, inspection and supervision of quality of studs, protection chemicals and foods remain ineffectively operating. This situation leads to low-ensured quality and food safety of raising animals and unsustainable development which cause impacts to competitiveness of export products. These weak points limit the access of agricultural products of Vietnam Mekong Delta Area to export markets with high economic values since export products are difficult to meet technical standard barriers.

*Third*, the organization of production and development chains of agricultural products is a crucial point in efforts for agricultural development in Vietnam Mekong Delta Area. Majority of farmers in the Area have small scale of cultivation and limited capitals and then experience heavy losses from market pressures (input and output price fluctuations). Existing collective organizations and vocational associations are not successful in mobilizing their effective actions of support and attracting active participation from farmers then they cannot develop linkages between farmers and enterprises in basis of close contractual agreements.

*Fourth*, three weakest points in S&T aspects in agricultural sectors of Vietnam Mekong Delta Area are the selection of studs (animals, plants and trees), production and supply of foods and deep processing technologies. In

the Area which is even recognized as the capital of aquatic production of the country there is no developed facilities for production and supply of studs and the potentials in production of stud remain very limited[6]. Heavy part (more than 80%) of foods needs to be imported from overseas sources or supplied from fully FDI domestic sources. Low controlled measures (heavy shares up to 80% of costs in income structures) lead to great risks and losses by farmers facing to price fluctuation under market speculation by suppliers. Agricultural and aquatic product processing enterprises are slow in technological innovation moves. The structure of products remains frozen ones with low values. Deep processed products remain low in quantity and competitive force. The level of mechanization in processing procedures is low also which leads to massive use of labors and low values of produced items.

*Fifth*, there exist shortages in linkages between actors inside agro-forest-aquatic sectors. The irrigation system in the Area is still focused to serve the cultivation of rice without adequate cares for other types of plants and aquatic cultivation. Another problem is the loosen links between the re-structuring process of agricultural sectors and the development of communities, between the sustainable agricultural living modes and the suitable agriculture and rural infrastructure development.

### *3.3. Directions of development of driving agricultural products of Vietnam Mekong Delta Area by sub-areas*

In this study the regional division of Vietnam Mekong Delta Area is based on the Development Plan of Mekong Delta built jointly by Vietnamese and Dutch Governments by 2013. The way of regional division allows to make analysis and to define development directions of agricultural products in a way more suitable to actual conditions of climate changes. According to it, Vietnam Mekong Delta Area is divided into three sub-areas, namely:

***Up-stream sub-area*** includes Dong Thap, An Giang and Long An Provinces. In long term visions it will be the key region of rice production which would secure the national food security, and specialized cultivation of catfish in modern and sustainable ways. In more details it includes:

- *Rice cultivation:* Setting of large fields for specialized cultivation of rice with 2-3 crops per year. The cultivation superficies would be thousands hectares which is planned to follow advanced cultivation modes, high tech application, integrated mechanization, 4.0 technology based

[6] Actually, Vietnam Mekong Delta Area has more than 800 farms for production of shrimp studs but they scatter over the whole Area with small scale of production, low quality of produced studs and low capacity of supply (meeting only 50% of needs).

integration of irrigation management with the global management system. The production will be conducted by a large scale of production by farmers and cooperatives with large enterprises. A road map will be defined for a shift of the total deeply submerged superficies of 2-3 crops of rice cultivation to a new mode of agricultural production suitable to submersion conditions. The high quality species of rice will be used to enhance the trademark of Vietnamese rice in international market;

- *Aquatic cultivation*: Pushing up the cultivation of catfish by maximally using advantages of fresh water sources. In context of climate changes and challenges from markets, it is necessary to keep stable the superficies of cultivation of catfish, giant freshwater shrimp and other specific local aquatic products, to develop production chains and to pay more attentions for higher quality of products. An Giang Province will be indicated to become the high tech hub to supply studs of catfish in a three level structure. The province is targeted to satisfy totally with the demands of studs of catfish for Vietnam Mekong Delta Area and give parts to set up the sector of catfish cultivation in sustainable and effective manner in the Area.

***Middle sub-area*** includes Tien Giang, Vinh Long, Can Tho, Hau Giang Provinces and parts of Ben Tre, Tra Vinh, Soc Trang and Bac Lieu Provinces. In long term visions, it will be the key region of production of export fruits of the country with partial use of lands for cultivation of rice, vegetable (the use of these lands should be flexible in vision of fast shift to production of rice if needed).

- *Fruit trees*: Developing regions specialized in cultivation of mango, grapefruit, other citrus trees, durian and others. The system of cultivation fields should be developed in advanced models with active watering-draining systems. The fruit production chains should be linked to a system of on-site initial processing and supporting services and deep processing clusters in large cities for maximal use of values of produced fruits. Attentions should be focused on application of Global G.A.P. standards, organic cultivation principles, building up of trademarks, control of quality and food safety requirements;
- *Aquatic cultivation*: Developing strongly freshwater aquatic species (catfish, giant freshwater shrimp) and other specific local aquatic products in Can Tho, Vinh Long, Hau Giang and Tien Giang Provinces. Brackish water cultivation of aquatic products should be developed in some districts next to coastal zones of Kien Giang, Bac Lieu, Soc Trang, Tra Vinh, Ben Tre and Tien Giang Provinces;
- *Specialized cultivation of rice*: Building zones of 2 crop specialized cultivation of rice in 20-50 km distance from coastal lines in Tien Giang,

Kien Giang, Vinh Long, Can Tho and Hau Giang Provinces. A special structure of rice varieties should be defined with focus for middle duration of crop (115-125 days), perfume species and high quality species.

***Coastal line sub-area*** includes parts of Tien Giang, Ben Tre, Tra Vinh, Soc Trang, Kien Giang Provinces and big parts of Ca Mau and Bac Lieu Provinces. This area falls under most impacts of climate changes. In long term visions, it is the key region of cultivation of aquatic products of the country where the next target is the value of USD10 billion of shrimp export by 2025.

- *Aquatic cultivation*: Keeping stable the existing superficies of cultivation of tiger shrimp (about 600 thousand hectare) in parallel with developing advantageous positions of shrimp cultivation in mangrove zones as well as combined cultivation of shrimp and rice. This would allow to keep competitive advantages in international export market of tiger shrimp. Particular attentions should be reserved for cultivation of white shrimp in favourable localities in visions to enhance export volumes and values of white shrimp.

  It is necessary to build up agricultural zones of high tech application for development of shrimp cultivation in Bac Lieu Province which is targeted to become a leader in incubating technologies, introduction of research results in production activities, transfer of technologies, attraction of investment by enterprises for creation and application of high techs for cultivation of shrimp in Bac Lieu Province and further propagations over Ca Mau region as well as Vietnam Mekong Delta Area. The industrial cultivation of shrimp should be developed in advanced directions with production of commercial goods, high level of quality and efficiency, strong competitiveness and sustainable development in context of climate changes.

  Ca Mau Province should become the biggest hub of shrimp cultivation (particularly eco friendly cultivation) of the country. The cultivation model should be defined suitable with application of high techs for higher productivity, quality, quantity and competitiveness of products with a tough vision to high adaptation to climate changes and protection of eco environment.

- *Rice-shrimp alternate cultivation*: Developing the zone 10-20 km far from coastal lines in Tien Giang, Ben Tre, Soc Trang, Tra Vinh, Bac Lieu, Ca Mau and Kien Giang Provinces for alternate cultivation of rice and shrimp. Specific and perfume rice varieties should be used to produce specific local products and the suitable geographical indications should be built up for high class markets.

### *3.4. Initial proposal ode some solutions for development of driving agricultural products of Vietnam Mekong Delta Area*

On basis of the actual situations and above noted orientations, Vietnam Mekong Delta Area should carry out adequate implementation of the following groups of solutions:

#### *3.4.1. Restructuring the agricultural production in the Area*

*First, the shift of agricultural production structure in direction of production of commercial products and formation of agricultural production zones with high tech application.*

- The re-set of agricultural production practice (the master plan of socio-economic development in context of climate change, and of land use master plan are to be reviewed to meet the integrated plans with East Area of South Vietnam Region) should be conducted. The targets are the regional linkage on basis of market supply-demand relations in the region, higher efficiency of production activities and higher quality and values of agricultural products. In addition, local authorities should offer favourable conditions for establishment and enhancement of links in enterprise-enterprise, enterprise-farmer and farmer-farmer relations which would lead to a set-up of new organizational modes and close links in the chain of production, processing and consumption of agricultural products;
- The re-structuring of agricultural production and the development of agricultural economy in Vietnam Mekong Delta Area are to meet the direction of production of commercial products. In short visions, the attention should be focused on set-up and propagation of the model of large cultivation fields, specialized cultivation zones and the enhancement of linkage between "5 actors"[7] in a new approach of cooperation organization. The re-structuring process should pay attentions to improvement and innovation of mechanisms and policies to ensure the harmonic benefit sharing between actors involved in the chain of production and use of produced driving agricultural products;
- The radical adjustment is to be conducted in production of rice, catfish and shrimp, in long term visions, in direction of re-allocating adequately investment resources, developing a taught linkage from production to consumption and export of products for higher values of made products to bring in more benefits for communities of producers and traders;

[7] Manager - Businessman - Scientist - Farmer - Financier.

- Efforts are to be focused for the chain of production and supply of studs (animals and trees) which target new varieties with higher productivity, quality and values. The process would involve the faster introduction of new technologies in all the production stages: producing, harvesting, storing, processing, transporting and consuming;
- Investments are to be made for construction and implementation of pilot production zones based on S&T advances, particularly in bio and information technologies, application of new models of linkage, modern standards of management and new knowledge. The approach should be extended to create break-through moves in agricultural production of Vietnam Mekong Delta Area.

*Second, the linkage of producing zones, the innovation of modes of organization of production and consumption of products. It is the crucial factor in face of increasing tough competition.*

- For specialized rice cultivation zones:

The programs are to be conducted to provide supports for best farmers to gather cultivation lands, namely: long term credits for purchase or lease of cultivation lands; exemption or reduction of land transfer fees between farmers in specialized cultivation zones under plans, simplification of procedures and supports for registration, survey and map drawing in cultivation land transfer process between farmers in specialized cultivation zones.

A new model of cooperatives or unions of cooperatives is to be set-up for farmers in the zones. This relates also to the linkage of farmers in large scale models of cooperatives with well established links of input and output connections, particularly with enterprises-hubs of exports to large markets.

The producing stages should be linked closely in a chain including production and supply of studs, cultivation, preservation, processing, distributing and consumption (domestic or export markets). For a stable and sustainable production of driving agricultural products, in addition to mechanisms to set-up interlinks between localities the attentions should be focused on specific features of actual products.

- For specialized aquatic production zones:

Organizational modes are to be applied to develop links between enterprises and farmers on basis of models of transparent, sustainable and fair contracts.

Local authorities should issue the modes of lump sum based contracts for use of mangroves and coastal lands.

Coordination works should be developed with non-government organizations for application of community based models to create chains of values.

Modes of interlinks between enterprises should be developed also on basis of mechanism of transparent operations, fair competition and united activities for higher capacities and stronger position in negotiation and supply of technical requirements in export of technological advances. These moves would enhance competition positions with external suppliers while reducing competition among internal actors, particularly in efforts for investments in terms of lands, capitals and technologies (the cultivation of catfish is the best illustration).

- For specialized fruit tree cultivation:

The diversified production is to be organized under multiple forms including household gardens, farms and new forms of cooperatives.

The linkage is to be developed for farmers and organizations of farmers with enterprises of large scale of consumption, home as well as overseas, for immediate provision to supermarkets and retail sale chains.

The linkage of "5 actors" should be more essential and effective where the attention should be paid more for benefits of farmers because they are the factor which may change all directions of efforts if their benefits are ignored.

*Third, the change of mindset and modes of investment and the shift from investment by segments to investment by chains in production process.*

The mode of investment by chains would let avoid unbalanced investments which could lead to instability in process of production and consumption of products. For that, it is necessary to define stages the production of products pass through in the production chain for setting up plans and policies to attract suitably all sources of investment.

The program of regional linkage should be implemented to develop driving agricultural products in chains of value. First of all, the region needs to have a type of orchestra conductor to steer and to manage activities and, at the same time, to share information and potentials of every related localities. It relates also to the studied problems in global S&T databases.

### *3.4.2. Market solutions for driving agricultural products of Vietnam Mekong Delta Area*

*First*, investments are to be made for market investigation and forecast, home and overseas, for enterprises to promote driving agricultural products

of localities. Enterprises also need to coordinate among themselves in building up marketing strategies and product presentation to reduce costs of promotional activities. In addition, it is necessary to build up and develop trademarks for these driving agricultural products which would be a break-through move in market development efforts. Particularly, State agencies and State own corporations need to coordinate effectively supports for strongly based outputs of driving agricultural products of the Area.

*Second*, service organizations and support programs should be set up for realization of regulations for trade promotion.

*Third*, some trials should be conducted for new trade mechanisms and formalities (quarantine, customs clearance and etc.) which would provide most favours to reduce costs and time of transaction and transportation of driving agricultural products.

*Fourth*, efforts should be made for connection to large S&T centers in the world for cooperation of research, transfer of technologies and joint actions of investments.

*Fifth*, joint efforts for PPP should be promoted to build up and develop 10 agricultural-aquatic trademarks up to the world's level, to build up a system for origins of products, analysis and warning of risks for chains of values of shrimp, catfish, fruits and rice.

*Sixth*, supports in terms of credit provision should be made for development of driving agricultural products of the Area with accents to be focused for: (i) enterprises and projects related to production and processing of agro-aquatic products; (ii) projects to develop storing facilities for agro-aquatic products; (iii) projects for transfer of technologies; (iv) projects to support cooperation between research institutes/universities and enterprises in research, transfer of new technologies, particularly the ones related to driving agricultural products.

### *3.4.3. Vocational training and development of human resources*

*First*, programs should be implemented to attract highly qualified experts and talents for key centers of education, training and research of the Area;

*Second*, programs should be promoted to attract young and well educated graduates to rural areas, namely: granting of scholarships for selected students, special scheme of recruitment for permanent positions, transparent mechanisms of recruitment practice in State agencies for highly capable young staffs, offer of capitals for development of services in private sectors, supports for cooperatives and enterprises to employ young and well educated staffs, to train them further and to ease administrative procedures of recruitment;

*Third*, plans should be prepared and conducted to attract experts from research institutes/universities to support local facilities, to make orders of S&T products and services, consulting services and information provision;

*Fourth*, international technical support sources should be mobilized to build up programs and projects of agricultural re-structuring in Vietnam Mekong Delta Area. The supports may be provided to set up production-business models to meet actual local conditions, to link chains of values, to set up management hubs of key sectors, to link markets and etc.;

*Fifth*, the system of agricultural vocational training activities needs to be re-structured with promotion of start-ups. Financial supports should be provided for agricultural promotion with focus for rural farmers and for activities of vocational education, transfer of agricultural production-business advances and access to information;

*Sixth*, the roles of centers of vocation training at regional level should be promoted to prepare instructors of technical skills for farmers which should be meet practical needs and development of local production-business activities. And, above of all, the Government should make Vietnam Mekong Delta Area as the key area for implementation of programs of vocational education for farmers during 2016-2020 period.

### *3.4.4. Solutions for development of research and application of S&T advances in production and processing sectors*

*First,* the sources should be mobilized as priorities for research and application of high techs in cutting edge sectors of driving agricultural products in Vietnam Mekong Delta Area such as bio technologies, information technologies and new materials for selection and creation of new varieties of animals, plants and fruit trees as well as procedures in the chain of cultivation, preservation, storing and processing of agricultural products. These activities target to create new break-through moves in terms of productivity, quality and production efficiency in context of climate changes;

*Second,* research and application should be made to restore, select, create and import varieties of high quality and good adaptation capacities. It relates to development of facilities to produce and to supply seeds, studs and varieties (rice, fish and fruit trees);

*Third,* research and application should be made to offer good formulas of foods for animal and aquatic production. The system of supply of foods has to meet fully the needs of the Area.

*Fourth,* research and application should be made to enhance technical level and high tech application for the close loop of high level agricultural production for better quality, productivity, safety and environment protection;

*Fifth,* research and application should be made to develop bio production system on sustainable and environment friendly basis.

The concrete measures include:

- Vietnam Mekong Delta Area Research Institute of Rice and South Research Institute of Fruit Trees should be developed up to international level to cover needs of the Area. The development priorities should be focused to create joint ventures with international research institutes and business communities. A project is to be developed to establish Research Institute of Aquatic Production of Vietnam Mekong Delta Area in Can Tho City;
- Service supports should be promoted for farmers to receive and to apply S&T advances. Farmers and enterprises are empowered to evaluate and to order products from research organizations. S&T activities should be socialized. Agricultural promotion activities should be down shared to the level of farmer organizations and enterprises;
- Programs should be set up to support modernization of machines and mechanization of agricultural production. The coordination between financial institutions and enterprises should be enhanced to develop tools of financial loans for farmers.

## 4. Conclusion

The development of driving agricultural products in Vietnam Mekong Delta Area turns out to be the crucial and objective demand to enhance competing capacities of products and to exploit potential advantages of the Area. In the recent time, due to numerous reasons both objective and subjective, the development of driving agricultural products could not meet expectations. Therefore, in close future time, the Area needs to implement many integrated measures, particularly S&T based ones, to provide a new platform for sustainable development of driving agricultural products. They should be put in urgent agendas to meet global trends of international economic integration./.

**REFERENCES**

1. Le Thi Hong Gam, 2014. "Development of driving agricultural products of Vietnam Mekong Delta Area: actual status and solutions". *Report at Workshop for exploitation of socio-economic potentials of provinces in Vietnam Mekong Delta Area in inter-regional linkage approaches*.

2. Le Tat Khuong, 2015. "Potentials and advantages of development of some key products of Vietnam Mekong Delta Area". *Report at Conference for S&T Development of Vietnam Mekong Delta Area*, 2015.

3. Tran Anh Tuan, 2016. "Development potentials and advantages of some mean products of Vietnam Mekong Delta Area". *Can Tho Province Magazine of S&T,* Issue 02 (56), 2016, p. 11.

4. Le Tat Khuong, 2017. *Studies of S&T based solutions for exploitation of potentials, advantages and specific conditions for sustainable development of agricultural production in economic regions of Vietnam.* MOST level research project. Institute for Regional Research and Development.

5. Ousmane Dione, 2017. (in Vietnamese) "Development of Vietnam Mekong Delta Area: A regional development orientation needed". *Tia sang Magazine*, 01st October 2017, <http://tiasang.com.vn/-dien-dan/Phat-trien-DBSCL-Can-dinh-huong-mang-tinh-khu-vuc-10943>

6. *Solutions for shifting of agriculture production for sub-areas in Vietnam Mekong Delta Area.* Special report. Ministry of Agriculture and Rural Development (MARD), 2017.

7. *Final Report of S&T activities of 2017 and directions for implementation of tasks of 2018*, MOST, 2018.