

**STUDY OF APPROPRIATE TECHNOLOGY TRANSFER MODES  
FOR SOCIO-ECONOMIC DEVELOPMENT PURPOSES  
IN RED RIVER DELTA REGION -  
STUDY CASE FOR AGRICULTURAL SECTOR**

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**Abstract:**

*During the recent time, numerous enterprises in Red River Delta Region have conducted the implementation of many advanced technologies from developed countries for improvement of production - business activities. As result, some sectors such as agriculture, processing industries and etc. manage to modernize their facilities and turn their products to higher competition level and then help Red River Delta Region get a development shift faster than other regions in the country. We should note, however, that there are a variety of modes and ways for realization of technology transfer process and certain short aspects among them still limit the efficiency of technology transfer activities in agriculture sector. Every technology transfer mode has its own strong and weak aspects which need to be analyzed properly to learn lessons necessary for further moves to issue policies and mechanisms for better development of technology transfer activities. In this optics, the research topic "Study of appropriate technology transfer modes for socio-economic development purposes in Red River Delta Region" had been implemented to target the evaluation of actual status and difficulties of technology transfer in certain key economic sectors (the research scope of this paper being focused on agriculture sector) in the Region. The model of researches can be extended for other economic regions.*

**Keywords:** *Technology transfer; Agriculture; Red River Delta Region.*

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## **1. Some basic features in technology transfer activities in agriculture sector in Red River Delta Region**

Red River Delta Region has a very important feature: low average agricultural land of 0.42 hectare per household (the figure of Mekong River Delta Region is 0.78 hectare per household).

Every household gets small patches of cultivation land where they cultivate various species of plants and animals. Every of them requires a different production procedure and then the transfer of scientific and technologic (S&T) advances conducted in the region faces many difficulties.

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Also, the agriculture production in Red River Delta Region experiences big post-harvest losses (11-13% for rice and 25% for fruits and vegetables). Agriculture products are made mainly in form of raw materials or semi-products which have very low values (only few products pass deep processing processes) then lead to low rates of economic efficiency, investment volumes and innovation of technology in agriculture production and processing activities.

Agriculture production is a very diversified, complex, largely expanded, weather dependent and highly risky sector. Agricultural products are made in large volumes and diversified categories which may be consumed shortly or stored for a long period. The technology transfer in agriculture sector also has specific features different from the ones made in other sectors which are seen in the actors involved in technology transfer process, namely research organizations, producing enterprises and farmers. Also, transferred products (plants, animals, bio species and etc.) are those objects which are very sensible to eco environment and socio-economic conditions. A commonly observed difficulty of technology transfer activities in agriculture sector is a large space of implementation where tens thousands of households get involved and many of them still have limited education level, difficult economic base and lack of information.

But here we see certain advantages in the matter. Red River Delta Region is rich with research organizations in agriculture sector. Here many new technologies were successfully developed and transferred to producers. During recent years, the agriculture sector in Red River Delta Region gets successful to produce certain products to meet demands of consumers and standards of export needs.

Technology transfer activities are conducted in many various modes, from simple to complex ones, depending on specific natures of transferred technologies, involved parties and transfer purposes. In this study, the technology transfer modes are understood as the combination of forms, procedures and operational mechanisms of transfer activities.

Technology transfer modes are highly diversified, continuously developed and updated to keep pace with the common process of socio-economic development. Regarding Red River Delta Region, some highly specific technology transfer modes in agriculture sector can be summarized as follows, namely:

- Fully integrated technology transfer mode including patent purchase and rights;
- R&D based technology transfer mode;
- Training based technology transfer mode;
- Project-program based technology transfer mode;
- Model survey based technology transfer mode;

- JV enterprises and partnership based technology transfer mode;
- Expert-consultant based technology transfer mode.

## **2. Analysis and evaluation of technology transfer modes in agriculture sector in Red River Delta Region**

Technology transfer in agriculture is made in highly diversified in modes and objects. Certain of them are suitable for some technology transferring actors but remain unsuitable for other ones. At the same time, there exist modes which are suitable for many types of technology transferring actors and technological research and development (R&D) organizations.

### ***2.1. Fully integrated technology transfer mode including patent purchase and rights***

This mode appears very suitable for technology R&D organizations and enterprises which is implemented mainly through import of technologies for local users (import of seeds and studs, equipment and etc.). This mode is implemented by many enterprises in Red River Delta Region for technology purchase contracts of original seeds, plants and studs or bio species of high economic values.

- For cultivation business, transferred technologies in general are simple because the volume of plants imported by S&T organizations and business enterprises is not big (mainly seeds which are imported in a volume of some kilograms). Then the plant studs get selected and developed in professional ways and then reviewed and acknowledged by expert councils for larger application as “original studs” of high values;
- For stockbreeding business, the transfer of animal studs is usually very high cost (in connection to stud species and quantity of import). The costs also relate to the weight of animal studs as well as their specific quality requirements of species. For example, a survey conducted in Dabaco Pig Studs Ltd. Co. (Tien Du District, Bac Ninh Province) show that the costs for transfer of new species young pig studs of weight 40-50 kg per stud (Check 1) may raise up to thousands USD per animal and the costs for grown up ones of weight 80-100 kg per animal may raise up to tens thousand USD per animal, and it is necessary to import fully the four lineages.

In agriculture practice, this mode of technology transfer is highly advantageous which is to meet many requirements in quantity and quality aspects (fully and wholly transferred to meet requirements of technical production processes) in conformity to technology transfer contracts signed by the partners. This mode, however, is usually high cost because the

transferors are to transfer almost the whole set of know-hows, integrated technological processes, and training and instruction of implementation for further direct and effective application by transferees. Also, administrative procedures related to licenses for import of technologies from State authority agencies are usually cumbersome and time consuming.

## **2.2. R&D based technology transfer**

This technology transfer mode is popular and diversified in agriculture practice in terms of application and contents. It is necessary to note that the implementation of self-management mechanisms in R&D organizations leads to more freedom in technology transfer activities. Almost all the scientific research organizations in agriculture sector in Red River Delta Region establish their own S&T service units and, then, their research results get transferred soon to application after having been admitted by competent agencies of Ministry of Agriculture and Rural Development (MARD). These research results when applied in practice give great contributions to agricultural production. Transferred technologies are usually focused on certain fields such as stud production (plants and animals), crop protection measures and cultivation advances. This technology transfer mode has certain advantages, namely: higher practice adaptive capacity and faster production applicability (because they are research results of domestic organizations) and lower costs (in comparison to the fully integrated technology transfer mode). This mode, however, is usually accompanied with some problems: they have short lifetime and are easily substituted by new technologies.

This technology transfer mode is conducted usually in the following two ways:

- Technology transfer is carried out being supported by State institutions. Survey results show this technology transfer mode is realized mainly through agriculture promotion channels (from National Agriculture Promotion Center down to province and district centers) and then further to farmers who are beneficiaries of support measures. In this mode, the technology transfer is carried out with State financial supports to cover fully costs of training and partially material purchases for demonstration and application of practical models (plant and animal studs, fertilizers, plant protection chemicals and etc.);
- Technology transfer is carried out by S&T service units of research organizations. This can be realized in two ways: *First*, the technology transfer is realized on basis of research projects or production projects through research-transfer contracts between parties. It is the mode where producers are the most beneficiaries because of its high social support nature. *Second*, the technology transfer is realized on basis of direct

moves of technology transfer to transferees (this mode is usually implemented in stockbreeding business or single time technology transfer). In this technology transfer mode, producers and technology owners look each for other and the two parties sign the economic contracts for technology transfer. In practice, this technology transfer mode does not use State budget and technology transferors get more benefits from transfer of their own technologies.

### ***2.3. Training based technology transfer***

It is a popular and compulsory technology transfer mode in agriculture sector because this is the main way to transfer technologies to farmers. This mode is realized mainly in the following ways.

*First*, multiple days training courses which are carried out on basis of S&T cooperation programs with foreign partners. This mode is applied when local research organizations or management agencies organize training courses in coordination with foreign research organizations. In practice, enterprises and S&T organizations in Red River Delta Region sent their staffs to attend training courses held in Asian Institute of Technology - AIT (Thailand) or International Rice Research Institute - IRRI (Philippines) or to participate in survey missions conducting in other countries such as China, Taiwan, Japan and etc.

*Second*, short days training courses which are carried out for local officials and farmers. This mode can be one of the two types:

- Technology transfer held for local officials: When a new technology is to be largely transferred to farmers, it also should be conveyed to a group of local officials from conceptual aspects to actual techniques. For example, when a new plant species is to be applied the provincial level management agency should hold training courses for local officials which are to master the transferred technology and then convey it to farmers;
- Technology transfer held for producers: This category of technology transfer activities is very necessary. It has no way to be missed in agriculture sector because farmers are large community, and they own resources for application of technologies. Also, they are, at the same time, applicators of new technologies. So, farmers should catch new technologies in details as well as values and benefits the new technologies can bring them. As result, farmers are voluntarily and consciously to apply transferred technologies. This technology transfer mode can attract a large community of participants through year-around activities of training courses held by central agencies and local ones. The scope of training courses can be very large including a new way to

organize cultivating and breeding activities, application of a new plant or animal species, new plant and animal protecting measures which are to be implemented for the coming time or next crops.

This technology transfer mode requires State financial supports and it can produce social effects higher than other standard investment rates. At the same time, this technology transfer mode attracts and involves more producers during training courses and direct discussions where experiences and know-how can be largely exchanged. The latter may be least but the effects may be huge because they may lead to further researches and surveys to set up new technical procedures to be applied in agricultural production of the region. In implementation stage, however, farmers may not follow strictly technological indications due to their different economic conditions or perceptions. Then, outcomes of this technology transfer mode may vary from one to another group of farmers and households.

#### ***2.4. Project-program based technology transfer***

This technology transfer mode relates to actual objectives and economic indicators of projects or programs. Then, the implementation of technology transfer, as norms, has fixed plans, schedules and financial resources provided by State budgets or foreign supports. This technology transfer mode usually has a narrow scope of objects, short time of implementation, small scale of application and limited number of participants. The transfer mode is usually limited by establishment of models through demonstration and instruction for application of newly acknowledged technologies. The lifetime of this type of transferred technologies is not long because these technologies would not be further applied or promoted when the project or program get terminated.

There are examples to illustrate this project based technology transfer mode which are seen through national objective programs such as the MARD implemented programs for development of Sind cows, lean pigs and crossed rice varieties. These programs have the time of implementation from 10 to 15 years. In practice, the program of crossed rice varieties was implemented for 10 years and reached a scale of 50-60% of rice cultivation lands in Red River Delta Region. The same situation was observed for development of Sind cows where only 50% of born calves were of Sind variety in Red River Delta Region. The program of development of lean pigs was implemented through introduction of foreign varieties to improve quality of existing local varieties in Red River Delta Region. The stockbreeding activities of foreign pig varieties face many difficulties because they can be applicable only in large scaled business activities from 100 to 200 pigs or by industrial scale stockbreeding enterprises of tens thousand animals. As practice, households raise pigs only from F1 or F2 varieties for commercial purposes.

Regarding the project based technology transfer mode annually has tens projects to be implemented in agriculture sector in Red River Delta Region. Thanks to these projects and programs the technical advances are conveyed to producers which lead to excellent models of productivity and quality of commercial agricultural products, even for export purpose, in Red River Delta Region.

### ***2.5. Model survey based technology transfer***

In their activities, MOST and MARD have built many models of application of S&T advances in many areas including plant cultivation, stockbreeding, aquatic production, integrated production organization and etc. They serve as foundations for farmers, provincial management agencies and enterprises to visit, to learn and to exchange experiences.

In technology transfer activities in agriculture sector, this mode also plays a very important role because the agricultural production is a sector highly diversified in production organization aspects, rich in production objects, sensible to weather conditions and crucial for a multi-million community of labors. Therefore, there is not a single fixed model for all the farmers to follow in different contexts of natural and socio-economic conditions. From another side, the absorption of new technologies by farmers is not easy since the implementation of new technologies would affect directly their incomes and life.

Another positive point of this technology transfer mode is its trust winning effect to those households who desire to apply new technologies with low rate of costs. The negative side of this mode is, however, farmers do not get trained in actual ways with new technologies. In many cases, they have to do themselves, from perception and selection to implementation of technological measures without adequate supportive information.

In Red River Delta Region, this mode is carried out mainly in aquatic cultivation area. During recent time, Research Institute for Aquaculture No. 1 (MARD) has transferred many models of application of S&T advances in production activities such as cage fish cultivation in Quang Ninh Province seas, pearl mollusk cultivation in Hai Phong Province. These models play important roles in technology transfer, development of research results and agriculture development in the region. In addition to that, there are some projects for transfer of commercial fish raising techniques led by National Fishery Promotion Center.

### ***2.6. Joint venture enterprises and partnership based technology transfer***

Actually, this technology transfer mode is not yet popular in activities. During recent years, the technology transfer mode on basis of joint venture

(JV) enterprises and partnership is applied by many enterprises in animal feed production area in Red River Delta Region. Regarding the JV based technology transfer mode, Vietnamese sides provide infrastructure and labors, and foreign sides provide technological lines, production organizations and product consumption channels. The typical model is Proconco, a Vietnam-France animal feed JV. Co. which was established many years ago and now well present in Red River Delta Region.

The positive point of this mode is that Vietnamese sides are not to provide finances and product consumption channels which are always difficult points for Vietnamese enterprises. The negative point, in this mode, is Vietnamese enterprises do not catch “technological know-how” which are also are under protection by other sides of JV companies. Then it is never easy to learn and catch new technologies.

### ***2.7. Expert-consultant based technology transfer***

This technology transfer mode is applied largely for private companies and Joint-Stock companies. Here, non-State enterprises have initiatives to import technologies, particularly in stockbreeding area (e.g. production of animal studs). Depending on the nature of business areas, the technology transfer contracts in these areas would include terms related to requirements of consulting experts in initial stages which may get extended for recruitment of experts.

In Red River Delta Region, this mode is most implemented for technology transfer of milk cow stockbreeding. This business area, however, did not turn successful for many reasons. In fact, the business of milk cow stockbreeding is one of high techs fields which must be developed in integrated manner including infrastructure facilities, feed supply chains, raising techniques and etc. Actually, the development of this business in household scale cannot meet these high standards which lead to failures and big losses (extended diseases, low milk production) of farmers. This would be a lesson of failures of import of technologies for large scale production.

## **3. Some limitations in implementation of technology transfer modes in agriculture sector in Red River Delta Region**

Despite of important achievements in development of agricultural production some limitations remain in technology transfer activities in agriculture sector in Red River Delta Region, namely:

- Enterprises remain passive in innovation of technologies. Survey conducted for 11 enterprises shows that 8 of them are not motivated for innovation of technology where their owners are not well aware of the importance of technological innovation in production-business activities.



Even, these 11 enterprises do not set up their units and staffs in charge of S&T innovation. Exchanges show enterprise owners lack knowledge of searching and selecting necessary and adequate technologies. One enterprise even halted production activities because of wrongly purchased technologies and out-dated equipment use;

- S&T organizations are not pre-active in activities of technology transfer. In fact, the market of technology transfer in Red River Delta Region is in high potentials with many enterprises to desire to make investments for innovation of technology but there is not any S&T organization to make offers for that. S&T organizations still do not take technologies as commercial goods. They have a passive approach when waiting for enterprises to make demands for technologies;
- Domestic research results are not preferred for use by local enterprises or cannot meet their practical expectations. Also, a majority of enterprises lack of capitals for innovation of technology. From another side, enterprises getting many incentives from State issued mechanisms do not pay attentions for innovation of technology;
- The evaluation of economic efficiency of technology transfer in projects and programs remains simple (number of trainees, produced products, rate of achieved technical norms and specs, etc.). Also, the evaluation of economic efficiency has little orientation indicating values, particularly concerning post-transfer evaluation procedures. It comes from the actual miss of rules to define “who” is responsible for monitoring, evaluating and expanding the implementation and application of transferred technologies;
- Enterprises actually have low capacities to “purchase” technologies and to pay technology transfer related costs. State owned enterprises have a large practice of spreading out investment sources for innovation of technology. The socialization and commercialization of technologies in Red River Delta Region do not yet facilitate and mobilize initiatives of technology transferees and local communities;
- The application and the popularization of imported technologies is not much based on internal efforts by enterprises in Red River Delta Region, and the market is not yet established for technology transfer in the Region.

#### **4. Visions to priority and supports for appropriate technology transfer modes in agriculture sector in Red River Delta Region**

##### ***4.1. Providing stimulations for innovation and enhancement of technological level in production and business***

Market driven mechanisms would lead production-business enterprises to find out ways for their existence and development. In this contest, the only way for good quality, lower selling prices and higher competition of products is to innovate and upgrade production technological level.

It is necessary to open new forms in activities to get access and to attract the world's advanced technologies in agriculture sector. Being provided with visions of open economy and incentive supports in attraction of foreign investments, R&D organizations as well as production-business enterprises in the Region get favor conditions to access resources of advanced technologies. In the period up to 2020, the rate of investment for innovation of technology in agriculture sector globally in the region must achieve at least 10 - 15% per year, and over 25% per year in certain areas.

#### ***4.2. Offering favorable environment for production-business enterprises to innovate technologies or to enhance technological level through technology transfer activities***

It is necessary to define the road map for innovation of technology applied entirely for the Region and individual localities with possible highest rate of efficiency and schedule arrangement. In this approach, the potentials and advantages of every locality should be the basis to define driving groups of agricultural products and then to target advanced technologies for transfer focus.

It is also important to offer policies to set up the technology market and the service for technology transfer which would enhance the accessibility to information by production-business enterprises. The extension of the technology market can be made through activities to encourage commercial contacts of technology with information - consultation centers of technology transfer service, and to link research organizations with production-business enterprises. It is necessary to build up law support offering centers to help production-business enterprises overcome barriers in innovation, application and transfer of technology.

It is needed, on basis of State regulations and policies, to concretize the application rules to meet actual local conditions in order to expand faiths for investments for technological development, to attract foreign investment sources for development of key important agricultural and commercially advantageous products which are required by master plans of local development.

It is necessary to have policies for development of human resources and to link them to training programs for enhancement of production management capacities for officials and of practical skills of farmers which target innovation and absorption of new technologies.

### ***4.3. Enhancing State management for technology transfer in localities***

It is necessary to define technologies as commercial products with increasing important roles on market and good business tools. Therefore, the enhancement of State management activities towards technology transfer activities is needed to ensure the conformity of management capacities to practical requirements in every stage, particularly to prevent the entry of out-dated and environment polluting technologies. The roles of provincial S&T departments should be enhanced to orient and guide technology transfer activities, and to evaluate and value investment plans and transferred technologies. It is necessary to implement well the State protection for technologies as well as solutions to protect interest of technology transferees.

## **5. Proposals for technology transfer modes to be applied in agriculture sector in Red River Delta Region**

According to the concepts of the research team in this paper, the transfer mode to be considered as “appropriate” needs to be viewed in two aspects:

- *First*, technologies to be transferred must be “appropriately meet” priority objectives of application in indicated localities;
- *Second*, technologies to be transferred must “appropriately meet” the absorption conditions for new technologies in indicated localities.

On basis of the above presented analysis as well as advantages and disadvantages of the above noted technology transfer modes in agriculture sectors in Red River Delta Region the recommendations can be proposed for selection as follows:

### ***5.1. Fully integrated technology transfer mode including patent purchase and rights***

This mode is noted as important because many developed countries made great investments for fundamental researches in agriculture sector which produce technologies which are advanced and fully integrated. Our investments, if made for these researches, should be big wastes accompanied with possible risks of failure. Therefore, priorities should be held for transfer of integrated technologies which may be high cost but sure to bring better results. This type of technologies can be applied right after in production practice and transfer receiving units have chances to enhance their qualification and to learn experience to meet requirements for next researches. This mode has huge meanings for technology transfer in agriculture in Red River Delta Region.

### **5.2. Project-program based technology transfer mode**

This technology transfer has a large space sale and involves participation of local officials and producing households. This would give chances to mobilize the application of new technologies and then lead to higher awareness of farmers for their implementation. This mode of transfer is also lower costs than the fully integrated technology transfer ones but offers the production of products to meet quality specs and quantity requirements as well as demands of market users.

This mode, if combined with study tours and surveys of local models, would offer chances to farmers to learn experiences of neighboring areas. At the same time, officials in charge of transfer may get demands, comments and wishes from farmers which lead them to further studies to improve technologies under implementation or to create new ones. They could be the best way to combine technology transfer modes in agriculture sector in Red River Delta Region.

### **Conclusions**

In order to develop technology transfer activities in agriculture sector and to make them sustainable, it is necessary to promote socialization of transfer activities and to encourage the active and initiative involvement of producers. The transfer of S&T advances is not only the concern and work of MOST units but the roles and integrated coordination of other related organizations and local government agencies are also important to maintain and largely popularize technologies in agriculture sector in Red River Delta Region./.

### **REFERENCES**

1. Institute of Regional Research and Development. (2013) *S&T Materials of Red River Delta Region, 2012 Year*. Hanoi. Science & Technics Publishing House. .
2. Nguyen Nam Binh *et al.* (2011) *Research for appropriate modes of technology transfer for socio-economic development in Red River Delta Region*. MOST grade research project. Institute of Regional Research and Development.
3. Dau Thanh Tu *et al.* (2012) *Evaluation of actual status and proposal of solutions for promotion of technological innovation in agricultural and forestry product processing technologies by small and medium enterprises in Red River Delta Region*. MOST grade research project. Institute of Regional Research and Development.