

SOME ACHIEVEMENTS ON AGRICULTURAL MECHANIZATION IN VIETNAM

Dr. Nguyen Quoc Viet

Organization: Vietnam Institute of Agricultural Engineering and Post-harvest Technology (VIAEP)

Address: 102/54, Truong Chinh Rd., Dong Da Dist., Hanoi, Vietnam.

Tel: +84 4 8687884; Fax: +84 4 8689131; Email: quoc5viet5@yahoo.com

I. INTRODUCTION

In 2007, the United Nations says more than 850 million people in the world do not have enough food. Experts see a number of reasons for the shortage of food. These include not enough investment in agricultural technology. A loss of farmland to development. Droughts and floods made worse by climate change. And, growing competition for water. Population growth also means a greater demand on food supplies. The United Nations predicts a population of more than eight billion by the year 2030. Therefore, to relieve the hardship of the hungry people, every country should pay attention to sustainable development in agriculture [1].

Vietnam's success in achieving rapid agricultural growth since the implementation of policy reforms in the late 1980s is now well documented (World Bank 2004). Agricultural growth was fueled mainly by growth in rice productivity following the rapid adoption of modern varieties, increased fertilizer use, and increased cropping intensity. The policy reforms created the right economic incentives for farmers to adopt yield-increasing technologies. Rice production grew at more than 5% per annum during the early 1990s and Vietnam rapidly achieved the status of a major exporting country [2, 3]. Besides rice, other agro-products also increase in both quantity and quality as black pepper, rubber, maize, legumes, vegetables, etc. Nowadays, many agro-products are exported at the top ranking of the world, like rice, coffee, black pepper, cashew nuts, etc. The world community has been giving high assessment on the application of scientific and technical achievements on agricultural production of Vietnam, since they have been contributing to free labor force and increase productivity. Advanced machinery is increasingly used to bring higher effectiveness of agricultural production.

II. VIETNAM'S AGRICULTURAL ECONOMY

Agriculture plays an extremely important role in Vietnam's economy. This sector contributes 24% to national GDP, accounts for nearly 30% of total export value, and employs over 60% of the country's economically active population.

In the decades of implementation of Renovation, initiated by the Vietnam Communist Party, agriculture and rural development have registered major achievements despite heavy losses due to frequent natural disasters:

- High and sustained agricultural growth, with benefits for many rural people as well as for the urban population from the production of food crops (notably rice, maize), industrial crops (coffee, rubber, tea, cashew, sugarcane, pepper, peanut, soybean), fruits (litchi, longan, orange, rambutan, lemon, and several others), vegetables, livestock (pigs, poultry, beef and dairy cattle, buffalo), as well as forest products [5].

According to socio-economic statistical survey, some specific data of 2008 are as follows:

Output values of agriculture, forestry and fishery in 2008 at 1994 constant prices were estimated increasing by 5.6% against 2007; of which agriculture rose by 5.4%; forestry by 2.2% and fishery by 6.7%.

The rice output was estimated at 38.6 million tons, rose by 2.7 million tons (equivalent to 7.5%) against 2007. If 4.5 million tons of maize were included, the gross cereal was 43.2 million tons, grew by 7.5% year-on-year.

The production of industrial perennials continued to develop toward the direction of producing goods for domestic consumption and for export: output of coffee, rubber, tea and pepper was 996.3 (rose by 3.6%), 662.9 (8.7%), 759.8 (7.5%) and 104.5 (17%) thousand tons, respectively.

Animal husbandry activities were gradually recovering after losses caused by natural calamity and diseases, but the rate was still slow.

The total fishery production was estimated at 4582.9 thousand tons, increasing by 9.2% over last year, of which farmed production gained 2448.9 thousand tons and rose by 15.3%; catching: 2134 thousand tons, rose by 2.9% (sea catching: 1938 thousand tons rose by 3.3%).

- An increased market orientation in agricultural production, recognition of the farm household as the basic unit of agricultural production and marketing decision-making, and reorganisation of the State-owned enterprise system to raise efficiency under market competition.
- Improved income and living standards for many people, and remarkable successes in poverty reduction.
- Improved rural infrastructure, beginning to give Vietnam's rural areas a new face.
- Achievements in the protection and recovery of forests, water resources and biodiversity. The total area of concentrated forestation in 2008 was 210.8 thousand ha, rising by 6.6% year-on-year; replanted area: 944.4 thousand ha fell by 0.8%; forest area under care: 486.2 thousand ha fell by 1.2%; woodcut production: 3562.3 thousand cubic meters rose by 2.9%. The phenomena of burnt forest and illegal cutting wood decreased much in 2008 compared to 2007. Total damaged area was 3919.7 hectares fell by 39.5%, of which burnt forest area was 1677.3 ha fell by 67.3%.

Although Vietnam agricultural economy reached many achievements, the average farmer's income is still very low, and there are large disparities between the different zones across Vietnam. Furthermore, the income gaps between population groups tend to increase rather than decrease. As an agricultural country with over 76% of the people living in rural areas, this situation creates difficulties in economic growth and social security. Increased production, processing and trade in all regions of the country are essential requirements for the creation of an equitable basis for increasing income and reducing poverty.

Income growth also needs to be achieved by increasing the quality of production (thereby obtaining higher prices) and by satisfying the more diverse demands which are now being expressed. Diversification, product quality improvement and marketing are mentioned in just about any discussion on the challenges of Vietnamese agriculture. This is not only an issue of producing "better" or "other" products, but also of ensuring that these products reach the consumer at the right time, in the right

form and the right amount. It also requires exploring the specific opportunities and problems of the country's different regions [5].

III. RECENT ACHIEVEMENTS IN RESEARCH AND DEVELOPMENT ON AGRICULTURAL MECHANIZATION IN VIETNAM

3.1. Mechanization to improve yield and quality for main crops

a. Comprehensive mechanization for rice production

So far, the highest level of mechanization in soil-preparing, irrigation, sowing and threshing is near 72%, 86%, 20% and 100%, respectively. The main achievements in research and development are as follows:

- Research on and develop all kinds of machinery and facilities with high capacity and good quality for land preparation of rice as well as other crops: various kinds of iron cages, floating boats, rotavaters, harrows, etc...
- Complete design and manufacture transplanters, machines for producing mat-type paddy seedling, applicator in rice intensified regions: Transplanters model MC-6, MC-8 and comprehensive equipment for producing mat-type paddy seedling.
- Development on rice-care mechanization as pesticide sprayer with high capacity and health protection
- Development on threshers and combine harvesters with various capacities used for household and farm, particularly for service providers in Mekong River Delta in order to reduce losses and lower threshing cost while lack of labors, and also approach to reduce imported machines: rice combine harvesters GLH-1.5, GLH-1.8; windrow reaper; Many kinds of threshers have been transferred to manufactories for larger scale production by VIAEP.

b. Mechanization in drainage and irrigation

The rural socio-economic infrastructure has been improved and developed, especially those for irrigation/drainage, contributing to promoting production and improving the population's living conditions.

In agricultural production, water always plays the most important role, guaranteeing whether there is a good or poor crop. Traditional, Vietnamese farmers say: "Water is first, fertilizer second, hard work third and variety forth". According to the review of FAO two thirds (many studies show 90%) of the world's water resources coming from rivers, lakes and underground resources are used for irrigation, the rest for domestic and industrial use. In Vietnam, agriculture now uses over 90% of the total water resources available for domestic and industry, having a total surface water capacity of over 2360 rivers and lakes estimated about $850 \times 10^9 \text{ m}^3$.

The main achievements are as follows:

- Set up model of systems of sprinkling, dropping type, absorbing irrigation have been widely applied for different areas of lowland, highland, mountains, etc
- Set up model of systems of water pumps: axial-flow, vertical-flow, centrifugal pumps.

- Complete design, manufacture and transfer system of water saving irrigation for dry land crops as central area and midland, contributed to friendly environment and also further climate change in the world
- Set up applied models in every appropriate scale with low cost in comparison with those of the Israel or other countries

c. Development of greenhouse system and devices to create micro-climate area

Greenhouses in various scales with system of automatic/semi-automatic control and monitoring in watering, fertilizer distribution, micro-climate change have been built

d. Comprehensive mechanization for Sugar-cane production

- Research and develop on machinery and facilities system to reduce labor force and increase quality for land preparation as small tractor, furrower, rotavator, pesticide spreader in row; leaf rotary chopper, deep chisel, etc.
- Set up models of cutter, combine harvester SHC-0.2; windrower CMRH-0.18; collector and others.

e. Mechanization for corn and legumes

- Design and transfer corn shellers for seed and commercial grains with very low rates of unshelled corn and kernel damage; specific lower energy consumption. Especially, maize ocrea peeler and sheller could shell corn with husk at moisture content to above 25%. The above-mentioned machines are used for stations producing seed or commercial corn. They are also suitable for farm households doing service in corn shelling on yards or in fields. E.g. Corn sheller TN-4.0M, ocrea peeler and sheller BBT-2.5, bench manual corn sheller TNQT-70, combine harvester
- Set up model of decorticator for groundnut pods to take out kernels with high rate recover for export and food processing at farm households as BVL-100, BVL-400
- Develop facilities for threshing and cleaning soybean with high performance and appropriate to house hold, farm at industrial scale.

3.2. Improvement of post-harvest technology to reduce losses, ensure quality and food safety

a. Technology and equipment for rice seed processing

- Develop seed processing line with semi-automatic control system, including technology and equipment at industrial level, ensuring high germination rate and seed security in Vietnam. The above-mentioned models have been transferred to almost localities throughout the country. The ratio of processed seed with the processing line has been improved from 0% (1995) to 30% (2008)
- The line is also applied for other seeds like corn, legumes, etc...

b. Drying technology and equipment for agro-products

- Carry out successfully the work on research, design, manufacture and development of various kinds of dryers such as batch bed, vertical-type, rotary drum-type, tower-type, recirculation-type, bulk dryers..., on the establishment of

several new production lines and other related technological progresses suitable for the practical condition and the need of the agriculture

- Develop grain dryers, especially paddy dryer for MRD with low cost local materials, contributing to loss reduction and quality assurance, particularly in autumn-summer crop or rainy season crop. Also dryer special for flood areas. This contributes to increase the ratio of dried paddy from 11% (1998) to above 35% (2008). The dryers can also apply on corn drying of 20-30% in volume in the mountainous areas of the North and the Central Highland.
- Research and develop new technology for drying as Infra-red, Heat pump, Fluidized, Drop Intermediate Control ... and successfully initial application to dry high value agro-products.

c. Technology and equipment for diversification of agro-products

- Complete technology and equipment for traditional food processing in order to improve quality, extend storage life and ensure food safety in localities. As some types of cakes, fermented rice noodle, fruit dehydration, fruit and vegetable fermenting, salting ...
- Develop new products from agro-products as many kinds of non-alcohol, soft drink, fast food, cut-fresh food for consumption in cities and industrial zones.
- Utilize waste from processing and storage for food and animal feed in order to increase high efficiency in manufacture and good waste management

d. Technology and equipment for pre-processing, storage, and transportation

- Research, design, manufacture and transfer to production comprehensive lines of pre-processing and storage vegetable and fruits at the scale of 1-2 tons, serving gathering markets and exporting bases with the products of good quality, hygiene and safety
- Manufacture specialized containers for far-away transportation of fresh vegetable and fruits
- Transfer to production models of cold stores at different scales, for fresh vegetable and fruits and aqua-products preservation

e. Agro-product preservation to reduce losses

- Research and development on technology and equipment of grain, fruits and vegetables drying in household and industrial scale (of 0.1-40 tons per batch)
- Research and development on Cooling and Frozen technology by Individual Quickly Frozen (IQF) of fruits and vegetable at industrial scale
- Research and development on preservation and processing technologies and equipment of multi year crops, including tea, coffee, cashew nut and cashew apple in household and industrial scale
- Research and development on horticulture crop preservation technology, including Modified Atmosphere Packaging (MAP) in order to exportation at National level
- Research and development on new materials used for preservation, coating, waxing of fruits and vegetable

- Research and development on indigenous knowledge for Agro-food preservation and processing in Ethnic Minorities group regions of Vietnam

3.3. Mechanization in feed processing for animal and aquatic species

- a. Mechanization in breeding facilities and animal slaughter: Mechanization in supply of feed and drinking water, in sanitation and modification of micro-climate state for the breeding facilities. Slaughtering line of poultry and pig with capacity up to 500 and 50 heads per hour, respectively, were designed and manufactured. This has ensured good hygiene and safety.
- b. Mechanization in feed processing for animals and aquatic species: complete feed processing lines for animals with capacity of 15 tons per hour with advanced technology and equipment were designed and manufactured. These processing lines have brought high benefits for animal feed processing units.

3.4. Agro-residue upgrading and agro-environmental control

- Study, design and manufacture a dysfunctional generator which can simultaneously produce electricity and heat. Rice husk has been used as fuel for this generator – dryer with capacity of 500 kg/h.
- A rice husk gasified combustor has been developed at small scale serving for paddy rice dryers located in MRD. The dryer proves better performance such as blame is more stable and cleaner, burning coefficient of rice husk is higher (80-90%) and the dryer life has been extended.
- Many agricultural wastes such as sugarcane bagasse, corn cob, cassava stem, sawdust have been investigated for use as substrate in edible and medicinal mushrooms.

3.5. Quality control in agro-product and machinery

- Step by step agricultural machinery and equipment made in Vietnam or imported ones have been tested about quality to give advice to users and help policy makers issue appropriate policies for the users.
- Every year, tens of thousands of food samples with more than 5,000 criteria are analyzed and tested on quality to help producing units and management bodies get basis to control product quality and food hygiene and safety.

IV. MAJOR REASONS FOR THE ABOVE ACHIEVEMENTS

- The Government has always paid attention to agricultural and rural sector, and issued many new policies to conform to the reality and the people's desires. Other reasons include active and effective support from Ministries and sectors and close guidance from party committees and authorities of various levels, in addition to the unit-level initiatives and determination to overcome difficulties as well as enormous efforts from farmers all over the country.
- Many advanced techniques and technologies have been applied. So far, more than 90% of rice growing area, 80% of maize area, 60% of sugarcane area, cotton, fruit trees, etc. have used new varieties. In animal husbandry, new breeds have also been used and helped to increase significantly the productivity and quality of meat, eggs and milk products. Mechanization, new farming techniques, harvesting/preservation and processing techniques for agro-forestry products has been used widely and extensively, and new side jobs have also been developed.

- The concern about sustainable land use has become a worldwide issue, and finding the ways to achieve synchronic increase in food production and preservation of natural resources requires the world common efforts. In this context, conservation farming or conservation agriculture has become the most promising way to maintain agricultural production sustainable.

V. CONCLUSION

In recent years, Vietnamese agricultural production has obtained rapid, steady growth. The agricultural production value achieved an average increase of 5.5% per annum. Thanks to this, Vietnam basically ensured its food security, paved the path for shifting structure of agricultural economy and for developing non-agricultural industries. Several export agro-products of Vietnam have been in the world highest rank such as black pepper, coffee, rice and cashew nut. In the past 10 years, average per-capita income in the rural areas of Vietnam has increased roughly twice.

According to the Ministry of Agriculture and Rural Development of Vietnam; however, Vietnamese agricultural economy has achieved great initial results, but process of its development is seen not completely sustainable. The rapid shift of structure of crops and domestic animals makes changes of exploitation mode of resources of land, water and biology in large scale. Moreover, activities of survey, design, control and supervision are still insufficient; therefore, many dangers occur such as ecological imbalance, threat to the competitive ability of agricultural sector.

For this reason, simultaneous with application of safer technology to reduce environmental pollution, Vietnam has done its utmost to prevent deforestation, conserve biological diversity, control birth-rate, improve environmental hygiene, create jobs and increase standard of living for the people. To protect the environment, many countries have waged environmentally friendly movements in various names as sustainable agriculture, ecological agriculture, appropriate agriculture, integrated agriculture, etc. with the activities of research and application of production modes oriented to sustainable development in all sectors.

REFERENCES

1. VOA news – Special archive
2. ESA Working Paper No. 04-11, 2004. *Food Insecurity and Vulnerability in Viet Nam: Profiles of Groups Four Vulnerable*. Food Security and Agricultural Projects Analysis Service (ESAF)-FAO, May 2004.
3. The World Bank. 2007. *Key Development Data & Statistics*. Washington, DC. Available: <http://web.worldbank.org>
4. FAO. 2008. *FAOSTAT*. Food and Agriculture Organization of the United Nations. Available: <http://faostat.fao.org/site/291/default.aspx>
5. Master plan for agricultural research in vietnam. UNDP/FAO VIE 98/019.08

