

# Sustainable agriculture

[Countries](#), [Vietnam](#)



## SUSTAINABLE AGRICULTURE VAC SYSTEM APPLICATION Ha Thu Huong

Undergraduate student, Hanoi Architectural University , Department of Advanced Program of Architecture, Hanoi, Vietnam mikta92@gmail. com

Abstract Agriculture is a human productive activity which is the cultivation of animals, plants and other products used to sustain life. Agriculture was the key development in the rise of human civilization and. Sustainable agriculture is an important factor which becomes the foundation of the low carbon city development. The history of agriculture dates back thousands of years, and its development has been driven and defined by greatly different climates, cultures and technology. Nowadays, the kind of food are developing tend to develop domestic agriculture. However, the food production and recycling agriculture waste we use is not sustainable. The land nutrient will become exhausted because of using in a long time. Agriculture domestic take a long time, land and cost to treatment. Capital investment for each ingredient individual is expensive. We introduce VAC (VACR) system which food gardening (V), fish rearing (A) and animal husbandry (C) are integrated to restrain environment impact and create production efficient. The VAC system is a highly intensive method of small scale farming that makes optimal use of land, water and solar energy, achieving high economic efficiency for low capital investment. VAC leads to the creation of pleasant, peaceful landscapes, tree planting is encouraged with no artificial chemicals are used and maximum amount agriculture pollution by creating biogas.

Keywords: VAC system, sustainable agriculture, biogas

### 1. Introduction

Agriculture plays an important role in continuous human life and develop civilization. Agriculture is supplying food to meet requirement of different

social classes, supplying the primary materials to other economy sectors, supplying the capital for other economy sectors (industry), marketing for other economy sectors, supplying the human force to other economy sectors and creating the good environment. This will become foundation of all city. However, it affect environment which is one off the largest survice of greenhouse gases, waste a lot of domestic in the environment. It also change the land form and make climate change also. Therefore we have to consider the use critical water, land, and ecosystem and recycling waste and tend to sustainable agriculture. Sustainable agriculture has been defined as an integrated system of plant and animal production practices having a site — specific application that will last over the long term: satisfy human food and fiber needs, enhance environmental quality and the natural resource base upon which the agricultural economy depends, make the most efficient use of non-renewable resources and on-farm resources and intergrate, where appropriate, natural biological cycles and controls, sustain the economic viability of farm operations and enhance the quality of life for farmers and society as a whole. In order to built low carbon city, the first thing we need is to create sustainable agriculture. So, we introduce the VAC system is production methods appication leading to increased income, improved standards of living and reduce environment impact.

1. 1. Background of VAC system. In Vietnam, a country of small-scale farmers, an integrated farming system called VAC rapidly gains interets which develop from traditional gardening in the fertile Red River Dalta. In 1986, due to decades of war Vietnamese's agriculture was seriously set back. Food intake was inadequate, especially animal protein. Many programs were implemented in

Vietnam to improve the food intake and nutritional status of the people, and especially the intake of animal source foods. The VAC system is a traditional type of farming for Vietnamese people. The aim of VAC is to provide diversified agricultural products to meet the complex nutritional demands of man. Research has shown that in many communities in the Red River Delta where VAC farming is practised, income from VAC constitutes 50 – 70% of farmer income. Annual income through VAC farming is 3 to 5 times higher than that derived in the same area from growing two rice crops per year.

**1. 2. The Basic Design** In the fertile plains of the Red River delta, a major rice growing area, farmers have traditionally had gardens around their houses for growing produce for their domestic needs. Such gardens form the model for VAC farming. Initially a hole is dug in the ground. The soil from the hole is used for the foundations on which the house and the animal sheds are built, and to build up banks around the garden beds. (The buildings and the gardens need to be protected from rising water, as the delta floods each summer.) The hole itself becomes a pond, as a result of rainfall and the high water table, and a well is dug for fresh water for the household. Thus an area is created in which animal husbandry, gardening and fish rearing can all take place in an interrelated fashion adjacent to the house.

**2. Methods**

**2. 1. Mode of operation** Fig. 1: Outline VAC System VAC system makes optimal use of land, water and solar energy to achieve high economic efficiency with low capital investment and people make interational effects to VAC system: They consume products from the garden (V) is used to feed the fish (A). Fish pond (A) provides water, mud and slime to irrigate and fertilize the garden (V). Some of the fish (A) generally the cast of fishes, can be used as nutritious

animal feed (C). Animal manure (C) is used for plant (V) and fish food (A). It can control the process of waste treatment of VAC simultan. Plants are grown in the garden in a system of tiered cultivation, in which various species are intercropped and overlapped to make full use of solar energy and soil nutrients. Fruit trees are interspersed with vegetable and legume crops that will grow in the shade. Other legumes are grown around the perimeter of the garden, and timber trees and rattans are planted to form green fences. A variety of fish is reared in the pond, so that food resources are fully used at different water depths. (For example, tench feed at the top, roach in the middle and carp and tilapia at the bottom.) Taro is planted around the pond and on part of its surface. Gourds are grown on trellises just above the water. Sweet potato is cultivated as pig feed. The pig sty and the poultry shed are situated close to the pond. Pig manure is used for fish food, and various garden products are used to feed the livestock and fish. During the dry season the pond provides nutrient-rich water and sludge to irrigate and fertilise the garden. Surplus fish are fed to the pigs, or sold. 2. 2.

Modifying VAC The original VAC model has been modified to suit Vietnam's three principal ecological regions: the coastal area, the deltas and the foot — hills and mountains. In different topography, we have some characteristics changes. Example: in the coastal areas a typical VAC garden is bordered by a row of tree acting as a windbreak, hindering drifting sand and filtering salt. Fish and prawns are raised in brackish ponds and canals. Fruit trees grown here are selected according to their suitability to water quality and soil type. In the deltas, especially Mekong Delta, people dig canals around and between their gardens to achieve better drainage and to wash salt from the soil. Fig 2:

Example of upland intergrated farming system. 2. 3: Achievement Reseaech has shown that in some communes in the Red River delta where VAC farming is being practiced, VAC income consitutes 70 — 90 percent of farmer' incoms and that their annual income through VAC farming is from 3-5 times higher (and sometimes as much as ten times higher) than that derived in the same area from growing two rice crops per year. This assists in reducing malnutrition. This farming system promotes the full use of all material produced on the farm for production of food for human consumption to reduces domestic agriculture in evironment impact. VAC leads to the creation of pleasant, peaceful landscapes, tree planting is encouraged with no artificial chemicals are used and maximum amount agriculture pollution by creating biogas. Table 1: Changes and annual growth rates in area of land uses and in productivity of crops, aquaculture and animal in the Mekong Delta by different periods. Items | Years | Annual growth (%) | | 1990 | | 1999 | 2001 | 1990-95 | 1995-99 | 1999-2001 | Area (103 ha) | Agricultural land | 2, 464. 3 | 2, 654. 1 | 2, 658. 9 | 2, 688. 0 | 1. 5 | 0. 0 | 0. 5 | Rice-grown area | 2, 080. 1 | 3, 305. 6 | 4, 003. 8 | 3, 782. 4 | 11. 8 | 5. 3 | -2. 8 | Upland crops | 162. 5 | 281. 9 | 286. 2 | 274. 3 | 14. 7 | 0. 4 | -2. 1 | Fruit trees | 79. 3 | 141. 2 | 165. 1 | 183. 9 | 15. 6 | 4. 2 | 5. 7 | Aquaculture | 22. 7 | 301. 3 | 349. 1 | 503. 4 | 244. 9 | 4. 0 | 22. 1 | Productivity | Rice (106 tons) | 9. 84 | 13. 89 | 16. 72 | 16. 10 | 9. 3 | 5. 1 | -1. 9 | Aquaculture (103 tons) | 126. 4 | 267. 0 | 295. 1 | 443. 4 | 22. 2 | 2. 6 | 25. 1 | Farmed fish (103 tons) | 119. 5 | 198. 7 | 248. 5 | 16. 6 | 12. 5 | Farmed shrimp (103 tons) | 47. 1 | 41. 4 | 118. 4 | -3. 0 | 93. 0 | Pig (103 heads) | 1, 118 | 2, 377 | 2, 797 | 2, 946 | 22. 5 | 4. 4 | 2. 7 | Poultry (103 heads) | 18, 173 | 34, 051 | 42, 236 | 45, 580 | 17. 5 | 6. 0 | 4. 0 |

2. 3: Biogas. Biogas obtained from the treatment of animal waste in order to produce energy. The biogas technology should appeal to the rural people. The underground flat-top system integrates both pigsty and latrine while providing a concrete floor on which the animal helters are built. 1- inlet system 2. Digester 3. Outlet 4. Gas reservoir A biodigester is an anaerobic tank (oxygen-free), which digests organic material biologically. It is used to treat black water (human waste) on site, eliminating pathogens and malignant bacteria, so the treated water can be used for irrigation. It produces enough daily fuel for cooking and lighting. It improves the surrounding environment, whilst livestock produce meat, milk and fish products for local consumption and subsistence farming. Vegetable production is enhanced through use of biogas slurry - a high value bio-fertilizer. Thus, farmers and households provide all the inputs and use all outputs. 2. 4. Conherence. Due to the production efficient is VAC which are small-scale integration so that it can be combined with distribution efficient by local food systems and another production is: vertical farming or active nature model. Local food systems is used to describe a method production and distribution that is geographically localized, rather than national and international. Active Nature model is combination of nature, agriculture and village to make the maximum possible use of the productive capacities of nature. They used a principle of successively larger zones, each responsible for own resources. Fig 3: Active Nature Model Vertical Farming is cultivating plant or animal life within skyscrapers or on vertically inclined surfaces. We believe all of the model can be combined effectively and have the potentials to meet the demand of food supply, more efficient use of resources, energy

and environmental impact reduction. 3. Conclusions At present, the agricultural still be the the based on the development of the city or even the country. This paper introduce one of the successfully production efficient and environmental impact reduction by the interactional relationship among the sector and creating biogas. It can be more efficient when combined with other production. 4. References 1) Nguyen Van Man, Research on Vuon — Ao — Chuong — The Traditional Vietnamese Farm in The permaculture Research Institute of Australia website. 2) Le Thi Hop , Research on Programs to Improve Production and Consumption of Animal Source Foods and Malnutrition in Vietnam in the Journal of Nutrition website 3) Le Thanh Luu, Research on The VAC system in Northern Viet Nam in Fao Corporate Document Repository website 4) Research on Viet Nam Farm Biogas in The popenergy site website. 5) Pham Van Thanh, Research on VAC integrated system with entire Energy chain in Vietnam by FAO technical consultation website. 6) Research on Intensive small — scale farming in Vietnam in Agriculture network website.