Animal Source Foods to Improve Micronutrient Nutrition and Human Function in Developing Countries

Programs to Improve Production and Consumption of Animal Source Foods and Malnutrition in Vietnam[1]

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ABSTRACT The objective of this paper is to review programs to improve production of animal source foods in Vietnam, emphasizing the VAC ecosystem and trends in undernutrition during past decades. The food consumption surveys of the Vietnamese population in 1985 showed that food intake was inadequate, especially animal protein. Most protein came from rice; the consumption of meats, beans and fish was negligible. During the last 10 y, much attention was paid to improving the health and nutritional status of the Vietnamese people. 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. Based on the scientific fundamentals of VAC, many different models of VAC have been developed at a national level. The intervention programs to improve production and consumption of animal source foods, and the VAC ecosystem in Vietnam during the last decade have been successful. The population's dietary intakes have clearly improved in terms of both quality and quantity. The consumption of staple foods in 2000, including meats, fish, fats and oils, and ripe fruits was much higher compared to 1987. The prevalence of undernutrition in children <5 y old, and of chronic energy deficiency (CED) in women of reproductive age, has been remarkably reduced. J. Nutr. 133: 4006S–4009S, 2003.

KEY WORDS: • *animal source foods* • *VAC ecosystem* • *undernutrition* • *Vietnam*

Vietnam is a poor country. In 1999, there were ~1000 poor communes in 91 districts, mainly concentrated in rural areas. It was estimated that the number of people who need emergency relief due to natural calamities was 1–1.5 million/y. However, during the past 10 y (1991–2000), the Vietnamese economy has maintained a rather high growth rate of 7.5%/y (1). Positive economic growth has occurred in Vietnam since 1985, and the annual growth rate in food production was ~2.2% during the period 1979–1993 (2). An increase in gross domestic product (GDP) per capita in Vietnam was also observed during the 1990s (3). The GDP per head in 2000 was 1.8 times that in 1990. In general it is clear that socioeconomic conditions have improved remarkably compared to 1980.

Compared to other developing countries, undernutrition among Vietnamese children is still a serious health problem (4). The prevalence of stunting remains high: 59.7% and 49.1% in 1985 and 1990, respectively (5,6). Early introduction of poor quality and quantity of complementary foods, a low rate of exclusive breastfeeding and a high frequency of diseases during early infancy may be the reasons for growth retardation (4,7,8). The food consumption surveys of the Vietnamese population in 1985 (9) showed that inadequate energy intake occurred in 15% on average, and protein intake was low. Most protein came from rice; the consumption of meats, beans and fish was negligible. During the last 10 y, much attention was paid to improving the health and nutritional status of Vietnamese people. In 1995 the government of Vietnam ratified the National Plan of Action for Nutrition (NPAN)[3] for the period 1995–2000 (10). Poverty reduction was one of the basic social policies given special attention. In this regard, the Hunger Eradication and Poverty Reduction program has been executed by the Ministry of Labor Invalid and Social Affairs since 1992 with special emphasis on infrastructure support for poor communes, financial support for ethnic poor households, building capacity for staff in poverty alleviation, agriculture and aquaculture extension, health care, and credit and education for the poor. This article will begin by looking at the programs to improve animal source foods (ASF) and trends in undernutrition in Vietnam during the past decades.

Programs to improve production of animal source foods in Vietnam

Intervention programs for improving animal source foods. Many programs were implemented in Vietnam to

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[3] Abbreviations used: ASF, animal source foods; NIN, National Institute of Nutrition; NPAN, National Plan of Action for Nutrition.

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TABLE 1

Trends in food production (tons/y) in Vietnam, 1997–2001

Food	1997	1998	1999	2000	2001
Beef	72,000	79,000	88,500	92,268	—
Cow milk	31,274	32,863	39,692	54,456	—
Pork	1,154,200	1,228,000	1,318,400	1,409,015	—
Poultry meat	226,100	239,200	261,900	295,692	—
Shrimps	49,298	54,853	57,433	69,433	—
Fish raised	279,323	285,626	302,930	386,09	400,000
Fish (total)	835,318	856,710	974,576	1,015,005	1,076,734
Vegetable oil	87,717	94,648	125,101	139,000	—
Rice	27,523,900	29,145,500	31,393,800	32,529,500	31,970,100
Soybeans	113,000	146,700	147,200	149,300	176,100

Source: FAO Hanoi, 2002.

improve the food intake and nutritional status of the people, and especially the intake of ASF. Because pork and poultry meats are the main ASF for the Vietnamese people, development of pig and poultry breeding was given special attention by the Ministry of Agriculture and Rural Development and the government (11). The program of controlling pasteurellosis in pigs and poultry was conducted from 1996 to 1999; the Centre of Training and Performing Techniques for pig and chicken livestock was established in Binh Thang in 1997; and many other programs were designed to strengthen veterinary services and pig-breeding development in many parts of Vietnam. In the year 2000, pig production increased by 5% per y and pork meat by 7% per y, compared to 1995 (12). Feed technology and feed processing also received attention and investments; there are 108 feed-processing factories producing an average of 2.8 million ton/y (11). According to the data of the U.N. Food and Agriculture Organization (FAO) 2002 data base, there was a positive trend in all kinds of animal source food production—beef, cow milk, pork, poultry meats and fish, as well as the main staple foods (rice and vegetable oil) (**Table 1**, **Fig. 2**) (13).

The VAC system: the solution to poverty alleviation, diet improvement and the prevention of malnutrition. The acronym VAC, invented by Professor Tu Giay, the founding director of the National Institute of Nutrition (NIN), refers to three Vietnamese words: V (Vuon for garden), A (Ao for pond) and C (Chuong for cattle shed). However, V has been extended to mean all kinds of land farming; A involves all activities of intensive exploration of water areas; and C refers to all husbandry activities including raising cattle and poultry. In English and French, V may be the abbreviation for Vegetation, A may stand for Aquaculture and C may be the initial letter of Cages for animal husbandry.

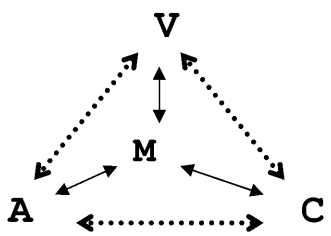

FIGURE 1 The VAC ecosystem (M refers to man).

TABLE 2

The impact of the VAC system on diet and income of the households[1]

Variables	No. of studied households	Households invested in VAC	Households without VAC	Source/ reference
Economic improvement	26.000	+++	–	Giay et al., 1991
	268	++	–	Ngu et al., 1991
	304	++	–	Huan, 1996
Improvement of dietary intake	500	+++	–	Giay et al., 1991
	268	+++	–	Ngu et al., 1991
	304	++	–	Huan, 1996
Reduction of undernutrition in children <5 y old	500	++	–	Giay et al., 1991
	268	–	–	Ngu et al., 1991

[1] ++ significantly improved ($P < 0.01$); +++ more significantly improved ($P < 0.001$); – not significantly changed.

The aim of VAC in Vietnam is to provide diversified agricultural products to meet the complex nutritional demands of man (14). Based on the scientific fundamentals of the VAC system, the strategy is to renew energy by recycling solar energy through photosynthesis of trees and plants, which will provide more foods for people and feeds for raising cattle and poultry. On the other hand, recycled residues of the VAC ecosystem create a permanent biological agriculture, in which waste is recycled into organic fertilizers to replace chemical fertilizers and helps to protect the environment. The VAC system is a traditional kind of farming for Vietnamese people. It is not an isolated activity of cultivation or husbandry but is an interactive and permanent ecosystem of combined activities (Fig. 1).

Since 1989, under the Doi Moi reform, the Vietnamese government has distributed land for farmers and encouraged development of the family economy through a diversified agriculture, not only by growing rice. Through the VACVINA (the Vietnam association of VAC participants), many different models of VAC have been developed at a national level using loans for the poor. The VAC ecosystem has had remarkable results. From the economic perspective (**Table 2**), the income of people has been increased (15–17). From a sociocultural perspective, the environment is well protected, and the health and nutrition situation (Table 2) of people has improved (15–20). Today, in Vietnam the VAC system is considered to be an effective solution for poverty alleviation, dietary improvement and the prevention of malnutrition.

TABLE 3

Food consumption of the Vietnamese population (g/person/d) in national surveys in 1987 and 2000

No	Food	1987	2000
1	Meats	24.4	51.0
2	Fish	42.0	52.0
3	Eggs and milk	2.9	10.3
4	Fat/oil	3.0	6.8
5	Rice	475.0	397.3
6	Ripe fruits	4.1	62.4

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TABLE 4

Characteristics of dietary intake of the Vietnamese population from 1965 to 2000

Variables	1965	1975	1985	1987	2000
Total (*kcal*)	1872	1912	1925	1932	1931
Protein (%)	10	13	11	12.3	13.2
Fat (%)	7	6	6	8.4	12.0
Carbohydrate (%)	83	81	83	79.3	74.8

Food and nutrition situation

Dietary trends in Vietnam. After the first national nutrition survey (1987), a second national survey was conducted in 2000. The population's dietary intakes had clearly improved. The consumption of staple foods such as meats, fish, fat oils and ripe fruits was much higher compared to 1987 (**Table 3**). Fat consumed was 6.8 g/d on average, twice as high as that in 1987 (3.0 g/d). Ripe fruit consumption is much higher (62.4 g vs. 4.1 g) than before, especially in the South and in some of the East-North provinces (21).

The National Nutrition Survey 2000 showed that the population's dietary intake has improved in terms of both quality and quantity: *1*) protein intake met the RDA of the NIN; *2*) energy from fat and oil increased from 8.4% to 12.0%; *3*) animal protein was 33.5% of the total; and *4*) the proportion (%) of the energy provided by protein, fat and carbohydrates was more balanced in 2000 (13, 12 and 75% compared to 12.3, 8.4 and 79.3% in 1987) (21).

Child and maternal nutrition in Vietnam. Child malnutrition (underweight) has been remarkably reduced from 51.5% in 1985 to 44.5% in 1995 (**Fig. 2**). With the NPAN starting in 1995, the rate dropped to 33.1% in 2000 (a reduction of 2% per y, which is considered to be a fast rate by the international community). However, according to the World Health Organization, the prevalence of child malnutrition of 33.1% is ranked in the "very high level" worldwide. This prevalence of child malnutrition varies among ecological regions of the country. It is lowest in Ho Chi Minh City (18%) and Hanoi (21%), whereas in some provinces, it is still above 50% (21). The prevalence of stunting has fallen from 56.7% in 1987 to 36.5% in 2000, and to 34.8% in 2001 (**Fig. 3**). There is no significant gender difference in the prevalence of malnutrition in Vietnam (21).

In rural areas, the prevalence of chronic energy deficiency (defined as BMI < 18.5) of reproductive-aged women fell from 48.7% in 1995 to 27.4% in 2000 (21). In urban areas it fell from 37.9% to 23.8%.

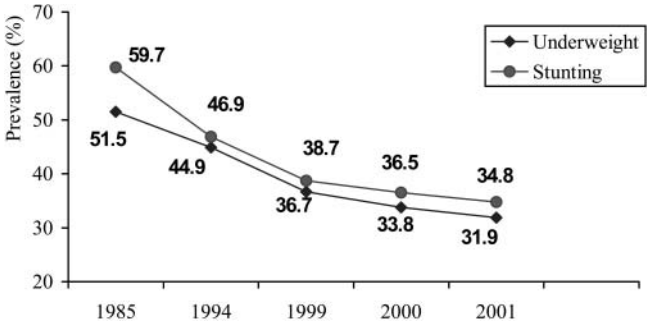

FIGURE 3 Underweight and stunting among <5 y old (1985–2001).

Micronutrient deficiencies in Vietnam. Anemia is a major public health problem in our country. The most vulnerable groups are women of childbearing age and children. Approximately 53% of pregnant women, 40% of nonpregnant women and 45% of children <5 y old suffered from iron-deficiency anemia in 1995 (**Fig. 4**). However, the prevalence of anemia had fallen in almost all groups by the year 2000 (22). The main cause of the anemia is a lack of iron-rich foods in the diet, e.g., ASF. Hookworm infection is highly prevalent in the country and also plays a role (23).

The most remarkable progress in the last 5 y has been the effective implementation of the national program for controlling vitamin A deficiency (24) and improvement of dietary intake through the VAC system and other programs to improve ASF intake. The rate, among children, of corneal lesions that lead to blindness has remarkably decreased. The prevalence of subclinical vitamin A deficiency (defined as serum retinol <0.7 μmol/L) among children <5 y old was reduced from 14% in 1995 to 10% in 2000 (25). The percentage of lactating mothers with low breast milk vitamin A is still very high, however, falling from 41% in 1995 to ~31% in 2000 (**Fig. 5**).

The intervention programs to improve production and consumption of animal source foods, and the VAC ecosystem in Vietnam during the past decade have been successful. The VAC system is considered to be an effective solution for poverty alleviation, dietary improvement and the prevention of malnutrition in Vietnam. The population's dietary intakes have clearly improved in terms of both quality and quantity. The consumption of staple foods such as meats, fish, fat oils and ripe fruits was much higher compared to 1987. The prevalence

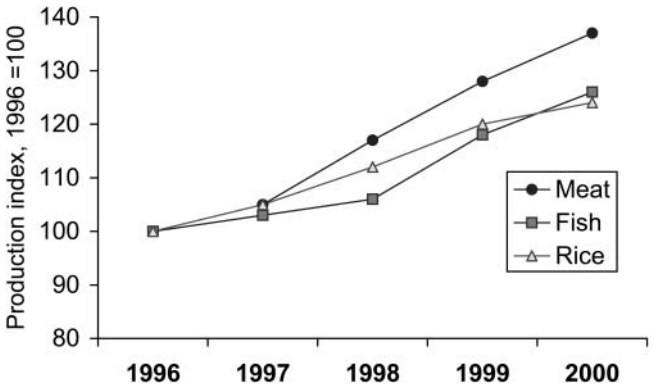

FIGURE 2 Trends in food production in Vietnam from 1996 to 2000.

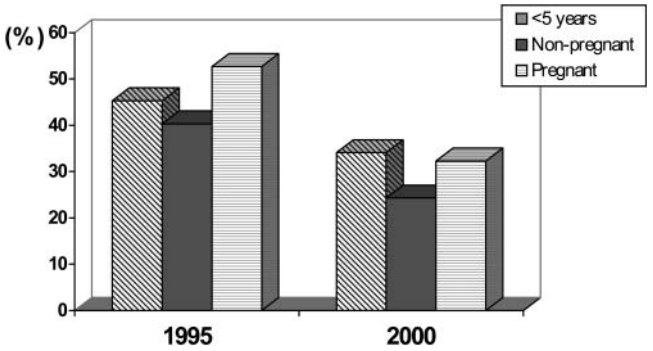

FIGURE 4 Prevalence of anemia in Vietnam during 1995–2000.

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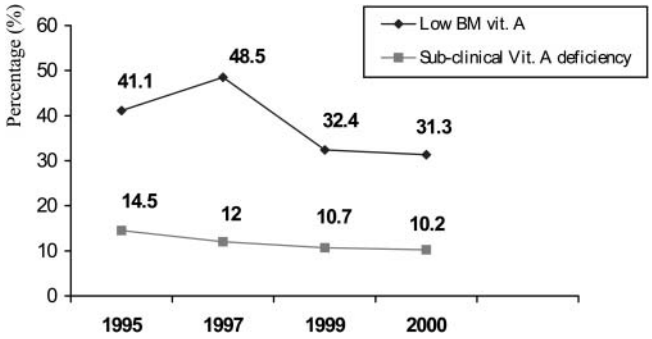

FIGURE 5 Subclinical vitamin A deficiency of <5 y old children and low breast milk vitamin A in lactating mothers.

of child malnutrition and the prevalence of chronic energy deficiency by women of reproductive age have been remarkably decreased.

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