

FIRST YEAR REPORT ACTIVITIES IN 2002



RIFAV

Department of Agriculture
Ministry of Agriculture and Forestry
of Lao PDR

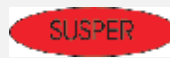
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**Sustainable Development of Peri-urban Agriculture
in South-east Asia Project**
(Cambodia, Lao, Vietnam)



FIRST YEAR REPORT

2002 ACTIVITIES



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- **Asian Vegetable Research and Development Center**
- **Centre de Coopération Internationale de Recherche Agronomique pour le Développement**
- **Department of Agriculture, Ministry of Agriculture & Forestry, Lao PDR**
- **Department of Agronomy and Agricultural Land Improvement, Ministry of Agriculture, Forestry & Fisheries, Kingdom of Cambodia**
- **Research Institute of Fruit and Vegetable, Vietnam**

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**Sustainable Development of Peri-urban Agriculture
in South-east Asia Project
(Kingdom of Cambodia, Lao PDR, Vietnam RS)**

SUSPER

SUMMARY OF THE MAIN 1ST YEAR OUTPUTS AND PROSPECTS

Objectives and activities

The main objective of the project is to strengthen the public and private institutions on the economic and ecological sustainability improvement of peri-urban agriculture. Main topics of the project are related to the seasonality of vegetable production, the sanitary quality of vegetable and animal production, the lack of farmer's organization in accessing to land and technical and marketing information. In the first year, those main activities are surveys on peri-urban production and marketing systems in Hanoi, Ho Chi Minh City, Vientiane and Phnom Penh; and tests of new technologies for vegetable production and aquaculture.

Outputs on specificity and diversity of production systems

The specificity of vegetable and aqua-cultural production systems in urban areas has been described as follows:

- Specificity of vegetables grown close to the cities;
- Smaller size of the farms;
- Larger part of non-agricultural incomes;
- More innovative and risky farmers, using more inputs;
- Higher pressure due to the polluting environment;
- Large competition for access to the land;
- Development of short marketing chains for convenient urban markets.

The diversity of urban and peri-urban agriculture is characterized by:

- The production systems which respond to different urban segment markets;
- The present function, aiming at food production;
- The evident role of open spaces to protect the four cities from flooding.

Issues on leafy vegetable and fish in urban polluted areas

The production of leafy vegetables is a characteristic of the urban or peri-urban areas. In the three cities, Hanoi, Phnom Penh and Vientiane, these highly perishable vegetables are marketed from areas located within thirty kilometers around the urban centers. This is the case of kangkong; a very common vegetable consumed by people of all living standards, and sold at one of the lowest vegetable prices. For urban leafy vegetable productions, one big issue is to evaluate and reduce the health risks: this is the case in Phnom Penh where 80% of kangkong production areas is irrigated with waste water. A similar problem concerns the fish production in Ho Chi Minh City, where arsenic levels are analyzed to be over the official national standard. It has been recommended to encourage the heavy metal analysis expertise transfer between Ho Chi Minh City and Phnom Penh. Furthermore, kangkong production in waste water in Phnom Penh could be a discussion theme within the peri-urban agriculture committee.

Problems and advantages of temperate vegetables and chicken in comparison with those imported: regularity and sanitary quality

In the case of less perishable vegetables, such as tomato and cabbages, supplying areas are more diverse and variable based on seasons. Inner-urban and peri-urban areas, within fifty kilometers, provide more than half of the supply during local production period. For these vegetables, there is a period of unavailability of about three months in Hanoi (July to September), seven months in Vientiane (May to November) and Phnom Penh (October to April). During these times, the products are imported from neighboring countries: from China to Vietnam, in supplement to Da Lat production; from the South of Vietnam (Da Lat) to Cambodia; from Thailand to Lao. So, the imports compensate mainly a decrease of local productions due to heat and excess of water. Answering to their preferences for local and imported products, the marketers of the three countries mention the local commodities due to their freshness and their reputation in terms of sanitary quality. To enhance the comparative advantages of local products, it's advisable to consist of an increase in production during the shortage period – with prices comparable to the imported products- and of a promotion of sanitary quality supported by a rigorous evaluation of pesticide residues. For the chicken commodity chain in Cambodia, there is a large dependency on Thailand. The farmers complain about price dumping. Only a promotion of local good-quality products seems able to strengthen the power of local chicken producers.

Problems of transaction size and coordination among farmers

Market surveys in the three countries show farmers and traders' issue of scaling up the transactions (sales). The combination of different functions: production, assembling, wholesale, is frequent. The sales activities exceed barely hundred of kilograms a day. The increase of transaction size requests coordination among farmers in order to develop a collective sale which will be done on a voluntary basis of trust relations and shared interests. The increase of transaction size needs also an improvement of the transportation systems, which are at the moment dominated by two-wheel vehicles; in Cambodia and Lao, it is more common than in Vietnam. Finally, the coordination among farmers is also necessary for the quality promotion. In Vietnam, farmers who get higher incomes are organized in a collective way to sell vegetables indicated as "safe products" in retail markets.

Innovation tests and dissemination

To develop the production of tomatoes during hot wet season, cultivation under plastic shelter and grafting has been tested. The best results have been obtained in Vientiane, where no tomato production can take place without tomatoes grafted onto soil borne disease resistant rootstocks. The eggplant EG 203 rootstock provided by AVRDC appeared as the most resistant to diseases during hot wet season. In Hanoi, where the soil and climatic conditions are less harsh, the differences between protected crops and open field crops, as well as between grafted and non-grafted tomatoes, were not significant, requesting tests again in the second year. To improve the vegetable sanitary quality, production of leafy vegetable under insect-proof tunnel nets to reduce the use of chemical pesticides has been tested. The yields were doubled in Phnom Penh and Hanoi.

If the technical efficiency of these innovations is confirmed, a strict economic evaluation will be done in relation with the investment cost, farmers' groups and credit agencies.

The activities with farmers have begun since 2002 and will continue in 2003. In Vietnam, visits to cooperatives in the project sites, farmer interviews to evaluate their perception on the suggested innovation are carried out. The problems of access to the basic investments and market information have been mentioned. Extension services in Vietnam have been analyzed and a working group has been set up for a good relation between the farmers and the research-development persons. In Cambodia, low education level is a constraint to the training program, thus technical information must be adapted to this situation. In Lao, a meeting with farmers, traders and extension staffs has validated the market survey results; and a dialogue on means to strengthen the local production based on regularity and quality has been started.

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Sustainable development of Peri-urban agriculture in South-east Asia

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SUSPER

FIRST YEAR PROGRESS REPORT
2002 ACTIVITIES

1) INTRODUCTION

The overall goal of the project is to provide tools to make peri-urban agriculture more sustainable in the moving environment of urbanization. Fortunately, place for agriculture has not yet disappeared from the urban areas in the four cities involved in this project. Solutions to improve agriculture areas should be flexible in a context of permanent interactions between the development strength of cities and the different roles of agriculture around them. In the first year, different accurate assessments about peri-urban agricultural production systems, marketing of the peri-urban products, the importance of peri-urban products in supplying to the markets, organization of the peri-urban agriculture and the needs of consumers are required. These assessments will be shared with all the players of peri-urban agriculture: farmers, traders, extensionists, urban planners and policy-makers, in order to provide useful and efficient tools.

All these activities have been started with the enthusiasm of all the stakeholders in the project: (i) in Vietnam: the Research Institute of Fruit of Vegetable, the Department of Agrarian Systems in Vietnam Agricultural Sciences Institute, the Hanoi Agricultural and Rural Department, the General Statistics Office, the Faculty of Fisheries of the University of Agriculture and Forestry in Ho Chi Minh City ; (ii) in Lao: the Department of Agriculture of the Ministry of Agriculture and Forestry, and the Municipality of Vientiane; and (iii) in Cambodia: the Department of Agronomy and Agricultural Land Improvement, the Department of Planning-Statistics and International Relations in the Ministry of Agriculture, Forestry and Fisheries, and the Municipality of Phnom Penh.

The first year activities include:

- Training of the collaborators through workshop and technical assistance missions,
- Group discussion on protocols with rigorous methods for surveys and tests,
- Collecting data,
- Setting up the laboratory, field and office equipment,
- Implementing the surveys and tests, and local group discussions with stakeholders,
- Writing reports,
- Disseminating the first successful results.

Training is an important part of the project and, specifically in the first year. Workshops, support missions, medium-term visits to advanced laboratories, practical experience, exchanges of information are different forms of new know-how acquisition.

This is a synthesis report of activities done in the four components of the project:

Component 1: Analysis of peri-urban production systems
Component 2: Market development
Component 3: Technical and institutional innovations - Sub-component 3A: Pilot operation on vegetable production systems
Component 3: Technical and institutional innovations - Sub-component 3B: Pilot operation on fish production systems
Component 3: Technical and institutional innovations - Sub-component 3C: Dissemination of innovations and promotion of associations
Component 4: Regional communication and coordination

In each component, a short abstract of each activity is included. In the conclusion, the main common features of peri-urban agriculture are underlined.

2) COMPONENT 1: ANALYSIS OF PERI-URBAN PRODUCTION SYSTEMS

The main objective of Component 1 is to appraise the constraints and opportunities of farmers in relation with their location in urban and peri-urban areas environment (land pressure, pollution, markets, labor, etc), and to gather baseline economic characteristics of the farms in order to monitor the project impacts. Different approaches have been used to get baseline information on the peri-urban agricultural systems: collection of secondary data (statistics data of the three countries Ministries of Agriculture and of the Municipalities Agricultural Services, Agrisud reports in Phnom Penh) and to conduct surveys on farms.

A study of the impact assessment of peri-urban agriculture in Hanoi has been done in order to give a general overview of the contribution of agricultural sector to the city. The study is based on secondary data. Two experts of RIFAV and HARDD have collected the data in Hanoi and have gone to AVRDC headquarters to finalize the report with Dr. Mubarik Ali.

Then, the vegetable farms have been studied by extensive surveys in Hanoi, Phnom Penh and Vientiane. The survey protocols have been discussed between CIRAD and AVRDC scientists. Surveys include three rounds: (i) the first survey on characterization of the vegetable peri-urban farms, done in this first year; (ii) in the second year, the second survey on the hot wet season crops, and (iii) the third survey, on the dry season crops. Training workshops have been organised in the three cities to launch the surveys with AVRDC and CIRAD scientists. A training workshop on statistical data analysis has been held together with collaborators working on market data in component 2.

Moreover, the surveys on animal sector have more specific areas: aquaculture production in Ho Chi Minh City, pig production in Hanoi, sanitary quality of the poultry farms in Phnom Penh, and livestock, pig, poultry flows in Vientiane. In the three cities, the surveys will be complemented with expert meetings in order to validate the results of the studies. Livestock specialists from Hanoi and Vientiane have been already invited to a training workshop in Hanoi at the end of July 2002.

i) Impact study of peri-urban agriculture in Hanoi (AVRDC supervision)

The manuscript “Urban and peri-urban agriculture in Hanoi: resources and opportunities for food production” reports this study. It critically evaluates the presence of human and physical resources, production and marketing constraints, and environmental problems as well as explores the opportunities for increased production and supply of quality food on sustainable basis. This report relies on secondary data sources. However, findings from farms and household consumption surveys done in the framework of the 1st year SUSPER project are also cited when necessary.

High added value agricultural products (vegetables, meat, fish) in Hanoi have more comparative advantage than rice does; so land should be protected for agriculture with conversion from rice to vegetables and from rice to aquaculture. Furthermore, the main constraints for peri-urban agriculture are: seasonal production of vegetables, lack of adapted and diverse varieties, lack of technology for off-season production (hot wet season), and lack of water resource management. The quality and cost of animal production including aquaculture are high; aquaculture sector needs support in term of techniques and varieties. Marketing of vegetables and animal products has been identified as constraints; it needs some support to new initiative such as the “safe vegetable” activity.

ii) Baseline information for vegetable peri-urban production system in Hanoi, Phnom Penh and Vientiane

(a) Hanoi (AVRDC supervision)

In Hanoi, the first round of the survey on vegetable peri-urban production system has been finished; data are keyed in; analysis is on process. Some data are used in the above impact study. The main specific characteristics are:

- Small farm size: 0.18 ha /family in urban districts; 0.25 ha in peri-urban districts; 0.3 ha in rural areas;
- Diversified cropping systems: 68 crops, including cereals, vegetables, fruits, flowers, ornamental trees;
- Main problems on crop production expressed by farmers: floods in rainy season (July-August), water shortage in dry season (November- January), high input costs, low output prices, pest problems in hot wet season and marketing.

(b) Phnom Penh (CIRAD and AVRDC supervision)

In Phnom Penh, the review of data is finished, and the survey of 400 peri-urban farms has been done and keying-in data is going on. Due to the long time for surveys and processing data, only one survey round will be done.

We consider the production inside Phnom Penh municipality as urban production, the boundaries of which extend from 15 to 20 kilometers around Phnom Penh center. Peri-urban production mostly corresponds to Kandal Province which provides the bulk of Phnom Penh supply (according to data of Component 2). The total area cultivated in Phnom Penh municipality in 2001 is 7,500 hectares of rice and 765 hectares of vegetables. The three most important districts producing vegetables in all seasons are by order of importance: Dangkor (South), Russey Keo (North), Mean Chey (South). Kandal Province is the most important area in terms of the vegetable market supply. The largest district in terms of vegetable production is Saang district (2,500 hectares), located around 40 kilometers from Phnom Penh. The second one is Kien Svay (1,000 hectares of vegetables), located 25 kilometers from the city.

The production systems are mostly documented for Kandal province, through Agrisud¹ data. In Kandal province, the topography and location with respect to the canals (*preks*) are essential to understand the calendar of flooding and the cropping systems. The lowest areas are the ones cultivating rice longest, and they also correspond to the poorest families. The areas grown with vegetables are the canal banks and the backside of the river bank tops (*chamcar*). The most

¹ Agrisud is a French Non Governmental Organization which has been working in Cambodia for ten years
 2002 First Year progress report –SUSPER project

favorable period to grow vegetables is the start of rainy season (May to August). The floods occur from August to November. The dry season lasts from November to April, with water shortages starting in February which constrains growing until May. This calendar of rainfall and droughts explain that the main vegetable shortages occur in May-June (end of dry season) and October-November (flooding time). The rainfall is highly irregular, in particular the time of floods between July and November. The production systems are very diversified, with the current combination of the following crops (i) in the high lands: on river bank tops fruits (banana, coconut, jackfruit, mango); in high *chamcar*, vegetables: Chinese kale, Chinese cabbage, cabbage, chives, salad, mustards, chilies, ginger; in low *chamcar*: sweet potato, sugar cane, mungo bean, maize, groundnut, ginger, yam, taro; (ii) in the lowland: rice (in the rainy or dry season), maize, beans.

30% of families has ox which are used for ploughing and manure. Pigs are fed with farm and home residues and are used as savings. Families having access to vegetable plots have the highest income, and they can afford investment in agricultural inputs and labour-force. The number of landless families is growing.

In Phnom Penh municipality, compared to production systems in Kandal province, the exploratory farmers' interviews indicate the following trends: less diversified production systems, with larger share of vegetables and lower share of cereals, larger share of leafy vegetables in the cropping systems, smaller plots, longer period of vegetable cultivation and more diverse modes of access to water

Access to land is one of the most critical point in Phnom Penh. Since 1989, in Phnom Penh only rivers and river banks belong to the state, and farmers consider their farm land as their own; the World Bank supports the registration of land titles, at the moment 20% of land is recorded. There is no master plan for Phnom Penh and the state has limited financial resources to protect land which would involve some purchase of land, compensations, etc. There is contradictory information about the directions of growth of the city, it is likely that it indeed extends in all directions (the Prime Minister wishing an expansion toward the East). The urban population growth represents nearly 10% per year. Industrialization which has started since 1995 is an important factor of urban development as factories attract new population and markets. The houses encroach on agricultural areas through embankments.

The farm plot size and potential, in addition to the livestock ownership, are highly variable according to farmers' financial assets. Large plots are few: in the five villages surveyed in Saang district by Agrisud, only 17% of farms were larger than 1.5 hectares. One sixth of farmers grow half of the land. 20% of farmers surveyed by Agrisud in 2000 rent the land, the status of access to land for the rest being unclear. 44% of farmers would like to buy new land – and 8% would like to sell.

(c) Vientiane (AVRDC and CIRAD supervision)

The first survey round has been done. It will be complemented by some interviews. The data have been keyed-in; processing is going on. There will be no additional rounds due to the delay in doing and analyzing data of the first round.

The Vientiane municipality production of vegetable registered a rapid increase during the last decade. Most of the production of Vientiane municipality is dedicated to leafy vegetables that represent 59% of the total vegetable cultivated area. The main vegetable production districts are Xaithani and Hatsayphong.

The production survey has been done in 4 districts of Vientiane municipality, namely: Naxaythong, Hatsayphong, Sikhottabong and Xaisettha on a total number of 200 households. A rapid analysis of the cropping calendar in the surveyed district shows a contrasted situation between Hatsayphong and Xaisettha districts. Most of the farmers grow a combination of leafy vegetable (lettuce, Chinese lettuce, peppermint, coriander), bulb (onion) and fruit (tomatoes) vegetables. The farmers who grow 2 rice crops per year tend to develop more on leafy vegetable (lettuce, peppermint, Chinese lettuce) while those who grow a single rice crop per year combine fruit vegetable (mainly tomatoes in Hatsayphong, cucumber in Xaisettha). In Sikhottabong district, most of the farmers do not cultivate during the flooding period. They produce mainly chilly and eggplant. Tomatoes are mainly produced by exclusive vegetable growers. In Naxaythong, the main system developed by farmers is combination of one rice crop per year and 3 vegetables (kangkong, cucumber and yard long bean).

This rapid analysis shows some spatial specialization of production areas. Tomato production is mainly developed in Sikhottabong and Hatsayphong districts, cucumber and kangkong production in Naxaythong, and eggplant and chilly in Sikhottabong district.

At farm level, complementary interviews with farmers show that farmers are prompt to change their crops according to price (last price and expected price, and income) and their available investment capacity. Nevertheless, if the farmers tend to take any opportunity to increase their incomes, they integrate the market and technical risks into their practice since they can grow several crops at the same times.

Based on the analysis of survey and bibliography, some general main constraints for peri-urban vegetable growers could be raised:

- Market constraints: high price instability (inter annual / intra annual) / high risk
- Climatic risk, especially flooding during July and August
- Technical constraints: pest management, fertilizer management
- Access to inputs (fertilizer, pesticides)

iii) Baseline information for animal based peri-urban production systems in Hanoi and Phnom Penh

In Hanoi, the objectives are to assess the pig production development's trends in peri-urban districts, to appraise their constraints and opportunities for farmers due to the close city, and to assess negative impacts consequently on animal production development. Surveys in Hanoi province with the national partner National Institute of Animal Husbandry (NIAH) have been carried out on 276 pig farms around Hanoi. The study focuses on impact of the development of intensified pig industry and the technical limiting factors for farmers. A draft report has been written by Mr. Tran Long in November 2002. Data have been stored into an ACCESS database. The assessment points out: pressure gradient of cities on pig production, opportunities gradient due to the close city, environmental issue and pig production concentration. The main technical constraints are: lack of technical knowledge, inappropriate livestock buildings and manure storage. An assessment of input flows has shown the difficulties in having access to: raw materials and by-products for feeding; piglets; exotic sows for reproduction; good drugs and vaccines. There is a lack of extension and support services.

In Phnom Penh, the survey focuses on "sanitary management and quality assessment in peri-urban poultry production in Phnom Penh" The purpose is to evaluate the main characteristics of poultry farms around Phnom Penh and sustainability regarding peri-urban constraints. It is considered that a higher sanitary and quality status would strengthen poultry farm development.

A sanitary baseline will be established in poultry farms by diagnosing the current sanitary status and observing risk management practices. This knowledge will allow SUSPER project and Phnom Penh municipality, Department of Animal Production and Health to highlight the development priorities and define the main capacity to develop. Moreover, a common work with a group of farmers will help the municipality staff to initiate the dialogue on sanitary aspects. The survey has been started since November 2002 upon five poultry farmers located in Phnom Penh. The survey includes chicken blood and feed sampling, and questionnaires. 114 samples of chicken blood focused on: *Mycoplasma synoviae* & *gallisepticum*, *Salmonella gallinarum*, Newcastle disease, Gumboro disease, Marek disease and Coryza. Meanwhile some raw materials such as maize, dry fish and rice bran were to be analyzed to find out the rate of protein, moisture, and other mineral contents. Feed analysis is done in the feed analysis laboratory of the National Institute of Animal Husbandry in Hanoi. Results will help evaluate the diet balance. Results of these questionnaires and blood samples analyzing have not come out yet. Laboratory analysis and the final report will be done during the first semester 2003 by NAHPIC.

A survey protocol on animal production systems and the related flows has been set up for Vientiane in May 2002. Two Vientiane staff were been invited to attend a training session in Hanoi on participatory tools. Without any follow-up, this activity has been stopped in Vientiane.

iv) Analysis of aquaculture peri-urban production systems in Ho Chi Minh City

Aquaculture around Ho Chi Minh City includes: freshwater fish culture (1,000 ha), brackish water fish culture (3,100 ha) and shellfish production in brackish shallow water (1,600 ha). The main species grown in the freshwater ponds are: tilapia, giant goramy, grass carp, silver carp and common carp. Characterization of the production systems has been done by a survey with 73 farmers from March to May 2002, in four peri-urban districts: Binh Chanh, Cu Chi, Hoc Mon and 9th district. The district average ponds surface varies from 2,200 m² to 5,400 m².

There are 3 main production systems: (1) fish monoculture, (2) fish polyculture and (3) integration of fish culture into other agricultural activities. Monoculture is not so popular: only 16% of the farms, with high-value species as clarias hybrid and red tilapia. This system requires high cost artificial feed although in some cases, manure is used. Polyculture system is the most frequent in this area with 84% of farm areas; the breeding of two or more different fish species allows using the natural productivity of pond water, i.e. different feed groups produced in ponds such as phytoplankton, zooplankton, and detritus... In this case, fish feeding is based on pond fertilization by manure or by irrigating nutrient-enriched sewage. The main species are: tilapia, kissing goramy, grass carp, silver carp, mrigal carp and common carp. This polyculture system provides high benefits to fish farmers. In the third category, aquaculture is integrated with other agricultural activities as pig raising, poultry, aquatic plants which are mainly lotus and water mimosa. Integration with lotus is the more common. There is only one crop of lotus each year, the fish, mainly tilapia, is introduced very soon in the pond, one to two weeks after lotus plantation. Artificial feed might be added to natural food of the pond. The “water mimosa – fish” system appears in some highly polluted area. The yearly gross revenue of aquaculture is very high. Mean district values vary from 4.2 millions by 1,000 m² to 7.1 millions Vietnam dong.

The polyculture system appears to be more adapted to the competitive environment of the city with high gross revenue. But, the location in polluted area and the use of polluted water remain important problems that need to be solved by use of new technologies.

v) Spatialization of the agriculture peri-urban data in Hanoi and Phnom Penh (CIRAD supervision)

This activity aims to spatialize the data got in project components and to provide a synthetic tool which will allow the players to discuss and make suggestions on the sustainability of peri-urban agriculture. Two technical assistance missions in Phnom Penh and Hanoi, done by a geographical information system specialist have allowed making an assessment and identifying the collaborators at the Municipality level (Bureau of Urban Affairs in Phnom Penh, Hanoi Agricultural and Rural Development Department) and national institutes (VTGEO). This activity will be developed in relation with the project in the two cities. Actions will start in the second year.

3) COMPONENT 2 – MARKET DEVELOPMENT

The main objectives of component 2 are as follows: (i) to understand the organisation of the market in terms of geography of flows, stakeholders' functions, stakeholders' interactions (in particular regarding the exchange of information); (ii) to appraise market performance in terms of import competition, supply variations, income generation and distribution; (iii) to set the basis of an information system on origins and quantities; (iv) to appraise the consumption behavior.

The market analysis focuses on vegetable in Hanoi, Phnom Penh and Vientiane, and aquaculture products in Ho Chi Minh City.

A starting regional training workshop was held in Hanoi, during February 26 – March 5, 2002 gathering participants from the four cities. Objectives, methods and protocols for the activity implementation have been detailed commonly. A second training session has been organized in Hanoi gathering most of the participants, to analyze the data with SPSS software. The commodity chain data are mainly collected by surveys carried out in SUSPER project.

i) Spatial and institutional organizations of the vegetables market in Hanoi (CIRAD supervision)

Thanks to the improvement of living standards, Vietnamese people have been consuming increasing amounts of fresh vegetable over the past ten years. Yet, the market for fresh vegetable seems quite sketchy and disorganized. The aim of this research is to provide a more transparent picture of this apparently chaotic market, by addressing questions related to: origin of the vegetable sold in Hanoi at different times of the year; means of transportation used; organization of the vegetable marketing chains; relationship between seasonality, geographic origin of vegetables and marketing chain; segments of market and its consequences in terms of organization; and opportunities for developing off-season production for various vegetables.

To answer such questions, surveys were conducted in March, June, August and November, in order to take into account changes in the origin of the products, and in the organization of the supply chain. Interviews focused on the different actors participating in Hanoi's main vegetable markets; e.g. producers (if they sold vegetables themselves), wholesalers, assemblers, retailers, etc. The survey was carried out on the main wholesale or producer markets, i.e. markets on which vegetable products are exchanged overnight between traders, wholesalers, assemblers and/or producers (who bring the products from the main production areas), and the retailers (who sell vegetables to city dwellers during day time). Seven retail markets were surveyed during the daytime.

The main results of the survey indicate that:

- Almost all leafy vegetables sold in Hanoi are grown close to the city: 95-100 % of the lettuce comes from less than 20 km around, and 73-100 % of the kangkong (water morning glory) is grown within 10 km from the city. Although leafy vegetables can be grown throughout the year, their yield may decrease during the cold season. Yet, these vegetables never come from outside the Red River Delta.
- Most “temperate” vegetables (carrot, tomato, and headed cabbage) sold in Hanoi come from the Red River Delta during the cold season. When the climatic conditions are favorable (in March and November), 75 % (resp. 90 %) of the tomatoes (resp. cabbages) sold in Hanoi come from less than 30 kilometers away from the city. Changes in the origin of the “temperate” vegetables sold in Hanoi occur mainly during the hot and wet season (July-September), with vegetables coming from as far as Son La and Lam Dong provinces or China (resp. 6 %, 14 % and 80 % of all tomatoes sold in August);
- Most vegetables are transported by two-wheel vehicles (bicycles and motorcycles). A very small share of the total amount of vegetables (1 %) is transported by trucks;
- Producers represent 43 % (August) to 65 % (March) of sellers presenting on the markets. One quarter of the sellers stop selling vegetables on the market several months per year. 81 % of these sellers are producers, who quit selling in the hot wet season because they do not have enough products to sell (84 %), and because they are busy in their farm (40 %);
- During the high season, most temperate vegetables are either directly brought by the farmers to the markets, or sold by the farmers to the traders presenting in the markets. As the season fades away, the farmers become less present: tomato producers represent 79 % of the sellers presenting on night markets in November, are completely absent in June (tomatoes are then sold by traders supplied by wholesalers), and represent 11 % of the sellers in June.
- Leafy vegetables are mainly sold by the producers themselves, yet traders are more present at some times of the year. In March, June, August and November, all kangkong sellers present on Hanoi wholesale markets are farmers who come to the markets with their production and sometimes that of other farmers. Choysum is sold mainly by the producers in March (81%) and June (67%), while 85% of the lettuce sold between March and November is sold directly by the producers.

Seasonality was also studied through the analysis of vegetables retail prices gathered on two urban and two peri-urban markets of Hanoi. These prices series, which cover a five-year period (1996-2001), were provided by the General Statistical Office of Vietnam (GSO). The data show that: (1) vegetable prices have been growing faster than the overall price index over the study period, which may be explained by the increasing demand for vegetables; (2) vegetable prices experience very strong seasonal variations, especially “temperate” vegetables that must be brought from distant provinces or even China during the summer. Seasonal variations in the price of vegetables match the survey results on the origin of vegetables, and changes in the activity of the markets over the year.

In conclusion, this study links together seasonality, organization of supply, origin of the vegetables sold, identity of the vegetable sellers and overall level of activity on the markets. Moreover, it highlights the major role played by peri-urban farmers in the supply of food to the city. Finally, it stresses the importance of off-season production, through the extension of hot season production for “temperate” vegetables (tomatoes, cabbages) in the vicinity of Hanoi, and

through the diversification of production away from some of these crops (cabbages) during the cold season. Finally, the number of farmers presents on the markets and the atomized nature of vegetable trade both put the accent on the need for improved information flows about prices, volumes and areas of production throughout the year.

ii) Strategies of stakeholders of commodity chains supplying Hanoi market (CIRAD supervision)

The objectives of this specific study are:

- To understand the situation of some vegetables areas supplying Hanoi,
- To describe the flows supplying Hanoi vegetable market,
- To understand the roles and relationships of stakeholders of the commodity chains supplying Hanoi vegetable market,
- To understand the advantages and constraints of each stakeholder.

The study focuses on 4 product flows from 4 different supplying regions:

- Safe vegetable flow from Dong Anh – the main safe vegetables supplier of supermarkets, stores of state-owned and private companies, canteens of schools and kindergartens;
- Normal vegetable flow from Me Linh – the important vegetable supplier of Dich Vong wholesale market-;
- Vegetable flow from Gia Lam– the main vegetable supplier of Bac Qua-Long Bien wholesale market-;
- Vegetable flow from Thanh Tri – the main vegetable supplier of Mo (old) and Nga Tu So market.

The relation between the producing areas and markets seems to be based on distance. “Safe vegetable” flow has relatively close organization. Retailers are the agents regulating the chain. They transmit the market demands to production areas and request the actors to widen their scales in order to meet the demand. The biggest limit of this flow is that the consumers do not trust product quality. Demand for “safe vegetables” is increasing but producers cannot find way to sell out their “safe vegetables”.

In the normal vegetable flows, tasks of the various actors are relatively clear; however, in almost all the three flows, the relationships among them are very loose, for example in the commodity chain from Me Linh to Hanoi. Participation of farmers in the market is relatively frequent, especially for farmers from Thanh Tri and Gia Lam. An irregular but rather frequent farmer’s participation in the market makes the flows less centralized. That is the reason why the information from the market transferred to producing regions is very scattered. This affects the income of actors.

Product quality is one of the factors connecting market and production levels. This is a tool to connect the actors playing in the commodity chain. This is clearly expressed in the “safe vegetable” flow. Nowadays, in peri-urban districts, the pressure of the urbanization and the cultivated area reduction has led the farmers to change their strategies. They choose vegetables giving more profitability and improve the quality to raise their income per area unit. On the other hand, to make customers willing to buy at higher prices, it is important to make them confident to the label “quality” mentioned on the products. So it is necessary to help consumers to have means to check the products quality. The first step is to help actors building the standard of

product quality. In any case, the state should act as a referee to make actors respect the regulations.

iii) Organization of fresh water fish market in Ho Chi Minh City (CIRAD supervision)

The objective of this study is to identify the market organization of fresh water fish products in Ho Chi Minh City: (i) to describe the marketing channel system for the products, (ii) to provide information on the market infrastructure for product distribution and transportation, and (iii) to identify the marketing strategies of market actors.

The survey has been conducted via direct interviews of 15 rural collectors- traders who collect and transport the products from provinces in the Mekong Delta; 53 fish producers in the peri-urban area of Ho Chi Minh City; 27 wholesalers in wholesale markets in Ho Chi Minh City; and 105 retailers in urban area of Ho Chi Minh City. Also, 3 wholesale market managers have been interviewed for general information.

The marketing channel can be broken down into 5 separated market segments: (1) “rural producers-rural collectors” segment, (2) “rural collectors-traders - urban collectors-wholesalers” segment, (3) “peri-urban producers-urban collectors” segment, (4) “urban wholesalers-retailers”, and (5) “retailers-final consumers” segment. Rural traders sell 83 % of the products to wholesale market in Ho Chi Minh City and the remaining 17 % to local retailing markets. 100 % of the traders transport their products to Ho Chi Minh City by truck. In peri-urban area of Ho Chi Minh City, fish growers sell 71 % of their products to collectors and middlemen, and 29% to retailers who sell the products directly to consumers. Means of transportation in this segment is motorcycles. Wholesalers in urban wholesale markets sell 88 % of the fish to retailers in urban area markets, 8 % of the products to wholesalers in retailing markets, and only 4 % of the products to restaurants and other eating-houses (factory, hospitals, schools). Retailers sell the products to final consumers, eating-houses, and street brokers with the shares of 83%, 12%, and 5%, respectively. Most of the products are transported by bicycles or motorbikes.

Infrastructure of the marketing system is quite simple using simple equipment for storing and transport. Most of traders communicate to each other with telephone and their relationship is based on truth.

iv) Marketing system in Phnom Penh (CIRAD supervision)

Two activities were implemented to study the marketing systems in Phnom Penh:

- Rapid market surveys investigating market flows and chains (activity 1). The surveys were conducted on one out of five traders in the three largest markets selling vegetables: Orussey retail market), Dumkor and Chaba Ampou (wholesale and retail markets). Questions mostly related to origin of supply, functions of middlemen, calendar of supply, quantities sold. Eight commodities were selected according to their importance in consumption: tomato, cabbage, choysum, Chinese cabbage, lettuce, cucumber, long green bean, water convolvulus. The surveys were conducted three times: April, July and October
- In-depth interviews on traders’ supply and distribution strategies and economic results (activity 2). A total of fifty-three interviews were conducted including different types of stakeholders (wholesalers, collectors, permanent and temporary retailers) in the three markets.

From Agrisud data, the amount of food expenses reflects poverty of the population. The average food expenses are 1,564 riels/head per year (that is around \$0.35), and 95% of households spend

less than \$1 per head and per day on food. Food expenses are distributed as follows: 30% on animal products, 20% on cereals, 18% on fish, 10% on vegetables, 10% on fruits. The poorer households eat more vegetables (water convolvulus, cabbage, cucumber) and less meat than the richer households. Vegetable imports (from Vietnam and Thailand) account for 23% of vegetable consumption, and 37% of vegetable expenses. The data from FAO and Agrisud describe the organisation of marketing chains in terms of functions and origin (Phnom Penh municipality, Kandal province, Vietnam), but some quantification is lacking.

The main results indicate that vegetables can be classified into the following categories according to their origin:

- Vegetables that only come from Phnom Penh municipality (maximum of 20 kilometres from centre): this is the case of kangkong: 80% from Dangkor district and 20% from Mean Chey;
- Vegetables that mostly come from Kandal province (20-40 kilometres from center) for 99% of transactions (the rest from Phnom Penh municipality): this is the case of choysum (Saang district, Chamkarmon district), lettuce (Saang, Mokampoul, Lek Dek), yard long bean (Saang, Lek Dek);
- Vegetables that mostly come from Vietnam: tomato (100% from Vietnam in April-June), and 95% from Vietnam, 2% from Kandal (Saang) and 3% from Phnom Penh (Chamkarmon) in July-September; cabbage (100% from Vietnam in April-June, 95% from Vietnam in July-September and 5% from Kandal); Chinese cabbage: 100% at both periods;
- Vegetables that mostly come from Kandal and the rest from Kampong speu province (beyond 50 kilometres from Phnom Penh): this is the case of cucumber (99% from Kandal in April-June, 60% in July-September, the rest from Kampong Speu)

In April-June and July-September, around 60% of retailers were supplied by wholesalers, themselves supplied by collectors in 75% of cases and directly by producers in 25% of cases. 20% of retailers are supplied by collectors; and 20% of retailers are directly supplied by producers. Half of transactions are transported by motorbike, 26% on foot, 16% by truck (the rest mostly corresponding to delivery on the spot). 70% of traders sell all year round. The main reasons for stopping the activity are floods during rainy season.

Results of the first processing of the traders' strategies and results indicate highly variable incomes, with net marketing margins varying from 6 to 60% across the traders. More than half of the traders indicate that they have a kind of "reserve" of fixed suppliers but get also their supply from other occasional suppliers. Wholesalers getting their supply from Vietnam indicate that they had better get their supply all year round from Vietnam even when there is some supply from Cambodia, so that they can get supplied when there is no Cambodian production. The information provided by the radio on prices is stated as unuseful for more than 60% of the interviewed because of too late broadcast. The comparison between local and imported products indicate mostly the longer availability and higher visual quality of the latter, but alleged higher sanitary quality and conservation length for the local products, while prices are similar.

In conclusion, the surveys provide information for the selection of project sites relative to their importance in the vegetable supply: Phnom Penh municipality for kangkong; Saang district for other vegetables. They stress the importance of increasing the scale of production and assembling in the present shortage periods so that local supply can be competitive with the imported ones. A rigorous assessment of the sanitary quality of local and imported products appears necessary to enhance the comparative advantage of the former over the latter.

v) *Consumption behavior: Qualitative analysis of vegetable consumption in Hanoi (AVRDC and CIRAD supervision)*

The consumption behavior of vegetable in Hanoi is studied with quantitative and qualitative approaches.

The quantitative approach aims to study the variations of vegetable consumption in relation with time, household incomes and vegetable prices. The work will be done by three agencies: RIFAV and GSO in Hanoi, and AVRDC. The survey planned on three rounds has started in October 2002. So, only the first round of the survey was done: the results are mentioned in the report on the Impact of peri-urban agriculture in Hanoi (Component 1).

The qualitative aspect analysis of vegetable consumption was carried out by CIRAD and IOS, in 2002, on health risks associated by consumers on vegetable consumption. With nearly 6 million tons consumed per year, vegetables represent in volume the second foodstuff in Vietnam after rice. The total increase in consumption at the same time results from population growth (2% per year) and individual consumption increase (46 kg/capita/year in 1987; 54 kg/capita/year in 2000). However, the value of consumed vegetables represents less than 5 % of the food consumption value. The consumption of vegetables is higher for urban consumers than for rural consumers (+17%), and increases with the income of the households.

Vegetables constitute a major component of Vietnamese cooking. But the way of cooking vegetables seems to change, especially in urban areas. Vegetables are more and more served with meat. But, in this survey, more than 85% of the Hanoian dwellers considered vegetable as one of the most risky foodstuff for health due to the increasing use of agrochemical pesticides. This fact does not seem to affect vegetable consumption, because vegetables are considered as having high nutritional qualities and consumers seem to trust in their own practices to avoid sanitary risks by choosing the vegetables suppliers and the cooking methods.

vi) *Consumption behavior of fresh water fish products in Ho Chi Minh City (CIRAD supervision)*

The study aims to understand the consumer behavior of Ho Chi Minh City consumers on fresh water fish products. Specifically, the study has surveyed socio-economics conditions of households and households' perception with respect to fresh water fish consumption. The study also tried to measure the impact of socio-economic factors as well as health concerns that impact on the quantity of fish consumed by households. To measure the impact of these factors, an econometric model (demand function) for snake-head fish has been developed to measure the impact of income, price, substitutes, taste, and food safety concern on the quantity demanded.

The quantity demanded of snake-head fish that could be considered the most popular fish on the market is quite elastic with respect to price of the product and income of households. The price and income elasticity are -2.041 and 0.445, respectively. Surprisingly, price of pork that is expected as a substitute for snake-head fish, shows no significant impact on quantity of snake-head fish demanded. Two dummy variables which have been introduced to capture the impact of consumer taste and food safety concern, show no statistically significant impact though they have correct signs.

Thirty-five percent of interviewed households rank fish (especially, snake-head fish) the first in terms of nutritional value, just below beef which is ranked the first by 43 % of interviewed households. When comparing the quality of farm fish to the wild caught fish, more than 76 % of

consumers said that farm fish has lower quality in comparison to wild fish, especially in term of firmness and smell. Study results also show most of consumers do not have enough information about the safety of fish. However, most of them concern about the food safety problems: 19 % of households concern about quality of water for fish raising; 20 % concern about origin of fish feed; 15 % concern about heavy metal contents in fish; 20 % concern about toxic substances in product; 26 % concern about color of the fish body.

4) COMPONENT 3 - TECHNICAL AND INSTITUTIONAL INNOVATIONS - SUB-COMPONENT 3A - PILOT OPERATION ON VEGETABLE PRODUCTION SYSTEMS (AVRDC supervision)

The objectives of component 3 during the first year are to transfer the technologies that are developed with peri-urban farmers on Year 2 & 3 to the national collaborators. A regional workshop has been held in Vientiane on 4-7 March 2002 to plan the activities and detailed protocols for the first year. Activities include: (i) protected cultivation under plastic shelter with emphasis on hot wet season tomato production and year-round production, (ii) safe vegetable production under insect-proof net using also Integrated Pest Management technologies and quick bioassay test, (iii) tomato grafting.

Grafting is used to decrease the risks caused by soil-borne diseases (bacterial wilt, fusariums, southern blight) and flooding. Shelter will protect vegetable from mechanical damages of heavy rain during the hot wet season and the spreading of diseases (bacterial spot, black leaf mold, alternaria...). Plastic shelters have been built in Hanoi, Phnom Penh and Vientiane in experimental stations. Some specific materials have been bought from AVRDC in Taiwan as this material was not available in the country: plastic and metal clips, plastic wire belt, UV-resistant polyethylene in Phnom Penh², 64-mesh net for nursery... The iron structures have been made in the cities. The shipment of material to the national collaborators was necessary to provide a standard example. Further adaptation may be made if necessary, in relation with the different materials available. Some vegetable seeds were also sent by AVRDC: rootstocks for grafting tomato; tomato, sweet pepper, mini-cabbage, Chinese cabbage and melon varieties to complement the range of varieties available in the three countries.

Field days, official visits, TV programs have already promoted these new technologies in Hanoi and Vientiane.

Six collaborators have been trained for six weeks in AVRDC on protected cultivation techniques, grafting and safe vegetable production from April 17 to May 30, 2002. A study tour for three senior staff has been organized by AVRDC on October 2-17, 2002. A vehicle has been purchased in Hanoi and transferred to the project coordinator.

i) Off-season tomato production under shelter (AVRDC supervision)

In Hanoi (RIFAV), six shelters (galvanized iron structure and polyethylene cover) have been set up for a total acreage of 576 m², plus one simple grafting chamber (15 m²) and nursery (17.5 m²) with the irrigation system. In Vientiane (Voeunkham station), one shelter (115.2 m² with painted iron structure), grafting chamber and nursery have been set up. In the two cities, some trials have been done during the year 2002's hot wet season: tomato grafting onto tomato (Hawaii 7996) and eggplant (EG 203) rootstocks, with the comparison of open field crops vs. protected crops.

² Mr Kham Sanatem, in Vientiane, bought the UV-resistant polyethylene in Thailand.

The seeds of rootstocks of the first tomato trial were sown on May 21, 2002. Seedlings were transplanted on June 26, 2002. Harvest began on August 21 and finished on October 3, 2002. Four heat tolerance varieties were used as scions: CHT 501 (small fruits: 25-35 g/ fruit), CLN 2026D (small-medium size fruit: 45-65 g/ fruit), CL 5915 (small-medium size fruit: 50-60 g/ fruit), VL 2000 (large size fruit: 100-150 g/ fruit). Grafting onto tomato (50%) was less successful than the second trial (78%). Grafting onto eggplant is easiest to do in hot wet season; the rate of success is 92 and 95 %. There was a little increasing of total yield under shelter: 886 g/plant under shelter vs. 761 g/plant in open field, i.e. + 16% in this trial with a short harvest period. Some non-grafted plants died due to bacterial wilt.

For the second tomato trial in Hanoi, harvested from September 13 to October 30, 2002, it was not possible to observe significant effects of the shelter and rootstocks on the total yield for different combinations of rootstocks and variety scions (HS 902, VL 2000, CHT 501); but the marketable yield appears a bit higher under shelter. For two varieties with medium size fruits (HS 902, VL 2000), there was an increase in the marketable yield due to grafting onto eggplant in open field (13.6 t/ha vs. 10.00 t/ha; 12.88 t/ha vs. 9.61 t/ha).

In Vientiane, the varieties used as scions were: CHT 501, SIDA and SR 382. Seedlings were transplanted on July 7, 2002. All non-grafted tomato plants grown in open field died before harvest probably due to bacterial wilt, whereas the grafted plants onto eggplant and tomato gave good yields. But, growing plants under shelter requires new crop management technologies: special attention must be paid to irrigation and fertilization.

ii) Off-season crop diversification under shelter (AVRDC supervision)

Cucumber, yard long bean, sweet pepper, mini-cabbage were tested in Hanoi from June to October under shelter in comparison with open field. No difference was observed for yard long bean. Cucumber (25.3 vs. 19.4 t/ha), sweet pepper (8.4 vs. 1.3 t/ha) and mini-cabbage (14.9 vs. 10.5 t/ha) give more yield under shelters mainly due to the decrease under shelter. In Vientiane, chilli pepper, melon, cucumber and cabbage were grown for diversification during hot wet season.

Crop diversification was also developed for the main season. Cucumber, French bean, broccoli, sweet pepper and melons have been transplanted in mid-October in Hanoi. No results are available at the moment.

iii) Safe vegetable production in Hanoi and Phnom Penh (AVRDC supervision)

In Hanoi, a program has started since 1996 to develop the safe vegetable production. Nowadays, 776 ha are cultivated, with a total developed area of 2,250 ha on 24 communes in the 5 peri-urban districts of Hanoi (cf. Component 2-activity: Strategies of stakeholders of commodity chains supplying Hanoi market). 40 species are grown in this program. There are three crop management systems: hydroponics, net houses and open field. All the products must be under the MLR for pesticides, microorganisms, heavy metals and nitrates. But, at the moment there are still a lot of difficulties to provide to consumers the guarantee for safe quality of these vegetables.

So in Hanoi, it has been proposed at the same time to control the results of different IPM technologies and propose some tests to control quality of the products. First tests with comparison of protected nylon net (32 mesh) and appropriate use of chemicals have begun with amaranth and choysum during hot wet season. Tunnel net provided significantly fewer damaged

plants in comparison with open field. Marketable yield increases from 4.2 t/ha and 8.7 t/ha with no net to 19.1 t/ha and 18.0 t/ha with net for amaranth, respectively without insecticide application. For choysum crop, marketable yield increases from 3.6 t/ha and 6.2 t/ha without net to 11.1 t/ha and 11.3 t/ha with net, respectively without pesticides application. Insecticides used in the experiment (dimehypo, diméthoate, cartap) were not necessary under the nets; some insecticide residues were observed in five to seven days after harvest both with Quick bioassay test and gas-chromatography analysis.

In Phnom Penh, in Dey Eth station, the same treatments are to be compared. Chinese kale and kangkong have been grown in October-November. There was no effect on kangkong yields. Net has a large effect (14 t/ha) in comparison with no net (10 t/ha), also pesticide application (13 t/ha) has good affect against no pesticide (10 t/ha).

In both locations, the 32mesh nylon net seems to be an efficient solution to prevent insect attacking the crops of short-cycle leafy vegetable species.

5) COMPONENT 3 - TECHNICAL AND INSTITUTIONAL INNOVATIONS - SUBCOMPONENT 3B – PILOT OPERATION ON FISH PRODUCTION

In order to explain the objectives of the project and to reach common consensus on the studies, two meetings were held in Ho Chi Minh City (June 12 and September 14, 2002) gathering fish farmers, local authorities and scientists. Three activities have been carried out: technology transfer to farmers, assessment of heavy metal in fish, propagation and nursing of green catfish.

Tilapia GIFT³ strains and red tilapia were promoted to develop in some sites in peri-urban area of Ho Chi Minh City. In sewage re-used systems in Binh Chanh, 7 farmers received GIFT strains from the project to culture. Besides, 2 farmers received red tilapia.

Heavy metals were analyzed in the flesh and liver of four species (five fishes by species), in two highly polluted locations around Ho Chi Minh City (Phong Phu and An Laic). The results show that fish cultured in the region may have higher Zinc (Zn) and Arsenic (As) levels accumulated in liver and flesh than the authorized limits for fish and meat (Ministry of Public Health). Pangasius catfish and common carps which are two bottom feeders seem to be more sensitive than other species. The evaluation of technology to reduce the heavy metals accumulation by stocking fish at harvest in non-polluted area has started. Fishes are transferred to a non-polluted pond at Experimental Farm of Aquaculture of faculty of Fisheries, University of Agriculture and Forestry, Ho Chi Minh City, before harvest in a period to be determined. Five hundred Tilapias at harvest were transferred to the experimental farm for this trial. Fish have been sampled every 15 days to analyze the heavy metal. At the moment, the experiment started in October, is not finished. Full report will be provided in 2003.

The propagation and nursing of the Green catfish, a wild species in Vietnam (*Mystus sp.*) have been successful. Broodstock was collected from the river Song May and Tri An reservoir located in Thong Nhat district, Dong Nai province (150 km north HCM city). Fishes were stocked in 300 m² earthen pond at Experimental Farm of Aquaculture (UAF, HCMC). The broodstock was daily fed with diet 4 – 7 % body weight, containing 50 % of trash fish and 50 % of rice bran. Spawning was induced using LH-Rha with Domperidone. The hormone was administered dorsally in a single injection. The eggs were stripped 10 – 11 hours after injection at 29.5–30°C. Fertilized eggs were incubated in funnel jars. Hatching occurred after 20 hours at water

³ GIFT: Genetically Improved Farms Tilapia
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temperature of 30°C. Fecundity rates were 126.000 – 142.000 eggs per kg female. Egg size is relatively small from 1.17 to 1.32 mm in diameter and fertilized eggs are brown–yellow in color. Larval rearing and fry nursing were undertaken on 1 m³-plastic tank and glass tanks. Moina fed the larvae from the third day after hatching. Then, from the fourth day, Moina have been replaced by bloodworm Tubifex. Fingerlings at 14 day old gained 16,4 – 18,7 mm in length and survival rate ranged 78 – 92 %.

6) COMPONENT 3 - TECHNICAL AND INSTITUTIONAL INNOVATIONS - SUB-COMPONENT 3-C – DISSEMINATION OF INNOVATIONS AND PROMOTION OF ASSOCIATIONS

The objective of the first year is to explain the different tools that could be used for improving the functioning of commodity chains through promoting new technology and farmers associations. Two ways are developed:

- Development of tools for improving dialogue among players of the commodity chains: training of expert meetings in the framework of the livestock/ vegetable commodity chains in Vientiane;
- Strengthening of farmers association with the dissemination of innovations, for instance, the themes in the vegetable commodity chain in Hanoi: off-season vegetable production and safe production under net, based on the RIFAV results.

In Hanoi, after a review of existing extension services (government, voluntary, NGOs) and existing farmers' organization types, strategies have been proposed for technology transfer based on: (i) participation of different extension services and farmers' organization; (ii) integration of marketing and technical information to disseminate to farmers.

Negotiation tools “experts meetings”

After an attempt on the livestock sector, the second CIRAD expert mission on negotiation tools, coming from Hanoi, focuses on the vegetable sector in Vientiane. The first meeting provides stakeholders involved in the vegetable sector with new information on the vegetable commodity chain in Vientiane which is obtained from the preliminary analysis of the production and market surveys carried out by SUSPER project. It has also allowed testing a methodology to generate new information on the market opportunities, to share it among actors of the commodity chain and discuss about it. Seasonal adaptation of the production to the market demand and reduction of price instability appeared as major issues for the development of peri-urban vegetable production. This negotiation tool is complementary to another tool of broadcasting information: the Market Information System, developed by the Planning department of the Ministry of Agriculture and Forestry. In a context where there is little coordination between farmers and traders, and where both sides rely only on market rule for regulation, this meeting has allowed to initiate a dialogue between farmers, traders and services in charge of vegetable development. Some actions were proposed.

If this meeting underlined the lack of coordination and farmers' high demand on market and technical information, it shows at this stage a low level of collective decision concern. Further activities will follow in the second year: (i) a meeting based on specific collection of data, (ii) an institutional analysis, (iii) short meeting based on market calendar and market opportunities elicitation. The meeting have revealed also some specific needs: (i) analysis of the Thai production of tomatoes to assess the competitiveness of Lao products, (ii) analysis of conditions

and technical constraints of tomato production in late dry season - early rainy season, (iii) strategies of farmers about tomato crops. These needs will be covered by activities in Components 1, 2 & 3A.

7) COMPONENT 4 – REGIONAL COMMUNICATION AND COORDINATION

After the First Steering Committee organized in Hanoi in October 3-4, 2001, activities have begun since February 2002, and were on full development in the three countries only around April 2002. So, there was some delay in implementing the project activities. In order to facilitate the elaboration of the reports and develop the communication, the project has taken care to provide two computers in each location. Beginning in February, various technical assistance missions by CIRAD and AVRDC experts have been realized in the framework of the different components. The project coordinator has also taken seven missions to Ho Chi Minh City, Vientiane and Phnom Penh (see the list at the end of this document).

Two documents have been published and disseminated:

- An A4-format English leaflet, to present and explain the main characteristics of the project,
- A two-page document, called *SUSPER Newsletter*, in English and French to present some highlights about the project activities.

The different full reports have been edited in Hanoi. The list of the reports is at the end of this document. The most important reports will be copied and disseminated in a project document set.

8) CONCLUSION

Most of the project activities have started now according to the first year Workplan. Activities are shared in assessment activities and technology transfer activities. The technology transfer activities on cultivation under shelter to protect from the rain, grafting technology, low net to prevent from insect contamination, new fresh water fish species raising have given successful results in all the locations.

Despite the differences of the four cities in terms of population, and human density, the assessments of the peri-urban agriculture and the specific vegetable and fish commodity chain has given some common features of the diversity of the peri-urban agriculture and its specificity. Urban and peri-urban agriculture are defined by the actors involved in and agricultural products. The study on products helps us have a more accurate definition of this agriculture in terms of distance access to the market.

Specificity of urban and peri-urban agriculture appears in:

- Specific vegetables grown in a very close area to the city,
- Smaller size of the peri-urban farms
- The higher income of the farmers, with a larger part of income coming from sources other than agriculture
- More risky farmers, with a higher use of purchase inputs and open to innovation,
- More pressure from a polluting environment, higher demand for access to land and water,
- Developing specific short distance marketing flows for the near urban market,
- For further areas, the location around the city has more comparative advantage in accessing to specific transportation channels.

Diversity of the urban and peri-urban agriculture is as follows:

- The production systems are diverse
- Very large range, trying to respond to the urban market segments,
- Functions which at the moment focuses on food production,
- Evident role of open space management over various river water levels in the four cities

All these combined information will allow us to begin building some tools to promote the sustainability of peri-urban agriculture. Dialogue with all stakeholders from policy makers to farmers and consumers will be based on technical, economic and social arguments and meet their demands.

National Coordinators

Sustainable development of peri-urban agriculture in South-east Asia (Kingdom of Cambodia, Lao PDR, Vietnam RS)			
<i>Name</i>	<i>Institution/Position</i>	<i>Country</i>	<i>Project Role</i>
Phat Leng	Department of Agro-industry, Ministry of Agriculture, Forestry and Fisheries, Director	Kingdom of Cambodia	National coordinator and Steering Committee Member
Kham Sanatem	Department of Agriculture, Ministry of Agriculture & Forestry, Assistant Director general of DOA	Lao PDR	National Coordinator
Tran Van Lai	Research Institute of Fruit And Vegetable, Director	Vietnam RS	National Coordinator

LIST OF TECHNICAL ASSISTANCE & COORDINATION MISSIONS

Comp onent	Name	Date 2002	<u>Objectives</u>
2	Paule Moustier, agro-economist Cirad-Flhor	14 Jan– 1 Feb	Preparation activities in Hanoi, HCMC, Phnom Penh & Vientiane on marketing assessment
4	Hubert de Bon, project coordinator	16- 19 Jan	Starting activities: budget, first meetings to be prepared, activities responsible in Vientiane
4	Hubert de Bon, project coordinator	27 Jan- 1 Feb	Starting activities: budget, first meetings to be prepared, activities responsible in HCMC and Phnom Penh
2	Paule Moustier, agro-economist Cirad-Flhor	25 Feb- 6 Mar	First regional workshop on marketing in Hanoi
4 & 3A	Hubert de Bon, project coordinator	3- 7 Mar	First regional workshop on vegetable production in Vientiane
1	Vincent Porphyre, veterinary, Cirad-Emvt	8 – 11 Apr	Preparation of the survey in Vientiane on livestock sector
1	Mubarik Ali, agro-economist AVRDC	8 – 12 April	Meeting with RIFAV staff – Hanoi
4	Hubert de Bon, project coordinator	21-25 April	Starting activities in Phnom Penh: budget; preparation of the first meetings; identification of the activities responsible
1	Vincent Porphyre, veterinary, Cirad-Emvt	21-26 Apr	Preparation of the survey in Phnom Penh on the livestock sector
1	Mubarik Ali, agro-economist AVRDC	5 – 15 May	Meeting with Ministry of Agriculture, Forestry and Fisheries staff and Dr P. Moustier in Phnom Penh,
1 & 2	Paule Moustier, agro-economist Cirad-Flhor	7 – 21 May	Implementing Components 1 & 2 in Cambodia and Laos – peri-urban production system assessment & Marketing
1 & 2	Mubarik Ali, agro-economist AVRDC	28 May – 1 June	Meeting with RIFAV staff and Dr P. Moustier in Hanoi - protocol for Consumption survey
4 & 3A	Hubert de Bon project coordinator	28 April – 1 May	Following up of the activities Participation to the ADB CLVnet II phase project meeting Vientiane
3A	Su Tien-Ji, horticulturist	16-22 May	To construct equipment in RIFAV, Hanoi
3A	Su Tien-Ji, horticulturist	23 May – 1 June	To construct equipment in Veunkham, Vientiane

Comp onent	Name	Date 2002	<u>Objectives</u>
4 & 3A	Hubert de Bon project coordinator	19- 25 June	Following up of the activities in Ho Chi Minh city, Phnom Penh and Vientiane
1 & 2	Paule Moustier, agro-economist Cirad-Flhor	3 – 10 July	Follow up Components 1 & 2 in Cambodia and Lao – peri-urban production system assessment & Marketing
2	Umar Farooq, agro-economist AVRDC	1-5 August	RIFAV and GSO training about Consumption survey in Hanoi
3C	Jean-François Lecoq; agro-economist, Cirad-Amis	11- 14 September	First mission to develop negotiation tools in Vientiane
4 & 3A	Hubert de Bon project coordinator	15- 20 September	Follow up activities in Phnom Penh and Vientiane
3C	Pierre-Marie Bosc, farmers organizations specialists, Cirad-Tera	September 23 – October 5	Contact to develop activities of farmers organizations in Hanoi
3A	Su Tien-Ji, AVRDC, horticulturist specialist	1 – 9 October	To set up shelter for off-season and safe vegetable production in Phnom Penh
1	Frederic Borne, GIS specialist, Cirad-Amis	7-11 October	Contact in Phnom Penh to launch activities on spatial representation of peri-urban agriculture
1	Mubarik Ali, agro-economist AVRDC	16- 19 October	Follow-up activities on impact peri-urban agriculture in Hanoi and vegetable farms assessment
4 & 3	Hubert de Bon project coordinator	15 – 19 October	Contact with AVRDC headquarters
3A	Lowell L. Black, phytopathologist, AVRDC	16- 25 October	Follow-up Component 3 vegetable activities in Phnom Penh, Hanoi and Vientiane
3A	Raj Lada, vegetable crop management, AVRDC	16- 25 October	Follow-up Component 3 vegetable activities in Phnom Penh, Hanoi and Vientiane
1 & 2	Paule Moustier, agro-economist Cirad-Flhor	7 – 20 November	Follow up Components 1 & 2 in Cambodia and Lao – peri-urban production system assessment & Marketing
1	Vincent Porphyre, veterinarian, CIRAD	10- 14 November	Poultry survey in Phnom Penh and collecting blood and provender samples
1	Frederic Borne, GIS specialist, Cirad-Amis	25 -29 November	Contact in Hanoi to launch activities on spatial representation of peri-urban agriculture
4 & 3	Hubert de Bon project coordinator	2 - 7 December	Contact with AVRDC headquarters
3C	Pierre-Marie Bosc, farmers organizations specialists, Cirad-Tera	4- 11 December	Launching activities on vegetable farmers organizations in Hanoi
3C	Jean-François Lecoq; agro-economist, Cirad-Amis	1-7 December	Second mission to develop negotiation tools in Vientiane
1 & 2	Mubarik Ali, agro-economist, AVRDC	March 20- 26, 2003	Follow-up activities in Hanoi: peri-urban production system assessment and consumption survey
4	Hubert de Bon, project coordinator	February 18- 28, 2003	Launching activities for the 2nd year project

CONTACTS WITH OTHER PROJECTS

- Strategic initiative on Urban and peri-urban agriculture, project of the International Agricultural Centers, led by CIP
- Research Platform on Market and Agriculture Linkages to supply cities (MALICA) implemented by CIRAD in Hanoi
- AGRISUD project on Development of Peri-urban agriculture in Kandal province, in Phnom Penh, funded by AFD
- Impact of heavy metals on sustainability of fertilization and waste recycling in peri-urban and intensive agriculture in south-east Asia, CSIRO/ ACIAR

LIST OF ACRONYMS

ACIAR	Australian Centre for International Agricultural Research
AIT	Asian Institute of Technology
AVRDC	Asian Vegetable Research and Development Center
CIRAD	Centre de Coopération Internationale en Recherche Agronomique pour le Développement
CSIRO	Commonwealth Scientific and Industrial Research Organization
DAFF- PPM	Department of Agriculture, Forestry and Fisheries – Phnom Penh Municipality
DAALD	Department of Agronomy, and Agricultural Land Improvement (Ministry of Agriculture, Forestry and Fisheries)
DAP	Department of Animal Production (Ministry of Agriculture, Forestry and Fisheries),
DOA-MAF	Department of Agriculture (Ministry of Agriculture and Forestry) , Lao PDR
GIS	Geographical Information System
GSO	General Statistics Office (Hanoi)
HARDD	Hanoi Agricultural and Rural Development Department
IOS	Institute of Sociology (Hanoi)
NARS	National Agricultural and Research System
NIAH	National Institute of Animal Husbandry (Hanoi)
RIFAV	Research Institute of Fruits and Vegetables (Hanoi)
UAF	University of Agriculture and Forestry (Ho Chi Minh City)
VASI	Vietnam Agricultural Sciences Institute
VTGEO	Centre de Télédétection et de Géomatique, Institut de Géologie, Centre National des Sciences et Techniques du Vietnam

FIRST YEAR REPORTS

Component 1

- Urban and peri-urban agriculture in Hanoi: resources and opportunities for food production. Mai Thi Phuong Anh, Hoang Lan Anh, Mubarik Ali, 32 pp
- Productions animales en zone périurbaine de Phnom Penh, Cambodge. Rapport de mission au Cambodge, du 22/04 au 26/04/2002, Vincent Porphyre; CIRAD, 14 pp
- Rapport de mission à Vientiane, Laos. Productions animales en zone périurbaine de Vientiane, Laos, du 06/04 au 11/04/2002, 20 pp
- First Year report December 2002. Component 1- Peri-urban production system / Livestock sector. Vincent Porphyre, 3 pp.
- First year report. Aquaculture systems in HCM City. Le Thanh Hung, 25 pp
- First year report on agricultural production systems in Vientiane municipality. Summary of data processed so far. Thavisith Bounyasouk, Paule Moustier, Kamou, Ketkeo Phouangphet, Vilaysouk Khennavong, Mubarik Ali, 2 pp

- Peri-urban production systems in Phnom Penh. Baseline information. Paule Moustier, Srun Sokhom & Mubarik Ali, 4 pp.
- Représentation spatiale de l'agriculture périurbaine. Mission de Frédéric Borne à Phnom Penh. 12 – 15 novembre 2002, 6 pp

Component 2

- Stakeholder strategies of vegetable commodity chain supplying Hanoi market. Ho Thanh Son, Bui Thi Thai, Paule Moustier, Vietnam Agricultural Sciences Institute and CIRAD, 48 p.
- Spatial and institutional organization of vegetable market in Hanoi. Hoang Bang An, Le Nhu Thinh, Dang Dinh Dam, Ngo Van Nam, Le Thuy Hang, Trinh Quang Thoai – RIFAV-, Paule Moustier, Isabelle Vagneron - CIRAD
- Qualitative analysis of vegetable consumption in Hanoi. Muriel Figuié, Nicolas Bricas, V.P. Nguyen Thanh, N. Khanh Ly, D.T. Viet Phuong, Cirad and Institute of Sociology, Hanoi
- Vegetable traders' strategies in Phnom Penh. Summary. Chan Sipana Department of International relations, Planning and Statistics, Ministry of Agriculture, Fisheries and Forestry, Cambodia, 4 pp

Component 3

- Component 3 Methodological Workshop: Pilot-operation on Vegetable Production System. Vientiane (Lao PDR) March 4-7, 2002, Department of Agriculture, Ministry of Agriculture and Forestry 9 pp.
- Training Programs at AVRDC, of Research Assistants from Cambodia, Lao, and Vietnam involved in the '*Pilot Operation on Vegetable Production Systems*' of the AVRDC-CIRAD-French MOFA Project No. 2000-56, 17 April-30 May 2002, 6 pp
- Training report. Technology of grafting tomato onto eggplant and tomato rootstock for hot-wet season production. Le Thi Thuy, 10 pp
- Training report. Effect of barriers nets in the control of insect pests on leafy vegetable production. Ngi Samnang, Philangam Keo Oudone, Nguyen Duy Hung, 10 pp
- Tomato production under shelter during hot wet season in Hanoi. Le Thi Thuy, 12 pp
- The effects of rootstock and scion on the production of tomato in hot wet season under different management technologies. Vu Thi Tinh, Dang Hiep Hoa, Le Thi Thuy, 10 pp + tables
- Crop diversification under shelter during hot wet season. Ngo Thi Hanh, RIFAV, 8 pp.
- Safe vegetable production activities. Nguyen Kim Chien, Vu Thi Hien, Nguyen Duy Hung, 8 pp
- Component 3 "technical and institutional innovation". Sub-component « institutional innovation » in Vientiane. Jean-François Lecoq, 16 pp
- Farmers' organizations and agricultural extension service in Hanoi peri-urban area. P.-M. Bosc, agro-economist mission report, September 23 – October 5, 2002, 8pp

Cambodia

- Sustainable development of peri-urban agriculture in South-east Asia. Activities in Phnom Penh. First Year report. Phat Leng, 8 pp.
- Mission à Phnom Penh du 12 au 16 novembre 2002, Paule Moustier, 4 pp

Regional coordination

- First Year Intermediary report. September 2002. 5 pp

FIRST YEAR TRAINING

AVRDC headquarters

- Mrs. Keo Oudone Philangam (Vientiane), Mrs. Le Thi Thuy (Hanoi), Mr. Mao Sarith (Phnom Penh), Mr. Ngi Sam Nang (Phnom Penh), Mr. Nguyen Duy Hung (Hanoi), Mr. Phanpradith PHANDARA (Vientiane): training at AVRDC of Research Assistants involved in the '*Pilot Operation on Vegetable Production Systems*' Component 1, April 17 – May 30, 2002
- Mr. Kham Sanatem (Vientiane), Mr Phat Leng (Phnom Penh), Dr Tran Khac Thi (Hanoi): study tour in Taiwan organized by AVRDC on October 2-17, 2002
- Mrs. Mai Thi Phuong Anh and Mrs. Hoang Lan Anh (Hanoi); 12 November – December 20, 2002; writing report –Component 1- : Urban and peri-urban agriculture in Hanoi: Resources and opportunities for food production

Regional training course in Hanoi

- Mrs. Chan Siphana (PhnomPenh), Mrs. Chean Sokhen (Phnom Penh), Mr. Nguyen Cong Tru (Ho Chi Minh City), Mr. Kamthanh Thadavaong (Vientiane), M. Viengsavanh Sisombath (Vientiane), Ms. Truc (Ho Chi Minh City), Mr Hoang Bang An (Hanoi), Mr Ngo Van Nam (Hanoi), Mr Le Nhu Thinh (Hanoi), Mr Dang Dinh Dam (Hanoi), Ms Le Thuy Hang (Hanoi), Mr. Trinh Quang Thoai (Hanoi), Mrs. Bui Thi Thai (Hanoi), M. Ho Thanh Son (Hanoi), Mr. Nguyen Xuan Hoan (Hanoi), Mrs. Nguyen Thi Thanh (Hanoi), Mrs. Bui Thi Gia (Hanoi), Mr. Phan Xuan Cam (Hanoi): Peri-urban food marketing workshop, Hanoi February 26th- March 6, 2002for Research Assistants involved in components 2, animated by Dr. Paule Moustier (CIRAD).
- Mrs. Chan Siphana (PhnomPenh), Mr. Nguyen Cong Tru (Ho Chi Minh City), Mr. Somsack Kethongsa (Vientiane), Mr. Thanongsinh Vongsipasom (Vientiane), Ms. Thao (Ho Chi Minh City), Mr. Tuov Vannak (Phnom Penh), Mr. Hoang Bang An (Hanoi), Mr. Ngo Van Nam (Hanoi), Mrs. To Thi Thu Ha (Hanoi), Mr. Le Nhu Thinh (Hanoi), Mr. Dang Dinh Dam (Hanoi), Ms Le Thuy Hang (Hanoi), Mr. Trinh Quang Thoai (Hanoi), Mrs. Bui Thi Thai (Hanoi), Mr Ho Thanh Son (Hanoi), Mr. Hoan (VASI), Mrs. Nguyen Thanh (Hanoi), Ms. N. Khanh Ly (Hanoi): using of SPSS software to analyze survey data from October 28 to November 1, 2002 for collaborators working in components 1 & 2. The trainer was Dr Le Cong Tru (University of Agriculture and Forestry, HCMC). This training session was partly supported by the CIRAD project MALICA.
- Mr Kham Sanatem & Mr Nivath (Vientiane): training on Negotiation tools in Pork commodity chain organized in Vietnam Agricultural Science from July 28 to August 1, 2002

Project 2000-56- Sustainable development of peri-urban agriculture in South-east Asia

EQUIPMENT LIST- YEAR 1- 2002

Description	Amount	Size (length*width)
Hanoi- RIFAV (Vietnam)		
Component 1		
- Notebook	1	
Component 2		
- Printer	1	
- Computer		
Component 3		
- Computer	2	
- Shaded tunnel grafting chamber	1	6 m * 2,5 m
- Nursery with 32-mesh net	1	10 m * 2,5 m
- Galvanized shelter with iron structure and UV polyethylene cover	2	24 m * 4,8 m
- Galvanized iron structure and UV polyethylene cover	4	18 m * 4,8 m
UAF-HCMC (Vietnam)		
Component 1		
- Computer	1	
Component 3		
- Computer	2	
- Printer	2	
- Air-conditioner	1	
- Motorbike	2	
- Composite tanks	13	1 m ³
Phnom Penh (Cambodia) *		
Component 1		
- Computer	1	
Component 2		
- Computer	1	
Component 3		
- Computer	1	
- Shaded tunnel grafting chamber	1	6 m * 2,5 m
- Nursery with 32-mesh net	1	10 m * 2,5 m
- Galvanized shelter with iron structure and UV polyethylene cover	2	24 m * 4,8 m
Vientiane (Lao)**		
Component 1		
- Computer	2	
Component 2		
- Computer	1	
Component 3		
- Computer	1	
- Shaded tunnel grafting chamber	1	6 m * 2,5 m
- Nursery with 32-mesh net	1	10 m * 2,5 m

Description	Amount	Size (length*width)
- Shelter with painted iron structure and UV polyethylene cover	2	24 m * 4,8 m
Project site in Hanoi (Vietnam)		
Component 4		
- Computer	2	
- Photocopier	1	
- Vehicle (Toyota Zace)	1	
AVRDC (Taiwan)		
- Computer	1	

Note: Participant organizations

* **Cambodia**

- Department of Agro-industry,
 - Department of Statistics, Planning and International Relation
 - Department of Agronomy and Agricultural Land Improvement
- of Ministry of Agriculture, Forestry and Fisheries

** **Lao**

Department of Agriculture, Ministry of Agriculture and Forestry