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Water Resources with Food Security in Vietnam

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1. DEFINITIONS

a. Water resources

Everyone understands that “water is an extremely important resource, an essential element of the life and environment. It decides existence and sustainable development of the country but also may cause damages for people in the other hand...” (Law on Water Resources). In reality, in many people’s awareness, water resources are only important in case of scarcity that can not satisfy water demands, especially in case of droughts... That incomplete awareness causes constraints in proposing of comprehensive approaches for water resources exploitation, development and protection and results in unsuitable water resources management and exploitation, water waste, water resources drying up and water pollution.

There still exists a concept that water resources remain “un-exploited” so it separates water resources from water use (water user organization). This causes limitations in water resources development studies as well as in governance of the water resources management and enforcement of the law on water resources. That’s also the reason why several projects concerning water resources development can only implemented at “macro levels”. Often only policy frameworks have been promulgated such as laws, regulations but without concrete mechanisms such as financial policies, management arrangements at lowest levels, and participation policies.

b. Food security

Food security is understood in the aspect that “to ensure quality of food, foodstuff to provide for consumers, ensure nutrient needs not only for the daily work but also for sustaining and developing of races, ensure every people to access to food sources”.

So food security situation is not only food production but also other aspects from processing to distribution on basis of the development of food industry, market information systems, infrastructure, technology introduction and application, water and land resources protection aiming to ensure a sustainable agriculture and stable environment. Sustainable fishery is also an important aspect that engages to realize a long-term food security.

Forest development and protection are seen as “the doors” of the food security that support a stable production, livestock development through elements such as lands, water, medicines and fuels...

In fact, in many people’s awareness food security remain, however food production and in food production they only emphasize on paddy production.

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2. WATER RESOURCES – FOOD SECURITY

a. Food production

Food security is closely attached to food production (growing of paddy and other subsidiary crops) and irrigation (from hydraulic works) is a decisive factor in ensuring food production.

In process of food production, Vietnamese farmers have confirmed the role of water as extremely important as saying in this proverb “Water as first, fertilizers as second, hardness as third and varieties as forth”.

In order to ensure food security, food production is also seen as the first strategic task of the Vietnam’s agriculture in every period. Food productivity includes production of paddy and subsidiary crops which are the two main types of crops grown and require irrigation for a good yield.

Many studies showed that paddy is an indigenous crop of Vietnam, which had been grown for 6,000 years and domesticated by ancient Vietnamese from wild specie.

Ancient Vietnamese had grown paddy on alluvial soils on flat, suitable plains and they had made them fields for irrigated paddy.

Diversion of water to paddy fields had been done at least since the 15th-17th centuries. Since the 18th, 19th centuries, irrigation and drainage had been emphasized in Vietnam with more attention and everybody had understood that successful irrigated paddy agriculture had mainly attributed to a good irrigation and response to natural disasters, irrigation had been seen as a community work.

Vietnamese farmers concentrate on paddy production as a traditional food crop. Therefore, food surplus happens at many places (mainly in the Mekong Delta) that provide a cash product for export. However, food deficit still occurs at some places in particular in high mountains and remote areas.

According to statistic data, paddy growing area represent 84-86% of total areas for the two main types of crops, paddy production account for 84-91% of food production. This is an irrational structure in the cropping pattern (paddy and subsidiary crops) causing high demand for irrigation water and affecting water resources; at the same time it results in a slow livestock development and affects food security in a wider sense.

b. Agricultural diversification

The social demands for food and foodstuff are very divers, besides rapidly increasing demands for rice, other demands for meat, fish, milk, vegetable, fruits in the people ration also increase. Therefore it is necessary to diversify agriculture as a basis solution to increase cropping intensity, soil fertility, products on an area unit, job creation, and income for farmer households.
Increasing crops, yields, production aiming at raising income and satisfying consumption needs are set as objectives of the food security.

Therefore in addition to irrigated paddy, other crops such as maize, potato, cassava, vegetable, bean, fruits, and industrial crops including groundnut, sesame, sugar cane, rubber, coffee, tea, cashew, etc are indispensable. They are, however water demanding crops to get high yields although their water requirements are less than those of paddy (water requirements of paddy are 8,000-10,000 m$^3$/ha at fields while they are 1,200-1,500 m$^3$/ha and 1,000-1,200 m$^3$/ha for maize and groundnut respectively). It is required to have a rational structure to harmonize regions and crops.

Besides paddy, food crop development is one of the conditions to develop livestock husbandry serving production of meat, milk and pulling forces. In particular, water surfaces have recently been exploited in many places for shrimp cultivation including fresh and brackish water. That has become considerable revenue for farmers.

c. Land, water resources and a sustainable ecological system

Water resources play an important role in the ecological system and changes in water resources exert impacts on ecological system, especially the agricultural ecologies including followings:

- Positive impacts: rational water use have impacts on changing land use purposes, making lands more fertile serving production of high yield food crops.
- Negative impacts: irrational water use cause water-logging and inundation resulting in soil acidification, sulphurization, exhausting due to erosion, wash-out, and broken soil texture resulting in unfavorable changes in land use purposes, bad crop development and low yields.
- Positive and negative impacts: water supply (positive) but not of standard quality cause pollution in upstream and pollution in downstream as consequence.

d. Water resources with forest development and protection

Forests as “natural water stores” play an important role in ensuring ecological balance through water storage at the cover vegetation, erosion control, soil conservation, aquatic species in rivers, streams and ensure water supply especially in the dry season for production and human life. Forest protection is to protect natural resources and environment including water resources and to ensure food security.

3. ACHIEVEMENTS

Water users use water at different levels in both quality and time. Nevertheless water resources are unevenly distributed between regions, between seasons, that necessitate regulation for better use in order to meet water use demands through hydraulic structures or hydraulic systems (reservoirs, weirs, pumping stations, sluices, etc.).
At present, there exist in the whole country, 8,263 hydraulic structures at different scales including 743 reservoirs of large and medium scale, thousands reservoirs of small scale. Total investment costs at current price reach nearly 100,000 billion VND (equivalent to 6.5 billion USD). Those structures supply irrigation water for above 3 million ha of cultivated lands and 7 million ha of sown lands.

In view of management of that above mentioned hydraulic infrastructure, there are about 170 state-owned enterprises and more than 10,000 water user organizations (cooperatives, associations, units, groups, teams and private organizations). Most of structures of suitable scales handed over to farmers for their participatory management perform better (with 90-100% of designed capacity) in comparison with those managed by State owned enterprises (only 40-60% of designed capacity at some places).

In order to safely operate structures and raise beneficiaries’ responsibility in construction, protection and exploitation of hydraulic works, Government of Vietnam has issued a policy to mobilize people contribution under the title “State and People do together”. Farmers contribute their money and labor force in building hydraulic works (with the contribution share of 80/20-60/40), pay water fees (pursuant to the Decree No. 112/HDBT) at the rate of 4-8% of paddy yields. For instance farmers at some places have paid water fees at 749-810 kg of paddy per ha per year or 1.1-1.2 million VND per ha per year (equivalent to 70-80 USD). Despite low water fees and incomplete water fee collection, annually 500-600 billion VND (or 35-40 million USD) are collected in the country that considerably decreased the government subsidies and increased investment funds for O&M.

According to research documents, water contributes to increase 16-35% on average of paddy yields in parallel with other factors (especially high yield varieties) at specific conditions of each region (soils, climate, intensive farming level). Survey data after construction of the hydraulic work in Bac Duong revealed that paddy yields increased 33%, paddy production 44% thanks to expanded growing areas and increased yields.

In many places of the Mekong Delta, paddy yield increased from 4.5 tons per ha (in 1975) to 9.5 tons per ha (in 1990) and 10-12 tons per ha (in 1999) thanks to stable irrigation and drainage.

Also thanks to irrigation, annually sown areas increased with the cropping intensity from 1.3 to 2.2 and to 2.4-2.7 at some places especially, that contribute to increase food production from 5.7 million tons (in 1930) to 16 million tons (in 1986) and to 34 million tons (in 1999).

Increasing cropping seasons and yields are not only to raise production but also to create job opportunities for millions of rural people.

Thanks to increase of yields, production and crops, the average per capita food consumption increased from 328 kg per year (in 1930) to 400-500 kg (in 2000) despite highly growing population (the population are triple from 1930 to year 2000) and decreased average per capita cultivated lands (from 2,548 m² per capita in 1930 to 730 m² per capita in 1990). Chronic hunger is no longer existent. In 1998, 9.3 million people (accounting for 39.5% of rural population) in 21 provinces and cities lacked food of which 3.6 million people faced critical hunger.

Agriculture has been changed in the orientation to exportation. Agricultural GDP in year 2000 increased 5.3 times in comparison to that in 1990. Export values out of total agro-
forestry-fishery sector production increased from 16.2% (in 1990) to 35.4% (in 2000). Many large-scale production zones have been established to ensure food security and foodstuff for domestic consumption and exportation.

Increased food production result in livestock development, despite that livestock development (25-26% of total agricultural production values) is not well responding to the agricultural development in general but it importantly contribute to export values.

(Agro-forestry export values were 66768.5 billion VND in 1990, 113766.00 billion in 2000 of which fishery export values accounted for 8135.2 billion VND and 20983.0 billion VND in 1990 and 2000 respectively).

“On average, each people in the Mekong Delta annually produce 62 kg of aqua-products, contribute 45 USD of aqua-product export values for the country, create job opportunities and sustain life for 4-5 million people who live on fishery and aquaculture” (Report by Dr. Nguyen The Binh – Sub-Institute of Agricultural Planning and Projection).

Farmers’ incomes increase thanks to agricultural production, especially in cash production areas that really eliminates hunger and reduce poverty, then raise farmers’ purchase power in rural areas and promote development of other sectors. That is correctly reflected in the proverb “Declining agriculture results in failure of hundred sectors”.

Food prices increased 0.6% only while industrial product revenues increased 8.5%, services 17% in 2 years (December in comparison with December 1995).

Reality in past decades confirmed that wherever water resources develop, physical and spiritual lives of population are improved, political and social security is stabilized, hunger and poverty are gradually eliminated.

In summary food security in Vietnam is different in each specific region but has met in general the minimum level in many places.

Thanks to the policy to allocate lands and forests, reforest bare lands and hilly areas, forest cover areas has increased considerably since 1991 with average annual increase of 500,000 ha.

In line with increased areas of forests and perennial crops, areas of industrial crops and fruit crops also increased at 70% and 37% respectively that contribute to reduce soil erosion and to create job opportunities for millions of rural households.

In view of rural drinking water: according to survey data in 1997, 42% of national population are served with clean water in which 80% are citizens. Currently there are only 37-40% of rural population served with clean water.

4. CHALLENGES

a. Supporting Factors

+ Vietnam is favored with advantageous natural conditions, e.g. climate, land, geographical locations, water source etc. which of the advantages of each zone and mitigating impacts of agricultural cultivation on the environment; (2) utilizing, as much as possible the local labor force; (3) meeting fully diversity food demand beside rice; (4) producing materials for
processing industry, upgrading food quality for domestic consumption and export; and (5) decreasing irrigation water requirement during the low flow season represent advantages for the development of a diversified commercial agriculture.

+ An abundant labor forces in rural area that are capable of obtaining the advanced technology and science and possess rich experiences in agricultural production.

+ Vietnamese party and state have been always put a high priority on the development of water resource. At present, water resource development is considered as the top strategy of all development periods.

+ The promulgation of law on water resource since 1998 regarding the management of water resource, policies for the investment in water resource development, financial obligations of water users, control against water degradation, water exhaustion and water quality conservation etc…

+ Such related by-laws as some published Acts and Resolutions are also important legal foundations for the effective conservation and exploitation of the water resources.

**b. Dealing with Population Pressure**

Booming population growth, increased urbanization and contracted cultivation land are posing difficulties concerning the requirements of food and foodstuff, drinking water and jobs for not only the existing labor force but also another 1.3 - 1.5 million of labors in the future. Food and water securities are facing daunting challenges.

**c. Mitigating Natural Disaster**

Changing nature and natural disaster occurring at great frequent have been threatening the water resource development. Natural disaster related risks have impacts on water resource to both aspects: damages (flooding) and benefits (water supply) which means effects on food security.

- Floods: cause disastrous damages regarding life and property losses. During the period of 1991 - 1994, annually, storms resulting in floods have claimed the lives of 300 people, injured 157 people, 379,000 ha of rice and crops lost, 17,000 cattle and 172,000 poultries washed away and 379,000 houses collapsed.

In recent years, flash floods happening at high rate has caused extreme damages for human and property and resulted in seriously polluted environment and ecosystem.

According to Statistics of Center for Natural Disaster Management and Mitigation under Office of Central Flood and Storm Steering Committee, within a period of 22 years (1977 - 1999), natural disasters in Vietnam have resulted in 13,000 people died, interpreting to 590 people died annually. The annually average socio-economic damages are estimated at USD 70-100 million (including food loss).
Drought: exhaustion of water resource will lead to insufficient water supply for domestic demand, affecting the environment and threaten human’s health. Especially, shortage of water in agricultural production will directly affect the crop productivity and yield which mean damages of food crops, polluted environment and high cost for drought control. This is also a repeated situation. During 1980 -1990, there have been 11 winter - spring crops damaged, the drought affected 1997-1998 winter - spring exclusively claim VND 38 million for drought control.

Pest: the spreading and ravaging of pest depends on the cultivation pattern, including plant protect chemicals, irrigation and drainage techniques. In some cases, water also helps control pest and damaging of harmful pests as rats, insects. Taking the instance of 1991 crops, 46,330 ha was complete lost due to the ravaging activities of these pests, resulting in the loss of 487,000 tons of food. The extermination of active pests using chemicals will not only have direct impacts on in-situ environment but also its neighboring.

d. Managing acid sulphate and salt intruded soils

The unreasonable and arbitrary exploitation of water resources (both surface and underground water) has resulted in the imbalance between the supply and demand of water use. This is also the reason for the acid sulphate and salt intruded soils.

According to statistics, about 1.3 million ha of rice production located in the saline intruded area along the coast of Mekong river delta and extremely arid lands in the central area fail to be irrigated by active irrigation and drainage works.

As per findings in many reports of agricultural sector, about 1.7 million ha are under the effect of tidal salt intrusion during the low flow season. The figure can be higher in the absence of prompt control measurements.

After years of land reclamation, only 1.6 million ha, making up for 41% of land in Mekong river delta are acid sulphate soil, in which 658,000 ha is situated mainly in the inadequate irrigation and drainage area and along the coast. These areas could be reclaimed into stable agricultural land provided that fresh water is sufficiently supplied for irrigation and acid dilution.

e. Preserving the Environment

The developments of agriculture, industry, and livelihood have negative impacts other than positive effects on the environment, namely:

Commercial agricultural productions, especially ones produce high economic values, have stimulated the increase in cultivation area and converted many rice land to aquaculture water surfaces. This is the reason for excessive water demand, especially underground water, causing drought and drying up of water sources. These adverse effects in turn are the main causes for the polluted water resources (water for domestic use is most concerned), putting human’s health under high risks and causing forest fire
(e.g. in the 1998 drought in Daklac, thousands of ha of coffee was lost and followed by forest fires) as well as water resource pollution as aquaculture production was not properly managed.

- The use of fertilizers, including chemical fertilizers and pesticides have resulted in increase pollution in irrigation water (the amount of fertilizers applied in 1 ha of rice in was 80.3kg and 63.2kg in 1990 and 1996, respectively, similarly the pesticides was 2.5kg and 1.2kg in 1990 and 1996 per ha, respectively). The soil intensity index has been raised in order to increase crop productivity and yields (especially of rice) which is the task of great importance in agricultural production. However, the practice is the reason for negative aspects in the protection of water resources through irrigation systems. Once the irrigation systems help improve cultivation conditions (through irrigation) of one area (irrigation water has been polluted), they will cause adverse pollution for the other (downstream) through irrigated and drained water. This represents big challenges in terms of environment in agricultural production.

- Industry: urban areas and concentrated industrial zones have increasing demand for drinking water and discharge a larger amount of sewage and solid wastes from industrial activities into water sources. These water sources are not properly treated which pollute and threat the water quality as a result. The restoration and renovation of handicraft villages create more jobs and increase incomes for rural residents on one hand and set forth a difficult task for management and protection of water resources on the other hand.

- According to some study reports, 1 ton of iron produced will require 120 - 130m3 of water. The sewage from the process will account for 80-85% of the used amount, carrying solid wastes and pollutants as lead, acid…

- Wastes from agricultural product processing, food processing and other industrial activities as paper-making, tanning, silk weaving etc… also contain such pollutants as soda, floating residues (BOD - Biochemical Oxygen Demand) and COD (Chemical Oxygen Demand).

- Forest: in recent years, deforestation is happening at higher frequency (especially in watershed). People cut wood for timber, agricultural land, aquaculture production. Forest fire is caused by quite various kinds of reasons.

Forests have been being degraded in a large scale which affect the water resource and ecosystem balance whereas the protection measures are not inadequate. Suffering the shortage of food, local people earn their own living on cutting wood which lead to changes in ecosystem. The subsequent outcomes are soil erosion, sedimentation in rivers and streams and irrigation channels, causing floods, inundation and drought and affecting food security.

According to many studies, the plant cover was reduced from 14,325,000 ha in 1943 to 9,395,000 ha in 1990 or from 48% to 28% of the total land area. At present, the forest cover in North West area (including provinces of Son La, Lai Chau) is only 6-7%. According to statistics of 2000 of General Department of Land and Housing, the natural forest area in the whole country is 10 million ha. Of which, the protection forests make up for 3.7 million ha. It is also reported in the “Statistics of Vietnamese Environment in 1999”, that during period from 1981 to 1992, 65,300 ha of mangrove in two provinces of Bac Lieu and Ca Mau have been cut for shrimp farming.
f. Managing Water Supply and Demand

The distribution of water resources in Vietnam is uneven by space, time and with respect to the population:

- Rainy season: 80%, dry season: 20% of run-off
- Mekong river delta makes up for 61% of the total area and house only 22% of the total population.
- Remaining areas make up for 39% and accommodate up to 78% of the total population

In order to meet all water demands, Vietnam must rely on water control and irrigation systems. Large investments have been put in water resource development. However, according to many investigations, the existing irrigation works have not brought into full production in line with investment rate in the sector. These irrigation works could only supply reliable irrigation water at 50-60% of the total design capacity.

According to statistics, the national average irrigation development is 46.4%. Of which, the irrigation is best developed in red river delta, i.e. 90%, North of Central region and coast of central area 50-60%. Irrigation development is less carried out in central highland as of 2.3% (year book statistics- 2000). It can be found that investment portion in irrigation development is quite potential, concentrated mainly in poor, remote and mountainous areas.

Irrigation works mainly supply water for rice (making up for 87%) which can not meet the crop pattern shifting. The annual average irrigated area makes up for about 80% of cultivation area. The irrigation management requires improvement, especially irrigation organizations at local levels are not properly managed due to the absence of the participation of farmers as members of these groups which result in inefficient management of irrigation works as well as of water resources. The lack of cost recovery for O&M activities and repair of degraded works can not ensure irrigation water for the command area. This is the reason why farmers have to invest in the construction of more electric pumping stations and petrol pumping stations other than planned ones so that additional irrigation can be carried out. Hand pumping using buckets is also applied. This results in increased cost for irrigation area in some locations and this augment is inevitably charged to both farmers and the state (for one irrigated hectare in Long Thanh commune – Yen Thanh – Nghe An province located at the end of N4 canal, the farmers have to pay 40,000 VND/ha more for cost of electricity, petrol and 8-10 hours/day of labor for fetching irrigation water). Nevertheless, the productivity in this locality is still 20% lower than that of commune located at the beginning of the canal.

g. Institutional Reforms

General investigations revealed the fact that 24 out of 32 factors affecting the efficiency of irrigation works were associated with institutional factors (accounting for 75%). Institution can be considered as the key factor which determines the entire activities in water resources management and exploitation of hydraulic works.
Institutions are defined in general term as follows: Institutions ensure the sustainable development of households, enterprises, cooperatives. They can be defined as the mechanisms or policies rather than organizations (monetary, law, price, market…), as common lobby for the guarantee of activities of the community, for the solution of conflicting relationship concerning the rights between individual and the community, between the state and people.

In fact, the role of institutions has not been properly emphasized for example high priority is placed on construction investment rather than management tasks, whereas certain mechanisms and policies are not completed and timely finished. Particularly, the financial policy related to O&M activities shows quite a lot of limitations. In spite of the issuance of Decree 112HDBT, it proved to be unsuitable to the actual situation. This can be seen in the low water fee based on rice productivity and that the fee is only imposed on the farmers involved agricultural production. Other individuals are not charged with this kind of fee or only at small rate. The fact that farmers fail to pay water fee or water fee is appropriated by some individual are not solved. This leads to the inequity in the payment of water fee. As a result, the water is used in wasteful manner; there are insufficient funds for O&M and seriously degraded irrigation works.

The existing situation can be traced to several causes. One of them is that the by laws are not complete which restrict the enforcement of water law and the water resource development for the sake of a better food security.

h. Other Challenges

- Water resources development for multipurpose utilization
- Need to limit risks caused by flood, drought and pest. Within the next 10-15 years, ensure the reliable irrigation water supply for 4 million ha so that active irrigation and drainage will help maintain rice production. Low yield rice land can be turned into land for other plants with higher productivity. For instance, subsidiary crops can be grown on arid land and aquaculture can be carried out on low land, flood plan or on coastal land or suburb land can be good for planting of vegetables, flowers or fruit trees…Rice can also be grown in remote area provided with favorable conditions as the availability of small irrigation works. This may help improve the livelihood of local people and prevent deforestation for terraced field and restrict shifting cultivation (according to Resolution No. 09/2000/NQ-CP dated 15th June, 2000 by the Government).
- 90% of the population should be supplied with minimum water demand.
- By year 2010 the water demand in agricultural sector will increase by 23 % as compared to the year 2000.
- Agricultural development must be based on proper economic principles so as to fully exploit the advantages of individual agricultural economy and improve the productivity and quality of agricultural products. This can help reduce the product cost and raise income per ha of cultivation land (e.g. the revenue on 1ha of cultivation land in 2010 is 3000USD, on average rural labor earn 2500 USD/annual). The agricultural growth rate in concentrated are is 7-7.5%/annual).
5. GENERAL APPROACH TO WATER RESOURCES DEVELOPMENT AND FOOD SECURITY

5.1 A planning to change cropping and livestock patterns (including aquaculture) is necessary for each region corresponding to the water availability, it is not recommended to supply irrigation water for paddy at any costs. It is required to ensure incremental food production with stable and necessary export production (3.5 million tons per year) but with decreased sown areas in order to meet the water resources security.

It is indispensable to study into a suitable plan to change cropping and livestock pattern, with detailed alternatives which can improve irrigation operation and water supply as required, rational and economic water use, increasing crop yields, etc in order to fully solve raised issues (with structural and non-structural measures), not only for “phenomena” but also reasons for bad and ineffective operation.

5.2 Forest protection and development: a deep investment plan is needed to zone and restore forests aiming to protect and develop water resources as well as to reduce floods, droughts, to protect environment, balance ecologies, conserve lands and ensure food security.

5.3 Water resources modernization serving rural agricultural industrialization and modernization: “Rural agricultural industrialization and modernization is a process to change the agricultural economy to the great cash production”… “Implementation of mechanization, electrification and irrigation development…”

Water resources development is identified as “the leading measure in agriculture”. Modernization of water resources sector is an important substance in rural agricultural industrialization.

"Priority should be given to develop hydraulic systems in the orientation of multi-purpose use of water resources to supply irrigation water for agricultural production, industries, domestic uses and environmental improvement, prevention and control of natural disasters. It is required to apply advanced technologies in irrigation and drainage, in economic water use and in hydraulic work construction and management, and to develop water user cooperatives and farmers’ irrigation management organizations”.

"Modernization is a process to improve utilization of resources (water, lands, labor and environment economics) through upgrade and improvement (contrary to simple rehabilitation) of hardware and software of irrigation projects and maintenance or improvement of water service delivery to fields.”

5.4. Policies and mechanism in water resources development

Ensuring “food security” much involves policies and mechanisms in different domains (varieties, crops, fertilizers, water, processing, trade, etc) but policies in water resources sector exert an extremely important role, include following:
5.4.1 Investment policies

a. Mechanism for capital investments

In order to ensure complete construction of hydraulic systems (from headwork to on-farm canals), it is necessary to secure investment funds in a close mechanism in enhancing the role of State and beneficiaries in investment, attach their rights and responsibilities with a clear tie through detailed policies and mechanisms on investment distribution at different types:

+ Government sponsor 100%.
+ Government support (Government and people do together)
+ Community investment (mostly for small structures on their locality)

or following investment decentralization:

+ Central level
+ Local levels
+ Beneficiaries

with an appropriate investment share:

- Central/Local/People: 4/3/3 or 4/4/2.

- Farmers (beneficiaries) should have an engagement in investment. The Central can only pour investments in case with locality’s and beneficiaries’ engagement in investment.

Therefore it is necessary to have “policy to encourage people to participate in investment in, management and exploitation of hydraulic works” (Resolution No.06 by the Politic Bureau on November, 10, 1998)

However current situation occurs as follows:

Locality and beneficiaries had promised to engage in investments in order to get Central investments but they do not act as they promised after the Central investment implemented. That result in only headworks and main canals done while secondary and tertiary canals (which must be done by local governments and beneficiaries) have not yet built. Therefore hydraulic schemes can not well perform.

At some schemes, headworks and main canals have been completed and gone into operation for years and they are not degraded and deteriorated meanwhile secondary and tertiary canals which should had been done by local investments are not yet constructed. That cause low efficiencies in the system operation (at 40% of design capacity only).

b. Investment in forest protection and development:
The policy on land and forest allocation to farmers has created opportunities to protect and develop forests. However deep investment plan is required to sustainable protect and develop forests.

c. Investment in new construction of hydraulic works:

Where possible new construction of hydraulic works should be done in order to expand irrigation areas for crops, to supply domestic water, irrigation for upland, industrial crops and fruit trees especially in mountainous and remote areas, to develop aquaculture and improve environment.

d. Investment in rehabilitation and improvement of existing structures

“Firstly, priority should be given to management improvement and strengthening in order to raise effectiveness in hydraulic work exploitation” (Resolution No.06 by the Politic Bureau on November 10, 1998).

This is an important content because it is the most economic investments, easy to invest in with visible and quick benefits.

According to preliminary calculations, rehabilitation and improvement of existing structure in order to increase current operation productivity to 15-20% (from current 50-60% to 70-80%) will increase irrigated areas (with stable irrigation supply) of 300,000-400,000 ha with investment requirements of about 1,000 billion VND. Meanwhile new construction of a hydraulic work of the same capacity needs about 10,000 billion VND (10 times more).

e. Investment in lining canals

Lining canals is an important policy by the Government of Vietnam. It is also a content of the modernization of hydraulic works aiming at economizing water, increasing irrigated areas; reduce management costs, timely supply water for irrigation and increasing crop yields. Nevertheless, it is necessary to have a mechanism to well prepare for planning, investigation, design, construction in favor of an economic investment, good quality construction serving multi-purposes in order to effectively implement the policy. However, it is not absolutely necessary to line every canal at any costs.

The Government has promulgated a policy on capital investments for lining canals (pursuant to Decision No.66/2000/QD-TTg on June 13, 2000) but difficulties still raise concerning investment sources for canals of types 1 and 2 and procedures to get loans, payment periods for canals of type 3. Therefore there exist constraints for some localities, especially for those which are not well determined for implementation of that policy.

Lining canals shows many positive benefits but also reveals disadvantages which should be addressed, especially in case of canal break and deterioration (due to improper design, construction and management). Reparation and rehabilitation of canals are very difficult due to high costs, complex investment procedures while farmers can’t do themselves like the case of earth-filled canals. Therefore, lined canals, and small canals at commune and
inter-commune levels in particular should be transferred to farmers’ organization (beneficiaries) for management (irrigation management transfer) in order to well perform at high effectiveness and sustainability.

**f. Financial policies in operation and maintenance**

Water supplied by hydraulic works should be seen as a “good” with its price and cost. Depending on specific users, the Government can apply different selling policies with possible exemption or discount (like water for agricultural production), it is impossible to see water from hydraulic works as “free”.

Due to different levels of awareness, water from hydraulic works has not been charged at its real price for years and that cause disadvantages in operation of management organizations for hydraulic works.

- In agricultural production: Decree No. 112 –HDBT issued on August 25, 1984 on water fees is still valid although it is no longer convenient to the current situation. The reason why not to amend or whether to collect water fees is still not yet responded. *Water fee collection is a very sensible policy that exerts positive impacts on food production; however the government does not have economically effective decisions but still depends on political and social factors.*

Calculations according to the Decree No.112-HDBT showed that required investments for operation and maintenance of existing hydraulic works reach 1,200-1,500 billion VND per year (or 2,200-2,500 billion VND with cost recovery included). Annual collected water fees are 500-600 billion VND (representing 50% of the rate provided for by in the Decree No.112-HDBT). However, the government can only support not more than 200 billion VND so investment deficits happen annually for operation and maintenance of hydraulic structures that result in deterioration and low efficiency.

Therefore, it is indispensable to have a clear and appropriate financial policy (water fees collected from farmers must afford financial costs for O&M) and to encourage economic water use serving stable food production so that food security can be ensured. It is recommended to implement the approach intensify “indirect collection” (applied for commercial units that trade agro-products to support agriculture) and “direct collection” applied for farmers (at the rate to afford O&M costs), aiming to self-finance, enhance water users’ role and transfer appropriate hydraulic works to farmers’ management (Article 10 – Ordinance for Exploitation and Protection of hydraulic works). It is targeted to emphasize their role in water fee paying and attach to their rights, at the same time the government should given proper attention and guides, promptly issue policies and mechanisms, especially financial policies to facilitate self-financing in O&M.

- Other users such as industries, navigation, recreation, power generation, aquaculture all must pay water charges pursuant to the policy on water price, and wastewater discharge in order to enhance users’ awareness for water resources.

**5.4.2 Management arrangement**
In enforcing the Law on Water Resources, the National Water Resources Council as well as some River Basin Organizations have been established, but local water resources management organization (provincial Sub-branches for Hydraulic Work and Water Resources Management). Nevertheless, there is not any detailed regulation for their operation so they currently face difficulties in operation. Therefore the River Basin Organizations must be arranged closely so that water resources development planning can be done consistently in each river basin.

The Ordinance on Management and Protection of Hydraulic Works has been issued but without guidelines for implementation. In the Ordinance, there are many new substances which confirm the role of management organizations for hydraulic works (including State, collectives, individuals – Article 9). In particular, the Ordinance has addressed the State-owned management organization (Irrigation Management Companies) “Water User Cooperatives”, individuals and transferring management of hydraulic works invested by the government to the Water User Cooperative (Article 10). The Ordinance has also mentioned financial policies: “providing funds” for the IMCs and Water User Cooperatives in 5 cases (in Article 13). However, the Ordinance has not discussed any policy for the case of individuals. This is a challenge and can only effectively implemented with tense governmental guidelines, with appropriate attention by governments at different levels, management organizations (especially local water user organizations) should be strengthened with concrete decentralization and assignment so that community participation and participatory irrigation management can be well performed.

The Decision No.58/2002/QD-TTg on April, 26, 2002 by the Prime Minister has opened a new mechanism for socialization of water resources sector in line with the Ordinance for Management and Protection of Hydraulic Works. This is not beyond the purpose to promote strengthening of irrigation management organizations including State-owned organizations (IMCs) and collectives and that would be a premise and a key factor for modernization of hydraulic systems. However, it will be very difficult without effective and consistent guides.

Strengthening of local irrigation management organizations, irrigation management transfer at appropriate scales have been effectively done at some places with high consensus by farmers and this has been confirmed as a decisive factor for effectiveness of water management and hydraulic work exploitation. Many staff have now discussed and shared their opinions which are however closely linked to “local” benefits due to their limited awareness and different approaches. Therefore policies and mechanism on participatory irrigation management (PIM) and irrigation management transfer (IMT) have not been finalized so PIM and IMT models have not been developed and multiplied.

**5.4.3 Introduction and application of new technologies**

Application of new technologies (new equipment and software in planning, design, construction and management, and technologies in economic water use) is a content of modernization in water resources management. Although being important and pressing, this work requires suitable procedures and should be implemented in case of an ensured hydraulic infrastructure with appropriate management, well trained staff and farmers’ participation in
order to realize the objective to decrease costs, enhance the role of water service provision for the ultimate purpose of food security and self-financing for O&M.

Application of new techniques and technologies covers following contents:

- Technologies in supply bulk water for irrigation and domestic use, notably water supply for the mountainous areas; technologies for using locally regenerated energy such as electricity, water power.

- Software including software serving design, calculation for infiltration stabilization, dam slipping, hydrological calculation, canal design, hydraulic software serving flood discharge, software for operation of irrigation system

- Technologies to prevent saline water, keep fresh water for coastal areas

- Technologies for economic irrigation (drop and sprinkle irrigation)

- Technologies for new materials (composite valve gates, PVC joints, FS rug to prevent infiltration in canals and to protect sea dikes from erosion and collapse, raw drops for dam building, geo-textile for infiltration prevention, betony materials, etc).

- New technologies in construction in order to reduce costs such as the pillar dam and stake dam, raw drop dam, technologies for exploration of termite nests by radar, etc.

- Technologies for ecological power generation such as solar power, wind power for local use in mountainous areas where the electric gridlines are not existent.

5.4.4 Training and capacity building

Establishing organizations must involve staff; staff should be trained in those organizations to realize the organizations’ functions serving water resources management, water sector modernization and sustainable water resources development.

Training include following forms: long-term, short-term education, training, seminar, propagation via press, radio, television aiming at capacity building, dissemination of knowledge, techniques, skills, technology transfer, exchange of experiences and information, issuing governmental policies and mechanisms in water resources organization, management and exploitation.

Training contents must be suitable to trainees who include both staff and farmers as water users.

Therefore it is necessary to set up a complete training policy that should involve decentralization, assignment, training contents, training responsibilities (universities, management schools, professional agencies) with concrete provisions on finances and training contents for each type of trainees.
6. CONCLUSION AND RECOMMENDATIONS

Water resources “decides existence and sustainable development of the country” in which food security is the most important element in the stabilization of the economy, politics and society in rural areas in particular and of the whole country in general.

However, food security can only be ensured with water resources security, therefore water resources security plays an important role in food security.

In water resources sector, there exist constraints because water resources management and exploitation are not completely, timely and synchronically institutionalized that result in waste water use, water source drying up and water pollution. All menace life and environment.

Following are some urgent recommendations to ensure sustainable water resources development:

1. Enhance people awareness on water resources and food security through training programs (training, seminars, radio, television, press, etc) in order to raise capacity (skills and techniques), propagate knowledge about laws, policies and mechanisms for staff and farmers for a good enforcement of the Law on Water Resources and by-laws that better serve objectives of food security.

2. Timely issue by-laws and regulations (Regulation on administrative fines, regulation on granting licenses, Regulation on guides for implementation of the Ordinance on the hydraulic work exploitation and management, including policies on water fees, management arrangement, Circulars for water user cooperatives, handover of hydraulic work management to farmers…) all that create a legal framework for enforcement of effective water resources management and exploitation.

3. Guide from central to local levels enforcement of the Law on Water Resources on basis to reinforce, enhance the role of the National Water Resources Council, River Basin Organizations and enhance water resources governance of the provincial Sub-branch for Hydraulic works and water resources management and the Department for Hydraulic works and water resources management under Ministry of Agriculture and Rural Development.

4. The Government sets out detailed action program in institutional strengthening of water resources management enterprises in order to well manage hydraulic works of large scale and with complex techniques. Suitably implement decentralization, transfer management of hydraulic works to local farmers in the direction to develop “Water user organizations” that is provided for by in the Ordinance for Hydraulic Work Management and Exploitation in order to raise their responsibility in water work management and exploitation.

5. Establish pilot models on changing cropping and livestock pattern and close water resources management (river basin management, local irrigation organization, etc) on basic of effective operation, experience drawing and model multiplying.
Everybody should have a common say and concrete actions to protect water resources in conformity to the Laws and on the base to: “Enhance the community’s role, socialize water resources works, reasonably exploit water resources, well serve production and domestic needs, contribute to the country’s sustainable development”
Water Resources Management?

Water Resources (5)

Water requirements (3)

Water users (1)

Institution (2)

Water balance calculations (4)