Excerpts from the ENRAP3 Scoping Study:
ICT AND RURAL LIVELIHOODS[1]

Infrastructure and Policy Environment for ICT4L

This review explores the prevailing ICT4L environment in the following countries: Cambodia; China; Indonesia; Lao PDR; Philippines; Thailand; and VietNam. The main sources are grey literature, i.e., agency and project reports, some of which were prepared by the Consultant himself.

Cambodia. Cambodia is one of the six countries making up the Greater Mekong Subregion or GMS. In the past nine years, the GMS has kept up with the rest of Asia and the Pacific in terms of telecommunications infrastructure development (ADB, 2004). This was due primarily to the multilateral assistance provided by the Asian Development Bank and bilateral funding coming from Germany, the People's Republic of China, JICA and KOICA. One distinguishing feature of infrastructure development in the GMS is its subregional character. The laying out of a fiber optic backbone in one country is planned with the provision of linking up with fiber optic backbones in neighboring countries the idea being the formation of a subregional telecommunications backbone for the entire Greater Mekong Subregion (Flor, 2005).

For the three GMS countries covered by this scoping study, it may be stated that the national telecommunications backbones are in varying stages of completion, the most advanced being Viet Nam's. Lao PDR's strategic location bordering all GMS countries provides it with a distinct advantage in potentially reaping maximum benefits from a subregional infrastructure. Cambodia, on the other hand, has the most developed wireless connectivity in the subregion.

However, there is still the matter of extending this ICT infrastructure and, in effect, connectivity and bandwidth, to peripheral areas in the countryside, an initiative which is being pursued in all three countries with different degrees of progress and measures of support (Flor, 2005).

Nevertheless, infrastructure development must be linked to thematic sectors such as educational equity, health access, economic policy, and science and technology (S&T) promotion. The link between telecommunications and thematic sectors has been a continuing concern of the International Telecommunications Union since it forwarded its *missing link hypothesis*, wherein the level of telecommunications infrastructure development has not been directly correlated with levels of utilization particularly in developing countries. Calvano (2002) believes that the missing link is the partnering of infrastructure development to thematic sectors represented by institutions such as UNESCAP for the economic sector, UNESCO for the education sector, FAO for the agriculture sector or WHO for the health sector. The extension of ICT infrastructure from the national backbone to peripheral areas is, after all, likened

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to the growth of a living network. The impetus for infrastructure development to extend or grow radially is provided by these thematic sectors. Further investments into infrastructure should likewise address these concerns (ADB, 2002).

Among the three countries, the Cambodian backbone is the least developed. This may be expected from a country with the lowest electricity availability and the highest generation cost in the region. However, there are two factors that easily redeem this situation. Firstly, Cambodia has a robust wireless network. It is the first country in the world where the number of cellular phone subscribers exceeded the number of landline subscribers. This began in 1996, when the number of cellular subscribers reached the 25 thousand mark. Now there are 325 thousand cellular phone lines compared to a mere 40 thousand landlines, increasing the country's teledensity to 2.75 (Flor, 2005).

Secondly, Cambodia has recently received JBIC financing for its segment in the Greater Mekong Subregional Backbone network (from Phnom Penh to Sihanouk Ville to Kampong Chiang Road 6). The design and development phase is now ongoing.

The Ministry of Posts and Telecommunications of Cambodia (MPTC) is the government agency for spearheading ICT development. It is likewise the main telecoms provider, sometimes characterized as a monopoly. Plans are now in the offing to privatize MPTC. There is also a plan to establish at least one exchange via fiber optic cables per province to make available services to the village through private providers. Since fiber optics is cheaper than microwave, the cost of the service will go down thus increasing demand (Flor, 2005). Its establishment of the National Information and Communication Technology Development Authority evidences national government support for ICT development or NIDA attached to the Office of the President above the cabinet level. Among NIDA's responsibility is the drafting of a national ICT Master Plan.

Cambodia may easily be categorized as an LDC or least developed country. Its public school teachers have an average monthly salary of US$30. Among the labor force, there is a lack of middle-level capacity or supervisory skills. The demand for eServices in rural areas is quite low primarily because of: low access and availability; the lack of eServices awareness; low information and communication literacy; preoccupation with daily survival needs; and high service cost (Flor, 2005).

However, being a socialist country with a centrally planned economy, Cambodia has a firmly entrenched governance structure that extends from the national to the provincial to the district then to the commune and village levels. The agency tasked for the delivery of basic services is the Ministry of Rural Development (MRD). Services from the national to the village flow through this structure: At the highest level is the Council for Agriculture and Rural Development (CARD) chaired by the Prime Minister. CARD provides policy and program directions to the Ministry of Rural Development. At the provincial level, there is a Provincial Rural Development Council or PRDC. This body coordinates closely with the

Provincial Office for Rural Development under the MRD. At the district level is the District Rural Development Council (DRDC), which coordinates closely with the District Office for Rural Development (DORD) under the PORD. At the commune level is the Commune Rural Development Council (CRDC), which is made up of the heads of the Village Development Councils (VDCs). The VDC acts as the bridge between the rural community and government. The support of the VDCs would be invaluable in ICT4L undertakings in Cambodia.

The government ministry structure reaches down to the district level. Connectivity is likewise down to the district level only (Bestle, 2004). Hence the last mile linkage from the district to the village is missing. CeCs stationed in the communes may provide such a linkage.

China. China is the world's biggest nation and fastest growing economy. It is Asia's most powerful country with a population of 1.25 billion. However, rural dwellers account for 78 percent of its population. Agriculture is the main source of livelihood in the rural areas. In fact, this sector accounts for a substantive portion of China's GNP. Chinese agriculture is diverse and technology driven. Yet, it has reached less than half of its potential because of poor education (FAO, 2001).

Because of centralized planning, China has adopted a radial approach in developing its rural ICT infrastructure. In collaboration with the telecommunications and education ministries, the Ministry of Agriculture has taken the lead in establishing eCommunity centers all over China, albeit employing an approach that differs from that of other countries in four respects (Flor, 2004).

Firstly, China is simultaneously developing both satellite and fiber optics technology for its rural ICT infrastructure. It currently operates a robust satellite service actively participated in by commercial service providers. Recently, however, it has entered into an agreement with the Government of Israel for the provision of 500 very small aperture terminals (VSAT) for its rural satellite broadcasts and Internet access. Hand-in-hand, the development of the fiber-optics backbone is well on its completion. The last mile links, however, are concurrently being addressed primarily through eCommunity centers.

Secondly, the eCommunity centers belong to a centralized multi-tiered network at the national, provincial, prefecture, township and village levels. In other countries eCommunity centers usually start as independent community initiatives and are thus not networked institutionally.

Thirdly, the Ministry of Agriculture is building upon existing networks of agricultural service providers such as agricultural bureaus, agricultural information centers, local governments and other distance education institutions. For the past three decades, the Ministry has been establishing an expanded network of farmers' libraries. These libraries are gradually being retooled and transformed into eCommunity centers thus ensuring density and penetration.

Fourthly, the eCommunity centers particularly those under the Ministry of Agriculture form part and parcel of a distance-learning network called the Central Agricultural Broadcasting and Television School (CABTS).

The Central Agricultural Broadcasting and Television School was established in 1980 with a mandate for providing education and training to enhance agricultural production. Its target audiences are farmers, rural youth, rural women, leaders of rural communities and agricultural extension workers. CABTS, which has been called the "cradle of competent farmers," is now the world's largest educational establishment for agriculture and rural development catering to an average of 900,000 enrollees per year (FAO, 2001).

To say the least, the CABTS Network is huge. It has: one central school in Beijing administering the network; thirty eight provincial schools; three-hundred and thirty prefecture schools; two-thousand four hundred and eight county schools; twenty-three thousand township training centers; sixty virtual classrooms, which will soon increase to five hundred and sixty with Israel's donation of VSAT units; two-thousand seven hundred and fifty administrators; and forty-five thousand one hundred and seven staff.

Since it was established in 1980, CABTS has been employing traditional print, radio and TV-based distance learning delivery. In 2001, however, it began migrating to online teaching and digital learning environments employing broadband and wireless technologies. It will make full use of the noncommercial Internet backbone and will eventually establish two thousand virtual classrooms all over China. In other words, most of the CABTS network is now linked.

In the past few years, CABTS have begun venturing into learning programs dealing with non-agricultural livelihood. The shift is becoming more pronounced since rural-urban migration has become a dominant trend in most provinces. This shift would definitely be worthwhile monitoring under ICT4L.

Indonesia. Presidential Decree Number 3 of 2003 promulgates the application of eGovernance all throughout Indonesia. Yet, two laws have severely impacted on the information and communication capacities of the agricultural extension system in Indonesia although not relating directly to ICT.

Republic Act Number 22 of 1999, otherwise known as the Local Government Code has decentralized the agricultural extension function from the Ministry of Agriculture to the *Dinas Pertanian* of the devolved local governments. It may well be worth mentioning that there are several *Dinas's* responsible for agriculture. Aside from the Dinas Pertanian, the major ones are the Dinas Perikanan, for fisheries and the Dinas Perhutanan for forestry. Prior to the implementation of this Code, the then Agency for Agricultural Extension had a network of 32 Agricultural Training Centers (BLPPs) and 343 Rural Extension Centers (BIPPs) based in the provinces and districts (*kabupatens*), respectively. These centers were equipped with what was then considered as high-end information and communication hardware. When the responsibility for these

centers was transferred to the Dinas, most of them went exclusively to one Dinas, marginalizing the others from utilizing it.

Another law, Republic Act Number 25 of 1999, distributed the budget for agricultural extension to the local governments, which had the liberty to reallocate it for other pressing priorities. Hence, money that was meant for extension activities were channeled elsewhere. This effectively weakened the information and communication capabilities of the agricultural extension force. As of today, the number of productive BIPPs have dwindled 343 to 28. Of the 32 BLPPs, 7 were retained by the Ministry and are operational.

In a scoping study conducted for FAO, Flor (2004) observed that the GOI has since retraced its steps along this line. The Agency for Agricultural Research and Development (AARD) has made a strategic decision not to devolve its Assessment Institutes for Agricultural Technology (AIATS). In other words, Indonesia's agricultural R&D network is still intact in spite of decentralization. Republic Act Number 8 of 2003 has limited the number of Dinases in each district to three unless certain criteria are met for establishing more. Additionally, the Ministry, although unable to exert any direct influence in decisions regarding agricultural extension programs at the local level, has decided to play its financial card. It has set guidelines in the release of budgets meant for extension. In Indonesia, devolution has emasculated the national agricultural extension system (Flor, 2002). Among the casualties was the agricultural information and communication system. In a devolved structure, there was no scope for national or regional communication programs. Moreover, the devolved services just did not have the capability to launch their own localized information and communication campaigns. The contribution of information and communication in mainstream extension gradually diminished since these were not supported by the current structure.

The GOI has invested heavily and early into ICT for the basic delivery of services in the country. Considered to be the world's largest archipelago, it was a strategic decision on the part of the government to do so. Indonesia was the first Southeast Asian country to launch its own satellite for telecommunications purposes. Furthermore, the country has pioneered in programs that promote rural access. The WARTEL (*warung telepon* or rural telephone service) and the WARNET (*warung Internet* or rural Internet service) have been present in Indonesia long before the Digital Divide became an issue in the developing world. However, Internet penetration is still one of the lowest in Southeast Asia, below that of Singapore, Thailand and the Philippines. Furthermore, the non-commercial Internet backbone is not adequately tapped for agricultural extension. The MOA Center for Agricultural Database and Information (CADI), for instance, contracts the services of commercial ISPs for its district and sub-district level programs.

The Ministry of Agriculture has adequate hardware, software and networking facilities up to the provincial level and, in some cases, the district level. In particular, four high-end Sun Microsystems servers power CADI's system. At the sub-district level and below, however, hardware is extremely lacking and aging.

Although the potential for ICT infrastructure exits, it is not being adequately tapped for agricultural extension purposes. Indonesia's *Palapa* satellite may be used for wireless technologies. The non-commercial Internet backbone should be developed and utilized accordingly.

The Agency for Agricultural Extension and Training has since been renamed as the Agency for Agricultural Human Resource Development (AAHRD). Given the current devolved structure AAHRD cannot directly implement ICT programs at the field level for agricultural extension. However, a number of ICT-related programs are in the pipeline that may be linked to an agricultural extension ICT system for Indonesia. These are: the FAO TCP National Program for Food Security (NPFS); the ADB Poor Farmers Income Improvement through Innovation Project (PFI3P); and the World Bank Farmers' Empowerment through Agricultural Technology and Information (FEATI). Furthermore, there are current FAO initiatives that are active in Indonesia such as the SPFS Asia Information Management System (SAIMS).

On the other hand, the National Center for Agricultural Extension Development has expressed the need for a program strategy that combines ICT with traditional media most accessible in the rural areas. This again points towards innovative interfaces for last mile linkages. Although programs on agricultural extension ICT systems are lacking, there are opportunities to link-up with existing and up coming programs that relate directly to this area. Furthermore, an explicit and comprehensive last mile linkage strategy should be developed for Indonesian agricultural extension. This strategy should utilize: high end ICTs such as the Web, cable modem, PDAs, 3G Cellular telephony; low end ICTs such as cable television, SMS or rural radio; and indigenous media (Flor, 2004).

As mentioned earlier, the AARD has strategically kept its AIATS and retained its nationwide agricultural research network. This network has given AARD the ability to implement field level activities from a national program perspective. Because of the vacuum left by the dismantling of the agricultural extension system, AARD has found itself carrying part of the extension burden in the countryside. Note that the content for innovative agricultural technologies is housed in the AIATs. This has a significant bearing in agriculture-related ICT4L in Indonesia.

Insofar as market information is concerned it should be likewise noted that CADI developed a market information system that was piloted in Indramaya and Sukhabumi in collaboration with the Directorate General for Processing and Marketing. The ADB Poor Farmers Income Improvement through Innovation Project further pursued this. With the participation of the AIATs in the agricultural extension ICT system, content will be made available. Insofar as market information is concerned, CADI can potentially supply the content.

Lao PDR. With a population of 5.5 million, Lao PDR has a total of 442,500 mobile and fixed lines resulting in a teledensity of 8.04. As regards to Internet service, it has a capacity of 5,700 dial up lines and 192 ADSL lines bringing the Internet penetration ratio to 2. Ninety-five out of 140 districts have public

telephones. The Ministry of Communications, Transportation, Posts and Construction has been tasked to spearhead the development of the Lao telecommunications backbone. The initiative began with the China-Singapore Optical Fiber and Cable Project financed by a loan from Germany. A succeeding loan from China has resulted in 430 kilometers of fiber optic cables laid down and utilized locally (ADB, 2004).

The development of the national telecommunications infrastructure has been divided into four phases. Phase 1 targeted the initial 430-kilometer backbone that traversed the Thailand and Vietnam borders from west to east of the country. Phase 2 covered 1,250 kilometers extending the backbone northwards and southwards. Phase 3 covered 1,500 kilometers further, extensions to the south and north as well as outlying peripheral areas. Phase 4 covers 1,500 kilometers of mostly peripheral areas in the north, for a total of 4.680 kilometers of fiber optic cables laid out nationwide.

As in the case of Cambodia, the national government has placed much priority on ICT development. The lead agency for this is the Science, Technology and Environment Agency (STEA) of the Prime Minister's Office. In 2004, STEA drafted the National Policy on Information and Communication Technology. Otherwise known as the Lao ePolicy, it contained ample provisions for the development of ICT in rural and remote areas. The ePolicy will pave the way for an ICT Master Plan (Flor, 2005).

Likewise initiated was the eGovernment Project funded by KOIKA. The project will produce an eGovernment Plan within the framework of ASEAN integration. STEA ha also been charged in drafting the eCommerce Law.

In the past five years, much progress has been made in the development of an eExtension platform for the agriculture sector. In particular, the National Agriculture and Fishery Research Institute (NAFRI) and the National Agriculture and Fishery Extension Service (NAFES) have made gains in the use of ICT for the storage, retrieval, sharing and reuse of agricultural knowledge and information (Riggs and Flor, 2005). Linkages between research and development institutions in Lao have been electronically established. A one-stop shop for agricultural information has also been launched by both NARFI and NAFES to serve farmers in rural and remote areas.

In the case of Lao PDR, connectivity can only be assured down to the provincial level. The flow of services generates from the central or national government to the provincial government, down to the prefectures, the districts and on to the villages (Bestle, 2004). As in the case of Cambodia, there is a need to facilitate the flow of basic services down to the village level through the various ICT4R platforms. However, the GOL realizes that fulfilling the demand for eServices in rural and remote areas has to be done in phases. The provincial level needs to be linked to central government before the district level and the village level.

Philippines. In the Philippines as in the rest of Asia, the use of the term ICT is hardly a decade old. Before 1996, the term most prevalently in use was IT or

information technology. There were three factors that influenced the shift from IT to ICT: firstly, the marriage of telecommunications and information technology in the form of the Internet; the spawning of revolutionary Web-based applications, which required expertise not generally associated with IT; and the increasing recognition that the advent of new IT is transforming social processes that are often classified under the gamut of communication.

ICT was indeed changing the corporate horizon, and its potential for catalyzing upheavals in the development sector as well was seriously considered. However, there were and still are, serious reservations about its applications in the development sector considering its classification as high-end or non-appropriate technology (Flor, 2005). After all, how can one talk about connectivity in rural areas when electricity itself is lacking? How can one assume computer literacy when functional literacy itself is a problem?

Proponents of ICT argued along with leading economists that the portion of the gross national product of the Philippines attributable to information-related activities is getting larger and larger. The number of information workers is also increasing while the number of agricultural and industrial workers is decreasing (Flor, 1986). In other words, the Philippine economy is getting to be more and more information-based. Simultaneously, the realization that the world is turning into a global information society wherein information becomes the source of wealth and the most critical economic resource, has prompted development planners to support investments in ICTs.

The international development assistance community has since been actively endorsing ICT as a thematic area that cuts across all sectoral concerns such as agriculture, health, the environment, and education (Flor, 2005). Thus, almost every development project proposed, funded and implemented contains an ICT component or element in the form of the design and development of information systems or the provision for public awareness employing digital tools.

Government policy and programs have also been quite supportive. To the Arroyo Administration's credit, a cabinet-level Commission on Information and Communication Technology has been established. The General Appropriations Act and financial injections from international funding agencies and the private sector have supported ICT programs in every line agency.

Insofar as agricultural livelihoods are concerned, extension workers serve as the frontline support group for farmers, rural women and out-of-school youth. As in the case of Indonesia, the network of agricultural extension workers in the Philippines began disintegrating in the eighties due to reorganization within the Department of Agriculture and the devolution of basic services to local governments. The alternative deemed most logical under the circumstances was the use of ICT to re-establish a network of extension workers that would *transcend devolved governmental structures* (Flor and Hazelman, 2004). This response was the Open Academy for Philippine Agriculture or OPAPA, a network of institutions providing education, training, extension, and communication in agriculture to farmers, and support service providers. It is an

alliance of national, local, and international organizations that utilize and tap the potentials of existing infrastructure from the government and private sectors, their content and information databases, in an open environment. It links policymakers, researchers, service providers, markets, business organizations, and farm communities using ICT and distance learning.

The Philippine Rice Research Institute or PhilRice serves as the lead agency or the official hub for OPAPA because of the institution's advanced network infrastructure, trained ICT specialists and current initiatives in the promotion of hybrid rice technology, which is the pilot course offering of OPAPA.

OPAPA is not a formal organization but a network of organizations. It is not registered with the Securities and Exchange Commission and has no charter as an organization. Hence, it does not have a mission and vision statement. However, it is an active living network engaged in ODL at the nonformal level backed up by the most prestigious Philippine institutions in this area. Clearly, the OPAPA case merits closer study specifically in its impact on farmers' livelihoods.

Thailand. The Government of Thailand has prioritized the use of information and communication technology in bringing its services to the countryside through a comprehensive eGovernment policy. Championed by former Prime Minister Thaksin Shinawatra, the government has sponsored several initiatives along this line. Thailand has established a National Information Technology Committee made up of four modules covering agriculture, finance, industry and governance. All four clusters are linked to the Prime Minister's Office (Flor and Hazelman, 2004). Furthermore, Thailand has enacted six ICT Laws, which includes the Digital Opportunity Law designed to provide grants to build rural telecenters.

The general policy of the Thai Government to employ ICT in the delivery of basic services has set the tone for the Ministry of Agriculture and Cooperatives. Most of its line departments, including the Department of Agricultural Extension, have their own ICT programs. What may be lacking is an explicit policy for the integration of and coordination among these programs and systems. Such a policy would ensure that: efforts are not fragmented; no duplication of programs and systems occur; resources are not wasted; standards for ICT services are established; and synergy is created among the line departments.

Thailand has a National Information Infrastructure Action Plan, which is divided into three components: the SchoolNet; public Internet services by CAT and TOT; and PubNet. Telephone density is pegged at 8 lines per one hundred persons for terrestrial services and more than 9 lines per one hundred persons for cellular services. There are a total of 24 Internet Service Providers: 18 commercial, 4 non-commercial and 2 domestic hubs. The National Electronics Technology and Computer Center (NECTEC), a quasi-governmental think-tank, provides government agencies with ICT solutions. However, bandwidth availability continues to be a pressing concern among field-level extension workers and farmer users.

Insofar as information support for agricultural livelihoods is concerned, the Department of Agricultural Extension is well endowed with hardware, software and networking facilities up to the provincial level. Below this level, hardware is extremely lacking. Attempts have been made, however, to tap the Internet Tambon program for this "last mile linkage" and for community livelihood projects (Flor and Hazelman, 2004).

The Thai ICT infrastructure for agricultural extension can best be strengthened through strategic interventions for the expanded access and use of the non-commercial research and education backbone instead of the commercial Internet backbone. Innovative interfaces between the Internet technologies and other media such as cable television, radio and cellular telephony should be explored as "last mile linkage" options.

The Ministry of Agriculture and Cooperatives has an IT Master Plan upon which the Department of Agriculture's IT Master Plan is built. The DOA has an Information Service Center (DISC) that serves as the support unit to the Chief Executive Officer and the Chief Information Officer. The Department of Agricultural Extension, on the other hand, has established an ICT Center exclusively devoted to the agency and extension services. It has likewise embarked upon a five-year Master Plan dubbed *eExtension* dovetailing the GOT's *eProvince* initiative. The Master Plan, which began implementation in 2000, is now on its second phase.

One of the most prominent stakeholders in the ICT for extension arena is the Bank for Agriculture and Agricultural Cooperatives. BAAC initiated its Agricultural Information Network (AIN) in 2002 offering several innovative products and services. Among these are: an agricultural information gateway that provides unified access to most of the agriculture-related databases of the GOI; eLearning for farmers; and the Pocket PC Project, that makes available a DA-powered decision support system (DSS) for farming/livelihood options. One of its high-end applications is the Global Mapper geospatial information systems (GIS) using CONUS satellite-generated base maps (Flor and Hazelman, 2004).

BAAC has gone beyond credit provision services into information, education and communication services to farmers and housewives. Providing technical assistance to specific components of the bank's AIN Program are the Japan Bank for International Cooperation (JBIC), the Canadian International Development Agency (CIDA), the U.S. Trade Development Agency (USTDA), and the European Union (EU).

As in the case of ICT policy, the Thai agricultural sector has adequate programs for the use of ICT in agricultural extension. However, these programs are only coordinated to a certain extent and not at all integrated. A case in point is the need for integration between the ICT programs, products and services of BAAC and the MOAC Department of Agricultural Extension.

For Phase I (2000-2002) of the *eExtension* Master Plan, the ICT Center of the Department of Agricultural Extension has designed, developed and tested 21

data/information bases, all of which have been made available online. Eight of these data/information bases have administrative (MIS) applications accessed by staff over the Intranet while the remaining 13 have technical applications made available to DOAE clients over the Internet. The latter includes: the Agribusiness Network; the OnIIne Library on Agricultural Knowledge; the Plant Clinic; Agricultural Experts' Directory; Success Stories; and the Web Board, an agricultural online discussion forum for farmers and experts.

For Phase II (2003-2004), DOAE intends to set up the Contact Center for Agricultural Extension or CCExt with field level extension agents and farming communities as users. CCExt is designed as the DOAE's knowledge management platform, an electronic system for the sharing and reuse of best practices and lessons learned among extension workers and farming communities. Initially, these best practices and lessons learned will be mined from the Web Board discussion forum. CCExt will eventually employ a Counter Service Real Time Web-based front-end. With CCExt, the DOAE is migrating from data management and information management to knowledge management.

BAAC, on the other hand, makes their products and services available via satellite through their network of 370 branch-based nodes all over Thailand. It has entered into a Memorandum of Agreement with Kasetsart University for the provision of technical content. Furthermore, it interfaces with the MOAC Department of Agricultural Extension for selected agricultural information and field level activities (Flor and Hazelman, 2004).

Content provision is the least of the Thai agricultural extension sectors problems. Research institutions and the academe provide technology and innovations. Economic, credit and financial information is provided by BAAC. There may be a need, however, for up-to-date reliable market information.

VietNam. Flor (2005) observes that Vietnam has the highest developed ICT infrastructure among the three countries. Its approach to ICT development is also the most sophisticated. The National Institute of Posts and Telematics has put forward a three-way model to illustrate the key components of ICT in Viet Nam. These key components are:

- *Users* - consume products and services; indirectly influence business investments; interact with businesses and government.
- *Government* – provides laws, institutions and policies; conducts regulation, supervision and coordination; conducts training, international cooperation; provides support and facilitation.
- *Businesses* – make investments; deliver products, services and training; promotes and develops markets; works with government.

These three components are said to interact within four areas: infrastructure; applications; human resource; and industry.

Another facet of the Viet Nam ICT policy environment is legislation. A US$ 860 thousand grant has been awarded by KOIKA to the GOVN to fund the Drafting of the ICT Law. The project is now in the final stage and the draft will soon be submitted to the National Assembly. The ICT Law includes provisions on eGovernance and eCommerce. MPT has also prepared a proposal for the IT Industry Master Planning that would be funded by JICA. The proposal has already been submitted to the Ministry of Planning and Investment for consideration.

Lastly, the Ministry of Posts and Telematics and the National Institute of Post and Telematics is currently implementing a US$ 80 Million ICT loan project funded by the World Bank. Executing agencies other than the MPT and NIPT are the cities of Danang, Hanoi, Ho Chin Minh, and the Government Statistics Office. The project will: review of existing ICT infrastructure; promote ICT standards; establish an eGovernance platform powered by GIS; establish an eCommerce platform; develop an ICT HRP Plan; conduct assessments and strategy development; and develop a roadmap for ICT4D. At the community level, this undertaking may result to solid gains in ICT4L.

National Policy and Agricultural Livelihoods

The existing infrastructure and policy environment for most of the countries analyzed reflect a conscious effort of governments to bring to bear new ICTs to improve agricultural livelihoods. China and the Philippines are focusing their efforts on the provision of agricultural knowledge and skills to extension workers, rural women and farmers through CABTS and OPAPA respectively. Indonesia and Thailand are embarking on district and provincial level market information undertakings. Cambodia, through the Ministry of Agriculture's Council for Agricultural and Rural Development (CARD) has adopted ICT4L as a national level agenda. A study of the infrastructure and policy environment, however, can only reveal government initiated programs at the national and local scale. Seldom does this reflect ICT4L at the community level.

In the Philippines, for instance, the Infanta Community Development Association, Inc. or ICDAI, a community NGO based in two municipalities of Quezon province, has succeeded to increase the productivity of rice farmers from an average of 6 tons per hectare to 9 tons per hectare through knowledge sharing and reuse, which involves, among other things, the use of mobile phones. Although a cause and effect relationship cannot be established due to the lack of documentation and evaluation studies, the ICDAI experience provides a strong argument for the direct correlation between ICT use and agricultural productivity. However, there may be a variety of intervening factors.

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