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INDONESIAN AGENCY FOR AGRICULTURAL RESEARCH AND DEVELOPMENT

Poor Farmers Income Improvement through Innovation Project
ADB LOAN NUMBER 1909-INO (SF)

INFORMATION MANAGEMENT DELIVERABLE NO. 1

INFORMATION MANAGEMENT NEEDS ASSESSMENT OF INDONESIAN AGRICULTURAL RESEARCH, DEVELOPMENT AND EXTENSION WITH EMPHASIS ON POOR FARMERS' EMPOWERMENT

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ABBREVIATIONS

ADB	:	Asian Development Bank
AHT	:	Agraar und Hydro Technique
AIAT	:	Assessment Institute for Agricultural Technology
BPTP	:	Balai Pengkajian Teknologi Pertanian
BP2HP	:	Badan Pengolahan dan Pemasaran Hasil-hasil Pertanian
CABTS	:	Central Agricultural Broadcasting and Television School
CADI	:	Center for Agricultural Data and Information
CALTD	:	Center for Agricultural Library and Technology Dissemination
COFISH	:	Coastal Community and Fisheries Resources Devt Project
CPIP	:	Comprehensive Project Implementation Plan
DCC	:	District Coordination Committee
DLO	:	District Liaison Officer
FAO	:	Food and Agriculture Organization
GOI	:	Government of Indonesia
GIS	:	Geographic Information System
IAARD	:	Indonesian Agency for Agricultural Research and Development
ICALTD	:	Indonesian Center for Agricultural Library and Technology Dissemination
ICT	:	Information and Communication Technology
ICT4D	:	Information and Communication Technology for Development
IM	:	Information Management
IMS	:	Information Management Specialist
ISP	:	Internet Service Provider
KM	:	Knowledge Management
KTNA	:	Kolompok Tani Nelayan Andala
LAN	:	Local Area Network
MIS	:	Management Information System
MOA	:	Ministry of Agriculture
MOF	:	Ministry of Finance
MOHA	:	Ministry of Home Affairs
NARI	:	National Agricultural Research Institute
NGO	:	Non Government Organization
PAM	:	Project Administration Memorandum
PDA	:	Personal Digital Assistant
PFI3P	:	Project Poor Farmer Income Improvement through Innovation
PCMU	:	Project Coordination and Monitoring Unit
PIU	:	Project Implementation Unit
R & D	:	Research and Development
RRP	:	Report and Recommendation of the President
SAIMS	:	SPFS Asia Information Management System
SINGOSARI	:	Sistem Informasi Pengolahan dan Pemasaran Hasil Pertanian
SMS	:	Short Message Service
SPFS	:	Special Program for Food Security
TA	:	Technical Assistance
TOR	:	Terms of Reference
WAN	:	Wide Area Networks
WARNET	:	Warung Internet (Rural Internet Services)
WARTEL	:	Warung Telepon (Rural Telephone Services)
VPIC	:	Village Project Investment Committee

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF FRAMES

EXECUTIVE SUMMARY

This study entitled, ***Information Management Needs Assessment of Indonesian Agricultural Research, Development and Extension with Emphasis on Poor Farmers' Empowerment***, presents an information management needs assessment of PFI3P stakeholders and traces the information flow to project districts relevant to farmers' problems. It attempts to answer the following research questions:

- What is the existing policy environment for poor farmers' empowerment through information?
- Who are the major users of agricultural information in the Indonesian research, development and extension sub-sectors? How can the poor farmer become a major user?
- What content is most relevant to the poor farmer?
- What are the information management needs of the Indonesian research, development and extension sub-sectors? What IM strategies can be adopted to benefit the Indonesian poor farmer?
- Do existing national and local agricultural information systems and resources adequately address the information needs of the Indonesian poor farmer?
- How does information flow from the research sub-sector to the extension sub-sector to the farming sub-sector and finally the market sub-sector? How can this flow be reconfigured to maximize the benefits for the poor farmer?

The study made us of knowledge management as its general approach and systems networking as its framework. It employed key informant interviews, focus group discussion, documents analysis and ocular visits as data gathering methods.

The report concludes that:

1. The existing policy environment is very conducive for poor farmers' empowerment through information and communication.

2. In the order of levels of utilization, the major users of agricultural information are: scientists and researchers from national agricultural research institutes; scientists from the private sector specializing in agricultural products; technical staff of the Ministry of Agriculture; professors, lecturers, students and researchers coming from leading universities; extension workers based at the Dinases and private firms; and finally, farmers, but not the poor ones.

3. The Indonesian poor farmer can become a leading user of agricultural information if sufficiently given attention to by the Project. Information management-wise, the Project can improve access to conventional media through its PIU-based rural agricultural information and communication centers. It can even pilot village-based rural agricultural information and communication centers. Furthermore, it may incorporate the use of indigenous and local media in its dissemination programs. Finally, the Project can increase capacities for

effective dissemination among staff at the NARIs, AIATs and Dinases through practical training.

4. Content most relevant to the poor farmer are those that would have immediate impact on his income: accurate, up-to-date price information; available assistance to source potential market outlets; low-input technologies for crops in marginal areas; low-cost post-harvest technology that extends the shelf-life of his products.

5. Information management needs of the Indonesian research, development and extension sub-sectors revolve around three main topics: knowledge management; developing the “last mile” linkage for agricultural innovation dissemination; and intermediary training.

6. The Project is adequately fulfilling its two major deliverables: the establishment of national and local agricultural information systems where agricultural technologies are made available; and the setting up of a Web-based agricultural marketing information system. However, areas for improvement have been identified. Firstly, the national agricultural information network needs to have institutional and social dimensions, as well, not merely focusing on electronic networks. This entails the establishment of an active ICT4D Network for coordination among agencies and even across ministries. Furthermore, social networks at the village level should be strengthened and tapped by the Project.

7. Although, the Indonesian agricultural research-extension-farming sub-sectors have made progress in cyclic and three-way interfaces, cyclic information flows between and among the research-extension-farming sub-sectors can be further strengthened by: incorporating into the National Agricultural Information System a feedback system from the farmers groups at the local level to national decision makers; incorporating an indigenous knowledge sub-system; and employing a mechanism through which poor farmers are involved in establishing the national and local agricultural research agenda.

Recommendations on agricultural information management needs, technical assistance deliverables, and inputs into the project implementation plan are given at the end.

I. INTRODUCTION

A. Background

1. The poorest of the poor in Asia are found in farming communities within marginal rainfed areas. Indonesia is no exception. Poor farmers in Southeast Asia's largest country have failed to respond to market opportunities because of a lack of appropriate technologies, village-level investments in public goods, and access to information. While the Government is taking steps to fill the gaps in providing public goods support for agriculture, and increasingly for non-rice crops, additional support is needed to target village-level public investments to the needs of poor farmers, to increase the access of poor farmers to information, and to increase the availability of technologies needed by poor farmers.

2. In January 2003, the Government of Indonesia and the Asian Development Bank signed a loan agreement for purposes of implementing the Poor Farmers' Income Improvement through Innovation Project. The agreement identified the Ministry of Agriculture as the Project Implementing Agency with the Indonesian Agency for Agricultural Research and Development as the Executing Agency.

3. The long-term development goal of the Project is increased innovation in agricultural production and marketing by poor farmers. Its immediate objectives are as follows: (i) improved targeting of village-level public investments to locations-specific needs; (ii) increased access of poor farmers to information; and (iii) a reorientation of the focus of agricultural research to the needs of marginal rainfed areas.

4. Benefiting farmers in five districts with about 2.75 million people and an overall poverty rate of 66 percent (almost twice the national average) the Project responds to poverty in the Indonesian countryside by empowering farmers to undertake simple village-level investments, providing support for the development of proper technologies for rainfed areas, and providing them with the relevant information resources. It is comprised of four components to be implemented over 5 years: (i) poor farmer empowerment, (ii) development of national and local agricultural information resources, (iii) support for agricultural innovation development and dissemination, and (iv) project management.

5. Like most ADB loans projects, PFI3P has a technical assistance package comprising mainly of international and domestic consulting inputs. The Project Administrative Memorandum states that Components 2 and 3 (development of national and local agricultural information resources and support for agricultural innovation development and dissemination) will be implemented substantially by the Executing Agency with minimal consultant support. For these two components, an international Information Management Specialist was engaged for three person months to fulfill the following responsibilities:

(i) Carry out a needs assessment for relevant Ministry of Agriculture units, indicate how these needs can be best met, and include the findings in the appropriate sections of the project implementation plan.

(ii) Identify the present information supply to project districts of the technology and marketing information relevant to the problems identified by the Farmer Empowerment component.

(iii) Produce a plan for development of the information systems relevant to the identified problems/needs of target poor farmers.

(iv) Produce a plan for development of the information networking operational.

(v) Support the establishment of national information resources and operation training.[1]

6. This study entitled, ***Information Management Needs Assessment of Indonesian Agricultural Research, Development and Extension with Emphasis on Poor Farmers' Empowerment***, addresses the first two tasks of the Information Management Consultant. Firstly, it presents an information management needs assessment of the Project stakeholders. Secondly, it traces the information flow to project districts relevant to farmers' problems. Thirdly, it inputs recommendations to the Comprehensive Project Implementation Plan.

B. Statement of the Problem

7. This study attempts to answer the following research questions:

(i) What is the existing policy environment for poor farmers' empowerment through information?

(ii) Who are the major users of agricultural information in the Indonesian research, development and extension sub-sectors? How can the poor farmer become a major user?

(iii) What content is most relevant to the poor farmer?

(iv) What are the information management needs of the Indonesian research, development and extension sub-sectors? What IM strategies can be adopted to benefit the Indonesian poor farmer?

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[1] *Project Administration Memorandum. Poor Farmers' Income Improvement through Innovation Project. ADB LOAN NUMBER 1909-INO (SF)*

(v) Do existing national and local agricultural information systems and resources adequately address the information needs of the Indonesian poor farmer?

(vi) How does information flow from the research sub-sector to the extension sub-sector to the farming sub-sector and finally the market sub-sector? How can this flow be reconfigured to maximize the benefits for the poor farmer?

C. Objectives

8. The objectives of this study are:

(i) To assess the policy environment for ICT4D in Indonesia.

(ii) To identify the major users of agricultural information in the Indonesian research, development and extension sub sectors.

(iii) To study how the Indonesian poor farmer can become a major user of agricultural information.

(iv) To determine the content most relevant to the poor farmer.

(v) To ascertain the information management needs of the Indonesian research, development and extension sub-sectors.

(vi) To identify IM strategies that can be adopted to benefit the Indonesian poor farmer.

(vii) To determine if existing national and local agricultural information systems and resources adequately address the information needs of the Indonesian poor farmer.

(viii) To trace the information flow from the research sub-sector to the extension sub-sector to the farming sub-sector and finally the market sub-sector.

(ix) To analyze how this information flow can be reconfigured to maximize the benefits for the poor farmer.

II. APPROACH AND METHODOLOGY

A. General Approach

9. The Poor Farmers' Income Improvement through Innovation Project is an innovation from conventional loan projects of the Asian Development Bank for Indonesia because of its emphasis on farmer empowerment to alleviate poverty. It requires an equally innovative approach to information management.

10. The Consultant proposes that a *knowledge management* approach be adopted by PFI3P. Firstly, it is the optimum solution that ICT can offer to any undertaking, be it agricultural R&D or otherwise. Knowledge management (KM) is a newly emerging discipline that combines organizational dynamics, knowledge engineering and ICT to manage the intellectual assets of an organization or, as in the case of PFI3P, a *system,* the Indonesian agricultural R&D system. For PFI3P, KM may be defined as managing the intellectual capital and knowledge assets of the agricultural R&D sector for the benefit of the Indonesian poor farmer. The goal of knowledge management is the sharing and reuse of knowledge.[2] For PFI3P, this goal can be restated as the sharing and reuse of technology, innovations, indigenous and local knowledge.

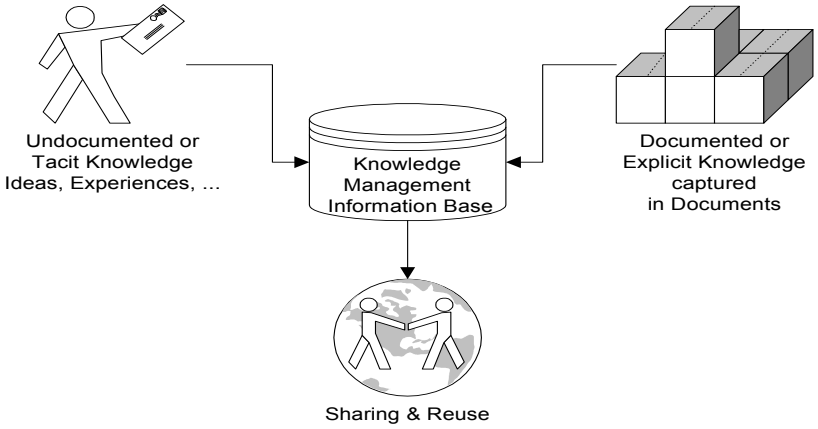


Figure 1. The Goal of Knowledge Management

11. Secondly, agricultural knowledge, particularly pertaining to marketing, leads to farmer empowerment. As Francis Bacon said, "Knowledge is Power." The knowledge management strategy makes available to the poor farmer both documented and tacit knowledge of subject matter specialists in agriculture. Much of KM experience has been limited to the private sector. Although the World Bank has embarked upon a KM Program in 1997, few development agencies have followed suit with comparable

[2] *Matthias Leibmann, A Way to KM solutions: Things to Consider When Building Knowledge Management Solutions with Microsoft Technologies. World Wide Technical Services, 1999. Microsoft Corporation.* www.microsoft.com

success. However, knowledge management offers vast potentials and much promise to the research-extension-farmer-market interface. Since KM may be Web-based or stand alone, extension workers and farmers in areas which have minimum Internet penetration may still be part of the loop through cellular phone text messaging and a system of exchange of multimedia products stored in CDROMs.

B. Framework

12. The needs assessment and information flow framework adopted by this study is that of *networking* from a general systems, i.e. *living systems* perspective. Research and development, extension and the farming sub-sectors may be regarded as subsystems of the larger agricultural and natural resources system. These subsystems have interfaces wherein information is largely exchanged. These information flows can neither be exclusively top-down nor bottom-up.

13. Scientists and researchers in the national agricultural research institutes or NARIs should not be considered as the only source of information. The Indonesian poor farmer should also be recognized as a potential source, particularly of indigenous technology and local knowledge that may guide the sector's R&D agenda. Similarly, the flow of information cannot originate solely from the poor farmer.

14. Furthermore, the flow of information should not be compartmentalized, i.e., from the research subsystem to the extension subsystem, and then from the extension subsystem to the farmer. Interfaces should exist between: the research subsystem and the farmer; the research subsystem and the extension subsystem; and the extension subsystem and the farmer. In other words, the study adopts a non-linear, cyclic framework characteristic of information flows in living networks.

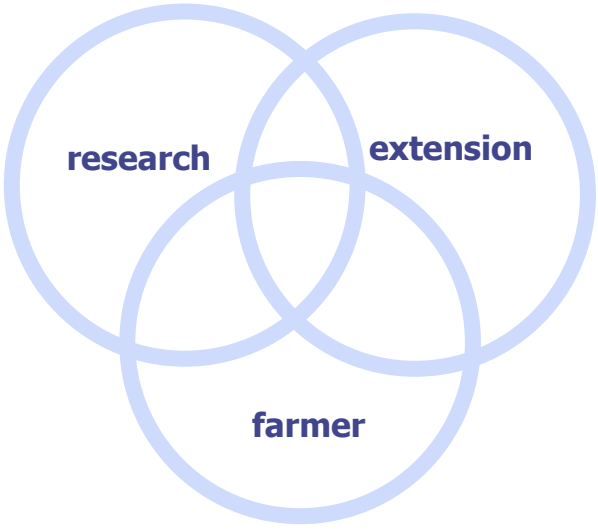


Figure 2. A Cyclic Research-Extension-Farmer Interface

15. Finally, living systems do not merely mean electronic networks that most information systems refer to. The information system for this project should be multi-dimensional involving the electronic network of the National Farming Website, institutional networks at the agency level, and social networks made up of extension workers, NGOs and farmers groups at the local level. The terms of reference allude to "national and local agricultural information resources." The national agricultural information network has an institutional dimension composed of all agencies involved in information generation and dissemination. Local information networks on the other hand are mostly made up of social networks. Hence, the information network of PFI3P has electronic, institutional and social dimensions, all of which this needs assessment study is addressed to.

C. Methods

16. The study employed the following methods and procedures:

17. ***Documents Analysis*.** The Consultant analyzed existing project documents such as the RRP, PAM, RFP, Review Mission Aide Memoir and the project feasibility study. He also studied relevant reports such as the Impact Evaluation of the World Bank Agricultural Research and Management Project II.

18. ***Ocular Visits*.** Site visits were made to Bogor at the Indonesian Center for Agricultural Library and Technology Dissemination (ICALTD), the point agency for Component 3. The Consultant likewise validated his preliminary findings through site visits at the Semarang AIAT and in the Temanggung District. In the latter, he met with the Dinas officials, the PIU staff and proceeded to Purwosari Village, one of the project beneficiary villages.

19. ***Key Informant Interviews.*** Key informants from the Executing Agency, other relevant agencies within the Ministry of Agriculture, the Ministry of Communication and Information, the District Government, the Project Implementation Unit, the Local Government and the poor farmer beneficiaries were interviewed. APPENDIX A gives the list of key informants for the study.

20. ***Focus Group Discussion*.** The following meetings with the staff of agencies involved in the Project provided excellent opportunities for focus group discussions (FGD):

21. *ICT4D Workshop*. A workshop among representatives of the major actors of the Indonesian agricultural information sector was organized by the Project on 6 April 2005. The meeting lasting the entire day was held in the Indonesian Agency for Agricultural Research and Development Agency. It was attended by senior officials from the Indonesian Center for Agricultural Library and Technology Dissemination, the Center for Agricultural Databases and Information, the Directorate General of

Processing and Marketing of Agricultural Products as well as counterpart staff from the Project Coordination and Monitoring Unit.

22. *ICALTD Meeting*. A leveling-off meeting was held in the Indonesian Center for Agricultural library and Dissemination in Bogor on 12 April 2005. The session was attended by the Director of ICALTD, all ICALTD staff members involved in PFI3P, information management counterparts from IAARD, representatives from the PFI3P Technical Advisory Committee, the ICT Specialist and the Information Management Specialist. The status of national agricultural information resources was discussed lengthily in the meeting.

23. *CADI Meeting.* On the same day, 12 April, a meeting was held in the Center for Agricultural Databases and Information at the Ministry of Agriculture. The meeting was chaired by the Director of CADI and involved all his division heads, the ICT Specialist, the IM Specialist, and the Agricultural Marketing Specialist. The status of the agricultural market information system was discussed in this meeting.

24. *SINGOSARI.* Related to the initiatives of CADI to develop an agricultural market information system, the Planning Division of the Directorate General of Processing and Marketing of Agricultural Products, Ministry of Agriculture, has established a Web-based agricultural market information system. This service, called SINGOSARI, covers the entire nation but originates at the provincial level. A meeting was held on 15 April 2005 to discuss the status of SINGOSARI and to resolve overlap issues with CADI.

25. *PCMU Brainstorming*. The PCMU conducted a brainstorming session on 19 April 2005. The IM Specialist presented his initial observations during the forum and gathered information on the status of information flow between the Project and its intended beneficiaries.

26. *BPTP Central Java*. The IM Specialist accompanied by the Temanggung DLO visited the BPTP of Central Java on 20 April 2005. The BPTP Director organized a group composed of the coordinators for research, dissemination, and cultural management practices accompanied by the BPTP web mistress and the finance officer for a group discussion on the Project.

27. *Temanggung PIU Staff*. A focus group discussion among the key staff of the PIU was conducted on 20 and 21 April in Temanggung and in Purwosari.

28. *Farmers Group in Purwosari*. A focus group discussion involving the Pak Lurah, farmer leaders, KID officers, and the village facilitator of Purwosari was conducted on 21 April 2005.

III. RESULTS AND DISCUSSION

A. The Policy Environment

29. ***Related Laws and Decrees.*** 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 research and extension interface in Indonesia although not relating directly to information management.

30. 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.

31. 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 sometimes 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, seven were retained by the Ministry and are operational.

32. Realizing the adverse effects on operations, the GOI has since retraced its steps along this line. The IAARD 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.

33. In conclusion, devolution has had adverse effects on national agricultural information resources, particularly manpower resources. Among the casualties was agricultural information and communication management. In a devolved structure, there is little scope for national information management programs.

However, the policy environment is generally trying to correct the adverse effects of devolution and is conducive for the revival of information management initiatives.

34. ***Infrastructure.*** 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. Some Dinases, for instance, contract the services of commercial ISPs for its district websites.

35. 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.

36. ***Related Programs*.** A number of ICT-related programs are in the pipeline that may be linked to Components 2 and 3. These are: the FAO TCP National Program for Food Security (NPFS); and the World Bank Farmers' Empowerment through Appropriate Technology and Innovation (FEATI). Furthermore, there are current FAO initiatives that are active in Indonesia such as the SPFS Asia Information Management System (SAIMS).

37. Hence, 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 information and communication. This strategy may utilize: high end ICTs such as the Web, cable modem, PDAs, 3G Cellular telephony; low end ICTs such as television, SMS or rural radio; and indigenous media.

B. Major Users

38. Based on the analysis of documents, particularly the *Impact Evaluation of ARMPII*, the major users of agricultural information in the Indonesian research, development and extension sub sectors, listed in the order of their level of information utilization, are as follows:

39. ***Staff of NARIs.*** Scientists and researchers from national agricultural research institutes are the primary users of agricultural information in Indonesia. It may sound paradoxical but they are also the leading producers of agricultural information. The flow of information by nature is cyclical, hence, this situation.

40. ***Agricultural scientists and researchers from the private sector.*** Scientists from the private sector specializing in agricultural products and agribusiness rank next to NARI's staff as the major users of information.

41. ***Technical staff of the Ministry of Agriculture***. The technical staff of the Ministry of Agriculture is the third largest users of agricultural information.

42. ***University faculty, staff and students.*** Professors, lecturers, students and researchers coming from Institut Pertanian Bogor, Gadja Madha University, Hasanudin Universty and other leading universities with agricultural programs are the fourth largest users of agricultural information.

43. ***Private and government extension workers***. Extension workers based at the Dinases and private firms such as Monsanto, Bayer and Ciba Geigy also make use of agricultural information particularly those packaged as extension materials by the Ministry.

44. ***Farmers***. Finally, farmers come in as the fifth major user of agricultural information. Most of them are progressive well-to-do farmers or early adopters of new agricultural technology. Very few are poor farmers residing in marginalized areas.

45. This situation may be attributed to the following factors: low literacy rates among poor farmers; limited access to conventional media such as television and publications; close to zero computer literacy among them; lack of information and communication infrastructure in marginalized areas; relatively lack of contact with extension workers; under-utilization of indigenous or popular media; and finally, a survival mentality among poor farmers that prevent them from participating in agricultural development programs.

46. The Director of the Central Java AIAT believes that land ownership is the biggest problem among poor farmers. The lack of information on technologies is merely a secondary concern. They cannot adopt these because of the lack of resources. They are operating in a *survival mode,* their main concern being where to find their next meal. Thus, the AIATs ordinarily involve well-off

progressive farmers as cooperators because they are more receptive and cooperative. However, he believes that the new practices eventually reach the poor farmers because traditionally, communication flows in two-steps: from the extension worker to the farmer leader; then from the farmer leader to the individual farmers.

47. The Indonesian poor farmer can become the leading user of agricultural information if the situation described above can be addressed. Information management-wise, the Project can improve access to conventional media through its PIU-based rural agricultural information and communication centers. It can even pilot village-based rural agricultural information and communication centers. Furthermore, it may incorporate the use of indigenous and local media in its dissemination programs. Finally, it can increase capacities for effective dissemination among staff at the NARIs, AIATs and Dinases through practical training.

48. However, the above mentioned interventions merely address the issue of access. The following section explores the issue of content.

C. Content

49. ***Technology Dissemination Agenda Setting.*** AIAT technologies for dissemination are not limited to biogeophysical technologies but may relate to social technologies as well. In the case of Central Java, the content disseminated cover: hybrid chicken and sheep husbandry; integrated farming systems management; agro-industrial products such as vanilla and prawn; marginal crops such as upland rice, potato and corn; as well as community development. Indigenous knowledge is taken into consideration through the PRA process conducted buy the BPTP in the villages.

50. Generally, the Governor's office and the *kabupatens* determine the technology for dissemination through the Provincial Technology Commission. Apart from the Governor's Office and the kabupatens, this commission is composed of the Head of the Provincial Contact Farmers and Fishermen's Organization, all heads of the Dinases, a representative from BAPPEDA, as well as representatives from the academe, NGOs and the local governments. The Commission is chaired by the Director of the Central Java BPTP, although ordinarily BPTP heads act as secretaries of these commissions.

51. ***Poor Farmers Information Needs.*** Farmers' needs are supposed to be represented in this body since the provincial contact farmers' head is elected by his district, sub-district and village counterparts. The *Kontak Tani Nelayan Andala* may not be composed of poor farmers but they should represent the needs of their poorer fellows. This is a national network that stems from villages (*Kontak Tani Tingkat Desa*), sub-districts (*Kontak Tani Tinkat Kecamatan*), districts (*Kontak Tani Tengkat Kabupaten)* and the provinces. It is a formal

nongovernmental organization, duly registered with and recognized by the GOI, which even possess some form of political clout during election time. However, their information needs may differ from that of the poor farmer.

52. Content most relevant to the poor farmer are those that would have immediate impact on his income: accurate, up-to-date price information; available assistance to source potential market outlets; low-input technologies for crops in marginal areas; low-cost post-harvest technology that extends the shelf-life of his products.

53. ***Market Information and Technologies***. In the Temanggung District, market information and technology on chili production and post harvest handling have been requested by farmers from the extension worker. Under the existing system, market information is gathered once a month at the *kacamatan* level by the extension worker using the statistical forms from the Agency for Agricultural Statistics. There is no written data gathered directly from the village. Observation and taxation form the bases of these figures. Formerly the Pak Lurah brings monthly market data from the village during monthly meetings with the Camat. Now this procedure is only applied for the population census.

Frame 1. Info Pasar Billboard, Temanggung

54. Nevertheless market info services are currently being done by other agencies at the local level. In Temanggung, a service known as Info Pasar is being delivered by the Department of Trade and Industry. These services include: market prices and export demand available online through www.temanggung.go.id Agricultural commodities are reported weekly at the Kabupaten level. No official collaboration with the Dinas Pertanian has yet been established.

D. Information Management Needs

55. Information management needs of the Indonesian research, development and extension sub-sectors revolve around three main topics: knowledge management; developing the “last mile” linkage for agricultural innovation dissemination; and intermediary training. Knowledge management has been explained in an earlier section of this report. Developing the “last mile” linkage refers to the interface between the National Farming Website and the poor

farmer. At this point, there hardly is any interface between the two because of the lack of access. Hence, other information and communication channels may be employed such as conventional media (radio, TV and publications), folk media (*wayng kulit, wayang orang*, etc.) or popular media (*sandiwara, dangdut*, etc.). Furthermore, an intermediary in the person of the village facilitator may assume this last mile linkage role. In the case of the Central Java AIAT, technology dissemination is done through media (RRI, publications, VCD, TVRI), farmers' visits, and demonstration plots. Folk media is not used. Popular media such as *sandiwara* is employed only in their project with the International Rice Research institute. However, the agricultural research, development and extension sub-sectors as a whole may not be adequately trained in these areas.

56. ***Researcher IM Needs***. The *Impact Evaluation of ARMPII* found that sixty percent of the AIAT's budget is allotted to the dissemination function. Although the researchers are trying their best to perform this function, they lack the requisite training to maximize their dissemination efforts. Very few of the AIAT staff have an information and communication background. Because of the lack of in-house capability, a substantial chunk of this budget (estimated at 70 percent) is used to contract out the design and production of communication materials.

57. Although information and communication materials design, production, and utilization is part and parcel of the technology assessment process, AIATs do not have an information and communication unit or an extension division for that matter. The key informants from the PIU feel that generally, the adoption rate of new technology is low. This situation is echoed in other areas such as the BAPPEDA of West Kalimantan. There were several factors attributed to this: the high cost of inputs; farmers' attitudes towards new technology; budgetary problems caused by decentralization; and weak dissemination. In some cases, the extension function at the district level is not functional.

58. ***Capability Building Needs.*** Although both researchers and extension workers have tried their best to fulfill their dissemination function, they may not have succeeded significantly in building-up the capability of poor farmers. The dissemination function of the AIATs and NARIs is not supported by their organizational structure. There are very few well-equipped information management unit that could assist the researcher in performing a critical step in the technology assessment process, i.e., the design and production of information and communication materials. Furthermore, researchers are not generally trained in dissemination approaches, strategies, and skills. The lack of an efficient extension system in the district, sub-district and municipal levels has exacerbated this situation. This conclusion is shared by almost all of the key informants.

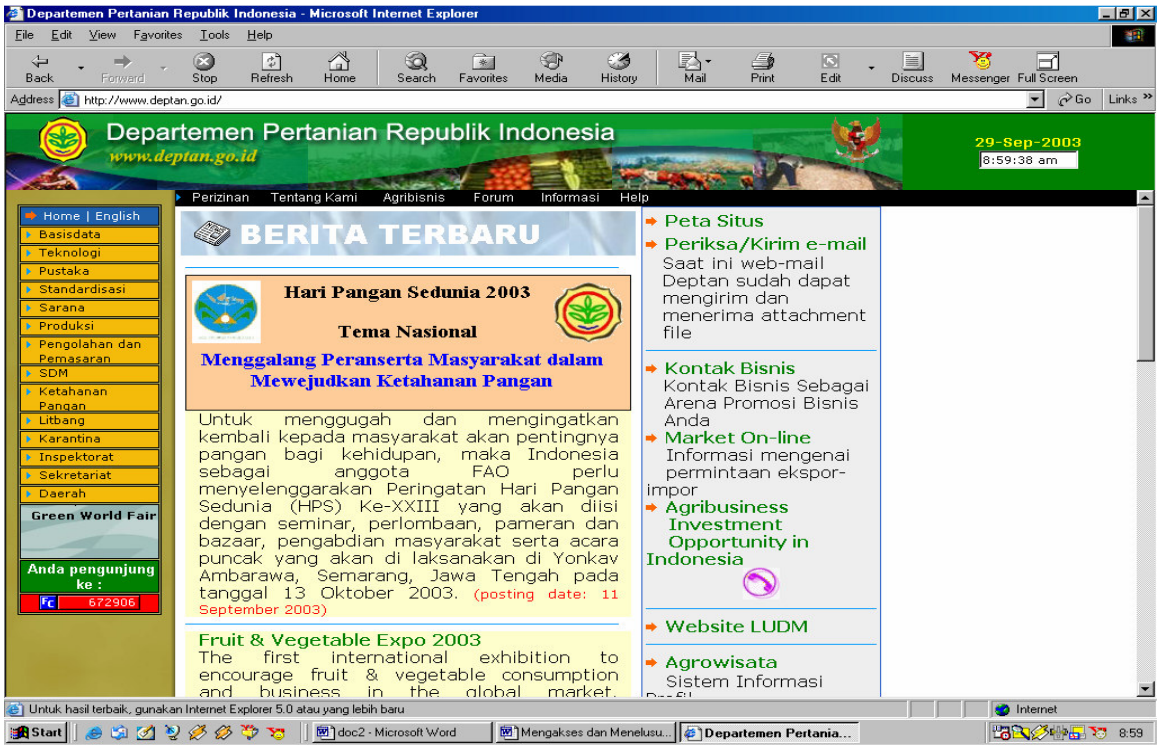
59. Thus, the capacity for agricultural technology and information dissemination should be strengthened functionally, structurally and operationally. Functionally, the IAARD should reaffirm the role of dissemination in technology assessment through a policy statement. Structurally, the AIATs, NARIs and

Dinas staff should have an information management unit. Operationally, dissemination staff in the AIATs should undergo training in new information and communication strategies and techniques. Likewise, researchers should be trained in process documentation using digital tools such as digital photography, digital video, and digital journals entries. These digital products may be used by the information and communication staff as raw material for their communication materials. Lastly, long-term and short-term training programs for IAARD, NARIs, AIAT and Dinas staff are strongly recommended.

E. Existing National and Local Agricultural Information Systems

60. Insofar as its Component 2 targets are concerned, the Project is adequately fulfilling its two major deliverables: the establishment of national and local agricultural information systems where agricultural technologies are made available; and the setting up of a Web-based agricultural marketing information system.

Frame 2. National Farming Website Interface



61. However, areas for improvement have been identified. Given the dynamic information and communication technology environment, it is but fitting for the research and development sub-sectors to invest on Web-based electronic networks. However, the national agricultural information network needs to have institutional and social dimensions, as well, not merely focusing on the electronic dimension.

62. An institutional network would be made up of all the agencies involved in agricultural information and technology dissemination. The network be coordinative in nature, preventing the duplication of efforts and overlapping of initiatives. With scarce resources available, this would make sense. Having an institutional dimension to information management entails the establishment of an active ICT4D Network for coordination among agencies and even across ministries.

63. For instance, under PFI3P, CADI is supposed to establish an agricultural market information system. However, as mentioned earlier, the Planning Division of the Directorate General of Processing and Marketing of Agricultural Products, Ministry of Agriculture, has already established a Web-based agricultural market information system. This service, called SINGOSARI, covers the entire nation but originates at the provincial level. Again as mentioned earlier, the Ministry of Trade and Industry has a web-based market information system operating at the kabupaten level, which gathers and posts online, agricultural market information every two weeks. These initiatives could have been merged had the appropriate institutional networking been in place.

64. Similarly, PFI3P plans to pilot rural information centers at the local level. The Ministry of Communication and Information has a similar nationwide initiative that will establish “community access points” at the kabupaten level. These two initiatives should merge somewhere down the road and could only do so if there is an institutional dimension to networking.

Frame 3. Farmers Group in Purwosari Mosque

65. Furthermore, social networks at the village level should be strengthened and tapped by the Project. These networks not only involve formal groups such as the KTNA but informal groups that exist in every village. These should involve schools, youth/women groups, as well as opinion leaders such as imams and *dukhons*.

F. Information Flows

66. In the past two and a half decades, the Indonesian agricultural research-extension-farming sub-sectors have made some modest but concrete progress in cyclic and three-way interfaces. Interventions beginning with the UNDP-FAO Upper Solo Watershed Management Project through People's Participation and Income Generation (1980-83) and progressing to the World Bank PASIG and DAFEP (2000-03) projects as well as the ADB COFISH Project (1999-2002) have focused on non-linear, participatory approaches. This is apparent in the existing policy environment in spite of the problems resulting from the devolution of the extension service.

67. ***Information Flow at the Village Level***: For PFI3P, the IM Specialist observed that the flow of information at the local level begins with the *Kacamatan* to the *Pak Lurah*, then to key *desa* leaders, to the sub-village, then finally to the informal farmer leaders who elect KID members. During the socialization process, a team from the *Kacamatan* invited 100 village representatives for a briefing on PFI3P. The sub-district meeting was meant to initiate the proposal preparation process. Proposals on farm to market roads and market structures were eventually submitted to the KID for endorsement and to the FAD for approval. Farmers who were involved were not from the KTNA but from informal groups based in each sub-village.

68. ***AIAT Technology Assessment Procedure***. At the provincial level, the Technology Assessment procedure of the AIATs involves the following steps:[3]

(i) Participatory rapid appraisal (PRA) in identified sites
(ii) Needs identification and assessment
(iii) Proposal preparation and approval
(iv) Technology assessment with local extension personnel
(v) Information and communication materials design and production
(vi) Information and communication materials utilization
(vii) Monitoring and evaluation

69. This process attempts to employ two-way information flows, involving farmers in PRAs, needs identification, technology assessment, and monitoring and evaluation.

70. ***National Agricultural Information System.*** The current national agricultural information system configured specifically by PFI3P has been designed to accommodate two-way in formation flows between and among the different project stakeholders from national agencies down to the level of the farmer.

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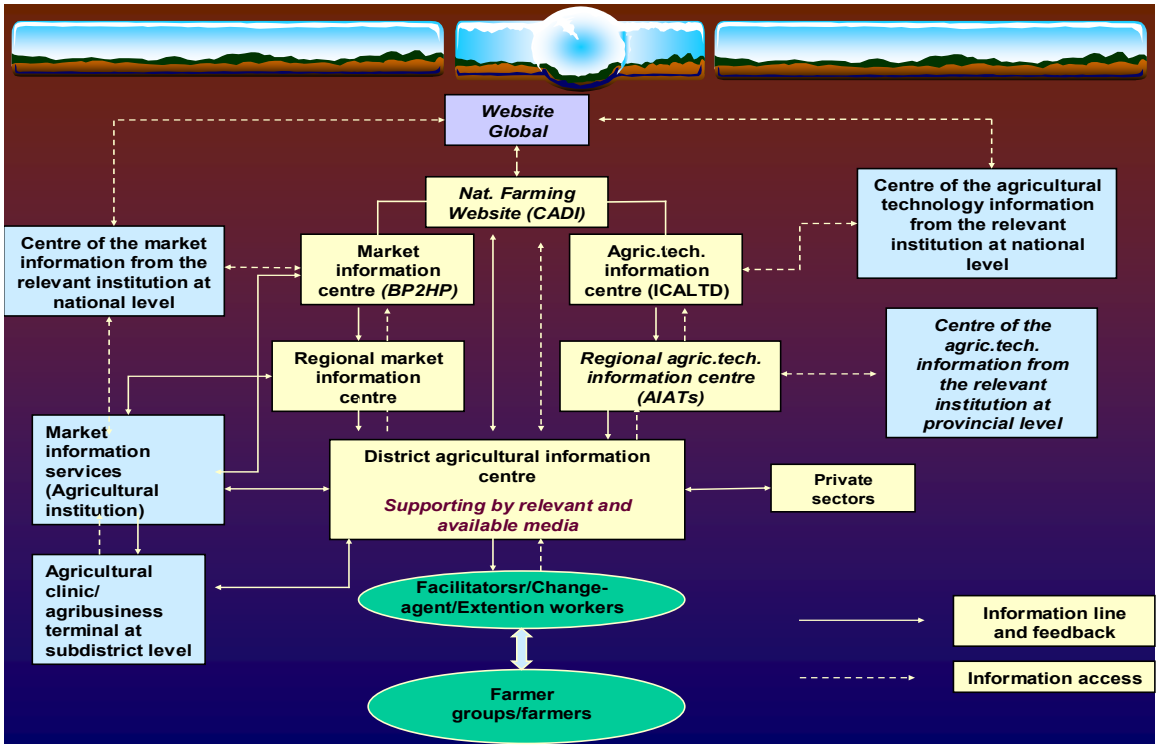
[3] *Bernardo, Fernando, Tito Contado, Daisy Fuentes and Arnulfo Garcia. 2002.* ***Impact Evaluation of the Agricultural Research Management Project II.*** *World Bank, Washington D.C.*

Frame 3. National Agricultural Information Flow[4]



71. However, this system may be further strengthened by:

(i) incorporating into the National Agricultural Information System a feedback functionality from the farmers groups at the local level to national decision makers;
(ii) incorporating an indigenous knowledge sub-system; and
(iii) employing a mechanism through which poor farmers are involved in establishing the national and local agricultural research agenda.

72. An improved system may add on a functionality for poor farmers to participate in online discussion forums with the assistance of intermediaries based at the village level. These discussion forums may even deal with the formulation of the national or local research agenda of the NARIs and the AIATs, respectively. In China, such a functionality may be found in the website of the Central Agricultural Broadcasting and Television School (CABTS), whose enrollment at any one time total an estimated 900,000 farmers, rural housewives, youth and extension workers. This functionality was recently added to the CABTS website when the school shifted to digital learning.

[4] *Retno. 2004. Program Pengembangan Sumber Informasi Pertanian National Dan Local, PFI3P 2003-2007, Ministry of Agriculture (Jakarta).*

73. A very important sub-component for the national agricultural information system is the documentation, capture and uploading of indigenous and local knowledge found in the beneficiary villages.

Frame 4. Pak Luhrah with Patolo Chips.

74. ***Indigenous Knowledge***. As a case in point, one may site that Purwosari farmers are known for their indigenous technologies and local knowledge on food processing. *Patolo*, a snack made from cassava originated from this village and is now distributed to Jakarta, Surabaya, even outside Java. When there was an acute shortage of food in the seventies, Purwosari farmers used the trunk of the *aren* palm to make sago, a flour-like ingredient. Years later, middlemen from Klaten were purchasing aren trunks from them at Rp.1M each, which in turn produces 500 kilos of sago. Since then, the Bupati has banned cutting of naturally growing *aren.* Now it is cultivated by the farmers.

75. Such knowledge have not been documented, captured, shared and reused.

76. PFI3P can profit from information management models employed in development assistance undertakings of many countries. The next section describes this range of options in detail.

IV. INFORMATION MANAGEMENT OPTIONS FOR PFI3P: A REVIEW OF ICT4D MODELS

A. Characteristics and Features

77. Information management options for the Poor Farmers Income Improvement through Innovation Project have elements of both the old and the new; the conventional and the sophisticated; the analog and the digital.

78. ***Conventional Media.*** This grouping of technology dissemination options includes analog AM and FM radio, VHF and UHF television, the print media, video, cinema, and indigenous communication media.

79. Generally, conventional media has become more available, more accessible, and cheaper. A comparison of statistics given by the Asian Communication Handbook shows that there are more radio and television stations, more radio and television sets, higher video ownership, more movies, and more publications today.[5] Fifty years ago, radio was acknowledged as the most pervasive medium in rural farming communities. Today, it remains to be the most omnipresent, the only difference being that farmers today have equal access to both AM and FM broadcasts. With the spread of television coverage, rural communities have higher access to VHF and UHF transmissions. Increased incomes and more affordable pricing have made VHS players almost as available as television sets. The increased availability has resulted in a seemingly contradictory situation wherein the number of cinemagoers has decreased but the popularity of cinema has increased. Moreover, higher literacy rates have also led to better potentials for print media.

80. There are higher prospects for us to tap conventional media for agricultural information and communication purposes today than it was in the seventies, with one exception. Indigenous communication or folk media is losing its potential as an extension medium in rural communities. The greater the influence of popular culture brought about by radio, television, and cinema, the lesser the popularity of folk media. There are, of course, exceptions of this observation, such as the sustained *dangdut* craze spreading all over Indonesia.

81. ***Digital Media***. Like most other regions in the world, Asia is being deeply impacted by new information and communication technology or ICT. The business sector, in particular, has profited immensely from the convergence of computers and telecommunications, allowing faster access to market information, sounder decision-making, quicker response to market developments, as well as more efficient streamlining of operations.

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[5] *A, Goonasekara and D. Holiday, eds. (1998 and 2001 Editions).* ***The Asian Communication Handbook.*** *Asian Mass Communication Research and Information Center and the Nanyang Technological University (Singapore).*

82. The agricultural sector has lagged behind in exploring and tapping the potentials that ICT has to offer. These potentials range: from the sharing and re-use of data, research findings, lessons learned and best practices among R&D institutions to developing quick response mechanisms for agricultural and natural resources crises situations; from permitting informed decision making among our agricultural officials to sounder policy making among our legislators; from improving the extension delivery systems in the rural areas to bringing *eCommerce* to our farmers. The possibilities are next to endless.

83. ICT refers to new generation technologies spawned by the marriage of computers and telecommunications. In fact, ICT is more than that. It is the product of the convergence of digital technologies encompassing computers, telecommunications, audio-video, and publishing. It covers mobile phones, personal computers, the Internet, email, imaging technology, digital audio-video, and digital broadcasts, even cable television. ICT types range from web-enabled, network, and stand-alone technologies. Web-enabled applications refer to those that tap the World Wide Web Global Communication Backbone in their uplink-downlink infrastructure. It is operational in several kinds of systems, from management information systems to the more upstream knowledge management systems. ICT products include databases, websites, and multimedia packages, which may be in the form of CD-ROMs.

B. Research-Extension-Farmer-Market Linkages

84. What is the connection between information management and the research-extension-farmer-market interface?

85. The 2000 Okinawa Summit of G7/G8 nations describes information and communication technology as "one of the most potent forces in shaping the Twenty-first Century…fast becoming a vital engine of growth for the world economy."[6] Indeed, ICT may be applied to almost every problem in probably all sectors. The founders of the SEAMEO Regional Center for Graduate Study and Research in Agriculture or SEARCA had the foresight to establish the connection at the very onset. Founded in Los Baños in 1966, SEARCA's first Director was Dr. Dioscoro L. Umali, who became the Regional Director of FAO in the seventies and eighties. Early on, Dr. Umali harbored a vision to make SEARCA the center for agricultural information and communication in Southeast Asia. In 1975, SEARCA became the first institution worldwide to sponsor a professorial chair on development communication, with Dr. Nora C. Quebral being the first recipient. A year later, the Center published the first two monographs on the subject. Furthermore, the Center has been the Southeast Asian regional hub for agricultural information for more than a quarter of a century. It established the Agricultural Information Bank for Asia (AIBA) in 1974. In the same year, AIBA became the regional hub of the Food and Agriculture Organization Agricultural

[6] *Okinawa Charter on Global Information Society, G8 Scholarly Publications and Papers, University of Toronto G8 Information Center.*

Information System (AGRIS). A decade later, the Center funded the first Philippine research study on the so-called Digital Divide.

86. ***The Digital Divide.*** The SEARCA study argued that the widening gap between the information-rich and the information-poor had dire policy implications particularly in the agricultural sector. The existence of this gap, not only in this sector but in all other sectors associated with development, is now widely recognized due primarily to the July 2000 Okinawa Summit of the G7/G8 nations. Today, this gap is known as the Digital Divide.

87. Nowhere else in the world is the Digital Divide considered more of an enigma than in Southeast Asia. This region boasts of countries that are in the forefront of digital technology. Singapore, Taiwan, Malaysia and Thailand are producers and exporters of such technology. Also in this region are agricultural countries, which may be considered as the most deprived in ICT – Laos, Cambodia, Myanmar and Vietnam.

88. To begin with, the differences in the standards of living among countries within the region are quite glaring. Based on the 1999 UNDP Human Development Report, the human development index (HDI), human poverty index (HPI) as well as the HDI ranks of ten Southeast Asian countries are given in Table 1. Out of 174 countries, Singapore is ranked 22nd in human development, while Lao PDR is ranked 140th. Brunei Darussalam is ranked 25th while Cambodia is ranked 137th. Malaysia is ranked 56th, while Myanmar is ranked 128th. Within the same region, we find countries classified under high, medium and low human development.[7]

89. Singapore and Brunei's poverty indices are negligible, while Myanmar and Lao PDR's (38.9 and 32.3, respectively) are quite high. The poverty index of Malaysia, Thailand and the Philippines (14.2, 18.7, and 16.5) are within the same range, while those of Indonesia and Vietnam (27.7, 28.7) are moderate. The HDR database also offers some interesting insights on the correlation between ICT and poverty. Data on four major ICT indicators, namely, internet hosts per 1000 persons, telephone lines per 1000 persons, personal computer ownership and television ownership were placed side by side with the aforementioned poverty indices. The correlation is unmistakable.

90. The higher the HDR rank, the higher the ICT indicator values. The higher the human poverty index, the lower the number of ISPs, telephone lines, PCs and TV sets per 1000 persons. The higher the value of ICT indicators (as in the case of Singapore, Brunei and Malaysia), the lower the poverty index.

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[7] ***Human Development Report 1999****, United Nations Development Program and Oxford University Press: New York and Oxford, 1999.*

Table 1. Poverty and ICT Indicators

HDI Rank	COUNTRY	Human development index	Human poverty index	ISPs/ 1,000	Telephone Lines/ 1,000	PCs/ 1,000	TV/ 1,000
22	**Singapore**	0.887911	..	15.11	513	216.8	361
25	**Brunei Darussalam**	0.877795	..	2.41	263	..	417
56	**Malaysia**	0.768328	14.2	2.09	183	42.8	228
67	**Thailand**	0.753147	18.7	0.03	70	16.7	167
77	**Philippines**	0.739973	16.3	0.21	25	9.3	125
105	**Indonesia**	0.680862	27.7	0.11	21	4.8	232
110	**Viet Nam**	0.663824	28.7	no data	16	3.3	180
128	**Myanmar**	0.579768	32.3	..	4	..	7
137	**Cambodia**	0.514409	no data	0.01	1	..	9
140	**Lao PDR**	0.491107	38.9	no data	6	1.1	10

91. The gap between hardware and software capabilities also exists. For instance, the Philippines is considered to be the second largest exporter of ICT professionals and software developers next to India. Yet, it has hardly caught up with broadband and wireless technologies. The Digital Divide within sectors is likewise formidable. In Thailand and the Philippines, the business sector is fast catching up with its counterparts in Singapore ICT-wise. However, the educational sector is lagging far behind. At the tail end of the ICT utilization spectrum is the agricultural and rural development sector with the least number of ICT users, applications and solutions. In these sectors, we find the preponderance of the information-poor. It is in these sectors where active interventions are required the most.

92. ***Convergence.*** By definition, information management relates to convergence or the process of increasing the interface between two systems. Convergence in agricultural extension is finding a common platform for the research system, the extension system, the production system and the marketing system for the sharing and re-use of knowledge. That platform has been made possible by and large by digital technology. In more concrete terms, ICT allows information generated by the researcher to be more efficiently accessed by the extension worker to be more effectively transferred to and applied by the farmer. A case in point is the UNDP Mango Information Network (MIN) that we established at the Philippine Council for Agriculture and Resources Research and Development in 1997. Research results on mango production, mango pests and diseases, and post-harvest technology were made available in the World Wide Web, specifically for nodes of extension workers based in strategic mango producing areas. The extension workers, in turn, transmitted these to the farmers. At times, the interface was so substantive that the roles between the researcher and the extension worker, and the farmer began to blur. Traditionally, the researcher is considered the *source* of information, the extension worker, the *channel*, and the farmer the *receiver*. However, in the MIN, the boundaries

between these traditional roles at times dissolved. More progressive farmers accessed research information themselves through the Web without going through the extension workers. Occasionally, the farmers become sources of local information for the researchers.

93. Basically, ICT facilitates two elements critical in the Research-Extension-Farmer Interface and technology transfer process: *information access* and *networking*. The storage and retrieval of research results facilitates information access while telecommunications facilitates networking. Both elements are found in some of the strategies and approaches discussed in the next section.

C. Strategies and Approaches

94. ***Riding the Tide of Popular Media***. Popular media is spreading like wildfire in rural Asia. In July 2002, while serving as the Project Director for the Impact Evaluation of ARMPII, the Information Management Specialist visited the hinterlands of West Kalimantan where Dayak youths in communities seven hours away from urban centers were dressed in Ricky Martin T-shirts or Britney Spears style jeans. In the evenings, you would see them dance to a *dangdut* tune in wedding celebrations conducted in the middle of a provincial highway. The popularity of music videos, songs, and artists may be tapped in our agricultural extension activities. For instance, a product endorsement from a local popular music artist would go a long way. Instead of rural radio forums or schools on the air, the extension worker should experiment on inserting agricultural technology messages in entertainment programs and music videos. The COFISH Project in Indonesia implemented by the Directorate General of Fisheries produced a music video in 1999 entitled *Laut Ku, Masadapan Ku* featuring local pop diva Rita Effendi.[8]

95. ***Community Based/ Participatory Media.*** With the increased availability of conventional media, communities are now able to participate in the production of low-cost information and communication materials. A case in point is the use of video in the documentation of best practices. Using a low-cost camcorder, local talents may be tapped in the documentation process. The videotapes may then be shared with other communities. If several communities are involved in this documentation, then a "sharing network" for the exchange of materials among these communities may be initiated.

96. ***Capacity Building for Support Agencies.*** The Okinawa Charter recommends "the development of human resources capable of responding to the demands of the Information Age through education and lifelong learning…" Along this line, the capacity building approach increases the institutional capability of central as well as devolved agricultural extension agencies in providing support

[8] *Alexander G. Flor.2000.* ***Information, Education and Communication Master Plan for the ADB Coastal Community Development and Fisheries Resource Project****. Directorate General for Fisheries, Ministry of Marine Affairs and Fisheries, Jakarta.*

services to farmers. Increasing the institutional capability involves: *system design and development*; *hardware and software procurement*; and *staff development*. However, this approach does not directly target the ultimate beneficiary, the farmer, but the services that provide support to him.

97. The design of a typical digital extension system would look like this:

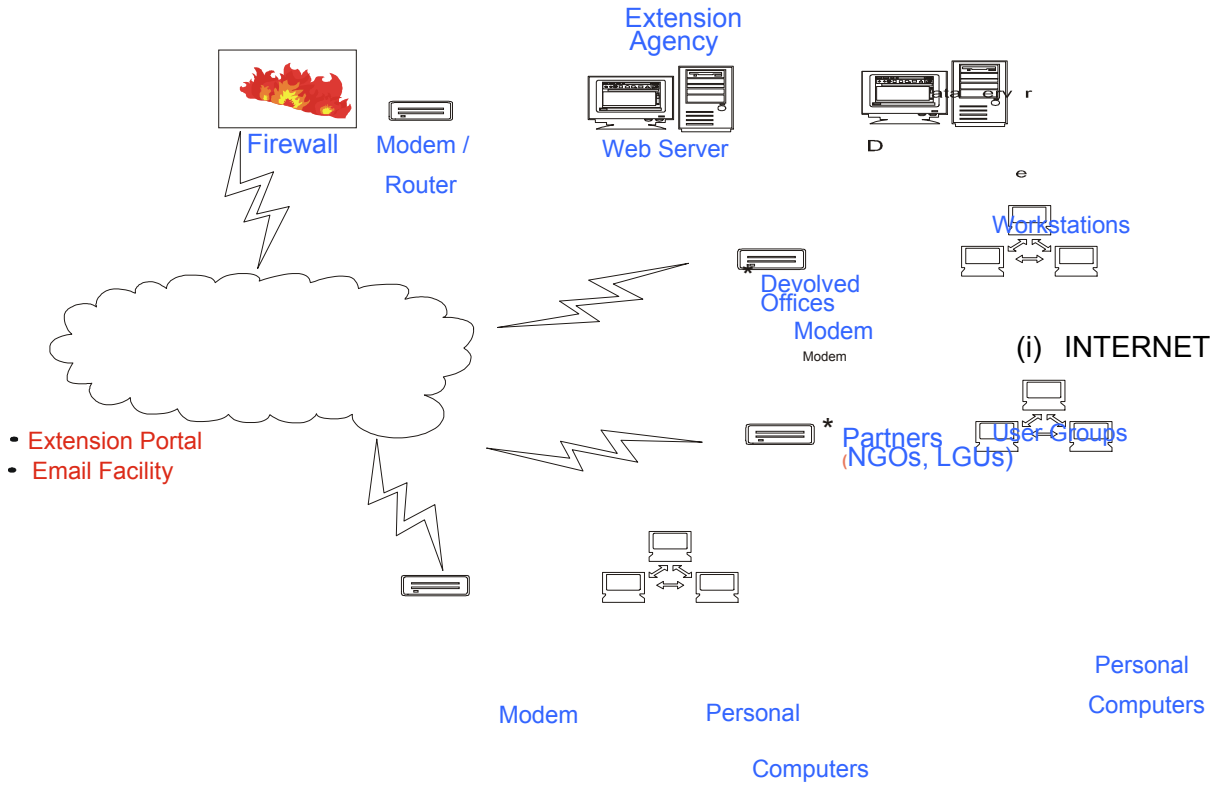

Figure 3. IM System Design for an Agricultural Extension Agency

98. ***Programmatic ICT Strategy.*** The ideal approach, however, is the use of ICT that would directly improve the farmer's access to information and reinforce his linkages with the research, extension, and market sub-systems. Some are of the opinion that such an approach is difficult if not impossible for the following reasons:

- Farmers are not computer literate. Many of them are not even functionally literate.
- ICT is very expensive. Farmer's would rather spend their hard earned money on basic necessities rather on ICT.
- Internet service providers are unavailable in the rural areas.

99. These concerns may be adequately addressed by two strategies:

- employing low-end, low-cost information and communication technology such as cellular phones, VCDs, cable television;
- achieving economies of scale; and
- using a programmatic instead of a technological approach.

100. The first strategy will be dealt with in the succeeding section. The second is self-explanatory. With regard to the last, ICT should not be introduced as a purely technological intervention alone but a programmatic intervention with a comprehensive set of attendant services, which may include: pre-financing; market linkages; and technical assistance.

101. An example of the programmatic ICT approach is the Empowerment of Rural Households Through Information Technology Project processed by the Asian Development Bank as a technical assistance project for the Philippines. The objectives of the project is to increase the income of poor rural households by linking the production of high-value products, using available natural resources in the community, with domestic and international markets through ICT for sustainable development. The goal of the project is to reduce poverty of several ethnic minority groups and several ethnic majority groups.

102. The project area consists of twelve pilot provinces, all of which belong to the poorest provinces according to Government classification. The project will have two parts. Part A will consist of three components: (i) community empowerment, (ii) establishment of IT Livelihood Centers in the Rural Communities, and (iii) development of sustainable livelihoods. Part B will consist of three components: (i) establish a network of DTI Livelihood Centers at provincial capitals, cities, and the national capital, and (iii) provide public information service.[9]

D. Technology Dissemination Modalities

103. Table 2 presents the information and communication modalities currently available as well as the information that these may contain, which is not necessarily limited to agricultural technology. Some have earlier been discussed, while others need a little more elaboration.

[9] *Antonio Perez. Concept Note: Empowerment of Rural Households Through Information Technology Project. Asian Development Bank (Manila, 2002).*

Table 2. Technology Dissemination Modalities

Information and Communication Modalities	*1. CONTENT*			
	Research-Extension	**Extension-Farmer**	**Extension-Market**	**Farmer-Market**
Knowledge Networks	Experts Network Knowledge bases	Farmers' Profile	-	-
Knowledge Bases	On-line publications Research Results	Research Results Technology Packages	Pricing Policy	-
GIS Output Maps	Agro-ecosystem Demographics	Precision Farming	-	-
Community Telecenters	-	Technology Market Information	Technology Market Information	Market Prices Potential Markets
Digital Broadcasts	-	Agricultural Technology	Prices and Markets	Prices and Markets
Digital Audio-Video	Documentation of Best Practices and Success Stories	Documentation of Best Practices and Success Stories	Documentation of Best Practices and Success Stories	Documentation of Best Practices and Success Stories
Desktop Publishing	Documentation of Best Practices and Success Stories	Documentation of Best Practices and Success Stories	Documentation of Best Practices and Success Stories	Documentation of Best Practices and Success Stories
Databases	Research Data	Farmers' Profile	-	-
Cellular phones	-	Market Prices	Market Prices	Market Prices
VHF/UHF TV	-	Agricultural Technology Market Information	Agricultural Technology Market Information	Market Prices Potential Markets
AM/FM Radio	-	Agricultural Technology Market Information	Agricultural Technology Market Information	Market Prices Potential Markets
Audio-Video	Documentation of Best Practices and Success Stories	Documentation of Best Practices and Success Stories	Documentation of Best Practices and Success Stories	Documentation of Best Practices and Success Stories
Print Media	Agricultural Technology	Agricultural Technology	Agricultural Technology	Market Prices Potential Markets
Folk Media	-	Agricultural Technology	Agricultural Technology	Market Prices Potential Markets

104. ***Conventional and Digital Broadcasting****.* AM and FM radio, as well as VHF and UHF television remain the most cost-effective means of technology transfer in rural farming communities. However, they require economies of scale. This requirement prevents conventional radio and television from being interactive or individualized. Making audio and video products available over the World Wide Web allows the user to access these on his own time and pace and to interact with his facilitators.

105. Another alternative available is digital broadcasting, which allows a wider range of audio and visual stimuli for the user, greater interactivity, and individualized instruction.

106. ***Comic Books.*** Among the array of print media that are available (i.e., leaflets, brochures, posters, magazines, wall newspapers, etc.) comic books offer the best potential in technology transfer. Localized, limited circulation comic books that would serve the requirements of devolved extension personnel are now possible though desktop publishing. Imaging technology, layout and design software supplemented by a good quality copier produce professional-looking comic books for distribution by extension workers.

107. ***Community Telecenters.*** The inability of rural farmers in general to have access to personal computers, VCDs, video cameras and the Internet may be remedied by establishing ICT or telecenters in rural communities. These telecenters may be hosted by the local government and would have facilities that may be utilized by the community. The basic equipment contained in the telecenters should include: an Internet-ready PC with a printer; a photocopier; a television set; a karaoke machine (to be used as a sound system); a video camera; a digital stills camera; and two cellular phones. Farmers groups should be able to avail themselves of the telecenters through the extension agents. In these facilities, low-cost communication materials may be produced with the participation of farmers, youth, and women's group representatives.

108. ***Using Low-End ICT.*** All over the world, small independent initiatives are being undertaken to employ information and communication technology in rural development. The most common of these initiatives is the actual introduction of low-end ICT (i.e., mobile phones, PCs, the World Wide Web, the Internet kiosk, and others) to impoverished communities.

109. In June 2000, CNN aired a special that was co-sponsored by the World Bank and the Bill and Melinda Gates Foundation. The thirty-minute documentary, entitled *"Virtual Villages: Technology and the Developing World,"* featured four segments, each of which showed dramatic results in the introduction of information and communication technology to poor villages. These cases may have little to do with agricultural extension, but one can easily see parallels in the research-extension-farmer interface. The opening spiel of the documentary relates:

> *Technology has become the driving force of change in the modern world. It has altered our economic structures and the ways we communicate. It has even changed how we relate to one another. Examine how technology -- even in small amounts -- is helping developing nations and communities overcome convention and tradition to take leaps forward.*[10]

110. ***Using Mobile Phones in Bangladesh.*** Among the more successful financing models ever to emerge from the Third World is the micro-credit system introduced by the Grameen Bank of Bangladesh. Grameen's founder and director, Professor Muhammad Yunus, has again embarked on an innovative undertaking based on an idea that is as simple as it is elegant. The bank has initiated a cellular phone project, dubbed the Grameen Phone Company, which would put a mobile phone in some 45,000 villages, giving residents access to ICT. Each mobile phone is acquired by an individual through a small loan from the bank. This phone becomes a community telephone service provider, earning income for the owner besides providing a much-needed utility to the community.

111. Professor Yunus is following this up with an experimental Village Computer and Internet Program or VCIP, which would provide an email and Internet service to villagers. Instead of paying for phone calls to contact relatives in the cities or friends abroad, the villagers will now be able to avail themselves of email for a fraction of the cost of a long distance call. A simple form of e-commerce will also been initiated by this system. Farmers will now be able to check out market prices and study the list of wholesalers in Dhaka by surfing the Web.

112. ***Surfing the Web from the Hinterlands of the Dominican Republic.*** El Limon is a tiny village in the Ocoa region of the Dominican Republic. With the help of a volunteer, Jon Katz of Cornell University, its residents built a local hydroelectric system to generate enough electricity to light their houses and their schoolhouse. CNN continues:

> *Once they had electricity, the villagers hooked up a donated computer to the Internet using a digital radio and an antenna relay system that connects to the nearest phone line, ten miles away. Now, their school, which has no library – in a village with neither telephones nor indoor plumbing – has a connection to the World Wide Web.*
>
> *The students in El Limon are learning digital video editing on a computer and are making their own documentary about the hydroelectric project. They plan to show the video to other communities in the area – in the hope of repeating El Limon's success story.*[11]

113. ***Community Cable TV and Cable Modem Interface***. Yet another modality is community cable TV interfaced with the cable modem. This technology is being proposed for extension activities in per-urban communities using the *Tambuli* model.

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[10] http://www.asia.cnn.com/SPECIALS/200/virtual_villages
[11] *Ibid*

One of the most innovative undertakings in the area of ICT implemented during the nineties was a ten-year Unesco-DANIDA funded project implemented in the Philippines called *Tambuli*. The project sought to determine and monitor the impact of communications technology on rural areas that were hardly reached by media. Low-cost, limited-ranged FM transmitters were installed in eight extremely poor municipalities in Luzon, Visayas and Mindanao. Local volunteers to operate the radio transmitters were trained by project staff. The programming and operations were essentially left to the host community.

114. *Tambuli*, which in Filipino means “clarion,” thus established community FM radio stations in impoverished areas in the Philippines with the intention of improving the lives of people in these areas through the provision of timely information that would assist in community mobilization and the improvement of local government services.

115. Does cable television and the Internet, hold as much promise in agricultural extension? *Tambuli II* will determine and monitor the impact of new ICTs on rural and peri-urban communities. There are three distinguishing characteristics of Tambuli II as compared to the original Tambuli. Firstly, the intervention will take the form of community cable TV and cable modem interface, thus making cable television transmission and production as well as high-speed Internet service available to the pilot communities. Secondly, the target beneficiaries are not exclusively the rural poor. Recognizing their role in the food security of urban areas and their impact on the urban poor, peri-urban communities form an important part of this study. Peri-urban communities are communities within the periphery of urban areas that serve as a buffer zone between the cities and the outlying communities. The urban poor are usually relocated in these areas. The potentials of peri-urban agriculture to ensure the food security of urban areas and to provide livelihood to the urban poor is now being vigorously pursued internationally. Thirdly, and perhaps most importantly, the scope of Tambuli II will be the Southeast Asian Region.

116. The objectives of Tambuli II are as follows:

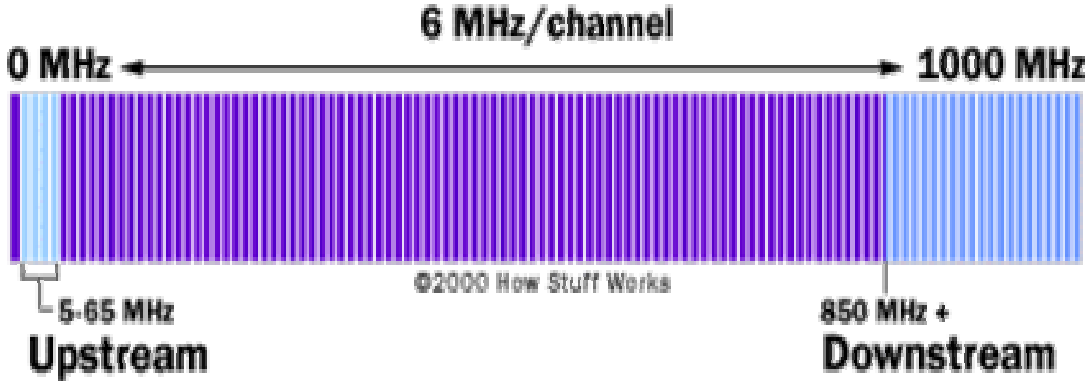
- to determine the impact of new information and communication technologies (ICTs), specifically community cable TV and high-speed Internet on rural and peri-urban communities in Southeast Asia;
- to monitor the impact of these technologies on governance, education, micro-finance, commerce, peace and order, and agricultural production;
- to determine significant deviations in impact across countries and cultures; and
- to document these impacts for model building purposes.

117. In this project, it is proposed that information and communication technology interventions will be limited to community cable television and high-speed Internet through cable modem. The system offers a much broader bandwidth than what commercial Internet Service Providers offer (Figure 3). The cable modem system

puts downstream data into a 6 MHz channel. Upstream data requires just 2 MHz since users download more information than they upload. [12]

118. Access to cable television channels will be limited to appropriate networks.[13] Access will initially be governed by strategic considerations since the number of television receivers and workstations are limited. However, community residents who are able to afford these services on a token fee may avail themselves of a connection. Specifically, the users of these media are: local government agencies; schools; farmers cooperatives; NGOs; utilities; development councils such us the BDCs, MDCs, MAFCs and FARMCs. Training will be provided to the community cable operators for the production of community cable television programs and for operating the facility. Training will likewise be provided to the Internet Service Provider as well as the strategic users: LGUs, schools, coops and others.

Figure 4. Cable Modem Bandwidth



119. ***Geographic Information System.*** Another potential modality for agricultural extension and technology transfer is the GIS output map. Fisher and Nijkamp (1992) define GIS or geographic information system as a computer-based information system which attempts to capture, store, manipulate, analyze and display spatially referenced and associated tabular attribute data, for solving complex research, planning and management problems.[14] ESRI (2000) describes it as a computer-based tool for mapping and analyzing things that exist and events that happen on earth. GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps. In other words, GIS is a system that adds a spatial dimension to traditional databases by incorporating geo-referenced data.

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[12] *How Stuff Works website*

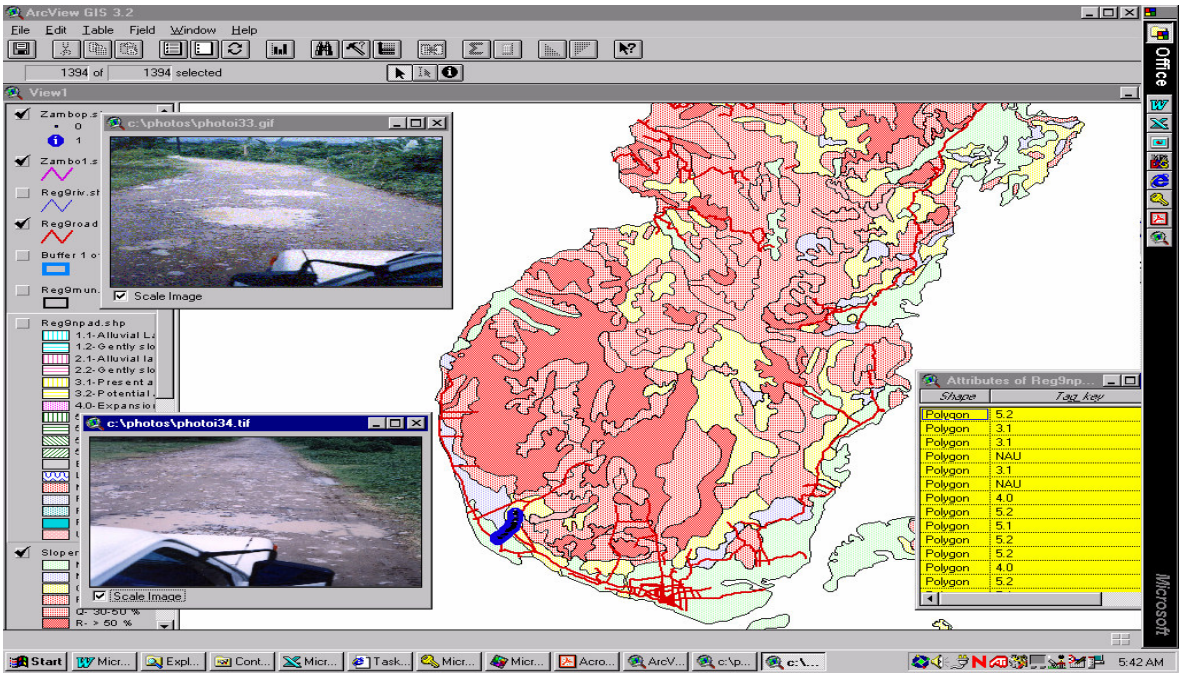
[13] *In the Philippines, part of the licensure requirements of offering a community cable television service is the provision of one channel for community bulletin boards, programs, and special events announcements.*

[14] *Esteban C. Godilano. GIS: A tool in setting the policies and direction of agriculture in the Philippines. Paper presented to the faculty and staff of the College of Agriculture, College-wide seminar, 26 September 2001.*

120. Being closely attached to land, water, and ecosystems, agriculture almost always has a spatial dimension. Applied to agricultural research, GIS then becomes a powerful tool for the analysis, interpretation, presentation, and application of research results in on-farm trials or even farmers' fields. It produces accurate and contextualized, visual and locational representations of relationships between climate and commodities, soil type and recommended crops, productivity and cropping patterns, nutrition and land-use, agricultural technology and poverty. GIS provides a value added service to research data by bringing in visual and contextual elements that serve to concretize abstract concepts. An extension worker could better appreciate research results when seen in GIS output maps. Furthermore, he could easily arrive at its implications and is better able to relay it to his farmer-clients.

121. A picture is worth a thousand words, so they say. GIS output maps serve as effective extension materials for farmers. An example of such a map is given below.

Frame. Output Map of the ADB Rural Productivity Enhancement Project[15]



122. ***Knowledge Networks.*** The Okinawa Charter proposes the "development of information networks offering fast, reliable, secure and affordable access through competitive market conditions and through related innovation in network technology, services and applications." Establishing knowledge networks to operationalize the research-extension-farmer interface fits snugly into this recommendation.

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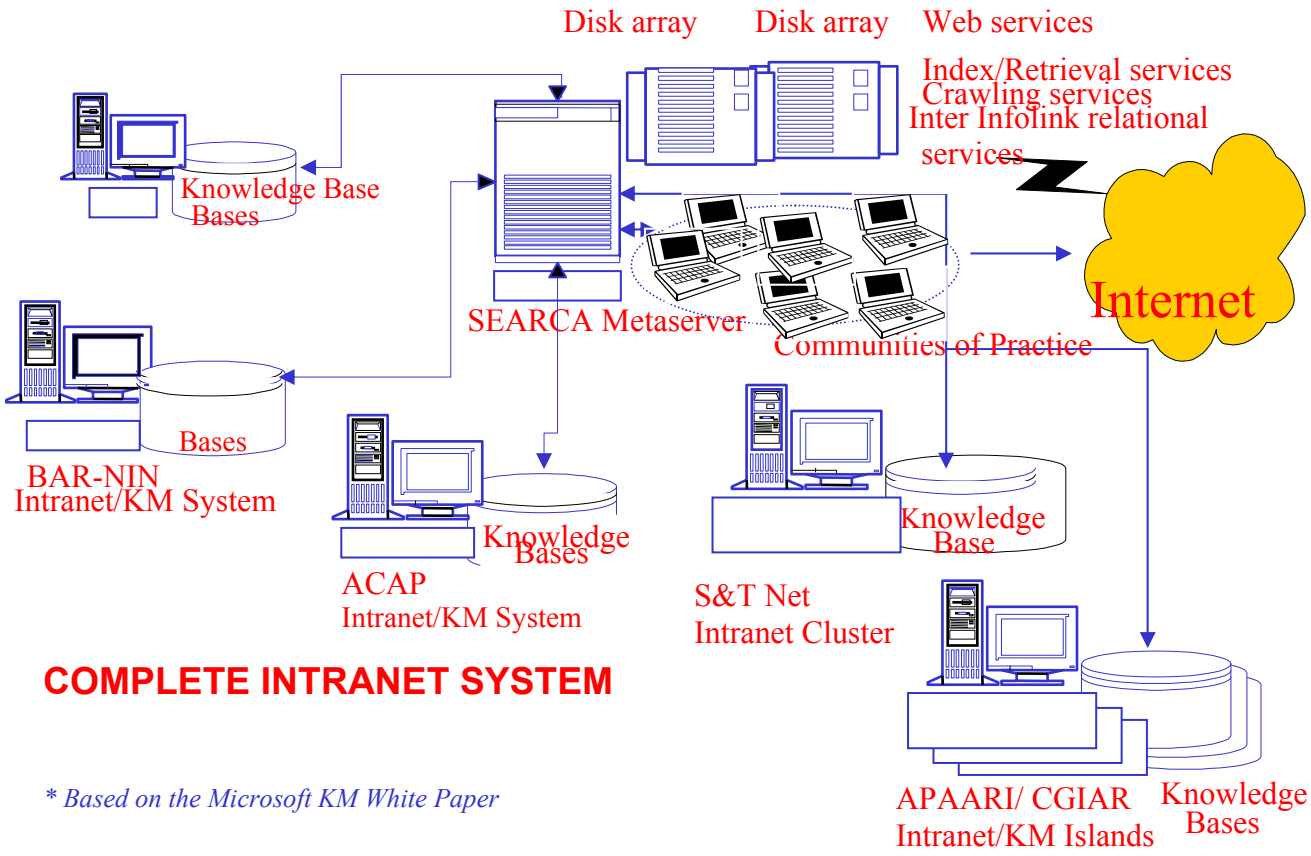
[15] *Groff, Stephen P., Neil Thurston and Tom Chidley. Infrastructure for rural productivity enhancement: A GIS-based approach to rural development project management in the Philippines. Asian Development Bank (Manila).*

123. A knowledge network is a complete Intranet system.[16] Its main function is to facilitate the sharing and re-use of information and knowledge between and among the nodes of the network. At present, two knowledge networks are hosted by SEAMEO-SEARCA: the ASEAN Integrated Pest Management Knowledge Network, established in 1998; and the Biotechnology Information Center, established in 2000. A third knowledge network known as the Southeast Asian Sustainable Agriculture Knowledge Network (SEASAKNet) is being established.

124. The following figure shows the configuration of a proposed regional knowledge network.

Figure 5. SEASAKNet Network Configuration[17]



E. Institutional and Social Networks

125. In spite of the trends that have weakened the potential contributions of information and communication, the conditions are ripe for PFI3P to make full use of the expanded set of tools available. The question now is, how should the Project reposition itself vis a vis the existing information and communication environment?

[16] *Ibid*
[17] *Configuration based on Leibmann (op cit, 1999)*

How should staff members of IAARD, NARIs, AIAT's and Dinases retool themselves within this new environment?

126. Two features of the agricultural technology dissemination system that were lost in decentralization and devolution were synergy and economies of scale. Assuming that decentralization and devolution is an irreversible trend, Indonesian agricultural research, development and extension can still revive its integrity as a system and regain its synergy and economies of scale by establishing institutional and social networks. These networks should go beyond provincial groupings, extending themselves to regional or even national systems. As networks, agricultural dissemination services can share information and communication resources, coordinate campaign activities, and conduct integrated, well-coordinated programs that extend beyond constraining local government boundaries. As network members, agricultural workers will be able to retool themselves within given standards that they themselves will set. Appropriately, the networking tools that are required for this initiative are information and communication technologies.

V. CONCLUSIONS

What is the existing policy environment for poor farmers' empowerment through information?

128. The existing policy environment is very conducive for poor farmers' empowerment through information and communication.

Who are the major users of agricultural information in the Indonesian research, development and extension sub-sectors? How can the poor farmer become a major user?

129. In the order of levels of utilization, the major users of agricultural information are: scientists and researchers from national agricultural research institutes; scientists from the private sector specializing in agricultural products; technical staff of the Ministry of Agriculture; professors, lecturers, students and researchers coming from leading universities; extension workers based at the Dinases and private firms; and finally, farmers, but not the poor ones.

130. The Indonesian poor farmer can become a leading user of agricultural information if sufficiently given attention to by the Project. Information management-wise, the Project can improve access to conventional media through its PIU-based rural agricultural information and communication centers. It can even pilot village-based rural agricultural information and communication centers. Furthermore, it may incorporate the use of indigenous and local media in its dissemination programs. Finally, the Project can increase capacities for effective dissemination among staff at the NARIs, AIATs and Dinases through practical training.

What content is most relevant to the poor farmer?

131. Content most relevant to the poor farmer are those that would have immediate impact on his income: accurate, up-to-date price information; available assistance to source potential market outlets; low-input technologies for crops in marginal areas; low-cost post-harvest technology that extends the shelf-life of his products.

What are the information management needs of the Indonesian research, development and extension sub-sectors? What IM strategies can be adopted to benefit the Indonesian poor farmer?

132. Information management needs of the Indonesian research, development and extension sub-sectors revolve around three main topics: knowledge management; developing the "last mile" linkage for agricultural innovation dissemination; and intermediary training. Long-term and short-term training programs for IAARD, NARIs, AIAT and Dinas staff are strongly recommended.

Do existing national and local agricultural information systems and resources adequately address the information needs of the Indonesian poor farmer?

133. Insofar as its information management targets are concerned, the Project is adequately fulfilling its two major deliverables: the establishment of national and local agricultural information systems where agricultural technologies are made available; and the setting up of a Web-based agricultural marketing information system.

134. However, areas for improvement have been identified. Firstly, the national agricultural information network needs to have institutional and social dimensions, as well, not merely focusing on electronic networks. This entails the establishment of an active ICT4D Network for coordination among agencies and even across ministries. For instance, the CADI and SINGOSARI agricultural market information systems should merge into one Web-based service. Furthermore, social networks at the village level should be strengthened and tapped by the Project.

How does information flow from the research sub-sector to the extension sub-sector to the farming sub-sector and finally the market sub-sector? How can this flow be reconfigured to maximize the benefits for the poor farmer?

135. In the past decade, the Indonesian agricultural research-extension-farming sub-sectors have made progress in cyclic and three-way interfaces. This is apparent in the existing policy environment in spite of the problems resulting from the devolution of the extension service. The cyclic information flows between and among the research-extension-farming sub-sectors can be further strengthened by: incorporating into the National Agricultural Information System a feedback system from the farmers groups at the local level to national decision makers; incorporating an indigenous knowledge sub-system; and employing a mechanism through which poor farmers are involved in establishing the national and local agricultural research agenda.

V. RECOMMENDATIONS

A. On Agricultural IM Needs

136. ***Facilitating Information Flows***. There is a need to further facilitate cyclic, non-linear information flows within the existing national agricultural information system. This can be achieved by:

(i) Incorporating a feedback functionality such as online forums or bulletin board discussion groups within the National Farming Website for farmers to interact with decision makers and policy makers. This will be done through online intermediaries.
(ii) Incorporate an IK system as a pillar in the National Farming Website with the assistance of the ICT Specialist. The capacity for researchers, extension workers and farmers themselves to capture IK should be built.
(iii) Employ a mechanism, again through the National Farming Website, through which poor farmers are involved in setting-up national and local research agenda.

137. ***Multidimensional Networking.*** The national agricultural information network needs to have strong institutional and social dimensions, not merely electronic. Hence the Project should take the initiative by:

(i) Establishing the ICT4D Network for coordination
(ii) Facilitating the merger of the CADI and SINGOSARI market information systems and coordination with the Ministry of Trade and Industry Info Pasar at the local level.
(iii) Establishing partnerships with the Ministry of Communication and Information and Ministry of Trade and Industry for provision of information at the local level should be strengthened.

138. ***Last Mile Linkage.*** There is a need for the Project to develop its "Last Mile Linkage" for agricultural innovation dissemination. Hence, PFI3P should:

(i) Deploy intermediaries between
    a) National Farming Website and poor farmers
    b) Market info system and poor farmers
(ii) Establish community access centers run as coops by farmers
(iii) Employ conventional media and folk media as intermediary tools.

139. ***Capacity Building.*** The agricultural R&D sector's capacity for knowledge management should be increased. It is strongly recommended that the Project conduct:

(i) Long-term training for IAARD staff
(ii) Short term training for IAARD and NARIs staff

(iii) NGO intermediary training
(iv) Farmers training

B. On IM Deliverables of the TA Package

140. As provided for in the Project Administration Memorandum, the International and Domestic Information Management Specialists should submit the following Technical Assistance Deliverables:

- The Needs Assessment Study and Information Flow Analysis Report
- An Improved Design for the National Agricultural Information Network

141. Furthermore, the Specialists should develop a training plan and training modules to improve the capacities if researchers, dissemination staff, Dinas staff, and cooperator-farmers on knowledge management and intermediary skills.

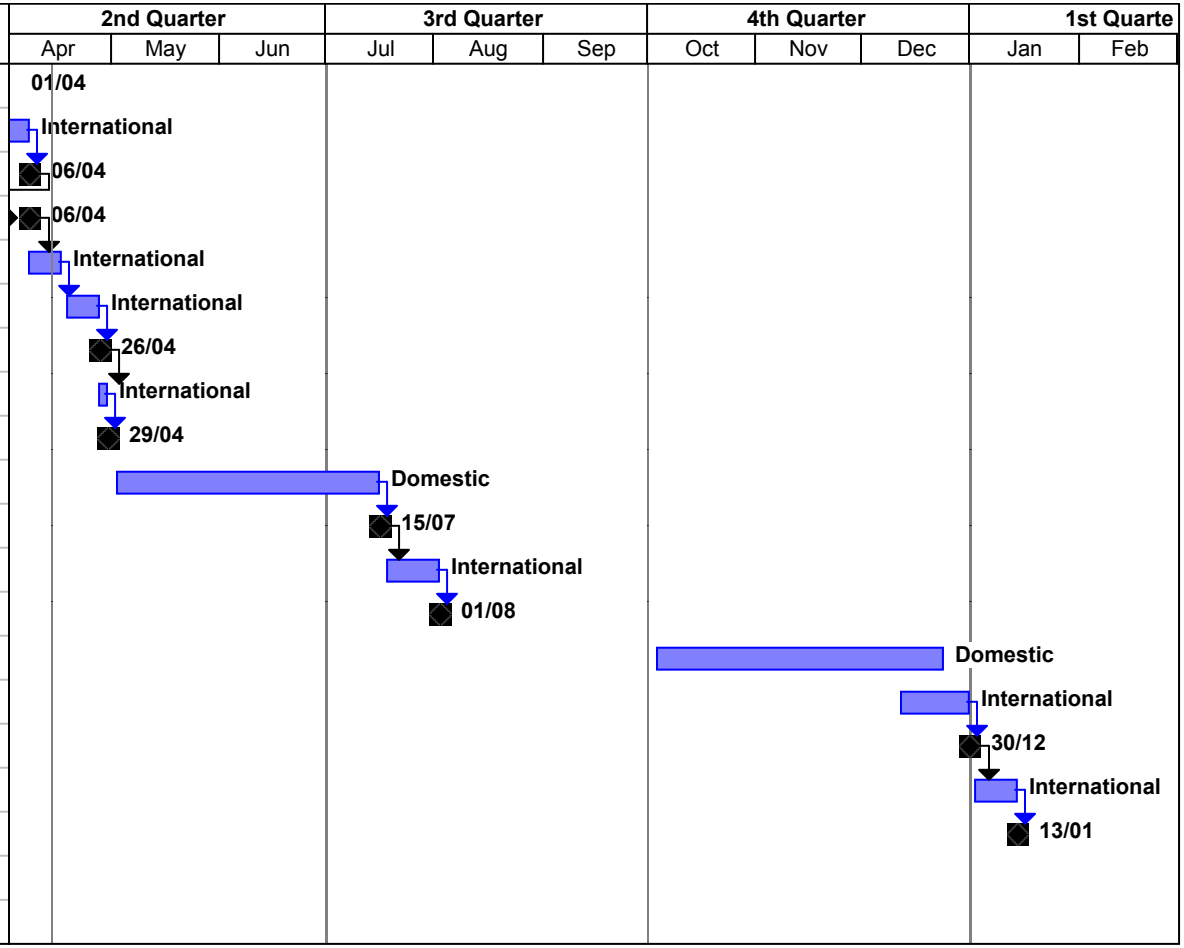
C. On the Project Implementation Plan

142. As per Project design, the International Information Management Specialist was only supposed to deliver his inputs during the Inception Phase. However, his engagement began two years after the Project was mobilized. It is recommended that his inputs be maximized by assisting not merely in planning and designing but in the implementation of Project activities. This may be achieved by breaking his three-month engagement into three missions: April 2005 for the Needs Assessment; July 2005 for the Improved Design for the National Agricultural Information Network; and December 2005 for the development of the training plan and training modules.

143. The following Gantt Chart gives the proposed scheduling for the International and Domestic Information Management Specialists as well as the proposed dates for the submission of deliverables.

Table 3. Information Management Inputs (International and Domestic) in the CPIP

ID	Task Name
1	Mobilization
2	Write INS Inception Report
3	Submit inputs to Team Inception Report
4	Present IM Framework
5	Conduct Needs Assessment Study
6	Conduct information flow and network analsyis
7	Present NA and network study results
8	Revise Draft NA & Network Study
9	Submit Needs Assessment and Network Study
10	Design Information Mgt and Networking Plan
11	Conduct Validation Workshop
12	Revise Info mgt & Networking Plan
13	Submit Info Mgt and Networking Plan
14	Design and develop Training Plan
15	Develop and prepare Training Modules
16	Submit Training Plan and Modules
17	Prepare Consultant's Final Report
18	Submit Consultant's Final Report
19	
20	



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APPENDIX A.

List of Key Informants

Dr. Tjeppy D. Soedjana
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Indonesian Agency for Agricultural Research and Development

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Assessment Institute for Agricultural Technology (Central Java)
Indonesian Agency for Agricultural Research and Development

Ir. Roni Nurhastuti
Director
Dinas Pertanian
Temanggung, Central Java

Ir. Zainal Arifin
Expert Staff for International Cooperation
Ministry for Communication and Information

Ir. Gayatri K. Rana
Head, Planning Division
Directorate General of Processing and Marketing of Agricultural Products

Ir. Harisno
Head, Data and Information Services Division
Center for Agricultural Data and Information

Ir. Muhammad Tassim Bilah
Head, Information Systems Division
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Information Management Specialist
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Indonesian Agency for Agricultural Research and Development

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Temanggung PIU

Ir. Djoko Prabowo
Project Manager
Temanggung PIU

Ir. Hariyadi
Assistant Project Manager and Coordinator of PIPK
Temanggung PIU

Ir. Ariyati
Head, Planning Division
INFO Pasar, Department of Trade and Industry

Temanggung District

Ir. Nana
Coordinator for Gender Mainstreaming
Temanggung PIU

Ir. Sunardi
Extension Worker
Temanggung PIU

Ir. Karno Budiriyanto
Pak Lurah
Purwosari, Kranggan, Temanggung

Ms. Suwaldi Sugiarta
Chair of KID
Purwosari, Kranggan, Temanggung

Mr. Musiyono
Member, KID
Purwosari, Kranggan, Temanggung

Mr. Arusmadi
Chairman of Farmers' Group
Purwosari, Kranggan, Temanggung

Mr. Asnawi
Chairman of Farmers' Group
Purwosari, Kranggan, Temanggung

Mr. Supriyono
KID Secretary
Purwosari, Kranggan, Temanggung

Mr. Srimunasi
Village Facilitator
Purwosari, Kranggan, Temanggung

Mr. Jumali
Member, Lembangan Katahanan Masyarakat Desa
Purwosari, Kranggan, Temanggung

APPENDIX B.

KII/ FGD Guide Questions

1. What is the existing policy environment for poor farmers' empowerment through information?

2. Who are the major users of agricultural information in the Indonesian research, development and extension sub-sectors?

3. How can the poor farmer become a major user?

4. What content is most relevant to the poor farmer?

5. What are the information management needs of the Indonesian research, development and extension sub-sectors?

6. What IM strategies can be adopted to benefit the Indonesian poor farmer?

7. Do existing national and local agricultural information systems and resources adequately address the information needs of the Indonesian poor farmer?

8. How does information flow from the research sub-sector to the extension sub-sector to the farming sub-sector and finally the market sub-sector?

9. How can this flow be reconfigured to maximize the benefits for the poor farmer?