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**Impact Assessment of the e-AGRIKultura Project:
Philippines***

by

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Abstract

We investigate the link between ICT and rural livelihood expansion in the context of the sustainable livelihood framework. Using two sets of agrarian reform communities (beneficiaries and non-beneficiaries of e-AGRIKultura project), we found evidence of a positive association between ICT, livelihood, and income. There is greater appreciation of the value of information among beneficiaries compared to the non-beneficiaries. While income for non-beneficiaries has increased due to another development intervention, because they appreciate information less, there is a potential threat in sustaining income gains. The ICT project is successful in converting rural communities to have a more progressive viewpoint on the role of ICT in providing information to enhance their livelihood assets. Considering the present endowments available to the rural households, they are better off with the ICT project with significant impact in increasing farm incomes as it facilitates expansion of rural livelihood thereby increasing non-farm incomes as well.

While there is a growing realization of the role of ICT among rural households, more extensive advocacy campaign and investments are necessary to ensure that information can be usefully accessed by all the potential stakeholders. Community organizations can be used to develop sustainability plans and as a conduit in empowering rural communities. Local governments should play a vital role in ICTs supporting livelihoods through policies that will facilitate operations of private businesses thereby forming catalysts of public-private partnerships.

Keywords: Information and Communication Technology, Sustainable Livelihood Framework, Rural Development, Agrarian Reform Communities.

1. Introduction

Rural households in the Philippines are the most marginalized since more than two-thirds of the poor are located in rural areas and a majority of the rural households are dependent on agriculture for livelihood (Barrios, 2007). Farming is the most vulnerable livelihood due to its dependence on weather. Market access also contributes to the vulnerability of farmers since their produce should be properly stored if it cannot be distributed immediately to the consumers. In the Philippines where rural infrastructure still requires further investments, the farmers easily suffer losses since production areas and the marketplace are often unconnected.

The thrust of rural sector agencies in the Philippines (Department of Agriculture, Department of Agrarian Reform, and Department of Environment and Natural Resources) is to achieve

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sustainable development through the modernization of agriculture, transforming rural communities into viable rural enterprises thereby expanding livelihood opportunities, and stewardship and rehabilitation of natural resources. In the process, various strategies had been adopted, and most recently, the use of ICT has been piloted in some areas.

1.1 Rural Livelihood and Development

Rigg, 2006 postulated that there is a changing landscape in the rural areas in Southeast Asia. Households still depend on agriculture but now have other sources of livelihood too. As accessibility infrastructure gradually improves, the previously isolated rural Southeast Asia is experiencing more non-farm activities. There is a gradual reversal of rural livelihood migration, expected to intensify as greater delocalization of livelihood is expected. Farmers become more informed of modern technologies and high value crops and the government needs a paradigm shift where farmers are no longer peasants but rather agrarian entrepreneurs. The Philippine Comprehensive Agrarian Reform Program (CARP) implemented in 1989 posit that agrarian reform beneficiaries treated as members of the communities (not as individuals) can benefit optimally when these communities are transformed into rural enterprises, empowered to participate and implement marketing contracts, and are into demand-driven agricultural production. As farming systems become more efficient, excess labour would relocate to another sector where their skills would be most appropriate, facilitated through the expansion of rural livelihood and employment opportunities, e.g., through the private-public partnership.

How is rural diversification initiated? The framework of public-private partnership is an important element. Narrod, et al, 2009 presented case studies on public-private partnerships and collective action in high value fruit and vegetable supply chains. The role of institutional support was noted in facilitating smallholder's capability in coping with stringent food safety standards. It was further noted that selling in markets with food safety standards requires considerable market knowledge where ICT can play a significant role.

Market access is the most challenging bottleneck for the development of small landholders. The small volume produced makes it very difficult if not impossible for small landholders to negotiate and enter into contract with market players, e.g., traders. Opportunities for them to raise their incomes will open only if they are able to compete in the market (Markelova, et al, 2009). Collective action can help address the inefficiencies, coordination problems, and barriers to market access (Hellin, et al, 2009).

Huallachain, 2007 noted that the regional economic performance has been affected by the acceleration in the transition to a knowledge-based economy. In this, ICTs have come to play an important role in making information available and accessible to a large number of people. In the context of rural communities, "blending" of ICT with more traditional modes of communication (e.g., radio and telephone) is proposed to be useful (James, 2005). Such blending guarantees an inclusive outcome, ensuring this is not limited to a small subgroup within the community.

Even if ICT is theoretically effective in supporting rural development, the benefits can be optimized only if there is a sound sustainability infrastructure. Moreover, the community-

oriented factors intertwined with the social, political, cultural and economic factors will induce effective and efficient implementation of rural ICT projects (Pade, et al, 2009). With the harmony of these factors, sustainability of ICT projects are ensured, thereby maximizing the rural development benefits.

1.2 The Research Problem and Objectives of the Study

Planning of the e-AGRIKultura (ICT) project started in June 2004 but was implemented only in February 2005 for some sites, and in 2006 for the others. It was intended to be pilot-tested in six provinces, three in Central Philippines (Aklan, Bohol, and Northern Samar) and three in Southern Philippines (Misamis Occidental, Agusan del Sur, and Surigao del Norte). This study was conducted in February 2010 where in each province, the cooperative-beneficiary of the ICT project was visited and 50 members are included as respondents. From a nearby cooperative comparable to the project beneficiaries, not covered by e-AGRIKultura, 25 members were included as respondents to serve as the control group.

The main goal of e-AGRIKultura is faster access to information on agricultural and farming technologies through the Internet and optical media. Connectivity to the Internet allowed farmers to research on agricultural and farming advancements and practices. In relation to another project promoting use of ICTs called ***Pinoy Farmers Internet***, members of the cooperative were trained to access the site and gain new information such as modern techniques in farming, information on how to address crop diseases, which fertilizer and pesticide to use, what seeds to plant and how to optimize yield of crops. Aside from the information site, members were also given a list of other agricultural and farming information sites.

Replication of the project to other sites would require tremendous amount of justification considering the huge amount of investments required to implement this information delivery mechanism to the farmers in the electronic platform. Also, since this is the first intervention of its kind targeted at agrarian communities, there was an element of trial-and-error rather than adopting empirically tested best practices.

This study documents the lessons learned from the project and elucidates the role of ICT in facilitating rural livelihood expansion with e-AGRIKultura as an illustration. It shows how ICT complements the evolution of more diverse rural livelihood that could eventually reduce farmers' vulnerability due to over-dependence on agriculture. Specifically, the following research questions were investigated:

- What are the e-AGRIKultura Project components related to ICT? Were the intended goals for these components realized?
- Is it possible for ICT to complement/facilitate the expansion of rural livelihood?
- How much of a contribution to increasing rural livelihoods can ICT generate?

2. Methodology

Framework: With development as the ultimate goal, the sustainable livelihoods framework (SLF) was proposed as a framework for studying the impact of ICT interventions. The sustainable livelihoods approach (SLA), is a way of thinking about the objectives, scope, and priorities for development activities (Serrat, 2008). SLA guides in identifying the action plans that need to be prioritized to ensure attainment of the development goal.

SLF assess the interplay between livelihood assets (human capital, natural capital, social capital, financial capital, and physical capital) and households' influence and access as this is affected by external factors causing vulnerability to the households while policies and institutions providing the safety nets. Using a perception survey, (Mohapatra and Suar, 2008) developed a scale that included constructs/dimensions of livelihood sustainability and used this to assess whether technological capital influences sustainable livelihood of people in a watershed area.

This study modified the Sustainable Livelihood Framework to be more suitable in the rural Philippine setting. Barrios, 2007 proposed the interplay of various economic, social and environmental factors towards the improvement of well-being of rural communities. Furthermore, Barrios, 2008 proposed a model that characterized the dynamics of rural development highlighting rural livelihood expansion outside the farm. Following this methodology, the study focused on the six pilot areas where e-AGRIKultura was implemented.

Research design: The study used a quantitative research design in a quasi-experimental setting. Since there are no baseline studies in the pilot areas, some control groups (sites not covered by e-AGRIKultura) are identified to provide a benchmark upon which the initial impact was measured. Sample survey was used to collect information from the project beneficiaries, complemented with key informant interviews with project implementers.

While measurable final outcomes are desirable yardstick on how much impact a project or intervention has made, the intermediate process can be examined through participatory approaches using measurements based on perceptions (Appleton and Booth, 2005). Desired development targets can hardly be realized if the target beneficiaries' perceptions are not congruent with those of the implementers (Kottak, 1991). Perceptions can serve two purposes: as a proxy indicator of potential rural development outcome; and as a source of information on how the sense of ownership can be advocated to move towards sustainability of these projects (Barrios, 2008). Thus, along with some factual information on the respondents, scales were included in the questionnaire to assess impact.

From each of the six provinces, data was collected from 50 members of the cooperatives who accessed e-AGRIKultura services, and from 25 members of the cooperatives that did not benefit from the project. Members of the cooperative can be the household head, spouse of the head, a beneficiary of the agrarian reform program, or a household member engaged in farming activities. A total of 450 respondents were enumerated in the study.

In assessing the data from project sites and the non-project sites, the contribution of ICT was computed using selection models (estimation of treatment effects - Heckman, 1979) accounting for the bias induced by non-random assignment of the respondents to the treatment groups. The treatment groups are the beneficiaries and non-beneficiaries. The advantage/disadvantage of the treatment groups could have been compounded by superior endowments to start with which is evident in the average incomes being higher in study areas not covered by e-AGRIKultura than those that were covered under this project (see Table 1). Hence, the model adjusts the manifested effect of the treatment accounting for such factors that could possibly cause bias. There is a large amount of literature on the use of selection models in estimating effect of an intervention on development outcomes. For example, Frisvold, et al, 1988 used selection models in estimating the effect of sanitation and living condition on health and welfare of agricultural workers.

3. Results and Discussion

For the purpose of this study farm income is defined as any proceeds from production activities related to crop production and/or livestock-raising within the farm cultivated by the household. Non-farm income includes all proceeds from economic activities outside any farm, e.g., value-adding activities, micro-enterprises, or employment/provision of services in economic activities not connected with the farm.

Over half of the households in the e-AGRIKultura sites reported that the main employment of the head is related to farming, fishery or forestry. In the non-ICT project sites, more household heads (over 75%) are engaged in activities related to farming, fishery or forestry. While the numbers are still very small, the proportion of entrepreneurs or self-employed household head in ICT project sites is double the proportion in the non-ICT project sites. Apart from the household head, the household members too, in ICT project sites are engaged in non-farming activities, while in sites not covered by e-AGRIKultura they are engaged in farming activities. This is initial evidence that households in the non-ICT project sites are still mainly dependent on farming, but those covered by e-AGRIKultura have more options other than farming, possibly, an early indication of livelihood expansion.

Average incomes from different sources are summarized in Table 1. Income in sites covered by e-AGRIKultura is lower than in the non-ICT project sites. The higher farm and non-farm income in non-ICT project sites can be attributed to some integrated development intervention projects funded by Asian Development Bank (ADB), The World Bank, and the Belgian government, implemented way ahead of the e-AGRIKultura project. Unfortunately, both the ICT and the non-ICT project sites are still typical pictures of rural poverty since the total income for both groups are lower than the 2006 poverty threshold of PhP72,876 (US\$1,656) for the ICT project sites (household size is 4.82) and PhP 77,995 (US\$1,773) for the non-ICT project sites (household size is 5.18). One interesting feature of the income data though, is that income from non-farming activities is a significant proportion of total income, indicating diversity of livelihood opportunities among residents in agrarian reform communities.

Table 1. Income by Sources (in PhP)

	TOTAL		ICT PROJECT SITES		NON-ICT PROJECT SITES	
	Mean	SD	Mean	SD	Mean	SD
Total Annual Income	65,327	358,390	61,797	431,609	72,387	114,703
Annual Income from Farming Activities	47,881	356,656	44,468	430,503	54,706	106,484
Annual Income from Non-Farm Activities	42,037	115,127	39,732	130,214	46,649	76,705
Total Area Harvested (Hectares)	1.34	1.761	1.11	1.516	1.64	2.006

Source: Survey of 450 Respondents
1 US\$=44 PhP

3.1 Perceptions on Living Conditions

Of the 18 items in the living condition scale (see Appendix 1), the two groups have comparable perceptions on 7 items, including: utilities, income and food sufficiency, availability of jobs, and overall ratings on living conditions in the community. However, the respondents from the ICT project sites have significantly better perceptions on the concerns related to education access and quality, regularity of income, training on livelihood, and improvement of transportation. All these items pertain to better endowments that can facilitate the realization of benefits from ICT. This could mean that the beneficiaries in the e-AGRIKultura sites are indeed ready in the mobilization of ICT as an instrument towards livelihood expansion and subsequently achievement of development goals.

3.2 Perceptions on ICT

Table 2 summarizes perceived availability, necessity, access, satisfaction, and effectiveness of various ICT infrastructure, ICT services, and trainings among the respondents from the two sites. Majority of the respondents in e-AGRIKultura sites believe that these infrastructure, services and trainings are available (70-95%). Internet is the least available infrastructure; information on farming technologies is the most available ICT services, while information on processing of local products and information on market of processed commodities are the least available. All respondents agreed that these are needed but those who actually accessed the infrastructure and services are fewer than those who are aware of their availability. This means that either some beneficiaries were not aware of the benefits from ICT or that there is inadequate technical know-how for them to access benefits of ICT. Those who accessed these services unanimously reported satisfaction and agreed that they are indeed effective.

In comparison to the e-AGRIKultura users, low proportion (13-43%) of the non-ICT project beneficiaries reported that these ICT facilities, services, and training are available except in case of cellphones (74%). Just like in ICT-project sites, internet is the least available facility,

and information on processing of local products and information on market of processed commodities are least available services. While they believe these are not available in their communities, they think that these are needed. The proportion who reported to have accessed ICT services is lower than those who reported that they are available. However, those who accessed these services are satisfied and reported that they are effective.

Table 2. Use of ICT And ICT Services

	E-AGRIKULTURA SITES					NON E-AGRIKULTURA SITES				
	Available	Needed	Accessed	Satisfied	Effective	Available	Needed	Accessed	Satisfied	Effective
ICT Infrastructure										
Computers	93.90	95.60	67.20	95.10	96.10	31.00	72.20	17.50	70.00	78.90
Telephone/Cellphone	93.50	96.90	83.80	98.70	99.10	74.70	88.10	78.40	98.90	98.90
Internet	70.90	89.80	46.80	93.60	96.70	13.10	68.60	7.40	50.00	50.00
Information Center	91.20	95.60	75.80	96.60	99.00	22.20	80.70	24.00	96.60	96.60
ICT and Other Services										
Info on Farming Technologies	92.90	96.90	72.20	95.40	95.80	43.20	89.40	36.00	91.50	91.30
Info on Sources of Production Inputs	88.70	94.50	65.80	96.00	96.50	41.70	89.90	35.30	100.00	100.00
Info on Market of Commodities	85.40	93.50	61.10	93.90	95.00	39.30	87.90	31.60	85.40	82.50
Info on Prices of Commodities	84.20	94.20	61.70	96.40	94.50	36.10	85.10	29.30	86.50	86.10
Info on Proc. of Local Prod./Raw Materials	76.90	93.50	53.00	95.80	97.20	21.90	83.10	17.90	82.60	82.60
Info on Market of Proc. Commodities	77.10	93.10	52.60	96.40	97.10	26.00	80.90	18.50	91.70	91.70
Info on Employment Outside the Farm	85.60	95.90	60.40	96.30	98.10	35.40	81.40	24.20	92.00	92.00
Training on ICT Equipment	78.80	94.90	58.60	92.50	94.90	19.20	78.30	13.00	100.00	100.00
Training on Information Uses/Benefits	80.30	95.90	59.40	95.00	98.70	28.30	87.10	20.90	95.70	95.70

Stakeholders in the ICT-project sites show greater appreciation of the value of information as compared to the non-ICT sites. This can be easily linked to their access to and use of information centers established under e-AGRIKultura. Almost all respondents from the ICT-project sites are aware of the availability and necessity of the information center leading to their realization regarding the importance of the information on farming technologies, sources of production inputs, market of commodities, prices of commodities, procurement of local products/raw materials for value-adding, market of processed commodities, and

other employment outside the farm. In the non-ICT project sites, while there is better income level as a result of other development intervention projects, they have lesser appreciation of the information that can potentially contribute in sustaining initial gains in income they have already realized.

Table 3 indicates that almost all respondents from ICT project sites perceived that ICT can increase farm productivity, can increase farm income, can help expand livelihood, and can contribute in starting up a business. Similar proportion agreed that ICTs could help achieve all these: these are feasible, actually realized, and can be sustainable. In non-ICT project sites, the perception is not as promising as there is only a little more than half who think so. While they indicated these are feasible, they are more pessimistic as to whether these can be realized or are sustainable. This implies that if ICT is to be introduced in replication sites, some preparatory work might be needed to advocate with communities, initial investments to experiment with different modalities to tailor-fit the service design to the environmental realities (physical, social, and economic conditions), and actual experience on ICT facilitating access to information that they can experience.

Table 3. Perceptions on the Purpose of ICT

Purpose of ICT	E-AGRIKULTURA				NON-E-AGRIKULTURA			
	Perceived	Feasible	Realized	Sustainable	Perceived	Feasible	Realized	Sustainable
ICT can increase farm productivity	97.9	94.5	93.3	92.9	57.9	93.9	63.2	85.4
ICT can increase farm income	96.1	94.1	92.2	92.6	60	87.1	63	84.2
ICT can help expand livelihood	95.8	92.9	91.2	91.6	55.9	93.8	62.5	82.5
ICT can contribute in starting Business	94.8	92.8	93.3	93.9	57.9	96.9	63.2	87.8

An 18-item scale (Appendix 2) was also created to assess their perceptions on various facets of ICT like purpose, capability, availability, access and other issues surrounding ICT implementation. The respondents from ICT project sites are in stronger agreement on these items than those in the non-ICT project sites. After three years of project implementation, perceptions of the stakeholders on issues around ICTs had improved significantly. Thus, the ICT project has already made some initial impact through the changing perspectives of rural stakeholders on the use of ICT and to enhance livelihood.

It is very important for the stakeholders to appreciate and experience the value of the information accessed from the information center integrated into the e-AGRIKultura components. Counterfactual simulation suggests that non-farm income can be higher by 54% among those who believed that an information center is needed than those who

believe otherwise. Furthermore, farm income can be 64% higher among those who value the importance of an information center relative to those who believe otherwise. This means that an information center that is considered a necessity by the stakeholders can help increase income irrespective of whether it comes from farm or non-farm sources, consistent with the sustainable livelihood framework, i.e., expansion of rural livelihood assets.

3.3 Discussions

We used two scales (Living Conditions; and ICT and Livelihood) that incorporate the typical indicators monitored in the sustainable livelihood framework; these are subsequently aggregated into indices. Income is significantly correlated with both the living condition index and ICT and livelihood index. Non-farm income is even more significantly correlated with living condition index and with ICT and livelihood index. This is clear evidence of the positive association between ICT, livelihood, and non-farm income and validates the usefulness of perception scales as proxy indicators of quantifiable development outcomes like income. ICT facilitates the expansion of livelihood opportunities among the rural households by improving both farm and non-farm incomes and subsequently alleviating the dependence of rural households from farming. While farming remains the major livelihood (as should be the case in the context of food security), alternatives are available that can mitigate their economic vulnerability and farming itself becomes more income-generating. This is expected as e-AGRIKultura primarily provides agriculture and farm related information leading to an upward movement in farm incomes.

Selection models are fitted for outcome indicators, counterfactual simulations are also made to assess the expected outcomes given the endowments currently available among the beneficiaries/non-beneficiaries of the e-AGRIKultura project. Total household income is significantly influenced by the living condition index (an aggregate of various constructs of the living conditions reported by the households and the indicators of the sustainable livelihood framework). The effect of ICT intervention on total income can be optimized if there are more employment opportunities available to various members of the benefiting households leading to the contribution of non-farm employment in income-generation. Given the current characteristics of the beneficiaries and non-beneficiaries of the ICT-project, provision of the ICT-project can generate an expected income of PhP 161,202 (US\$3,664) for the households. On the other hand, without the ICT project, expected income is only PhP 118,552 (US\$2,694). ICT within the sustainable livelihood framework can best contribute to total income if there is complementary expansion in employment opportunities, more specifically, for livelihood outside the farm contributing to total income. Provision of information related to these may support this process.

With the project, the expected household farm income is PhP 93,030 (US\$2,114). Without the project, farm income is only at PhP 52,919 (US\$1,203). This can be explained by the fact that the center provides information mostly related to agriculture. For the non-farm activities, the expected income among beneficiaries of the ICT-project is at PhP 52,494 (US\$1,193). Without the project, expected household non-farm income is higher at PhP 66,332 (US\$1,508). This is so because, the non-project sites are covered by an integrated development project (also targeting expansion of non-farm livelihood) implemented way

ahead of the e-AGRIKultura. Thus, non-project beneficiaries are better off in terms of non-farm income. This further suggests that provision of information related to non-farm activities may help improve these livelihood options for the households.

The counterfactual simulation for the living condition index pointed out a higher score of 57.68 and 53.63 percentage points in favor of the e-AGRIKultura project. Furthermore, ICT and livelihood index is at 88.76 in e-AGRIKultura sites, but only at 57.89 in the others. This points out to the important role of the ICT-project in opening/facilitating households to realize better livelihood opportunities.

3.4 ICTs and Development

Physical viability of ICT is a crucial pre-condition to establish the ICT-development linkage especially, in the rural areas. One prominent feature of rural Philippines is that communities are isolated due to the absence of accessibility infrastructure (Barrios, 2008). At the community level, physical infrastructure like accessibility (roads) and communication infrastructure, and electricity, among others are necessary. Further what is also important is that the beneficiaries appreciate and recognize its potential contribution to their well-being. Their economic capabilities need to be in place, or at least support services are available. Household endowments like an educated member, communication appliances, etc., should also be present. In the event that ICT could indeed stimulate the generation of livelihood activities, readily available economic support like microfinance- and enterprise development should be available. Social networks like people's organization or cooperatives play an important role in advocacy, awareness and use of ICTs.

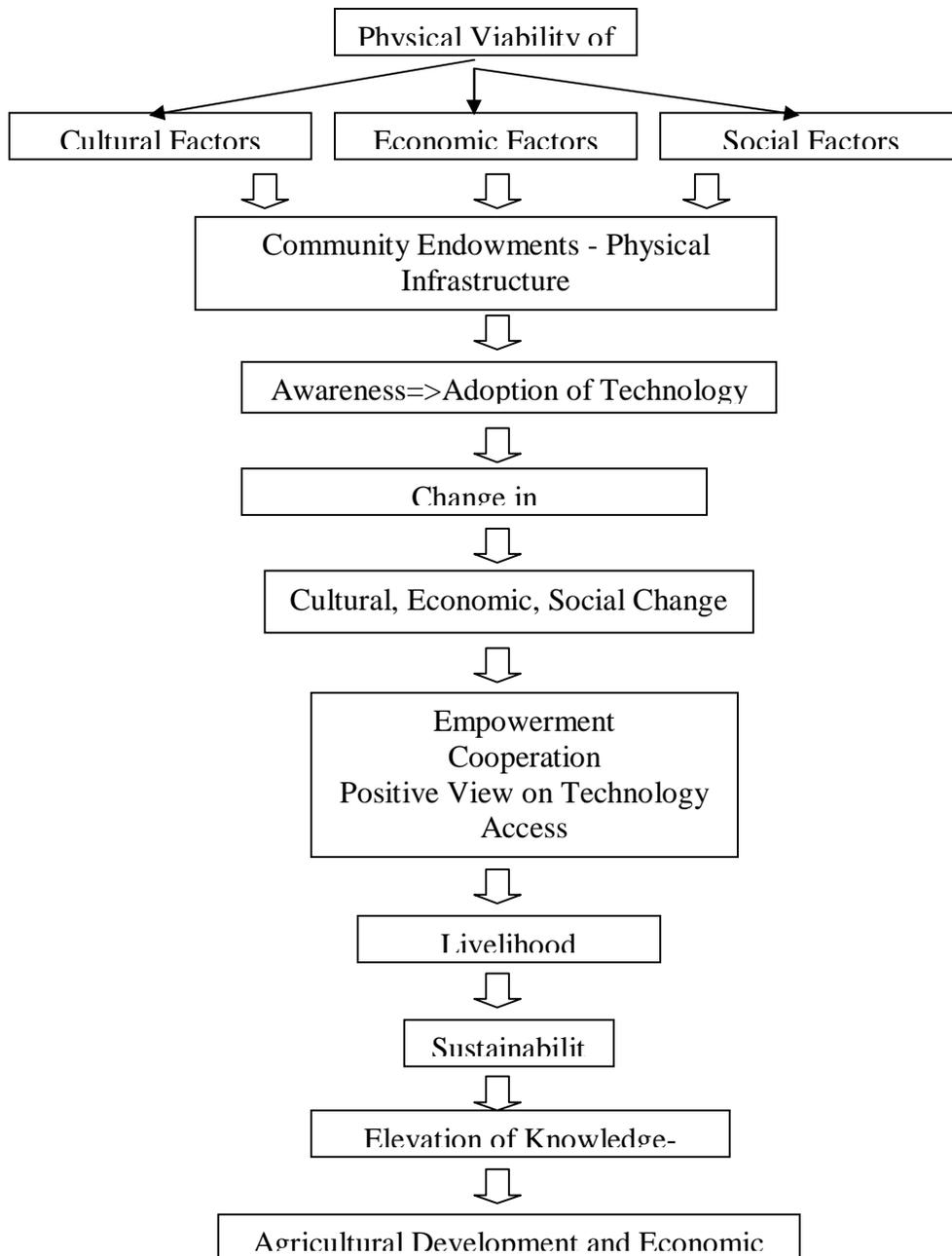
For any kind of technology, adoption can only be ensured once the stakeholders are aware of the dynamics in which this will work and how this can contribute in alleviating their conditions. And this might require some experience and experimentation of the community in the use of ICTs in accessing information and using it. Technology adoption leads to change in perceptions. As long as the potential benefit of ICT is understood, perceptions of the stakeholders could become more optimistic. Change in perception leads to further application of ICT and greater usage. These changes will empower the rural stakeholders and help develop relative advantage in competing for access to production opportunities.

Sustainable access to information would positively affect livelihood expansion of rural households as knowledge and information become systemic drivers of agriculture and eventually rural development. Figure 1 summarizes the dynamics in which ICT contributes in the sustainable livelihood framework.

The role of ICT in expanding rural incomes can be divided into four Phases. The first phase happens prior to the introduction of ICT. There is limited access to various factors of production, a constraint in economic production; hence, income is not necessarily generated at the frontier level. Non-farm livelihood sources are relatively scarce; hence, more farm income is generated than from the non-farm sources. In the second phase, ICT technology may already be adopted, but possibly be limited only to other uses, e.g., social networking, communication, etc. This is the stage when farmers are still familiarizing with the different facets of the ICT technology. Phase 2a is experienced by a group similar to the non-

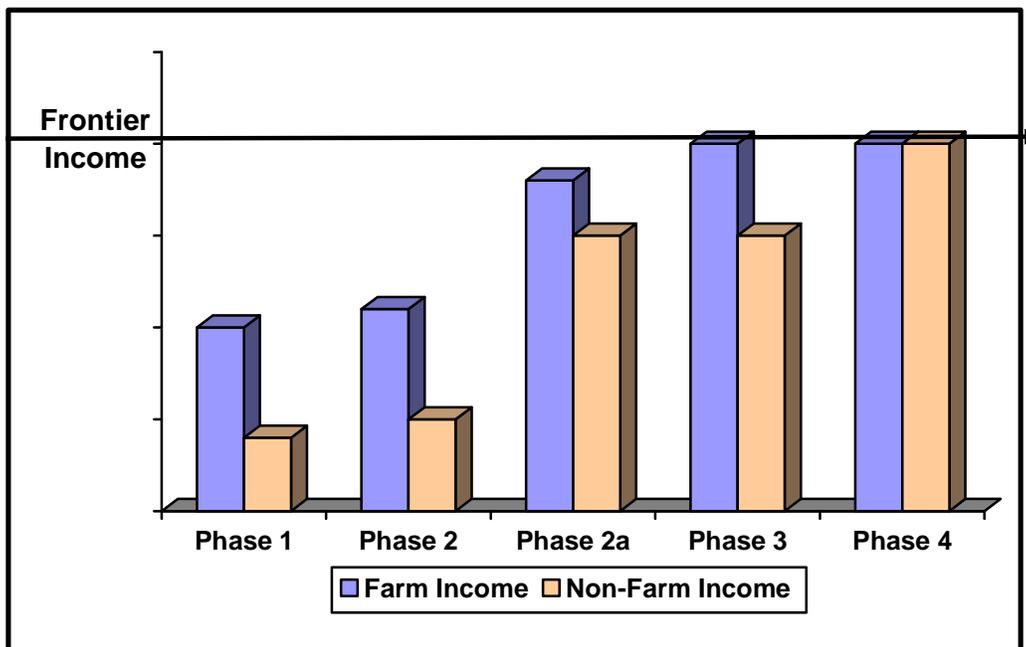
beneficiaries of e-AGRIKultura project included in this study. While they may also go through the process of familiarization with ICT, income coming from farm and non-farm may already be pushed near the frontier level, this movement in income is not necessarily driven by ICT, but perhaps, other integrated development interventions.

Figure 1. ICT and Sustainable Rural Development Framework



Phase 3 evolves into the actual utilization of the information accessed through ICT for its intended purpose. It is but natural for the farmers to appreciate the value of agriculture-related information first. Improved farming practices and marketing information will push farm income towards frontier level. The non-farm income may or may not be elevated to the frontier level since farmers may not yet be optimizing the use of information. In the final phase, it is expected that there will be a spillover effect of information utilization from farm income-generation towards the generation of non-farm income. ICT will open a network between farmers and firms and more employment opportunities will open up or perhaps value-adding activities by the farmers may increase. There will be reallocation of excess labour from agriculture as a result of the attainment of efficient production systems. At this point, ICT will ensure that continuous flow of information will necessarily provide a safety net for the rural households to produce at the frontier level both from farm and non-farm sources. Those coming from Phase 2a will also pass through Phases 3 and 4, not to elevate income-generation to the frontier level, but to sustain the levels achieved through other development interventions. In any case, access to information through ICT will facilitate the sustainable generation of income among rural households. These phases are summarized in Figure 2 below.

Figure 2. ICT and Development Timelines



4. Conclusions and Recommendations

Using the SLF, this study assessed the linkage between ICT and rural livelihood expansion in the context of e-AGRIKultura. With expanded livelihood sources, vulnerability of rural communities can go down by reducing dependence on agriculture. Not only has farm income increased as a result of e-AGRIKultura, there is also increasing diversity in livelihood opportunity as reflected in rising income from non-farming activities through this intervention. The ICT-project is also successful in converting the rural communities'

viewpoint, on the role of ICT in enhancing their livelihood assets and opportunities available to them through better access to information, to a more progressive one.

Are the Rural Communities Ready for ICT?

The physical and economic conditions of the rural communities may not yet be fully ready to realize complete potential of ICT, but the ICT-project beneficiaries are indicating their willingness to learn and experience ICT as it facilitates livelihood expansion and eventually reduces economic vulnerability. There is however a need for extensive advocacy campaign to ensure that the potential stakeholders are aware of such benefits from ICT. Some basic trainings on access and utilization of ICT services will also equip the stakeholders with such empowering tools in economic production.

There is improving outlook in rural communities, especially those who have had some experience with using ICTs to access information, about their potential benefits for living condition, rural development, and livelihoods. While ICT may not yet be physically viable in certain communities, there are enough community and household endowments that can be tapped towards advocacy campaigns, social preparations, and capacity building to push ICT as a viable conduit in livelihood expansion in rural areas.

Can ICT Projects be Sustainable in Rural Communities?

The respondents all agreed that information is needed. However, there were fewer respondents who actually accessed the ICT infrastructure and services than those who are aware that they are available; implying that some beneficiaries are not aware of the benefits from ICT or that there is inadequate technical know-how for them to use ICT. Those who accessed these services unanimously reported satisfaction and agreed that they are indeed effective.

Almost all beneficiaries of e-AGRIKultura agreed that ICT can increase farm productivity, can increase farm income, can help expand livelihood, and can contribute in starting a business. Similar proportion agreed that these purpose are feasible, actually realized, and can be sustainable. In non-ICT-project sites, the perception is not as promising. While they indicated these are feasible, they are more pessimistic as to whether these can be realized or are sustainable. This indicates a learning curve which users need to go through to fully appreciate and use ICTs to their benefit.

If an ICT-project is to be replicated, advocacy on the purpose of ICT should be done ahead of any intervention. Community organization can be used in developing a strategy to promote sustainability, in developing the community into a rural enterprise, and as a conduit in empowering rural communities.

With a substantial social preparation strategy, advocacy campaign, tapping resources of local government, and strengthening of community institutions (e.g., cooperative), the rural communities are indeed ready for ICT as an instrument for livelihood expansion.

How Should an ICT Project be Packaged?

In the Philippine setting, segmentation of rural communities generated by the agrarian reform communities (ARC) launched by the Department of Agrarian Reform (DAR) can provide the basic building blocks for an ICT project. DAR aims to convert these communities into a viable rural enterprise by facilitating access of these communities to various economic and physical support services, strengthening of people's organization, facilitating access to basic social services, and linking the governance issues of people's organizations to the local government. ICTs can be integrated in the inherent development strategy of DAR to help communities to conduct their own assessment of the endowment available to them, needs assessment, and planning for a strategy to implement this plan.

There is a need for further advocacy on the potential benefits from ICT especially among the most remote communities. However, ICT advocacy, intervention to mitigate the physical isolation of rural communities (e.g., farm to market roads), microenterprise development, and microcredit access should be integrated for a more sustainable development. Thus, ICT as an integral component of a rural development strategy can best serve the purpose of supporting livelihoods improvement. On the policy side, the local government can contribute in terms of an environment that will facilitate and simplify entrance of the private investors in rural areas. As it is right now, there is no motivation for private ICT stakeholders to mobilize in rural areas since the business opportunity cannot be seen yet from official statistics. This is one area where the local government can play a very vital role.

There are several ways in which information can be shared with community members, e.g., visual presentation of information (physical or electronic). Interpretation and communication of information can be done using a media more appropriate for them, e.g, radio, television, SMS and MMS sent to experts for interactive consultation on agriculture and the like.

Policy Implications

While there are existing legislations in the Philippines intended to pursue the complementation between ICT, agricultural development, and rural development, there is a need to strengthen some of the implementation strategies of such programs such as:

1. More defined implementation guidelines related to the National Information Network (NIN) feature of the Agriculture and Fisheries Modernization Act (AFMA). NIN is a network linking all offices and level of the Department of Agriculture, research institutions, and local end-users. The goal of NIN is to provide easy access to information and marketing services related to agriculture and fisheries. The e-center in the ICT-project can be used as model for NIN.
2. AFMA included a provision on taxation that should not deter growth of value-adding (microenterprise development) but there is no explicit provision on how private investors can be encouraged to invest in rural areas. One problem cited as a bottleneck of the ICT-project is the poor signal for connectivity. Incentives or complementary support from the local government can be introduced to

- encourage private investment such as on physical infrastructure for communication facilities.
3. AFMA also included provisions on microcredit but there is a need to further institutionalize a national microcredit program that will include not only credit at lower interest rates, but also an advocacy campaign on the uses and functions of microcredit. While some rural households tend to access credit with excessively high interest rates, others are misusing microcredit funds.
 4. Policy on the adoption of agrarian reform communities (or other similar concepts) as a viable strategy in rural development. Government agencies working in rural areas still deliver the interventions as outright provision of support services that is not sustainable. The ARC approach aims to facilitate access instead of direct provisions of factors of production that will eventually translate rural communities into a viable enterprise.
 5. More thorough rationalization of integrated rural infrastructures program. Rural infrastructure must be demand-driven and match the needs of the communities. The communities must be involved in the identification of the kind of infrastructure they need. This will develop in them a sense of ownership that will facilitate the layout for sustainability strategies.
 6. Inclusion of ICT in rural extension programs.
 7. Institutionalization of local government support, especially on policies that will serve as catalysts of public-private partnerships essential in technology projects.

Future Research

This study provided empirical evidence on the dynamics in which ICT and rural development are linked in the sustainable livelihood framework. The non-beneficiaries included are actually beneficiaries of other integrated development interventions. It would be a valuable insight to come up with similar quasi-experimentation to include different kinds of integrated interventions with or without ICT and a true control group who were not exposed to any development intervention.

Learning curve is believed to increase as trial-and-error schemes from ICT interventions are becoming available to various stakeholders. Spatial spillover is also unavoidable as information spreads quickly through technology adoption. It is imperative then to examine the space-time dynamics in which ICT and rural development are linked, greater knowledge can be generated that can potentially minimize randomness of the intervention approaches in the future.

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Appendix 1. Living Condition Scale

1. Housing unit is comfortable for the family
2. Toilet is hygienic
3. Cost of electricity is reasonable
4. Water source is accessible
5. Water is safe for drinking
6. Water cost is reasonable
7. School is more accessible now
8. There is an improved quality of education
9. Income is more regular
10. Income is sufficient for household needs
11. There are enough jobs available now
12. There is enough training on possible livelihood
13. There is enough training on new farming practices
14. There is enough food for the family
15. It is now easy to take a public transportation
16. There is general feeling of satisfaction in the community
17. I am contented with the way our needs are met.
18. Our living conditions now are much better than 5 years ago

Appendix 2. ICT and Livelihood Scale

1. Information on farming technology can be obtained from the internet
2. Information on farming technology should be delivered by the extension worker/technician
3. Information on farming technology can help improve productivity.
4. Information on marketing of produce can be obtained from the internet.
5. Information on marketing of produce should be delivered by extension workers.
6. Information on marketing (incl. transportation) of produce can increase income from the sale of the produce.
7. Information on market linkages can increase farm income
8. Internet can provide information on livelihood opportunities within the farm
9. Internet can provide information on livelihood opportunities outside the farm.
10. Internet can help in planning to start a small business.
11. Information and communication technologies are needed.
12. Information and communication technologies are useful.
13. I/family members have enough knowledge on the use of internet and computers
14. I/family members have enough skills on the use of internet and computers
15. I/family members are willing to be trained on the use of internet and computers
16. I will support information and communication technologies project
17. I will contribute in maintaining information and communication technologies project.
18. I believe information and communication technologies project can contribute in rural livelihood.

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