IEC and Technology Transfer for Biodiversity Conservation and Utilization in Central Luzon

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This study was conducted to enhance public awareness on the importance of biodiversity for better appreciation and participation in conservation programs and organize the local communities for meaningful participation in program activities. Training on biodiversity and nature conservation and promotion of green technology were conducted as well as technology transfer to farmers, SDU multisectoral networks, LGUs, students, and interested individuals/organizations for possible adoption.

Pamphlets, brochures, and handbooks on biodiversity and nature conservation and environmental problems/issues affecting biodiversity were prepared, developed, produced, and printed for public education/awareness. Furthermore, videos on the biodiversity of Central Luzon entitled Video on Flora and Video on Fauna in Central Luzon were also prepared, developed, and produced for environmental information and awareness. Furthermore, seminar-workshops on biodiversity conservation and utilization in Central Luzon were conducted in Carranglan, Nueva Ecija; Baler, Aurora; and Balanga, Bataan. Moreover, media linkages through print and broadcast media were undertaken for wider information dissemination. Promotional activities through different social media were also utilized including Facebook, Twitter, and Instagram.

Green technology promotion and transfer were also carried out in the three study sites wherein brochures, posters, videos, and jingles on botanical pesticides and phytoremediation were promoted. Field demonstrations were also conducted to farmers, SDU multisectoral networks, LGUs, students, and interested individuals/organizations as part of the promotion and transfer of technology.

The IEC materials and other promotional campaign materials are very effective and important instruments for public awareness and education. Hence, they are very potent tools in biodiversity conservation

and green technology transfer for possible adoption.

Keywords: Biodiversity Conservation, Green technology, IEC, Technology Transfer

INTRODUCTION

Applied communication, a specific discipline under development communication, is the planned and systematic use of communication for the application of science. It aims to specify the internalization and utilization of research and useful indigenous information and technology, so these are integrated into the development process. Further, applied communication aims to disseminate research information and technologies through a variety of appropriate communication channels, modern communication technology, and interagency arrangements and strategies so that they may actively participate in research diffusion and utilization (ACD, PCAARRD Leaflet, 1993).

With the above premise, IEC can be a potent tool in biodiversity conservation. By proper identification of a suitable media for the target clientele, it is indeed an effective channel through which community leaders, members, and other stakeholders can develop awareness and skills that could help prevent biodiversity erosion.

In view of the problems and concerns which constantly threaten the future of the country's biodiversity and in consonance with the Convention on Biological Diversity's objectives of conservation, sustainable use, and equitable sharing of the benefits of the country's biodiversity, a National Biodiversity Strategy and Action Plan with modular programs and projects and corresponding resource requirements was formulated. The IEC component aims to build up people's appreciation of the values, attributes, and conservation approaches to biodiversity resources at the community level to ensure people's participation (www. psdn.org.ph).

Hence, this study was conducted primarily to produce brochures and fact sheets on biodiversity and nature conservation, a handbook on economic plants, handbook on flora and handbook on fauna in selected forest ecosystems in Central Luzon, and pamphlet on Indigenous Knowledge System (IKS). This study also aimed to enhance public awareness on the importance of biodiversity for better appreciation and participation in conservation programs; to organize the local communities for meaningful participation in program activities; to train stakeholders on biodiversity and

nature conservation and promotion of green technology; and to undertake green technology promotion/transfer to farmers, SDU multisectoral networks, LGUs, students, and interested individuals/organizations for possible adoption.

METHOD

Publication of IEC Materials (Print and Audio–Video)

Pamphlets and brochures on biodiversity and nature conservation and environmental problems/issues affecting biodiversity were prepared, developed, produced, and printed for public education and awareness. All IEC materials were reviewed by experts on flora and fauna and experts on environmental science in PCAARRD, DOST, and DENR before these IEC materials were published and disseminated.

These IEC materials were launched and distributed during the meetings of the provincial, municipal, and barangay board and/or during the barangay seminar-workshop in Carranglan, Nueva Ecija; Baler, Aurora; and Abucay, Bataan for environmental awareness in order for them to be prepared and more equipped in their community-based environmental management.

On the other hand, from the data that were gathered in Activities 1 and 2 of a project which focused on the assessment of diversity of plants and animals in the selected forest ecosystems in Central Luzon, three handbooks were prepared, produced, and printed. Examples of handbooks and brochures are as follows: Handbook on Flora in Central Luzon, Handbook on Fauna in Central Luzon, and Handbook on Economic Plants in Central Luzon; Brochures on Environmental Issues Affecting the Forest Ecosystems to wit: Kaingin (Slash and Burn), Pangangaso (Wildlife Hunting), and Pagmimina (Mining); and brochures on Biodiversity Conservation (Pangangalaga sa Laksang Buhay). Brochures and pamphlets on Indigenous Knowledge System (IKS) were also developed, published, and disseminated.

In addition, videos on the biodiversity of Central Luzon entitled "Video on Flora in Central Luzon" and "Video on Fauna in Central Luzon" were prepared, developed, and produced for environmental education and awareness.

Furthermore, seminar-workshops on biodiversity conservation and utilization in Central Luzon were also conducted in Carranglan, Nueva

Ecija; Baler, Aurora; and Abucay, Bataan in Central Luzon.

Green Technology Promotion

Green technology promotion and transfer was also one of the ultimate outputs of this project. Positive results that were gained from another project particularly in the screening for plants that exhibit potential phytoremediation and pesticidal properties were promoted to the local communities. Brochures, fact sheets, field demonstrations, and trainings for farmers, SDU multisectoral networks, LGUs, students, and interested individuals/organizations were conducted as part of the promotion and transfer of technology.

Moreover, media linkages through print and broadcast media were undertaken for wider information dissemination. Likewise, the technology was also introduced to the different Farmer's Information Technology Services (FITS) Center for utilization.

RESULTS AND DISCUSSION

Preparation, production, and publication of IEC materials

Various IEC materials for promotion of biodiversity conservation and utilization were prepared, produced, and published (Table 1). Figures 1–2 illustrate some of these brochures and pamphlets on environmental issues, biodiversity conservation, and IKSP. These IEC materials were disseminated to various stakeholders for public awareness and information.

Table 1. IEC materials for promotion of biodiversity conservation and utilization.

Project	Title of IEC	Type of IEC	Dialect
Project 1	Biodiversity Conservation	Brochure	English
	Pangangalaga sa Laksang-Buhay	Brochure	Tagalog
	Environmental Issues Affecting the Ecosystems		
	Slash and Burn	Brochure	English
	Kaingin	Brochure	Tagalog
	Mining	Brochure	English
	Pagmimina	Brochure	Tagalog
	Wildlife Hunting	Brochure	English
	Pangangaso	Brochure	Tagalog
	Handbook on Flora in Central Luzon	Handbook	English
	Handbook on Fauna in Central Luzon	Handbook	English
	Handbook on Economic Plants in Central Luzon	Handbook	English
	Video on Flora in Central Luzon	Video	English
	Video on Fauna in Central Luzon	Video	English
Project 3	Indigenous Knowledge System and Practices of Kalanguya for Biodiversity Conservation and Utilization	Brochure	English
	Mga Katutubong Kaalaman at Kaugalian ng mga Kalanguya para sa Pangangalaga at Paggamit ng mga Samu't saring buhay	Brochure	Tagalog
	Indigenous Knowledge System and Practices of Magbukon-Ayta for Biodiversity Conservation and Utilization	Brochure	English
	Mga Katutubong Kaalaman at Kaugalian ng mga Magbukon-Ayta para sa Pangangalaga at Paggamit ng mga Samu't saring buhay	Brochure	Tagalog
	Indigenous Knowledge System and Practices of Dumagat for Biodiversity Conservation and Utilization	Brochure	English
	Mga Katutubong Kaalaman at Kaugalian ng mga Dumagat para sa Pangangalaga at Paggamit ng mga Samu't saring buhay	Brochure	Tagalog
	Indigenous Knowledge System and Practices for Biodiversity Conservation and Utilization	Pamphlets	English
	Mga Katutubong Kaalaman at Kaugalian para sa Pangangalaga at Paggamit ng mga Samu't saring buhay	Pamphlets	Tagalog

Figure 1. Samples of IEC materials developed on biodiversity conservation and some environmental issues present in the forest ecosystems of Central Luzon.

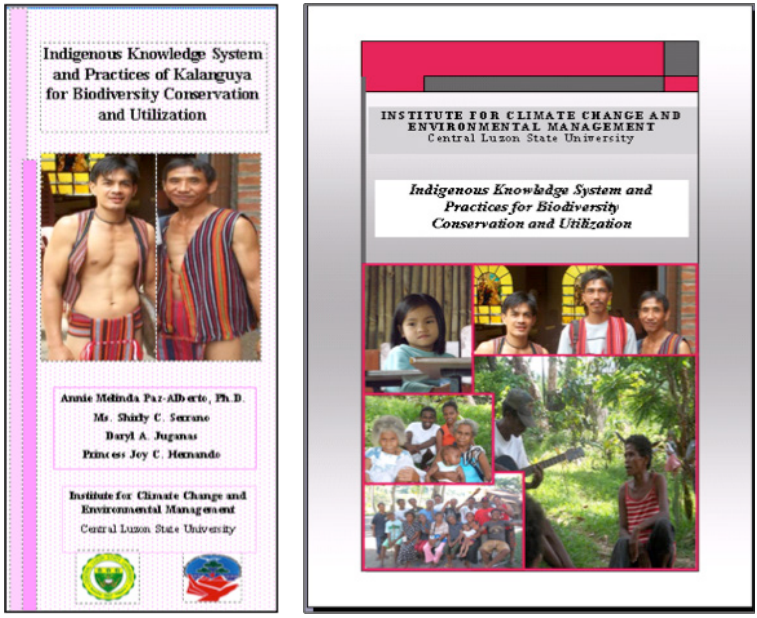

Figure 2. Samples of IEC materials developed on Indigenous Knowledge Systems on biodiversity conservation.

Enhancement of Public Awareness on the Importance of Biodiversity Conservation

Promotional materials, specifically tri-media presentations and collateral materials, were developed to create awareness on biodiversity and the importance of Carranglan Watershed, Carranglan, Nueva Ecija; Bataan Natural Park, Abucay, Bataan; Baler Forest Reserve, Baler, Aurora; and Dibut River Watershed, San Luis, Aurora in Central Luzon. Marketing students from the College of Business Administration and Accountancy who had been taking up Advertising and Sales Promotions and Marketing Management students were tapped to come up with the best advertisement campaigns. They actively participated in conceptualizing, creating, and executing the advocacy campaigns on biodiversity conservation. Different IEC materials and promotional materials and activities were developed and conducted (Table 2).

Table 2. IEC materials developed and promotional activities conducted for promotion of biodiversity conservation and utilization.

Types of Promotional Materials	Title of Promotional Materials	No. of Materials Produced
Posters	Posters on Biodiversity Awareness and Watershed Conservation in Carranglan Watershed (20), Bataan Natural Park (12), Dibut River Watershed and Baler Forest Reserve (6)	38
Posters	Posters on Environmental Issues regarding Kaingin, Wildlife Hunting and Landslide (4) and Environmental Protection (1)	5
Videos for Commercial advertisements	Status and Importance of Biodiversity for Biodiversity Awareness and Watershed Conservation	18
Variety show	"Gift to Biodiversity (G2B)" and "Gift to Biodiversity (G2B V.2.0)"	2
Social Media Networking: Facebook, Twitter, and Instagram	Gift to Biodiversity website	3
Advocacy campaign	"Piso Para Sa Carranglan", t-shirt printing for a cause, biodiversity conservation booth, G2B photo booths, and mini concert.	T-shirts/G2B Booth; 2 G2B Photo booth; 2 mini concerts

Road shows and campaign	Local celebrities, locally known personalities and different stakeholders in Central Luzon were also convinced to post pictures to promote the advertisement campaign on biodiversity conservation.	87 road shows and campaigns

Moreover, three seminar-workshops were conducted in the three study areas to promote biodiversity conservation. The main theme of the three seminars was "Sama-samang Pagkilos Tungo sa Pagpapaunlad at Pangangalaga sa Kabundukan at Tubig Kanlungan". The main objective of the activity was to enhance public awareness and education on biodiversity conservation and utilization in the Selected Forest Ecosystems in Central Luzon and to possibly create and implement a biodiversity conservation plan in the area.

The seminar-workshops were attended by participants from various government and private offices, representing indigenous people organizations, LGU officials and councils, church workers, students, researchers, and faculty and staff from Carranglan, Nueva Ecija; Abucay, Bataan; and Baler, Aurora.

There were six topics presented during the seminar-workshops namely Biodiversity and Nature Conservation in the Philippines; Mining and Its Effect and Impact on Biodiversity; Slash and Burn (Kaingin) Farming System and Its Effects in the Forest Ecosystem; Wildlife Hunting: A Major Threat to Biodiversity; Phytoremediation: A Green Technology to Remove Pollutants for Soil and Water Conservation; and Antimicrobial Activity of Medicinal Plants for the Common Pathogen of Animals, Human and Antimicrobial Screening of Potential Botanical Pesticides.

Furthermore, workshops were also conducted, and the commitments and pledges were given by the different stakeholders to conserve and protect the biodiversity in the three watersheds. The participants were grouped and instructed to make an action plan and commitment for biodiversity conservation and utilization (Table 3). The participants from the different study sites were delighted by the items given to them as promotional materials which included t-shirts, pins, ballpens, and ecobags.

Pamphlets and brochures on biodiversity conservation and on green technology such as botanical pesticide and phytoremediation which were developed and produced were also given to the participants.

Table 3. Commitments and plans of participants in the seminar-workshop for biodiversity conservation in the study areas.

Group	Commitment to Save Biodiversity
Carranglan Watershed, Carranglan, Nueva Ecija	1. *"Magbantay sa mga ilegal na nagmimina sa aming lugar". "Magtanim ng tambo sa bakuran at gawin itong walis upang mapagkakitaan".*
	2. *"Magbantay at magpatupad ng mga batas tungo sa pangangalaga sa Carranglan Watershed." "Magtanim ng mga halaman gaya ng prutas at gulay sa bakuran na siyang maaaring pagkunan ng pangkabuhayan"*
	3. *"Magkaroon ng Autoridad ang mga local na mamamamyan na magpatupad ng batas" at "Isulong ang pakakaroon ng eco-tourism site sa Carranglan Watershed".*
	4. *"Magparami ng mga seedlings na itatanim sa Watershed at magpapatupad ng batas sa panggugubat at pagkakaingin" at "Magtayo ng nursery para sa mga gulay at puno at gayundin ang paghahayupan sa lugar".*
Baler Forest Reserve, Baler, Aurora	1. *"Magbantay sa mga nagtatapon ng basura sa aming lugar".*
	2. *"Magtanim ng mga punog kahoy".*
	3. *"Ipatupad ang mga batas pangkalikasan"*
	4. *"Patuloy na pangnalagan ang Tubig-Kanlungan"*
	5. *"Bantayan ang mga nag-huhuntig sa lugar"*
	6. *"Magtayo ng eco-tourism area sa lugar"*
Bataan Natural Park, Abucay, Bataan	1. *"Pangangalaga sa mga tubig kanlungan, Reforestation, at Mahigpit na implementasyon sa mga lumalabag sa batas".*
	2. *"Watershed Rehabilitation, Appropriate Forest Cover, Ibalik sa mga Indigenous People ang mga lupang katutubo, pangangalaga sa kabundukan at IEC campaign"*
	3. *"Magtanim ng mga puno, Gamitin ng maayosat palitan ang mga puno o halaman, alagaan ang mga hayop sa ilang. Magtanim ng Punong Kahoy para maalagaan ang ating lupa"*
	4. *"Tamang pagtapon ng mga basura, pagtatanim ng mga ibat-ibang halaman (tree planting) at paghahayupan."*
	5. *"Pagtatanim ng mga punog kahoy, palitan ang mga punong GMELINA, organic, vegetable and herbal gardening at palaganapin ang kaalaman sa science para sa mga IPs."*

GREEN TECHNOLOGY PROMOTION

Preparation of comic books, brochures, and videos

The IEC materials such as brochures, comic books, and videos on botanical pesticides were also prepared, developed, and produced (Table 4).

Table 4. IEC materials developed for green technology promotion.

	Title of IEC	Type of IEC	Dialect
Project 2	Botanical Pesticide	Brochure	English
	Pestisidyong Halaman	Brochure	Tagalog
	Pamuksa (Botanical Pesticide)	Comics	Tagalog
	Panipsip (Phytoremediation)	Comics	Tagalog
	Audio–visual presentation for Botanical Pesticides/Pestisidyong Halaman	Video	Tagalog

Enhancement of public awareness on the importance of green technology

Field demonstrations and trainings were conducted as part of the promotion and transfer of the green technology specifically regarding the importance and results of studies on botanical pesticide and phytoremediation to farmers, SDU multisectoral networks, LGUs, students, and interested individuals/organizations. Media linkages through print and broadcast media were undertaken for wider information dissemination. Likewise, the technologies were introduced to the different Farmer's Information Technology Services (FITS) Center for utilization.

Promotional materials, specifically tri-media presentations and collateral materials, were developed to create awareness on the importance of green technology in Carranglan Watershed, Bataan Natural Park and Baler Forest Reserve in Central Luzon (Table 5).

Table 5. Campaign materials developed for green technology promotion.

Title of IEC	Type of IEC
Botanical Pesticide Promotion	Poster
Logo used in Botanical Pesticide for T-shirts, Fans, and Ecobags	Logo
Logo used in Phytoremediation for Comics	Logo
Promotional Jingle on Botanical Pesticide	Video
Promotional Jingle on Phytoremediation	Video

Green technology (botanical pesticide) promotion and field demonstration with the theme "Ang Pestisidyong Halaman na Gamit sa Pananim Para sa Kaligtasan at Kalusugan ng Tao" were held in Carranglan, Nueva Ecija, Baler, Aurora and Balanga, Bataan. These promotional

campaigns and field demonstrations were organized by the Institute for Climate Change and Environmental Management (ICCEM), CLSU as the lead agency in cooperation with the different Municipal/City Agriculture Offices (MAO/CAO) in the study sites. The main objective of these activities was to train stakeholders on promotion of green technology and to undertake green technology promotion/transfer to farmers, SDU multisectoral networks, LGUs, students, and interested individuals/organizations for possible adoption.

The promotion and field demonstration were attended by participants who came from various government offices (LGUs), indigenous people organizations and councils, and farmers.

The participants from Carranglan, Nueva Ecija; Baler, Aurora; and Abucay, Bataan were very glad and thankful for the items given to them as promotional materials which included long sleeve shirts, novelty ballpens, and ecobags as well as brochures and comic books which, according to them, would increase and enhance their knowledge on botanical pesticides and phytoremediation.

The various IEC materials which were developed, produced, published, and disseminated and the promotional activities conducted filled the gap on the general lack of campaign about the importance of biodiversity conservation in the forest ecosystems. Campaigns are necessary to address biodiversity crisis because behaviors of individuals are significant for addressing the problem. Effective mass media campaigns are a powerful vehicle for giving awareness and information to the public. Therefore, these IEC and promotional materials increased the knowledge of the local communities and other stakeholders with regard to biodiversity conservation, and these provided accessible up-to-date information on the status of biodiversity which could give guidance in their planning and decision making. Similar findings were obtained by various organizations that utilized IEC in their campaigns (Zimbabwe National Planning Council, 2010; Tanggol Kalikasan, 2004; IPM-CRSP, 2002). According to them, IEC proved to increase awareness and change attitudes and practices as well as bring about change in specific behaviors. The IEC materials also improved the general well-being of individuals and community by encouraging people to be responsible for their own actions through their own efforts.

Evaluation of Activities Conducted for Biodiversity Conservation and Utilization in Central Luzon and Green Technology (Botanical Pesticide) Promotion and Field Demonstration

Evaluation of the effectiveness and satisfaction rating on the different promotional activities for "Biodiversity Conservation and Utilization in Central Luzon" and "Green Technology (Botanical Pesticide) Promotion and Field Demonstration" was conducted.

Table 6 shows the result of the evaluation during the conduct of the "Seminar-workshop on Biodiversity Conservation and Utilization in Central Luzon" in the three study sites namely, Carranglan, Nueva Ecija; Baler, Aurora; and Abucay, Bataan.

Table 6. Evaluation and ratings of the seminar-workshop on biodiversity conservation and utilization in the three study sites in Central Luzon.

Overall Rating			
Questions	**Ratings**		
	Yes (%)	**No (%)**	
Are you satisfied for the trainings provided to you regarding biodiversity conservation?	99.19	0.81	
Is the training adequate and complete?	99.19	0.81	
Did you get what you need to know about biodiversity conservation?	100	0	
Is the timing very timely in order for you to still save biodiversity in the forest ecosystem?	99.19	0.81	
Average Rating	**99.39%**	**0.61%**	
	Excellent	**Very Good**	**Good**
How did you find our services for the training that was provided to you regarding biodiversity conservation in general?	67.98%	25.28%	6.74%
No. of Respondents	**121**	**45**	**12**

The results of the evaluation and ratings on the three seminar-workshops conducted showed that the participants and audience were satisfied with the services provided in the various activities as evident in the average rating value of 99.39%. The services, in general, also obtained an excellent rating from 67.98% of the participants.

Evaluation and ratings of the "Green Technology (Botanical Pesticide)

Promotion and Field Demonstration" in Carranglan, Nueva Ecija; Baler, Aurora; and Balanga, Bataan are shown in Table 7.

Table 7. Evaluation and ratings of the green technology (botanical pesticides) promotion and field demonstration in the three study sites in Central Luzon.

Overall Rating			
Questions	**Ratings**		
	Yes (%)	**No (%)**	
Are you satisfied for the green technology promotion provided to you?	97.50	2.50	
Is the green technology promotion adequate and complete?	76.06	23.94	
Did you get what you need to know about botanical pesticides as a green technology?	82.61	0	
Is the green technology promotion provided to you very timely in order for you to still use botanical pesticides in your farms?	94.52	0.81	
Average Rating	**87.67%**	**6.81%**	
	Excellent	**Very Good**	**Good**
How did you find our services for the promotion and field demonstration on botanical pesticide in general?	32.76%	29.31%	37.93%
No. of Respondents	**38**	**34**	**44**

Based on the result of the evaluation and ratings on the three green technology promotion and field demonstrations conducted, it was found that the participants and respondents were also satisfied with the services provided for these promotional activities as can be gleaned from the average rating value of 87.67%. Overall, 32.76% of the respondents rated the promotional activities as excellent, 29.31% of them rated the activities as very good, and 37.93% of them rated the activities as good. The services rendered were rated only as good by the respondents perhaps because the project team was not able to immediately provide all the information they requested regarding the plants that could be used as botanical pesticides and the process of preparation and administration of the product because of intellectual property rights (IPR) and patent issues. However, the research team informed the local communities that they would be informed at once of the types of the plants and botanical pesticide products once they are already available.

Evaluation of the IEC Materials Developed for Biodiversity Conservation and Green Technology Promotion in Central Luzon

Tables 8 to 10 show the results of the survey and evaluation of the comprehension, visual comprehensibility, attractiveness and preference, inducement to action, and impacts of the various IEC materials developed, produced, and published for biodiversity conservation and green technology promotion in Central Luzon.

Table 8. Ratings on the comprehension of the IEC materials.

Comprehension		
Questions	**Ratings**	
	Yes (%)	**No (%)**
Are the proposed messages and supporting information technically accurate?	92%	8%
Do the proposed messages provide information for the target audience?	92%	8%
Are proposed messages presented in logical order?	100%	0
Does it look like information presented has been carefully chosen to convey only the most important information?	100%	0
Are the proposed messages used simple and easy to understand languages?	100%	0
Is the written/spoken language appropriate?	100%	0
Are the proposed messages easy to understand?	92%	8%
Average Rating	96.57%	3.43%

Majority of the respondents answered positively with regard to the accuracy of the messages, provision of information, logical sequence of the topics, conveyance of the most important topics, and use of simple and easy words and messages for understanding and appropriate words for the various IEC materials.

Table 9 shows the results of the survey on visual comprehensibility, attractiveness, and preference of the IEC materials developed, published, and produced for biodiversity conservation and green technology promotion.

Table 9. Ratings on the visual comprehensibility, attractiveness, and preference for the IEC materials.

Visual Comprehensibility, Attractiveness, and Preference		
Questions	**Ratings**	
	Yes (%)	**No (%)**
Do you like the pictures/graphics presented?	92%	8%
Do you understand the pictures and graphics presented in the promotional materials?	85%	15%
Do the visuals correspond to what is being said in the text or narrative?	92%	8%
Are the visuals appealing, not abstract or cluttered?	92%	8%
Do the visuals enhance rather than confuse the message?	100%	0
Do the graphics/photos illustrate the most important concepts?	92%	8%
Average Rating	**92.17%**	**7.83%**

Majority of the respondents were agreeable to the pictures and graphics presented for easy comprehension and understanding. Likewise, majority of them were in conformity that the visuals were appealing and illustrated the most important concepts whereas 100% of them were in accord that the visuals enhanced the messages of the IEC materials.

Table 10 shows the results of the survey on inducement to action and impacts of the IEC materials developed, published, and produced for biodiversity conservation and green technology promotion. Majority of the respondents (85%) were motivated to take actions to conserve biodiversity in their forest ecosystems because of the various promotional activities that the project had undertaken. Moreover, majority of them (92%) agreed that the IEC materials given to them were related to their daily tasks and were very useful to their environment. Moreover, 100% of the respondents were in conformity that the IEC materials were all very valuable to their social and economic lives.

Table 10. Ratings on the inducement to action and impacts of the IEC materials.

Inducement to Action		
Question	**Ratings**	
	Yes (%)	**No (%)**
Do these promotional materials inspire and motivate you to act and conserve the biodiversity?	85%	15%

Impacts		
Questions	**Ratings**	
	Yes (%)	**No (%)**
Can the IEC material relate to your everyday tasks?	92%	8%
Is the IEC material useful to your environment?	92%	8%
Is the IEC material valuable to your social and economic life?	100%	0
Average Rating	**94.67%**	**5.33%**

Based on the results of the survey conducted to effectively educate people about biodiversity conservation, various sources of awareness and promotional campaign should be in the form of mass media. For home use, leaflets, flyers, and shirts are a few of the most effective media for awareness and promotional campaigns. Furthermore, social media like Facebook and mass media, to wit and posters, shirts, leaflets, and flyers are the effective tools for office and school use in promoting awareness of biodiversity conservation. Lastly, for community use, field demonstrations and seminar-workshops are effective sources of public awareness and information.

The various IEC materials which were developed, produced, published, and disseminated as well as the promotional activities conducted filled the gap on the general lack of knowledge about the importance of biodiversity conservation in the forest ecosystems. The IEC materials and campaigns are necessary to address biodiversity crisis because behaviors of individuals are significant for addressing the problem. Effective mass media campaigns are powerful vehicles for giving awareness and information to the public. Therefore, these IEC and promotional materials increased the knowledge of the local communities and other stakeholders with regard to biodiversity conservation, and these materials provided accessible up-to-date information on the status of biodiversity which can give guidance in their planning and decision making. Similar findings were obtained by various organizations that utilized IEC in their campaigns (Zimbabwe National Planning Council, 2010; Tanggol Kalikasan, 2004; IPM-CRSP, 2002). According to them, IEC proved to increase awareness, change attitudes and practices, and bring about a change in specific behaviors. The IEC materials also improved the general well-being of individuals and community by encouraging people to be responsible for their own actions through their own efforts.

CONCLUSION

Based on the various activities that were conducted and the different IEC materials and promotional campaign materials on biodiversity conservation and green technology particularly on botanical pesticides and phytoremediation that were prepared, developed, produced, and disseminated to indigenous people, local communities, LGUs, farmers, students, SDU multisectoral networks, and other institutional organizations, the IEC materials and other promotional campaign materials are very effective and important instruments for public awareness and education. Hence, they are very potent tools for biodiversity conservation and green technology transfer for possible adoption.

RECOMMENDATIONS

Development of IEC materials should be done to enhance public awareness on the importance of biodiversity for better appreciation of and participation in conservation programs in other watersheds in Central Luzon.

The conduct of seminar-workshops and field demonstrations should be strengthened in other areas such as Carranglan Watershed, Baler Forest Reserve, Dibut River Watershed, and Bataan Natural Park to organize the local communities for meaningful participation in program activities and to train stakeholders on biodiversity and nature conservation.

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REFERENCES

IPM-CRSP (2002). 9th Annual Report of Integrated Pest Management Collaborative Research Support Program.

Tanggol Kalikasan (2004). Institute of Environmental Governance (IEG) Brochure. http://www.psdn.org.ph.

ACD PCAARRD Leaflet (1993). Applied Communication. Retrieved from http://www.pcaarrd.dost.gov.ph/home/portal/index.php/acd. 2016.

Information Education Communication. Zimbabwe National Family Planning Council (2010). Retrieved from http://www.znfpc.org.zw/index.php/what-we-do/information-education-communication/material-development. 2016.