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Abstract
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Inspired by the truism that "a picture is worth a thousand words," communicators use visuals to teach people improved techniques and to motivate them to use these innovative strategies. The rationale for this is the iconic nature of pictures, which make them less abstract, hence, easier to understand (Dale, 1969).

With their special capacity to represent the environment (Espe, 1990) and as concrete referent for ideas (Heinich, Molenda, Russel, & Smaldino., 1996), visuals have a special niche in the communication process. Evidence abounds that visuals attract and direct attention, make learning more enjoyable, facilitate comprehension (Saunders, 1978; Levie & Lentz, 1982; Brody & Legenza, 1980; Bernard, Peterson, & Ally, 1981; Donald, 1983; Anglin, 1987), and make it possible to communicate even with illiterates and people with reading constraints (FAO, 1990; 1994).

However, there are instances where visuals fail to communicate the message. These instances occur, according to Wileman (1986), because visual communication, like communication through language, is a complex and difficult process, especially when attempting to produce visuals aimed at instructing people who have limited experience with illustrations.

Efforts to harness the potential of visuals as communication media have been confined in various research projects. One such project is the study by Munoz (1986) which examined the differences in perception among farmers with different literacy levels.

Munoz also pointed out the flaw in the way in which communicators use visuals. According to him, communicators use illustrations based on subjective feelings of design and on the concepts of pictorial composition that are intuitive rather than scientific in nature. As a result, pictures are sometimes misunderstood by the audience.

With the current worldwide efforts to reverse the deteriorating global ecological situation, pictures will be used by communicators in transmitting environmental messages to the people. To be effective, however, Wileman (1986) said that communicators should consider the total communication process. According to him, when using visuals as communication channel, it is not enough that people are able to identify the visual. They should also believe what they see and value it.

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To provide communicators, therefore, with pertinent information regarding visuals, this study was conducted to explore upland farmers' comprehension of pictorial materials carrying environmental messages. This paper compares the comprehensibility of the different pictorial representations and explores the variables that affect visual comprehension.

Methods

Respondents

This study was conducted in two upland communities in Leyte (a province in Eastern Visayas, Philippines) which were sites of the Rainfed Resources Development Project (RRDP) implemented by the Department of Environment and Natural Resources in Eastern Visayas. Among others, the project aimed to develop the forest reserve in the area and to improve the socio-economic condition and quality of life of the farmers. Accordingly, farmers have generally low crop productivity due mainly to soil erosion and rapid siltation of canals, creeks, and rivers, brought about by deforestation. To address this problem, the project sought to teach farmers appropriate soil and water conservation measures.

Following the survey research design, the study included 60 farmers drawn randomly. This group represented 50% of the total number of RRDP-beneficiaries in the area. Since the study involved comparing comprehensibility of various visual representation techniques, respondents were grouped into two groups, Group A and Group B. Group assignment was done at random—that is, the first name drawn was assigned to Group 1, while the second, to Group 2. This process was followed until the desired number of respondents for each group was reached.

The Visuals

Visuals used in this study dealt with interrelated topics on environmental protection applied in upland environment. Some of the visuals were adapted from various publications, while the others were conceptualized by the researcher. Artist-illustrators who have sufficient experiences in making visuals for communication materials were requested to draw. For the photographs, a professional photographer was requested to take the photos. To ensure technical accuracy, subject matter specialists (SMS) in agroforestry and ecology were asked to

review the visuals. With the aim of comparing their comprehensibility, the visuals were grouped into two sets — Form A and Form B. During the data-gathering, visuals under Form A were shown to Group 1, while in Form B, to Group 2. Table 1 presents the test visuals.

Data Collection

Data were gathered through individual interviews using an interview schedule translated into the dialect of the respondents. Prior to data collection, the schedule was first pretested with upland farmers who matched the characteristics of the intended respondents. In the pretest, it was observed that the questions could elicit the desired responses. Technical terms, however, which farmers found inappropriate, were changed, as suggested by the farmers themselves and the SMS.

During the actual data-gathering, interviews were conducted by pairs. One of the interviewers showed the visuals and asked the questions, while the other recorded the farmers' responses. Simultaneous with the individual interviews, the focus group discussion (FGD) was conducted. Participants in the discussion were 8 farmers who were not included in the individual interviews. During the discussion, the group was shown the visual and asked to tell what they saw in it and the message it conveyed.

Results

Respondents' Profile

Respondents' ages ranged from 18 to 71. Most of the respondents were middle-aged, tenants, had been farming for about 1 to 56 years and were members of community organizations. All of them had formal schooling. Based on their reported monthly income, respondents' mean monthly income was P5,803.3 (approximately $145). Although this amount indicates the poor economic status of these farmers, this figure may not be very accurate. As experienced, when asked for their income, farmers do not consider non-cash as part of their income.

Many of the respondents were literate. Because of their low exposure to such media as posters, leaflets, technoguides, comics, newspapers, books, slide tape presentations, TV, video, and movies, most of them had low visual exposure. However, many of them had a high knowledge level of envi-

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Table 1 *The Test Visuals*

TOPIC	VISUALS	
	Form A	Form B
Colored and black-and-white photograph and illustration	Colored photograph of a contoured farm	Black-and-white photograph of a contoured farm
	Colored illustration of a contoured farm	Black-and-white illustration of a contoured farm
Realistic and cartoonized illustration	Realistic illustration on contour bund establishment	Cartoonized illustration on contour bund establishment
Line drawing and reverse reproduction	Line drawing of soil traps utilizing farm stubbles	Reverse reproduction of soil traps utilizing farm stubbles
Check mark (to mean "proper way of plowing a hilly farm")	Black-and-white photograph of a farmer plowing along the contour with a check mark	Illustration of a farmer plowing along the contour with a check mark
"X" (to mean "don't burn farm stubbles")	Black-and-white photograph of a farmer burning farm stubbles with **"X"**	Illustration of a farmer burning farm stubbles with **"X"**
Arrow as a visual cue	Arrow within a black-and-white photograph pointing where to plant hedgerows	Arrow within an illustration pointing where to plant hedgerows
Sequential visuals connected by arrows and numbers	Sequence on A-frame construction connected by arrows and numbers A - Preparation of materials B - Tying the upper ends of the longer poles C - Tying the stone D - Marking the crossbar E - An A-frame ready for use	Same only that the parts of the visual were connected by numbers
Sequential visuals arranged horizontally and vertically	Sequential visuals on the effects of deforestation arranged horizontally A - Denuded forest B - Upland farm with stunted corn plants C - Heavy rain, storm, typhoon E - Sad family F - Family migrating to urban areas	Same only that parts were arranged vertically

ronmental protection related to upland farming. This high level of knowledge could be attributed to the implementation of the RRDP in the area.

Comprehension of Visuals

In this study, visual comprehension, alternately referred to as visual literacy, was defined as respondents' ability to interpret the messages on environmental protection depicted by the visuals. This was determined by asking the respondents to give the message that the material conveyed to them. Answers were then compared vis-a-vis the intended message. A score of 1 was given to the answer that matched the intended message and 0 if wrong and/or if the answer veered away from the message. The number of respondents who correctly interpreted the message was taken as the visual's comprehensibility rating.

Table 2 shows respondents' comprehension of the visual materials. Results from the *t*-test showed that among the visuals, only the line drawing and reverse reproduction were significantly different in terms of comprehensibility.

Results further showed that only the photographs had relatively higher comprehensibility scores. Between the colored and black-and-white photos, the colored ones had higher comprehensibility. For instance, the colored photograph had a 76.33% comprehensibility rating while the black-and white, 63.33%. The same trend was observed in the colored and black-and-white illustration (i.e., the colored illustration had a 60% comprehensibility rating while the black-and-white, only 50%).

As regards the realistic and cartoonized drawings on contour bund/canal establishment, the realistic rendition was more comprehensible than the cartoon (43.33% as against 30%, respectively), although the comprehensibility rating of both drawing types was low.

Meanwhile, the line drawing came out to be more understandable than the reverse reproduction. The line drawing had 71.66% comprehensibility score, while the reverse reproduction, 18.33%.

The photograph and illustration of a farmer plowing along the contour with a check had an equal comprehensibility rating of 36.66%. However, the photograph of a farmer burning

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Table 2 *Comprehensibility of the Visuals*

Visuals	Comprehensibility(%)	Computed *t*	Prob.
Colored photograph	76.66	1.20	.211
Black-and-white photograph	63.33		
Colored illustration	60.00	.77	.440
Black-and-white illustration	50.00		
Realistic illustration and	43.33	1.09	.293
Cartoonized drawing	30.00		
Line drawing	71.66	2.11	.043*
Reverse reproduction	18.33		
Photograph with a check	36.66		
Illustration with a check	36.66		
Photograph with "X"	30.00	.30	.770
Illustration with "X"	26.66		
Photograph with an arrow	0		
Illustration with an arrow	0		
Visuals connected by numbers	33.33	.38	.707
Visuals connected by arrows	20.00		
Visuals arranged horizontally	13.33		
Visuals arranged vertically	13.33		

*significant at .05 level of significance

farm stubbles with "X" was more comprehensible than the illustration portraying the same message.

Both the photograph and illustration with arrow indicating where to plant hedgerows were totally incomprehensible. Not one of the respondents was able to interpret correctly the message of both visuals.

For the sequential visuals dealing with steps on A-frame construction, the sequence connected by numbers was more understandable than the sequence connected by arrows. Moreover, both of the sequences of illustration on the effects

of deforestation arranged from left to right and from top to bottom had an equal comprehensibility rating. Their comprehensibility rating, however, was very low (13.3%).

Association of Variables

This study also determined if a relationship exists between farmers' characteristics and their visual comprehension. Two statistical tools were used for this purpose. For the variables measured categorically (i.e., gender, tenure status, organizational affiliation and literacy), the contingency coefficient C was used. The results indicated that the above variables are not related to visual comprehension.

For the variables measured intervally (i.e., age, educational attainment, income, and farming experience), the Pearson-product moment correlation coefficient was used. Results show that among these variables, age (r^2= –.311), educational attainment (r^2=.309), visual exposure (r^2=.334), and knowledge of environmental protection (r^2=.266) were significantly correlated with visual comprehension at .05 level of significance. However, based on the characterization of the strength of correlation (e.g., Fink, 1995; Best, 1981), the correlations are weak. Worth noting is that age had negative correlation, while educational attainment, visual exposure and knowledge on environmental protection, positive. Table 3 presents the simple correlation of these variables.

Table 4 shows the multiple regression analysis of the selected socio-demographic variables, visual exposure, and visual comprehension scores. The analysis revealed that only 26% of the variability in the visual comprehension scores could be explained by the variables included in the analysis. From the *t*-values obtained, only knowledge of environmental protection was significantly related to visual literacy. The multiple correlation of .509 gives the extent of correlation between the variables.

Discussion

Only the visuals on contoured farm were comprehensible. This occurrence could be due to the fact that the respondents, being beneficiaries of the RRDP program, were so familiar with contour farming. In fact, during the data-gathering, it was observed that farmers were already practicing contour farming. Likewise, based on discussion with the project staff, it was

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Table 3 *Simple Correlation Between Visual Comprehension and Selected Socio-demographic Variables, Knowledge of Environmental Protection and Visual Exposure*

Variable	Correlation Coefficient	Computed *t* value
Sociodemographic Variables		
Age	-.311*	-2.492
Educational attainment	.309*	2.473
Income	-.078	-.595
Farming experience	-.193	-1.487
Visual exposure	.334*	2.753
Knowledge on environmental protection	.266*	2.105

*significant at .05 level of significance

revealed that farmers were shown illustrations on contour farming during the on-farm classes.

Results showed that the colored and black-and-white visuals were not significantly different in terms of comprehensibility. This clearly shows that color does not necessarily improve the

Table 4 *Multiple Regression Analysis of Selected Socio-Demographic Variables, Visual Exposure, and Visual Comprehension Scores*

Variable	Regression Coefficient	Standard Error	*T* (*DF*=53)	Prob.	Partial R^2
Sociodemographic variables					
Age	-0.369	0.036	-1.039	0.304	0.020
Educational attainment	0.217	0.161	1.351	0.182	0.033
Farming experience	-0.000	0.000	- 1.178	0.244	0.025
Knowledge on environmental protection	0.335	0.139	2.403	0.020*	0.982
Visual exposure	0.126	0.115	2.097	0.278	0.098
Constant	3.739				

Standard estimate of error= 2.8778
R^2= 0.26
Multiple *R* = 0.51
Linear regression model :*LS* = *f* (age, educ, farmex, income, know, visexpo)

*significant at 0.05 level of significance

instructional value of a visual material. In fact, in a review of various studies, Koroluk (1988) reported that color seemed to be a distractor in the comprehension of visual materials. Thus, he suggests the use of color to highlight and direct attention, to facilitate viewers in comparing, associating, and organizing items. He added that color can be used also to suggest or provoke a particular feeling or mood to be connected with the message in the visual material.

In this study, the arrow as a visual cue was totally incomprehensible. In fact, not even one respondent recognized that it was meant to direct the viewer toward where to plant hedgerows. Thus, care should be taken when using this visual cue. Likewise, the sequential visuals were less comprehensible. This is perhaps due to their complexity. Cook (1981) said that the content of a visual affects its comprehensibility.

Like previous studies (Petterson, 1982; Mangan, 1983), this study highlights the role of culture in visual comprehension. This role could be gleaned from the respondents' literal interpretations which reflect their tendency to associate the activity portrayed in the picture or illustration to their cultural and farm practices. A case in point are visuals of a farmer burning farm stubbles with an "X" mark meant to suggest not to burn them. Many respondents said that the farmer is "burying the dead" and "applying lime." This observation suggests that farmers have a pictorial vocabulary composed of images of their day-to-day activities. Thus, in producing visual materials for farmers such as these respondents, this unique pictorial vocabulary should be considered.

Moreover, this study found a significant relationship between age and visual comprehension. The same result was obtained in earlier studies by Frio (1976) and Heinich, Molenda, and Russel (1982). Here, however, the relationship was negative which is consistent with Munoz' findings in his study of Mexican farmers. This finding suggests that as the farmer grows older, his ability to interpret visual materials diminishes. Possible reasons for this are: (a) poor and/or impaired vision which occurs as the person matures, and (b) his low visual exposure. As this study shows, exposure to visual materials cultivates one's visual cognitive ability.

On the other hand, educational attainment, visual exposure and knowledge of environmental protection were found to be

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positively related to visual comprehension, indicating that these factors enhance visual comprehension. This direct relationship between visual exposure and comprehension confirms the results of Spain (1986) and McBean (1984) which showed that respondents who have higher pictorial experience (i.e., having seen photographs, drawings, etc.) had high ability to understand visuals, while McBean's research found that people with low exposure to visual messages had low visual literacy level.

The weak relationship between total visual comprehension scores and such variables as age, educational attainment, income, farming experience, visual exposure, and knowledge on environmental protection indicates that regardless of attributes, upland farmers may still be able to decode a visual message as long as this is designed properly (i.e., it should be culturally relevant to the intended audience and not too simple nor complicated). A complicated visual like the sequential visuals tested in this study may go beyond the ability of the intended audience, while the simple one might offend them.

Implications and Suggestions for Further Study

The results of the study provide a number of implications to communicators and visual artists in the design and production of visual materials beamed for farmers. Among others, findings suggest that persons in the visuals who are performing farm practices should be portrayed similar to how farmers appear in their day-to-day and farm activities—e.g., plowing and cutting grasses. Even their attire should be consistent with the general attire of farmers in the locality. Likewise, persons should be portrayed as happy in order for the respondents to get the idea that the recommendation is rewarding, thus encouraging them to follow it.

Results also suggest that visual designers and producers should use realistic representations and as much as possible, avoid complex materials such as the sequential visuals included in this study.

To improve comprehensibility of such visual symbols and cues as "X", check mark, and arrow, designers should accompany them with words. For example, "X" should be accompanied with "don't do this", while the check mark, with "do this". Judging from the results of the literacy tests, farmers could actually read and understand written messages. However,

words accompanying visual symbols should be big enough for ease in reading.

Results also suggest that visuals intended for farmers should contain the elements necessary for correct interpretation. Obviously, when a visual lacks an element, perceivers are led to misinterpretations, just like in the illustration of a farmer plowing an upland farm. During the focus group discussion, since the upper portion of the upland farm was not portrayed as "plowed", participants did not think that the check mark was meant as "do this" or "correct way of plowing". This need for a detailed pictorial representation can be explained by the fact that visuals, as communication media, are supposed to provide what Gibson (1979) calls affordances. Conversely, if the visual lacks the elements necessary for correct codification, the visual would in turn cease to provide these affordances, thus leading perceivers to incorrect interpretation.

Overall results of the study underscore the need for pretesting prior to mass production of communication materials. As demonstrated by this research, through pretesting, communicators would be able to gauge the likelihood of the material to be understood, accepted, attractive and believed by the audience.

The above findings, however, may have limitations. For one, the study had a relatively limited number of respondents. Thus, a replication of this study covering a larger sample size is needed.

As indicated earlier, respondents of this study were farmers who had high knowledge of the topic the visuals were intended to communicate. A study comparing visual literacy of farmers with high and low knowledge level of the subject matter is in order.

Research on the comprehensibility of pictorial representations of farm machines is likewise needed. With the desire to improve production in developing countries, communication campaigns have included teaching farmers how to use machines. However, no study has been conducted to find out if these pictures and illustrators of these machines are understood and in what way could they be conveyed better.

Another facet to be explored is the aspect on methodology. A look at various studies so far conducted would reveal that

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these studies vary in terms of procedures and approaches used, especially the questions asked. This variation poses a problem as it would render difficulties if one were to conduct a meta-analysis. It would, therefore, be interesting to examine these methodologies and find out which of these was able to bring about the information needed. Information on this aspect is urgently needed in the light of efforts to fully understand the phenomenon of visual literacy/illiteracy.

Key Words

Visual literacy, visual perception, environmental communication, environmental protection, upland farmers

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