

Correlation of Rice Waste Utilization to Pangasinan Men and Women Farmers' Environmental Awareness, Willingness, Knowledge and Lifestyle

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Abstract - *The assessment of the relationship of rice waste utilization to Pangasinan men and women farmers' awareness, willingness, knowledge and lifestyle was carried out. From the assessment, the data of rice waste utilization to Pangasinan men and women farmers' awareness, willingness, knowledge and lifestyle was derived. The study made use of secondary data from LGUs, OPAG and DA and primary data through observation and questionnaires. The use of correlation statistic was conducted to determine the relationship of the data. From the result, it is found out that rice waste utilization to Pangasinan men and women farmers' environmental awareness, willingness, knowledge, and lifestyle reveal substantial relationship.*

Keywords - *rice waste utilization, environmental awareness, willingness, knowledge and lifestyle*

INTRODUCTION

Rice waste increases as more rice is being produced to feed the increasing population. The rice waste consists of rice straw, rice hull, spilled paddy rice, rice bran, and broken rice. Annually, the country produces 15 million metric tons of rice. Out of this, 3.3 million are lowly rice hull and 2.5 million (M) tons of it accumulate from the milling are thrown away or burned including the rice straw which has become a habit of rice farmers nationwide (BAR 2002). Pangasinan being the third largest rice producer in the country with 180,000 hectares of agricultural land, produced more than 1.033 million metric tons (MT) of rice in 2007 (Office of the Pangasinan Provincial Agriculturist 2007).

Most of the rice waste especially straw and hull, burned and dumped near river and streambanks. Such wastes become an eye sore and clogged rivers and streams. Globally, accumulation of agricultural wastes such as rice straw and hull and the traditional methods of disposing it pollutes the air and contributes to the production of greenhouse gases (i.e methane and carbon dioxide) that contributes eventually global warming and climate change.

Locally, beside weather fluctuations, pollutants from burning wastes which causes respiratory irritants may increase morbidity and mortality rates due to bronchitis, asthma, and chronic obstructive pulmonary disease. Silted or clogged rivers and streams promote flooding in low lying areas that would affect crops, livestock, and lives of people especially during heavy rains (The World Bank 2004).

The enactment of RA 10068, Organic Agriculture, on May 18, 2010, which promotes organic farming as well as utilization of rice waste may cause the farmers to concern on their production output or rice wastes. Only some farmers convert these into fuel energy for cooking, compost for fertilizer, soil conditioner or soil media, building material, feeds and others.

The main impetus for rice production is food security and obviously spur economic growth and development but the generation of rice waste and its by product affect the environmental quality, and farmer's social conditions. Hence, this study was done to amplify the dynamic interaction of

environment and farmers way of life as influenced by their rice waste utilization.

OBJECTIVES OF THE STUDY

The study aimed to examine the relationship between the rice waste utilization by Pangasinan men and women farmers to their environmental awareness, willingness to adopt rice waste utilization and management, knowledge on environmental issues and concerns, and lifestyle.

Specifically the study sought to:

1. determine the socio-demographic characteristics of men and women farmers;
2. identify the farming systems adopted by men and women farmers;
3. identify rice waste utilization done by men and women farmers;
4. determine the men and women farmers' environmental awareness, willingness, knowledge, and lifestyle; and
5. correlate the farmers' rice waste utilization to their environmental awareness, willingness, knowledge, and lifestyle.

Significance of the Study

Results of this study would be particularly useful to the agriculturists/farmers, environment and natural resources planning officers and conservationists, agroindustries and policy makers at the local level. The provincial government and selected LGUs of Pangasinan might utilize the findings of this study to further support farmers and group of farmers in environmental undertakings such as rice waste utilization and management, and entice agroindustries in the province or neighboring LGUs to make use of the rice wastes as their raw materials. The Pangasinan farmers could use the results of the study to countercheck and monitor their farming strategy, their environmental awareness, knowledge and lifestyle as influenced by their rice waste generation, utilization and management. The Department of Agriculture through the Office of the Provincial Agriculturist (OPAG) and Municipal/City Agricultural Office (M/CAO) may use this study in facilitating the planning and implementation of appropriate rice waste utilization and management by the farmers. The results of this study may serve as basis in strengthening the farmers' cooperative or association.

Further, this study would be significant to other rice farming academe, research and

environment related government and non-government institutions and use the strategies and findings in planning and implementing their rice waste utilization and management.

Definition of the Terms

Conventional Agriculture (CA) is an agricultural system that promotes the use of synthetic chemical inputs and non-renewable energy sources for at least a year. Rice straw and hull in a CA ha is estimated to be 3,500 kg and 6,300 kg, respectively. **Environmental awareness** refers to the farmer's knowing that something exists in the environment or around him/her through notice or having told about it. **Knowledge** refers to all information, facts, truths, and principles learned throughout time by a farmer. **Low External Input Sustainable Agriculture (LEISA)** refers to an agricultural system that gradually converts the farming system from conventional to organic for at least two cropping seasons. LEISA could generate an estimate of 4,250 kg rice straw and 765 kg rice hull in a ha. **Lifestyle** refers to the way of life characteristic of a farmer. Farmers' sources of information are closely aligned to the information they already possessed, so that "what they know" is intimately configured within "who they are and what they do" as members of a family, a community, and as farmers. **Organic Agriculture (OA)** refers to an agricultural system that promotes the environmentally, socially, and economically sound production of food and reduces chemo-synthetic fertilizers and pesticides inputs for at least three years. An estimate of 5,000 kg rice straw and 900 kg rice hull per ha could be generated in this farming system. **Rice waste utilization** refers to the way farmers harvest, sale, offer, trade and or utilize their rice waste by-product into a more useful but economically and environmental friendly form. **Willingness** refers to farmer's readiness to do something without being forced.

MATERIALS AND METHODS

Selection of Study Sites, Sample Farms, and Farmer Respondents

The study was conducted in selected farms in Pangasinan from March 2009 to March 2010. Figure 1 shows the location of the study sites. Farms were selected based on the following criteria: a) farm size of at least 0.10 ha; b) must be in the same barangay (smallest administrative division in the Philippines); c) have been planted with the same

crop; d) farmers have been practicing the specific farming systems Organic Agriculture (OA), Low External Input Sustainable Agriculture (LEISA), and Conventional Agriculture (CA) continuously for at least three years for OA and at least one year for LEISA and CA; and e) farmers are willing to share the results of their farming practice and rice waste utilization.

The respondents of the study were systematically selected farmers from Amangbangan, Alaminos City; Bogtong Bolo, Mangatarem, Nangcamaliran East, Urdaneta City; and Camangaan San Nicolas, Pangasinan. At least one barangay study site with farmers practicing OA, LEISA, and CA.

The total farmer population in Amangbangan, Bogtong Bolo, Nangcamaliran East and Camangaan were 56, 76, 92 and 60, respectively. Twenty five percent (25 %) of the total population of farmers were selected using systematic sampling at every 5th farmer in the list provided by the City/Municipal Agriculturist. Hence, a total of 71 (4 OA, 34 LEISA, and 33 CA) farmer respondents including farmers of the selected 12 farms underwent in this study's socio-demographic. Replacement was considered when identified respondents were not available.

Research Design

Descriptive research techniques were employed in gathering data. The Spearman Rho Correlation technique was employed to determine the influence of rice waste by-product utilization to Pangasinan men and women farmers' awareness on effects of rice waste by-product utilization and management, their willingness to adopt rice waste management, knowledge on environmental issues and concerns, and lifestyle.

Gathering Secondary and Primary Data

Secondary data were gathered from various documents while primary data were taken with actual measurement of rice wastes and the use of questionnaire to gather socio-demographic data.

Secondary baseline information such as documents, maps, and sketches and data such as rice yield per municipality were obtained from the municipal development office and local Department of Agriculture (OCA/OMA) and Office of the Provincial Agriculturist. To familiarize with the place and do reconnaissance ocular survey, cursory

visits were done prior to actual field measurement and distribution of questionnaires to the rice farmers.

Data Analyses

Descriptive analysis was done to assess awareness, knowledge, and lifestyle. The correlation analysis determined the strength or degree of the variables' relationship. The Spearman Rho Correlation technique through SPSS version 17.0 was used.

RESULTS AND DISCUSSION

Socio- Demographic Profile of the Farmer

Respondents

Age Category. Majority of the farmer respondents fell under the category of middle age. Five were female and forty five male. One female was in her early adult and one in old age. Only one male was a teenager, 9 early adult, 45 middle age, and 9 old. A total of seven female and 64 male farmers.

Gender. Majority of the respondents (64) were male. Only seven of the respondents were female.

Civil status. Sixty four of the farmer respondents were married, 7 females and 57 males. Four male farmers were single, while three of them were widowed.

Educational attainment. Twenty one of the respondents graduated in high school. Two were female and 19 male farmers. Sixteen of them reached high school level, 2 female and 14 male farmers. Among the respondents, 13 reached college level, two female and 11 male. One female and four male tried a vocational course, while six male finished vocational school. Seven of male reached elementary level while three male finished elementary.

All women and most men farmers were educated and married. Majority of them were in middle age.

It can be deduced that though most of them were educated, job opportunities were less during their early adult age and so resorted to farming.

Farming systems

Five of female farmer respondents were engaged in LEISA farming system and 2 in CA. Four male farmers were engaged in OA, 29 in LEISA and 31 CA.

Rice Straw Utilization

The identified rice straw utilization were rice straw land incorporation, give to other, sell, feeds for animals, erosion control, mulch, mushroom substrate, and compost. Out of 71 farmers, only one LEISA male farmer did rice straw land incorporation. Two CA male farmers gave their rice straw while 2 LEISA and 1 CA male farmers sold their rice straw. Sixteen of these rice farmers utilized their rice straw as feeds for their animals. One OA, 10 LEISA and 3 CA male farmers did feeding their animals with rice straw while 2 LEISA female farmers did the same. At least one LEISA and a CA male farmer converted the rice straw for erosion control, mulch, and mushroom substrate. Two OA male, a LEISA male and female farmers utilized rice straw for compost.

Most of the rice straws were utilized as feeds for animals by some men and women LEISA farmers. It can be deduced that both men and women LEISA farmers keep cows and carabaos as their helpers in rice farming and transporting.

Rice Hull Utilization

Three LEISA male farmers incorporated rice hull in their rice farms. One CA male farmer gave his rice hull and another CA farmer used it for mulching. Three CA male farmers utilized rice hull as fuel for cooking. All four OA male farmer respondents utilized rice hull into carbonized rice hull (crh), and 4 female and 6 male LEISA farmers did the same.

The said farmers utilized the crh in their rice farming and the excess were sold as extra income by LEISA female and male farmers.

Spilled Paddy Rice Utilization

Fifty seven farmers utilized spilled paddy rice as feeds for their chickens and other fowl animals. All OA male and female farmer respondents practiced it. Also, 24 LEISA and 22 CA male farmers utilized the same.

Rice Bran Utilization

Three LEISA and 6 CA male farmers sold their rice bran while 58 (all female and OA male) farmers utilized rice bran as feeds for their animals. Usually, rice bran are incorporated with hog's food.

Broken Rice

One LEISA female and male farmers incorporated broken rice with milled rice. A LEISA female and male, and 2 CA male farmers

incorporated broken rice with rice bran. An OA male, 1 LEISA female and 3 male, and 3 CA male farmers sold their broken rice. Three of OA male, 1 LEISA female and 22 male, and 1 CA female and 22 male farmers utilized broken rice as feeds for animals.

Like rice bran, broken rice were regarded as feeds for farmers' animals.

Except for rice hull which were utilized by OA and some LEISA men and women farmers as crh, rice straw, spilled paddy rice, rice bran and broken rice were utilized as feeds for animals. It can be deduced that both men and women kept animals for farming and income augmentation.

Men and Women Farmers' Environmental Awareness, Willingness, Knowledge, and Lifestyle

Men and Women Farmers' Environmental Awareness

The following statements were asked from men and women farmers. Most of the OA male farmers were environmentally aware. Regardless of farming system, only one LEISA female and 14 (3 OA, 4 LEISA, and 7 CA) male farmers were aware **when wastes are just dumped. . . eyesore, nose irritation because of foul odor** are possible. Only 1 CA female and the 10 (2 OA, 4 LEISA, and 4 CA) male farmers were aware **when rice wastes are just dumped. . . dengue fever** may happen. One LEISA and CA female farmers, and 21 (4 OA, 9 LEISA, and 8 CA) male farmers were **when rice wastes are being burned. . . bronchial asthma and other related respiratory diseases** occur. A CA female farmer and 15 (4 OA, 6 LEISA, and 5 CA) male farmers were aware **when rice wastes are being burned. . . accumulation of carcinogenic dioxin and furan in the body (regular exposure to waste burning) results to cancer.** Twenty two (4 OA, 10 LEISA, and 8 CA) male farmers were aware **when rice wastes are recycled or composted. . . prevention of any air or water borne disease** happen. Nineteen (3 OA, 7 LEISA, and 9 CA) were aware **when rice wastes are recycled or composted . . . maintenance of good health.** Seventeen (3 OA, 8 LEISA, and 6 CA) male farmers were aware **when wastes are dumped for a long period. . .**

devaluation. A CA female and 23 (4 OA, 11 LEISA, and 8 CA) male farmers were aware **when wastes are dumped for a long period . . . produce methane which contributes to warming the earth.** A LEISA female and 28 (4 OA, 14 LEISA, and 9 CA) male farmers were aware **when wastes are always burned. . . carbon dioxide (greenhouse gas) production which contribute to global warming/climate change** is feasible. A LEISA female and 22 (4 OA, 10 LEISA, and 7 CA) male farmers were aware **when wastes are always burned. . . climate change can cause sea level to rise and flood.** A CA female and 30 (4 OA, 14 LEISA, and 12 CA) male farmers were aware **when rice wastes are recycled or composted. .generate more income out of rice yield and additional income out of selling recycled/composted rice wastes in the long run (economic benefit).** Two (1 LEISA and 1 CA) female and 24 (4 OA, 10 LEISA, and 10 CA) female farmers were aware **when rice wastes are recycled or composted. . .clean environment prolong the life of humans i.e. clean soil, air and water (environmental services benefit).**

Not half of the total farmer respondents were environmentally aware of the effects of rice waste utilization.

It can be inferred that farmers lack awareness especially women on the effect of rice waste utilization to their environment. Their traditional method of disposing it i.e dumping and burning is an indication of lack of environmental awareness.

Willingness

Willingness to recycle or compost for farm use. Fifty (4 OA, 21 LEISA, and 20 CA male; and 1 LEISA and 1 CA female) of the respondents were more than willing to recycle or compost rice wastes for the use of their farms.

Willingness to recycle rice hull as fuel for cooking. Thirty-seven (3 OA, 17 LEISA, and 13 CA male; 3 LEISA and 1 CA female) farmers were more than willing to recycle rice hull as fuel for cooking.

Willingness to recycle rice straw, spilled paddy rice and rice bran as animal feeds. Thirty nine (4 OA, 15 LEISA and 17 CA male; 2 LEISA

and 1 CA female) farmer respondents were more than willing (39) to recycle rice straw, spilled paddy rice and rice bran as feeds for animals.

Willingness to recycle rice straw for use as mulch. Thirty-four (4 OA, 14 LEISA, 13 CA male; 2 LEISA and 1 CA female) farmer respondents were more than willing to recycle rice straw as mulch.

Willingness to sell if no plan to recycle or compost rice wastes. Out of 71 farmer respondents, 31 (4 OA, 14 LEISA and 10 CA male; 2 LEISA and 1 CA female) were more than willing to sell their rice wastes.

Willingness to use less technology but efficient in rice harvesting, threshing, and hulling/milling. Thirty nine (4 OA farmers, 16 LEISA, and 14 CA male; 3 LEISA and 2 CA female) farmers were more than willing to use less technology for as long as it is efficient in rice harvesting, threshing, and hulling/milling.

Willingness to properly handle and process rice to avoid wastes. Forty three farmers (4 OA, 17 LEISA and 17 CA male; 3 LEISA and 2 CA female) were more than willing to properly handle and process rice waste to avoid wastes.

Willingness to convert rice straw and rice hull into energy. Forty (4 OA, 12 LEISA, and 18 CA male; 4 LEISA and 2 CA female) farmers were more than willing to convert the wastes into energy.

Willingness to pay rice waste collection charge to government or cooperative. Only 27 (2 OA, 9 LEISA and 13 CA male; 2 LEISA and 1 CA female) farmer respondents were more than willing to pay rice waste collection charge.

Almost all OA and some LEISA and CA male farmers were willing to the abovementioned activities. LEISA and CA women farmers were willing to use less technology but efficient in rice harvesting, threshing, and hulling/milling, to properly handle and process rice to avoid wastes, and to convert rice straw and rice hull into energy.

Women farmers concern more on avoiding waste and utilize it to benefit many. It can be deduced that women are more on prevention and wise utilization of rice waste.

Knowledge

Changing climatic patterns due to burning. Twenty one (4OA, 7 LEISA, and 9 CA male; 1 LEISA female) farmers admitted they had knowledge on changing climatic patterns due to burning.

Waste is a resource that can augment income. The twenty one (4 OA, 8 LEISA, and 7 CA male; 1 LEISA and 1 CA female) farmers knew that waste is a resource that augment income.

Farms deserve to be respected. Twenty three (4 OA, 9 LEISA, and 8 CA male; 1 LEISA and 1 CA female) farmers knew that farms deserve to be respected.

Caring the earth is caring for yourself and your children's children. The twenty three (4 OA, 12 LEISA, and 5 CA male; 1 LEISA and 1 CA female) farmers knew that caring the earth is caring for themselves and their children's children.

Think globally, act locally. Twenty three (4 OA, 10 LEISA, and 7 CA male; 1 LEISA female) farmers knew that it is best to think globally and act locally.

Less than half of the farmer respondents had knowledge on the above environmental concerns. Women farmers knew less of the above.

It can be deduced that busyness of women farmers at home and in the field deprived them of receiving information and knowledge.

Lifestyle

I raise my own rice seeds. Forty six (4 OA, 17 LEISA, and 23 CA male; 1 LEISA and 1 CA female) farmers raise their own rice seeds.

I plant other crops like trees, vegetables, and even raise fish and animals. Forty four (4 OA, 19 LEISA, and 17 CA male; 3 LEISA and 1 CA female) farmers plant other crops i.e. trees, vegetables and even raise fish and animals.

I segregate waste and compost rice waste by-product such as straw and hull into fertilizer. Twenty six (3 OA, 11 LEISA, and 9 CA male; 1 LEISA and 2 CA female) farmers segregate rice waste, do composting for fertilizer.

I apply natural/biological pesticide which is hazard free. Twenty (4 OA, 8 LEISA, and 8 CA) male farmers apply natural/biological pesticide.

I share my knowledge to other farmers, contribute time and resources (bayanihan) to community development. Forty one (4 OA, 19 LEISA, and 14 CA male; 3 LEISA and 1 CA female) farmers share their knowledge to other farmers, share time and resources to community development.

Most of the male farmers' lifestyle were raise their own rice seed, plant other crops like trees, vegetables and raise fish and animals and share

knowledge to other farmers, contribute time and resources to community development.

Women farmers' lifestyle were plant other crops other than rice, and share knowledge, time and resources to the community.

Both men and women have the same lifestyle of planting other crops and share knowledge, time and resources to others and community.

It can be deduced that men and women farmers embrace traditional lifestyle rooted from their awareness and knowledge. Rice waste segregation and utilization is yet to take part in their lifestyle.

Correlation of Rice Waste Utilization to Pangasinan Men and Women Farmers' Environmental Awareness, Willingness, Knowledge and Lifestyle

Correlation of rice waste utilization to farmers' awareness

Rice straw utilization such as, sell for further processing, use as erosion control and as mulch were positively correlated with farmer's awareness on effects of rice waste management to human health, economics, and environment. This means that most of the farmers were not aware on the effects of rice waste management. Giving rice straw to others, on the other hand, was negatively correlated to farmers' awareness. Tough farmers were aware of its effect, they do not use it fully. It can be deduced that giving rice straw to others and use as soil erosion control were the most significantly related to farmer's awareness specifically when rice wastes are recycled or composted.

Rice hull utilization such as land incorporation, use as fuel for cooking, use as mulch, use as soil medium, and carbonized rice hull as soil conditioner were positively correlated to farmers' awareness on effects of rice waste management to health, economics and environment. This implies that farmers were not highly aware, and thus, were not maximizing the rice hull utilization.

Spilled paddy rice utilization is positively correlated to farmers' awareness. Farmers were not aware of spilled paddy rice utilization, hence, do not use it. On the other hand, farmers who were aware maximized the use of spilled rice paddy.

Correlation of **rice bran utilization** to farmers' awareness on effects of rice waste by-

product management to health, economics and environment. Selling rice bran to millers is negatively correlated to farmers' awareness particularly on recycled or composted products. Farmers might not be aware of such effects but they are doing this kind of utilization or farmers are aware but not selling it. Meanwhile, rice bran as feeds for animals is positively correlated to farmers' awareness. Farmers could be aware so they are selling it to others.

Broken rice utilization such as incorporating it with milled rice and rice bran were negatively correlated with farmers' awareness on effects of rice waste management to human health, economics, and environment. Other utilizations like selling broken rice to millers and use as feeds for animals were positively correlated to farmers' awareness. Farmers utilize broken rice and rice bran as animal feeds, and yet, may not be aware on the consequence of their utilization to human health, economics, and environment.

Correlation of rice waste utilization to farmers' willingness

The correlation of **rice straw utilization** to farmers' willingness to adopt rice waste by product management i.e. giving rice straw to others, selling for further processing and recycling it as mulch were positively correlated to farmers' willingness to adopt rice waste management. Farmers were willing to give away and recycle their rice straw. Rice straw used as soil erosion control is negatively correlated to farmers' willingness to adopt rice waste by-product management. Farmers do not utilize rice straw as erosion control and also not willing to.

The correlation of **rice hull utilization** to farmers' willingness to adopt rice waste by product management i.e. giving rice hull to others is negatively correlated to farmers willingness to recycle or compost for farm use. Farmers who were not willing to give away their rice hull maximize its use on their own. On the other hand, those who gave the rice hull away did not fully maximize the utilization. Utilizing rice hull as soil conditioner or CRH is positively correlated to farmers' willingness to recycle or compost for farm use.

A negative correlation exist between farmers' willingness to pay waste collection charge and feeding **spilled paddy rice** to animals. Farmers were hardly willing to pay for waste collection because they highly utilize spilled paddy rice as feeds for animals. . Willingness to support

government through agricultural waste endeavors to use less technology yet efficient in rice harvesting, threshing and hulling/milling by farmers were positively correlated to feeding spilled paddy rice to animals.

Rice bran as feeds for animals was negatively correlated to farmers' willingness to recycle as erosion control. Farmers tend not to be willing to recycle such wastes or sell if there is no plan to recycle because rice bran is highly utilized as feeds for their animals.

Incorporating **broken rice** to milled rice and rice bran as farmers' way of utilizing broken rice are positively correlated to their willingness to adopt rice waste by-product management. Farmers tend to be willing because they highly utilize broken rice by incorporating it with rice bran and milled rice.

Correlation of rice waste utilization to farmers' knowledge

Based from the results, **rice straw utilization** such as land incorporation, used as mulch and compost for fertilizer were positively correlated with farmer's knowledge on environment. Farmers turned out to be highly aware on caring the earth by means of thinking globally and acting locally, for their future generations and wastes augment income. Giving rice straw to others and selling it, on the other hand, are negatively correlated to farmers' knowledge on environment which means that farmers who have high knowledge yet they are not maximally utilizing the rice straw. It can be deduced that all of the above variables were significantly related to farmer's knowledge on environment.

Rice hull utilization such as used as fuel for cooking, as soil medium and land incorporation, use as fuel for cooking, use as mulch, use as soil medium and carbonized rice hull as soil conditioner were positively correlated to farmers' knowledge on environment. The positive correlation suggest that farmers have high knowledge on abovementioned variables and thus, highly utilize the waste. On the other hand, those who have little knowledge on environment did not maximize the use of rice wastes.

Correlation of rice waste utilization to farmers' lifestyle

A negative correlation exists between farmers' rice straw utilization such as feeds for animals and for animal's housing materials and lifestyle. It was not the farmers' lifestyle to I raise

their own seeds, though they utilize **rice straw**. The rest of the variables like rice straw land incorporation, used as mulch and compost were positively correlated to farmers' lifestyle like raising their own rice seeds, applying hazard-free biological pesticide, sharing knowledge to other farmers, contribute time and resources (bayanihan) to community development.

The indication of positive correlation suggests that farmers did not do the given variables as part of their life activities because they did not utilize **rice hull**. Farmers hardly raise their own rice seeds, apply hazard-free natural/biological pesticide, and share their knowledge to other farmers, contribute time, and resources (bayanihan) to community development.

Overall correlation

Of all rice waste by-products, the rice straw utilization, specifically mulch was significantly related to farmers' awareness on effects of rice waste by-product, willingness to adopt rice waste by-product management, knowledge and lifestyle. Among rice hull utilization, carbonized rice hull was significantly related to farmers' awareness, willingness, knowledge and lifestyle. The spilled paddy rice utilization, animal feeds was significantly related to farmers' awareness and willingness. Incorporating broken rice with rice bran and milled rice were the utilizations employed for broken rice which found to be significantly related to farmers' awareness and willingness to adopt rice waste by-product management.

It can be deduced that rice waste utilization reveal substantial relationship to men and women farmers' environmental awareness, willingness, knowledge, and lifestyle.

Summary

All women and most men farmers were educated and married. Majority of them were in middle age. Five of female farmer respondents were engaged in LEISA farming system and 2 in CA. Four male farmers were engaged in OA, 29 in LEISA and 31 CA. Most of the rice straws were utilized as feeds for animals by some men and women LEISA farmers. The said farmers utilized the crh in their rice farming and the excess were sold as extra income by LEISA female and male farmers. Majority of men and

women farmers utilized spilled paddy rice as feeds for their chickens and other fowl animals. Majority of men and women farmers utilized rice bran as feeds for their animals. Like rice bran, broken rice were regarded as feeds for farmers' animals. Except for rice hull which were utilized by OA and some LEISA men and women farmers as crh, rice straw, spilled paddy rice, rice bran and broken rice were utilized as feeds for animals.

Not half of the total farmer respondents were environmentally aware of the effects of rice waste utilization. Almost all OA and some LEISA and CA male farmers were willing to the abovementioned activities. LEISA and CA women farmers were willing to use less technology but efficient in rice harvesting, threshing, and hulling/milling, to properly handle and process rice to avoid wastes, and to convert rice straw and rice hull into energy. Women farmers concern more on avoiding waste and utilize it to benefit many. Less than half of the farmer respondents had knowledge on the above environmental concerns. Women farmers knew less of the above. Both men and women have the same lifestyle of planting other crops and share knowledge, time and resources to others and community.

Of all rice waste by-products, the rice straw utilization, specifically mulch was significantly related to farmers' awareness on effects of rice waste by-product, willingness to adopt rice waste by-product management, knowledge and lifestyle. Among rice hull utilization, carbonized rice hull was significantly related to farmers' awareness, willingness, knowledge and lifestyle. The spilled paddy rice utilization, animal feeds was significantly related to farmers' awareness and willingness. Incorporating broken rice with rice bran and milled rice were the utilizations employed for broken rice which found to be significantly related to farmers' awareness and willingness to adopt rice waste by-product management.

CONCLUSION AND RECOMMENDATION

Most men and women farmers were educated, job opportunities were less during their early adult age and so they resorted to farming. Both men and women LEISA farmers keep cows and carabaos as their helpers in rice farming and transporting. The said farmers utilized the crh in their rice farming and the excess were sold as extra income by LEISA female and male farmers. Usually, rice bran are incorporated with hog's food. both men and women kept animals for farming and income augmentation.

Farmers lack awareness especially women on the effect of rice waste utilization to their environment. Their traditional method of disposing it i.e dumping and burning is an indication of lack of environmental awareness. Women are more on prevention and wise utilization of rice waste. It can be deduced that busyness of women farmers at home and in the field deprived them of receiving information and knowledge. Men and women farmers embrace traditional lifestyle rooted from their awareness and knowledge. Rice waste segregation and utilization is yet to take part in their lifestyle.

It can be concluded that rice waste utilization reveal substantial relationship to men and women farmers' environmental awareness, willingness, knowledge, and lifestyle.

It is recommended that Pangasinan men and women farmers should be given seminar-training on various ways of utilizing rice wastes with the support of the Department of Agriculture, Department of Environmental and Natural Resources, the local government units, and non-government ones. Women farmers should be trained for information, education and communication (IEC).

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