



Farmers' Knowledge and Awareness on Pigeonpea (*Cajanus cajan*) in Camarines Sur, Philippines

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Author's contribution

The author consolidated, analyzed and interpreted the data and prepared the manuscript.

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ABSTRACT

Aim: Filipino farmers need a crop which provides affordability and food security at the same time. Pigeonpea (*Cajanus cajan*) is a valuable crop with quality protein which can be grown successfully in the Philippines. It is ideal for home gardening, can generate additional income, increase soil fertility, prevent soil erosion and produce quality fodder. With these numerous advantages, it is essential to know the level of awareness and knowledge of farmers on the benefits of this protein-rich crop.

Methodology: With the use of structured questionnaire and interview, a total of 357 farmers from five districts in Camarines Sur, Philippines were taken as respondents through stratified sampling technique. Frequency counts and percentages were used to describe the profile of farmers, their knowledge and awareness on pigeonpea. Chi-square test was used to determine the association of gender, age, district and type of ecosystem on the farmers' knowledge on pigeonpea.

Results: Findings showed that 92% of the total respondents were aware of pigeonpea crop. Statistical analysis showed that there was a degree of association with knowledge on age but no association existed on knowledge with other factors such as gender, district/location and type of

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ecosystem. Farmers' highest information needs were on breakthroughs and researches and the preferred media for information dissemination was through assembly/fora and print media. Promotional activities was conducted through seminars and trainings, seed distribution, product development and cooking demonstration and information, education and communication (IEC) materials development.

Conclusion: The high level of farmers' awareness and knowledge must be sustained through participatory approach in planning research and extension programs on pigeonpea. The proactive roles and strategic partnership of the local government units and academic institutions in providing start-up financial resources and technical know-how to respond to location-specific needs of farmers is imperative to stimulate and drive farmers to cultivate this crop.

Keywords: Pigeonpea; farmer's awareness; farmer's knowledge; promotion of pigeonpea; information; education and communications materials.

1. INTRODUCTION

Legumes rank second in importance to cereals as human food sources because they contain protein almost comparable to what is derived from animal and fish meat. Legumes, regarded as poor man's meat, are the cheapest sources of protein among the underprivileged that cannot afford animal and fish proteins [1].

Pigeonpea (*Cajanus cajan*) is a leguminous crop which grows abundantly in many countries such as India, some regions of Africa, Central America, Australia and Asia [1,2]. It continues to be an agricultural occupation sustained by small food producers in Trinidad and Tobago as well [3]. In Dominican Republic, pigeonpea is also grown on small farms of less than 2 hectares and about 80% of the annual harvest is exported, in the form of canned or frozen green peas [4].

Pigeonpea is a nutritious food being rich in protein and well-known for its usefulness in increasing soil fertility, preventing soil erosion [5] and in suppressing weeds in upland farms. It has a wide adaptability to different climates and soils. This crop can tolerate higher temperatures than other legume crops such as chickpea, lentils, and peas. It is cultivated to some extent in most tropical and subtropical environments. The exceptions are areas that are excessively wet or that experience severe frost [5].

In terms of production, there is an increasing trend in pigeonpea cultivation globally with respect to area and production from 3.66 million hectares (M ha) and 2.23 million tons (MT) in 1961 to 4.63 M ha and 3.46 MT in 2006 [6]. However, the productivity level of pigeonpea has stagnated over time, estimated currently at 890 kg per hectare [7].

In the Philippines, pigeonpea is a valuable crop which can be grown successfully. It can be the ultimate answer to one of country's serious problem of food shortage especially to low-income families. Likewise, the prolonged dependence on cereals could result in the prevalence of protein-calorie malnutrition, especially in the vulnerable group of masses of developing and underdeveloped countries [8]. Hence, planting pigeonpea is a welcome alternative that does not only provide food, fuel and forage [9] but it is also used to enrich soil fertility. Moreover, it is now exported as a whole range of products thus providing extensive benefits to smallholder farmers and consumers [7].

The diversity in morphological traits of pigeonpea makes it a crop with great potential for the rainfed areas in the Philippines. The existence of various maturity types of pigeonpea makes it ideal for different cropping systems in the country. The introduction of pigeonpea will not only help in soil amelioration but also generate income per unit of land. Pigeonpea is likewise ideal for home gardening because of its nutritive value. Apart from its use as food and fodder, pigeonpea can be used for preparation of processed food that is known for long shelf life, which can generate employment through the creation of small-scale industries. Since pigeonpea also produces quality fodder, it can also be integrated in the crop-livestock farming system [10] or as feed supplement in aquaculture [7].

The adoption of pigeonpea as an important crop to farmers is impinged by some challenges when cultivated in the farm. For instance, it was reported that pigeonpea is highly attractive to livestock when this was intercropped with maize [11]. Likewise, previous research result revealed

that pigeonpea is susceptible to waterlogging, frost and insect attack [12]. However, the benefits far outweighs the disadvantages. In fact, new-high yielding varieties of pigeonpea had been introduced through the efforts of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in the country. A local program has been started to promote the production of this crop in Mariano Marcos State University in Batac City, Philippines. The result of this program revealed that two hybrid varieties are highly suitable under Philippine condition and these are ICP7035, a perennial plant, which produces a lot of fruiting branches resulting in high yields and ICP88039 which bears fruits throughout the year [8].

While planting pigeonpea can be considered as a solution to food insecurity, yet some farmers seem to have second thoughts to grow this leguminous crop even if an array of information had been available on this crop both locally and globally. In the university alone, various research studies had been conducted on pigeonpea. Research studies undertaken were on promising varieties, effective use of pigeon pea in arresting soil erosion, pest management and development of food products from pigeonpea.

Indeed, there is voluminous of information available about this leguminous crop. This information need to be known and shared to farmers and make them aware about the value and importance of this crop. It is in this context that this study was undertaken.

2. METHODOLOGY

The study was carried out in 5 districts in the province of Camarines Sur, Philippines. The research study employed the descriptive-evaluative method.

A survey-questionnaire was used as the main tool for gathering the needed data. The questionnaire consisted of dichotomous questions to determine farmers' knowledge and awareness on pigeonpea. Likewise, focused group discussion was also undertaken to elicit additional information from the farmers. Document review and analysis of data was also undertaken to confirm and validate the data gathered from the survey.

Respondents were identified from municipalities and districts using stratified sampling technique. Likewise, the type of ecosystem, whether upland or lowland, was considered in site selection for

the conduct of survey. Upland and lowland municipalities in a district are characterized by portions of plain that are categorized by their elevation above the sea level, somewhere around 200 m to 500 m and no higher than 200 m, respectively, Frequency counts and percentages were used to describe the profile of farmers, their knowledge and awareness on pigeonpea. To describe the knowledge of farmers on pigeonpea, respondents were asked on some aspects about pigeonpea. Furthermore, farmers' knowledge was associated with gender, district, age and type of ecosystem using chi-square test. Information, education and communication (IEC) materials were developed and seminars/trainings on pigeonpea growing and processing were also conducted after the conduct of survey.

3. RESULTS AND DISCUSSION

A total of 357 farmers from 5 districts of Camarines Sur, Philippines served as respondents for this survey. Figure 1 shows the location site for the research study. Of the total, 51% were males and 49% were females. District 4 had the highest number of respondents which was 83, corresponding to 23% (Table 1).

Table 1. Total number of respondents by district, gender and percentage distribution, Camarines Sur, Philippines

District	Male	Female	Total	%
District 1	29	28	57	16
District 2	48	23	71	20
District 3	35	37	72	20
District 4	38	45	83	23
District 5	32	42	74	21
Total	182	175	357	100
%	51	49		

In terms of age, all districts showed the highest percentage of respondents who were above 50 years old and the percentage of respondents who were below 31 years old were districts 2 and 4 with 19% of the respondents (Table 2). On the level of education, the highest percentage recorded for respondents was consistent for the 5 districts on secondary level. Districts 1 and 4 gave the highest percentage of respondents at the primary level at 26% and 30%, respectively. Districts 2, 3 and 4 have the highest percentage of respondents at tertiary level at 35%, 31% and 29%, respectively. This may imply that most of the respondents prefer to engage themselves in

farming and earn income after high school or secondary education rather than continue with their college studies. Majority of the respondents' major source of income was farming with District 5 having the highest percentage of 88%. Except for District 4 wherein highest percentage of respondents (65%) with a monthly income of less than Php1,000.00, all other four districts, the highest percentage of respondents' income bracket of Php 1,001-Php5,000.00. This is way below the average monthly income of the Bicol region which was reported by the Philippine Statistics Authority at Php13,500.00 [13].

3.1 Farmers' Awareness on Pigeonpea

As to the awareness of farmers, almost 92% of them were aware of pigeonpea while only 8% were not aware (Table 3). Of those who were aware of pigeonpea, Districts 2, 3 and 5 had the same percentage awareness of over 93% while Districts 1 and 4 showed an awareness of 84% and 86%, respectively. Only 8% of the total respondents said that they were not aware of pigeonpea.

Table 2. Respondents' Profile by Percentage Distribution in the 5 Districts Camarines Sur, Philippines

Age	District number				
	1	2	3	4	5
Below 20	0	6	3	2	0
21-30	4	13	8	17	3
31-40	9	18	10	8	11
41-50	35	18	26	28	23
Above 50	52	45	53	45	63
Level of education					
Primary	26	20	11	30	22
Secondary	54	45	58	41	63
Tertiary	20	35	31	29	15
Income source					
Farming	64	57	77	60	88
Fishing	5	8	5	13	3
Vendor	10		5	15	3
Labor/Domestic Work	21	21	13	12	6
Monthly income					
Above P10,000.00	16	13	14	11	12
P5,001-10,000.00	26	25	14	4	15
P1,001-5,000.00	37	35	38	20	53
Less P1,000.00	21	27	34	65	20



Fig. 1. Map showing the Five Districts in Camarines Sur, Bicol Region, Philippines

3.2 Farmers' Knowledge on Pigeonpea

With regards to the farmers' knowledge about pigeonpea, the amount of knowledge they have did not vary by gender and type of ecosystem as well as by districts ($P > 0.05$) (Table 4). This further implies that there is no significant difference in the knowledge of both male and female farmers about pigeonpea. Similarly, knowledge level of farmers on pigeonpea in upland areas is not significantly different from the knowledge level about pigeonpea of those in the lowland areas. This is also true among farmers in the different districts wherein it shows no significant difference on knowledge about pigeonpea.

Table 3. Percentage of farmers' awareness by district on pigeonpea camarines sur, Philippines

Response	District number					Total %
	1	2	3	4	5	
Yes	84	94	100	86	96	92
No	16	6	0	14	4	8

Table 4. Chi-square test on knowledge of farmers on pigeonpea camarines sur, Philippines

Variable	Test value	Df	P value	Statistical significance
Gender	7.93	6	0.243	ns
District	13.16	30	0.997	ns
Age	64.46	24	0.000	**
Ecosystem	4.60	6	0.595	ns

On the other hand, farmers' knowledge about pigeonpea vary by age ($P < 0.01$). This implies that age influences the knowledge of farmers about pigeonpea wherein old farmers are more knowledgeable than those farmers who are young and middle age. This may be explained by the old farmers' long exposure to the crop and they know very well its importance and uses. This findings corroborate with the study wherein the extent of awareness and adoption of pigeonpea varieties largely depend on the extent to which farmers are made aware of their existence as well as the farmer's preference of the traits embedded in such varieties [14]. There is universal awareness of pigeon pea in some areas but very few are aware of the crop in other areas. An examination of the differences in the awareness level indicated that local varieties are the most widely known by farmers.

Additional information gathered during the conduct of the interview revealed that about 20% of the respondents used pigeonpea for bathing especially for mothers who had just delivered newborns and as treatment for skin diseases. Likewise, they had used pigeon pea as substitute for soy beans and mixed mature seeds in food preparation like the local foods known as Bicol express or "dinuguan".

Farmers showed keen interest on growing the pigeonpea crop. However, survey showed that they still lack vital information on this crop. The highest need for information by farmers was on breakthroughs and researches related to pigeonpea which may be used to augment their need for food (Fig. 2). Likewise, farmers were also keen on knowing the demand and supply and how pigeonpea may be marketed.

Market information is critical in promoting pigeonpea. Constraints that relate to economic attributes of the crop like the lack of reliable markets and support specifically on market information and poor extension service contribute to low adoption [1]. However, previous studies conducted in India showed that, marketing of pigeonpeas are functioning relatively well, even though on the average only about 35% of the production appears in the formal market channels [2]. Most of the pigeonpeas that are grown are first processed and only the dhal samples enter the market channels for consumer use. Therefore for pigeonpea utilization, milling and processing characteristics of whole seed, as well as the consumer's preferences are important and must be well-considered [15,16]. This further supports the recommendation that effective procurement, attractive minimum support price coupled with enhanced productivity would promote pigeonpea cultivation in green revolution tracts [17]. Otherwise, high market price will result to low consumption even though pigeonpea contributes to as much as 22% of the total lysine and 10% of the total protein in farmers' diets [18].

In terms of location, it was District 3 that showed highest interest on various breakthroughs and researches related to pigeonpea. Most of the farmers are already aware of the different varieties of pigeonpea and have access to this information. These findings imply that even if there are numerous researches and information available, there has been little dissemination efforts made to create awareness and increase the knowledge level about pigeonpea. Research

outputs/results on pigeonpea had not reached the target clientele/farmers thus, their knowledge level and awareness on this crop barely increased.

Findings of the study also revealed that most of the information gathered by farmers was from the Department of Agriculture and academic institutions like the Central Bicol State University of Agriculture (CBSUA) (Fig. 3). Farmers from district 3 had the highest access on information compared to other districts. This may be because of the proximity of said institutions to this district.

There are various ways by which farmers may be able to get information and the means of

accessing it. The most preferred method of communication channel by farmers was through the conduct of assembly or fora (Fig. 4). Four out of the 5 districts had consistently showed that they prefer assembly and/or fora for information dissemination on pigeonpea. They prefer this medium because of the interaction between the researchers and experts and questions may be easily answered. Likewise, an alternative way preferred by farmers was print media through the production of flyers, brochures which they can read and review the information whenever they need to.

Various promotional activities were conducted in the 5 districts in the province of Camarines Sur,

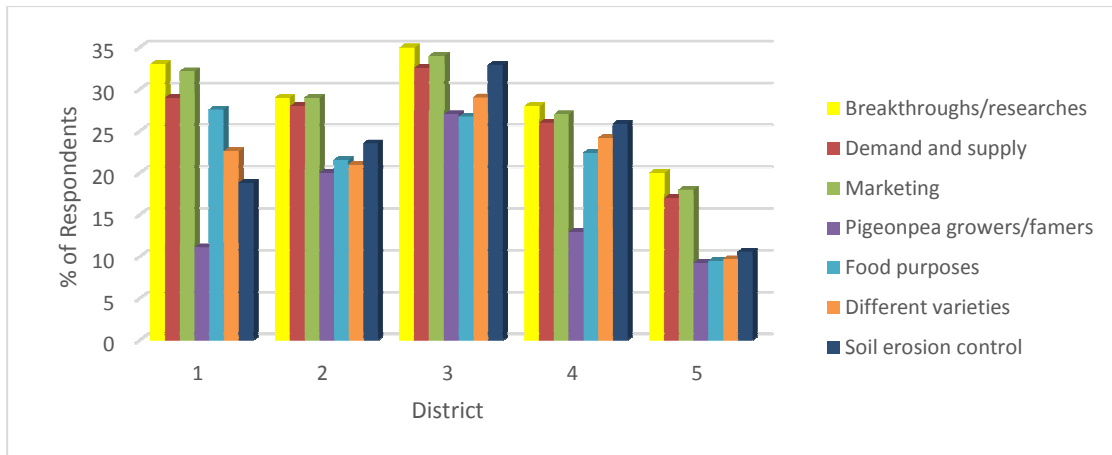


Fig. 2. Information Needs of Farmers on Pigeonpea

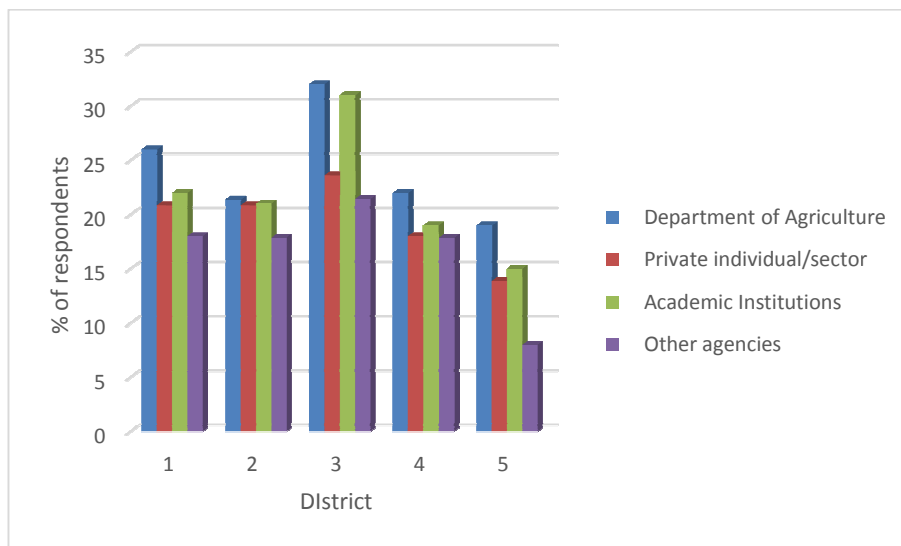


Fig. 3. Information Source of Farmers on Pigeonpea

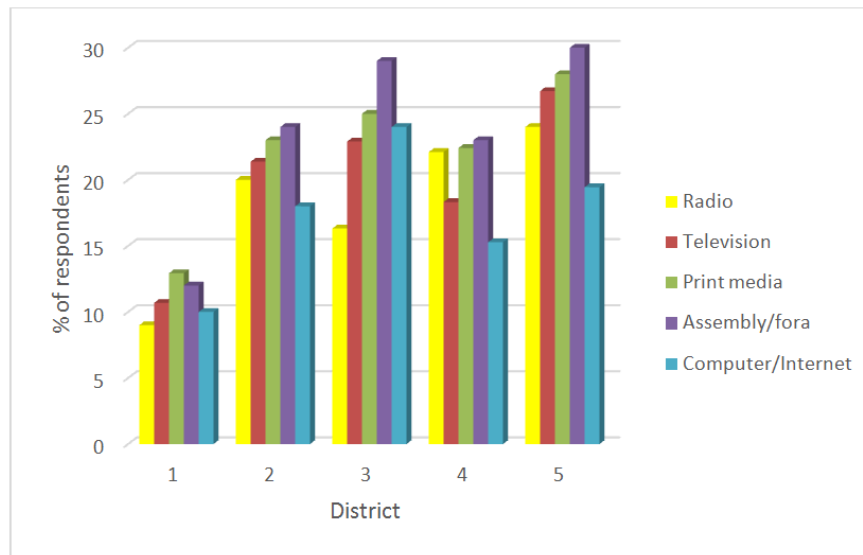


Fig. 4. Communication Channel Preference by District

Philippines. These were in the form of seminars and trainings, seed distribution, product development and food processing, information dissemination through mass media and information, education and communication materials development. Brochure and flyer which include essential information about pigeonpea such as crop management, its importance and uses, different varieties available in the country, pest management and product development or alternative food products out of pigeonpea were also developed.

The research team conducted seminars and trainings to disseminate information about pigeonpea. This was done in close collaboration with various government agencies such as the Department of Agriculture, Department of Agrarian Reform, DA-Agricultural Training Institute and private organizations. Information sharing was conducted vis-à-vis the conduct of trainings, conferences and workshops.

In a previous research study, it revealed that for enhancing the production and productivity of pigeonpea crop, strategy should be made for getting the more recommended technology adopted by the farmers [19]. Training and extension programs may be effective in changing the attitude, skills and knowledge of farmers in favor of recent technology for high yielding varieties including their adoption. However, this continues to be a difficult task to researchers and extension workers in the field. For instance,

research initiatives by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) on hybrids has shown that yield advantage of pigeonpea hybrids can range from 20-150% as compared to existing varieties with yield of about 700 kg/ha. How to influence the farmers who have been traditionally planting varieties for the last five decades to switch to hybrids is a major challenge [1]. Corollary to this, USAID's report in Malawi project also stressed that project technology transfer activities should include the use of farm field demonstrations and field days to increase the awareness of farmers of the advantages in the use of improved groundnut and pigeonpea varieties [20].

During the conduct of seminars and trainings, different varieties of pigeonpea seeds were likewise distributed for free to farmers so that they can plant and grow this crop in their respective farms. The arrangement was for farmers to grow this crop, harvest the seeds at maturity and sell it back to Central Bicol State University of Agriculture at the prevailing price hence, will be an additional source of income for farmers. Cooking demonstration was also done to promote pigeonpea at the village level. Information dissemination was conducted in coordination with the local government officials (LGUs) and other non-government organizations such as the Rural Improvement Club (RIC) to create more awareness especially on women that they can use pigeonpea for their small scale enterprises/businesses.

To further enhance information dissemination the research team went live on television and discussed the production, management and product development of pigeonpea for the Mag-Agri Tayo TV program. This aims to disseminate at the national level the research efforts and results on pigeonpea to encourage more farmers to grow this crop with the numerous potentials and benefits that they can get that will ultimately improve their standard of living in the community.

Furthermore, as one of the major outputs of this research, several IEC materials were developed and produced for distribution not only to farmers but to students and other interested individuals as well who might want to venture into pigeonpea business. Among the promotional materials developed were the following:

- Brochure on the production guide for pigeonpea (Kadyos) which includes information on cultural practices and management, varieties, pest management and products that can be produced out of pigeonpea.
- Flyer on the nutritional value of pigeonpea
- Flyer on various food products made of pigeonpea

The use of mass media and production of IEC material are potent strategies for enhancing awareness and knowledge of pigeonpea to farmers. This is supported by previous research study [7] wherein it was suggested that dovetailing training with improved means of extension education such as the use of information technology (IT) driven media materials, demonstration farms, and farmers' orientation/forums and visits can increase awareness towards a more successful uptake of an initiative such as on pigeonpea. Likewise, there is no better method to change the attitude or practice of the farmers than through field demonstrations where farmers are the implementers and observers of the crop's management system. Showcasing matured technologies through demonstrations and even field days provide the initial steps towards their adoption and field days are essential to arouse interest of key actors in pushing for the cultivation of the crop.

4. CONCLUSION

Of the total farmer-respondents for this study, 329 or 92% are aware of the existence of pigeonpea. This implies that farmers in Camarines Sur are highly aware of the crop.

Statistical analysis showed that there is a degree of association with knowledge on age but no association existed between knowledge and other factors such as gender, district/location and type of ecosystem. The association of knowledge with age of farmers may be explained by the old farmers' long exposure to the crop.

The major sources of information for pigeonpea are the Department of Agriculture and academic institutions like CBSUA. However, they still need more Information on breakthroughs and researches especially for food purposes. Likewise, farmers are also keen on knowing the demand and supply, how pigeonpea may be marketed and the technology of using pigeonpea for controlling soil erosion. By location, District 3 showed highest interest on various breakthroughs and researches related to pigeonpea. The communication channel preferred for this information is through assembly/fora and through print media by developing brochures and flyers about pigeonpea. Promotional activities had been conducted in various municipalities and districts through the conduct of seminars and trainings, seed distribution, product development and cooking demonstration for rural women and entrepreneurs, information dissemination through mass media and IEC materials development.

The high level of farmers' awareness and knowledge must be sustained through participatory approach in planning research and extension programs on pigeonpea. The proactive roles and strategic partnership of the local government units and academic institutions in providing start-up financial resources and technical know-how to respond to location-specific needs of farmers is imperative to stimulate and drive farmers to cultivate this crop.

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COMPETING INTERESTS

The author has declared that no competing interests exist.

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