



RESEARCH ARTICLE

Factors affecting food security of children from corn farming households in Cagayan valley, Philippines

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ABSTRACT

In the Philippines, the adoption of Bt maize has been persistent to address the benefits for smallholder producers. The objective of this study is to identify the factors affecting the food security of children from corn farming households in Cagayan Valley, Philippines. Multi-stage random sampling was used in a cross-sectional study of 1-10-year-old children of corn farmers in the provinces of Isabela, Quirino, Nueva Vizcaya and Cagayan. In this particular study, a total of 408 children from corn farming households were included. A face-to-face interview was conducted to gather socio-economic and demographic information. Food insecurity was assessed using a nine-item *Radimer/Cornell* food insecurity measure translated to the Ilocano dialect. Descriptive statistics were performed for all variables to describe the percentage distributions of all *Radimer/Cornell* food insecurity items. Regression analysis was employed to examine the factors affecting food security. The result of the study revealed that educational attainment of father, occupation of both parents and type of corn grown are significant factors of food security of children from corn farming households. Moreover, parents who have higher educational attainment and whose primary occupation was *Bacillus thuringiensis* corn farming have food secured children. The result of analysis on the food security of children from this study provides a useful baseline information for future interventions towards the fight against poverty, hunger and malnutrition.

Introduction

Food insecurity is one of the major problems that requires immediate attention among our leaders today. Food insecurity refers to “limited or unstable physical and economic access to acquire sufficient amounts of nutritionally sufficient and safe foods in socially suitable means to allow members of the household to stand active and healthy life” (1). From this definition, four dimensions of food security such as food availability, food accessibility, stability and food utilization (2) are of great importance. If an individual is severely food insecure, especially young children, they are most likely to experience hunger. Long standing hunger may result to poor nutrition and poor health outcomes (3) that may have long-term consequences.

Food insecurity also possess threats among growing children and this may result to undernutrition and increased risk to infection (4).

Undernutrition is continuous to be a chief public health challenge in developing countries (5) including Philippines. According to the National Nutrition Survey, the prevalence of undernutrition among children below 5 years has been shown to be significantly greater in 2015 at 21.5% than in 2013 at 20.0%. Meanwhile, undernutrition among 5-10 years old has a significant increase from 29.1% in 2013 to 31.2% in 2015 and observed to be greater in rural settings than in urban areas (6, 7). The consequence of malnutrition has been highlighted for the physical and intellectual development of children. Thus, it is important to guarantee that investments in nutrition especially in the among younger children can be long-standing initiative towards economic growth (8).

Meanwhile, as the population continues to grow, agricultural innovation is urgently needed to sustain production, enhance the supply chain, lessen food losses and waste and ensure access to nutritious food

especially those who are suffering from hunger and malnutrition (9). The diversity of farm production can affect the diversity of household diets, which is related with the dietary adequacy in nutrients and the state of nutritional status of a population. In low-income countries, usual household diets are often limited to two-starchy foods with insufficient micronutrient-rich fruits, vegetables and animal-source foods. Furthermore, rural agricultural households primarily devour on self-produced food that contributes directly to diversity of the diet and improved nutritional status (10).

Moreover, agriculture is the prime and frequently the only source of livelihood for poor rural individuals, who, in turn, are most vulnerable to ill health and undernutrition (11). As of 2015, only 33.9% of Filipino households were food secured and almost 60% resided in rural areas (12). With its associations to both the immediate causes underlying determinants of undernutrition, the agricultural sector performs a significant part in mending nutrition outcomes (12). Agriculture serve as a primary source of income among smallholder farmers and corn is one of the most essential crop in the Philippines. Despite campaigns of conserving and using local corn varieties in the Philippines, some farmers resort to corn varieties which produces higher yield and more resistant to pests. *B. thuringiensis* maize is the first genetically modified crop introduced to farmers in the Philippines. The efforts of the government and development agencies to adopt *B. thuringiensis* maize have been persistent to address the benefits for smallholder producers by increasing their harvests and decreasing the use of pesticides, therefore strengthening their livelihoods and health and easing poverty (19). Several studies on factors affecting food security (4, 13-18) have been published, however many possible benefits of *B. thuringiensis* maize that could have an influence in food security specially among children in corn farming households have not been realized. Furthermore, most of the studies that have been published recently on the topic of food security in the Philippines are just being reflected at the national level and is considered in general. Though data are existing at the national level, insufficient researches have been completed to identify the food security problems especially at the household level specifically in corn farming households. The national data on food security is inadequate to understand the factors affecting food security in corn farming households in the country. Although, there is an accelerating global initiative of addressing food security, the extent and nature of food security at rural areas and at the household level are not well documented. Therefore, this study determines the factors affecting food security of children from corn farming households in Cagayan Valley, Philippines.

Materials and Methods

Subjects and Locale of the Study

The study was conducted in Cagayan Valley Region, Philippines. Cagayan Valley was chosen as the locale

of the study because its is considered as the top corn producing region in Philippines. The study population was among households of corn farmers with children aged 1-10 years old in the provinces of Isabela, Quirino, Nueva Vizcaya and Cagayan. Study sites were presented in Supplementary Fig. 1.

Research Design and Sampling Procedures

In this particular study, a multi-stage random sampling was considered in a cross-sectional study design study from February to April 2019. The total population of corn farming households with children aged 1-10 years old was 264, 100. The single population proportion formula ($n = Z^2 (p) (1-p) / (d^2)$) was used to determine the sample size (20). The proportion of underweight children in Cagayan Valley in 2015 was estimated at 20.1% (7). A 5% margin of error (d) with a 95% confidence interval was considered to get the ideal sample size. The calculated sample size was 247. For the non-response rate, 10% was considered and it was multiplied by 1.5 for the design effect of the research. Hence, 408 households of farmers with children aged 1-10 years old was the final sample size. Supplementary Table 1 shows the distribution of randomly selected participants according to provinces and municipalities. Furthermore, to determine the desired number of samples from each participating municipality, proportional to population size allocation was initiated (Supplementary Table 1).

Pre-Testing of Questionnaire

A pre-testing of the questionnaire was conducted to the same target group (n=10). Participants were asked to answer the questionnaires completely, while the researcher observed how they completed the survey. The questionnaire was revised according to acquired observations, such as the hesitation of the participants to answer. The validity of the questionnaire was then evaluated by expert evaluators, with a mean rating of at least 3.5 and a *Chronbach* alpha of 0.71 showing it was reliable and consistent (21).

Data Collection

A face-to-face interview was performed by skilled and trained researchers to gather all pertinent information such as the socio-economic and demographic profile of the participants. Children were identified through the supervision of a Barangay Nutrition Scholar and Barangay Health workers. Written informed consent was obtained from parents, while oral assent from the children. Written consent was translated verbally to local dialects for better understanding. For food insecurity assessment, a nine-item Radimer/Cornell food insecurity measure was translated to Ilocano.

Data Processing and Statistical Analysis

All statistical analyses were assessed using Statistical Package for the Social Sciences (SPSS) ver. 21, with a *p*-value <0.05. Descriptive statistics were performed for all variables to describe the percentage distributions of all *Radimer/Cornell* food insecurity items. Regression analysis was employed to examine the factors affecting food security.

Results and Discussion

Socio-Demographic Profile of the Children of Corn Farmers

Out of the 408 children, 63.7% were 1 to 5 years old while 36.3% were 6 to 10 years old, with a mean age of 4.6 years. Of the children, more than half (51.0%) were males while 49.0% were females. Almost half (49.3%) of them had one to two siblings, who belonged to a nuclear family (70.3%) with a maximum family size of four (51.0%).

In terms of monthly income, 43.63% of households had an income ranging from Php 10,000.00 to Php 29,000.00, which indicates above the poverty threshold of Php 10, 481.00 (PSA, 2019). While 49.0% of households had monthly expenses of less than Php 10,000.00. In terms of household assets, 51.0% of the parents had owned their land who were planting *Bt* corn (94.9%) at an average year of the planting of 6-10 years (28.7%).

Household Food Insecurity and Socio-Demographic Profile

Supplementary Table 2 shows the percent distribution of corn farming households according to household food insecurity. Results showed that majority of the households were worried that their “family may run out of food before they have money to buy again” (64.2%), may not be able to “afford to buy adequate food” (64.7%), and “wished that they could buy more food if they had more money” (60.5%). In addition, more than half of the households had “never run out of food because they do not have more money to buy food” (56.4%), however, they “had eaten the same type of food for several consecutive days because they do not have enough money to buy different food” (53.4%) and had “eaten less than they want because they do not have enough money to buy food” (50.7%). Also, findings revealed that almost 60% of the households “had children who do not have enough to eat because they do not have enough money to buy food” (55.9%). Also, 59.8% of them have “enough money to buy healthy and nutritious food for their children”, while 43.9% “had their body weight dropped in the last year because of the lack of food”.

Supplementary Table 3 shows the percent distribution of corn farming households according to the classification of household food insecurity. Results showed that 54.5% of the households were “severely food insecure” while only 12.4% were food secured.

Using multinomial regression analysis, the identified factors of household food security were educational attainment of the father, occupation of the father, occupation of the mother and crops grown. The computed F value of 11.883 with <.000 level of significance shows a significant relationship between the levels of household food security and identified predictors. The multiple regression correlation values $R = .397$ suggests a substantial relationship between household food security and independent variables. The adjusted R Square with a value of .158 presents that 15.8% of the variability of the dependent variable is attributed to the identified significant factor (Supplementary Table 4).

The father’s educational attainment contributes positively and significantly to household food security. This implies that household food security significantly increases with the increased educational attainment of the father. This result is consistent with the finding that food insecurity was negatively associated with the father’s educational attainment (22). The perceived significant relationship between educational attainment and food insecurity could be attributed to the fact that people with higher educational attainment have greater income and therefore can offer enough food much more easily than others. Further, the educational status was an important determinant of food insecurity based on published researches on this field (23, 24) and that the higher the educational attainment, the less severe the food insecurity status. Education, as a measure of human capital, is associated with both productivity and efficiency. Education has direct and wider returns to individual and immediate members of their family and society at large in terms of increased income, improved health and better decision making.

The father’s occupation contributes negatively and significantly to the level of household food insecurity. Household food insecurity decreases among households of farming fathers. As pointed out by a study (22), food insecurity was negatively associated with the occupation of the father. Likewise, the unemployed household head was significantly more food insecure than employed ones. The employed head of the family can provide enough food for their family members much more easily than others (25). Further, father’s occupation can increase household income levels and contribute to the purchasing power of the household. Adequate income means a higher ability to provide good food for all family members in the household.

The mother’s occupation contributes positively and significantly to household food security. This implies that household food security is proportionately higher when mothers are employed. Likewise, a study (26) found out the significant relationship between the employment status of mothers and food security. The significant association of mother’s occupation and food security can be explained by the fact that the employment of mothers can provide income and enough food for their family members and thus, food security.

The type of crops grown contributes positively and significantly to household food security. This implies that household food security is proportionately higher when the type of corn grown is *B. thuringiensis* corn. A study (27) suggests that initial *B. thuringiensis* corn adoption provides a modest but statistically significant increase in farm yields. Also, the result of a study (28) proved that the adoption of genetically modified cotton has improved calorie intake and dietary quality, resulting from increased family incomes. It was noted further in this study that this technology has reduced food insecurity of about 15–20% among cotton-producing households. Likewise, genetically modified crops may serve as an important instrument for surpassing threats to food security (29) by providing highly productive and resilient agricultural products (30). Thus, genetically modified crops could contribute to

food production increases and higher food availability. Producing genetically modified crops may impact farmers' income and thus their economic access to quality food.

Conclusion

This study focused on assessing the factors affecting food security of children from corn farming households in Cagayan Valley, Philippines. In conclusion, food security of children from corn farming households was affected by the educational attainment of the father, occupation of both parents and type of corn grown. Parents who had higher educational attainment and farming as the primary occupation, particularly *Bt* corn farmers, had food secured children. Based on the findings of the study, it is necessary to design future researches and appropriate interventions to enhance sustainability and resiliency of food security among smallholder farmers.

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Authors' contributions

AY was involved in the conceptualization, conduct and completion of this research.

Conflict of interests

The author do not have any conflict of interests to declare.

Ethical issues

Informed consent and oral assent were provided to the respondents before the conduct of the interviews.

Supplementary files

Table 1: Distribution of participants according to provinces and municipalities in Cagayan Valley

Table 2: Frequency and percent distribution of corn farming households according to household food security

Table 3: Frequency and percent distribution of children of corn farmers according to the classification of household food insecurity

Table 4: Factors affecting household food security among children of corn farmers

Fig. 1. Sites of the study

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