ORIGINAL ARTICLE

Effect of a Capacity Building on the Knowledge, Attitude, and Self-efficacy on Nutrition-Sensitive Agriculture (NSA) of the Local Agriculture Planners in CALABARZON: A Non-randomized Controlled Trial

Kim Leonard G. dela Luna, PhD, RND,[1] Maria Theresa M. Talavera, DrPH,[2] Leila S. Africa, PhD,[2] Clarissa B. Juanico, RND, PhD,[2] Nancy A. Tandang, PhD[3] and Marison Felicidad R. Dy[4]

[1]Department of Nutrition, College of Public Health, University of the Philippines Manila
[2]Institute of Human Nutrition and Food, College of Human Ecology, University of the Philippines Los Baños
[3]Institute of Statistics, College of Arts and Sciences, University of the Philippines Los Baños
[4]Department of Human and Family Development Studies, College of Human Ecology, University of the Philippines Los Baños

ABSTRACT

Background. Filipino farmers recorded the highest incidence of poverty in the last decade. In addition, a heightened awareness was observed within agriculture and different government agencies to better understand the link between agriculture and nutrition. However, limited studies have been conducted in the Philippines integrating nutrition-sensitive agriculture into the Municipal Agricultural Development Plan (MADP).

Objectives. This study aims to determine the effect of capacity building on the knowledge, attitude, and self-efficacy of municipal agriculturists on Nutrition-Sensitive Agriculture (NSA) in CALABARZON.

Methods. This study utilized a non-randomized controlled trial design to measure the change in knowledge, attitude, and self-efficacy of the municipal agriculturists on NSA and nutrition sensitivity of the MADP. A total of 57 municipal agriculturists from CALABARZON participated in the capacity building.

Results. Local agriculture planners' knowledge, attitude, and self-efficacy significantly improved after capacity building. In addition, membership of municipal agriculturists to local nutrition committee was significantly associated with higher scores difference in knowledge and self-efficacy after the training. Meanwhile, the score difference in their attitude was significantly related to the tenure of employment in local agriculture planners.

Conclusion. Capacity building on the NSA can significantly improve local agriculture planners' knowledge, attitude, and self-efficacy. Thus, the government must support programs and initiatives concerning the NSA, like increasing the capacity of local agriculture planners. This will allow them to integrate nutrition-sensitive agriculture concepts positively into their agriculture development plan.

Keywords: agriculture, food security, agriculture extension program on NSA, nutrition security, capacity building

INTRODUCTION

Nutrition-sensitive agriculture (NSA) encompasses agricultural practices that go beyond mere food production, taking into account factors such as the nutritional value of the food produced, the environmental consequences of production, and the economic and social ramifications of agricultural activities.[1] NSA aims to enhance the presence, reach, and consumption of a wide range of nourishing and safe foods, to improve the nutritional well-being and health outcomes of the population. This focus is particularly

Corresponding author:
Kim Leonard G. dela Luna, PhD, RND
Department of Nutrition
College of Public Health
University of the Philippines Manila
Email: kgdelaluna@up.edu.ph

important for vulnerable groups, including women and children.[2] This approach also recognizes the vulnerable group in the community, which acknowledges that access to adequate food is an essential human right.[3,4] It also provides a concept to reduce the gap between the available and accessible food essential for a balanced diet. However, it can only be achieved if nutrition objectives are introduced to agriculture to address the dimensions of food security, including health, environmental, economic, educational, and social aspects.[5]

The environment plays a crucial role in nutrition-sensitive agriculture. Sustainable agricultural practices that conserve and enhance natural resources such as soil, water, and biodiversity can support the production of nutritious foods while minimizing the negative environmental impact of agriculture.[6] On the other hand, environmental degradation, including deforestation, soil erosion, water depletion, and pollution, can negatively affect the nutritional quality and availability of food, especially in low-income countries.[7] Hence, it is crucial to adapt agricultural methods that support nutrition-sensitive agriculture while simultaneously conserving and enhancing the environment. Achieving this goal necessitates a comprehensive and integrated approach that recognizes the interconnections among food, health, and the environment.[8]

Aside from the identified gap between the environment, agriculture, health, and nutrition sectors, the literature suggests that most of the undernourished and poor people reside in rural areas that rely on agriculture. Although agriculture provides them with a livelihood, it can also cause problems because of fluctuating prices of agricultural products, low production because of climate change, and other factors that result in different problematic issues among people. Hence, it substantiates that agriculture provides the economic backbone among SEA countries to ensure food sustainability among food-insecure populations.[9]

Despite the government's efforts in poverty, and hunger reduction, the Philippines continuously sustains a high prevalence of undernutrition among children and food insecurity, particularly in households relying on agriculture. The household wealth index tends to be the most important factor associated with undernutrition outcomes among children who belong to agriculture-related families.[10,11] Based on the 2015 National Nutrition Survey (NNS) conducted by the Food and Nutrition Research Institute (FNRI), undernutrition was still considered a significant public health problem.[11]

Hence, the importance of agriculture's link to the achievement of the Sustainable Development Goals results from its impact on the long-term consequences of child undernutrition. Undernutrition among children and women is a complex and urgent issue that needs to be addressed through adequate food and essential nutrients. Diet diversity and nutrition composition are critical for adequate nutrition.[12] Globally, increased awareness was observed within different development institutions and government agencies to better understand the link between agriculture and nutrition and to decipher ways that the agriculture sector can improve the nutrition situation of a community. NSA involves designing and implementing nutrition-based approaches to sustainable farming and cropping systems.[13]

In the Philippines, the Provincial/City/Municipal Agriculturists and or Municipal/ City Agriculture Officer coordinate and supervise the agriculture plans and programs in the local government units, respectively. The decentralization of government services mandated by the Local Government Code devolved the implementation of agricultural and on-site research services and extension programs. To deliver these basic agricultural services to the people, the Provincial and Municipal Agriculture Office hired agricultural extension workers who served as project implementers and agriculture extensionists.[14] Agriculture offices also employed Agriculture Technicians and/or Agriculture Extensionists that will accelerate the agricultural program implementation to farmers by conducting farmer-farmer extension modality.[15,16]

The agriculture plan of a municipality should be reflected in the Comprehensive Development Plan and/or Municipal Development Plan. These plans are anchored to the Comprehensive Land Use Plan that aims to mainstream sectoral and thematic areas. Although not mandated, some of Local Government Units in the country have their own Municipal Agriculture Development Plan that serves as the blueprint of their respective agriculture programs and projects.[17] However, due to financial constraints and lack of human resource, several municipalities often dispense with the hiring of agriculturists at the local level because these are optional positions as dictated by the Local Government Code.[17,18] These concerns often resulted to fragmented delivery of agriculture services including nutrition at the local level which can be accounted to lack of human resources and funds, and low support from the local chief executives.[17,19,20]

The importance of the multisectoral approach in integrating nutrition concepts in agriculture extension activities has provided significant improvements in food intake and nutrition security in different countries. Thus, it is important to bridge the gap between nutrition and agriculture by providing evidence-based actions to harmonize the delivery of interventions.[21] Despite these positive outcomes, limited studies have been conducted in the Philippines to explore the effectiveness of this concept and the possible impact of NSA on the nutrition situation in the country. Hence, this study aims to determine the effectiveness of capacity building in improving the local agriculture workers' knowledge, attitude, and self-efficacy towards NSA. Specifically, it aims to determine the knowledge, attitude, and self-efficacy of local agriculture planners toward NSA. Lastly, it also sought to identify the association of different demographic factors with the knowledge, attitude, and self-efficacy scores' differences after capacity building.

METHODS

Research Design

This study considered a non-randomized, one-group pre-test-post-test design, to assess the effectiveness of a designed capacity-building program among local agriculture planners to improve their knowledge, attitude, and self-efficacy towards NSA. A comparative group was not recruited to evaluate the effect of the designed intervention. The research design also allows for determining the changes in the level of knowledge, attitude, and self-efficacy of local agriculture planners on NSA after capacity building.

Study Sites

CALABARZON region which has the largest population in the Philippines accounting for 14.41 million people was the area considered in the study.[22] The region is situated in the southwestern part of Luzon and bounded by the National Capital Region and Bicol Region. CALABARZON is the fifth smallest region in the country and is composed of Cavite, Laguna, Batangas, Rizal, and Quezon. It has 18 cities, 124 municipalities, and 3,985 barangays that cover its 16,560 square kilometer land area.[23]

In terms of agriculture, the total agriculture production in CALABARZON rebounded from 2014 to 2015. The growth can be explained by improved performance in livestock, poultry, crops, and other subsectors. In 2015, the total agriculture sector of the region earned Php135.92 billion but showed a remarkable decrease of 0.62% compared to 2014. In 2015, a contraction of 6.12% for crops, 5.28% for livestock, and 3.32% for poultry was documented. However, the average farm gate prices of fisheries and aquaculture products increased by 3.99%.[24]

Despite agriculture advancement in the region, malnutrition among preschool and school children remains a significant public health concern. Based on the recent survey, the prevalence of stunting among preschool children at the region was 23.7% indicating a medium severity of public health significance. Moreover, the existence of double burden of malnutrition in the region was evident suggesting that 5.4% and 5.0% of preschool children were wasted and overweight, respectively. Aside from the poor nutritional outcomes among children, the prevalence of overweight/obesity among adults in the region was observed at 42.1%, next to the National Capital Region with the highest prevalence.[25]

Sample Size and Survey Design

The sample size was computed using the following formula:

$$n = \frac{P(1-P)(Z_{\beta} + Z_{\alpha})^2}{diff^2}$$

where P is defined as the perceived proportion of outcome; Z_{β} pertains to the Z- variate for power; Z_{α} is defined as the Z-variate for level of significance; and *diff* is the difference between the proportions of outcome. Hence, with an 80% power of the test and a 95% level of confidence with a 10% attrition rate for possible dropouts, the sample size was computed as 52 respondents. Study participants were selected from the list of municipalities in CALABARZON using the simple random sampling method.

The randomly selected municipalities were invited to send participants to join the capacity building. The following inclusion criteria were strictly implemented: (1) Municipal Agriculturist/ Municipal Agriculture Officer or a legitimate representative of the municipality involved in the crafting of the local agriculture development plan; (2) must be willing to participate in the 3-day capacity building; (3) must be involved in the preparation of the municipal agriculture development plan.

Capacity Building as an Intervention

A desk review of existing materials related to the NSA and key informant interviews among the provincial agriculturists and selected municipal agriculturists were conducted prior to capacity building. The main references included in the desk review includes the Compendium of indicators for NSA, Agriculture Training Manual of the Feed The Future Ethiopia Growth through Nutrition Activity, and related literature on the use of NSA initiatives on improving nutritional outcomes.[26-28] Aside from the local literature on NSA, different nutrition education materials from the National Nutrition Council, Food and Nutrition Research Institute, and International Institute of Rural Reconstruction were also reviewed. Lastly, the Ambisyon Natin 2040, Updated Philippine Development Plan 2017-2022, Philippine Plan of Action for Nutrition 2017-2022, and other developmental frameworks were also included in the review. [29-31]

The findings from desk reviews and key informant interviews were used to develop a manual on NSA. The manual was designed to improve the knowledge, attitude, and self-efficacy of the local agriculture planners towards NSA. The developed manual underwent pre-testing facilitated by five experts in nutrition and agriculture.

The developed manual on NSA was divided into three modules: (1) Basic of Nutrition; (2) Introduction to NSA; and (3) Steps in Integrating NSA in the Municipal Agriculture Development Plan. Each module was equipped with guided preliminary activities and evaluation. A training plan has been devised aligned to the manual with different activities that were facilitated by resource persons from different institutions. After finalizing the capacity building program, the recruited participants underwent a 3-day training program.

After the finalization of the training manual and plan, Letter of Invitation was sent to the selected municipalities to join the 3-day online training program. Prior to training, baseline information and a pre-test was conducted to collect the demographic profile of the participants and measure

their existing knowledge, attitude, and self-efficacy on NSA. The 3-day training program includes didactic lecture, panel discussion, and writeshop/ workshop.

Research Instrument

To evaluate the capacity building, the following tool was used to assess the changes in knowledge, attitude, and self-efficacy of the local agriculture planners and the nutrition sensitivity of the local agriculture development plan:

Demographic profile of the respondents. The first part of the tool collected information on the general demographic profile of the local agriculture planners and the municipality.

Knowledge. To measure the knowledge of the local agriculture planners on NSA, a total of 26-item questions were used after the inter-rater reliability test. The total knowledge score was categorized into three levels using Bloom's cut-off point (60–80%): low level (less than 60%), moderate level (60–80%), and high level (more than 80%).

Attitude. To measure the attitude of the local agriculture planners toward the NSA, a total of 17-item questions were used after the inter-rater reliability test. Total attitude scores were categorized similarly to the knowledge scores, i.e., using Bloom's cut-off point (60–80%). Attitude scores were categorized as poor (less than 60%), neutral (60–80%), and good (more than 80%).

Self-efficacy. To measure the self-efficacy of the local agriculture planners on NSA, a total of 16-item questions were used after the inter-rater reliability test. The combined self-efficacy scores of the respondents were also categorized into three levels using Bloom's cut-off point (60–80%), i.e., low confidence (less than 60%), fair confidence (60–80%), and high confidence (more than 80%).

The developed questions was adopted from the Compendium of Indicators for Nutrition-sensitive Agriculture indicating the components of NSA and its corresponding key indicators.[27] The developed questionnaire underwent face validation and pre-testing to check its inter-rater reliability and internal consistency. Comments of the experts during the face validation was used to revised the research instrument before pre-testing.

Validity and Reliability of the Research Instrument

To ensure the validity of the research instrument, the questionnaire was subjected to face validation by eight experts in nutrition and agriculture, and pre-testing. The face validation of the research instrument refers to the extent of the subjective agreement of experts towards the ability of the tool to measure what it intends to measure. The data from the face validation was analyzed using Cohen's Kappa Index (CKI). The kappa statistic is commonly used to evaluate the inter-rater reliability of a test based on the answers of the experts. Inter-rater reliability is essential since it measures the extent to which the collected data are correct representations of the variables being measured. The kappa statistic can range from –1 to +1. The lowest acceptable kappa level used was 0.60 for interrater agreement.[32] All parameters (knowledge, attitude, and self-efficacy of local agriculture planners) of the research instrument had an acceptable overall CKI inter-rater reliability score.

Furthermore, the pretesting to determine the reliability of the instrument was done among 15 participants from Occidental Mindoro. Internal consistency was measured using the Cronbach alpha coefficient. To have a good level of internal reliability, a minimum internal consistency coefficient of 0.70 must be achieved before the actual implementation of the data collection.[33] The reliability scores of all parameters used suggested acceptable reliability scores, indicating the reliability of the questionnaire to assess the knowledge, attitude, and self-efficacy of the agriculture workers toward NSA.

Data Encoding and Editing

Data were reviewed during coding, encoding, and editing to ensure that the information gathered was complete, consistent, and accurate for the data analysis. A coding manual allowed for more straightforward checking and validation of information. The data gathered were encoded using Microsoft Excel, while the data were verified using STATA 15 to ensure the accuracy and correctness of the figures before proceeding to data analysis.

Data Analysis

For qualitative variables, frequencies and proportions were reported to describe the distribution of respondents according to categories. Meanwhile, descriptive summary measures like mean, median, and standard deviation were reported for quantitative variables.

The test procedure t-test for related samples was used to determine if there were significant changes in the mean score in the knowledge, attitude, and self-efficacy of local agriculture planners toward NSA. Furthermore, to determine factors significantly associated with score differences in the knowledge, attitude, and self-efficacy scores of the local agriculture planners towards NSA after the capacity building, the correlation coefficients used include Spearman's rank correlation for quantitative explanatory variables because of the non-normality of the data on score differences, ETA for qualitative explanatory variables, and point biserial for binary variables. Also, the Spearman rank of association was used to determine if the positive change in knowledge was significantly related to the positive change in the attitudes and practices towards NSA of local agriculture planners in CALABARZON.

Ethical Consideration

Prior to the conduct of the study, the participants were asked to sign the Informed Consent Form outlining their rights and confidentiality of information shared during the research process. The conduct of this study is also compliant

to the Data Privacy Act of 2012 in safeguarding the information shared by the participants during the research. The protocol of this study was approved by the Batangas Medical Center-Research Ethics Review Committee with research protocol code BatMC RERC-2021-015. The said committee was also responsible for monitoring and keeping track of this research as an ethical approval body for this study.

RESULTS

Demographic Characteristics of Local Agriculture Planners in CALABRZON

Table 1 presents the demographic characteristics and training attended by the local agriculture planners who participated in the capacity building on NSA in CALABARZON. The majority (70.7%) of the participants were female and married (63.8%), with a mean age of 43.0 and a standard deviation of 12.7 years. At least fifty percent of the respondents were aged 45 years or younger. Meanwhile, most (70.7%) of the participants were college graduates, and some (15.5%) had a master's degree. Furthermore, the majority (82.8%) of the participants had a permanent designation in the government, while above half (55.2%) had a monthly income of ≤ PHP 32,053.00. Lastly, almost half (44.8%) of the participants were designated as Municipal Agriculture Officers/Municipal Agriculturists, and some (37.9%) were Agriculture Technicians Extensionists (Table 1).

In terms of training, the majority (86.2%) of the local agriculture planners did not participate in any NSA training, seminars, capacity building, or other related activities before the conduct of this study. However, only a few (10.3% and 3.4%) had attended 1-to 2 training and more than two trainings before this study, respectively. On the other hand, almost a third (32.8%) were part of the local nutrition committee, of which some were members (24.1%), and only a few (8.6%) were also designated as Municipal Nutrition Action Officers (Table 1).

Change in the Mean and Median Scores in Knowledge, Attitude, and Self-efficacy of Local Agriculture Planners on NSA after the Capacity Building

Table 2 summarizes the changes in the knowledge, attitude, and self-efficacy mean scores of the local agriculture planners towards NSA after the conducted training. After the training, there was a significant increase in terms of the mean knowledge score ($p < .0001$), mean attitude score ($p = .0001$), and self-efficacy score ($p < .0001$) of municipal agriculturists on NSA in CALABARZON. Thus, a significant improvement in the knowledge, attitude, and self-efficacy of municipal agriculturists after capacity building can be concluded. Furthermore, the highest improvement was observed in the mean knowledge scores of municipal agriculturists after the capacity building.

Moreover, significant differences were observed between the median knowledge, attitude, and self-efficacy scores of the participants before and after the training. The highest improvement was also noted in the median knowledge scores of the participants. Details are shown in Table 2.

Relationship between the Knowledge, Attitude, and Self-efficacy Score's Change of the Local Agriculture Planners towards NSA after the Capacity Building

Table 3 shows the relationship between knowledge, attitude, and self-efficacy score changes among the local agriculture planners towards NSA after the training. There

Table 1. Demographic Characteristics of the Local Agricultural Planners in CALABARZON, 2021

Demographic Characteristics	n	(%)
Age (in years)		
Mean ± SD	43.02 ± 12.66	
Skewness	-0.04	
Sex		
Male	16	29.3
Female	41	70.7
Highest Educational Attainment		
Vocational/ Diploma	3	5.2
College (BS)	41	70.7
With Masteral (MS/ MA) Units	4	6.9
Masteral Graduate/ or with PhD Units	8	15.5
Doctoral (PhD)/ DMV	1	1.7
Marital Status		
Single	17	29.3
Married	36	63.8
Widowed	4	6.9
Tenure		
Job Order/ Contractual	9	17.2
Permanent	48	82.8
Monthly Income (in PhP)		
<32,053.00	31	55.2
32,053.00- 59,353.00	4	6.9
59,353.00- 75,359.00	17	29.3
>75,359.00	5	8.6
Position/ Designation		
Office of the Agriculture Staff	10	17.2
Agriculture Technician/ Extensionist	21	37.9
Municipal Agriculture Officer/ Agriculturist	26	44.8
Participation in nutrition-sensitive agriculture training, seminars, etc.		
Yes	9	13.8
No	48	86.2
Number of NAS trainings attended		
None	48	86.2
1-2 trainings	7	10.3
>2 trainings	2	3.4
Membership in Local Nutrition Committee		
Yes	19	32.8
No	38	67.2
Designation in the Local Nutrition Committee		
Municipal Nutrition Action Officer	5	8.6
Member	14	24.1
No Designation	38	67.2

Table 2. Mean and Median Scores on Knowledge, Attitude, and Self-efficacy on NSA among Local Agriculture Planners before and after the Training

Parameters	Statistics	Scores		*p*-value
		Before (%)	After (%)	
Knowledge	Mean	62.27 ± 14.15	77.40 ± 8.85	<0.0001
	Median	69.23	80.77	<0.0001
Attitude	Mean	79.96 ± 15.90	88.39 ± 7.65	0.0001
	Median	81.18	89.41	<0.0001
Self-efficacy	Mean	75.92 ± 17.33	87.57 ± 12.09	<0.0001
	Median	80.00	90.00	<0.0001

Table 3. Relationship between the Knowledge and Attitude with Self-efficacy Score's Differences of the Municipal Agriculturists towards NSA after the Capacity Building

Factors	Spearman Rank Correlation	*p*-value
	Change in Attitude	
Knowledge	0.3484	0.0079
	Change in Self-efficacy	
	0.1870	0.1636
Attitude	0.2260	0.0910

Table 4. Measure of Association between the Socio-demographic Factors of the Participants with the Score's Differences in Terms of Knowledge, Attitudes, and Self-efficacy toward NSA

	Knowledge		Attitude		Self-efficacy	
	Coefficient	*p*-value	Coefficient	*p*-value	Coefficient	*p*-value
Age [a]	-0.1023	0.4480	-0.0513	0.4228	0.0001	0.9993
Number of trainings attended related to NSA [a]	-0.1076	0.4256	0.0381	0.7786	-0.0544	0.6874
Province [b]	0.0924	0.2060	0.3249	0.6817	0.1989	0.9953
Highest Educational Attainment [b]	0.3675	0.1292	0.1479	0.8640	0.1931	0.7154
Marital Status [b]	0.1822	0.4104	0.1094	0.6330	0.1523	0.4027
Tenure [b]	0.1985	0.3380	0.2322	0.0068*	0.2709	0.3095
Monthly Income [b]	0.2740	0.3681	0.0779	0.5729	0.1784	0.6674
Position/ Designation [b]	0.2233	0.2510	0.0404	0.5969	0.0979	0.7051
Sex [c]	0.2085	0.1196	0.1072	0.4278	0.0012	0.9930
Attendance to training related to NSA [c]	0.0915	0.4982	-0.1144	0.3968	0.0338	0.8027
Membership to the local nutrition committee [c]	0.2890	0.0292*	0.1440	0.2850	0.2890	0.0292*

**significant at α=0.05; [a] Spearman's rank correlation, [b] ETA, [c] Point biserial*

was a significant association between the change in knowledge and change in attitude after the capacity building (p-value= 0.0013). Moreover, the association was observed to be positively weak (r= 0.3484; p-value= 0.0079). Lastly, there was not sufficient evidence to conclude that the change in knowledge and attitude was associated with the change in self-efficacy.

Association of Different Demographic Factors to the Score's Differences in Terms of Knowledge, Attitudes, and Self-efficacy towards NSA after the Capacity Building

Table 4 presents the measure of the association of different demographic factors with the local agriculture planners' knowledge, attitudes, and self-efficacy scores toward NSA. It was observed that membership in the local nutrition committee was associated with the change in knowledge of the participants after the capacity building, moreover, the association was found to be positively weak (r= 0.2890; p= 0.0292). Furthermore, membership in the local nutrition committee positively affected the change in knowledge after the training. However, the significant relationship observed was not strong. Furthermore, it was also observed that the tenure of participants in their present work was associated with their change in attitude after the training. However, the association was found to be weak (r= 0.2322; p= 0.0068).

Lastly, the result of the study also suggested that membership to the local nutrition committee was significantly associated with the change of self-efficacy among participants after capacity building, whereas the association was found to be positively weak (coefficient= 0.2980; p= 0.0292). Moreover, if a participant was a member of the local nutrition committee, they tended to have higher self-efficacy after the capacity building.

DISCUSSION

The Local Agriculture Planners in CALABARZON

The result of this present study about the socio-demographic profile of the participants was supported by different literature suggesting that personnel employed in the municipal agriculture office experienced work displacement due to devolution. The devolution of agricultural basic services stemmed from a substantial deterioration of service conditions among agriculture personnel resulting in demoralization. Many tenured agriculture personnel lost

their tenured position, were deployed to other assignments and offices, or were transferred to remote areas, leading to resignations. Moreover, some tenured personnel experienced demotion in rank, including their salary, while others remained stagnant in their respective ranks without any chance of being promoted.[34,35]

In addition, the only position that agriculture personnel can aim for is the post of municipal agriculturist, but the position/ rank is usually limited. Moreover, it will take a long time for the position/rank to be vacated, different if the item positions came from the national level due to the upward vertical mobility of positions. These employment conditions resulted in the displacement of many agriculture personnel from the Office of the Municipal Agriculturist to other positions not related to their job descriptions as Agricultural Technicians.[34,35]

This present study observed that most of the respondents were female, but based on different studies, males were more likely to pursue agricultural courses of study in school. However, these male agriculturists had limited ability to deliver gender-sensitive services and nutrition programs and activities.[36]

Training Related to NSA and Designation in the Local Nutrition Committee

In this present study, only a few of the participants had training in NSA despite the promising role of this concept in nutrition and food security. Despite the significance of training and scholarships for agriculture personnel in the technology transfer, limited opportunities were given to agriculture personnel at the local level.[34] According to the Philippine Association of Municipal Agricultural Officers/ Municipal and City Agriculturists, agriculture personnel have a low chance of attending training or receiving scholarships due to devolution because employees at the national level are usually prioritized.[14] In addition, the local government has a limited budget allocated for capacity building, training, and scholarships to fuel the need for career advancement of the agriculture personnel.

Moreover, it was also observed that in some LGUs, agriculture is not a priority or there is an existing political difference. This resulted in a more complicated implementation of agriculture programs and special projects supported and sponsored by national agencies. Political patronage always rules, even for special projects to be implemented by the national government, which incurs higher costs for agriculture projects.[37] Furthermore, the Office of the Regional Director of DA has no power to appoint agriculture personnel to carry out the project unless instructed by their respective LGU. This can hamper the implementation of the national programs at the local level. This also deteriorates the prompt submission of pertinent reports, information, and data at the provincial and municipal level. Thus, the coordination at the regional level must be more personal than institutional, which can affect the monitoring performances of the LGU.[14,35]

In this present study, only a few municipal agriculture personnel were members of the local nutrition committee even though it was mandated that they serve as co-chairs of the committee, assisting the Municipal Nutrition Action Officer. This can be explained by the multiple designations assigned to them by the local chief executives. The literature cited that some agriculture personnel was assigned as market collectors, cash clerks, staff detailed in the nutrition office, social welfare and municipal assessor, and any other departments. There were also instances that agriculture personnel were designated as market administrators, environmental officers, traffic officers, and other nonrelated positions, leading to dissatisfaction.[14,34]

However, it cannot be assumed that the devolution of agricultural services is accountable for the lag in agricultural efficiency. Nevertheless, if the LGUs continue to disregard improving the technical capacity of agriculture personnel, it can contribute to the stagnant situation of agriculture at the local level. Lastly, the insufficient agriculture data from the LGUs is already a marker of neglect.

Change in Knowledge, Attitude, and Self-efficacy of the Local Agriculture Planners towards NSA after the Capacity Building

Capacity building was used to improve the knowledge, attitude, and self-efficacy of local agriculture planners towards NSA. The improvement is expected to assist them in planning a nutrition-sensitive municipal agriculture development plan. Positioning agriculture to enhance nutrition security needs agriculture personnel who can understand nutrition objectives and weave agriculture into health and nutrition programs to create a common goal.[38]

The record on capacity strengthening for nutrition is generally poor in the past. It can be explained by poor training programs and curricula for nutrition and agriculture.[39] Numerous studies focusing on capacity assessment are usually created in high-burden contexts, outdated training materials and curricula, and unpractical and misaligned targets with local nutrition objectives.[40] Meanwhile, unlike past studies, the present study shows improvement in the local agriculture planners' level of knowledge, attitude, and self-efficacy toward NSA. This is consistent with the findings of Lam-Antoniades, Ratnapalan, and Tair, which indicated that the conducted online course impacted participants' behavioral intentions and that reasonable changes in practice would follow.[41]

Many participants had poor knowledge but not in terms of attitude and self-efficacy toward NSA before capacity building. The result is consistent with related research showing that agriculture workers had poor nutrition-related knowledge while good attitudes across most nutrition constructs were observed. Critical nutrition knowledge remains low among agriculture workers.[42] The inadequate knowledge of agriculturists can be justified by a lack of understanding of nutrition concepts and the absence of joint planning. This results in a lagging practical understanding of nutrition concepts among agriculture personnel. In the past,

the disciplines of nutrition and agriculture adopted different priorities and languages that further constrained their integration.[19]

The level of knowledge of local agriculture planners on NSA was lower compared to other constructs. In the study conducted by Fanzo et al., awareness and knowledge tend to be suboptimal, but reported behaviors were adequate.[19] These nutrition knowledge needs must be effectively shared with rural households in the context of food and agricultural systems, and commodity value chains. In a related study by Sharma and Rani, nutrition-related attitudes and practices were somewhat better, but the quality of information established from these constructs is inadequate.[43] Moreover, the use of e-learning interventions can help enhance knowledge of nutrition among non-nutrition professionals.

Based on the baseline information collected before capacity building, the need to conduct continuous education is very vital to improving the ability of agricultural extension agents and planners to efficiently integrate the basic concepts of nutrition in planning and implementing their activities.[44] Aside from the technical concepts of nutrition, soft skills are also required to integrate other nutrition-related skills. In addition, strong critical thinking and problem-solving skills are also essential to ensure effective planning and implementation. However, at present, educational gaps are observed.[38] Thus, a capacity-building plan should be based on preliminary assessments and contextualized to the existing systems of the agriculture sector. In addition, capacity building for non-health sectors must be tailored to the nutrition competencies expected from the sectors.[45]

Like knowledge and attitude, significant improvement was noted in the self-efficacy of the local agriculture planners towards NSA after the capacity-building activities. Essentially, self-efficacy pertains to the self-confidence one must have to produce the desired end goal. The level of self-efficacy can impact an individual's dedication, persistence, motivation, goals, choices, and how they respond to a challenge.[46] People with high self-efficacy tend to be more confident and optimistic, and can recover from failures and disappointments.[48] Furthermore, people with low self-efficacy tend to be less confident which results in the avoidance of challenging tasks.[47] Consequently, self-efficacy can be affected by mastery or failure at a task, social comparison, verbal persuasion, or emotional arousal when a task seems simple due to a lack of challenges.[47] Research in many disciplines has supported the role of teaching training in increasing teacher self-efficacy.[48-50]

However, changes in knowledge, attitude, and self-efficacy do not warrant practice changes. The decision of local agriculture planners to perform the learned concepts of NSA is affected by their ability to rationalize radically, which requires autonomous social agents and motivation.[51,52] Furthermore, change in practice would only be possible if the required requirements of activities related to NSA also fit the talents and skills of participants.

Relationship between the Changes in Knowledge, Attitude, and Self-efficacy of Local Agriculture Planners towards the NSA

Even though this study is premised on the idea that there is a possible relationship between knowledge, attitude, and self-efficacy among local agriculture planners, the present study suggests that the change in knowledge has a significant relationship with the change in attitude but not with self-efficacy. Moreover, the change in attitude did not warrant a positive change in self-efficacy.

The results of this study were supported by the suggested gap between knowledge and practices about nutrition, which can be further explained by attitudinal assessment. The increased knowledge does not warrant an improved self-efficacy and practice. This can be explained by Health Belief Model stipulating that the willingness of individual to take an action depends upon their attitudes, beliefs, and other factors influencing the decision to act including barriers and cues to action. These concepts includes perceived susceptibility, perceived seriousness, perceived benefits, perceived barriers and psychological costs of the advised action.[53] Thus, nutrition-related attitudes should be channeled as a potential strategic technique of nutrition education using the Health Belief Model.[54,55] It has also been suggested that the increasing number of initiatives that can support the integration of nutrition interventions into agriculture investment plans were already been made available and can already be considered comprehensive plans.[56]

Also, the observed findings on the relationship of knowledge to attitude can be supported by the fact that participants' attitudes towards nutrition were increasingly positive as the study progressed, although not significantly. Another reason that can be explained is the consistency of the findings with other research designs and recognizing the importance of nutrition in health can affect the participants' behavior.[57]

Meanwhile, self-efficacy was expected to improve after the intervention, which can be attributed to the simultaneous increase in knowledge about NSA. As mentioned earlier, subjecting agriculture planners to nutrition education can increase the level of comfort that will facilitate behavior change.[58] However, the relationship between self-efficacy and practices is argued.[59] The direction of the relationship is very vital to understanding the change in behavior, which can be explained by social cognitive self-regulation through the Social Cognitive Theory.[60] The Social Cognitive Theory suggests that interventions must aid individuals to develop self-efficacy in specific area considering the physical and social characteristics of the environment. Higher levels of self-efficacy can eventually lead to the modification and improvement in the self-regulatory skills which is important in maintaining behavior change.[61]

Thus, understanding the processes of change can help determine the constructs that need priority, especially interventions with scarce resources.[62,63] Extreme scores for

practices can also lessen the relationship between behavior and self-efficacy. An individual might have high self-efficacy but not perform the practice because of expectations.[64]

Factors Affecting the Changes in the Score of Knowledge, Attitudes, and Self-efficacy of Local Agriculture Planners on NSA after the Capacity Building

Although improvement was noted in the knowledge, attitude, and self-efficacy of the local agriculture planners in CALABARZON, other factors might affect the change. It was observed in this present study that only the membership of participants in the local nutrition committee positively contributed to the changes in knowledge and self-efficacy of the local agriculture planners. The mechanism for collaboration pertains to the involvement of different stakeholders from the government and non-government agencies by increasing their awareness of the need to bridge the gap between the agriculture sector and nutrition and health. However, many developing countries still have disjointed institutions that tackle agriculture, health, and nutrition. The case of Mongolia provides positive outcomes when the agriculture sector addresses nutritional issues. It provides an avenue for the paradigm shift that the agriculture sector must adopt a nutrition-sensitive agro-food system to maximize the outcome of the programs.[65] Moreover, the level of professional education affected nutrition knowledge. Respondents with degree qualifications had very good nutrition knowledge and practices.[66]

Meanwhile, the tenure of the local agriculture planners was found to be significantly related to the positive change in their attitudes towards NSA. However, the devolution of agricultural programs and activities at the local level put an overly decentralized extension system. Moreover, due to financial constraints, several municipalities often dispense with the hiring of agriculturists at the local level because these are optional positions leading to low number of tenured positions in the agriculture office.[17] The lack of resources and overly decentralized system contributes to the gap between research and extension that may affect the attitude of non-tenured personnel towards a new initiative in the agriculture office.[14,34]

However, the recent findings is inconsistent with existing literature suggesting that the educational attainment of the agricultural extension agents was not associated with the change in knowledge, attitude, and self-efficacy. This can be explained by the consideration citing that the intellectual capacity to integrate nutrition concepts in their agricultural expertise, was significantly related to their knowledge.[36] Aside from their highest educational attainment, their current designation is also a concern. Many agriculture employees work long days, and adding NSA to their plates is an obvious concern. However, integrating NSA into their municipal agricultural services is viable.[19]

In related studies, gender and age were observed to be related to the level of knowledge of study participants about nutrition. Gender was found to be a factor related to knowledge about nutrition, particularly among women.[67,68] Nutrition training and services traditionally attract female extension staff to promote and support nutrition-enhancing activities. Meanwhile, in the study of Moses, male respondents had higher nutrition knowledge than their female counterparts.[66] In addition, young agriculturists appeared to have the desire for higher competence because of societal pressure. They perceived that a lower competence level in the performance of their duty would greatly affect their reputation and could also possibly decrease their future income.[69]

Limitations of the Study

This study utilized a non-randomized controlled trial hence, comparative group was not recruited to evaluate the effect of the designed intervention. In addition, causality is more difficult to be identified in non-randomized trials because the lack of random assignment means other factors could explain the observed outcomes. Hence, the generalizability of this research might be only limited to the study participants. To account for this, a well-defined inclusion and exclusion criteria was set and possible confounding variables were controlled using statistical analyses. Lastly, the research design cannot distinguish whether the change in knowledge, attitude, and self-efficacy was a result of the method of instruction (online) or the design of instruction as an approach, independent of the method being used.

CONCLUSION

The present study revealed that capacity building on NSA among local agriculture planners could significantly improve their knowledge, attitudes, and self-efficacy regarding the topic. Meanwhile, the difference in scores in knowledge and self-efficacy after capacity building was positively affected by participants' membership in the local nutrition committee. It was also observed that tenure positively affected the participants' attitude towards NSA. Thus, capacitating local agriculture planners can significantly improve their knowledge, attitudes, and self-efficacy toward NSA.

Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

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