



Knowledge, Attitude and Practices of Nutrition Workers on Climate Change in Laguna, Batangas and Cavite Provinces, Philippines

ABSTRACT

Climate change and malnutrition are two global phenomena that affect millions of population groups. The Philippines is considered one of the most vulnerable countries for extreme natural events and at the same time has a high prevalence of underweight (19.0%) and stunting (28.8%) in 2019 among under five children. The nutritionally vulnerable groups are children, pregnant and lactating women, and elderly. These groups are also greatly affected by climate change-related events then the malnutrition situation is exacerbated. The local nutrition workers are the frontline workers who plan, implement, and monitor nutrition programs. Mainstreaming climate change in the local nutrition planning processes will be facilitated if nutrition workers are knowledgeable. This study aimed to determine the current knowledge, attitudes and practices of nutrition workers and perceptions on how to mainstream climate change in the nutrition sector's local planning system. A survey was conducted among local nutrition workers. Ninety-five percent of nutrition workers were highly knowledgeable, 86% were with high level of attitudes and 50% were exhibiting moderate level of practices related to climate change. The gaps can be narrowed by capacity building and possibly this can lead to mainstreaming climate change in the local nutrition planning process.

Keywords: malnutrition, climate change, nutrition workers, capacity building

Maria Theresa M. Talavera^{1*}

Angelina R. Bustos¹

Carmelita M. Rebancos²

¹ Institute of Human Nutrition and Food, College of Human Ecology, University of the Philippines Los Baños (UPLB), Philippines, College, Laguna 4031

² School of Environmental Science and Management, UPLB

*corresponding author:

mmtalavera@up.edu.ph

INTRODUCTION

Globally, malnutrition and climate change are both recognized as problems that are threats to human health (Dietz 2018). The Philippines is also experiencing the same problems. The high prevalence of underweight and stunted children are considered of public health significance at 19.0% and 28.8%, respectively (DOST-FNRI 2020). The Philippines is one of the countries that are vulnerable to the effects of climate change including typhoons. Greenhouse gas emissions are causing climate change, and this is contributing to stronger typhoons (Holden and Marshall 2018). Around 20 typhoons occur in the country in a year (PAGASA n.d.). The Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) has projected that for extreme events that may occur in 2020 and 2050, hot temperatures would continue to become more frequent, the number of dry days will increase in all parts of the country, and events of heavy daily rainfall exceeding 300 mm will also continue to rise in Luzon and Visayas (PAGASA 2011). It is estimated that climate change will lead to a relative increase in moderate stunting of 1-29% in 2050 compared with a future without climate change and that the rates of severe

stunting are estimated to increase by 23% in central Sub-Saharan Africa to 62% in South Asia (Lloyd et al. 2011).

Climate change and undernutrition are inextricably linked (Tirado et al. 2013). On one hand, climate change has specific effects on nutritionally vulnerable population groups, such as children and pregnant and lactating women. Climate affects food security (FAO, IFAD, and WFP 2015). Climate change affects the factors needed to achieve food security, such as food and water, necessary for populations to meet their nutritional requirements and adequately grow and develop. It also challenges the realization of human rights for adequate food and health. Climate change will also affect nutrition through different causal pathways that affect food security, sanitation, water and food safety, health, maternal and child health care practices, access to health services and many socio economic factors (UN-SCN 2010; Fanzo et al. 2018). On the other hand, undernutrition can exacerbate the effects of climate change. Such situations necessitate considerable efforts to prepare the Philippines to deal with climate change's impact on different climate-sensitive sectors, including nutrition.

Nutrition workers in the Philippines are the frontline staff in carrying out program planning and management functions for the delivery of nutrition services in their respective LGUs. Specifically, they are the Provincial Nutrition Action Officers (PNAO), Municipal/City Nutrition Action Officers (M/CNAO), District/City Nutrition Program Coordinators (D/CNPC), Barangay Nutrition Scholars (BNS); and members of the Local Nutrition Committees (LNCs). No training on climate change and nutrition has been provided to the nutrition workers.

While there are existing policies on mainstreaming climate change in local plans, this has not been explored yet in the local nutrition planning process wherein the output is a Local Nutrition Action Plan (LNAP). Mainstreaming climate change refers to the full integration of climate change adaptation policies into national development programs (Huq *et al.* 2003). It also refers to integrating climate change considerations into planning and decision-making processes (UNDP Colombia 2010). The National Nutrition Council (NNC) is the policy-making body in the country and has institutionalized local nutrition program planning and management as stipulated in the NNC Governing Board Resolution No. 3, Series of 2014. The formulation of local nutrition action plans (LNAP) and their integration into the local development plan and annual investment plan will help ensure that nutrition action at the local level is strategic and purposive. However, the LNAP does not contain climate change considerations yet. Moreover, there is a need to focus on damages brought about by climate events and focus more on adaptation strategies to better cope with the changes in climate and their impact on the individual nutrition status particularly of the vulnerable groups, such as children, pregnant women, and elderly and the nutrition situation of the community.

In order to mainstream climate change in the local nutrition planning process, the nutrition workers should have the capacity to do so. Few studies on climate change have been conducted in the Philippines, but not on its link with nutrition and the respondents are not nutrition workers. For one, the study of *Lubos and Lubos (2019)* had settlers as respondents and focused on their knowledge, attitudes, practices (KAP), and action on climate change. The study of *Lopez and Malay (2019)* among senior students showed moderate to high level of awareness on issues concerning climate change. Likewise, the study of *Barreda (2018)* revealed the level of awareness is generally higher among senior students than first year students. Very few countries have KAP studies on climate change and nutrition. Examples are

Belize (UNDP and Japan-Caribbean Climate Change Partnership 2016) and Nepal (Oli *et al.* 2018).

In the nutrition sector, KAP studies have been used to collect key information during a situation analysis, which can then feed into the design of nutrition interventions (Macias and Glasauer 2014). There have been no data the nutrition workers have been informed or trained about climate change and the link of climate change and nutritional status. Thus, this study was conducted to determine the knowledge, attitudes, and practices of local nutrition workers on climate change and their perceptions on how to mainstream climate change in the local nutrition planning process.

MATERIALS AND METHODS

This study used a cross-sectional study design wherein the exposure and the outcome variables are examined at one point in time. Thus, causal association cannot be established (Boushey *et al.* 2006). The respondents were composed of 79 local nutrition workers from the provinces of Laguna, Batangas, and Cavite in the Philippines (Figure 1).

The researchers developed a self-administered questionnaire that covered respondents' institutional and personal profiles; and knowledge, attitudes, and practices on climate change; and respondents' perception on mainstreaming climate change into the local nutrition action plan (LNAP). For knowledge, the respondents were categorized as having low (0-4 points), moderate (5-8 points) or high (9-13 points) scores (total score is 13). The same categorization was done for the scores in attitude. For practice, the total score was 19; thus, the grouping was as follow: low (0-6 points), moderate (7-12 points), and high (13-19 points). The self-administered questionnaire was pretested among local nutrition workers with similar characteristics. The questionnaires were either mailed to the participants or administered during meetings called by the head of the provincial or regional nutrition offices. Coordination with the regional and provincial nutrition offices to inform them of the study and the involvement of the nutrition workers was conducted before the data collection. Written consent was sought from the respondents. Descriptive statistics was applied such as mean, frequency and percentages. A Spearman rank correlation was used to evaluate the possible association between knowledge-attitudes (K-A), knowledge-practices (K-P), and attitudes-practices (A-P) scores. Spearman's correlation coefficient measures the strength and direction of association between two ranked variables.



Figure 1. Map of the study site.

RESULTS AND DISCUSSION

Profile of Respondents

The socio-demographic profile of the respondents showed that majority belonged to the age group of 41 to 60 years old (**Table 1**). Of the 79 respondents, most were female (85%) and married (68%). In terms of educational attainment, 62% were college graduates. The respondents work in the local government units as Provincial Nutrition Action Officers (PNAO, 3%), Municipal Nutrition Action Officers (MNAO, 52%), and City Nutrition Action Officers (CNAO, 20%). The remaining 35% were members of the Local Nutrition Committee (LNC) and were employed in various positions. Most of the respondents were regular/full-time employees. All respondents are considered as nutrition workers as they perform tasks related to nutrition.

Nutrition Workers' Knowledge on Climate Change

The majority (80%) of the respondents were aware of climate change (**Figure 2**). Television was the primary (40%) source of information on climate change. Others received information from the radio (16%), Citizens Band Radio (6%), friends (13%) and own observations (8.0%). A few (14%) of the respondents attended training/seminars on climate change and related topics, such as

nutrition in emergency, disaster management, teaching environmental science, climate change and health, and climate change and mitigation. The rest do not have any source of information (3.0%).

Many of the local nutrition workers are knowledgeable about aspects of climate change (**Table 2**). More than 85% of the respondents correctly answered 'true' for statement numbers 1 to 10 and number 13; and 65% in statement number 12. More (57%) respondents incorrectly answered 'false' in statement number 11. Many of the respondents recognized that climate change is a global problem and a concern in the Philippines. Respondents have a grasp of the effects of climate change, such as drought, heavy rainfall increases risk of flooding, increase in temperature, reduced rainfall, which may lead to water shortages. Respondents believed that climate is a factor that should be considered in agricultural production and fishing; hence, information on climate variables can aid in production decisions. However, there was a low appreciation of breastfeeding's likeliness getting disrupted during typhoons, flooding, and extreme temperatures. Climate change can affect women and children.

Nutrition Workers' Attitude on Climate Change

The majority of the respondents disagreed that that

Table 1. Profile of the nutrition workers in Laguna, Batangas and Cavite, Philippines, 2016.

Socio-demographic Variables	Frequency (n=79)	Percentage (%)
Age		
20-30	10	12.7
31-40	14	17.7
41-50	17	21.5
51-60	28	35.4
61-70	5	6.3
No Response	5	6.3
Total	79	100.0
Gender		
Male	12	15.0
Female	67	85.0
Civil Status		
Single/Never Married	13	16.0
Married	54	68.0
Separated/Divorced	6	8.0
Widowed	6	8.0
Live in/Common Law	0	0.0
Total	79	100.0
Educational Attainment		
College: not completed	6	8.0
College: graduate	49	62.0
With graduate study units	11	14.0
Completed graduate studies	13	16.0
Total	79	100.0
Position		
Provincial Nutrition Action Officer (PNAO)	2	3.0
Municipal Nutrition Action Officer (MNAO)	41	52.0
City Nutrition Action Officer (CNAO)	8	10.0
Member of the Local Nutrition Committee (LNC)	28	35.0
Total	79	100.0

climate change is a cause for concern (87%) and that El Niño and La Niña (77%) are natural occurrences (**Table 3**). On the other hand, majority of the respondents agreed with statements about the importance of climate change (84%), the individual and family's capacity to adapt to climate change (81%), and the effect of climate change on local climate and the quality of life. Nearly 90% of the nutrition workers indicated that the government should consider communities' views when making policy decisions about climate change. For them, the government can help families to adapt to climate change, and that budget should be allocated to address this issue.

Nutrition Workers' Practices about Climate Change

The practices where more than 80% of the respondents were already practicing include planting trees, establishing or maintaining gardens, conserving water using energy-saving appliances and bulbs, planting trees, and avoiding food wastage (**Table 4**). Also, nutrition workers actively search for participation in awareness programs and information on climate change through media, which is conveyed to family members to encourage household-level strategies of reducing the impact of climate change (**Table 4**). Furthermore, the adoption of new crop varieties and different cropping patterns for agriculture-resilient production and food substitution and use of locally available foods are practiced to reduce greenhouse gas emissions. Breastfeeding practice was relatively high among women to ensure optimum nutrition for infant and young children. In nutrition during emergencies, breastfeeding can make infants food-secure. Likewise, preparing for the occurrence of floods and drought is practiced by the respondents.

Perceptions on How to Integrate Climate Change into the Nutrition Sector

More than half of the respondents (57%) had no idea how to mainstream climate change into the nutrition sector (**Table 5**). For those who had, their suggestions were to integrate climate change in the local nutrition planning; incorporate nutrition concerns in every administrative level of the government from the regional level to the barangay (village); implement ordinances and resolutions; conduct public consultations, barangay assembly, and mass media; and increase awareness on the impact of climate change to health, nutrition and food availability. The respondents favored integrating climate change in the local nutrition action plan because of its perceived positive impact on health and nutrition, economic situation, and food availability.

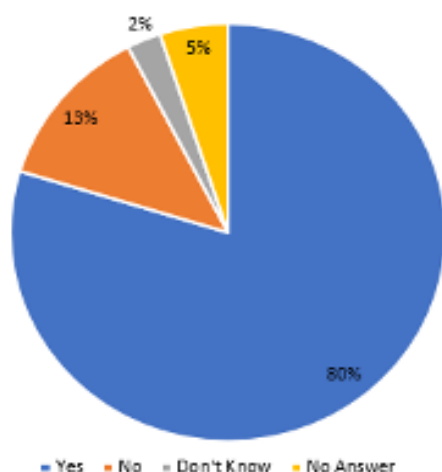


Figure 2. Awareness of respondents from Laguna, Batangas, and Cavite, Philippines about climate change, 2016.

Table 2. Knowledge of nutrition workers in Laguna, Batangas and Cavite, Philippines on climate change, 2016.

Knowledge Statements	True		False		No Response	
	n	%	n	%	n	%
1. Climate is the average weather condition in a particular area that prevails over a particular period.	70	88.6	6	7.6	3	3.8
2. Climate change is a global problem.	78	98.7	1	1.3	0	0.0
3. Climate change is caused by natural processes and is also human-induced.	69	87.3	7	8.9	3	3.8
4. Climate change is happening in the Philippines.	73	92.4	6	7.6	0	0.0
5. Climate change is already affecting the people in the municipality.	74	93.7	2	2.5	3	3.8
6. Drought is one of the manifestations of climate change.	78	98.7	1	1.3	0	0.0
7. Climate is a factor that should be taken into consideration in fishery.	79	100.0	0	0.0	0	0.0
8. Information on climate variables can aid in making decisions regarding agricultural production and fishing.	74	93.7	5	6.3	0	0.0
9. Heavy rainfall can increase the risk of flooding.	78	98.7	1	1.3	0	0.0
10. Food can be contaminated by floodwater.	74	93.7	3	3.8	2	2.5
11. Breastfeeding can be disrupted during typhoons, flooding, and extreme temperatures.	33	41.7	45	57.0	1	1.3
12. Climate change affects women and children most.	53	67.1	22	27.8	4	5.1
13. An increase in temperature and reduced rainfall may lead to water shortages.	73	92.4	2	2.5	4	5.1

Table 3. Attitudes of nutrition workers in Laguna, Batangas and Cavite, Philippines on climate change-related issues.

Attitude Statements	True		False		No Response	
	n	%	n	%	n	%
1. Climate change is part of a natural cycle; hence, I need not worry about it.	69	87.0	4	5.0	6	8.0
2. My family and I will naturally adapt to climate change.	27	34.0	18	23.0	33	42.0
3. I feel climate change is as important as crime, food security, education, health, and corruption.	10	13.0	3	4.0	66	84.0
4. My family will naturally adapt as the climate changes.	24	30.0	22	28.0	31	39.0
5. Average temperatures increasing by a few degrees concern me.	9	11.0	6	8.0	64	81.0
6. El Niño and La Niña are natural occurrences; hence, I do not worry about them.	61	77.0	5	6.0	13	16.0
7. Global climate change is affecting my local climate.	10	13.0	3	4.0	66	84.0
8. Every individual can do something to adapt to climate change.	7	9.0	0	0.0	72	91.0
9. Climate change will reduce the quality of life of my children and grandchildren	12	15.0	11	14.0	55	70.0
10. I feel that climate change information is difficult to understand.	45	57.0	16	20.0	18	23.0
11. The government should listen to the views of communities when making policy decisions about climate change.	10	13.0	1	1.0	68	86.0
12. The government should do more to help families to adapt to climate change.	8	10.0	2	3.0	69	87.0
13. The government should allocate a budget (also allocated to education, crime, etc.) to address climate change.	7	9.0	2	3.0	70	89.0

Majority of the respondents had existing knowledge on climate change as evidenced by the high percentage of respondents who got the correct answers (95%). Likewise, more than 85% of respondents had high attitude scores. A lower percentage of respondents were implementing climate change-related practices (Table 6). A gap was observed in terms of knowledge, attitudes, and practices on climate change, but this is considered low.

The association is significant between knowledge and practice as well as attitude and practice although the strength of association is small with *r* values of 0.1 to 0.3 (Table 7).

Still among the respondents who had ideas on mainstreaming climate change (*n*=37), several reasons were mentioned for integrating climate change in the local nutrition action plan. These are: climate change affects health and nutrition (10%); climate change affects the economic situation (2.5%); climate change affects the availability of food (16.3%); for financial and technical assistance and budget in addressing climate change (12.5%); and for technical support in forecasting, preparation, and taking action to mitigate climate change (5.0%).

The respondents were also asked what possible

Table 4. Practices identified by nutrition workers in Laguna, Batangas, and Cavite, Philippines to address the effects of climate change as identified by nutrition workers, 2016.

Practices in Addressing the Effects of Climate Change	Practicing		Not Yet Practiced		Plans to Practice	
	n	%	n	%	n	%
1. Adopt different cropping systems.	31	39	21	26	18	23
2. Adopt/plant new varieties that are suitable for cold or warmer temperature.	27	34	27	34	16	20
3. Plant trees.	66	84	2	3	11	14
4. Establish/maintain garden (as source of food).	66	84	3	4	11	14
5. Conserve water and reuse water.	74	94	4	5	2	3
6. Walk/cycle instead of drive.	63	80	8	10	8	10
7. Recycle and reuse materials.	71	90	4	5	5	6
8. Buy energy-efficient vehicles.	33	42	30	38	14	18
9. Reduce the use of a heater in cold weather.	36	46	29	36	10	13
10. Buy energy-saving bulbs.	69	87	6	8	5	6
11. Buy energy-saving appliances.	62	78	9	11	9	11
12. Participate in public awareness or mitigation activities regarding climate change, such as the Earth Hour.	51	65	12	15	17	21
13. Talk to family about global climate change and consider household strategies to reduce impact.	40	51	18	23	22	28
14. Learn more about climate change through media.	56	71	6	8	16	20
15. Observe adequate consumption of food (no excess; leaving foods in the plate).	65	82	7	9	7	9
16. Substitute/exchange one food with another (staple food – rice with cassava or sweet potato or corn).	41	52	23	29	15	19
17. Prepare locally available foods (reduce GHG emissions caused by transportation).	43	54	12	15	25	31
18. Practice breastfeeding.	56	71	10	13	2	3
19. Prepare for the occurrence of floods and drought.	58	73	9	11	12	15

Table 5. Suggestions on how to mainstream climate change into the nutrition sector in Laguna, Batangas, and Cavite, Philippines, 2016.

Suggestions on how to mainstream climate change	Frequency	Percentage (%)
1. Integrate climate change in the local nutrition action plan	5	6.3
2. Implement mitigating measures in answer to climate change	5	6.3
3. Implement strategies to increase food production/allocation	7	8.9
4. Increase awareness on climate change and its impact on health, nutrition and food availability	13	16.5
5. Formulate and implement ordinance and resolutions	1	1.3
6. Conduct public consultation, barangay assembly, and mass media	2	3.8
7. No Answer	45	57.0

Table 6. Summary of knowledge, attitudes, and practices of local nutrition workers in Laguna, Batangas, and Cavite, Philippines, 2016.

Categories	Knowledge (n=13)		Attitude (n=13)		Practices (n=45)	
	n=79	%	n=79	%	n=79	%
Low	0	0	2	2.5	0	0
Moderate	4	5.1	9	11.4	39	49.4
High	75	94.9	68	86.1	40	50.6
Mean score	11.0		9.0		12.0	

Table 7. Strength of association between knowledge, attitude and practices of nutrition workers in Laguna, Batangas and Cavite, Philippines, 2016.

	Knowledge and Attitude	Knowledge and Practice	Attitude and Practices
Spearman Rank Correlation Coefficient	0.091	0.271	0.262
p-value	0.427	0.016	0.019

problems they would encounter if climate change is to be mainstreamed into the local nutrition program planning. The majority of the respondents (54.2%) had no answer simply because they have not started or included climate change adaptation in their plans. When asked about the difficulties encountered in plan preparation, some respondents identified the lack of support, budget, awareness and information, and training and technical assistance. There were also constraints in monitoring, coordinating, and prioritizing the nutrition program and a lack of compliance (**Table 8**). In terms of support needed, respondents had varying answers from funding to technical assistance and policies. Funds are required to finance mitigation strategies that bring co-benefits and enhance adaptive capacity for food and nutrition security and nutrition-sensitive technological innovation.

The findings in this study showed that the local nutrition workers were aware of climate change and its possible effects on nutrition especially that of children. Moreover, their attitudes were favorable towards integrating aspects of climate change in the local nutrition action plan. However, the respondents were realistic enough to have identified the possible problems and needed support from the local nutrition workers and local nutrition committee members on climate change. The importance of enhancing the knowledge, attitudes, and practice of nutrition workers is important as climate change affects food production, availability of and

access to food, food quality, food safety, diet quality, and thus people's nutrition and health (*von Braun 2020*). Furthermore, nutrition workers can benefit from understanding that climate change will affect good nutrition through complex indirect pathways, such as income shocks when droughts or floods occur, loss of employment opportunities, health effects resulting from air pollution and changed water systems.

While the local nutrition workers possess some information about climate change, their capacity on climate change and how to integrate it in the local nutrition action plan needs to be built. A highly skilled workforce for nutrition is needed to be able address the various forms of malnutrition; industrialization of the food chain; and climate change (*Fanzo et al. 2015*). The gaps in knowledge, attitudes, and practices can be addressed by capacity building. For example, a training course can be designed to focus on climate change and its relationship with nutrition and food security. To address the knowledge gap, topics can include what is climate change, its causes and consequences, and actions of the government, communities, and families. For attitude, the focus can be on the appreciation of individual, family, and community roles in addressing climate change. For practices, there were respondents who were already practicing climate change activities. It is possible that respondents are not practicing because of low appreciation and comprehension of what climate change

Table 8. Anticipated problems and support needed in mainstreaming climate change into nutrition planning in Laguna, Batangas, and Cavite, Philippines, 2016.

Problems and Support Needed in Mainstreaming Climate Change	Frequency	Percentage (%)
Problems*		
1. Lack of support from the local government unit (LGU)	8	9.6
2. Budgetary constraints	8	9.6
3. Monitoring, coordination, and prioritization of nutrition program	4	4.8
4. Lack of training and technical assistance	4	4.8
5. Lack of awareness and information	6	7.2
6. No climate change adaptation plan	45	54.2
7. Others	6	7.2
8. No answer	2	2.4
Support needed*		
1. Technical assistance/training activities/orientation	12	12.0
1. Budget/resources/manpower	25	25.0
2. Policies/executive orders/resolutions and ordinances	10	10.0
3. Support from higher authority	7	7.0
4. Information dissemination	5	5.0
5. Proper advocacy	3	3.0
6. Activate Municipal Nutrition Council at the local level	2	2.0
7. Linkage with other agencies (e.g., Department of Health)	3	3.0
8. Others	2	2.0
9. No answer	31	31.0

*Multiple answers

is. In general, it is important for local nutrition workers to have more knowledge on climate change so that they can understand their roles better and carry out actions in preventing the effects of climate change. The participants of a capacity building initiative should not only include the local nutrition workers but also the other members of the Local Nutrition Committees (LNC) as they are the group responsible for the formulation of Local Nutrition Action Plan (LNAP). The LNC members are heads or representatives from the Planning and Development Office, Health Office, Engineering Office, Agriculture Office, Social Welfare and Development Office, and Budget Office. While the Disaster Risk Reduction and Management Office (DRRMO) is not a member of the local nutrition committee, the mayor, as chair of the LNC office can issue a memorandum to said office to this effect. Involving these sectors will determine their level of awareness of the issues on climate change and nutrition; and identify the entry points for integration of climate change into sectoral policies (Rauken *et al.* 2015).

The recommendation of the Global Nutrition Report (IFPRI 2015) is for governments to include climate change more explicitly into existing and new national nutrition strategies. This is because many countries have not yet integrated climate change in nutrition plans or programs. If climate change is to be integrated in the LNAP, the existing process for local nutrition program planning and management have to be rethought to consider aspects of climate change into the programs, projects and activities. The LNAP contains objectives and nutrition

interventions to address the malnutrition problem at each administrative level. The LNAP is integrated into local development plans such as the Comprehensive Land Use Plan (CLUP), Comprehensive Local Development Plan (CLDP), Executive Legislative Agenda (ELA), and Annual Investment Plan (AIP) (Figure 3).

Local nutrition workers shall continue to implement interventions giving priority to the nutritionally vulnerable groups, such as infants, children 0-23 months, pregnant and lactating women, and the elderly with or without climate change considerations to prevent the worsening of the country's nutrition situation. However, Tirado *et al.* (2013) suggested the inclusion of nutrition considerations in all climate change mitigation efforts. Furthermore, the authors recommended that nutrition sensitive mitigation strategies, which bring co-benefits in enhanced production of and access to food and enhanced health be examined, tested, and scaled up. Nutrition-sensitive agriculture is an intervention that can improve dietary diversity and nutrition through agricultural extension services, integrated agro-forestry systems, integrated farming systems, and household level food production. This intervention requires partnering with a variety of stakeholders from multiple sectors and shall include behavior change communication (Ruel *et al.* 2018). Other interventions which needs to be implemented amid climate change situations are infant and young child feeding; micronutrient supplementation; food fortification (market purchases or home fortification); and therapeutic feeding for children with severe forms

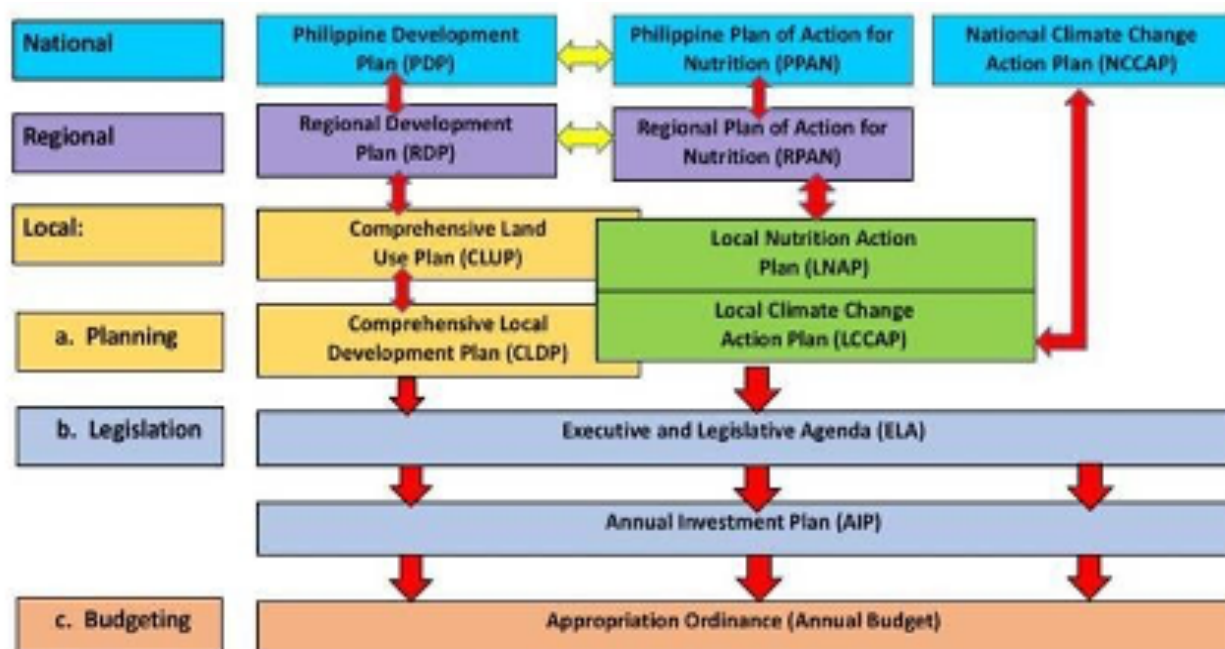


Figure 3. Process of local nutrition action planning in the (Source: National Nutrition Council 2011).

of undernutrition.

The main limitation of this study is the inherent feature of the cross-sectional study design that it cannot establish the temporal relationship among knowledge, attitude and practices of nutrition workers on climate change with the capacity to integrate climate change into local nutrition planning system. Moreover, the depth of the study would have been improved with the addition of other data collection methods such as focus group discussion.

CONCLUSIONS AND RECOMMENDATIONS

This study sought to ascertain local nutrition workers' knowledge and attitudes and practices and the perceptions on mainstreaming climate change concerns in the local nutrition action planning procedures. Majority of the local nutrition workers had some knowledge about climate change and had varied perceptions about climate change. Since climate change can affect food and nutrition security and exacerbates the current high prevalence of hunger and undernutrition, the strategy of mainstreaming or integrating climate change in the nutrition sector can be explored. The integration process would be more successful if the existing planning system and policies and plans are considered, building the nutrition workers' capacity on climate change, and providing the necessary support mechanisms to address undernutrition and the effects of climate change on vulnerable groups. The benefits of mainstreaming will not be maximized unless the local nutrition workers are engaged in capacity building and development to fully understand the concepts of climate change and develop the appropriate attitude and embrace suitable practices in reducing undernutrition amidst climate change.

REFERENCES

- Barreda, A. B. 2018. Assessing the Level of Awareness on Climate Change and Sustainable Development Among Students of Partido State University, Camarines Sur, Philippines. *Journal of Sustainability Education* Vol 17, ISSN: 5121-7452. <http://www.susted.org>
- Boushey, C., Harris, J., Bruemmer, B., Archer, S.L., and Van Horn, L. 2006. "Publishing Nutrition Research: A Review of Study Design, Statistical Analyses, and Other Key Elements of Manuscript Preparation, Part 1". *Journal of the American Dietetic Association* 106(1):89-96 <https://doi.org/10.1016/j.jada.2005.11.007>
- Department of Science and Technology- Food and Nutrition Research Institute (DOST-FNRI). 2020. Pre-pandemic Nutritional Status of Pinoys Revealed by DOST-FNRI.
- nutritional-status-of-pinoys-revealed-by-dost-fnri
- Dietz, W.H. 2018. "Climate change and malnutrition: we need to act now". *The Journal of Clinical Investigation* 130(2):556-558. <https://doi.org/10.1172/JCI135004>
- Fanzo, J.C., Graziose, M.M, Kraemer, K., Gillespie, S., Johnston, J.L., de Pee, S., Monterrosa, E., Badham, J., Bloem, M.W., Dangour, A.D., Deckelbaum, R., Dobermann, A., Fracassi, P., Hossain, S.M., Ingram, J., Jerling, J.C., Jones, C.J., Jap, S.I., Kiess, L., Marshall, Q., Martin, K., Narayan, A., Amuyunzu-Nayamongo, A., Pepping, F., West, K.P. 2015. "Educating and Training a Workforce for Nutrition in a Post-2015 World". *Advances in Nutrition* 6(6):639-647 <https://doi.org/10.3945/an.115.010041>.
- Fanzo, J., Davis, C., McLaren, R., and Choufani, J. 2018. "The effect of climate change across food systems: Implications for nutrition outcomes". *Global Food Security*, 18, 12-19. <https://doi.org/10.1016/j.gfs.2018.06.001>
- Food and Agriculture Office, International Fund for Agricultural Development and World Food Program. 2015. The State of Food Insecurity in the World 2015. Meeting the 2015 International Hunger Targets: Taking Stock of Uneven Progress. Rome, FAO.
- Holden, W.N. and Marshall, S.J. 2018. Chapter 24 – "Climate Change and Typhoons in the Philippines: Extreme Weather Events in the Anthropocene". In: *Integrating Disaster Science and Management* (eds. P. Samui, D. Kim, C. Ghosh). Elsevier pp 407-421.
- Huq, S., Reid, H., Konate, M., Rahman, A., Sokona, Y., and Crick, F. 2003. "Mainstreaming Adaptation to Climate Change in the Least Developed Countries (LDCs). *Climate Policy* 4(1): 25-43. <https://doi.org/10.1080/14693062.2004.9685508>.
- International Food Policy Research Institute. 2015. Global Nutrition Report 2015: Actions and Accountability to Advance Nutrition and Sustainable Development. Washington DC: IFPRI; 2015.
- Lloyd, S. J., Kovats, R. S., and Chalabi, Z. 2011. "Climate Change, Crop Yields, and Undernutrition: Development of a Model to Quantify the Impact of Climate Scenarios on Child Undernutrition". *Environmental Health Perspectives* 119(12):1817-1823. <http://doi.org/10.1289/ehp.1003311>
- Lopez, J.J.D. and Malay, C.A. 2019. "Awareness and Attitude Towards Climate Change of Selected Senior High Students in Cavite, Philippines". *Asia Pacific Journal of Multidisciplinary Research*, 7: 2, 52-62.
- Lubos, L. C., & Lubos, L. C. 2019. Knowledge, Attitudes,

- Practices, and Action on Climate Change and Environmental Awareness of the Twenty-two Villages along the River Banks in Cagayan de Oro City, Philippines. *Liceo Journal of Higher Education Research*. 14(1).
- Macías, Y.F. and Glasauer, P. 2014. Guidelines for assessing nutrition-related Knowledge, Attitudes and Practices. Food and Agriculture Organization (FAO), Rome.
- National Nutrition Council. 2011. Nutrition Program Management Manual. Manila, Philippines. 282 pp.
- Oli, N., Vaidya, A., Pakkala, K., Eiben, G., and Krettek, A. 2018. "Knowledge, attitude and practice on diet and physical activity among mothers with young children in the Jhaukhel-Duwakot Health Demographic Surveillance Site, Nepal". *PLoS ONE* 13(7): e0200329. <https://doi.org/10.1371/journal.pone.0200329>
- Philippine Atmospheric, Geophysical and Astronomical Services Administration. n.d. Tropical Cyclone Information. Retrieved from <http://bagong.pagasa.dost.gov.ph/climate/tropical-cyclone-information>, November 30, 2020.
- Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA). 2011. "Climate Change in the Philippines." Diliman, Quezon City. Accessed online at: http://dilg.gov.ph/PDF_File/reports_resources/DILG-Resources-2012130-2ef223f591.pdf.
- Rauken, T., Mydske, P.K., and Winsvold, M. 2015. "Mainstreaming climate change adaptation at the local level". *Local Environment* 20 (4): 408-423. DOI: 10.1080/13549839.2014.880412
- Ruel, M. T., Quisumbing, A. R., and Balagamwala, M. 2018. Nutrition-sensitive agriculture: What have we learned so far?. *Global Food Security* 17:128-153. <https://doi.org/10.1016/j.gfs.2018.01.002>
- Tirado, M.C., Crahay, P., Mahy, L., Zanev, C., Neira, M., Msangi, S., Brown R., Scaramella C., Costa Coitinho, D., and Müller, A. 2013. "Climate Change and Nutrition: Creating a Climate for Nutrition Security." *Food and Nutrition Bulletin* 34(4): 533-547.
- United Nations Development Programme and Japan-Caribbean Climate Change Partnership. 2016. Knowledge, Attitudes and Practice Study on Climate Change. Retrieved from https://www.adaptation-undp.org/sites/default/files/resources/knowledge_attitudes_and_practice_study_on_climate_change_in_belize.pdf, November 30, 2020.
- United Nations Development Programme Colombia. 2010. "Mainstreaming Climate Change in Colombia." Accessed online at <http://www.undp.org/content/dam/> [aplaws/publication/en/publications/environment-energy/www-ee-library/climate-change/mainstreaming-climate-change-in-colombia/CC%20risk%20Mainstreaming%20Climate%20Change%20in%20Colombia-EN.pdf](https://www.undp.org/content/dam/aplaws/publication/en/publications/environment-energy/www-ee-library/climate-change/mainstreaming-climate-change-in-colombia/CC%20risk%20Mainstreaming%20Climate%20Change%20in%20Colombia-EN.pdf).
- United Nations System Standing Committee on Nutrition. 2010. Climate Change and Nutrition Security
- von Braun, J. 2020. Climate Change Risks for Agriculture, Health, and Nutrition. In: Health of People, Health of Planet and Our Responsibility (eds. W. Al-Delaimy, V. Ramanathan and M. Sánchez Sorondo). Springer, Cham. https://doi.org/10.1007/978-3-030-31125-4_11

ACKNOWLEDGMENT

The authors would like to acknowledge the support provided by Ms. Carina Santiago, Nutrition Program Coordinator for CALABARZON and the local nutrition workers. The authors also acknowledge the assistance of Ms. Eileen M. Redera, Ms. Jorrajine Nor P. Rasay and Dr. Leila S. Africa in data cleaning and analysis.