FACTORS RELATED TO HOUSEHOLD DIETARY DIVERSITY SCORE (HDDS) AS NUTRITION OUTCOMES IN EASTERN INDONESIA

Adi Yeremia Mamahit[1*], Ni Wayan Sudarmi[2], Theo Welly Everd Mautang[3], Debby Christine Rende[4], Dyah Suryani[5]

Departement of Public Health, Faculty of Sports Science and Public Health, Universitas Negeri Manado, Minahasa, Indonesia[1,3]
Program Studi Ilmu Keperawatan, Fakultas Keperawatan, Universitas Pembangunan Indonesia, Manado, Indonesia[2]
Program Studi Ilmu Politik, Fakultas Ilmu Sosial dan Ilmu Politik, Universitas Pembangunan Indonesia, Manado, Indonesia[4]
Program Studi Gizi, Fakultas Kesehatan Masyarakat, Universitas Ahmad Dahlan, Yogyakarta, Indonesia[5]
Corresponding Author : adimamahit@unima.ac.id

ABSTRAK

Wilayah Indonesia bagian timur masih mempunyai permasalahan kesehatan, termasuk permasalahan gizi. Permasalahan gizi dapat berupa rendahnya keberagaman pangan rumah tangga. Penelitian ini bertujuan untuk menguji hubungan antara faktor pertanian dan faktor sosiodemografi terhadap skor keanekaragaman pangan rumah tangga (HDDS). Data mentah penelitian ini diambil dari Bank Dunia dengan menggunakan data yang telah dilakukan sejak tahun 2018 hingga 2019. Total sampel dalam penelitian ini adalah 2.874 rumah tangga. Variabel terikat dalam penelitian ini adalah HDDS berdasarkan standar Organisasi Pangan Dunia. Variabel bebas meliputi karakteristik rumah tangga yang meliputi, agama, jenis kelamin,dan umur. Variable lainnya adalah jumlah anak di rumah tangga, pendapatan rumah tangga dari aspek pertanian, pengalaman rumah tangga dan desa, dan pendapatan rumah tangga bruto. Hasil penelitian menunjukkan bahwa rata-rata HDDS adalah 8,75 dari interval 0 hingga 12. Analisis bivariat dan multivariat dalam penelitian ini menemukan bahwa faktor yang berhubungan dengan tingginya HDDS antara lain kepala rumah tangga yang beragama Kristen, usia 45 – 55 tahun, 55 – 65 tahun, > 75 tahun, semakin tinggi jumlah anak dalam rumah tangga, desa mengalami hilangnya pekerjaan non-pertanian dan semakin tinggi pendapatan kotor rumah tangga. Kesimpulannya, HDDS sebagian besar dipengaruhi oleh karakteristik rumah tangga.

Kata kunci : gizi, Indonesia Timur, skor keanekaragaman makanan rumah tangga

ABSTRACT

The eastern part of Indonesia still has a health concern, including an issue of nutrition. A lower dietary diversity score is one of the nutrition issues at the household level. This study aimed to examine the correlation between agricultural factors and sociodemographic factors to household dietary diversity score (HDDS). The raw data of this study was retrieved from the World Bank using that have been done from 2018 to 2019. The total sample in this study was 2,874 households. The dependent variable of this study was HDDS which uses the FAO standard. The independent variables were household characteristics such as religion, sex, and age. Moreover, other variables were several children, household income from the crop, households experiencing loss of non-agricultural employment, the household had access to any agri cultivation, village experiencing loss of non-agri employment, and gross household income. The bivariate and multivariate analysis in this study found that factors associated with higher HDDS included head of household who were Christian, aged 45 – 55 years, 55 – 65 years, > 75 years, the higher number of children in the household, village experienced the loss of non-agricultural employment and higher gross household income.

Keywords : *nutrition, household dietary diversity score, Eastern Indonesia*

INTRODUCTION

Household dietary diversity score is an important indicator of the quality of diets consumed by households. In Indonesia, studies have shown that dietary diversity is associated with various factors such as nutritional status, socioeconomic status, and breastfeeding practices. For instance, a study in urban Indonesia found a positive association between minimum dietary diversity and socio-economic status (Sebayang et al., 2019). Additionally, the diversity of food consumption significantly influenced the nutritional status of children aged 6–23 months in Indonesia (Samosir et al., 2023). Furthermore, the Indonesia DHS 2017 survey reported that approximately 40% of boys and girls aged 6-23 months do not meet the criteria for minimum dietary diversity (Young & Kang, 2020). This pattern has also been observed in other areas of Indonesia, where low dietary diversity has been linked to nutritional status and stunting prevalence (Marchianti et al., 2022). Moreover, low diversity of the food might contribute to high risk of obesity (Maretalinia et al., 2020).

Moreover, it has been found that dietary diversity is influenced by factors such as food production diversity, food taboos, and knowledge, attitudes, and practices of eating behavior. A study in Indonesia reported that food taboos and low dietary diversity were prevalent among pregnant women, with almost half of the respondents having low dietary diversity (Angkasa & Iswarawanti, 2021). Additionally, data from Indonesia, Kenya, Ethiopia, and Malawi found a positive association between production diversity and dietary diversity (Bellows et al., 2019). However, the relationship between food production diversity and household dietary diversity was found to be significant in Indonesia and Malawi but insignificant in Kenya and Ethiopia (Akerele & Shittu, 2017; Sibhatu et al., 2015).

Furthermore, interventions such as a web-based application for promoting a balanced diet among pregnant women in Indonesia have been shown to have a positive impact on increasing dietary diversity scores (Koeryaman et al., 2023). Additionally, mass media and community-based interventions have been found to increase dietary diversity scores among children aged 6-24 months in Indonesia (White et al., 2016).

The factors associated with household dietary diversity in Indonesia are multifaceted and influenced by various determinants. Studies have shown that dietary diversity is influenced by socioeconomic status, educational status, market integration, agricultural biodiversity, and household income/expenditure levels. For instance, socioeconomic drivers such as educational status and market integration were found to be more influential drivers of household dietary diversity than agricultural biodiversity in Indonesia, Kenya, Ethiopia, and Malawi (Singh et al., 2020). Additionally, household income, gender, level of education, access to a home garden, and ownership of livestock were found to have a positive influence on rural households in attaining high dietary diversity (Nengovhela et al., 2022).

Furthermore, the nutritional transition in Indonesia, indicated by the increasing prevalence of overweight and obesity, has also impacted dietary diversity (Vaezghasemi et al., 2020). The growth of supermarkets, increasing household incomes, and urbanization have been associated with Indonesia's economic growth, which has influenced food consumption patterns and dietary diversity (Arifin et al., 2019). Additionally, the dietary diversity of people in a geographical area is determined by a variety of factors, including production diversity, household income/expenditure levels, and demographic and socioeconomic characteristics of households (Nithyavathi et al., 2022).

Moreover, household dietary diversity is also influenced by food consumption patterns away from home, as well as perceptions of food security status (Anindita et al., 2022; Diansari & Nanseki, 2015). The variation of agriculture household poverty due to differences in characteristics between districts in Indonesia has also been found to impact dietary diversity (Romadhon et al., 2022). Additionally, the prevalence of stunting among children in Indonesia

has been associated with dietary diversity, with approximately 40% of children not meeting minimum dietary diversity (Halim et al., 2020). This study aimed to examine the correlation between agricultural factors and sociodemographic factors to household dietary diversity score (HDDS).

METHOD

This study used secondary data from the Coastal Community Development Project (CCDP), IFAD Impact Assessment Survey 2018. The data collection was done from May 2018 to April 2019. (World Bank). The unit of analysis of this survey is the household level. The geographic coverage of this survey included 181 villages within 12 districts throughout eastern Indonesia. The primary investigators of the survey are the International Fund for Agricultural Development (IFAD) and, the United Nations. The producers were from the Ministry of Marine Affairs and Fisheries, Government of Indonesia as project executing agencies. The sampling procedure consisted of households that directly participated in the CCDP as a treatment group and a spillover group that indirectly benefited from the CCDP. The final number of the sample was 2,874 households.

This current study focused on household dietary diversity score (HDDS) as a proxy of nutrition outcomes. This score reflects a quality diet from 12 food groups at the household level. The food groups consist of cereals; root and tubers; vegetables; fruits; meat, poultry, and offal; eggs; fish and seafood; pulses/legumes/nuts; milk and milk products; oil/fats; sugar/honey; and miscellaneous FOA. The HDDS score is calculated by cumulative scores which is 1 for HH consumed each food group in the last 7 days of survey time and 0 for not. This study used the univariate analysis to see the characteristics of HDDS based on some variables including, province, district, religion, and head of household age. The analysis was done using STATA version 17. The ethical clearance of raw data was obtained by IFAD. The raw data is open access after registration and can be accessed through the website: https://microdata.worldbank.org/index.php/catalog/5738#metadata-metadata_production.

RESULT

Table 1 below describes the characteristics of respondents. It was revealed that the mean HDDS was 8.75. From 2,874 households, the majority of heads of households were Muslim (67.36%), male (96%), in aged 35 – 44 years old (33.61%). Moreover, according to the number of children in the household, there was 1.33 mean of children in the household, with a minimum of 0 and maximum of 7. The household's income source from crop sales or crop subproduct sales was 60.54%, and 98.99% of Households experienced loss of non-agricultural employment, 59.99% of Households had access to any Agri cultivation, 92.35% of Villages experienced loss of non-agricultural employment, and the gross household income with mean 2.87e_08.

Table 1.   The General Characteristics of the Samples

Characteristics (n = 2,874)	Frequency	Percentage
Household dietary diversity (Mean = 8.75, Min = 0, Max = 12)		
Household's head religion		
Islam	1,936	67.36
Christian	928	32.29
Confucianism/Konghucu	6	0.21
Household's head gender		
Male	2,759	96.00
Female	115	4.00

Household's head age		
15 – 24 years old	52	1.81
25 – 34 years old	515	17.92
35 – 44 years old	966	33.61
45 – 54 years old	746	25.96
55 – 64 years old	470	16.35
65 – 75 years old	115	4.00
>75 years old	10	0.35
Number of children 0 – 14 years in the household, Mean = 1.33, Min = 0, Max = 7		
The household has income sources from crop sales or crop subproduct sales		
Yes	1,740	60.54
No	1,134	39.46
Households experienced loss of non-agricultural employment		
Yes	2,845	98.99
No	29	1.01
The household has access to any Agri cultivation		
Yes	1,724	59.99
No	1,150	40.01
The village experienced the loss of non-agricultural employment		
No	2,654	92.35
Yes	220	7.65
Gross household income, Mean 2.87e_08, Min = 0, max = 2.16e+10		

The bivariate and multivariate analysis was reported in Table 2 below to see the impact of each independent variable and adjusted with other independent variables to HDDS score. It was found that heads of households who were Christian (compared to Islam) had a lower tendency to have higher HDDS with crude coefficient and adjusted coefficient -0.36 and -0.43, respectively. Moreover, heads of household age who are 45 to 54, 55 to 64, and >75 years old have a higher likelihood to have higher HDDS by crude and adjusted analysis, 0.012; 0.006; and 0.029 respectively for crude and 0.015; 0.006; and 0.020 respectively for adjusted. According to the number of children in the household, it was found that a higher number of children will increase the probability of having higher HDDS by 0.08 and 0.14 for crude and adjusted. Moreover, villages that experienced loss of non-agricultural employment will be less likely to have higher HDDS with crude and adjusted -0.41 and -0.57. Additionally, increasing gross household income will also increase the HDDS with crude and adjusted coefficients of 1.62 and 8.19, respectively. However, the factors including household head sex, the household having income source from crop sales or crop subproduct sales, households experiencing loss of non-agricultural employment, and households having access to any agri cultivation found an insignificant correlation with HDDS.

Table 2.   **The Crude and Adjusted Coefficient of Correlation Between Agricultural and Sociodemographic Factors Related to HDDS**

Characteristics	Crude Coefficient (lower – upper)	p-value	Adjusted Coefficient (lower – upper)	p-value
Household's head religion				
Islam (ref)				
Christian	-0.36 ((-0.52) – (- 0.21))	**0.000**	-0.43 ((-0.59) – (-0.27))	**0.000**
Buddhism	-0.20 ((-1.83) – (1.43))	0.810	0.02 ((-1.59) – (1.64))	0.978
Confucianism/Konghucu	-0.37 ((-2.36) – (1.63))	0.719	-0.52 ((-2.49) – (1.45))	0.603
Household's head sex				
Male (ref)				
Female	0.09 ((-0.29) – (0.47))	0.639	0.11 ((-0.27) – (0.49))	0.562
Household's head age				
15 – 24 years old (ref)				
25 – 34 years old	0.38 ((-0.20) – (0.96))	0.203	0.24 ((-0.34) – (0.81))	0.417
35 – 44 years old	0.49 ((-0.08) – (1.06))	0.090	0.35 ((-0.21) – (0.92))	0.221

45 – 54 years old	0.73 ((0.16) – (1.30))	**0.012**	0.70 ((0.14) – (1.27))	**0.015**
55 – 64 years old	0.81 ((0.23) – (1.39))	**0.006**	0.81 ((0.24) – (1.39))	**0.006**
65 – 75 years old	0.37 ((-0.29) – (1.04))	0.269	0.39 ((-0.27) – (1.05))	0.241
>75 years old	1.53 ((0.15) – (2.90))	**0.029**	1.62 ((0.25) – (2.98))	**0.020**
Number of children 0 – 14 years in the household	0.08 ((0.02) – (015))	**0.013**	0.14 ((0.08) – (0.21))	**0.000**
The household has income sources from crop sales or crop subproduct sales				
No (ref)				
Yes	-0.01 ((-0.16) – (0.14))	0.873	-0.22 ((-0.49) – (0.05))	0.114
Households experienced loss of non-agricultural employment				
No (ref)				
Yes	0.50 ((-0.25) – (1.124))	0.189	0.38 ((-0.36) – (1.12))	0.310
The household has access to any Agri cultivation				
No (ref)				
Yes	0.07 ((-0.08) – (0.22))	0.355	0.21 ((-0.06) – (0.48))	0.128
The village experienced the loss of non-agricultural employment				
No (ref)				
Yes	-0.41 ((-0.69) – (-0.13))	**0.004**	-0.57 ((-0.85) – (-0.29))	**0.000**
Gross household income	1.62 ((8.52e-11) – (2.39e-10))	**0.000**	8.19 ((7.63) – (8.75))	**0.000**

DISCUSSION

The household dietary diversity score (HDDS) is associated with various factors influencing nutritional outcomes. Studies in Indonesia and other countries have shown that factors such as farm production diversity, nutrition education, food insecurity, and socioeconomic status play significant roles in determining dietary diversity and nutritional status. For instance, in Indonesia, it was found that approximately 40% of children aged 6-35 months did not meet the minimum dietary diversity, indicating the importance of dietary diversity in addressing nutritional challenges (Halim et al., 2020). Additionally, in Zimbabwe, nutrition education, farm production diversity, and commercialization were positively associated with household and individual dietary diversity (Murendo et al., 2018). In Ethiopia, the household food insecurity access scale and dietary diversity score were used as proxy indicators of nutritional status among people living with HIV/AIDS, demonstrating the relevance of dietary diversity in assessing nutritional status (Hussein et al., 2018). Furthermore, in Malawi, farm and non-farm enterprise diversity, as well as expenditure on food items, played major roles in influencing household dietary diversity (Edriss & Mehare, 2021). Similarly, in Eastern India, agricultural diversity, dietary diversity, and nutritional intake were found to be interlinked, emphasizing the importance of agricultural diversity in influencing dietary diversity and nutritional outcomes (Kumar et al., 2016).

Based on the provided references, agricultural factors play a crucial role in influencing household dietary diversity. For instance, studies have shown that farm production diversity is positively associated with household dietary diversity (Kattel et al., 2021; Murendo et al., 2018; Sekabira & Nalunga, 2020). Additionally, the adoption of agroforestry has been linked to increased farm production and dietary diversity (Kattel et al., 2021). Furthermore, interventions that increase household crop diversity and livestock ownership have been found to improve household-level diet diversity and child dietary diversity (Fiorella et al., 2016; Sly et al., 2022). Livestock diversification and market participation have also been positively associated with household, women, and children's dietary diversity (Murendo et al., 2018). Moreover, increased farm production diversity has been associated with seasonal food consumption diversity (Kissoly et al., 2018). It is important to note that the relationship between farm production diversity and dietary diversity is influenced by various factors such as income, market access, and non-farm income (ALIM et al., 2022; Rahman & Mishra, 2019). Additionally, the mean for farming experience and annual farm income of the respondents were

found to be associated with food security status among rural farming families ((ALIM et al., 2022). These findings underscore the significance of agricultural diversification and production practices in enhancing household dietary diversity and food security.

CONCLUSION

In conclusion, the mean of HDDS in Eastern Indonesia was 8.75. The factors found significantly associated with HDDS were household head religion and age, number of children, the village experienced loss of non-agricultural employment, and gross household income. HDDS in Indonesia is influenced by various factors including socioeconomic status, food production diversity, knowledge and attitudes towards eating behavior, and the effectiveness of interventions. Understanding these determinants is crucial for designing targeted interventions to improve dietary diversity and ultimately the nutritional status of households in Indonesia. The household dietary diversity in Indonesia is complex and interconnected, involving socioeconomic, agricultural, nutritional, and demographic determinants. Understanding these factors is crucial for developing targeted interventions to improve dietary diversity and address nutritional challenges in Indonesia.

ACKNOWLEDGEMENT

REFERENCE

Akerele, D., & Shittu, A. M. (2017). Can Food Production Diversity Influence Farm Households' Dietary Diversity? An Appraisal From Two-Dimensional Food Diversity Measures. *International Journal of Social Economics*. https://doi.org/10.1108/ijse-03-2016-0080

ALIM, A. S., IBRAHIM, S., & YAHAYA, A. (2022). Socio-Economic Determinants of Food Security Status Among Rural Farming Families in Jigawa State, Nigeria. *Jaeess*. https://doi.org/10.56160/jaeess202281010

Angkasa, D., & Iswarawanti, D. N. (2021). Do Food Taboo and Dietary Diversity Associated With Risk of Chronic Energy Deficiency Among Pregnant Women Living in Rural Setting of Southeast Sulawesi, Indonesia? *Proceedings of the Nutrition Society*. https://doi.org/10.1017/s0029665121000847

Anindita, R., Khoiriyah, N., & Sa'diyah, A. A. (2022). Food Consumption Pattern Far Away From Home as a Source of Household Food Protein in Indonesia. *Iop Conference Series Earth and Environmental Science*. https://doi.org/10.1088/1755-1315/1107/1/012118

Arifin, B., Achsani, N. A., Martianto, D., Sari, L. K., & Firdaus, A. H. (2019). The Future of Indonesian Food Consumption. *Jurnal Ekonomi Indonesia*. https://doi.org/10.52813/jei.v8i1.13

Bellows, A. L., Canavan, C. R., Blakstad, M. M., Mosha, D., Noor, R. A., Webb, P., Kinabo, J., Masanja, H., & Fawzi, W. W. (2019). The Relationship Between Dietary Diversity Among Women of Reproductive Age and Agricultural Diversity in Rural Tanzania. *Food and Nutrition Bulletin*. https://doi.org/10.1177/0379572119892405

Diansari, P., & Nanseki, T. (2015). Perceived Food Security Status – A Case Study of Households in North Luwu, Indonesia. *Nutrition & Food Science*. https://doi.org/10.1108/nfs-01-2014-0007

Edriss, A.-K., & Mehare, A. (2021). Impact of Farm and Non-Farm Micro-Enterprise Diversifications on Household Dietary Diversity in Malawi. *European Journal of Development Studies*. https://doi.org/10.24018/ejdevelop.2021.1.2.16

Fiorella, K. J., Chen, R. L., Milner, E. M., & Fernald, L. C. H. (2016). Agricultural Interventions for Improved Nutrition: A Review of Livelihood and Environmental Dimensions. *Global Food Security*. https://doi.org/10.1016/j.gfs.2016.03.003

Halim, K., Sartika, R. A. D., Sudiarti, T., Putri, P. N., & Rahmawati, N. D. (2020). Associations of Dietary Diversity and Other Factors With Prevalence of Stunting Among Children Aged 6-35 Months. *Indonesian Journal of Public Health Nutrition*. https://doi.org/10.7454/ijphn.v1i1.4380

Hussein, F. M., Ahmed, A. Y., & Muhammed, O. S. (2018). Household Food Insecurity Access Scale and Dietary Diversity Score as a Proxy Indicator of Nutritional Status Among People Living With HIV/AIDS, Bahir Dar, Ethiopia, 2017. *Plos One*. https://doi.org/10.1371/journal.pone.0199511

Kattel, K., Byanju, R. M., & Atreya, K. (2021). Does Adoption of Agroforestry Increase Farm Production and Dietary Diversity in the Hills of Nepal? *Archives of Agriculture and Environmental Science*. https://doi.org/10.26832/24566632.2021.060208

Kissoly, L., Faße, A., & Grote, U. (2018). Implications of Smallholder Farm Production Diversity for Household Food Consumption Diversity: Insights From Diverse Agro-Ecological and Market Access Contexts in Rural Tanzania. *Horticulturae*. https://doi.org/10.3390/horticulturae4030014

Koeryaman, M. T., Pallikadavath, S., Ryder, I., & Kandala, N.-B. (2023). The Effectiveness of a Web-Based Application for a Balanced Diet and Healthy Weight Among Indonesian Pregnant Women: Randomized Controlled Trial. *Jmir Formative Research*. https://doi.org/10.2196/38378

Kumar, A., Saroj, S., Singh, R. K., & Jee, S. (2016). Agricultural Diversity, Dietary Diversity and Nutritional Intake: An Evidence on Inter-Linkages From Village Level Studies in Eastern India. *Agricultural Economics Research Review*. https://doi.org/10.5958/0974-0279.2016.00030.6

Marchianti, A. C. N., Rachmawati, D. A., Astuti, I. S. W., Raharjo, A. M., & Prasetyo, R. (2022). The Impact of Knowledge, Attitude and Practice of Eating Behavior on Stunting and Undernutrition in Children in the Agricultural Area of Jember District, Indonesia. *Jurnal Berkala Epidemiologi*. https://doi.org/10.20473/jbe.v10i22022.140-150

Maretalinia, M., Suryani, D., Edwin, V. E., Suyitno, S., & Nilasari, N. (2020). Prevalence And Risk Factors Of Underweight For Adolescent In Indonesia: A Cross-Sectional From Global School-Based Student Health Survey 2015. *Public Health of Indonesia*, 6(4), 129–137. https://doi.org/https://doi.org/10.36685/phi.v6i4.360

Murendo, C., Nhau, B., Mazvimavi, K., Khanye, T., & Gwara, S. (2018). Nutrition Education, Farm Production Diversity, and Commercialization on Household and Individual Dietary Diversity in Zimbabwe. *Food & Nutrition Research*. https://doi.org/10.29219/fnr.v62.1276

Nengovhela, R., Belete, A., & Hlongwane, J. J. (2022). Measuring Rural Households' Food Consumption Pattern Using HDDS. A Case of Mopani District Municipality, Limpopo Province, South Africa. *Journal of Agribusiness and Rural Development*. https://doi.org/10.17306/j.jard.2022.01513

Nithyavathi, K., Rani, S. P., Vidhyavathi, A., & Hemalatha, S. (2022). Dietary Diversity of Public Distribution System Beneficiaries Households in Villupuram District of TamilNadu, India. *Asian Journal of Agricultural Extension Economics & Sociology*. https://doi.org/10.9734/ajaees/2022/v40i1031092

Rahman, A., & Mishra, S. (2019). Does Non-Farm Income Affect Food Security? Evidence From India. *The Journal of Development Studies*. https://doi.org/10.1080/00220388.2019.1640871

Romadhon, A., Sari, D. I., & Wicaksono, B. R. (2022). Multilevel Analysis: Household and Regional Factors Influence Agricultural Household Poverty in Indonesia, 2019. *Proceedings of the International Conference on Data Science and Official Statistics*. https://doi.org/10.34123/icdsos.v2021i1.173

Samosir, O. B., Radjiman, D. S., & Aninditya, F. (2023). Food Consumption Diversity and Nutritional Status Among Children Aged 6–23 Months in Indonesia: The Analysis of the Results of the 2018 Basic Health Research. *Plos One*. https://doi.org/10.1371/journal.pone.0281426

Sebayang, S. K., Dibley, M. J., Astutik, E., Efendi, F., & Kelly, P. J. (2019). Determinants of Age-appropriate Breastfeeding, Dietary Diversity, and Consumption of Animal Source Foods Among Indonesian Children. *Maternal and Child Nutrition*. https://doi.org/10.1111/mcn.12889

Sekabira, H., & Nalunga, S. (2020). Farm Production Diversity: Is It Important for Dietary Diversity? Panel Data Evidence From Uganda. *Sustainability*. https://doi.org/10.3390/su12031028

Sibhatu, K. T., Krishna, V. V, & Qaim, M. (2015). Production Diversity and Dietary Diversity in Smallholder Farm Households. *Proceedings of the National Academy of Sciences*. https://doi.org/10.1073/pnas.1510982112

Singh, S., Jones, A. D., & Jain, M. (2020). Regional Differences in Agricultural and Socioeconomic Factors Associated With Farmer Household Dietary Diversity in India. *Plos One*. https://doi.org/10.1371/journal.pone.0231107

Sly, B. C., Weir, T. L., Melby, C. L., Cunningham-Sabo, L., Leisz, S. J., & Stull, V. J. (2022). *Increasing Household Diet Diversity and Food Security in Rural Rwanda Using Small-Scale Nutrition-Sensitive Agriculture: A Community-Level Proof of Concept Study*. https://doi.org/10.1101/2022.09.27.22280437

Vaezghasemi, M., Öhman, A., Ng, N., Hakimi, M., & Eriksson, M. (2020). Concerned and Conscious, but Defenceless - The Intersection of Gender and Generation in Child Malnutrition in Indonesia: A Qualitative Grounded Theory Study. *Global Health Action*. https://doi.org/10.1080/16549716.2020.1744214

White, S., Schmidt, W., Sahanggamu, D., Fatmaningrum, D., Liere, M. v., & Curtis, V. (2016). Can Gossip Change Nutrition Behaviour? Results of a Mass Media and Community-based Intervention Trial in East Java, Indonesia. *Tropical Medicine & International Health*. https://doi.org/10.1111/tmi.12660

Young, A., & Kang, Y. (2020). Obstetrical Care Is Associated With Child's Dietary Diversity in Indonesia: Analysis From Demographic and Health Survey 2017. *Public Health Nutrition*. https://doi.org/10.1017/s1368980020002396