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Information sources and organic practices used by women farmers in organic farming of Chiang Mai province, Thailand

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Abstract

The aim of the study was to investigate the information sources and organic practices used by women farmers in performing organic farming. Data were collected from purposively selected 100 women farmers, who are certified organic farmers from Sankamphaeng, Mae on, Mae Taeng, Doi Saket, and San Sai districts of Chiang Mai. A questionnaire was used to collect data in February and March 2019 through face to face interviews. A four-point rating scale was used to ascertain the extent of use of information sources and the extent of practices regarding organic farming. The findings of the study indicate that 62 percent of respondents used medium level of information sources while about 79 percent practiced high level of organic practices. "Searching in different websites and online chatting", "neighbors and friends", and "participation in group meetings" were the most used information sources. "Application of bio-extract", "use of bio-control agents", and "mixed cropping" were topmost organic practices concerning insects-pests and disease controlling aspects. Besides, "compost", "vermicompost", and "green manuring" were mostly used organic practices concerning soil and plant health-improving aspects. Age, education, farming experience, and knowledge on organic farming had a significant positive association with the use of information sources and organic practices. Moreover, to manage the flow of information from sources and popularizing more organic practices different comprehensive campaigns, demonstration, organizing training focusing on all these issues can be done by Government Organizations (GOs) and Non-Government Organizations (NGOs) to harvest more benefits from organic farming.

Introduction

Organic farming is a sustainable and environment-friendly approach for agricultural crop production (Seufert, 2012; Chappell & LaValle, 2011; Scialabba, 2000). In Thailand, the popularity of organic farming has resulted from awareness of health-related issues in the public for natural and safe foods to live healthily. Having less or zero integration of agrochemicals, organic foods are perceived as the safest option (Ellis, Panyakul, Vildozo, & Kasterine, 2006). In this sector, women play a significant role as they perform most of the activities at the farm level (Desai, 2017; Soltani, Azadi, Mahmoudi, & Witlox, 2014), from seed selection to crop harvesting, even in post-harvest activities, marketing and selling products (Food and Agricultural Organization [FAO], 2011) and ensure food security for the family (Farnworth & Hutchings, 2009).

Information sources are essential for agricultural growth and development (Opara, 2008; Uwandu, Thomas, & Okoro, 2018). Quintessential features of farming are uncertainty and risk which are related to climate and weather conditions, insect plagues, disease and market price (input and produce). These risks affect crop production and the adoption of new farming practices (Aimin, 2010). Therefore, it is important

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to reduce uncertainty at the farm level (Solano, Leon, Perez, & Herrero, 2003). To get knowledge regarding farming, ideas, technologies, innovation, information sources are indispensable (Pornpratansombat, Bauer, & Boland, 2011). Information sources help farmers through providing information related to weather trends, different practices and market information, which direct farmers to make correct decisions at the right time related to crop production and reduce uncertainty (Bachhav, 2012). Information acquisition and organic farming practices are interrelated because information acquisition has a great impact on the adoption of organic practices (Genius, Pantzios, & Tzouvelekas, 2006; Sarker & Itohara, 2007). Organic farming practices ensure biodiversity, conserve water and improve soil structure. Accurate information from trustworthy sources increases the value of information and motivates farmers to adopt the right organic practices, essential for successful crop production. In Nigeria, 44.4 percent of farmers (male and female) learned about organic practices through neighbors, relatives or friends while 27.8 percent learned through extension visits, which had an effect on the adoption of organic practices. They adopted crop rotation, mixed cropping, hoeing, and hand weeding, slash and burn, and intercropping (Adesope, Matthews-Njoku, Oguzor, & Ugwuja, 2012). In Tanzania, most of the agricultural producers comprised of women farmers who seek agricultural information from radio and agricultural extension worker,at around 96 percent. (Isaya, Agunga, & Sanga, 2018). Adio, Abu, Yusuf, and Nansoh, (2016) found in their study that fellow farmers, town criers, television, mobile phones, film shows, radio etc. were the most used information sources and services by the farmers of Kwara State. Pornpratansombat, Bauer and Boland (2011) found in their study that extension agent was the most important source for farmers' (60%) knowledge. Besides, in northeastern Thailand, 18 percent depended on neighboring farmers and 14 percent used mass media as an information source for organic rice cultivation. Farmers also used mobile phones for solving their problems related to crop planting, insecticide information and input cost. Mostly, they used mobile phones to seek information from their neighbors in Chiang Mai (Rattanacharoen, 2009). In addition, extension worker was another source of information for farmers in Chiang Mai (Pinthukas, 2015). In Khon Kaen province, sequential cropping, using organic manure, light trap, kitchen waste were the most practiced organic practices (Mondal, Haitook, & Simaraks, 2014). Besides, to reduce insect-pest infestation different organic practices like weeding, green manuring, using cover crops, field sanitation, crop rotation are practiced by farmers in Chiang Mai province, Thailand (Pinthukas, 2012).

Chiang Mai is one of the most efficient organic product producing areas (Limnirankul & Gypmantasiri, 2012) and women farmers in Chaing Mai make a remarkable contribution to this sector. They make their own organic products such as compost, botanical pesticides, bio-extracts from locally available materials. Besides participation in organic crop production (rice, vegetable, fruit and herb), they are also involved in the value addition of different organic produce through processing, making and selling (Eisses & Chaikam, 2002). Information sources can provide knowledge to the women farmers for reducing farming related uncertainty and risks. Besides, availability of information related to organic practices can enhance adoption of organic farming. From the above discussions, different researches identified information sources and organic practices generally. Most importantly, they did not concentrate on the issue of women. That is why it is essential to find out different information sources and organic practices used by women farmers. Considering all these facts, the present study was undertaken. The specific objectives of the studywere: (1) to find out the information sources and organic practices used by women farmers; (2) to explore the relationship between socio-economic characteristics and use of information sources, and socio-economic characteristics and organic practices.

Methodology

Study Area, Sampling and Sample Size

The study was carried out in five districts of Chiang Mai province, namely, Sankamphaeng, Mae on, Mae Taeng, Doi Saket, and San Sai districts. The information sources and organic practices in performing organic farming were investigated from 100 women farmers who are certified organic farmers. The purposive sampling technique was used to select the respondents from these five districts. Purposive sampling is a non-probability sampling where participants for the data collection are selected based on the judgments of the researcher (Baxter & Babbie, 2003). In addition, a pre-tested and validated questionnaire was used to obtain primary data for the study. Through using the questionnaire, data were collected by face to face interviews between February and March 2019.

Measurement of Variables of the Study

Socio-economic characteristics of the respondents such as age, education, farming experience, farm size, annual family income, training experience, credit facility, knowledge on organic farming activities were selected and raw data scale was developed and measured based on such.

The extent of use of information sources was one of the focus variables of the study. Eleven (11) information sources were identified and a 4-point rating scale was used weighing 3, 2, 1 and 0 for frequently, occasionally, rarely and not at all, respectively, for use of information sources. For each respondent, possible score could range from 0 to 33. Information Index (II) (Asaduzzaman, Rahman, & Khan, 2016; Kabir, Roy, & Kuri, 2014) was calculated to determine the extent of use of information sources done by the respondent of a specific source. This was done by using the following Equation (1):

$$\text{II (Information Index)} = (U_f \times 3) + (U_o \times 2) + (U_r \times 1) + (U_n \times 0) \quad (1)$$

Where, U_f = Total number of respondents indicating frequently, U_o = Total number of respondents indicating occasionally, U_r = Total number of respondents indicating rarely, U_n = Total number of respondents indicating not at all. Information Index (II) could vary from 0 to 300 while 0 indicated "no use" and 300 indicated "frequent use".

The extent of practice regarding organic farming was another focus variable of the study. Twenty-one (21) practices regarding organic farming were identified into two categories such as insects-pests and diseases controlling practices, and soil and plant health-improving practices. A 4-point rating scale was used weighing 3, 2, 1 and 0 for frequently, occasionally, rarely and not at all, respectively. For each respondent, possible score could range from 0 to 63. Organic Practice Index (OPI) (Farouque & Sarker, 2018; Roy, Farouque, & Rahman, 2014) was calculated to determine the extent of the practice done by the respondent for a specific practice. This was done by using the following Equation (2):

$$OPI\ (Organic\ Practice\ Index) = (P_f \times 3) + (P_o \times 2) + (P_r \times 1) + (P_n \times 0) \quad (2)$$

Where, P_f = Total number of respondents indicating frequently, P_o = Total number of respondents indicating occasionally, P_r = Total number of respondents indicating rarely, P_n = Total number of respondents indicating not at all. Organic Practice Index (OPI) could vary from 0 to 300 while 0 indicated "no practice" and 300 indicated "frequent practice".

Statistical Analysis

Descriptive statistics were used whenever necessary. Pearson's product-moment correlation coefficient (r) was also conducted to see the relationship between socio-economic characteristics and use of information sources, and socio-economic characteristics and organic practices of the respondents using IBM SPSS statistics version 23.

Results and Discussion

Socio-economic Characteristics of the Women Farmers

Table 1 reveals that the majority (55%) of the respondents were old and 46 percent had graduated from various universities. With the increase of age, respondents faced different health-related problems and education performed as fuel to make the proper decision concerning organic farming. About 55 percent of respondents had farming experience of 11 to 20 years. Almost 47 percent of the respondents owned small farm and from such farm the majority (80%) had an annual income of up to 170 thousand Baht. Their major source of income was organic farming. Respondents got training on organic farming from different organizations, but most of them (96%) had training experience up to 30 days. About 97 percent of respondents took credit facilities from bank, village cooperatives, village funds and other sources of up to 500 thousand Baht.In addition, they had medium level of knowledge on organic farming activities.

Table 1 Selected Socio-economic characteristics of women farmers

n = 100

Silent feature	Possible score range	Observed score range	Category of women farmers		No.	Percent
Age (Years)	Unknown	29–70	Young	(up to 35)	1	1
			Middle	(36–55)	44	44
			Old	(more than 55)	55	55
Education (Total years of schooling)	Unknown	0–16	No schooling	(0)	1	1
			Can sign only	(0.5)	0	0
			Primary	(1–6)	9	9
			Secondary	(7–12)	44	44
			Graduate	(more than 12)	46	46
Farming Experience (Years)	Unknown	5–32	Up to 10		24	24
			11 to 20		55	55
			More than 20		21	21
Farm size (Hectare)	Unknown	0.08–7.36	Landless	(less than 0.02 ha)	0	0
			Marginal	(.02–0.2 ha)	10	10
			Small	(0.21–1 ha)	47	47
			Medium	(1.01–3 ha)	39	39
			Large	(more than 3.0 ha)	4	4
Annual family income (000'Baht)	Unknown	10–512	Up to 170		80	80
			171 to 340		18	18
			More than 340		2	2
Training experience (Days)	Unknown	0–90	Up to 30		96	96
			31 to 60		0	0
			More than 60		4	4
Credit facility (000'Baht)	Unknown	0–1500	Up to 500		97	97
			501 to 1000		2	2
			More than 1000		1	1
Knowledge on organic farming activities (Score)	0–22	4–19	Low	(up to 7)	10	10
			Medium	(8–14)	46	46
			High	(More than 14)	44	44

Source: Authors' survey (2019)

Women Farmers Extent of Use of Information Sources in Organic Farming

From Table 2 it was found that almost 62 percent of respondents fell into the category of medium level use of information sources followed by 20 percent and 18 percent with high and low use of information sources respectively. Therefore, it can be said that respondents have good awareness regarding the importance of the use of information sources.

To measure the extent of use of information sources, the rank order of the sources was made according to Information Index (II) score. The top three (3) information sources used by the respondents have been described based on the II score as shown in Table 3. According to Table 3, "searching in different websites and online chatting" was the 1st ranked, "neighbors and friends" was the 2nd ranked and "participation in group meetings" was 3rd ranked information source according to the score II-274, II-270, and II-268, respectively.

It is clear from the Table that respondents' high educational background and improved knowledge level helps them to explore different information sources to meet their needs. The advancement of technology and available internet facility enables women farmers to access and collect various information related to their organic farming. They give priority to these ways because information requirements can be met immediately. Respondents also rely on their neighbors' and friends' suggestions because they think that information provided by them is credible and due to having a good acquaintance with the perceived situation, provided information proved more helpful to them. Besides these, respondents always participate in group meetings organized in the village, or other places. They think that they can share their practical experiences , and problems with other members of the group in such a meeting. Consequently, many farming problems can easily be solved.

Women Farmers Extent of Practice in Organic Farming

Table 4 reveals that the majority of the women farmers (79%) fell into the category of the high level of organic practices. Therefore, it can be said that respondents have a higher enthusiasm to use different organic practices for successful crop production.

To measure the extent of practice, the rank order of the organic practices was made according to Organic Practice Index (OPI) score. The top three (3) practices in each category have been described here based on the OPI score shown in Table 5.

Table 2 Distribution of the respondents according to their use of information sources

n = 100

Silent feature	Possible score range	Observed score range	Category of women farmers		No.	Percent
Information sources	0–33	2–29	Low	(up to 11)	18	18
			Medium	(12–22)	62	62
			High	(More than 22)	20	20
			Total		100	100

Source: Authors' survey (2019)

Table 3 Rank order of the information sources according to the extent of use

n = 100

Information sources		Extent of use				II	Rank order
		Frequently (3)	Occasionally (2)	Rarely (1)	Not at all (0)		
Personal contact	1. Local leader	61	8	29	2	228	8
	2. Field facilitator	55	8	34	3	215	9
	3. Volunteers	71	14	5	15	246	6
	4. Neighbors and friends	78	14	8	0	270	2
Group contact	5. Participation in group meetings	76	16	8	0	268	3
	6. Demonstration meeting	54	11	34	1	218	10
	7. Fair or other events	75	15	8	2	263	4
Mass contact	8. Listening agricultural program on radio	51	15	31	3	214	11
	9. Watching agricultural program on television	69	9	18	4	243	7
	10. Reading (leaflet/ poster/ bulletin etc.)	70	17	10	3	254	5
	11. Searching in different websites and online chatting	80	14	6	0	274	1

Note: II = Information Index.
Source: Authors' survey (2019)

Table 4 Distribution of the respondents according to their level of organic practice

n = 100

Silent feature	Possible score range	Observed score range	Category of women farmers		No.	Percent
Level of practice	0–63	21–60	Low	(up to 20)	0	0
			Medium	(21–40)	21	21
			High	(More than 40)	79	79
			Total		100	100

Source: Authors' survey (2019)

Table 5 Rank order of the organic practices according to the extent of practice

n = 100

Name of organic practices		Extent of practice				OPI	Rank order
		Frequently (3)	Occasionally (2)	Rarely (1)	Not at all (0)		
Insects-pests and diseases controlling practices	1. Weeding	90	10	0	0	290	4
	2. Mulching	88	6	4	2	280	7
	3. Intercropping	89	8	3	0	286	5
	4. Use of wood vinegar	56	12	24	8	216	13
	5. Sequential cropping	55	17	7	21	206	14
	6. Use of bio-control agents	95	5	0	0	295	2
	7. Mixed cropping	91	9	0	0	291	3
	8. Crop rotation	83	12	3	2	276	9
	9. Application of bio-extract	98	2	0	0	300	1
	10. Use of detergent and soap water	81	14	4	1	275	10
	11. Use different types of trap	82	13	5	0	277	8
	12. Ash (as pesticide)	80	11	4	5	266	11
	13. Spraying of raw milk	67	17	2	14	237	12
	14. Planting crops in the greenhouse	90	5	5	0	285	6
Soil and plant health-improving practices	15. Use of charcoal	69	21	9	1	258	5
	16. Cow dung	50	40	10	0	240	6
	17. Compost	100	0	0	0	300	1
	18. Vermicompost	91	6	3	0	288	2
	19. Using kitchen waste	71	19	8	2	259	4
	20. Green manuring	82	11	6	1	274	3
	21. Use of poultry litter	65	14	8	13	231	7

Note: OPI = Organic Practice Index.
Source: Authors' survey (2019)

Insects-pests and Diseases Controlling Practices

According to Table 5 "application of bio-extract" was the 1st ranked, "use of bio-control agents" was the 2nd ranked and "mixed cropping" was the 3rd ranked insects-pests and disease controlling practices according to the scores OPI-300, OPI-295, and OPI-291, respectively. To control insects-pests or diseases, respondents collect available resources from crop fields like chili, garlic, ginger, lemongrass, tobacco, neem, marigold, basil, citronella, etc. and cut into small pieces. They mix all these materials with water and leave for two weeks to three months for fermentation. After that, the mixture is ready for spraying to the crop plants. Besides application of bio-extract, respondents apply ladybird beetle, earwig, hornet, and *Beauveria bassiana* etc. for their farming purposes because it is well known that these agents are very effective for controlling insects and disease. This is why use of different bio-control agents was 2nd most preferable practice by the respondents. Moreover, respondents mostly preferred mixed cropping patterns to grow different vegetables. Diversity of crops keeps away different harmful insects and alters the disease causing pattern in the crop fields.Also, various vegetables can be cultivated at the same time to meet their daily needs.

Soil and Plant Health-improving Practices

According to Table 5 "compost" was the 1st ranked, "vermicompost" was the 2nd and "green manuring" was the 3rd ranked soil and plant health-improving practice according to the scores OPI-300, OPI-288, and OPI-274, respectively. Application of compost is the most popular practice among women farmers. They collect composting materials (dead leaves, twigs, fruit rinds etc.) from their own farms and prepared compost beds for composting. Prepared compost is applied to the soil and through improving soil health crop yields are increased. Besides this, vermicompost influences soil properties through improving physical, chemical, and biological properties of soil, which enhances crop productivity. Respondents use earthworms to prepare vermicompost. They learned this technology from training organized by various GOs and NGOs. After the utilization of vermicompost, they found that it improves soil and plant health which provides good quality of yields. Moreover, to improve soil health and enrich soil microbial properties respondents apply green manuring approaches in their crop fields because it acts as a source of nutrients. They mostly apply leguminous (pea, bean, gram etc.) manure in the soil resulting in a significant yield increase in crops. Weed and disease management also became easier for them after applying green manures.

Information Sources Use and Organic Practices Performing Pattern of Women Farmers

Table 6 reveals that the old respondents used more information sources (mean value 18.4) and organic practices (mean value 46.69) than the other age categories. This may be because health-related problems increase with the increase of age, which is why they seek more information about organic farming to lead a healthy life. Graduates and experienced respondents (more than 20 years) were more involved in information sources use and organic practices. Education and experiences help them to analyze their farming problems and encourage them to utilize information sources for improving

their farming activities. Besides, medium category respondents having farm size of 1.01 to 3 ha and income of 171 to 340 thousand baht utilized organic farming related information sources and practices more than other categories according to the mean value. Information sources improve knowledge levels regarding different organic practices. Therefore, respondents who had training experience up to 30 days, use more information sources to seek knowledge and apply that knowledge in their crop field. In addition, respondents who had taken credit facilities of 501 to 1000 thousand baht and had medium level of knowledge engaged in more information sources use and organic practices compared to other categories.

Relationship between Socio-economic Characteristics and Use of Information Sources, and Socio-economic Characteristics and Organic Practices of the Respondents

Table 7 shows that age and education had a significant positive association with information sources use and organic practices performed at .01 level of probability. Besides, farming experience and knowledge on organic farming positively associated with information sources use at .05 level of significance. In addition, farming experience and knowledge on organic farming also positively associated with organic practices performed, which is statistically significant at 1 percent and 5 percent level of significance, respectively. This implies that, with the increase of age, education, farming experience, and knowledge, respondents use of information sources and organic practices also increased as respondents grow older, bear a lot of responsibility at home and farm level, gather experiences and knowledge about life and farming. Therefore, they can identify their farming problems and seek solutions through using information sources and organic practices. Nenna (2014) found in the research that age, education and farming experience of farmers had a significant positive relationship with the use of information communication technology in Nigeria.

Table 6 Information sources use and organic practices performing pattern of the respondents based on their socio-economic characteristics

n = 100

Socio-economic characteristics	Category of women farmers		Mean value of the respondents having specific socio-economic characteristics	
			Information sources use	Organic practices performed
Age (years)	Young	(Up to 35)	5	21
	Middle	(36–55)	14.98	41.55
	Old	(More than 55)	18.4	46.69
Education (Total years of schooling)	No schooling	(0)	5	21
	Can sign only	(.5)	0	0
	Primary	(1–6)	9.22	29.56
	Secondary	(7–12)	16.66	40.23
	Graduate	(more than 12)	18.59	51.30
Farming Experience (Years)	Up to 10		13.33	41.17
	11– 20		17.84	44.33
	More than 20		17.86	47.19
Farm size (Hectare)	Landless	(less than .02)	0	0
	Marginal	(.02–.2)	19.2	44.1
	Small	(.21–1)	15.23	42.64
	Medium	(1.01–3)	17.92	46.84
	Large	(more than 3.0)	17.25	36.25
Annual family income (000'Baht)	Up to 170		16.41	43.74
	171 to 340		19	47.06
	More than 340		18.06	35.5
Training experience (Days)	Up to 30		16.77	44.44
	31 to 60		0	0
	More than 60		16.5	37.75
Credit facility (000'Baht)	Up to 500		16.63	44.1
	501 to 1000		23	59
	More than 1000		17	21
Knowledge on organic farming activities (Score)	Low	(Up to 7)	17.1	42.6
	Medium	(8–14)	17.3	45.2
	High	(More than 14)	15.98	43.49

Source: Authors' survey (2019)

Table 7 Correlation between independent and dependent variables

$n = 100$

Selected Socio-economic characteristics	Correlation coefficient (r) with 98 degrees of freedom	
	Information sources use	Organic practices performed
Age	.387**	.347**
Education	.443**	.779**
Farming experience	.252*	.290**
Farm size	.025	-.105
Annual family income	.102	.039
Training experience	.032	-.090
Credit facility	.052	-.071
Knowledge on organic farming activities	.398*	.234*
Tabulated value of (r) at 98 degree of freedom at 5% level is .195 and 1% level is .254		

Note: *$p < .05$, **$p < .01$

Conclusion and Recommendation

Based on the study, it is evident that the majority of the respondents (62%) had a medium level of use of information sources and the majority (79%) were found with a high level of organic practices category. This is a positive sign, and there is ample scope for the respondents to increase the use of information sources because the use of information sources greatly contributed to their high level of extent of practice of organic farming technologies. "Searching in different websites and online chatting", "neighbors and friends", and "participation in group meetings" were the most used or top-ranked information sources preferred by respondents. Other information sources such as fair or other event and reading (leaflet/ poster/ bulletin etc.), volunteers, watching agricultural programs on television and so on should be made more effective to get more knowledge about organic farming. Besides this, insects-pests and diseases controlling practices such as "application of bio-extract", "use of bio-control agents", and "mixed cropping" and soil and plant health-improving practices such as "compost", "vermicompost", and "green manuring" were the mostly used organic practices.Also, age, education, farming experience, and knowledge had a significant positive association with use of information sources and organic practices. Therefore, considering all these issues, policy makers and other development practitioners can recommend suitable programs to manage the flow of information from sources, and to make other information sources and organic practices more popular for improving organic crop growth and development. In addition, through focusing on age, education, farming experience and knowledge level, different GOs and NGOs can take initiatives like campaigns, motivational program, demonstration, skill-based training regarding organic farming.

Conflict of Interest

There is no conflict of interest.

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References

Adesope, O. M., Matthews-Njoku, E. C., Oguzor, N. S., & Ugwuja, V. C. (2012). Effect of socio-economic characteristics of farmers on their adoption of organic farming practices. In P. Sharma & V. Abrol (Eds.), *Crop production technologies* (pp. 210–220). Rijeka, Croatia: InTech. Retrieved from https://www.intechopen.com/books/crop-production-technologies

Adio, E. O., Abu, Y., Yusuf, S. K., & Nansoh, S. (2016). Use of agricultural information sources and services by farmers for improve productivity in Kwara State. *Library Philosophy and Practice*, *1456*, 1–16.

Aimin, H. (2010). Uncertainty, risk aversion and risk management in agriculture. *Agriculture and Agricultural Science Procedia*, *1*, 152–156. doi: 10.1016/j.aaspro.2010.09.018

Asaduzzaman, M., Rahman, M. H., & Khan, M. S. (2016) Use of selected mass media by fish farmers in receiving technological information. *Bangladesh Journal of Extension Education*, *28*, 31–36.

Bachhav, N. B. (2012). *Information needs of the rural farmers: A study from Maharashtra, India: A survey library philosophy & practice*. Retrieved from https://digitalcommons.unl.edu/libphilprac/866/

Baxter, L. A., & Babbie, E. R. (2003). *The basics of communication research*. Boston, MA: Wadsworth.

Chappell, M. J., & LaValle, L. A. (2011). Food security and biodiversity: Can we have both? An agroecological analysis. *Agriculture and Human Values*, *28*(1), 3–26. doi: 0.1007/s10460-009-9251-4

Desai, R. M. (2017). *Role of women in organic farming and their family quality index in the selected agro-climatic zones of Northern Karnataka* (Unpublished doctoral dissertation). University of Agricultural Sciences, Dharwad, India.

Eisses, R., & Chaikam, J. (2002). Organic farming and gender roles in Northern Thailand. *Leisa Magazine*, *18*, 26–27.

Ellis, W., Panyakul, V., Vildozo, D., & Kasterine, A. (2006). *Strengthening the export capacity of Thailand's organic agriculture: Final report*. Geneva, Switzerland: International Trade Centre.

Food and Agricultural Organization. (2011). *The role of women in agriculture* (Working Paper No. 11–02). Food and Agriculture Organization of the United Nations. Viale delle Terme di Caracalla, Rome, Italy.

Farnworth, C., & Hutchings, J. (2009). *Organic agriculture and women's empowerment*. Bonn, Germany: International Federation of Organic Agriculture Movements [IFOAM].

Farouque, M. G., & Sarker, M. A. (2018). Farmers knowledge and practice of organic vegetable cultivation: A field level study of two villages from Bangladesh. *Journal of Agricultural Extension and Rural Development*, *10*(5), 99–107. doi: 10.5897/JAERD2018.0948

Genius, M., Pantzios, C. J., & Tzouvelekas, V. (2006). Information acquisition and adoption of organic farming practices. *Journal of Agricultural and Resource Economics*, *31*(1), 93–113.

Isaya, E. L., Agunga, R., & Sanga, C. A. (2018). Sources of agricultural information for women farmers in Tanzania. *Information Development*, *34*(1), 77–89. doi: 10.1177/0266666916675016

Kabir, K. H., Roy, D., & Kuri, S. K. (2014). Information seeking behavior of the farmers to ensure sustainable agriculture. *European Academic Research*, *2*(3), 3723–3734.

Limnirankul, B., & Gypmantasiri, P. (2012). Incorporating agro-biodiversity to market-oriented organic rice in Northern Thailand: An enabling innovation process and achievement. *Chiang Mai University Journal of Natural Sciences*, *11*(1), 469–482.

Mondal, S., Haitook, T., & Simaraks, S. (2014). Farmers' knowledge, attitude and practice toward organic vegetables cultivation in Northeast Thailand. *Kasetsart Journal of Social Science*, *35*, 158–166.

Nenna, M. G. (2014). Assessment of information and communication technologies (ICTS) among cassava farmers in Anambra state, Nigeria. *British Journal of Research*, *3*(2), 41–54.

Opara, U. N. (2008). Agricultural information sources used by farmers in Imo State, Nigeria. *Information Development*, *24*(4), 289–295. doi: 10.1177/0266666908098073

Pinthukas, N. (2012). Constraints to organic vegetable production in Chiang Mai, Thailand. *Chiang Mai University Journal of Natural Sciences*, *11*(1), 33–38.

Pinthukas, N. (2015). Farmers' perception and adaptation in organic vegetable production for sustainable livelihood in Chiang Mai Province. *Agriculture and Agricultural Science Procedia*, *5*, 46–51.

Pornpratansombat, P., Bauer, B., & Boland, H. (2011). The adoption of organic rice farming in Northeastern Thailand. *Journal of Organic Systems*, *6*(3), 4–12.

Rattanacharoen, N., (2009). *Mobile phone utilization of farmers in Chiang Mai province, Thailand* (Unpublished master's thesis). Agricultural Extension Department. Chiang Mai University, Chiang Mai, Thailand. [in Thai]

Roy, D., Farouque, G., & Rahman, Z. (2014). Practice of soil and crop management technologies by the FFS farmers for maintaining sustainable agriculture. *European Academic Research*, *2*(6), 8282–8297.

Sarker, A., & Itohara, Y. (2007). Information sources used by the farmers regarding practice of organic farming. *Journal of Rural Problems*, *43*(1), 234–239. doi: 10.7310/arfe1965.43.234

Scialabba, N. 2000. Factors influencing organic agricultural policies with a focus on developing countries. *IFOAM 2000 Scientific Conference*. Basel, Switzerland.

Seufert, V. (2012). *Organic agriculture as an opportunity for sustainable agricultural development.* Research to Practice Policy Briefs, Policy Brief (No. 13). Quebec, Canada: Canadian International Development Agency.

Solano, C., Leon, H., Perez, E., & Herrero, M. (2003). The role of personal information sources on the decision-making process of Costa Rican dairy farmers. *Agricultural Systems*, *76*(1), 3–18. doi: 10.1016/S0308-521X(02)00074-4

Soltani, S., Azadi, H., Mahmoudi, H., & Witlox, F. (2014). Organic agriculture in Iran: Farmers' barriers to and factors influencing adoption. *Renewable Agriculture and Food Systems*, *29*(2), 126–134. doi: 10.1017/S1742170513000069

Uwandu, C. N., Thomas, K. A., & Okoro, C. M. (2018). Utilization of agricultural information sources and adoption of animal and crop technologies among farming households in Imo State, Nigeria. *Journal of Agricultural Extension*, *22*(1), 143–155. doi: 10.4314/jae.v22i1.13