Abstract Proceedings of International Conference on Responsive Education and Socio-Economic Transformation

2019
Volume 2, Issue 1
ISSN 2651-7256

Research Paper

FARMERS COGNITION, PRACTICES AND ATTITUDES TOWARD LOW EXTERNAL INPUT FARMING TECHNOLOGY AND FARM PRODUCTIVITY UNDER LOWLAND AGROECOLOGICAL ZONE

Abstract

The Low External Input technology has been promoted widely to address the grave effects of Conventional Modern agricultural technology. It has been observed that modern agricultural system technology has been widely adopted by resource-poor farmers. Despite these programs and the efforts spent to widely promote the use and practice of this technology, there are still no clear evidences at the farmers' levels and sufficient documentations of success stories that manifest farmers' cognition (knowledge & awareness) and practices of this technology. Further, the claim that this technology has really increase farm productivity has yet to be proven. Thus, this study aimed to analyze the cognition, practices and attitude of farmers toward low external input technology and the degree of its relationship with farm productivity and income. The descriptive qualitative and quantitative designs were applied in this study. A triangulation method consisting of a Focus Group Discussions (FGD's), key informant interview, survey and sampling techniques conducted in the communities. The level of cognition (knowledge & awareness) on Low external input farming technology remains very low. Most of the farmers' respondent was very dependent on chemical input based technology such as using pesticides and commercial fertilizers. The productivity and income of the farmers in different barangays varies. The yield ranged from as high as 2.25 tons per hectare valued at 34,875 to as low as 1.63 tons per hectare valued at 25,265. The degree of relationship between cognition and productivity showed very weak correlation. The degree of correlation between productivity and practices showed a strong negative relationship.

Key words: Cognitive, Low External Input Farming Technology and Agroecological Zone

Authors' Information:
Corresponding Author: Norhaya S. Tiago, L.Agr.
E-mail Address: Ayatiago@yahoo.com
Contact Number:09262859145
Institution: Mindanao State University-Maguindanao

Co-Author: Shiela Mae Dionaldo, L.Agr.
Institution: Mindanao State University-Maguindanao
E-mail Address:shielamaedionaldo@yahoo.com
Contact Number: 09061765513, 09568620462

Co-Author: Maria Lina Dalamban, L.Agr.
Institution: Mindanao State University-Maguindanao
E-mail Address: malinz0722@yahoo.com
Contact Number: 09568620462

Co-Author: Engr. Jeanneflor Salva-Atong
Institution: Mindanao State University-Maguindanao

Paper Reference Number: DE31EF14O

How to Cite: Tiago, N.S., Dionaldo, S.M., Dalamban, M.L., Salva-Atong, J. (2019) Farmers Cognition, Practices And Attitudes Toward Low External Input Farming Technology And Farm Productivity Under Lowland Agroecological Zone. Abstract Proceedings of International Conference on Responsive Education and Socio-Economic Transformation. Vol02: Iss01: Pg31.

Introduction

Low External Input Technology refers to the knowledge, skills and practices in Agriculture that promote the optimal use of locally available natural and human resources such as soil, water, vegetation, local plants and animals, human labor, knowledge and skills. This is associated with the principles of Sustainable Agriculture which is centered on economically feasible, ecologically sound, culturally adapted and socially just agricultural undertakings. The use of external inputs is not excluded but is seen as complementary to the use of local resources and has to be paralleled with the given principles (Reijntjes et al.,1992).

This technology is promoted to address the grave effects of Conventional Modern agricultural technology. It is now clear that the widespread applications of chemical fossil –fuel based agricultural inputs in the modern agricultural farming systems have resulted to more problems than benefits to the resource-poor farmers. These problems that resulted to declining productivity are brought about by the increasing cost of chemical fertilizers and other farm inputs ;imbalance in the nutrient composition of the soil, lowering of the microbial population and plants inability to assimilate the available nutrients applied to the soil, pollution of water ways and irrigation systems, hazards to the farmers health, loss of significant plant species and biodiversity due to ill effects of too much chemical accumulation in the plant system and build- up of harmful insects and pests population (Tripp et al,.. 2005).

In Maguindanao, practices and strategies regarding the adoption of technology under Lowland rice Farming System varied. On one hand, the modern conventional agriculture advocates the use of fossil-fuel based technology such as chemical fertilizers and pesticides. This technology has been fully adopted and followed by these rice farmers. Even the program of the government still sticks to the wide promotion of this technology. On the other hand, the suggested paradigm shifts to Low External Input Technology has been promoted. In fact, the passing of the Organic Agriculture Act or R.A. 10068 of 2010 has paved the way to promote Low External Input Technology. Several programs that showcase the technology have been given emphasis by the government.

But despite these programs and the efforts spent to widely promote the use and practice of this technology, there are still no clear evidences at the farmers' levels and sufficient documentations of success stories that manifest farmers' cognition (knowledge & awareness) and practices of this technology. Further, the claim that this technology has really increase farm productivity has yet to be proven.

The study aimed to analyzed the farmers cognition, practices and attitude of farmers toward low external input technology and the degree of its relationship with farm productivity and income.

Methodology

Research Design

The descriptive qualitative and quantitative designs were applied in this study. A triangulation method consisting of a Focus Group Discussions (FGD's), key informant interview, survey and sampling techniques conducted in the communities. A participatory approach to ensure community involvement in the program done during an orientation and updates of the current program & studies conducted.
The field survey specifically determined the farmers' cognition (awareness, knowledge), practices and attitudes on Low external input technology. In the field survey activity, data regarding the personal factors and socio- economic, cognition, practices and attitudes on LEIT and the productivity of the existing farmers were taken. One hundred farmers –respondents were randomly selected from the 5 barangays of Datu Odin Sinsuat, Maguindanao. These barangays are Dados, Kakar, Benolen, Bonged and Baka.

Respondents and Sampling Method

The total population of the 5 barangays that engaged in lowland rice farming was considered. One hundred farmers were selected as respondent. Random sampling method was adopted in the selection of the respondents. There were 15 farmers respondent mostly farmer leaders and barangay officials with enough experiences on farming activities in the area were chosen to be part of the focus group discussion and key respondents. The 100 farmers were randomly selected using draw lots from the list of farmers name taken from the Municipal Agricultural Officer.

Published by Sons and Daughters Publishing House Inc.
Available on SSRN-Elsevier
https://www.ssrn.com/link/ICRESET-2021.html

Data Gathering Procedure

A survey using structured questionnaire was used to collect data. The instrument used was modified from Josue,D. (1999)survey questionnaire. The questionnaires were subjected to several critiquing by the adviser. The validity and reliability of the instrument was pre-tested from 15 randomly selected respondents in barangays Dados. Cleaning of the questionnaire was done after. All unnecessary questions and entries were discarded. The entries were based on their socio-demographic profile to include the gender, age, status, educational attainment, age and number of years in farming. Measures were also done to obtain data on the cognition (knowledge & awareness), practices and attitudes of the farmers towards Low external input technology with fixed responses. (Assis, K. and Mohd Ismail, H.A. 2011).

The Likert-type responses to include a five-point scale continuum ranging from strongly agree, agree, undecided, disagree and strongly disagree responses were used. The assigned scores for the scales were 5, 4, 3, 2 and 1, for positive statements, respectively and vice versa for negative statements. The productivity of the farmers was based on their yield and income. The yield was based on kilograms/hectare and the income was computed based on the prevailing market price of rice per kilogram multiplied by the number of kilograms obtained by the farmers during the given cropping's at the time of the study.

Results and Discussion

Socio-Demographic Profile

The socio-demographic profile in the 5 barangays of Datu Odin Sinsuat, Maguindanao shows more male farmers (97%) than female (3%) (Table1). Most of them are married (89%) with ages that ranged from 31-50 years old. The illiterates and those that finished only elementary grade level dominate the area (50%). The farmers are mostly practicing Islam religion (95%). Most of them (40%) are in farming in the last 15-25 years.

The male farmers lead the farming operation of the household. Majority of the respondents are married. This is attributed to the belief that getting married will help reduce the cost of labour on the farm as family members will also help. It also indicates that most of the farmers are illiterate in which it can contribute to the factor that hinders effective deliver new knowledge to the rural people. The Muslim area has different culture and beliefs compare to others. Almost half of their age begins on farming occupation.

The gender and age are one of the important demographic factors that can contribute to the knowledge, attitude and practices of farmers (Molder et al., 1991; Burton et al., 1999; Ghorbani & Hamraz, 2009; Sarker et al., 2010; Seyed et al., 2010). By taking into account these two demographic factors in sampling the respondents, the response bias could be reduced and the findings can be generalized.

Farmers Cognition Toward Low External Input Technology

Most (97%) farmers have low level of cognition toward low external input technology (Table 2). These include the use kitchen waste, plant and animal waste to fertile soil and farming system technology. Most (97%) of them also are very dependent on chemical inputs as reflected by their heavy usage of pesticides and commercial fertilizers. The farmers are not aware of the significant contribution of the organic inputs.

These findings are related to the reports and studies on socio-economic characteristics, farmers' awareness and perception of the technologies by numerous authors (Pretty (1996) Adegbola and Gardebroek 2007; Oladele and Fawolde 2007;Palis 2006; Palis et al. 2005; Somda et al. 2002;; Ghadim and Pannell, 1999; Corrales and Serrano 1999;Palis 1998. They discussed the major determinants affecting farmers' adoption of agricultural technologies and argued that sustainable agricultural system requires knowledge, management and skills to adapt a favorable attitude towards sustainability in agriculture.

Farmers Practices on Low External Input Technology

The practices used by the farmer towards low external input farming technology show that most farmers (scale= 1-1.37) are not using the insects predators to control pests, manure as biogas source, kitchen waste, green manuring and cover crop, mulching, plant and animal waste, crop rotation and organic fertilizer (Table 3). These imply that the farmers are not adopting low external input practices. Only manual weeding and trap method are being practiced by the farmers. These are

Published by Sons and Daughters Publishing House Inc.
Available on SSRN-Elsevier
https://www.ssrn.com/link/ICRESET-2021.html

indicated by their manual weeding more than once and used of trapping method once (scale= 1.82-2.75).

Generally, there is low level of awareness on Low external input technology. Many of the practices (Table 1) show negative responses from the farmers. Even the simple practices are not recognized. These are due to the limited information regarding the technology. On one hand, the use of fertilizers and pesticides has positive and negative consequences. These chemical-based inputs are proven to increase yields, and thus make a significant difference in food production particularly in rural areas. On the other hand, their excessive used results to water pollution as a consequence of run-off and erosion. There are also risks that these chemicals will have detrimental effects to non- target animals, plant species and humans (Tripp 2006)

Studies showed economic, technical and institutional factors that affect the farmer's decision to adopt low external input technology. For instance, Schneeberger, et al (2002) and Scialabba and Hattam (2002) revealed that Australian farmers did not adopt organic practices due to fear of decrease income and marketing problems. High prices and limited markets have historically curtailed the demand for organic agriculture products.

Table 1. Farmers Practices on Low External Input Technology in 5 Barangays of Datu Odin Sinsuat

Farmers Practices	Dados	Kakar	Benolen	Bonged	Baka	Mean	Interpretation
Crop rotation	1.4	1.35	1.2	1.15	1.65	1.35	Never
Manual weeding or hand weed	2.65	2.9	2.75	2.85	2.6	2.75	More than once
Intercropping/mixed cropping	1.45	1.35	1.2	1.6	1.25	1.37	Never
Using animal manure	1.1	1.2	1.1	1.05	1.3	1.15	Never
Using plant waste	1.05	1.15	1.2	1.15	1.45	1.2	Never
Using organic fertilizer	1.05	1	1.15	1.2	1.5	1.18	Never
Mulching	1	1	1.05	1.15	1.1	1.06	Never
Green manuring or planting cover crop	1	1.05	1	1.2	1	1.06	Never
Using kitchen waste	1	1	1.05	1.15	1	1.04	Never
Using trap method control	2.15	1.55	2	1.5	1.9	1.82	Only once
Using insect predators to control pest	1	1	1	1	1	1	Never
Use manure as biogas source	1	1	1	1	1	1	Never

Scale : never -1, only once-2, more than once-3

Farmers practices on the choice of types and sources of seeds used in 5 Barangays
Most farmers (58%) used recycled seeds obtained from fellow farmers. Thirty two percent were sourced their own on farm. Ten percent were purchased from the agricultural stores or the hybrid seeds stores.

Many farmers prefer to buy seeds from their fellow farmers. They believe on the sayings "to see is to believe". According to them, farmers with better croppings tend to have higher yield and net income. These are the farmers that are worth simulating (Focus Group Discussions, 2017).

Farmers practices on the choice of fertilizer types and frequency of applications in 5 Barangays
The farmers applied high amount of nitrogen fertilizer (urea 46-0-0). They apply this twice every cropping season. The complete fertilizer, ammonium sulfate & muriate of potash are applied once per cropping season.

Hartmann, et al. (2007) noted that most farmers use Urea, Ammonium sulfate, and Potassium phosphate fertilizers. Among the other fertilizers, granules fertilizers seem to have higher frequency of consumption. Too much consumption of Nitrogen fertilizers, have had agricultural pollution, detrimental effects on soil structure and polluted waters and underground water resources. Nitrogen losses from agriculture are a major threat to global health and agricultural policies. The nitrogen fertilizers, particularly urea turns into ammonia gas and are wasted due to surface distribution. In addition, the fertilizer is lost through leaching when applied simultaneously with irrigation (Malakooti et al. 2008). Most methods of consumption were surface distribution because most of farmers lack the mechanistic features as to fertilizing and are unable to take mechanized vehicles advantage.

Published by Sons and Daughters Publishing House Inc.
Available on SSRN-Elsevier
https://www.ssrn.com/link/ICRESET-2021.html

The repeated paddy rice cultivation also reduces the nitrogen- supplying capacity of the soil due to change in the composition of organic matter and the reduced microbial activity under flooded conditions. The unbalanced use of nitrogen –rich fertilizer can accelerate the depletion of other soil nutrients. (Pingali and Rosegrant, 2001).

Cropping Patterns in the 5 Barangays

Cropping activities go on all the year-round in the 5 barangays as long as irrigation is available (Figure 3). Barangays Dados and Kakar have the same cropping pattern. They start the land preparation in January followed by the transplanting or broadcasting depending on the methods used by the farmers. The care and maintenance lasts until March. After 95-105 days (3 months) they harvest the crops.

The other 3 barangays such as Barangay Benolen, Bonged and Baka have the same periods of land preparation. These are done in April. The care and maintenance lasts until July. Their harvesting is undertaken in August. These barangays can do 3 croppings annually. Their respective fields have regular supply of irrigation thus enabling them to have higher frequency of croppings than those in the neighboring rainfed areas

Farmers Attitude toward Low External Input Technology

The farmers strongly agreed and agreed (3.95-4.69) that chemical pesticides are more suitable to control pest and so with the use of herbicides to control weeds. They also think that it is very difficult to implement LEIT due to difficulties in obtaining organic matters. Thus, they strongly disagree (1.93-2.33) on the effectiveness LEIT in increasing the texture and fertility of soil. More so, in increasing the income of farmers (Table 6). But they disagreed (2.41-3.45) that LEIT can decrease the production cost by reducing the input purchases, benefitting the consumers not the producers. They also disagreed that LEIT will only be troublesome to farmers because it needs more attention.

The attitude of farmers in sustainable agriculture can effect on farming operational performance. In sustainability, issues determining individuals' attitude towards the environment are in the way that preserves the environment, and view to the environment resources and systems in the long-term (Fakoya et al., 2007). Stroup & Baden (1983) have reported that there is a strong relationship between beliefs, values, norms and attitudes toward environmental management practices. Kerhoft (1990) observed that environment (ecological region), income, age and education affected farmers attitude. In similar settings, farmers in wetland areas of Greece were not aware of the environmental impact of modern agriculture or were not considering it.

Sheikh et al. (2003) showed that attitude toward using technology and contacting with extension officers have been the main factors influencing the adoption of no tillage operation. Tatlidil et al. (2009) revealed that high levels of contact with extension services, education, land ownership and greater access to information leads to a greater understanding of sustainable agricultural practices.

Table 2. Farmers Attitude on Low External Input Technology in 5 Barangays of Datu Odin Sinsuat, Maguindanao

Farmer Attitude	Dados	Kakar	Benolen	Bonged	Baka	Mean	Interpretation
Low External Input Farming Technology will decrease the production cost by reducing the input purchase	2.65	2.2	2	2.6	2.6	2.41	Disagree
Chemical pesticides are more suitable to control pest	4.7	4.75	4.75	4.45	4.6	4.65	Strongly agree
Chemical herbicides are more suitable to control weed	4.75	4.85	4.9	4.95	4	4.69	Strongly agree
Low External Input Farming technology will only be benefiting the consumer not the producers	2.7	3.1	3.75	3.25	2.85	3.13	Disagree
Low External Input Farming technology will only be troublesome to farmers because it needs more attention	3.35	3.65	3.4	3.7	3.15	3.45	Disagree
Low External Input Farming technology is very difficult to implement due to difficulties in	4.55	4.35	4.7	3.6	4	4.24	Agree

Published by Sons and Daughters Publishing House Inc.
Available on SSRN-Elsevier
https://www.ssrn.com/link/ICRESET-2021.html

obtaining organic matter							
Low External Input Farming technology is very difficult to implement	3.8	3.95	3.95	4.35	3.7	3.95	Agree
Low External Input Farming technology is effective in increasing the texture and fertility of soil	1.7	1.15	1.8	2.5	2.5	1.93	Strongly Disagree
Low External Input Farming technology can increase the income of farmers	2.3	2.15	2.55	2.35	2.3	2.33	Strongly Disagree

Scale: do not know= 1, strongly disagree =2, Disagree= 3, Agree=4, Strongly Agree= 5

Farmers Productivity based on Yield (tons per hectare) in 5 Barangays of D.O.S

The productivity based on yield and measured by kilograms/hectare shows an average of 1.98tons/hectare in the first cropping during the wet season. This is higher than the second and third croppings with an average mean of 1.872 tons and 1.728 (Table 7). The higher yields of 2.25, 2.15 and 2.05 during the 1st, 2nd and 3rd croppings respectively were recorded in Barangay Bonged. The lowest yields were observed in Barangay Baka with the average yield of 1.79, 1.70 and 1.63during the 1st, 2nd and 3rd cropping season.

Declining productivity can be attributed to degradation of the natural resources. This is observed in rice areas where continuous croppings are coupled with high amount of fossil –fuel based chemicals application.

Uploff (2011) described this system developed in Madagascar. In irrigated conditions, rice yields could double the present world average without relying on external inputs, also offering environmental and equity benefits. The methods change the way plants, soil, water and nutrients are managed—rather than utilising new-variety seeds, inorganic fertilisers or other agrochemicals. It also reduces the need for irrigation water by about half and diminishes the requirements for capital and seed. Further, it requires more knowledge and skill on the part of farmers and initially more labour per hectare. But greater labour intensity is compensated by farmers achieving higher returns for labour, and the technology can become labour-saving and make irrigated rice production more sustainable, as well as profitable. The experiences in this technology may reveal other opportunities that can make agricultural systems more productive and beneficial for the long term.

However, better utilization of skill and knowledge depends on smooth movement of market information, serving as an important tier of agricultural and rural development process. The entire process of agricultural development showed weak linkages among its different components (Sharma, 2003; Mubangizi et al.., 2004)

Income of farmers / hectare (Php)/ cropping season in 5 Barangays

The farmer incomes per hectare per cropping season are higher during the first and second croppings. Farmers in Barangay Dados attained maximum income with an amount of 30,225, 28,675 and 25,575 pesos during 1st , 2nd and 3rd croppings. Barangay Kakar also earned per cropping season with an average amount of 26,350 pesos in 3rd cropping season and 29, 605 and 27,590 during the 1st and 2nd croppings. Farmers from Barangay Benolen attained also an income that is nearest to the highest income recorded. They earned 27,280 pesos in 3rd croppings and 31,000 and 27,590 during the 1st and 2nd croppings.

The highest income recorded from the Barangay Bonged which attained 34,875, 33,335 and 31,775 during the 1st, 2nd and 3rd croppings. While the lowest income was recorded in the Barangay Baka were attained an income amount of 27, 745 during the 1st croppings, while 26,350 and 25,265 in 3rd cropping season.

Relationship between Productivity, Cognition, Practices and Attitudes in 5 Barangays

There is very weak (r=-0.17) degree of linear relationship between productivity and cognition. The coefficient of determination (r2) indicated 2.89% of the level of cognition influences productivity. This indicated that cognition (knowledge & awareness) has little influenced on productivity.

Published by Sons and Daughters Publishing House Inc.
Available on SSRN-Elsevier
https://www.ssrn.com/link/ICRESET-2021.html

The degree of linear relationship between productivity and practices show a strong negative relationship (r=-59). The coefficient of determination (r2) indicated 34.89% of the practices influenced productivity. This indicated that practices of the farmers on LEIT have opposite bearings with productivity. This connotes that productivity increases could have negative effects when Low External Input Technology is adopted. This also suggests that any increases in yield are influenced by some other factors other than the use of Low External Input Technology. The yield could possibly decrease with the use of low external input technology in this case.

The degree of linear relationship between productivity and attitude of farmers showed very weak correlation (r=-0.15). The coefficient of determination (r2) indicated 2.25% of the attitude influenced productivity. This suggests that the attitude of farmers has less influence on productivity.

Increased production has to depend more on increasing productivity through the use of package of technologies comprising external input like chemical fertilizer, pesticides/herbicides, and better varieties of plants and use of irrigation water. These technologies benefited more the larger, and resource endowed farmers, and its adoption has spread rapidly among the small resource poor farmers. (FAO, 1996). If the adoption of LEIT involves a change in the perception of farm management, it is expected that those farmers who utilized LEIT would be more likely to lower their use of external inputs in general.

Conclusion

The socio-demographic profile showed more male farmers than females. There are more illiterate farmers and are mostly Islam practitioners'. The level of cognition (knowledge & awareness) on Low external input farming technology remains very low. Most of the farmers' respondent was very dependent on chemical input based technology such as using pesticides and commercial fertilizers. The farmers showed that they never practices low external input technology and only do manual weeding and trapping method. Most farmers used recycled seeds from fellow farmers and also applied high amount of nitrogen fertilizer. The farmers strongly agreed that chemical inputs are more suitable in farming. Many farmers also disagreed to the positive effect of Low external input technology. The productivity and income of the farmers in different barangays varies. The yield ranged from as high as 2.25 tons per hectare valued at 34,875 to as low as 1.63 tons per hectare valued at 25,265. The degree of relationship between cognition and productivity showed very weak correlation. The degree of correlation between productivity and practices showed a strong negative relationship.

Recommendation

The High External Input Agriculture and Low External Input Agriculture Technologies have been associated with several concerns. On one hand HEIA requires tremendous amount of input in the production of rice coupled with high cost of production and drastic effects to the environment (Figure 4). On the other hand, LEIA technology is associated with so much labor and hassles in the preparations of inputs such biopesticides and organic matter.

One alternative adheres is the complementation of adopting LEIA and HEIA. This complementation adheres to the balance application of Organic Inputs and chemical-based input and other related activities. The practice of Integrated Pest Management and Integrated Nutrient Management could be possibly done. Though these are common terms in Agriculture, these are not really popularly followed. Integrated Pest Management is a balanced, tactical approach to pest control. It involves taking action to anticipate pest outbreaks and to prevent potential damage. It utilizes a wide range of pest control strategies or tactics. It also offers the possibility of improving the effectiveness of pest control programs while reducing some of the negative effects. Many successful IPM programs have reduced pesticide use and increased protection of the environment.

Ethical Declaration

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants involved in the study.

Acknowledgement

The author acknowledges the participation of the students in this research, the support of the administration, co-workers, family and relatives in the pursuit of this research.

Published by Sons and Daughters Publishing House Inc.

Available on SSRN-Elsevier
https://www.ssrn.com/link/ICRESET-2021.html

Declaration of Conflict of Interest
No potential conflict of interest was reported by the author.

References:

Altieri, M. A; Companioni, N.; Cañizares, K.; Murphy, C.; Rosset, P.; Bourque, M.; and Nicholls, C. I. (1999) The Greening of the "Barrios": Urban Agriculture for Food Security in Cuba. Agriculture and Human Values 16 (2) 131-140

Assis K, et.al., Int. J. Eco. Res., 2011 2(3), 1-6 Knowledge, Attitude And Practices Of Farmers Towards Organic Farming

Bationo, A., and Mokwunye, A. U. (1991): Alleviating Soil Fertility Constraints to Increased Crop Production in West Africa: The Experience in the Sahel. p. 195-215. In A.U. Mokwunye (ed.) Alleviating soil fertility constraints to increased crop production in West Africa. Kluwer Academic Publications., Dordecht, the Netherlands.

Binswanger, H. P., and J. McIntire. (1987). Behavioral and Material Determinants of Production Relations in Land-abundant Tropical Agriculture. Economic Development and Cultural Change 36 (1): 73–99.

Brouwer, J., and Powell, J.M. (1995) Soil Aspects of Nutrient Cycling in a Manure Application Experiment in Niger, p. 211-226. In J.M. Powell et al. (ed.) Livestock and Sustainable Nutrient Cycling in mixed Farming Systems of Sub-Saharan Africa. Vol. II. Tech. Pap. Int. Livestock Ctr.-Africa, Addis Ababa, Ethiopia.

Burton, M.D., Rigby and Young, T. 1999. Analysis of the Determinants of Adoption of Organic Horticultural Techniques in the UK. Journal of Agricultural Economics 50(1): 47-63

Ghorbani, M.; Hamraz, S. 2009. A survey on factors affecting on consumer's potential willingness to pay for organic products in Iran (a case study). Trends in Agricultural Economics 2(1): 10-16

IFOAM (International Federation of Organic Agriculture Movements). 2000. IFOAM Basic Standards. International Federation of Organic Movements, Tholey-Theley, Germany

Molder, P.J., Negrave, P.D. and Schoney, R.A. 1991. Descriptive Analysis of Saskatchewan Organic Producers. Canadian Journal of Agricultural Economics 39: 891-899

Munir Hussain Naik, S.R. Srivastava, A K Godara and V.P S. Yadav. 2009. Knowledge Level about Organic Farming in Haryana. Indian Research Journal of Extension Education 9(1): 50-53

Parr J et al. 1990. Sustainable Agriculture in the United States. In: Sustainable Agricultural Systems, edited by Clive Edwards et al. Ankeny IA: Soil and Water Conservation Society. p. 52. Acland, J. D. (1986): East African Crops. Food and Agricultural Organization of the United Nations Organization, Rome

Pretty J. 1996. Sustainable Agriculture: Impacts on Food Production and Challenges for Food Security. IIED Gatekeeper Series No. SA60.

Reijntjes C, Bertus H and Water-Bayer A. 1992. Farming the Future: An Introduction to Low External Input and Sustainable Agriculture. London: Macmillan.

Sarker, M.A., Itohara, Y. and Hoque, M. 2010. Determinants of adoption decisions: The case of organic farming in Bangladesh. Extension Farming Systems Journal 5(2): 39- 46

Schaller N. 1993. The Concept of Agricultural Sustainability Agriculture, Ecosystems and Environment. 46: 89-97.

Seyed Abolhasan, S., Hosain Shabanali, F., Khalil, K., Yaser, M. and Abbas, A. 2010. Investigating Effective Factors on Attitude of Paddy Growers towards Organic Farming: A Case Study in Babol County in Iran. Research Journal of Applied Sciences, Engineering and Technology 3(4): 362-367

Published by Sons and Daughters Publishing House Inc.

Available on SSRN-Elsevier
https://www.ssrn.com/link/ICRESET-2021.html

Stockdale, E. A., Lampkin, N. H., Hovi, M., Keatinge, R., Lennartsson, E. K. M., Macdonald, D. W., Padel, S., Tattersall, F. H., Wolfe, M. S. and Watson, C. A. 2001. Agronomic and environmental implications of organic farming systems. Advances in Agronomy 70: 261-325

Tripp, R. (2006) Self-Sufficient Agriculture. Labour and Knowledge in Small-Scale Farming. London: Earthscan.

Tripp, R., Wijeratne, M. and Piyadasa, V.H. (2005) 'What should we expect from farmer field schools? A case study from Sri Lanka', World Development, 33, pp.1705-1720.

Uploff N. et al., 2011; SRI as a Methodology for Raising crop and Water Productivity: Productive adaptations in rice Agronomy and Irrigation Water Management. Paddy and Water Environment 2011; 9(1);3-11

Published by Sons and Daughters Publishing House Inc.

Available on SSRN-Elsevier
https://www.ssrn.com/link/ICRESET-2021.html