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Specialists' attitudes toward factors affecting on development of nuclear research in agriculture

Neda Najdabba^{1*}, Hasan Sadighi¹, Gholam Reza Pezeshki-Rad¹ and
Seyed Mahyar Mirmajlessi²

¹Department of Agricultural Extension and Education, College of Agriculture, Tarbiat Modares University, Tehran, Iran.

²Nuclear Science and Technology Research Institute, Agricultural, Medical and Industrial Research School, Karaj, Iran.

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This study provides an insight into affecting factors on the development of nuclear research in agriculture from scientists and researchers perspective and also explores the correlations between them. A questionnaire was developed and distributed to 165 scientists and researchers who work in Nuclear Science and Technology Research center and Biotechnology Institute, Tehran, Iran. Collected data were analyzed using the statistical package SPSS. Statistical measurements were used for description (standard deviations, means, percent and frequencies). For promotion of agricultural research, accurate inspection of government on research activities and governmental policies were identified as the main factors for governmental supports and political factors, respectively. The majority of researchers believed that investing in specialists' education and using of external researchers in order to exchange information are the top socio-economic and communication factors, respectively. There was a significant correlation between governmental supports, political factors, socio-economic factors, communication factors, years of employment, knowledge of researchers about nuclear technology in agriculture, participation level in agricultural projects with development of nuclear agricultural research. Backward regression of the study indicated that 75% ($R^2 = 0.75$) of variance on development of nuclear agricultural research could be explained by variables.

Key words: Communication factors, governmental supports, nuclear research, political factors, socio-economic factors.

INTRODUCTION

The increasing population has led to increase request for food. Contamination with microorganisms and pests causes considerable losses of agricultural products during production, storage, transportation and marketing

(Conway and Toenniessen, 2003; Diehl, 2002). Also, different issues such as economic crisis, limitation of fossil fuels and environmental concerns are discussed by researchers to discover suitable strategy in establishing

*Corresponding author. E-mail: najdabbasi@gmail.com, Tel: +9821-44530779. Fax: +98261-4464061.

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agricultural industry (Robins, 2006). Nuclear technology in agriculture is one of the useful techniques that can raise the agricultural products, food security and self-sufficiency for future generations and societies (Amin et al., 2007; Ahari-Mostafavi et al., 2010). Ionizing radiations are widely used in such areas as plant breeding, pest control, food industry, soil fertility and animal products. Food irradiation is finding acceptance as an effective means to protect agricultural products from spoilage and as a method for controlling pathogens associated with serious food-borne diseases (Ahari-Mostafavi et al., 2012). The international bodies including FAO (Food and Agriculture Organization), IAEA (International Atomic Energy Agency), WHO (World Health Organization) and CAC (Codex Alimentarius Commission) investigated different projects on radiation techniques to verify the safety of irradiated products (EFSA, 2011; IAEA, 2009).

Despite the clear benefits of radiation techniques, it has not been commonly accepted and approved and has been underestimated in agricultural industry (Guy, 2011; Kume et al., 2009). Freeman (2005) emphasized that, increasing of nuclear technology is one of the main economic infrastructures of each country and so, extension systems are highly related to communicative and informative tools. The IAEA has taken a number of administrative and programmatic measures intended to stretch limited resources in agriculture to obtain the best possible results. These efforts are part of steps to improve program efficiency and to attract greater resources enabling researchers to enhance its support for development of nuclear research and technology-transfer activities (EFSA, 2011; Baker, 2003). Barao (1992) suggested that, simplicity, visibility of results, usefulness towards meeting an existing need and low capital investment are reasonable characteristics of a new technology which can promote its eventual adoption through extension and education.

Governmental supports in research activities have particular importance for achieving practical application (Scott and Suresh, 2004). Each country has more emphasis on cost-effective techniques that significantly promote social and economic benefits, which have a lasting and environmentally sound impact on development (Knutson et al., 1990). Contado (2002) studied methods of extension in agricultural research and noted that, public research institutions are not the just source of innovation. A great division of the innovations in agricultural section is originating from other sources of research. Universities, CBOs (community-based organizations), NGOs (non-governmental organizations) and private institutes are other important sources in expanding and extension of agricultural innovations. Using nuclear technology in all agricultural fields needs essential contexts. Technical feasibility, adequacy of projects, funds, specialists and experienced persons and also new scientific information are some important contexts to assure the effective execution of the new technique (Tonukari and Omotor, 2010; Ahari-Mostafavi et al., 2012).

The objective of the present study is investigation of specialists' attitudes toward affecting factors including governmental supports, political factors, socio-economic factors and communication factors on the development of nuclear research in agriculture and different organization-related barriers. To date, no reportable data based on these factors has been shown.

MATERIALS AND METHODS

Sample selection and research design

The descriptive research methodology was used in this study. The population of the study was included 165 scientists and researchers who are working in research centers (Nuclear Science and Technology Research Center and Biotechnology Institute, Tehran, Iran) and participate in projects related to agriculture. A questionnaire was developed to investigate specialists' attitudes toward factors affecting on development of nuclear research in agriculture.

Instrumentation

The questionnaire covered seven areas: demographic characteristics (including age, gender, level of education, years of employment, knowledge of researchers about application of nuclear technology in agriculture and level of participation in agricultural projects); development of nuclear research in agriculture (the extent of importance of seven reasons for development of nuclear research in agriculture were measured on a five-point, Likert scale which ranged from 1 (high disagreement) to 5 (high agreement)); socio-economic factors (the extent of importance of eight reasons were measured on a six-point, Likert scale which ranged from 1 (none) to 6 (very much); the extent of use of six selected governmental supports and five selected political factors was measured on a five-point, Likert scale which ranged from 1 (high disagreement) to 5 (high agreement); communication factors (the extent of importance of eight reasons were measured on a six-point, Likert scale which ranged from 1 (none) to 6 (very much)); and also barriers related to organization (multi choice questions including seven organization-related barriers was measured on six-point, Likert-scale which ranged from 0 (none) to 6 (very much).

Validity and reliability

Face and content validity of the questionnaire was established using a panel of researchers at Nuclear Science and Technology Research Institute and department of agricultural extension and education, Tarbiat Modares University, Tehran, Iran. The questionnaire was field-tested in two agricultural research centers not included in the population. Cronbach's alpha, an internal consistency measure, was employed to estimate the reliability (Cronbach's alpha = 0.87). After mailing and sending copy of the instrument, 97 out of 165 researchers and specialists responded and identified as sample for this study. The sample size was determined on the basis of Krejcie and Morgan (1970). The number of individuals who did not return the questionnaire was rather high and this could affect the results. Late responders are often similar to non-responders (Miller and Smith, 1983). Also, to handle non-response error that threaten the external validity of the study, all identified variables in the questionnaire were compared for early and late responders as suggested by Lindner and Wingenbach (2002). No significant differences were found between early and

Table 1. The rank of development nuclear technology in agriculture.

Development of nuclear research in agriculture	N	Mean	SD	Rank
Advancement of scientific position in the world	97	3.90	0.83	1
Reduction of waste and the improvement of products quality	97	3.73	0.95	2
Associating with other new technologies	97	3.71	1.009	3
Self-sufficiency and increase in products	97	3.60	1.01	4
Agricultural advancement	97	3.56	0.96	5
Agricultural development in future years	97	3.55	0.97	6
Food security	97	3.34	0.87	7

Note: Scale: 1) High disagreement; 2) Disagreement; 3) Moderate; 4) Agreement; 5) High agreement.

late respondents, and the data were generalized to the population (Pezashki-Rad and Zamani, 2005).

Data analysis

Data collected were analyzed using the Statistical Package for the Social Sciences (SPSS) version 16. Appropriate statistical procedures for description (Frequencies, Percent, Means and Standard deviations), deduction, Pearson correlation coefficient and backward regression were used.

RESULTS AND DISCUSSION

Professional and personal characteristics of respondents

The age of researchers ranged from 28 to 51 years. Researchers were, on average, 40.81 years old. Also, most of the researchers (64%) were male. The results indicated that, most of the researchers (76.86%) had M.Sc. and Ph.D. degrees. Only, 23.14% of the researchers had B.Sc. degree and less. The number of employed years in the research centers ranged from 5 to 15 years for the majority of researchers (68%) and the minority of them (2.1%) had more than 25 years. Knowledge of researchers about nuclear technology in agriculture divided into separate groups (including very low, low, moderate, high and very high) that 45% of researchers located in high group and 3.1% located in very low group. Also, participation level in agricultural projects in half of the researchers was less than 5 projects. The results showed that, more than half of the researchers (62%) were formal employment and 35% of the researchers were informal employment (data not shown).

Development of nuclear research in agriculture

Table 1 presents importance of nuclear research development in agriculture by respondents. As shown in Table 1, advancement of scientific position in the world was the most important factor (mean = 3.90), reduction of

waste and the improvement of products quality was the second most important factor (mean = 3.73) and Food security (mean = 3.34), was the least important factor for scientists and researchers.

Governmental supports and political factors

The extent of use of governmental supports and political factors are two components affecting on development of nuclear research in agriculture. Respondents were asked to indicate on a scale of 1 (high disagreement) to 5 (high agreement). The data presented in Table 2 reveals that the top two governmental supports for scientists and researchers were accurate inspection of government on research activities with mean scores of 3.63; followed by nuclear technology in agriculture as an economic factor in government (mean = 3.50). Governmental attitude towards a new technology depends on a number of related factors such as perception of risks and benefits, socially communicated values and attitude of individuals on certain political issues (Aerni and Bernauer, 2006). Most of the respondents used nuclear technology in agriculture as a political strategy in government least frequently (mean = 2.91). Undoubtedly, the major challenge is the availability of sufficient financial resources to carry out approved projects (Ahari-Mostafavi et al., 2010).

Concerning use of political factors, governmental policies to promote agricultural research (mean = 3.75) and thriving of interior talents and reduction of technical dependence (mean = 3.56) were ranked respectively as the first and second political factors mostly used by respondents. Publication of papers in scientific journals (mean = 3.14) and Receiving the information from scientific resources (mean = 3.02) were the least important factors for scientists and researchers (Table 2). The beneficial effects of technological changes in agriculture will materialize if government policies be conducive and supportive (Knutson et al., 1990).

Socio-economic factors

Socio-economic factors are another components affecting

Table 2. The rank of governmental supports and political factors on development of nuclear research in agriculture.

Variable	N	Mean	SD	Rank
Governmental supports				
Accurate inspection of government on research activities	97	3.63	1.02	1
Nuclear technology as an economic factor in government	97	3.50	0.90	2
Necessary supports by public and private organizations	97	3.44	0.88	3
Performance of government in attracting of agricultural institutes	97	3.37	0.96	4
Creation of necessary infrastructures for application of nuclear technology	97	3.34	1.09	5
Nuclear technology as a political strategy in government	97	2.91	1.15	6
Political factors				
Governmental policies to promote agricultural research	97	3.75	0.89	1
Thriving of interior talents and reduction of technical dependence	97	3.56	0.95	2
Access to tools and facilities	97	3.28	0.87	3
Publication of papers in scientific journals	97	3.14	0.94	4
Receiving the information from scientific resources	97	3.02	1.06	5

Note: Scale: 1) High disagreement; 2) Disagreement; 3) Moderate; 4) Agreement; 5) High agreement.

Table 3. The rank of socio-economic factors on development of nuclear research in agriculture.

Socio-economic factors	N	Mean	SD	Rank
Investing in education of specialists	97	3.23	1.07	1
Role of advertisements in public acceptance	97	3.20	1.29	2
Allocating of budget to educational affairs	97	3.14	1.19	3
Allocating of budget for equipment of laboratories	97	3.13	1.32	4
Cultural convey in the field of nuclear research in agriculture	97	3.09	1.27	5
Financial supporting in order to collaboration with universities and scientific centers	97	3.07	1.18	6
Investing in scientific conferences and workshops	97	3.04	1.12	7
Improvement in the fields of production, distribution and extension of agricultural products	97	2.96	1.15	8

Note: Scale: 1) None; 2) Very little; 3) Little; 4) Somewhat; 5) Much; 6) Very much.

on development of nuclear research in agriculture. Some factors, which had been mostly investigated in previous studies, were selected and eight were used in the questionnaire. The respondents were asked to indicate the extent of importance that each factor had to them. Table 3 provides ranking of different socio-economic factors based on their relative importance as perceived by the respondents. 'Investing in specialists' education was the most important factor by scientists and researchers with mean scores of 3.23. Role of advertisements in public acceptance was the second most important factor (mean = 3.20) for development of nuclear research in agriculture. The main factor in the commercial application of radiation process is consumer acceptance as a social factor. For this reason, publicity has responsibility to help consumers' understanding about radiation process (Ahari-Mostafavi et al., 2010). Most of the respondents ranked improvement in the fields of production, distribution and extension of agricultural products as the least important factor (mean = 2.96).

According to Walden and Browne (2002), the development of a new technology in agriculture involves some interrelated cultural and social factors such as awareness, information, knowledge, evaluation and adoption.

Communication factors

The data presented in Table 4 reveals that, using of external researchers in order to exchange information (mean = 3.24), activity in conferences, meetings and exhibitions (mean = 3.13) were important factors by respondents, respectively and optimal use from specialists (mean = 2.87) was the least important factor. Also, among eight selected communication factor, internet, media and press collaboration for publicity, as a modern communication channels, was ranked as the third important communication factor selected by scientists and researchers. Weeler (2005) investigated,

Table 4. The rank of communication factors on development of nuclear research in agriculture.

Communication factors	N	Mean	SD	Rank
Using of external researchers in order to exchange information	97	3.24	1.24	1
Activity in conferences, meetings and exhibitions	97	3.13	1.33	2
Internet, media and press collaboration for publicity	97	3.09	1.44	3
Extension and submission for people and non-governmental agents	97	3.07	1.17	4
Transfer of researchers to developed countries	97	3.06	1.35	5
Information exchange by international organizations	97	3.02	1.36	6
Role of IT (Information Technology)	97	2.97	1.08	7
Optimal use from specialists	97	2.87	1.43	8

Note: Scale: 1) None; 2) Very little; 3) Little; 4) Somewhat; 5) Much; 6) Very much.

Table 5. Organizational barriers against development of nuclear research in agriculture.

Barrier	N	Mean	SD	Rank
Problems in receiving of new scientific information	97	3.34	1.16	1
Shortage of nuclear agricultural research centers	97	3.29	1.40	2
Lack of advertisements	97	3.25	1.38	3
Being impractical of some research and projects	97	3.17	1.37	4
Cost of laboratory equipments	97	3.16	1.19	5
Shortage of specialists and experienced persons in various fields of agriculture	97	3.1	1.36	6
Non-collaboration of some related institutions in common projects	97	3.08	1.35	7

Note: Scale: 1) None; 2) Very little; 3) Little; 4) Somewhat; 5) Much; 6) Very much.

factors influencing on professional's acceptance toward development of organic agriculture in Australia. The study showed that, professional's acceptance does not just rely on scientific results to make decisions to use of organic agriculture. Communication tools such as information exchange and publicity play positive role in professional's perception about organic agriculture.

Organization-related barriers to development of nuclear research in agriculture

To obtain additional insight into organizational factors that influence development of nuclear research in agriculture and use, study participants were asked to indicate the most important barriers in a multiple choice question including seven organizational barriers. It is clear from Table 5 that most of the respondents who answered this question blamed different problems in receiving of new scientific information as the main barrier that affect development of nuclear research in agriculture, followed by shortage of nuclear agricultural research centers and lack of advertisements were mentioned as the other barriers. Most of the respondents used non-collaboration of some related institutions in common projects least frequently.

Correlation between personal and professional characteristics and factors affecting on development of nuclear research in agriculture

For changing factors affecting on development of nuclear research in agriculture to numerical variables, and seek their correlation with personal and professional characteristics, Likert Scale scores of each factor were calculated for every person. The Pearson coefficient of correlation was used to explore the relationships. There was significantly correlation between development of nuclear research in agriculture with political factors, governmental supports and socio-economic factors. For all respondents, the development of nuclear research in agriculture was correlated with the extent of using communication factors. Also, the correlation between selected respondents' characteristics with development of nuclear technology in agriculture is shown in Table 6. The years of employment, knowledge of researchers about nuclear technology in agriculture and level of participation in agricultural projects were correlated with the development of nuclear research in agriculture. According to the correlation analysis, there is no correlation between researchers' age with development of nuclear agricultural research. This may be the result of lack of patience and energy that they hold after some

Table 6. Pearson correlation between selected variables and nuclear agricultural research.

Variable	Development of nuclear research in agriculture	
	(r)	(p)
Age	0.138	0.178
Years of employment	0.276**	0.006
knowledge of researchers about nuclear technology in agriculture	0.421**	0.000
Level of participation in agricultural projects	0.654**	0.000
Governmental support	0.705**	0.000
Political factors	0.681**	0.000
Socio-economic factors	0.873**	0.000
Communication factors	0.767**	0.000

** $P \leq 0/01$ Correlation between personal and professional characteristics and factors affecting on development of nuclear research in agriculture.

Table 7. Backward Regression of selected variables.

Variable	B	Beta	T	Sig
Constant	7.896	-	4.825	0.000
Governmental supports (x_1)	0.211	0.185	1.891	0.042
Political factors (x_2)	0.298	0.166	1.774	0.037
Socio-economic factors (x_3)	0.375	0.776	5.886	0.000
Communication factors (x_4)	0.157	0.316	2.092	0.039
Knowledge of researchers about nuclear technology in agriculture (x_5)	0.761	0.154	2.030	0.045

$R = 0/866$, $R^2 = 750/0$, $R^2_{Adj} = 736/0$, $F = 54/625$, $Sig = 000/0$.

time doing research activities or the result of too self-confidence that feel they are fully aware of everything concerning their expertise and do not need to seek new methods and information. These results are in conformity with Weeler (2005) who showed a positive correlation between communication factors with development of organic agriculture.

Backward regression

The independent variables with significant correlation were used in a backward regression. The result of the backward regression indicated that 75% ($R^2 = 0.75$) of the variance could be explained by the governmental supports, political factors, socio-economic factors, communication factors and knowledge of researchers about nuclear technology in agriculture. This means that about 25% of the variance that may have contributed on development of nuclear research in agriculture that were not investigated in this study (Table7).

The regression analysis showed variables with a statistically significant level. So, the following predication was formulated according to regression equation to estimate factors affecting on development of nuclear research in agriculture:

$$Y = \text{Constant} + b_1(X_1) + b_2(X_2) + b_3(X_3) + b_4(X_4) + b_5(X_5)$$

$$Y = 7.896 + 0.211(X_1) + 0.298(X_2) + 0.375(X_3) + 0.157(X_4) + 0.761(X_5)$$

Y = Attitude toward development of nuclear research in agriculture

Conclusions

Because of the significant correlation between level of participation in agricultural projects and development of nuclear research in agriculture, it is recommended that agricultural research centers try to increase level of participation related to nuclear agriculture projects; it may consequently develop the nuclear research in agriculture. Considering the significant correlation between researchers' knowledge of researchers about nuclear technology and years of employment with development of nuclear research in agriculture, researchers should be taught about the necessity of having up-to-date and relevant information. In this regard, participation in various scientific workshops could be useful for researchers. According to the findings, the government must accomplish accurate and integrated inspections in

research activities for creation of essential infrastructures. Thus, the financial supports in order to strengthening of cultural infrastructures such as conferences and seminars must be increased. Also, an accurate planning for localization and expanding of nuclear techniques in agriculture by government and subordinate institutes is essential. Because of the significant correlation between socio-economic factors and communication factors with development of nuclear research in agriculture, it seems that investing in research and educational affairs and publicity for public awareness will improve development of nuclear research in agriculture. Also, according to the communication factors, motivating researchers and specialists to get new information, will increase their use of communication channels and may consequently develop nuclear research in agriculture.

Since, nuclear research in agriculture plays a vital role in optimization of agricultural methods, the results of this study can be used to provide valuable information sources about factor affecting on development of nuclear research for organizations related to agriculture and remove barriers to facilitate nuclear research in agriculture. The findings of this study should be shared with the officials who are involved in establishing the agricultural systems and extension managers and specialists so that the right decisions can be made.

Conflict of Interests

The authors have not declared any conflict of interests.

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Full Length Research Paper

Vegetable farmers' attitude towards organic agriculture practices in selected states of South West Nigeria

J. O. Oluwasusi

Department of Agricultural Economics and Extension, College of Agricultural Sciences, Afe Babalola University, Ado-Ekiti (ABUAD), P. M. B 5454, Ado-Ekiti, Ekiti State, Nigeria.

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Organic farming as a sustainable agricultural approach is a growing concept in South West Nigeria. This study investigated the attitude of vegetable farmers toward organic agriculture practices in South West Nigeria and the determinants of their attitude. Cluster sampling was used to select 315 farmers from list obtained from the farmers' cooperative societies. Farmers were interviewed in person. Attitude was measured as a pooled score of respondents' responses to 25 positive and negative statements made on a five point Likert scale. Data was analysed using frequency counts, percentages, means and a probit regression model. A majority of the farmers had positive attitude toward organic agriculture practices. The most important attitudinal statement ranked by the farmers was that organic agriculture strengthens the use of indigenous knowledge (4.55). The results of the probit model revealed that farm size, farming experience, household size, membership of organization and sources of information ($t = 0.254, 0.089, 0.125, 0.694, 0.021, p < 0.01$) respectively showed a positive relationship with attitude toward organic farming practices. Therefore, there is need for effective linkage of research systems with extension services on relevant organic practices, as a build up to traditional farming, adaptable and sustainable to local conditions of vegetable farmers.

Key words: Organic agriculture, vegetable farmers, attitude, linkage, South West Nigeria.

INTRODUCTION

Organic farming evolves holistic approach of agricultural production that sustains healthiness of the soils, ecosystems, biodiversity and the people in an environment. Organic farming combines indigenous innovation and science to benefit the shared environment, promote unmarred relationships and enhances better quality of life for all living and non-living

things involved in an environment. Organic farming posits high potentials to assuage the problems of un-sustainability of agricultural production and environmental problems, providing food of optimum quality, utilizing sustainable management practices devoid of agrochemical inputs evident of damaging the environment and wildlife from conventional farming.

*Corresponding author. E-mail: yesky20@yahoo.com, Tel: +2348032094612.

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Organic farming disallows the use of synthetic, compounded fertilizers, pesticides, growth regulators, and livestock feed additives. It embraces indigenous practices of crop rotations, crop residues, animal manures, legumes, green manures, off-farming organic wastes and use of biological pest control to control insects, weeds, and other pests, improving soil productivity, minimum tillage and provision of plant nutrients to grown crops sufficiently.

Organic farming emphasises the use of renewable natural resources and their recycling (Emsley, 2001). It augments soil organic matter content, raises soil pH, and improves nutrient exchange and water holding capacity of soil (Williams, 1999). Nigeria appears to be at the early stage of the development of organic agriculture, with very few farms or projects claiming to be organic and even fewer operating a recognised form of certified organic agriculture (Harris, 2006). Organic farming has higher potential than conventional farming in building healthy soil which is the foundation of food chain. It reduces harmful chemicals and pesticides out of the food we eat, preventing disease and having vantage role in promoting human health. Organic products are lower in water content, reserving higher nutrient density richer in iron, magnesium, vitamin C, antioxidants and more balanced with essential amino acids than conventional products (IFOAM, 2005). However, despite the unparalleled beneficial effects and the great environmental friendly roles organic agriculture offers in supporting crop production and improvement of soil fertility in an agrarian environment, organic manure is not well applied by most farmers, even in areas where livestock population and adequate production permit its usage.

The underlining determinant of farmers' attitude towards organic farming as an innovation, involves the consideration of diffusion and adoption processes orchestrated by channels of communication, timeliness of dissemination, social structure and social values of the environment. Similarly, social, economic status and mental factors of the people also influence adoption of innovation. The five important characteristics of innovation related to an individual's attitude towards decision-making process and eventual adoption are; relative advantage, compatibility, complexity, observable and trial (Rogers, 2003). Furthermore, accessibility and affordability of innovation determine the sourcing, strength, will power and sustainable utilization of the innovation for optimum productivity and maximization of profits by the farmers. Vegetables' provide essential nutrients to humans affordably with its vantage cheap and reliable sources of protein, vitamins and minerals for body development and repair. They render relished support to main cereals in the country. Fruits, nuts and vegetables in the daily diet have been strongly associated with reduced risk for some forms of cancer, heart diseases, stroke and other chronic diseases (Hyson, 2002).

However, with the fore-going benefits of organic farming over conventional farming, global awareness of environmental degradation and climatic change that could score from continuous practice of inorganic farming, and the threats it poses on sustainable agricultural production, the farmers in South West, Nigeria are yet to practice organic farming as much as they practice inorganic farming.

This study was an attempt to understand the attitude of farmers about organic farming in the study area. Therefore, this study was designed to examine farmers' attitude of organic farming by providing answers to the following research questions:

- (i) What are the socioeconomic characteristics of the farmers in South West, Nigeria?
- (ii) What are the factors responsible for respondents' attitude towards organic farming?
- (iii) What are the farmers sources of information for practising organic farming?
- (iv) What are farmers' attitude about organic farming in South West, Nigeria?

MATERIALS AND METHODS

The study was carried out in South Western Nigeria. Cluster sampling technique was used to select the respondents because organic vegetable production practices in the production areas vary among the clusters. The sampling technique involved the random selection of three states from the six states in South Western Nigeria which are Ekiti, Ogun and Ondo. Three local government areas in the metropolis were purposively selected from each state to give a total number of nine local government areas used for the study. The choice of these local government areas was based on the prominence of vegetable producers in the different areas. The three local government areas chosen in Oyo state are Akinyele, Egbeda and Ogbomosho south. The three local government areas chosen in Ekiti state are Ado, Ikere and Ikole. The three local government areas selected in Ondo state are Akure south, Akure north and Ifedore. A cluster of vegetable producers was selected from each of the local government areas to give total of nine clusters. Thirty five producers each were randomly selected from the nine clusters to give a total sample size of 315 respondents for the study from a list of 420 vegetable farmers from the selected states.

Attitude was measured as a pooled score of responses to attitudinal statements (Table 4) made on a five point Likert scale. Scores for positive/ favourable items (that is, items that indicated a favourable disposition to environmental and organic production issues) were scored thus: strongly agree (SA) = 5; agree (A) = 4; undecided/neutral (U) = 3; disagree (D) = 2; strongly disagree (SD) = 1. While negative/ unfavourable items (that is, items that indicated an unfavourable disposition to environmental and organic production issues) the scores were reversed. Scores on all items were summed to get a composite attitude score for each farmer. The identified factors influencing vegetable farmers' attitude towards organic agriculture practices include age, gender, marital status, farm size, household size, extension contacts among others. Attitude was defined in this research as the inclination of the respondents to the organic vegetable farming practices. Attitude towards organic vegetable production among the respondents was assessed by asking the respondents in their local language to

indicate their opinion on 25 positive and negative statements. Individual scores were obtained and categorised. The highest score was 181, lowest was 45, and mean score was 93. Respondents with scores less than 93 were categorised as having unfavourable attitude on organic vegetable production, while those who scored 93 and above were categorised as farmers who have a favourable attitude on organic vegetable production.

Data collection and analysis

Data were collected from the respondents with the aid of a structured interview schedule consisting of both open and close ended questions. The data collected were analysed with the aid of the descriptive statistical tools of frequency count and percentage. An inferential statistical tool, Probit regression model was used to analyse the study hypothesis. The study hypothesis was that farmers' characteristics (e.g., age, gender, marital status etc.) would predict farmers' attitude toward organic practices. P-value ≤ 0.01 were considered statistically significant.

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

The socio-economic characteristics of the respondents analysed in this study relevant to respondents' attitude of organic farming, include age, sex, marital status, and educational attainment. Analyses of results obtained from this study on Table 1 reveal that a majority (70.8%) of the respondents were males, with mean age of 43.7%, between the ages of 41 and 50 years, youth comprised of 27.9% while, adult comprised only 17.8%. This indicates that most of the farmers were middle aged, in their economically active stage. The majority (97.8%) of the respondents were married, while very few were widowed. This implies that married people were more involved in organic farming using assistance from their family members as added advantage for labour input as catalyst for more productivity.

Education attainment shows that majority (83.5%) of the respondents had some formal education that included primary, secondary or post secondary education while, 16.5% had no formal education. This finding is in line with Daramola and Aturamu (2000) who reported that contacts with extension agents as well as acquisition of formal education exposes the farmers to the availability and technical-know-how of innovations and increases their desirability for acquiring them. Findings also reveal that majority (63.8%) had a farming experience of between 16 to 20 years with mean years of 18.2 in conformity to apriori expectation that experience affords farmers wide opportunities to master the skill required in any chosen farm enterprise. More than half (55.6) of the respondents had household size of 6 to 10 people. This implies that many farm families take advantage of their large household sizes for increase in production and maximization of profits in their farming enterprise. Onyenweaku and Nwaru (2005), supported this finding

that large household size eases labour constraints leading to increase in production.

High proportion of the respondents (64.1%) belonged to a co-operative society. This implies that co-operative society serves as a bolster for the respondents in accessing farm resources like agro-inputs, credits that could boost their timely adoption of improved vegetable practices. Barely half (44.8%) of the respondents had been into organic vegetable practices between 6 to 10years. This implies that organic farming is still a new practice in the country and yet to be deep-rooted into farmers' farm practices. Majority (62.5%) of the respondents had extension visits. This means that many of the respondents had quite some visits of extension agents that could facilitate transference of skills, knowledge and information on better practices of organic farming, which could facilitate better adoption. Respondents had access to information on organic farming through a variety of sources among which radio (43.2%) and extension agents (26.3%) were more accessible. This implies that radio and extension agents were the main information tools, playing significant roles in relating agricultural innovation on organic practices to the farmers.

Distribution of respondents' sources of information on organic vegetable farming

Table 2 indicates that a high proportion of the respondents (95.9%) had access to information on organic vegetable farming practices through farmers' co-operative society, more than half (84.8%) of the respondents sourced for information on organic vegetable farming practices from fellow farmers while few (7.9%) of the respondents sourced their information on organic vegetable farming practices from the newspaper. This implies that many of the respondents relied on innovators and early adopters among them for information on improved arable cropping practices and few of the respondents consulted the newspaper for information on organic vegetable production practices.

Accessible agricultural extension services on organic agriculture for the respondents

From the Table 3, the finding shows that 34.3% of the respondents accessed training and demonstration on various organic vegetable production practices sometimes, while 26.7% of the respondents sometimes had access to improved organic seeds. Low respondents (8.3%) were linked to biological control training practices all the time and small percent (19.6%) had link to market location of organic products by extension agents sometimes. Training on soil reclamation practices sometimes (22.9%) while few (14.9%) sometimes had

Table 1. Distribution of respondents' socioeconomic characteristics.

Variables	Frequency	Percentage	
Sex			
Male	223	70.8	
Female	92	29.2	
Marital status			
Married	308	97.8	
Widowed	7	2.2	
Age (years)			
31-40	171	54.3	Mean
41-50	88	27.9	33.8
51-60	49	15.6	
Above 61	7	2.2	
Educational level			
No formal education	52	16.5	
Primary education	82	26.0	
Secondary education	125	39.7	
Tertiary education	56	17.8	
Farming experience (years)			
10-15 years	103	32.7	Mean
16-20years	201	63.8	18.2
21-25years	11	3.5	
Household size			
1- 5 people	109	34.6	
6-10 people	175	55.6	
11-15 people	31	9.8	
Membership of cooperative society			
Yes	202	64.1	
No	113	35.9	
Years of organic farming			
1-5	67	21.3	
6-10	141	44.8	
11-15	65	20.6	
16 and Above	42	13.3	
Extension visit			
Yes	197	62.5	
No	118	37.5	
Source of information			
Friends	17	5.4	
Relatives	15	4.8	
Extension agent	83	26.3	
Radio	136	43.2	
Television	10	3.2	
Newspaper/Pamphlet	12	3.8	
Cooperative association	37	11.7	
Mobile phones	5	1.6	

Source: Field survey, 2012.

access to disease resistant seeds. This implies that the respondents had little access to extension services. This could be as a result of agricultural extensionists dearth knowledge on organic farming practices against the more pronounced conventional agricultural production practices in the country which may arouse a negative attitude by farmers to organic practices.

Attitude of respondents towards organic vegetable production

The result shows that more than half (67.6%) of the respondents had favourable attitude towards extension services received (score of 93 to 181), while 32.4% had unfavourable attitude towards extension services

Table 2. Distribution of respondents' sources of information on organic vegetable farming.

Source of Information	Yes		Frequency of accessibility (%)	
	Frequency	(%)	Always	Occasionally
Radio	74	23.5	31 (9.8)	43 (13.7)
Fellow farmers	267	84.8	109 (34.6)	158 (50.2)
Extension agents	99	31.4	0(0)	99 (31.4)
Television	38	12.1	9 (2.9)	29 (9.2)
Farmers Cooperative Society	302	95.9	175(55.6)	127 (40.3)
Newspaper	25	7.9	5(1.6)	20 (6.3)

Source: Field survey, 2012, *Multiple responses.

Table 3. Distribution of accessible extension services on organic agriculture.

Accessible extension services	All the time	Sometimes	Never
Training and demonstration on organic vegetable farming practices	43 (13.7)	108 (34.3)	164 (56.1)
Help source for improved organic seeds	21 (6.7)	84 (26.7)	210 (66.7)
Link with market location of organic vegetable products	38 (12.1)	62 (19.6)	215 (68.3)
Training on nurturing of vegetable plants to good harvest sales	23 (7.3)	54 (17.1)	238 (75.6)
Subsidized disease resistant varieties of seeds	15 (4.8)	47 (14.9)	253 (80.3)
Soil fertility reclamation	38 (12.1)	72 (22.9)	205 (65.1)
Biological pest control training	26 (8.3)	34 (10.8)	255 (80.9)

Source: Field survey, 2012, *Multiple responses.

received (score of 45 to 92). This implies that the respondents had an appreciable knowledge and inclination to organic farming practices in vegetable production. The experience of accessible agricultural inputs at low cost, environmental friendliness of practice and high economic returns though, with poor and shallow improved organic farming practices is likely to subsume them more to increased adoption of organic farming practices in vegetable production. The result confirms the a priori belief of the close knitted relationship of traditional farming with organic agriculture, advancing ecological resilience and development of farmers' local manpower, knowledge and strength for effective agricultural production amidst continual vagaries of weather condition and other environmental conditions of climate change. Food and Agriculture Organization (FAO, 2008) validated this finding that organic agriculture provides environmental goods and services.

The results showed a high positive and favourable attitude of farmers toward organic agriculture taking item by item analysis of attitude statements. A higher proportion of the means for farmers attitudinal statements were above the cut-off point of 2.5. The most important attitudinal statements as ranked by the farmers were statements that organic agriculture (OA) strengthens the use of indigenous knowledge (4.55), OA provides social compatibility with its practices (4.54), OA increases farmers income with low cost (4.44), OA reduces input

costs of production (4.38), OA has no long term effect on ecological health (4.38), OA is prone to soil erosion (4.36), OA reduces all forms of environmental pollution (4.30), OA reduces farmers exposure to health hazards (4.29), OA product enjoys poorer taste to conventional agriculture products (4.29), OA product is not as healthy and beautiful in appearance as conventional agriculture (4.29), OA improves soil fertility and soil structure (4.23), OA ensures biodiversity (4.21), OA is efficient in mitigating climate change effects (4.21), OA is efficient in reducing pests and diseases infestation (4.14), OA increases vegetable productivity (4.11), OA reduces environmental degradation (4.05), OA products are very expensive for consumers to afford (3.98), OA does not offer potential for food security (3.93), OA vegetables has higher demand than conventionally produced (3.78). These items revealed the potentials of organic agriculture in maintenance of environmental bio-diversity, mitigation of climate change effects, limitation of environmental pollution and degradation, sustenance of people's value and system stability among others.

OA does not offer potential for food security (3.93). This may be because organic agriculture do not hold same potential as conventional agriculture in providing same quantity of harvest to feed the teeming population of the country but contributes safely to local food security and increased farmers income in the country. Arponen (2009) supported this finding that one of the principal objections

Table 4. Attitude of respondents towards organic vegetable production.

Attitude statements	SA	A	U	D	SD	Mean score	Rank
Organic Agriculture (OA) ensures biodiversity	126(40.0)	162 (51.4)	4 (1.3)	16 (5.1)	7 (2.2)	4.21	12 th
OA improves soil fertility and soil structure	113(35.9)	181 (57.5)	6 (1.9)	9 (2.9)	6 (1.9)	4.23	11 th
OA provides social compatibility with its practices	179(56.8)	132 (41.9)	-	2 (0.6)	2 (0.6)	4.54	2 nd
OA reduces all forms of environmental pollution	123(39.0)	171 (54.3)	6 (1.9)	9 (2.9)	6 (1.9)	4.30	7 th
OA is efficient in mitigating climate change effects	127(40.3)	158 (50.2)	8 (2.5)	13 (4.1)	9 (2.9)	4.21	12 th
OA is efficient in reducing pests and diseases infestation	121(38.4)	162 (51.4)	-	18 (5.7)	14 (4.4)	4.14	14 th
OA reduces input costs of production	180(57.1)	115 (36.5)	-	20 (6.3)	-	4.38	4 th
OA strengthens the use of indigenous knowledge	182(57.8)	129 (40.9)	-	4 (1.3)	-	4.55	1 st
OA increases value addition to produce	108(34.3)	103(32.7)	45 (14.3)	33 (10.5)	26 (8.3)	3.74	21 th
OA increases farmers income with low cost	169(53.7)	122(38.7)	18 (5.7)	6 (1.9)	-	4.44	3 rd
OA reduces environmental degradation	123(39.0)	142(45.1)	11(3.50)	22 (7.0)	17 (5.40)	4.05	16 th
OA vegetables has higher demand than Conventionally produced	100(31.7)	135(42.9)	13 (4.1)	44 (14.0)	23 (7.3)	3.78	19 th
OA reduces farmers exposure to health hazards	137(43.5)	156(49.5)	6 (1.9)	9 (2.9)	7 (2.2)	4.29	8 th
OA is transitionally difficult to sustain	67(21.3)	79(25.1)	2 (0.6)	116 (36.8)	51 (16.2)	3.00	24 th
Certified OA products is limited	81(25.7)	102(32.4)	3 (0.9)	85 (27.0)	44 (14.0)	2.71	25 th
OA products are very expensive for consumers to afford	24(7.6)	19(6.0)	15 (4.8)	138(43.8)	119 (37.8)	3.98	17 th
OA does not offer potential for food security	19(6.0)	38(12.1)	-	145(46.0)	113 (35.9)	3.93	18 th
Health benefits of OA products is of low awareness among consumers	45(14.3)	23(7.3)	-	134(42.5)	113 (35.9)	3.78	19 th
Agricultural professions lack proper knowledge and training of OA practices	29(9.2)	54(17.1)	-	125(39.7)	107(33.9)	3.72	22 nd
OA product enjoys poorer taste to Conventional agriculture products	-	-	18 (5.7)	187(59.4)	110(34.9)	4.29	8 th
OA is prone to soil erosion	-	-	-	203(64.4)	112(35.6)	4.36	6 th
OA increases vegetable productivity	-	24(7.6)	11(3.5)	187(59.4)	93(29.5)	4.11	15 th
OA product is not as healthy and beautiful in appearance as Conventional agriculture	-	-	14(4.4)	194(61.6)	107(34)	4.29	8 th
OA has no long term effect on ecological health	-	5(1.6)	17(5.4)	146(46.3)	147(46.7)	4.38	4 th
OA market niche provides more tedious agronomic practices than conventional agriculture	23(7.3)	126(40)	25(7.9)	67(21.3)	74(23.5)	3.13	23 rd

SA: Strongly Agree, A: Agree, U: Undecided, D: Disagree, SD: Strongly Disagree, OA: Organic Agriculture.

to the assumption that organic agriculture can guarantee the global food security is its well known capacity to produce lower yields and

therefore less food in total compared to conventional agriculture. OA vegetables have higher demand than conventionally produced

(3.78). This may be because consumers of vegetable produce who want to reduce health care costs, increase their intake of minerals and

Table 5. Predictors of respondents attitude to organic vegetable production.

Variables (factors)	Estimates	Standard error	Z score	Significant values
Sex	-0.047	0.129	-0.035	0.623
Age	-0.058	0.014	-8.312	0.001
Marital Status	-0.051	0.126	-4.083	0.003
Religion	0.117	0.095	1.254	0.165
Educational level	-0.248	0.081	-4.532	0.002
Farm Size	0.254	0.016	11.281	0.000
Farming experience	0.089	0.008	9.634	0.000
House hold size	0.125	0.019	6.843	0.000
Years of organic farming	-1.017	0.138	-0.069	0.725
Membership of organization	0.694	0.173	5.163	0.000
Extension contacts	-1.761	0.694	-3.067	0.930
Frequency of extension contacts	-2.421	0.682	-3.472	0.821
Sources of Information	0.021	0.002	5.341	0.000
Intercepts	2.125	0.643	2.331	0.006

***p < 0.01, **p < 0.05, *p < 0.10, Chi square = 2.572E+092, PROBIT model: PROBIT (p) = Intercept + BX.

vitamins void of pesticides and agro-chemicals grown. Gliessman (2005) corroborated this finding that farm using organic practices have healthier soil which is able to sustain plant growth, higher in nutrient content and it enables the farmer to grow crops for longer periods, with higher yields and when conditions are marginal.

The remaining scores of other items ranged from 3.00 to 3.72. These items were related to organic agriculture practices' engendering reduced vegetable production and food security limitations. These show that organic agriculture has its own limitations and not a total revolutionary trend to food security.

Determinants of vegetable farmers' attitudes towards organic farming in South West Nigeria

Probit regression model was used to test the relationship among the determining variables attracting farmers' attitude towards organic vegetable production practices. The results of the probit model showed in Table 5 that farming experience ($t = 0.089$, $p = 0.002$), farm size ($t = 0.254$, $p = 0.002$), household size ($t = 0.125$, $p = 0.000$), membership of organization ($t = 0.694$, $p = 0.000$), and sources of information ($t = 0.021$, $p = 0.000$) of the farmers had a significantly positive relationship with their attitude towards organic farming practices. This indicates that farmers with long farming experience are more likely to have favourable attitude towards organic farming practices as compared to farmers with few numbers of years in farming. Also, farmers with large farm sizes adopted organic farming practices than farmers with small farm sizes. This could be as a result of the vantage ground the large farm-sized farmers hold for trials on small parts of their farms before they eventually adopted

organic practices on the entire farm as sustainable decision, unlike the small farm-sized farmers who may not take up risks of innovation on time due to their more cautious and skeptic nature, until they see a large number of farmers taking up such innovation for utilization, effectively well over time.

Furthermore, farmers with large household sizes adopted organic farming practices than those with small household sizes. This could be as a result of the intensive labour required in organic practices, calling for many hands in witnessing sufficient and efficient production. This confirms the a priori expectation that large household size reduces and eases labour constraints among farm families. Likewise, farmers belonging to an organization were better positioned to access new information, ideas and innovation through the forum they registered their membership other than the farmers that did not associate with any organization. However, the results of probit model implied that age ($t = -0.058$, $p = 0.001$), married status ($t = -0.051$, $p = 0.003$) and educational level ($t = -0.248$, $p = 0.002$) showed a significantly negative relationship with attitude towards organic farming practices. The results showed that younger farmers were more likely to practice organic farming than the older farmers. This could be that, the older farmers displayed more aversion to risk as they held lower net worth and risk capital in farming enterprise compared to the younger farmers. Also, age pre-disposes a supportive factor of an individual's strength to manual and intensive labour. Moreover, the unmarried farmers were advantageously placed to practice organic farming better than the married farmers. This may be that the unmarried have lesser dependants to cater for compared to the married, who have more dependants to look after and calls for cautious and careful decision on risks to be

taken without attraction of compromise to their societal statutory roles. In addition, the less educated farmers practiced organic farming more than the educated farmers. This could be a manifestation of the proximity of traditional farming methods employed by this group of farmers from time immemorial with shallow information on improved organic practices, attracted their attention and interest more to organic farming practices than the educated farmers. The years of organic farming and extension contacts received from the government showed a non-significant relationship with attitude. This showed that the farmers had poor extension services from the extension agents and organic farming practices adopted by farmers were not robust and well integrated organic practices, but low input agriculture, precision farming practices and biodynamic farming. Daneji et al. (2006) corroborated this finding that extension agents are ineffective in information dissemination in Nigeria.

CONCLUSION AND RECOMMENDATIONS

It can be concluded from this study that most of the vegetable farmers are middle-aged and have positive attitude towards organic agriculture. The big farm size, long farming experience, large household size acquired, membership of organization subscribed to and sources of information explored by most of the respondents are predicating and inducing factors attracting positive and favourable attitude of majority of the farmers to organic practices. The extension contacts received and frequency of extension services available to farmers on organic farming practices are poor and posit hindrance to massive adoption of innovation on organic practices. The study shows that organic farming is still a growing concept in the study area, with the vegetable farming practices adopted by the farmers being less robust but productive to efficient result-based of low input agriculture. Organic agriculture therefore, holds a great potential of effectively contributing to local food security, health of citizens, increased family health and environmental standards at a low expense than conventional agricultural practices. Attitude therefore, is formed primarily by socio-economic status and ethical values upheld by the people in an environment. Therefore, there should be strengthened collaborative effort by the research institutes and Agricultural Development Project (ADP) as the body mandated with extension delivery to ensure prompt and appropriate organic farming innovation dissemination to farmers as a guarantee to sustainable farming practices in the country in the face of challenging climatic conditions. Farmers should be charged and encouraged to form cooperative societies in order to facilitate improved access to credit facilities among themselves, so as to bolster their capital base for efficient and more productive organic vegetable farming practices. Organic farm service outlets or centres

where organic inputs such as improved organic seeds, organic fertilizers and herbicides etc. would be stocked for sale at subsidized and affordable prices to the farmers should be established and well funded by the federal and state governments in accessible locations to complement innovation dissemination effort of ADPs with accessible organic inputs sourcing for efficient organic farm production in the country.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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Full Length Research Paper

How intentions guide the application of principle in co-creating sustainable agriculture

Karin Eksvärd

Inspire Action and Research AB, Boängsvägen 98, 741 92 Knivsta, Sweden.

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Transitions towards sustainability require processes of decision-making that enhance sustainability in several dimensions at the same time. This article is about farmers' decision-making in the context of their intentions and practice, as they seek simultaneously to support natural systems and the social quality of their farms. What does it take? An initial response is provided by an exploratory study based on seven semi-structured interviews and farm visits conducted with farmers in mid Sweden. Five respondents were striving to base their production on bio-resources and/or local consumption; one operated a large-scale production system, and one was a professional gardener. The interviews covered a) the farm and the farming system, b) farm history and development, c) planning, management and decision making, d) satisfaction and evaluation, e) attitudes and intentions, f) collaboration and other interests, and, g) policy and governance issues. Important personal intentions that shaped how guiding principles were adopted into practice were found to include emotional orientations such as love and care, connectivity, empathy, capability, honesty, engagement and appropriateness. This paper discusses whether these drivers could be considered to offer appropriate guidelines for deciding how and when to make decisions linked to sustainability goals.

Key words: Co-creation, sustainable agriculture, intentions, transitions, decision-making.

INTRODUCTION

The official policy approach to sustainable development in Sweden has been based on environmental quality objectives for sixteen different areas that define "...the direction of the changes in society that need to occur within one generation ..." (Miljömålsportalen, 2011). The purpose is "to guide environmental action at every level of society", socially, economically and ecologically. Interim targets lead the way; progress is monitored and evaluated. The goals are progressively clarified in the light of experience. The importance and urgency of driving transitions (Rockström et al., 2009) has been

accepted in Sweden as a societal responsibility. However, many practical difficulties arise when transitions are required in multiple dimensions at the same time. Policy, business, technology, and information specialists offer useful guidance but, from many individuals' point of view, the guidance does not connect in a compelling way with their day-to-day experience.

With respect to farming, Gliessman (2007) and Francis et al. (2003) show how interdependence among multiple actors needs to be improved in the transition toward sustainable agriculture. In their description of agro-

ecology they reveal a number of systemic connectivities between the components of farming systems and their context. These have been discussed from various theoretical perspectives for example, also by Midgley (2010), Odum (1995), Holiday et al. (2002), Ison (2010), Eksvärd and Rydberg (2010), Bell and Morse (2008). The need for systemic thinking and learning for sustainable development transitions is particularly clear in a farm setting where everyday decisions are affected by the intentions of the operators, in interaction with many parts of the system on- and off-farm.

In agriculture, before fossil fuels were widely and abundantly in use, mankind's possibilities for living and increasing well-being lay in designing farm systems rich in biodiversity and in managing the interactions among natural and farm functions that had different system qualities. Through adapting their systems to the potential of the place, and by adapting their actions to enhance benign natural and social processes, and mitigate the negative, they co-created a variety of place-based agrarian systems. It could be said that farmers provided co-creative services to the functioning of the system as a whole, just as the bee or the grazing cow. However, the increasing amounts of external inputs of energy and other resources applied in farming have un-balanced the relationships within farms as well as between a farm and its context.

In his book on how to act in a climate change world Ison (2010) explores the importance of the decision-making processes and choices of individuals in creating transitions. He emphasises that we are always "in situations, never, outside them" (p.37) and that appreciation of the situation one is in must be anyone's starting point when decisions have to be made on the way forward. In this paper we adopt Ison's use of the term systemic decision-making to indicate decisions that are made out of conscious or unconscious awareness of the inter-connectivity of the situation in which they exist.

However, we also note Reason's (2006) claim that when someone is working for the purpose of transformative change (in his case through action research), the quality of the actions taken lies in our "ability to see the choices we are making and understand their consequences". Yet, as Midgley (2010) discusses, we do not and cannot have "God's eye view" of total connectivity, and thus our understanding of any situation is inevitably limited. The desire to understand connectivity in conditions in which only partial understanding is possible takes us toward the development of an ability to see our choices, while knowing that that the consequences of acting on any one choice can never be fully foreseen.

Eksvärd and Rydberg (2010) suggest that "organisms are capable in their roles of being both producers and consumers to add to each others' place" that is, the ability to co-create the world of their joint existence. Odum in 1995 captured a similar view in more formal terms: "During self-organization, system designs develop and prevail

that maximize power intake, energy transformation and those uses that reinforce production and efficiency."

In Sweden today, existing strategies for enabling transitions toward 'sustainability' have tended to prescribe what not to do, and to focus on how to limit the disrupting impacts of human deeds, not on what to do and how to co-create ones place and context. Building on studies as "Facilitating Systemic Research and Learning and the Transition to Agricultural Sustainability" (Eksvärd, 2010) where farmers interests are considered one of the drivers for the sustainability of the system, this paper turns the existing approaches around and asks if it is possible that farmers that have survived as farmers despite the harsh prevailing market conditions have a strategy of co-creating their place and context? If so, what do farmers do to co-create their own place in the prevailing system? What guidelines or basic assumptions do they use for systemic decision-making?

METHODOLOGY

Interviews

The methodology chosen for this study has been to follow the process of the Kolb learning cycle (Kolb, 1984), using farm visits to gain a rich picture of the farmers' situations and context. Seven semi-structured qualitative interviews (Flick, 2002) were conducted with six farmers and a gardener, at five farms (Table 1) during the summer of 2010, in mid Sweden. Of the seven persons interviewed, six were clearly experienced in cultivation and/or husbandry. One was comparably new to farming. In one case the two active farmers on the farm took part in the interview at the same time. The interview session and the visit to the farms included Participatory Action Research (PAR) (Whyte, 1991; MacIntire, 2008) interview methods such as systemic diagramming through rich pictures (Checkland and Poulter, 2006), a farm tour, and participant observation to support a better understanding of the whole farm situation and the farmer's context. The process of doing and reasoning while doing for example systemic diagramming usually tells more than the actual picture produced.

Three main criteria were used to select farmers to interview: a) they were identified locally as 'having a production system different from mainstream'; b) were striving to base their production on bio-resources and/or local consumption of the produce; c) were recognised as deriving their main income from farming. These criteria were chosen as indirect indicators to find farmers with socially, environmentally and economically functioning production systems. Therefore, three of the farms were purposefully selected from the membership of the society "Kärngårdar" (www.karngardar.se), that includes among its goals the development of sustainable cultivation and production systems. Another was selected from a book based on a low-input production system. For reasons of contrast an additional farmer was selected through peer referral, who operated a large-scale crop production system relying heavily on bought inputs. Overall, care was taken to select a range of farms that generated income by operating contrasting farming systems.

The topics discussed in general covered planning, management and decision-making, and to get a rich systemic picture of aspects that may influence this and the sustainability situation of the farm, specifically included a) the farm and the farming system, b) farm history and development, c) the respondent's degree of satisfaction with the current status of the farm, and evaluation of its prospects, d) the respondent's attitudes and intentions, e) interest

Table 1. Description of the farms visited and the people interviewed.

Respondents	Respondents profession	Enterprise description	Sources of income	Approx. work load	Respondents background
1	Farmer / project manager	The farm is run as an educative enterprise to “show a meeting place of the history and the future” and offering visits, courses and lectures. Formerly abandoned. 16 ha with native breed animals, bakery, café and garden.	Sold products Subsidies Project money Other jobs	On total 3 full-time	Non-farming
2	Gardener, working for Farmer 1	Produce products to the farm café. Aims at showing the joy and easiness of cultivation to visitors.	Salary	(Included above)	Educated gardener
3	Farmer	3 ha of horticultural production, Production idea: produce healthy quality products to a local market in a sustainable way.	Sold products	1 person + 0.5 extra during the summer.	Life-long experience Economist
4	Farmer/ “Organic inventor”	New enterprise, since 5 years, on formerly abandoned farm, 1 ha. Aim: Self sufficiency, finding new crops and production systems.	Other job Sold products	60% of full time	Long experience of farming
5	Farmer	Crop production Owns approx. 200 ha fields and 155 ha forest.	Sold products Farm services Subsidies Other jobs	2/3 of fulltime on farm	Life long experience + university farming education
6 and 7	2 farmers	Old-fashioned mountain farming with preservation interest. Production: meat and dairy products from 6 cows, potatoes for own use. Covers 2 600 ha of mainly forest and swamp.	Sold products Subsidies Hunting on lease Cultural subsidies through 1 paid worker.	3 persons full-time	Life-long experience

in collaboration with others, and other interests, and, f) policy and governance affecting farm development. The depth of discussion varied depending on the interest of the farmer. The shortest farm visit lasted 1 h and 25 min and the longest a full day, including an overnight stay.

The interviews were recorded, transcribed and analysed manually in order first, to identify situations and contexts and the development of the farm systems, and respondents’ explanations of why these systems are the way they are; secondly, to identify and examine the intentions and decision-making processes the respondents’ described for managing their farms in these ways.

FINDINGS

When asked about why their farm system was as it was, all farmers mentioned the nature of the place, their own interest and choices, and, the history of the farm (often referring to the people who had operated the farm before them). The gardener explained in detail how it is the place that tells how the garden should be. In one case, collaboration with a neighbour farmer was mentioned as an important additional factor, while another mentioned her concern to preserve local culture and the knowledge

interconnected with the place. The geographical location, and proximity to cities, was also mentioned. They all described clearly that their farm was a co-creation between them, nature, former inhabitants, neighbours and the local context. At this stage of the interviews, external issues of policy, subsidies and governance were not mentioned by any of them as influencing their farming system choices.

From the rich pictures of the farmer’s situation produced by the interviews, findings focusing on inclusiveness, connectivity and examples of systemic decision-making are presented below. Presenting them case-by-case, in turn gives a rich picture of how these aspects can be found in different parts of the farm systems.

Respondent 6 and 7 at their mountain farm

The whole farm system is organised around dairy production, based on the hay produced on the farm itself. Haymaking is the essential historical practice for self-

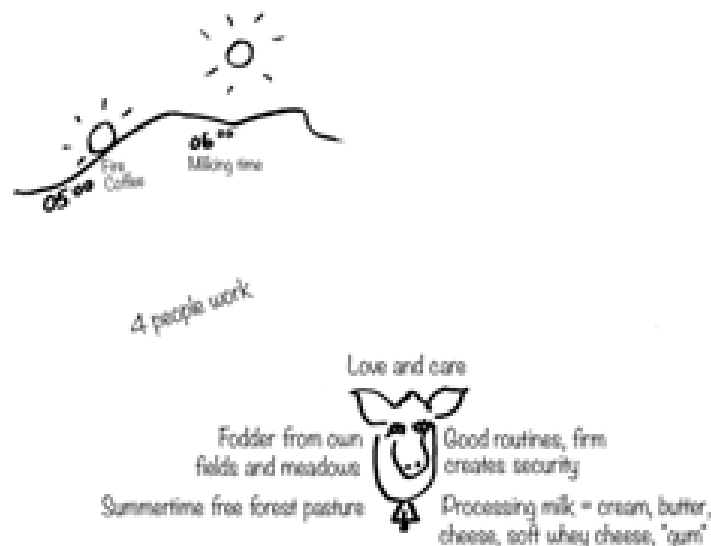


Figure 1. Picture of the mountain farm system as described by the farmers.

sufficiency in this mountainous area. The farm stead today has six mountain cows. The farm also has shielings (upland meadows), which give enough hay for approximately one cow. Fences have been constructed to keep the cows out of the hay fields and allow them to graze freely in the surrounding forest. The talk with the farmers clearly shows how connected their lives are with the cows' needs and behaviour.

R7: *We go to the shielings in the fall as we have to be at home to cut [the hay in the summer]. (...) This year we were not ready but we couldn't wait any longer as the cows were on their way [to the shielings]. They know when it is time to leave [the farmstead at end of August] and then they go here [to the shielings].*

The farmers clearly express that the animals are the main focus of the farm, and explain that without them, they themselves would not survive. They point at the importance of them, the humans, to take good care of the animals. When asked what the cows need they respond.

R6: *The first thing, if I may express myself, is love and care. That is the first. To get a good balance with the cow. So that she feels that she is taken care of...*

The cows need to be handled kindly, firmly and in a way that the cow feels important and taken care of. These two farmers' primary intention is to handle their animals out of love and care.

The farmers described how time bound they are both in their daily and yearly routines. They have heavy planning to do as the only time to transport things to the farm is

during the late winter when the snow for skiing and snowmobiles is good. When asked about how decisions are made they replied in terms of relying on tradition for guiding the main production planning. It is clear how these traditions are well interconnected with the prerequisites of the place.

The way the two farmers describe their lives and farm production correlates well with how they approached drawing a picture of their farm system (Figure 1). Quite hesitantly, the person holding the pen constructed a timeline, beginning with when they woke up in the morning, directly including themselves in the production system. They then decided to draw a cow in the middle of the picture because their six cows were the centre of their practice. These respondents did not abstract themselves from the system. They tried to represent it from inside their own lived and felt experience.

At this farm decisions concerning production and livelihood are made purposefully to sustain a very locally adapted and self-sufficient system based on love and care and that farm practices connect with the natural conditions.

Respondent 5 with large scale crop production

From first impression the farm seems thoroughly organised to maximise the efficiency of production. This is reflected in the enterprise structure and how the work is done. However, the importance of the enjoyment of the farmer, and care taking of the farm, were also emphasized by this respondent. His efforts are focussed on achieving a 'good result' in financial and economic

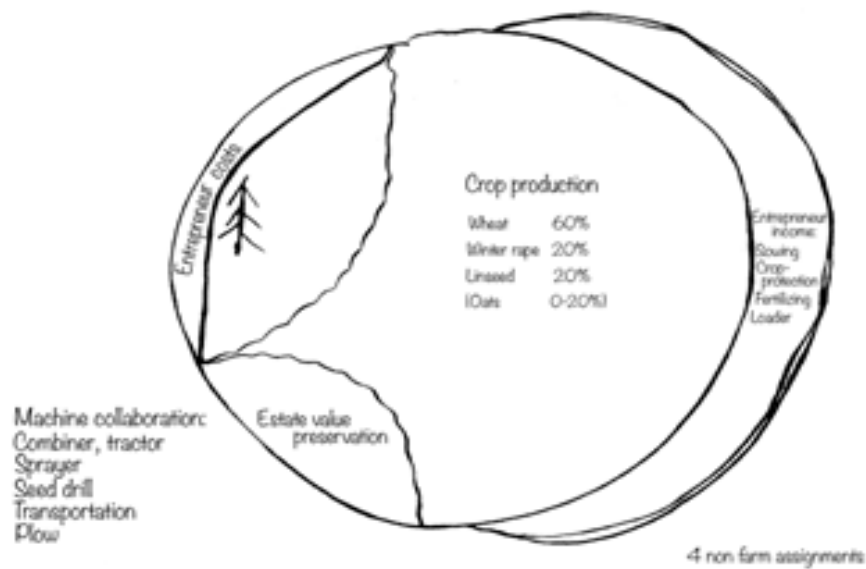


Figure 2. The large scale crop production farm enterprise as illustrated by the farmer.

terms. For instance, when he was asked how much the operating area was (in the drawn picture of the farm (Figure 2)), the farmer answered in terms of monetary turnover. When asked again about size, it turned out that his farming system comprises a number of inter-dependent arrangements with others: the number of hectares he owns (194 ha) is not the same as the area he sprays (1000 ha), while the area he fertilises and sows is 350 ha. The area he harvests (approx. 210 ha) produces mainly wheat (60%), oilseed crops (winter rape) (20%) and linseed (20%). In other words, he enters into various arrangements with other farmers to optimise his workload, income, and harvest returns.

The farm's production has become co-dependent on collaboration especially with a neighbour farmer. The respondent explains this relationship works perfectly and has its base in co-ownership of almost all the machines that cultivate the ground. He explains that he never waits impatiently for access to the combiner (risking that the quality of the wheat goes down). In his view, the advantages of having good machinery efficient on his large fields through sharing are so much greater than trying to operate the system alone.

R5: (...), and if something breaks down we are two who can share the toil with it and wrench it, and well, have some fun at the fact that the machine broke in the middle of the harvest.

He explains that it works as they are very straight with each other and do not hide feelings or thoughts.

The importance of enjoying the farm-related work stands out in this interview. For this farmer, enjoyment is

part and parcel of achieving a good monetary result. He explains that if the economic calculations of any type of production do not meet his standards it is not interesting:

R5: *It should be fun to work too, of course, it is all connected. You have to like to work, there is no one else driving you, no one to tell you what to do. That is the basic course [if you want to be a farmer].*

The above fits very well with the reasoning while drawing the picture (Figure 2) of his farm system where he presented his farm in terms of a commercial enterprise. The picture does not include him; rather he explains the situation as an outside manager.

However, when the interview turns to decision making, the monetary profit motive is not as apparent any longer in the conversation. What this farmer considers important are two things: that the decision is "right" and will do good in terms of the functioning of the system, and that the basis for collective decision making with partners is clear, honest and easy to understand.

R5: *we have a need and it costs more than we actually will make from it, but this need, should (...) be satisfied, then we need to do this. (...) it is right to do something just because it is connected [to other parts of the system], it will be good in the long run, so forget the calculations.*

And he continues:

R5: *A decision should be straight, simple, clear and serious, so that 'no-one will think there is anything*



Figure 3. The experimental farm with different perennial, annual and mixed systems, drawn by the farmer.

strange about the decision (...) all wildcards should be on the table (...) That's what's driving me.

At the end of the interview, the interviewer impressed by the level of organisation at the farm, says so to the farmer but he insists that this is not the case. He claims it has turned out to be incredibly structured because he wants things to be simple, practical and taken seriously, claiming that that is what he goes by.

At the farm productivity, profit, efficiency are important but underlying these intentions appear to be more personal principles of practicality, simplicity, being serious, collaboration, enjoyment, honesty and doing what is considered transparent and right.

Respondent 4: The experimenter.

Respondent 4 calls himself an "organic/ecological experimenter". His aim is to create a system of self-sustainability on his 1 ha of land. During the farm visit he shows about ninety different edible plants, both annuals and perennials. He explains the organisation and system plan while drawing Figure 3.

He works 2 days a week off-farm but says he needs little money. His dream is to be able to live fully from the farm produce, from a system that is organised to not take much labour when he retires, being independent on money. At the time of the visit he claims that 90% of what he and his wife eats are from the own production. He keeps looking for and trying "new" things and practices,

drawn from old ideas, un-conventional sources or practices not tried before in this location.

The production cycle draws on a mix of organic and biodynamic production principles. When asked how he decides when to do what, he simply answers that it depends on what feels best at the moment. The farm is for own use and his pleasure and interest in experimentation. He is also very keen to share his knowledge and experience through organisations, networks and the books on garden production he writes.

He had intended to become a veterinarian but quit half way through his studies as he did not like working for the large-scale farms that are the main clients of a farm-based veterinary practice. He explains his journey from intended veterinarian to experimenting self-sufficiency crop grower by his urge to live as close to nature as possible and to try new things:

R4: and then I got (...) a book by John Seymour on (...) self-sustainability and then I thought Wow! Blimey! This is what I am going to do. You have to try new things because if every body just continues in the old patterns there will never be any change to anything.

Respondent 4 is eager to find new ways forward but also is interested in conserving old production methods, varieties and species that flourish locally without external inputs. He keeps returning in our conversation to the need for local and small solutions to global problems and the need to try new things in order to create transformative changes.

Respondent 3 producing organic vegetables

Respondent 3 is a well-established organic vegetable and honey producer, who for decades has sold his products through alternative markets like consumer groups and farmers' markets, and direct to restaurants. He became widely known through the national press when he started free range, organic poultry production in the 1980s. This part of the enterprise he has now ended. Though the acreage is small, 3 ha, he lives from his produce, seems to be doing well and sets aside time to meet friends and do sports once a week.

He studied economics when deciding to take a break and try farming for one year and took over the farm from his grandparents. This was 1970. Being a vegetarian he wanted to grow the food he himself ate and started a production very different from his father's dairy production and the other conventional farmers in the area:

R3: I had to start from zero, and slowly get together a few pieces of machinery and some equipment. But, from 1980 I have supported myself from this.

The start was not always easy. He describes, for instance, the critical reactions of relatives and neighbours to his uncommon ideas about what he wanted to do, but he also speaks about the stimulation he got through learning together with other farmers (who lived a bit further away) about how to pursue his interests:

R3: (...) it became an excitement to try to show that it worked. Every, every neighbour said no, that won't work.

This farmer has stayed small scale and diversified. He tells of his friends in another area who have many beehives and relatively large acreages of potatoes (15 ha). For them, any set back has a serious impact. He declares that, in contrast, he has been able to absorb a real set back in some area every year and still makes a living. He enjoys the farming, the meetings with his customers, and running the farm as a business:

R3: So I feel satisfied when I see that I make it (...) and then when you are in the Market Square and meet people that show to much gratitude...

His farming system is organic; he says he would not have gone for conventional production for "every reason" - environmental, safety in work, customers' needs. To him organic production is the only choice. He explains how he has developed his organic system to be more efficient by adapting the production to his small scale system and direct contacts with his customers. For example he sows a little bit of carrots every week to have nice produce over the whole season. This is possible when using a one row manually driven seed drill.

The farmer is the only one left in the area solely living

from the farm. Yet, his acreage is too small to qualify for any subsidies. He has acted and developed his farm according to what he found to be healthy, fun, environmentally sustainable, safe, and to meet the needs of the customers. He has stuck to the production principles and practices that from the beginning he felt was right for him, no matter what parents or neighbours said, while collaborating with and learning from others. He has learnt to be efficient at a scale appropriate to his production intentions.

Respondent 1 and 2 at the model farm

This farm was brought back into production by a wife and husband team after having been abandoned for many years. It has been turned into a model farm that offers programmes for visitors and schoolchildren. In addition to their interest in growing native breeds and crops, they have started a small vegetable garden, an artisanal bakery, and a café, as well as holding courses and meetings at the farm. All the enterprise areas are integrated with each other. The farmer is an experienced project manager who is looking for transitions in society. She is frustrated by the possibilities and problems caused by the industrialism of the 20th century and describe her engagement and intentions with becoming a farmer in these terms:

R1: (...) I studied agricultural history (...) I thought I was going to read about farm history but then I realised it was all of Sweden's history – it was politics! (...) pastures are disappearing, meadows are disappearing, you overuse the soil to the point of non functioning and have no respect for it (...) this place is like, a meeting between history and the future. You get yourself encapsulated in a force wanting to change something, wanting to show something or wanting to make something clear.

She said she focuses on the possibilities, at times not quite realistically, rather than on problems, and notes that exploring the possibilities can incur heavy costs and an overload of working hours. But she enjoys the ability to not be limited by old thoughts and patterns. She explains her difficulties with authorities not accepting the farm budget as they cannot comprehend that she actually is selling sheep skins for 3-5000 SEK a piece by making them exclusive for a special market based on their traditional breed.

The intention to create and demonstrate the potential of a farm based on the natural resources of the place has had a major impact on the way that the enterprise has been developed. The place was also chosen because of its resources: water, a slope towards the south, a good garden spot etc. It has also had impact on their choice of breed, saving the original characteristics where you can use the meat, skins and wool from the sheep, not just one product. She does not set specific, quantified goals

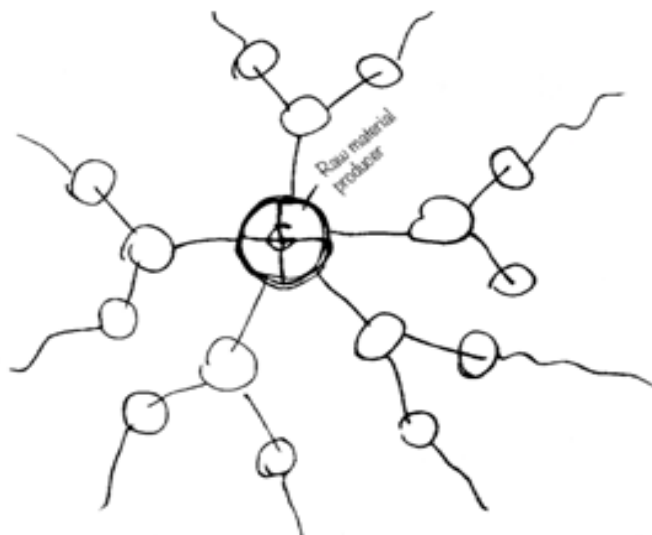


Figure 4. The model farm system as visualised by the farmer.

for the farm but rather looks for a quality outcome' of togetherness on a farm and works to reduce the gap between the city and the rural area, the large scale and small scale farming, humans and animals.

The conversation with respondent 1 covers about every fault she sees in society, from the negative health consequences of spending too many hours in front of a screen, to the spreading of sewage sludge manure on fields, on to industrialisation and its discontents. She presents a very wide picture of today's problems, clearly giving voice to the struggle. When describing the farm through drawing a picture (Figure 4) she describes a dynamic system dependent on its context, and in interaction with a variety of sub-systems.

She keeps coming back to the need to get things in balance, to close the gaps between things, relationship and functions that are set against each other. She wants to create a model farm where 'it all works out', according to the needs of society, the people working there, and the conditions of the place.

When asking respondent 2, a gardener employed by the farmer, about the development of the vegetable garden she explains:

R2: *I did not have any idea at the start but then it [the nature] told me, this should be here, this should be here and that should be there, that's what it is to be working with the soil (...), you should do what the stomach [gut instinct] tells you. That's the secret. (...) So I am into this way of thinking, to work from inside yourself (...).*

The gardener (R2) wants to show people that it is fun to grow vegetables, and keeps referring to the joy of co-creating relationships and functions together with nature, being connected to a whole system constituted in nature

and in experiencing life as fun.

ANALYSIS AND DISCUSSION

Guiding principles

All the farmers can be said to be satisfied with what they were doing as all did what they said they wanted to be doing and they all, in different ways, make their living from their farms. The gardener (R2) was satisfied when things felt good, R5 was satisfied when he produced a good economic result and an attractive farm system, while at R6 and R7, the respondents were very pleased with how things had worked out at their farm, and they were very thankful.

Within, the connected areas covered by the interviews all the respondents gave voice to principles that guided their decisions and actions and the intentions that had shaped the development of their farm systems. These are presented in Table 2.

The core guiding principles that the respondents referred to most often were "closing the gap", "doing together with nature", "appropriateness", "finding new systemic ways to farm", "doing what is right" and "acting with love and care". Doing what is right was explained to be that which is practical, simple, serious, honest and that would contribute to prosperous enterprises. Even though all were eager to learn, they all stuck to what they knew was right for them and their place whether other found it good or not.

These principles and intentions are examples of what guide them in what to do and are the base for their continued farming and prosperity. There are many principles given and presented, but they are all

Table 2. Guiding principles [N=7].

Principle	Respondents	Comment
Sense of connectivity	All	All farmers were aware of connectivity among the parts of their farms, but talked about this in various ways i.e. in terms of inter-actions with society, with customers, among crops, with partners, and in terms of the whole farm system. 2, 6, 7 are also express themselves as part of the system.
Love and care	2, 6, 7	Love and care as the basis for relating to the natural functioning of the place and with other species (the cows).
Efficiency and new ways	1, 3, 4, 5	These farmers talked about finding new ways to do things more easily and to improve production in terms of their guiding principles.
Functionality and Appropriateness	All	All valued technologies with good functionality and that were appropriate for their system and the context.
Good feeling	2, 4, 5, 6, 7	This was mentioned in various ways, e.g.in terms of getting knowledge from feelings, responding to something that feels good; and knowing what is "right" through observational and experiential attention to systemic feedbacks.
Engagement	All	All were very engaged in what they were doing, and believed in their ideas.
Collaboration	1, 2, 5, 6, 7	At the farms of R1and2 and R6and7 collaboration was mentioned as important; for R5 it was the basis for the farming system.
Trust	2, 5, 6	Trust was mentioned in a variety of ways, either in relation to nature or to partners.
Enjoyment	2, 3, 5, 6, 7	Work and running the farm as fun, or at least enjoyable.
Simplicity	4, 5	Both these farmers looked for the simple way of doing things.
Honesty and clarity	2, 5	R2 was honest and open about her not very common worldview, R5 was clear that honesty and clarity were drivers of his business and relationship to others.
Action	2, 5	All had adopted the practice of purposeful action as a means of learning.
Sharing	All	All where eager to share their knowledge.
Capability	All	All trusted their own capability.
Results - feedback	All	All enjoyed the results they had achieved and receiving feedback, whether it was through a relationship with customers, or in the form of a surviving walnut tree, a trusting cow, a good income or just the feeling of being happy.
Health effects of the system	1, 3, 4	These respondents emphasised the importance of striving to co-create a system that is healthy and that produces healthy products for customers, workers and the farmer.
Conserving knowledge and practices	1, 4, 6, 7	Conserving old varieties, animals, knowledge; not dependent on modern inputs .
Creating change	1, 4	Both actively desired to contribute to societal transitions and talked about the importance of "finding balance". In different ways both wanted to "close the gaps" caused by the tensions they saw as created by present societal arrangements and farm practices.

characterised of wanting to do well for the system.

Appropriate science, metrics and practices

According to Goobie (2011), today's modern science and technology try to comprehend and solve environmental problems with methods based on a number of '-isms': scientism (modern science as the authoritative source of knowledge), technological utopianism (technology as the solution to societal problems), mechanism (nature as made up of distinct parts and operating like a machine), empiricism (true knowledge based on observation and experimentation), dualism (people separated from nature), anthropocentrism (people as the most important

and advanced living creatures) and an instrumental rationality (nature's purpose is to be utilised). It is noteworthy that none of those interviewed saw science as the most authoritative source of knowledge for the running of their farms, none thought knowledge could be gained only from observation or experimentation nor that people are separated from nature. Five of the respondents did clearly not see nature as something to be utilised exclusively for mankind's satisfaction. They did not see nature to be working like a machine. None of the respondents claimed to set specific and quantified goals that they wanted to meet. Rather, their planning and management decisions were based on their intention to develop a working system constituted by the natural and social conditions and potential of the farm. Even

respondents 6 and 7, who were keen to maintain the proven solutions for working sustainably at that place, had no fixed ideas on how things should be or should become. No one said that they would be satisfied or happy if they reached this or that production level. All were happy when they received feedback on the way that their systems were working whether it was from a satisfied customer, or in terms of a surviving walnut tree, a trustful cow or a good sales result. This puts in question the appropriateness of the science and metrics normally used to help farmers move toward sustainable farming systems.

The findings suggest a need for discovering (or perhaps formalising) a new kind of appropriateness to both scale and intention. There are indications of what this might be in the way that the farmers in four farms talked about technology as 'appropriate' and a key factor in satisfying their own intentions for their farms. Respondents 6 and 7 said that they did not know how they would be able to replace the hand driven milk separator if it broke down; R4 respondent said he could not find equipment that matched the size of his fields; the respondent at R3 was pleased to have found the right equipment for his needs and R5 described co-owning equipment, such as a 50 metric tonnes/hour combiner, with a neighbour partner as one of the successes and joys of his farming practice.

Intentionality

All the farmers seem, to a varying degree, to have adopted the sentiments of Hall (1995), who says: "How can we see fit the activities of humans into the grand energy schemes of the world around us, which sooner or later will determine what we do anyway?" (p. 205). He notes that while people are free to choose what they do and what they value they are not free to choose the consequences of their actions. He suggests that people's actions will bring prosperity if only they are consistent with the larger patterns of nature. This fits nicely with Hamilton (2002) discussion on dualism being unsustainable and the claim by Rand et al. (2012) that to be maximal rational at decision making may have unintended side effects of making decisions more selfish "whereas, interventions targeting prosocial intuitions may be more successful". They conclude: "although the cold logic of self-interest is seductive, our first impulse is to cooperate."

Overall, the findings of this exploratory study suggest an underlying intentionality that is inclusive and non-separating, valuing connectivity and systemicity to shape farming in ways that mimic natural patterns. The large-scale farm – that had been brought into the study to serve as a contrast - produced a surprise in respect of intentionality. This farmer's guiding principles seem aligned to the same underlying intentionality although in

this case he was more focused on connectivity in terms of good collaboration with people than on connectivity with nature. Could the core intentions of the respondents be the drivers for systemic decision-making on a societal level? Are they the 'missing guidelines' needed? This article suggests that this might be the case and inspires further research.

How might Swedish agriculture look if the stakeholders to a larger extent made their choices based on such intentions? One implication might be that Swedish society (and the EU's agricultural policy) would need to develop a greater tolerance of diversity. Although this study suggests that there might be an identifiable cluster of underlying intentions that are associated with a drive toward sustainability, the outcomes in each case are very different. Application of the metrics used today in Sweden to judge the sustainability of farms and farm-based enterprises would not catch the dynamic differences in system outcomes that result as intentions interact with place. Goodie (2011) discusses the need to move on from just measuring ecological footprints to really thinking about our "thoughtprints" which aligns well with this study.

Conclusions

This article discusses the need to look at how farmers' intentions co-create the farmed landscape and farm-based enterprises. It has looked into the questions if it is possible that farmers have a strategy of co-creating their place and context as a means of being sustainable. Instead of looking into what not to do to contribute to sustainable development, the question is 'what to do' and if there are guidelines or basic assumptions to support such systemic decision-making.

This exploratory study strongly suggests that there is a lot to learn about transitions for sustainability at societal level from what already works in a sustainable manner in particular places. These farmers are prevailing in situations where others have had to close down. From the guiding principles found to be part of the respondents decision-making can be said that to be and act as a co-creative part of a sustainable system requires having the intention of 'doing well for the system'. All the guiding principles presented are prosocial and based on connectivity. Could it be that to have a pre-understanding of the type of effects coming from decision making for sustainability we need to look at the intention behind the decision? That is suggested by the findings of this study. According to this, intentions of co-creating prosocial solutions well interconnected with the place and contexts should guide transformations for sustainability.

The study also makes it clear that the same cluster of intentions and principles give rise to different decisions, actions and outcomes in different context. The exact outcome to emerge is not clear beforehand. This means that evaluation of sustainability through the lens of

intentionality would require different metrics than what is used today.

Conflict of Interests

The authors have not declared any conflict of interests.

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Full Length Research Paper

Consumers' attitude towards local rice production and consumption in Ondo State, Nigeria

Alfred S. D. Y.* and Adekayode A. B.

Department of Agricultural Economics and Extension, Federal University of Technology, Akure,
Ondo State, Nigeria.

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The Nigerian soils are well adapted to the production of rice. In all the ecological zones of the country, rice production is well entrenched. Despite their favourable soil and ecological conditions for rice production, Nigerians still spend substantial proportions of their earnings on imported rice. Why? It is against this backdrop that this study was carried out in Ondo State, Nigeria to investigate the consumers' attitude towards local rice. Two Local Government Areas (LGAs) were selected for the study and from each, two communities were randomly selected. Five wards from each community were selected, from where five respondents per ward were interviewed. The results showed that 93% of the respondents consumed local rice but only 26% consumed more of local rice than the imported. Also, 42% of the respondents consumed local rice for its relative cheaper price in addition, 80% of the respondents purchased their rice from the market while 82% spent less than 24% of their income on rice consumption. The attitude of the respondents from the study showed that, they were indifferent in their preference of local rice to imported rice, but they showed unfavourable attitudes towards importation of rice at the expense of the locally produced one given the favourable natural resources at the nation's disposal. It was recommended that, since the people desired an improvement in the production of local rice, the improvement would likely be in the area of processing which has much to be desired compared with the imported in terms of neatness and attractiveness, efforts must therefore, be made to make the rice more attractive. This can be accomplished by adopting the use of much improved technology.

Key words: Consumers, attitude, rice, consumption, production.

INTRODUCTION

Rice has become a predominantly staple food in Nigeria and other developing countries, having emerged from being a "festivity food" as in few previous decades. Rice provides 20% of the world's dietary energy supplies and it is a good source of thiamine, riboflavin and niacin (Odusina, 2008). An average Nigerian now consumes

24.8 kg of rice per year representing nine percent of total calories in take, giving the fact that the status of rice in the average Nigerian diet has been transformed from being a luxury food item to that of staple (Odularu, 2010). As food production grows at the rate of 2.3% annually, Nigerian population increases at 3.2% (FAO, 2006).

*Corresponding author. E-mail: yomialfred2003@yahoo.com

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Nigeria has therefore, not been able to produce enough rice for domestic consumption consequent to the mass rice importation with its unattractive consequences on the nation's economy (Daramola, 2005). Globally, there is the need for increase in rice production from 586 million metric tons in 2001 to 756 million metric tons by 2030 (WARDA/USAID, 2003)

Efforts of the various governments and donor agencies have been recorded in policy making, such as in the River Basin Authorities, which had the mandate of cultivating and irrigating the soil among other things for rice production, increase in awareness of improved inputs and credit facility (Bamidele et al., 2010). Despite that these efforts, coupled with those of researches and extension, have not correspondingly translated to sufficient rice production, much more so, there is a higher taste by the people for imported rice (Lancon, 2003). Some of the peoples' complaint for their distaste for local rice has been its poor quality comparative with imported rice. The general observation is that "local rice does not taste well; it is stony and such things". However, these observations are mainly attributed to poor processing methods which allow a mixture of rice products with pebbles (Kassali et al., 2010).

Evidence from the past studies has shown that, the Nigerian local rice has failed to meet the demand of her teeming population not only in quantity but also in quality, largely, due to neglect of the agricultural sector by successive governments (Ogazi, 2009). The crux of this study is therefore hinged on the attitude of the consumers towards local rice production and consumption. If rice must be produced to meet the needs of the populace, if there must also be drastic reduction in the rate of rice importation, local rice must no longer be treated with so much disdain. Specifically therefore, this study sought to:

1. Identify the socio-economic characteristics of the respondents.
2. Ascertain the degree of local rice consumption.
3. Determine the effect of respondents' socio-economic characteristics on local rice production and consumption.
4. Determine the consumers' attitude towards local rice production and consumption.

METHODOLOGY

The study was carried out in Ondo State. The ecological zone, under which the state falls, favors the growth of forest vegetation thus, making the area characterized with a vast of forest land with high relative humidity. The local food crop grown in the state includes rice, maize, beans, yam, cassava, plantain and vegetables. Two Local Government Areas (LGA) being Akure south and Ifedore were randomly selected. Two communities were randomly chosen from each LGA (Ibule Soro and Ilara Mokin from Ifedore LGA and Akure and Oda from Akure South). Five wards were randomly sampled from each selected community giving a total of 20 wards. Furthermore, five respondents were randomly selected from each ward making a total of 100 respondents for the study.

The data used in the study were primary and secondary data. The primary data were collected through the use of well structured questionnaire while the secondary data were from published works and the ministry of commerce and industry. Information was collected on demographic and non-demographic characteristics of the respondents. The data collected were analyzed using descriptive statistics such as frequencies, tables and percentages to show the socio-economic characteristics of the Local rice producers and consumers, their sources of input and consumption level, while correlation matrix was used to show the relationship that existed between the study variables.

Description of variables

Socio-economic characteristics

These villages include age, sex, marital status, and household size, level of education, occupation and income. Questions that elicited the information from the respondents were asked and the responses were coded as:

Age: Less than 25 years, 26-35 years, 36-45 years, 46-55 years and greater than 55 years

Sex: male or female

Marital status; whether single, married, divorced, or widowed

Religion; whether Christianity, Islam or others

Level of Education: Categorized as "No formal education", "Non-formal education", "Primary school education", "Secondary school education" and "Tertiary education"

Attitude: Attitudinal statements were measured on a five-point Likert scale of "very much preferred", "much preferred", "just preferred" "Not preferred" and "very much not preferred". The five-point Likert scale was also as strongly. Agreed, "agreed", "undecided", "disagreed" and "strongly disagreed", values were assigned to each category as 5, 4, 3, 2 and 1 respectively but were reversed (1, 2, 3, 4 and 5) for negative statements. The mean score of response for each statement was obtained and classified as 0.1-1.14, 1.5-2.4, 2.5 - 3.4, 3.5 - 4.4 and > 4.4 and which were interpreted as "strongly disagreed", "disagreed", "undecided", "agreed" and "strongly agreed" respectively. Further interpretation of the classification was also made as "strongly disagreed" and "disagreed" were regarded as "unfavorable attitude", "undecided" as "indifference" while "agreed" and "strongly agreed" were regarded as "favorable attitude"

RESULTS AND DISCUSSION

Table 1 shows the result of the respondents' socio-economic characteristics. It was found that only 17% of the respondents were above 55 years of age while the rest were 55 years and below. It is therefore, inferred that the majority of the respondents ranged between being young and middle aged. These ages could predict what their tastes, likes or dislikes were over some matter, including consumption pattern such as for local rice.

The findings also indicate that both sexes were well represented in the surveys as the males were 58% while the females were 42%. Inferences from this study would therefore be gender friendly. Furthermore, while 22% were single, 70% were married. Consumption of local rice could therefore, be regarded as a family or household decision which would further validate the outcome of the

Table 1. Socio-economic characteristics of t respondents.

Variable	Frequency	Percentage
Age		
1-25	16	16.0
26-35	18	18.0
36-45	23	23.0
46-55	26	26.0
55-80	17	17.0
Total	100	100.0
Sex		
Male	58	58.0
Female	42	42.0
Total	100	100.0
Marital status		
Single	22	22.0
Married	70	70.0
Divorce	1	1.0
Widowed	7	7.0
Total	100	100.0
Religion		
Christianity	77	77.0
Islam	20	20.0
Other	3	3.0
Total	100	100.0
Level of education		
No formal education	13	13.0
Non-formal education	5	5.0
Primary school education	25	25.0
Secondary school education	24	24.0
Tertiary education	33	33.0
Total	100	100.0
Total family size		
1-5	30	30.0
6 – 10	62	62.0
Above 10	8	8.0
Total	100	100.0
Monthly income		
Below 5000	8	8.0
5,000-15,999	31	31.0
16,000-25,999	10	10.0
26,000-35,999	25	25.0
36,000.45,999	16	16.0
Above 46,000	10	10.0
Total	100	100.0

study. It was further found that, 87% of the respondents attained one level of education or the other. The high literacy rate, could be the fact that, the people in the

study area were found in the political region that had early exposure to education consequent of the efforts of their political leader, before and immediate after

Table 2. Rice consumption patterns of the respondents.

Variable	Frequency	Percentage
Consumes local rice		
Yes	93	93.0
No	7	7.0
Total	100	100.0
Frequency of local rice consumption		
Daily	11	11.0
Weekly	34	34.0
Fortnightly	24	24.0
Monthly	18	18.0
Occasional	6	6.0
Nil	7	7.0
Total	100	100.0
Consumes local rice more than imported rice		
Yes	26	26.0
No	74	74.0
Total	100	100.0
Consumers local rice because of its Relatively cheap price:		
Yes	42	42.0
No	46	46.0
Others	12	12.0
Total	100	100.0

independence and who had as a focus, compulsory and free education. It was therefore, expected that, the information obtained was of valid judgment as they were conscious of the bases of their responses. The finding, on level of education, might equally be the reason while the level of the respondent's income, with a mean of about N27,000 could be regarded as average. With this, they were expected to be able to afford their preferred food item.

Results, as shown in Table 2, revealed that 93% of the respondents actually consume local rice while 1% consumes local rice daily, 34, 24, 18 and 6% consume it weekly, fortnightly, monthly and occasionally respectively. These findings indicate that local rice is still important as staple food in the study area corroborating Odulari (2010) who reported that rice form a staple in the diet of the people. Despite the fact that, imported rice seems to be more appreciated among Nigerian populace, the findings showed that, 74% of the respondents consume more of the rice than the imported. The reason why more of local rice was being consumed than the imported was because of its relatively cheaper price (42%).

Local rice is being sold at a relatively cheaper price so as to encourage patronage and consumption by the producers. This might be in the wisdom of the producers

who might have believed that, the processing of local rice has more defects, in terms of dirt content, than the imported corroborating Daramola (2005), FAO (2004) and Bamidele et al. (2010) who observed that local rice is non competitive with the imported rice due to high cost of production and poor processing technique. It is therefore hypothesized that if farmers could adopt more efficient methods of processing, the price of local rice can compete favorably with the imported ones.

Table 3 shows the respondents' perception of local rice. It was found that, even at equal price for both the imported and local rice, 48% still preferred to consume local rice just as 73% agreed to be getting real value for the money expended on local rice. However, the respondents (100%) acknowledged the need for improvement in local rice production, possibly, the processing stage. Furthermore, the findings indicated that, respondents had access to local rice through self production (7%), market contact (80%), as a gift (6%), and cooperative societies (2%) and through other means that were unspecified (5%). This implies that majority of the people buy local rice for consumption. Market forces could therefore, be said to be the determinant of the rate of local rice consumption.

In addition, the results revealed that, as a reason for

Table 3. Respondent's perception of local rice consumption.

Variable	Percentage
At the same price which would you prefer?	
Local rice	48.0
Imported rice	52.0
Are you getting real value for your money?	
Yes	73.0
No	27.0
Would you like improvement in local rice production?	
Yes	100.0
Source of local rice	
Self producing	7.0
Market	80.0
At Gift	6.0
Cooperative	2.0
Others	5.0
Reason for local rice consumption	
More palatable	73.0
Cheaper	21.0
More available	1.0
Others	5.0
Percentage of income spent	
On Local Rice	
10 – 24%	82.0
25 – 40%	16.0
41 – 54%	1.0
Above 54%	1.0
Informal source	90.0
Formal source	10.0

local rice consumption, 73% of the respondents found it to be more palatable, 21% found it cheaper while 1% found it to be more available. Majority of the respondents (82%) was found to be spending between 24% of their income on local rice consumption while 16% spend between 25 and 40% of their income on it. This result could therefore, be said to have confirmed local rice consumption as a staple food in the study area confirming the postulation of Daramola (2005), that the Nigeria's per caput consumption is about 30 kg.

Table 4 shows the attitudes of respondents towards local rice. The findings showed that the mean score of the respondent' responses on their preference for either local or imported rice was 3.32, implying that, respondents were indifferent (undecided) on which of the two types they preferred. The outcome of the study also showed that 67% of the respondents agreed with the

statement that local rice production would soon become a thing of the past", while 36% disagreed. Since 39% was earlier found to have preferred local rice to imported rice, that percentage could not have been part of those (57%) who wished for local rice production terminated, rather, that percentage could likely have included the 22% that never preferred local rice and the 39% who were indifferent to preference for local rice consumption.

The wishing away of local rice production could also be attributed to the taste of the Nigerian populace who has preference for imported commodities generally, and which could be the reason why local rice production is getting dwindling. Giving support to this assertion, further finding showed that, 81% of the respondents supported the fact that, with Nigeria's resources, she should not have been importing rice. This implies that, the neglect of the support for local rice production by the various

Table 4. Attitudes of respondents towards local rice.

Variable	Frequency	Percentage	Means
To what extent do you prefer local rice to imported rice?			
Very much preferred	21	21.0	1.05
Much preferred	18	18.0	0.72
Undecided	39	39.0	1.17
Not preferred	16	16.0	0.32
Very much un-preferred	6	6.0	0.6
Local rice production would become a thing of the past			
Strongly agreed	34	34.0	1.70
Agreed	23	23.0	0.92
Undecided	7	7.0	0.21
Disagreed	23	23.0	0.46
Strongly disagreed	13	13.0	0.31
With our resources should we import rice?			
Very much supported	57	57.0	2.85
Much supported	24	24.0	0.96
Undecided	11	11.0	0.33
Not Supported	6	6.0	0.12
Very much unsupported	2	2.0	0.02
Total	100	100	4.28

government administrations was likely responsible for the decline in rice production rather than because the people much more prefer the imported rice.

Conclusion

With the abundance of resources; manpower, ecological and other natural resources at the disposal of Nigeria as a nation, it is ironic for her to be largely dependent on importation of rice, to the extent of expending a large proportion of her GDP on it. Nigeria too grows rice, which is normally referred to as local rice. However, some people have greater taste for the imported while some for the local rice. The study has shown that a large percentage of the people consumes local rice, their attitude, however, shows that they were indifferent in their preference of local rice to imported rice. The people also showed unfavorable attitudes towards rice importation at the expense of the locally produced one, given the favorable natural resources at the nation's disposal. Those who consume local rice purchase it from the markets. Some consumers also believed that local rice tastes and cooks better than the imported rice but wished for improvement in the processing techniques. The wish might not be unconnected with the unattractiveness of the local rice in comparison with the imported as a result of foreign objects usually found in it. It is therefore

recommended that more effective processing techniques should be adopted to get rid of the foreign contents in local rice to bring it as part with the imported one. In addition, with a large proportion developing good taste for local rice consumption market exists for it, therefore, increase in production should be encouraged by the various levels of government administrations and private investors should also be encouraged.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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