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# Measuring Egyptian Farmers' Attitude towards Staying Organic

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**Abstract:** Organic agriculture (OA) in Egypt is well-developed and still fast growing. Improving the relation between organic farmers and the other agents in the chain can provide a positive contribution to the whole organic chain competitiveness. One possible approach to investigate the farmers' perceived role and satisfaction within the organic system is to explore the factors influencing their decision to stay organic. In particular, the aim of the present study was to measure the farmers' attitude towards staying organic. Organic agricultural experts and institutional stakeholders were interviewed to complete a literature review and to obtain information about the Egyptian context. The survey questionnaire was pre-tested (n = 13) and then administered to a different sample (n = 232). A split-half validation procedure was used to evaluate and then confirm the factor structure. Explorative and confirmatory factor analysis yielded a final 29-item measure consisting of 8 distinct factors showing how organic agriculture influences a broad range of farmers' life dimensions (environmental, economic, social, psychological). The significant role played by psychological and social factors in defining the farmers' decision to stay organic emerged as a relatively unexpected outcome. The study supports the sustainable development of small family farmers, providing a useful tool to support the growth of organic production and consumption, mostly in developing countries. By monitoring farmers' attitudes and perception towards OA, the instrument proposed in the present study can support policy makers, farmers' organizations, civil society organizations (NGOs) and organic chains focal companies when defining policies, advocating campaigns, and chain coordination strategies for farmers involved in the organic food system development.

**Keywords:** organic agriculture; factor analysis; organic attitudes; Egypt



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## 1. Introduction

Organic agriculture (OA) in Egypt is well-developed and still fast growing. According to the FiBL–IFOAM latest report [1] in 2016, about 116,000 hectares of land were under organic management, accounting for 3% of the country's total agricultural land. The growth of interest in OA in the European and USA markets is at the centre of the success of organic production in Egypt, where corporate, export-oriented models of development are currently adopted.

Although OA is showing considerable success in Egypt, few studies consider the attitude of farmers towards staying organic [2]. Existing academic literature focuses either on the farmer's reasons for the adoption of, or reversion from, organic farming. These two approaches do not provide an effective monitoring of the causes affecting the capacity of the organic sector to be a satisfactory long-term solution for farmers. By analysing the reasons for adopting an OA model only the expected consequences of the farmers' choice are considered; what happens once they entered the sector is not considered. The information provided is therefore not enough to monitor the farmers' satisfaction once they are actually in the organic system. On the other hand, an analysis of the reasons for leaving the organic sector is more likely to focus on the negative aspect affecting the

farmers' participation in the organic system; some interesting factors affecting a positive perception of belonging to the organic system can consequently be under-represented.

By extending the scope of the analysis to the farmers' attitude towards organic agriculture, a better understanding of the factors influencing the farmers' intention to stay organic can be provided. Farmers' perceived role, satisfaction, and expectations within the Egyptian organic chain improve collaboration between other agents in the chain which, in turn, can provide a positive contribution to the whole organic chain competitiveness [2–4].

Moreover, a more effective knowledge base for public and private policies for the organic sector development can be provided. This can positively affect the economic, social, and environmental sustainability of food production for the small family farmers in developing countries. Small farmers represent 90% of the world's 570 million farms [5], mostly found in the rural areas of the developing world; their evolution is closely related to economic growth of their countries and provide more than 70% of the food calories to people living in Asia and sub-Saharan Africa [6]. The small-scale family farming in Egypt shows very similar characteristics, providing a growing contribution to the production of cereals, legumes, oilseeds, and fibres (from 34% in 1990 to 47% in 2010) and to the livestock production (from 53% in 1990 to 61% in 2010) (FAOSTAT).

The main research interest of the present work is to measure farmers' attitude towards staying organic. The methodological steps used in the present study follow the generally accepted principles of instrument design [7,8] which involve three main stages: (1) item generation, (2) scale development, (3) scale evaluation.

## 2. Literature Review

The literature review was performed in Scopus and WOS database, using Google and Google Scholar for an iterative research process, searching for keywords such as farmer's decision, organic farmers, organic farming, organic agriculture, conversion, adoption, reasons, attitudes in the title, keywords, or abstract of the document. Moreover, major online journal reviews, existing papers, journals collected in our institution's libraries, and suggestions from other colleagues were considered. The search resulted in the collection of both academic and non-academic literature (associations and companies' reports, policy documents, etc.).

According to several authors [9–11], the first step for generating better items for a measurement instrument involves a literature review, in order to identify and specify the domain of the construct to measure. A construct is anything which cannot be measured directly; therefore, a pool of items is generated using both existing theory and research to provide "a sound conceptual foundation" [12]. Given the lack of literature investigating factors measuring the attitude of farmers towards "staying" organic, the literature review focuses on studies related to the factors influencing the adoption of OA in developing countries (such as Nepal, Iran, Bangladesh, and Zimbabwe) [13–15] representing the most similar regional contexts to Egypt where such studies have been carried out. Several studies categorized variables affecting "adoption" according to four areas of investigation: (i) household and farmers' characteristics; (ii) farm structure and production factors; (iii) business and economic factors; (iv) farmers' attitude towards OA. Moreover, the present study also reviewed the factors affecting the reversion to OA, which are categorized in four categories: (i) economic aspects; (ii) certification and standards difficulties; (iii) organic production techniques; (iv) farmers' macro environment.

### *2.1. Household Characteristics*

Some authors [14,16] have stated that the process of organic farming adoption is influenced by a wide range of factors, reviewing the evidence that the farmers' perceptions of organic farming advantages and their household's characteristics contribute to their willingness to adopt organic farming. According to several authors, [13,14,17–19] age, gender, education, household size, and farming experience are the most common socio-

demographic characteristics influencing a farmer's decision to adopt OA. Moreover, factors such as marital status, training and ethnicity have been investigated.

Earlier studies showed contradictory results on some socio-demographic characteristics such as the farmers' age and its effect on the adoption of organic farming [13,17], which indicated that older farmers tend to be adopters, owing to the reason that young people are attracted to jobs in large cities, while [18,19] agreed that young producers are more likely to adopt organics. In [14,20], the middle-aged farmers were the most likely to enter OA, since during this stage of life farmers are economically empowered and able to cover all the required costs.

Gender is hypothesized to be related to the adoption decision; in Zimbabwe, women are more involved in OA and are more likely to adopt the system than men [15]. This is due to their active participation in the agricultural activities of production, processing and marketing [20], while [17] noted that gender has a neutral effect on farmers' decisions to adopt OA in South Africa.

Education contributes to both positive and negative effects in organic farming adoption. The authors of [19] suggested that more years of education resulted in higher adoption rate. Since educated farmers are more able to select appropriate materials and techniques than the less educated or illiterate farmers, they can also ensure the exploitation of the advantages related to the organic methods [15]. In Egypt, [21] found that highly educated farm managers were aware of the perceived benefits of OA and were able to conduct it, thus the educational status of the farm manager is positively related to organic adoption rate. On the other hand, [22] found that education is negatively related to farmers' adoption decision. This was considered a good result especially in developing countries, where farmers are less educated or even illiterate, and are likely to adopt organic farming similar to those who are educated. However, organic farmers with a low level of education might face problems such as recording farming data needed for certification and inspection and having difficulty in accessing written information, such as agricultural magazines and written instructions on biological control products [13].

As a matter of fact, OA is a labour-intensive farming activity. Marital status and household size are hypothesized to have a direct effect on adoption decision. The author of [20] postulated that the majority of organic farmers were married and had large families. This finding was supported by [23], who emphasized the importance of family labour as a determining factor for organics adoption.

Most of the studies agreed that farming experience has a negative influence on the adoption of OA and those with less farming experience are more likely to adopt organic farming [22]. The author of [24] noted that certified organic producers are new members in the agriculture sector; this can be related to the fact that, as they gain more experience, the farmers also become more resistant to change, as they are more interested in more traditional and familiar practices [20].

Training is also considered a variable positively influencing the adoption of organic farming. The more trained a farmer is, the more successful and more likely he or she is to adopt organics than the less or non-trained farmer [15,25,26]. Trained farmers access updated information about farming techniques and production methods more easily. Training also positively affects the farmers' decision to convert to organic, since they can better perceive the benefits of OA [27,28].

Ethnicity is proposed to have a positive effect on farmers' adoption decision. This can be attributed to the sense of unity shared among members belonging to an ethnic group, which grows stronger when they are a minority [13]. Ethnic group members tend to cooperate through farmers' associations, for instance, by having group certification and a common market; such aspects increase the likelihood of organic farming adoption.

### *2.2. Farm Structure*

According to the literature on farm structure, farm size has been considered to have both positive and negative relations with the adoption of organic farming. In Egypt, (Fay-

oum governorate) the farm size was negatively correlated to the adoption of organics [21]. This was due to the high input costs of the organic production, making it easier for small sized investments in OA, which do not require high initial investments due to the difficulty in accessing credit. On the contrary, [13] revealed that farmers with large a farm-size were able to pay for such risky technology, while [22] suggested that an orchard of any size could be converted too, and adopt organic farming.

Land tenure status is considered to be positively related to the farmers' decision to convert to organic farming [23]. The reason for this is because the farmers who do not own the land (tenants), especially in developing countries, are less motivated to invest in innovative practices [29]. In Nepal, [28] found that around 75% of organic farmers own and directly cultivate their land.

Livestock integration into farming systems is one of the organic farming principles. A large proportion of organic farmers hold livestock in their farming system [28], since animal integration into an organic production system is considered as an alternative source of income [23]. In addition, organic farmers can benefit from the use of animal manure in their farms as an amendment for soil fertility [15].

### 2.3. Economic Factors

Farm management and other economic factors influence the adoption of organic farming. Different studies have found that extension agents and farmers' cooperative membership were positively related to the farmer's decision to adopt organic farming. Joining cooperatives can solve the farmers' problems in terms of group certification and group marketing [13]. Moreover, farmers can collectively sell their products to either a factory or an export company as a whole. In Nigeria, it was found that extension visits encourage the adoption rate by transferring information and correcting farmers' misunderstanding through face-to-face communication [20]. The fact that the adoption of organic farming is an information-intensive process [14] implies the importance of the role played by extension agents in the organic farming adoption process, particularly regarding the transformation of knowledge. Hence, farmers who have participated in extension programs are more likely to adopt organic system.

Some authors [14,25,30–34] found that farmers' access to credit represents an important variable and has a positive effect on organic farming adoption. This is in contrast with [13], who found out that farmers' access to credit does not have a significant effect on organic farming adoption decisions, while farmers who have difficulties in accessing credit are more likely to adopt the system. Other authors also found that financial institutions consider that providing credit to small farmers is too risky, as this affects their capacity to obtain resources to be invested in OA adoption [18].

In developed countries, grants proved to be a relevant factor affecting the decision of farmers to stay organic [26,35]. Usually, organic farmers tend to live in isolated locations [18] and, since organic farming reduces the need to transport fertilizers and pesticides, farmers who prefer to live in marginal and remote areas are more likely to adopt organic farming.

Farmers' income is positively influencing the adoption of organic farming. High-income farmers are more able to adopt new technologies, paying for the initial certification fees and covering the higher input cost [17,25,26,36]. Farming is the main occupation for organic farmers, but additional sources of income coming from off-farm activities supporting the adoption of this production model [22,30,37,38].

### 2.4. Farmers' Attitudes, Opinions and Perceptions

Farmers' attitudes, opinions and perceptions are crucial factors determining their intention and actual behaviour towards the adoption of organic farming. The authors of [21] proposed that the expansion of the organic farming sector in Egypt was influenced by the farmers' positive perception towards organics, in particular towards the increased international demand for organic products. Moreover, farmers' risk attitude has a positive

influence on organic farming adoption in Egypt [21], while risk-averse farmers have a lower probability of adopting organic farming [17].

Environmental awareness: farmers perceive organic farming as a sustainable solution to environmental issues such as the increasing soil degradation caused by conventional farming technologies, in particular the intensive application of agro-chemicals and the use of heavy machineries [23,37,39–41]. The environmental attitudes and the social embedding of the farmers within OA played a decisive role in the farmers' choice to stay organic [36,38].

Economic concerns: is a decisive factor favouring the adoption of organic farming [26,31,40,42]. Farmers realised that OA is a highly profitable production system depending on internal farm inputs; meanwhile, the outputs are sold with premium prices [34,36,39,42]. In addition, the presence of subsidy support programs in some countries, such as in Nepal [13].

Health concerns: is one of the main factors encouraging the adoption of OA. Farmers considered organic farming as an alternative farming system able to overcome the health problems resulting from direct contact with agro-chemicals [31,36,37,42]. Furthermore, the farmers' awareness of the importance of healthy food consumption for their families and consumers in general was reported by [14]. The study suggested that farmers who are aware of the health benefits of OA are most likely to adopt the system.

Social and moral concerns: the compatibility of organic farming with the farmers' social and cultural context (values, traditional farming experiences, and present needs) is positively related to organic farming adoption [28,30,40,43–46]. The study [47] indicated that the presence of a successor is also a stabilizing factor for organic farming.

### *2.5. Factor Affecting the Reversion to Conventional Agriculture*

The factors of reversion to conventional agriculture are classified into four broad categories: (i) economic aspects; (ii) certification and standards difficulties; (iii) organic production techniques; (iv) farmers' macro environment.

Economic aspects: due to financial problems and/or unmet economic expectations, economic aspects can influence the farmers' decision to leave the OA [48]. This is often related to the limited capacity of farmers to compensate for a reduction in the financial support to the organic certification, which still constitutes a relevant aspect in developing countries' OA development policies. This especially affects small farmers; together with high labour costs, these represent important factors affecting the reversion to conventional agriculture. Furthermore, organic premium prices not matching the increased production cost, or even the difficulty to market the organic products, represent other factors influencing reversion to conventional agriculture.

Complex and ever-changing certification and standards procedures: represents the second important reason for reversion to conventional agriculture. Farmers have complained about issues such as: the increased bureaucratic system of complicated, inflexible procedures; the changing of regulations that put farmers' future income at risk, especially for long-term investments such as animal husbandry and complicated regulatory issues that are difficult to be achieved, together with very strict inspection and control [49]. Economic motives and certification difficulties are the most definitive factors for deregistering from the system [50].

Complex production techniques: is considered a less important reason for reversion from OA. Some farmers resigned from certification owing to some agronomic issues, as they thought that organic is similar to conventional agriculture but without using chemicals, or that it is about preserving nature to carry out its work [51]. Other farmers lack specialist knowledge about farming techniques, plant protection and pest management, resulting in low yields or unmarketable products. Furthermore, the difficulty to obtain 100% organic feed for animals and the necessity to build free stall barns has encouraged farmers to abandon OA.

Macro environment: the following aspects represent a barrier to organic production and marketing, especially for small farmers: spatial distance between producers and

processors; difficult access to market infrastructure; reduced demand of organic products; and difficulty to obtain premium prices when selling the products at the local markets [52].

Table 1 shows factors affecting the adoption of organic farming.

**Table 1.** Literature review. Factors affecting the adoption of organic farming.

| | |
|---|---|
| **Household and Personal Characteristics** | |
| Age | [13,14,17–20,43] |
| Gender | [15,17,20,43] |
| Education | [13,15,19,21,22,43] |
| Household size | [23] |
| Farming experience | [20,22,24] |
| Marital status | [20] |
| Training | [15,27,28] |
| Ethnicity | [13] |
| **Farm Structure and Production Factors** | |
| Farm size | [13,21,22] |
| Land tenure | [23,28,29] |
| Livestock integration | [15,23,28] |
| **Economic Factors** | |
| Cooperative memberships | [13,14,20] |
| Risk Attitude | [17,21] |
| Access to Credit | [13,14,18,31,32,34,44] |
| Farmers' income | [17,22,36,37,44] |
| Grants | [24] |
| **Farmer's Attitude, Opinions and Perceptions** | |
| Environmental awareness | [23,36,37,39,40,42,47] |
| Economic concerns | [13,31,34,36,39,40,42,43] |
| Health concerns | [14,36,37,42] |
| Social and Moral concerns | [28,40,43–45] |
| **Factors Affecting Reversion to Conventional Agriculture** | |
| Economic aspects | [48] |
| Certification and standards difficulties | [49] |
| Production techniques | [51] |
| Macro environment | [52] |

## 3. Materials and Methods

The aim of the present study was to measure farmers' attitudes towards staying organically certified. The methodological steps used in the present study followed the generally accepted principles of instrument design [7,8], which involve three main stages: (1) Item generation, (2) Scale development, (3) Scale evaluation.

### *3.1. Item Generation*

The primary purpose of item generation is content validity [53]. The author of [8] suggested using both academic and practical perspectives in order to minimize questionnaire revisions. According to [11], the domain of various statement items has been identified and selected from previous studies on factors affecting the reversion and adoption of OA; the

generated items were then shown to experts to evaluate their content validity. Therefore, in order to ensure that the items fitted and were able to reflect the given context, not all the analysed variables were included in the final questionnaire.

Qualitative information was collected in order to obtain basic information about the Egyptian context. Such data were used to complete the literature review and for the elaboration of the survey questionnaire. These qualitative data were collected on August 2014 in order to describe the history of OA, the current situation of organics in Egypt, some socio-demographic profiles of organic farmers in the study area, and the available statistics on organics. To obtain the needed data, organic agricultural experts and institutional stakeholders were interviewed, in particular certification bodies (COAE-Centre for Organic Agriculture in Egypt and ECOA-Egyptian Centre of Organic Agriculture), the Central Laboratory for Organic Agriculture, and the Agriculture Directorate Information Office in Fayoum Governorate.

A semi-structured interview was performed according to the following issues: (i) the reasons that drove farmers to convert to OA; (ii) the role played by the associations in influencing farmers to convert to OA; (iii) the support and the services offered by international projects to each of the associations; (iv) the contribution of professors from Research Institutes and Faculties of Agriculture as governmental institutions, and the Sekem Company as a private institution in the diffusion of organics in the Governorate; (v) the selling companies dealing with each association, in addition to some contractual arrangement between the farmers and such selling companies; (vi) the problems facing some farmers that led to reversion or may lead to a reversion to conventional agriculture; (vii) the rules governing the relations between the buyer and the small farmer, and how the annual cultivation plan is organized.

Finally, with the aim of checking the items' content validity, ensuring their clarity and appropriateness, a pre-test was performed with 13 farmers from a neighbouring village to the study area; they were asked to critically analyse each item requiring suggestions and comments on ambiguity and improvements in wording. Minor modifications agreed among the collected feedback were applied to the questionnaire.

The resulting structured questionnaire, translated into the Arabic language, was distributed over three sections. The first section explored farmers' socio-demographical profiles: farmers' gender, age, marital status, number of household members, educational status, primary occupation, and secondary occupation and farm characteristics (Appendix A). The second section investigated farm characteristics through closed questions (Appendix B); the third section investigated the farmers' attitude towards staying with organically certified producers, who were then asked to respond to 29 statements in accordance with the five-point Likert scale, varying from not important (1) to very important (5) (Appendix C).

### *3.2. Scale Development*

The scale development stage consisted of three steps: (i) design of the development study, (ii) scale construction, and (iii) reliability assessment [53].

The development study design mainly referred both to a suitable population from which the sample is drawn and to all considerations related to the questionnaire composition (length of the questionnaire, number of points on the Likert scale, placement of scale items, use of reverse-scored items). According to these recommendations, a comprehensive questionnaire was administrated to organic farmers of Sakran village in an interval time of one month: February 2015. The implementation of the questionnaire was undertaken after coordination with the representative of each farmers' association, in order to reach the associations' member farmers according to the sampling procedures. Sakran village, Fayoum governorate, was chosen to be the research study area since farmers had a long experience, with more than 25 years in the organic farming sector and the presence of a number of local farmers' associations and several buyers, represented by exporting companies such as Long Life, Organic Valley, Safe Herbs, Pure Life and Sekem. The sample included all the

organic farmers belonging to Egyptian organic associations operating in the research area: Future Youth Association (FYA), Sakran Society for Community Development (SSCDA), The Egyptian Bio-dynamic Association (EBDA), Small Farmers' Association (SFA), Farmers Development Association (FDA), and Fayoum Agro-Organic Development Association (FAODA). This strategy significantly contributed to the high response rate obtained (see Table 2). The only exception relates to EBDA, the largest association, where 108 members had been randomly selected out of 320. In total, 232 out of 455 (51%) households were interviewed. Organic producers are certified according to the IFOAM standard [54], while the biodynamic farmers are certified according to the International Demeter and EU standards for organic production. The biodynamic farmers working for Sekem are certified by the Centre of Organic Agriculture in Egypt (COAE) as an independent inspection and certification body [55].

**Table 2.** Survey sample according to the local farmers' associations.

| Association Name | No. of Members of Sakran Village | No. of Respondents | (Share %) |
|---|---|---|---|
| FYA | 32 | 32 | (100%) |
| SSCDA | 83 | 76 | (92%) |
| EBDA | 320 | 108 | (34%) |
| SFA | 20 | 16 | (80%) |
| Total sample size | 455 | 232 | (51%) |

FDA and FAODA associations have, for each one, 1 organic member in Sakran, who is also a member, respectively, in EBDA and SFA associations.

Scale construction refers to its stability. Considering the exploratory nature of the present study, an exploratory factor analysis (EFA) was performed in order to define the possible underlying factor structure of a set of observed variables without imposing a preconceived structure on the outcome. EFA aims to reduce measurable and observable items to fewer latent variables that share a common variance and are unobservable, which is known as reducing dimensionality [56]. Items that are grouped together are presumed to be measuring the same underlying constructs [47].

Reliability assessment was measured by Cronbach's alpha, assessing the internal consistency of each item compared to other scale items.

### *3.3. Scale Evaluation*

Scale evaluation addresses the validity of the scale [53]. Validation of a measurement scale refers to the extent to which it measures what is intended to be measured [57]. Three types of validity were considered: (i) content validity, (ii) construct validity, (iii) convergent and discriminant validity.

Content validity depends on the extent to which the items' scale cover all aspects of the variable being measured [58]. The multi-stage process described above and employed (literature review, expert opinion, pre-test sample review) led to a refinement of the items used, indicating that the content of factor's affecting the decision to stay organic was well represented by the scale employed.

Construct validity is concerned with the extent to which the theoretical essence of the measure is captured [57]. In the present study, construct validity was evaluated, performing an exploratory factor analysis (EFA) supported by the KMO measure of sampling adequacy and with the Bartlett test of sphericity, which was used as a measure of the necessity to perform a factor analysis [59]. Convergent and discriminant validity are shown, respectively, when: (i) different measures of the same construct have high correlations; (ii) scale measuring different constructs have low correlations (Hensley, 1999). In the present study, confirmatory factor analysis (through structural equation modeling approach) was used to measure both types of validity [8,11,60].

### *3.4. Data Analytic Method*

Data analyses were conducted using SPSS 17.0 (IBM Corp., New York, NY, U.S.) and AMOS 7.0 (IBM Corp., New York, NY, U.S.) software. A split-half validation procedure [61,62] was used to evaluate and confirm the factors defining a farmer's decision to stay organic [58]. A random half of the interviewed farmers were used for the exploratory factor analysis (EFA), with the remaining half reserved for confirmatory factor analysis (CFA) procedures. Differences in demographic variables were examined to ensure that there was no significant difference between the two groups regarding the distribution of farmer's gender, age, occupation, marital and educational status (Appendix A). EFA was performed for the first group to identify the motivations driving farmers' attitudes towards staying organically certified. This was followed by CFA on the second group to verify the factor structure derived from EFA.

## 4. Findings

### *4.1. Sample Descriptive Statistics*

Appendix A shows that the majority of respondents were males (82.7%) and 71.5% aged between 24 and 54 years. Most of the respondents (91.4%) were married, while 5% of the farmers were single. The household size was generally large: Exactly 72.9% of the farmers' families ranged from 5 to 9 members, while 21.9% ranged from 1 to 4 members, and only 5.1% had 10 to 13 members in their household. The majority of the respondents (70.2%) received formal education, of which 47.0% had intermediate qualifications while 19.0% had a university degree. Farming was the primary occupation of the majority of the respondents (80.2%), while 15.5% were civil servants, working part-time on their inherited farm. More than half of the respondents (58.6%) worked exclusively in agriculture, 19.4% were farmers, 10.3% non-farm self-employed, and 7.8% were wage workers in agriculture.

### *4.2. Farm Structure*

Appendix B shows that 66.3% of the farmers had more than 20 years of farming experience. More than half of the respondents (58.6%,) had 10–20 years of organic farming experience, while 3.4% had more than 20 years of experience. The long-standing experience in organic farming had originally been a significant exploratory variable in the selection of Sakran as the study area of the research. The analysis revealed that 40.9% of the farmers were given the chance to attend from 5 to 10 training programs (field schools, field visits, and lectures) provided by the farmers' associations. All the surveyed farmers (100%) belonged to a farmers' association. Their farm size was generally small: 67% of farms ranged from 0.5 to 2 hectares. The share of land dedicated to organic production ranged from 70% to 100% of the total farm area. The largest share of farmers (97%) wholly or partly owned their land. Farming activities provided the main source of income to most of the farmers (84%). For 69.3% respondents, it represented from 70% to 100% of the total household income. A significant share (46.1%) of the farmers had no additional sources of income. About 83.3% of the farmers wholly or partly relied on family labour to conduct farming activities, and 87% were adopting two rotations cropping system.

About 18% of the farmers were suffering from health problems caused by agro-chemicals, 69% of which were hospitalized as a result of these problems.

All farmers (100%) had access to organic inputs and information either from their associations or the buying companies. Organic farmers considered the associations/buyers as their main sources for access to suitable farming conditions. All organic farmers in Sakran were certified as organic producers from the two national certification bodies, 48.7% and 51.3% of the farmers were certified from COAE and ECOA, respectfully. Almost all the farmers (97.9%) reported that they understood how the buyers establish the prices paid; moreover, 94.8% of the respondents knew that they are certified as fair-trade producers and understood what fair trade certification is.

*4.3. Exploratory Factor Analysis (EFA)*

For the first half of the sample (n = 116), the Kaiser-Meyer-Olkin (KMO) index of sampling adequacy was good (0.70) and the Barlett's test of sphericity was highly significant at 0.001 level. Principal components factor analysis with a Varimax rotation extracted 8 factors from 29 attitudinal statements (Appendix C). Table 3 shows that the two items: *organic farming is good to reduce health risks derived from the use of agro-chemicals* and *if I produce organic, I receive a better price for my products,* had the highest means. This indicates that both statements were ranked highly by famers, according to the 5-point Likert scale. Both the statements dealing with the environmental benefits of OA and those associated to human health concerns were loaded under the factor named "Environmental and human health protection", which includes six items. Four statements refer to the environmental aspect: *OA makes me feel I'm taking care of the environment, OA is good for the environment, to stop land and water pollution, to increase soil fertility.* The two other items concern human health protection: *OA is good to produce healthy products* and *to reduce health risk derived from the use of agrochemicals*. About 15.6% of the total variance is explained by this factor.

The factor "Associations'/buyers' services" comprises five items which relate to the support generally provided to farmers by their association or buyers present in the study area: training, technical advice, organic inputs, market and price information. Although 40.9% of the respondent farmers received from 5 to 10 training programs, they reported, during the interview, that they need more training. Technical advice about cultivation techniques and all information concerning market and prices are also included in the training programs. About 9.9% of the total variance is explained by this factor.

On one hand, the factor "Export market" comprises farmers' view on the profitability of exporting organic market, which, from the farmers' perception, is closely connected not only to high selling prices, but also to trustworthy relations with buyers. About 9.2% of the total variance is explained by this factor.

On the other hand, the factor "Domestic market" reflects the farmers' perceived profitability of the internal organic market, whose prices cover all the production costs. It integrates two items: access to profitable domestic market and save on production cost, the latter representing farmers' priority, especially when they cannot access export markets and are obliged for various reasons to sell their organic products in domestic ones. About 4.9% of the total variance is explained by this factor.

The factor "Independency" aggregates four statements: *Being organic makes me feel independent from conventional agriculture system, I'm able to meet my buyer's requirements, I can diversify market opportunities, if I produce organic, I have a less risky business.* The foregoing statements point out that farmers want to be independent from conventional farming systems as far as farming techniques, marketing of their products, and the governmental restrictions on conventional agriculture are concerned. About 6.9% of the total variance was explained by this factor.

The three items regarding farmers' access to sufficient resources, enough knowledge and skills, and suitable farm conditions to practice OA were loaded under the factor named "Knowledge Resources and farming Conditions" (KRC). This dimension reflects the farmers' needs to access resources and knowledge, enabling them to successfully manage their organic agricultural practices; 7.3% of the total variance is explained by this factor.

The factor "People around" includes items concerning the role of trusted neighbourly advice in converting and/or staying organic. This factor demonstrates the linkage between the effect of the surrounding community and the farmers' decision to convert to and adopt organic farming. About 6.5% of the total variance was explained by this factor.

**Table 3.** Factor analysis of the farmers' attitudes describing why farmers stay in the organic system.

| | Factors | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Environ. & Human Health Protection** | **Association/Buyers' Services** | **Export Market** | **Independence** | **KRC (*)** | **People Around** | **Need to Be Different** | **Domestic Market** | **Com.ties** | **Reliability** |
| 1.18_ATT_Stat | 0.924 | | | | | | | | 0.883 | 0.899 |
| 1.21_ATT_Stat | 0.921 | | | | | | | | 0.890 | |
| 1.20_ATT_Stat | 0.860 | | | | | | | | 0.788 | |
| 1.17_ATT_Stat | 0.716 | | | | | | | | 0.729 | |
| 1.2_ATT_Stat | 0.715 | | | | | | | | 0.670 | |
| 1.19_ATT_Stat | 0.657 | | | | | | | | 0.524 | |
| 1.15_ATT_Stat | | 0.903 | | | | | | | 0.889 | 0.815 |
| 1.13_ATT_Stat | | 0.887 | | | | | | | 0.874 | |
| 1.24_ATT_Stat | | 0.744 | | | | | | | 0.669 | |
| 1.16_ATT_Stat | | 0.563 | | | | | | | 0.615 | |
| 1.14_ATT_Stat | | 0.515 | | | | | | | 0.547 | |
| 1.25_ATT_Stat | | | 0.773 | | | | | | 0.710 | 0.743 |
| 1.8_ATT_Stat | | | 0.754 | | | | | | 0.748 | |
| 1.6_ATT_Stat | | | 0.711 | | | | | | 0.647 | |
| 1.3_ATT_Stat | | | | 0.744 | | | | | 0.569 | 0.701 |
| 1.10_ATT_Stat | | | | 0.720 | | | | | 0.590 | |
| 1.11_ATT_Stat | | | | 0.628 | | | | | 0.639 | |
| 1.5_ATT_Stat | | | | 0.603 | | | | | 0.612 | |
| 1.28_ATT_Stat | | | | | 0.856 | | | | 0.770 | 0.644 |
| 1.29_ATT_Stat | | | | | 0.769 | | | | 0.668 | |
| 1.27_ATT_Stat | | | | | 0.665 | | | | 0.652 | |
| 1.1_ATT_Stat | | | | | | 0.877 | | | 0.888 | 0.748 |
| 1.23_ATT_Stat | | | | | | 0.847 | | | 0.839 | |
| 1.22_ATT_Stat | | | | | | 0.256 | | | 0.705 | |

**Table 3.** *Cont.*

| | Factors | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Environ. & Human Health Protection** | **Association/Buyers' Services** | **Export Market** | **Independence** | **KRC (*)** | **People Around** | **Need to Be Different** | **Domestic Market** | **Com.ties** | **Reliability** |
| 1.26_ATT_Stat | | | | | | | 0.534 | | 0.672 | 0.476 |
| 1.12_ATT_Stat | | | | | | | 0.511 | | 0.520 | |
| 1.4_ATT_Stat | | | | | | | 0.403 | | 0.581 | |
| 1.7_ATT_Stat | | | | | | | | 0.805 | 0.746 | 0.237 |
| 1.9_ATT_Stat | | | | | | | | 0.341 | 0.286 | |
| % of variance | 15.635 | 10.706 | 9.239 | 8.749 | 7.326 | 6.555 | 5.586 | 4.885 | | |
| Cumulative % of variance | 15.635 | 26.340 | 35.580 | 44.329 | 51.655 | 58.209 | 63.795 | 68.680 | | |

(*) Knowledge Resources and farming Conditions.

The three items included under the factor "Need to be different" are: *being in the organic system I can meet new people and develop new relations, farmer's desire to be different from other farmers, and use of farm resources in a more rational way.* This factor refers to the farmers' desire to be different conventional farmers, and their determination to broaden their relations' network. Referring to the descriptive statistical results, most of the farmers (81%) are willing to introduce new investments to their farming activities, which can be fulfilled through widening the scope of their relations. About 5.6% of the total variance was explained by this factor.

### *4.4. Confirmatory Factor Analysis (CFA)*

In order to assess the convergent and discriminant validity of the emerging factors with the second half of the sample (n = 116), confirmatory factor analysis was performed through a structural equation modeling (SEM) approach. Several items are significant at the level of 0.001 (Appendix D), with the exception of the items 1.7, 1.3, 1.4. Overall, the model has good fit indexes: CMIN/DF = 1.795, df = 349, $p < 0.001$; NFI = 0.727; CFI = 0.882; RMSEA = 0.073 (Appendix E).

## 5. Discussion

The socio-demographic characteristics of the sample and the farm structure analysis confirmed the global trend, indicating that organic farmers are generally more educated, younger, and possess relatively sophisticated technical skills; they operate within small family farms, are specialized in organic production, are strongly dependent on the farm income, and are less dependent on the services provided by the farmers' association, since the buyers also play a relevant role in granting technical assistance.

The factor analysis showed better economic results and a positive environmental impact of their activity as drivers, significantly affecting the farmers' willingness to stay organic. An interesting result showed the farmers' perceived improvement in their social status and fulfilling their psychological needs as significant factors influencing their commitment to OA.

The role and relevance of some of the identified factors confirmed the findings reported in the literature. The identification and interpretation of other, more context-specific factors can provide interesting insights supporting the development of the Egyptian organic sector. In detail, the factors' role in influencing the organic farmers' willingness to stay organic can be described as follows.

Environment and human health protection are the first extracted factor with the highest level of variance explained. Farmers expressed their excitement in contributing to protect the environment and receiving advantages from the positive impacts OA has on the environment. This result confirmed the findings of [23] in Thailand and [14] in Bangladesh, where farmers' positive perception towards the ability of organic farming to reduce the environment pollution was a significant factor that influenced farmers' decision to adopt organic farming. It was also found in a study in Zimbabwe by [15] that organic farming had the potential to reduce water pollution, thus a reduction of water pollution is one of farmers' reasons to stay organic. Soil fertility was also of great concern for the farmers. These results, based on the farmers' perceptions, are in line with the results obtained by [18] and [13] in Nigeria and Nepal, showing that organic farming practices increased soil organic matter content and improved soil structure without harming the environment. One of the organic farmers' targets is the production of safe and highly nutritional quality food in sufficient quantities without harming their environment. During the interview, farmers expressed their willingness to produce food with reduced toxic load and exposure to agro-chemical contamination. Their concern on health-related aspects is possibly influenced by the designation of part of their organically produced commodities to their own families' consumption and to previous health problems affecting the farmers, caused by the use of synthetic inputs. According to the descriptive statistics' results, about 18% of the surveyed farmers were suffering from health problems from their contact with

agro-chemicals, 69% of which went to hospitals. Farmers were also concerned about their families' health, as most of farmers are carrying out their agricultural activities with the help of their family members. The results from the questionnaire showed that a considerable proportion (83.3%) of the farmers wholly or partly relied on family labour. In this regard, OA does not employ such toxic chemicals and thus eliminates this health hazard to farmers, their families, and their communities [14].

The foregoing factor has been named associations'/buyers services. The trainings provided by the associations/buyers are designed to give the farmers sufficient technical and economic skills to be able to operate their own farms. Since farmers who are members of organic farmers' associations are entitled to free training and certification fees, as well as group marketing of their organic production, it does not come as a surprise that 100% of the farmers were members in farmers' association. This study supports the findings of previous studies [14,15,20] in Nigeria, Bangladesh, and Zimbabwe, which showed that the extension services and trainings are significantly associated with the adoption of OA.

The factor export markets demand for organically produced food is growing fast and provides market incentives to farmers for a wide range of organically produced crops. The results show that higher yields combined with high premiums are the underlying causes for the higher relative profitability of organics' export market [63]. Relying on the organic export market is also common for countries such as Mexico, Nepal, and Vietnam [13,22,25] where exporting organic products positively affected farmers' decision to stay organic. In addition, the trust relationship between organic producers and buyers was a significant reason to stay in the system where farmers get export market access for their organic products.

Domestic market positively affects the farmers' decision to stay organic. Even if the organic domestic market in Egypt is not as profitable as the export market, it still is an important (but less significant) reason for farmers to remain organically certified. A possible explanation is that organic products for the internal market can still be more profitable than conventional agriculture and, at the same time, contribute to a sustainable farming system. In Egypt, the local marketing of organic products is growing and currently Egypt is recognized as one of the few relevant African organic domestic markets [1].

The factor Independence indicates a positive attitude towards staying organic. Egyptian farmers see OA as a reduction of the existing constraints related to the conventional agricultural system where, e.g., the selling prices of some conventional crops are fixed by the Ministry of Agriculture and Land Reclamation. Farmers practicing OA appear to be less obliged to cultivate specific crops, purchase off-farm inputs, or sell their production to specific suppliers. Descriptive statistics showed that the interviewed organic farmers adopted the traditional crop rotation, of which 87% adopted a two-crop rotation and 13% adopted a three-crop rotation. This factor is in line with the study performed by [23], where Thai farmers were motivated to stay in the OA system by the independence obtained from practicing organic farming. Moreover, it is in line with the results that emerged in a recent study where farmers expected organic farming to increase their autonomy [63].

The factor Knowledge Resources and farming Conditions (KRC) refers to the positive influence of the farmers' existing knowledge, skill and ability on their willingness to stay organic. This factor is in line with the study performed by [63], where organic farming was perceived as *"stimulating farmers learning, especially through a collective dynamic and an open exchange of experiences"*. Organic farmers in Sakran can be considered knowledgeable farmers for two main reasons: the first is that they have a longstanding experience in organic farming; more than half of the surveyed farmers (58.6%) reported that they have between 10 and 20 years of experience in OA. The second reason is that they have acquired scientifically based information from highly skilled actors from the buyers' and farmers' associations: agricultural engineers, extension services' personnel, and researchers (51.8% of interviewed farmers received their knowledge about organic farming through the associations, while 48.2% through their buyers). These actors play a relevant role transferring knowledge and related to sophisticated organic farming management techniques and physical inputs. One

of the consequences is that farmers do not use external inputs, since they are efficiently obtained by integrating animal husbandry to plant production; furthermore, most of the other required inputs are available through farmers' associations (51.2%) or buyers (47.8%).

The factor People Around indicates that the farmers' choice to stay organic is strongly influenced by trusted local social network agents like neighbouring farmers, confirming also the important supporting role of farmers' association and traders.

The factor Need to be different describes how farmers seek for better living conditions through adopting organic, rather than conventional, agriculture. Similar to the "Domestic market" factor, "Need to be different" positively influences the willingness of the farmers to stay in the system. This factor, in line with [63], refers to organic farming as an activity positively influencing their status by expanding their network relations, increasing their access to knowledge and investments, and tailoring the agronomic techniques to their farms' characteristics.

To further interpret the emerging results, going beyond statistical evidence, the eight factors extracted can be also arranged into three different categories, each slightly interrelated. The first one, Environmental and Human Health Protection, clearly refers to the positive externalities associated to the OA, improving the social and environmental conditions of the studied area; the second group includes the factors Export Market and Domestic Market, and refers to the capacity of organic farming to improve the farmers' competitiveness and, consequently, their access to the market through effective product differentiation. The third and larger group involves all the other factors, which are generally related to the changes in the technical and economic management of the farm due to OA, which influences farmers' self-fulfillment and self-actualization, both psychological needs as described by Maslow [64,65]: reliant on own experiences, judgement and autonomy, achievement, prestige, respect by others. It is interesting to notice that the status within the community is also related to the possibility to expand their network of acquaintances to obtain technical and economic advantages, thus reinforcing their competitiveness and access to market. This shows how the different factors are mutually reinforcing and an effective management of the organic system, provided by the different actors involved, which can generate a virtuous circle of development involving different dimensions other than the environmental and economic ones.

Overall, the results showed that farmers' attitudes toward staying organic are driven by their motivation and expectation that it would enhance their adaptive capacity, thus enabling them to better face, collectively, market turbulences and future changes in the broader context.

## 6. Conclusions

This study brings added value to the existing literature according to the joint presence of the following elements: (1) investigation of the Egyptian context, with a focus on the literature review related to the developing countries; (2) adoption of a methodological approach aiming to measure behavioral attitudes; (3) focus on organic farmers, interviewed on the field; (4) the relevance, among other factors, of psychological and behavioural attitudes.

In particular, the study measured the farmer's attitudes towards staying organically certified; the application to the Egyptian context confirmed some findings from the literature related to organic farmers in both developed and developing countries. The significant role played by psychological and social aspects in influencing the farmers' decision to stay organic emerged as a relatively unexpected outcome, particularly as far as the farmers' psychological needs are concerned. The explorative analysis showed how organic agriculture influences a broad range of farmers' life dimensions (environmental, economic, social, psychological).

The results obtained support the sustainable development of small, family farmers, providing a useful tool to increase the share of organic production and consumption mostly in developing countries. By monitoring farmers' attitudes and their perception towards OA, the instrument proposed in the present study can support policy makers, farmers'

organizations, civil society organizations (NGOs), and organic chains' focal companies when defining policies, advocacy campaigns, and chain coordination strategies for farmers involvement in the organic food system development. A more holistic approach to the OA policies is recommended to support the attitude of farmers to stay organic; this should involve supporting farmers' proactive participation in building a social as well as commercial and technical network within their communities, and between the different chain agents and stakeholders.

As far as the capacity of the proposed instrument to measure farmers' attitudes to stay organically certified, some issues have emerged in relation to the low values of Cronbach's alpha in some factors. This could be considered a measure of low reliability; however, Cronbach's alpha highly depends also on the number of items included in the measurement scale [66]. Given the exploratory nature of the study, emerging factors with a low number of items were expected, thereby negatively affecting the values of alpha.

Future researches should: (i) investigate the dynamics defined by the interactions between the different factors emerged; (ii) involve an evaluation of the measurement instrument in different contexts to validate the model in terms of quality and quantity of the factors emerged in the present study; (iii) further investigate the psychological dimension related to the farmers' attitude towards organic farming; (iv) use new and independent samples to conduct nomological analysis and testing of the reliability and validity of the different measures, in order to enhance their replication and generalizability [67,68] and, therefore, (v) further improve the fit of the CFA model to the data; (vi) increase the value of Cronbach's alpha by adding to the measurement scale more related items able to capture the same construct.

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## Appendix A

**Table A1.** Farmers' socio-demographic characteristics.

| Variable | Category | CFA Sample Frequency | EFA Sample Frequency | CFA Sample Percent | EFA Sample Percent |
|---|---|---|---|---|---|
| Gender | M | 98 | 94 | 84.5% | 81% |
| | F | 18 | 22 | 15.5% | 19% |
| Age | 0–14 | 0 | 0 | - | - |
| | 15–24 | 3 | 4 | 2.6% | 3.4% |
| | 25–54 | 85 | 81 | 73.3% | 69.8% |
| | 55–64 | 24 | 21 | 20.7% | 18.2% |
| | >64 | 4 | 10 | 3.4% | 8.6% |
| Marital status | Married | 105 | 107 | 90.5% | 92.3% |
| | Divorced | 1 | 0 | 0.9% | - |
| | Widowed | 5 | 2 | 4.3% | 1.7% |
| | Single | 5 | 7 | 4.3% | 6% |

**Table A1.** *Cont.*

| Variable | Category | CFA Sample Frequency | EFA Sample Frequency | CFA Sample Percent | EFA Sample Percent |
|---|---|---|---|---|---|
| Household size no. of members | 1–4 | 25 | 26 | 21.5% | 22.4% |
| | 5–9 | 85 | 84 | 73.3% | 72.4% |
| | 10–13 | 6 | 6 | 5.2% | 5.2% |
| Educational status | Illiterate | 33 | 30 | 28.4% | 25.6% |
| | Primary | 2 | 2 | 1.7% | 1.7% |
| | Preparatory | 8 | 4 | 6.9% | 3.4% |
| | Intermediate | 53 | 56 | 45.8% | 48.6% |
| | University and above | 20 | 24 | 17.2% | 20.7% |
| Primary Occupation | Farmer | 87 | 100 | 75% | 86.3% |
| | Governmental worker | 22 | 14 | 19% | 12% |
| | Public sector worker | 1 | 0 | 0.9% | - |
| | Non-farm self-employment | 4 | 2 | 3.4% | 1.7% |
| | Wage work in agriculture | 0 | 0 | - | - |
| | Wage work in another sector | 0 | 0 | - | - |
| | Other | 2 | 0 | 1.7% | - |
| Secondary occupation | Farmer | 29 | 16 | 25% | 13.8% |
| | Governmental worker | 0 | 0 | - | - |
| | Public sector worker | 0 | 0 | - | - |
| | Non-farm self-employment | 8 | 16 | 6.9% | 13.8% |
| | Wage work in agriculture | 14 | 4 | 12% | 3.4% |
| | Wage work in another sector | 0 | 0 | - | - |
| | None | 64 | 80 | 55.2% | 69% |
| | Other (pension) | 1 | 0 | 0.9% | - |

## Appendix B

**Table A2.** Farms' socio-demographic characteristics.

| Variable | Category | Frequency | Percentage | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Farming experience (yrs) | 0–<5 | 0 | 0% | 0 | 0 |
| | 5–<10 | 8 | 3.4% | 8 | 1.0 |
| | 10–20 | 70 | 30.1% | 16.3 | 3.6 |
| | >20 | 154 | 66.3% | 37.5 | 10.8 |
| Organic farming experience (yrs) | 0–<5 | 25 | 10.7% | 3.2 | 0.8 |
| | 5–<10 | 63 | 27.1% | 6.7 | 1.4 |
| | 10–20 | 136 | 58.6% | 14.1 | 3.2 |
| | >20 | 8 | 3.4% | 22.8 | 1.4 |

**Table A2.** *Cont.*

| Variable | Category | Frequency | Percentage | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Trainings (No.) | 0–<5 | 40 | 17.2% | 2.9 | 1.1 |
| | 5–<10 | 95 | 40.9% | 6.5 | 1.4 |
| | 10–0 | 85 | 36.6% | 13.0 | 3.1 |
| | >20 | 12 | 5.1% | 30.6 | 8.2 |
| Associations membership | FYA | 21 | 13.7% | - | - |
| | SSCDA | 76 | 32.7% | - | - |
| | FDA | 1 | 0.4% | - | - |
| | EBDA | 108 | 46.5% | - | - |
| | FOADA | 1 | 0.4% | - | - |
| | SFA | 16 | 6.8% | - | - |
| Sakran collective farm membership | N | 123 | 53.0% | - | - |
| | Y | 109 | 46.9% | - | - |
| Organic land area | <0.5 ha | 34 | 14.6% | 0.3 | 0.0 |
| | 0.5–1.25 ha | 59 | 25.4% | 0.8 | 0.1 |
| | >1.25–2 ha | 63 | 27.1% | 1.5 | 0.2 |
| | >2–4 ha | 45 | 19.3% | 2.7 | 1.5 |
| | >4–8 ha | 24 | 10.3% | 5.0 | 0.9 |
| | >8–12 ha | 3 | 1.2% | 8.3 | 0.0 |
| | >12 ha | 4 | 1.7% | 32.2 | 34.2 |
| Organic farm area (%) from the total | <20% | 3 | 1.2% | - | - |
| | >20–70% | 14 | 6.0% | - | - |
| | >70–100% | 215 | 92.6% | - | - |
| Land tenure status | Own | 129 | 55.6% | - | - |
| | Rent | 2 | 0.8% | - | - |
| | Share cropping | 1 | 0.4% | - | - |
| | Own + rent | 68 | 29.3% | - | - |
| | Own + sh. cropping | 25 | 10.7% | - | - |
| | Rent + sh. cropping | 2 | 0.8% | - | - |
| | Own + rent +sh. cropping | 5 | 2.1% | - | - |
| Farm business as main source of income | N | 37 | 15.9% | - | - |
| | Y | 195 | 84.0% | - | - |
| Farm income (%) of total annual household income | 0–30% | 20 | 8.6% | 0.2 | 0.0 |
| | >30–70% | 51 | 21.9% | 0.5 | 0.1 |
| | >70–100% | 161 | 69.3% | 0.9 | 0.0 |

**Table A2.** *Cont.*

| Variable | Category | Frequency | Percentage | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Additional sources of income | Agricultural wage income | 17 | 7.3% | - | - |
| | No agri. wage income | 0 | 0% | - | - |
| | Nonfarm self-employment | 23 | 9.9% | - | - |
| | Real estates | 29 | 12.0% | - | - |
| | Current transfers | 1 | 0.4% | - | - |
| | None | 107 | 46.1% | - | - |
| | Others | 55 | 23.7% | - | - |
| Organic farm revenue share (%) from the total | <20% | 0 | 0.0% | - | - |
| | >20–70% | 36 | 15.5% | - | - |
| | >70–100% | 196 | 84.4% | - | - |
| Health problems caused by agro-chemicals (no. of respondents affected) | N | 190 | 81.8% | - | - |
| | Y | 42 | 18.1% | - | - |
| of which no. of respondents reporting hospitalization in connection with agro-chemicals accidents | Y | 29 | 69 | - | - |
| Source of organic inputs | Govt. extension services | 2 | 0.8% | - | - |
| | Buying company | 109 | 47.8% | - | - |
| | My association | 119 | 51.2% | - | - |
| | NGOs | 0 | 0.0% | - | - |
| | Local shop | 0 | 0.0% | - | - |
| | Org. Input supplier | 1 | 0.4% | - | - |
| | Other | 1 | 0.4% | - | - |
| Organic certification body | COAE | 113 | 48.7% | - | - |
| | ECOA | 119 | 51.2% | - | - |
| Farmers' understanding of price setting | No | 5 | 2.1% | - | - |
| | Yes | 227 | 97.9% | - | - |
| Faire Trade certification | Don't Know | 10 | 4.3% | - | - |
| | No | 2 | 0.8% | - | - |
| | Yes | 220 | 94.8% | - | - |

## Appendix C

**Table A3.** Farmers' attitudes-descriptive statistics.

| Code | Statements | Mean | SD |
|---|---|---|---|
| 1.1_ATT_Stat | … I haven't got much choice but to be organic myself | 3.0 | 1.2 |
| 1.2_ATT_Stat | … I feel I'm taking care of the environment | 4.0 | 0.7 |
| 1.3_ATT_Stat | … I feel independent from conventional agriculture system | 3.4 | 1.0 |
| 1.4_ATT_Stat | … I use my farm resources in a more rational way | 4.3 | 0.5 |
| 1.5_ATT_Stat | … I'm able to meet my buyer's requirements | 3.9 | 0.7 |
| 1.6_ATT_Stat | … I receive a better price for my products | 4.6 | 0.5 |
| 1.7_ATT_Stat | … I get access to profitable domestic markets | 3.4 | 1.1 |

**Table A3.** *Cont.*

| Code | Statements | Mean | SD |
|---|---|---|---|
| 1.8_ATT_Stat | … I get access to profitable export market | 4.4 | 0.7 |
| 1.9_ATT_Stat | … I save on my production costs | 3.6 | 1.1 |
| 1.10_ATT_Stat | … I have a less risky business | 3.7 | 0.7 |
| 1.11_ATT_Stat | … I can diversify market opportunities | 3.8 | 0.7 |
| 1.12_ATT_Stat | … to be different from other farmers | 2.7 | 1.2 |
| 1.13_ATT_Stat | … I take advantage of technical advice offered by the buyer | 3.7 | 0.8 |
| 1.14_ATT_Stat | … access to inputs required for organics from the buyer | 3.8 | 0.6 |
| 1.15_ATT_Stat | … access to training opportunities provided by the buyer | 3.7 | 0.8 |
| 1.16_ATT_Stat | … access to market and price information through buyer | 3.6 | 0.9 |
| 1.17_ATT_Stat | … to reduce health risks derived from the use of agro-chemicals | 4.6 | 0.6 |
| 1.18_ATT_Stat | … to stop land and water pollution | 4.4 | 0.7 |
| 1.19_ATT_Stat | … to increase soil fertility | 4.1 | 0.7 |
| 1.20_ATT_Stat | … to produce healthy products | 4.3 | 0.6 |
| 1.21_ATT_Stat | OF is good for the environment | 4.3 | 0.7 |
| 1.22_ATT_Stat | … the advice of people I trust | 4.2 | 0.9 |
| 1.23_ATT_Stat | … my neighbours are doing well with organic and I do the same | 3.2 | 1.1 |
| 1.24_ATT_Stat | … I am motivated by the training I receive | 3.9 | 0.7 |
| 1.25_ATT_Stat | … I trust my buyer for organic products | 4.0 | 0.7 |
| 1.26_ATT_Stat | … I can meet new people and develop new relations | 2.8 | 1.2 |
| 1.27_ATT_Stat | I have knowledge and skills to practice organic agriculture | 3.9 | 0.9 |
| 1.28_ATT_Stat | I have resources to practice OA | 4.2 | 0.5 |
| 1.29_ATT_Stat | I have farm conditions to practice OA | 3.9 | 0.6 |

## Appendix D

**Table A4.** Properties of the CFA model.

| | | | Estimate | S.E. | C.R. | R.W. | *p* |
|---|---|---|---|---|---|---|---|
| 1.19_ATT_Stat | <— | Environment | 1.000 | | | 0.655 | |
| 1.17_ATT_Stat | <— | Environment | 0.680 | 0.135 | 5.021 | 0.499 | *** |
| 1.2_ATT_Stat | <— | Environment | 1.202 | 0.170 | 7.072 | 0.735 | *** |
| 1.20_ATT_Stat | <— | Environment | 0.970 | 0.140 | 6.926 | 0.717 | *** |
| 1.21_ATT_Stat | <— | Environment | 1.492 | 0.172 | 8.655 | 0.950 | *** |
| 1.18_ATT_Stat | <— | Environment | 1.520 | 0.177 | 8.603 | 0.940 | *** |
| 1.16_ATT_Stat | <— | Association/Service-Market | 1.000 | | | 0.243 | *** |
| 1.14_ATT_Stat | <— | Association/Service-Market | 1.370 | 0.570 | 2.405 | 0.433 | 0.016 |
| 1.24_ATT_Stat | <— | Association/Service-Market | 2.699 | 1.027 | 2.628 | 0.703 | 0.009 |
| 1.13_ATT_Stat | <— | Association/Service-Market | 3.143 | 1.173 | 2.680 | 0.853 | 0.007 |
| 1.15_ATT_Stat | <— | Association/Service-Market | 4.047 | 1.505 | 2.690 | 1.009 | 0.007 |
| 1.29_ATT_Stat | <— | KRC | 1.000 | | | 0.347 | |
| 1.27_ATT_Stat | <— | KRC | 2.356 | 0.962 | 2.449 | 0.597 | 0.014 |
| 1.28_ATT_Stat | <— | KRC | 1.368 | 0.558 | 2.450 | 0.581 | 0.014 |

**Table A4.** *Cont.*

| | | | Estimate | S.E. | C.R. | R.W. | *p* |
|---|---|---|---|---|---|---|---|
| 1.9_ATT_Stat | <— | Domestic Market | 1.000 | | | 0.067 | |
| 1.7_ATT_Stat | <— | Domestic Market | 32.621 | 236.057 | 0.138 | 2.028 | 0.890 |
| 1.10_ATT_Stat | <— | Independence/Business | 1.000 | | | 0.435 | |
| 1.11_ATT_Stat | <— | Independence/Business | 1.653 | 0.476 | 3.472 | 0.715 | *** |
| 1.5_ATT_Stat | <— | Independence/Business | 1.152 | 0.357 | 3.230 | 0.520 | 0.001 |
| 1.3_ATT_Stat | <— | Independence/Business | 0.408 | 0.360 | 1.133 | 0.131 | 0.257 |
| 1.12_ATT_Stat | <— | Need to be Different | 1.000 | | | 0.834 | |
| 1.26_ATT_Stat | <— | Need to be Different | 0.456 | 0.169 | 2.702 | 0.381 | 0.007 |
| 1.4 ATT_Stat | <— | Need to be Different | 0.006 | 0.054 | 0.114 | 0.012 | 0.909 |
| 1.22_ATT_Stat | <— | People Around | 1.000 | | | 0.389 | |
| 1.1_ATT_Stat | <— | People Around | 2.158 | 0.657 | 3.283 | 0.673 | 0.001 |
| 1.23_ATT_Stat | <— | People Around | 2.127 | 0.646 | 3.292 | 0.718 | *** |
| 1.25_ATT_Stat | <— | Export Market | 1.000 | | | 0.340 | |
| 1.6_ATT_Stat | <— | Export Market | 1.930 | 0.535 | 3.607 | 0.975 | *** |
| 1.8_ATT_Stat | <— | Export Market | 1.956 | 0.533 | 3.669 | 0.810 | *** |

*** statistically different from zero at the 0.001 significance level (two-tailed).

## Appendix E

**Table A5.** Standardized measurement model fit.

| Property | Recommended Value | Value |
|---|---|---|
| CMIN/DF | ≤3.00 | 1.795 |
| NFI | ≥0.90 | 0.727 |
| CFI | ≥0.90 | 0.882 |
| RMSEA | ≤0.08 | 0.073 |

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