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How to Promote Medium-Sized Farms to Adopt Environmental Strategy to Achieve Sustainable Production during the COVID-19 Pandemic?

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Abstract: To achieve sustainable production in medium-sized farms, this research proposes a hierarchical linear modeling (HLM) to predict environmental strategy (ES), which is a crucial source of sustainable production. Based on the theory of upper echelons, the present research puts forward that the environmental leadership (EL) of the chief executive officer (CEO) at phase one affects the development of environmental corporate social responsibility (ECSR) adoption, which in turn affects the development of ES adoption over time. The empirical data were obtained through a three-stage sampling method of 90 CEOs and 270 members of senior management teams (SETs) of Taiwanese medium-sized farms, over a period of six months. The research results support that the higher level of CEO EL at phase one results in the development of ECSR adoption, which in turn results in the development of ES adoption. This research opens a new direction for sustainable production by showing how to implement ES through organizational management mechanisms (EL). These findings can fill the gaps in the literature on the sustainable production of farms and can also help these farms to achieve sustainable production by adopting ES.

Keywords: environmental corporate social responsibility; environmental leadership; environmental strategy



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1. Introduction

1.1. Background

Contemporary farms should select an environmental strategy (ES) to achieve sustainable production under the pressure of external stakeholders [1,2] because farms can implement ES to realize sustainable production [3–5]. Indeed, the agricultural production process will inevitably consume a substantial number of resources and cause pollution [6]. ES is defined as the extent to which a company adds environmental issues to its development plan to reduce pollution caused by production activities [7]. Therefore, according to the theory of the upper echelons [8], this research adopts a novel model to predict the ES, that is, the environmental leadership (EL), of chief executive officers (CEOs), used as a driver of ES by the medium effect of environmental corporate social responsibility (ECSR). EL means leadership concerning ethical behavior and environmental responsibility [9]. ECSR means the company's responsible policy toward the welfare of multiple stakeholders [10]. The upper echelons theory believes that the features or values of senior managers should significantly influence the company's strategic choice [8], and leadership is an important feature of CEOs [11], thus indicating the relationship between EL and ECSR adoption.

Past agricultural research in the ES field often used environmental engineering techniques to deal with environmental issues, such as recycling fertilizers [12] or photovoltaic systems [13]. Since environmental engineering technology is no more effective than using ES, this research proposes a new stream that uses a psychometric perspective to deal with environmental issues. In addition, past research has suggested that organization-level policies (e.g., organization-level ECSR) may affect individual-level variables (e.g., individual-level ES) [14], but few studies have focused on this hypothesis. To fill this gap, this research adopts the HLM [15] to investigate how EL promotes ECSR growth, which consequently promotes the development of ES adoption at an organizational and individual level. In particular, the perspective of predicting ES from the perspective of multi-level psychometrics is rarely published in related journals in the agricultural field, leading to a serious gap in the investigation of farm organization psychology.

In summary, this research proposes the theoretical framework based on the theory of upper echelons [9] and adopts a HLM to conduct empirical data on 90 CEOs and 270 members of senior management team (SETs) members of Taiwanese medium-sized farms to address how EL can affect ES through ECSR. The incremental contribution of this research is to propose a novel HLM that constructs the key driving factors of ES from a multilevel perspective. This is because previous research is almost an individual-level perspective [16–19]. The research question (RQ) is as follows:

RQ: Can individual-level and organization-level EL influence the adoption of ES through the intermediary effect of individual-level and organization-level ECSR?

1.2. Literature Review

1.2.1. EL and ECSR

Transformational leadership theory has been regarded as an important driver of employee behavior and company strategy [20–25]. Indeed, transformational leadership has been studied across different disciplines [26–30]. Corporate social responsibility has also been studied across various disciplines [31–35].

EL denotes the transformational leadership toward ethics and environmental responsibility [10]. The theory of upper echelons [9] can be employed to connect these two variables. The theory of upper echelons [9] suggests that the features or values of senior supervisors (e.g., CEOs) will influence the company's preference for strategic attributes, and leadership is a key feature of the CEO [12], thus showing the relationship between EL and ECSR adoption. Indeed, past studies have also put forward similar assumptions that the leadership of the CEO can prompt the company to adopt corporate social responsibility [36–38].

Hypothesis 1. *A greater level of EL in phase 1 would lead to the development of ECSR adoption propensity.*

1.2.2. ECSR and ES

First, ECSR means the company's preference for environmental responsibility, which is determined by the company's senior supervisors. Indeed, senior supervisors have the legitimacy to engage in business activities [39], so these senior supervisors can influence the company's strategic choices because of their preferences or values. According to the theory of upper echelons, these preferences or values will affect the company's ES adoption [9]. Finally, since the company with a high-level ECSR pays attention to environmental-related stakeholders, ES is a tool for improving the corporate sustainability and corporate environmental performance that can satisfy the requirements of these stakeholders, thus showing the relationship between ECSR and ES.

Hypothesis 2. *More development of ECSR would lead to more development of ES adoption propensity over time.*

1.2.3. Organization-Level EL and ECSR to ES

Although EL and ECSR can be analyzed at an individual-level system, previous studies have examined these variables at an organization-level system [40–44]. The social information processing theory also believes that people obtain information from the same workgroup and form the shared and similar atmosphere of EL and ECSR (i.e., organization-level EL and ECSR) with other members.

Indeed, the theory of social cognition also confirms the hypothesis that human-level systems and environmental-level systems can affect human-level systems at the same time [45]. In other words, organization-level and individual-level EL can influence individual-level ES through the mediating effect of organization-level and individual-level ECSR. Previous empirical studies have tested similar hypotheses [46–48].

Based on the above discussion, the present research proposes that the individual-level hypotheses between EL, ECSR, and ES should be the same as organization-level hypotheses between EL, ECSR, and ES. Thus:

Hypothesis 3. *Organization-level EL at phase 1 would lead to more development of organization-level ECSR.*

Hypothesis 4. *More development of organization-level ECSR would lead to more development of ES adoption.*

2. Materials and Methods

The HLM of the present survey describes that the organization-level and the individual-level EL results in further development at the organization-level and individual-level ECSR, while more developments in the organization-level and individual-level ECSR will lead to more developments in ES over time (Figure 1).

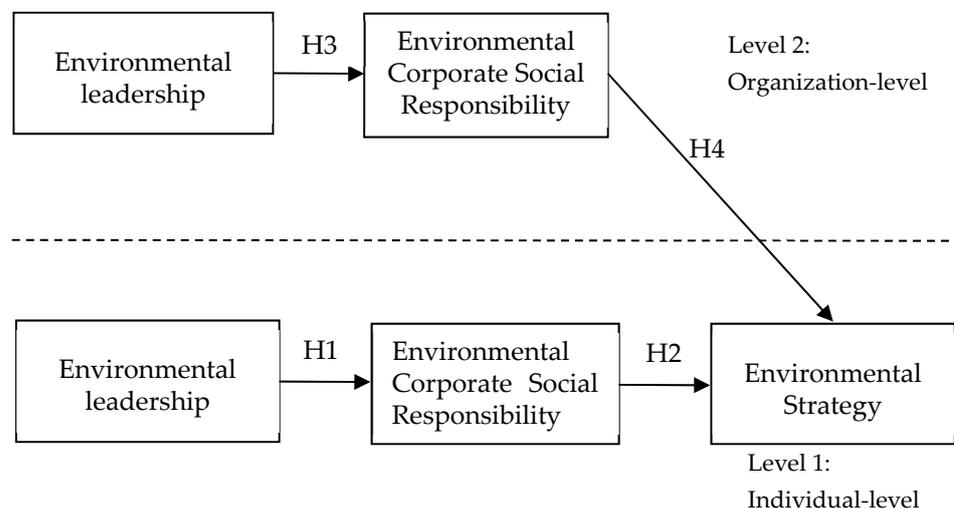


Figure 1. The HLM of this research. Note: H1 = Hypothesis 1; H2 = Hypothesis 2; H3 = Hypothesis 3; H4 = Hypothesis 4.

2.1. Sampling and Procedures

To obtain a sampling list of medium-sized farms, we approached several agricultural associations in Taiwan and contacted these medium-sized farms to take part in the survey. The 90 CEOs of these farms were willing to assist in the survey. We asked them to invite three members of their SETs to take part in the survey. We contacted these 90 CEOs and 270 members of their SETs from 90 different farms via email to prevent them from obtaining their questionnaire information.

This survey investigated the 90 CEOs' evaluations on ES in the first phase and the evaluations adopted by 270 members of SETs on the evaluations of the EL and their ECSR.

Three months after the end of the first phase, we surveyed 90 CEOs' evaluations of ES and 270 members of SETs on the evaluations of ECSR in the second phase. Finally, three months after the end of the second phase, we surveyed the evaluations of 90 CEOs on ES and 270 members of SETs on the evaluations of ECSR in the third phase.

2.2. Measures

The present survey adopts the 7-point Likert scale to evaluate the EL, ECSR, and ES. The operational definition for EL, ECSR, and ES is as Table 1. In addition, to confirm whether individual-level EL, ECSR, and ES can be aggregated into the organization-level EL, ECSR, and ES, we adopted James et al.'s [49] $r_{wg(j)}$ to confirm the feasibility.

EL was assessed by Robertson's 12-item scale [10]. ECSR was assessed by 4-item scale of Wei and colleagues [11]. ES was assessed by 5-item scale of Banerjee and colleagues [8].

Table 1. Operational Definitions.

Variables	Operational Definitions
Environmental Leadership	Leadership toward ethical behavior and environmental responsibility
Environmental Social Responsibility	The company's responsible policy toward multiple stakeholders' welfare
Environmental Strategy	A company adds an environmental concern to its development plan to reduce pollution caused by production activities

2.3. Model Validation

The descriptive statistics of EL, ECSR, and ES are as Table 2. We adopted an analysis technique of confirmatory factor to analyze the model fit, average variance extracted (validity), and composite reliability (reliability), which are in line with the suggestions of Fornell and Larcker [50] (please see Table 3).

Table 2. Means, standard deviations, and correlations.

	M	S.D.	EL	ECSR
Environmental Leadership	4.59	0.81		
Environmental Social Responsibility	4.79	0.80	0.41	
Environmental Strategy	4.51	0.82	0.31	0.39

Table 3. The analysis results of CFA.

Variables	$r_{wg(j)}$	Average Variance Extracted	Composite Reliability
EL	0.81	0.57	0.89
ECSR	0.83	0.56	0.87
ES	0.82	0.59	0.88

Note: EL = Environmental Leadership; ECSR = Environmental Corporate Social Responsibility; ES = Environmental Strategy. Root Mean Residual = 0.61; Root mean Square Error of Approximation = 0.48; Goodness of Fit = 0.91; Comparative Fit IndexI = 0.90; Normed Fit Index = 0.90.

3. Results

Since the data structure of this research is nested in multiple farms (the same within the group, but there are differences between the groups), we adopt the HLM [15] for analyzing multilevel framework. The analysis results are demonstrated in Table 4. Individual-level EL at phase 1 would significantly result in the further development of ECSR ($\gamma = 0.32$, $p < 0.01$). This would significantly result in the further development of ES adoption ($\gamma = 0.35$, $p < 0.01$). In other words, a higher level of EL at phase 1 would influence more

development of ECSR development, which would in turn influence further development of ES adoption over time to support Hypotheses 1 and 2.

The organization-level EL at phase 1 would significantly result in the development of organization-level ECSR ($\gamma = 0.41, p < 0.01$), which would significantly influence more development of ES adoption ($\gamma = 0.37, p < 0.01$). In other words, a higher level of organization-level EL at phase 1 would influence more development of organization-level ECSR. More development of organization-level ECSR would cause more development of ES adoption over time to support hypotheses 3 and 4.

To verify the intermediary effect of ECSR at the organizational and individual level, this research adopts the chi-squared difference test to analyze three potential models. The first potential model was formed by adding a path from EL to ES in Figure 1, and the positive change of the chi-squared value was 39 ($p < 0.01$), indicating the significant disadvantage of the fit index. The result shows that the ECSR should be a mediating variable. The second potential model was formed by removing the path from ECSR to ES in the first potential model, and the positive change of chi-squared value was 33 ($p < 0.01$), indicating a significant poor fit index. The result shows that the ECSR and EL cannot be the antecedents of ES at the same time, and ECSR should be a mediating variable between EL and ES. The third potential model was formed by removing the path from ECSR to ES and adding the path from ECSR to EL in the second potential model. That is, we assume that EL is the mediating variable between ECSR and ES. The positive change of the chi-squared value was 41 ($p < 0.01$), indicating the significant poor fit index. The result also supports that the ECSR should be a mediating variable. These results support that the EL in the first phase should directly cause more ECSR growth, and more ECSR growth should also cause more ES growth.

Table 4. Results of HLM.

Hypothesis	Path	Coefficient	Results
H1	Individual-level EL→Individual-level ECSR	0.32 **	H1 is supported
H2	Individual-level EL ECSR→Individual-level EL ES	0.35 **	H2 is supported
H3	Organization-level EL→Organization-level ECSR	0.41 **	H3 is supported
H4	Organization-level ECSR→Individual-level ES	0.37 **	H4 is supported

Notes: EL = Environmental Leadership; ECSR = Environmental Corporate Social Responsibility; ES = Environmental Strategy. **: $p < 0.01$.

4. Discussion

4.1. Contribution to Academic

The empirical results demonstrate that EL at phase 1 would influence the development of ECSR, which would influence more development of ES adoption, supporting Hypotheses 1 and 2. First, these results detect the key antecedents of ES adoption where the connection has not been studied in the past. Second, although ECSR research has received significant attention, the essence of ECSR still requires further extensive investigation [51]. Indeed, this research investigated how the CEO's EL would cause ECSR, which results in the SET's ECSR-specific behavior (e.g., the SET's preference or values for environmental responsibility). In addition, ECSR also affects ES. The link of EL-ECSR-ES opens the black box in different contexts.

In addition to considering the individual-level antecedents of ES, this research also considers the organization-level antecedents to echo the recommendations of previous research [14]. Based on a multilevel perspective, organization-level EL at phase 1 would influence more organization-level ECSR development, and more development of organization-level ECSR would influence more development of ES adoption, which suppose Hypotheses 3 and 4. Indeed, the multilevel theory also supports this presumption that environmental variables (e.g., organization-level ECSR) can significantly influence psychological variables (e.g., individual-level ES) [16], but past research has ignored this presumption. Therefore, the present research contributes to the ES literature through individual-level and organization-level mechanisms that EL at phase 1 time would lead to more develop-

ment of individual-level and organization-level ECSR, as well as more developments at the individual and organizational levels. ECSR would lead to more developments in ES adoption over time, which responds to the call of the researcher in the past to open more black boxes of corporate social responsibility [52].

4.2. Contribution to Practice

In the agriculture field, exploring how medium-sized farms can employ ES to improve environmental sustainability is a great benefit to sustainable agricultural production. Indeed, the results of this research show that medium-sized farms can implement ES through the organization management mechanism (EL of CEOs) and the ECSR adoption. In addition, ECSR has been recognized as a source of corporate sustainability [53], so ECSR may also be an important source of sustainable agricultural production. Finally, these human resource managers should pay attention to the key antecedent of green management (e.g., EL, and ECSR), and should keep in mind that maximizing these green management behaviors and constructing a green work environment are the key driving factors of sustainable production, such as green staff meetings, green activities, and the display of green vision and values of companies. Finally, to effectively enhance the CEO's EL ability, human resource managers should regard EL education and training as an important investment for the enterprise, because EL is a key driving factor for the development of ES.

4.3. Limitations

The present researcher believes that ECSR is a key intermediary variable used to transform the CEO's EL into the company's ES adoption, but other variables may have similar effects in different contexts. Next, although this research puts forward EL as an important driver of ES, other variables may have similar effects, such as transformational leadership [54], responsible leadership [55], and environmentally specific leadership [48]. Finally, the empirical data are limited to Taiwan, which may affect the generalization of the theoretical model.

5. Conclusions

The present research proposes the HLM to prove that the CEO's EL would lead to the development of ECSR, which in turn would lead to the development of ES adoption. The HLM has important contributions to EL, ECSR, and ES literature and can guide sustainable agricultural production to agricultural production companies. Indeed, past studies have rarely adopted this perspective to discuss why farms adopt ES and this research constructs the milestone that proposes EL and ECSR as antecedents of ES, which provides significant contribution for literature on sustainable production and guides the implementation of ES on farms. The research has also promoted the practical and academic development of ES and has filled the gaps in the multi-level framework and cross-sectional research of the previous literature. Finally, the other incremental contribution of this research is to verify that ECSR and ES can be changed over time to support the growth perspective. Indeed, past research has ignored this gap and regarded these constructs as cross-section structures, so this research opens a new way of thinking in behavioral science research by the HLM.

Further study should test the framework of the present survey under different backgrounds to explore other intermediary variables. Next, this research confirms that EL is a key antecedent of ES, and further study should explore other important leadership styles in different contexts. Next, further research should collect different data in different countries to verify the external validity of the theoretical model, because there is no strong evidence that the Taiwanese sample is the same as other countries. Finally, further study should employ experimental designs to verify the empirical results to reduce bias.

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