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REQUIREMENTS OF LOW INPUT SUSTAINABLE AGRICULTURAL IMPLEMENTATION: A FACTOR ANALYSIS OF EXPERTS' PERSPECTIVE

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ABSTRACT

Low Input Sustainable Agriculture seek to optimize the management and use of internal production inputs and to minimize the use of external production inputs, such as purchased fertilizer and pesticides to lower production costs, to reduce pesticide residues in food, and to increase both short- and long-term farm profitability. This study was conducted to identify the requirements of LISA implementation from experts' perception in Ilam. The research population included all the experts who are members of agricultural and natural resources engineering organization in Ilam province (N=1700). Using the stratified sampling technique and the results from the pilot test 313 experts were surveyed. Using factor analysis, the requirements have been classified into five factors named Cultural, Economical, Extension methods, Education methods and Technical factors. About 65 percent of total common variance explained by these 5 factors, which the majority of it explained by the cultural factor.

Keywords: low input sustainable agriculture, requirements, implementations, factor analysis, Ilam.

INTRODUCTION

Intensive usage of chemical pesticides and fertilizers has caused serious environmental problems (George, 2009). The negative effects on human health, agro ecosystems (e.g., killing beneficial insects), wider environment (e.g., non-target species, landscapes and communities), and polluting water and groundwater resources are some examples of unsustainable consequences of insecticide use. (Devine and Furlong, 2007; Pimental and Paoletti, 2009).

Several studies show a rapid growth of chemical pesticides and fertilizers usage in Iran. E.g. Mohammadi (2010) reported that about 50% chemical fertilizers usage is not necessary in Iran. It is estimated that pests damage 42 percent of agricultural products in Iran (Asgari, 2009). The estimated amount of different agrochemical pesticides (insecticides, nematicides, fungicides, and herbicides) used in Iran is 17-25 million liters a year, which is more than the optimum requirement (Molazadeh, 2010).

Experts in response to the adverse environmental and economic impacts of high chemical usages have proposed the adoption of low input sustainable agriculture (LISA).

U.S congress (1990) defined sustainable agriculture as following. It is an integrated system of plant and animal production practices having a site-specific application that will, over the long term, satisfy human food and fiber needs; enhance environmental quality and natural resources base upon which the agricultural economy depends; make the most efficient use of nonrenewable resources and on-farm ranch resources and integrated, where appropriate, natural biological cycles and controls; sustain the economic viability of farm operations; and enhance the quality of life for farmers and society as a whole.

Pretty (1996) identifies a number of goals of sustainable agriculture, which include: (1) a more thorough incorporation of natural processes. (2) A reduction in the use of off-farm, external and non-renewable resources. (3) More equitable access to resources. (4) Greater productive use of local knowledge and practices. (5) Greater self-reliance for farmers and rural populations. (6) A better match between production practices and climate and landscape. (7) Profitable and efficient production with an emphasis on conservation of the soil, water, energy and biological resources.

Low Input Agricultural farming systems seek to optimize the management and use of internal production inputs (i.e., on farm resources) and to minimize the use of external production inputs, such as purchased fertilizer and pesticides, wherever and whenever feasible and practical, to lower production costs, to avoid pollution of surface and ground water, to reduce pesticide residues in food, to reduce a farmers overall risk, and to increase both short- and long-term farm profitability (Parr *et al*., 1990).

Reijntjes *et al*. (1992) define Low External Input Sustainable Agriculture (LEISA) as "agriculture which makes optimal use of locally available natural and human resources (such as soil, water, vegetation, local plants and animals, and human labor, knowledge and skills) and which is economically feasible, ecologically sound, culturally adapted and socially just. The use of external inputs is not excluded but is seen as complementary to the use of local resources and has to meet the above mentioned criteria".

Schaller (1993) notes that adoption of the term "low input" had an effect rather different from that originally intended. The term was chosen to try to correct the view held by some agricultural groups that sustainable agriculture was just another name for chemical-free or organic farming.

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However, Schaller suggests that the impact was, for some, to encourage the notion that sustainable agriculture implied a general lowering of all inputs currently used, and a return to “hoes, hard labor, lower yields, and lower farm income.” This one example gives some indication of the care that has to be taken when discussing the terminology of “sustainable agriculture”.

Although, in implementation step, Low input sustainable agricultural implementation demands some requirements. So, this study was conducted to identify the requirements of Low input sustainable agricultural implementation from experts’ perception.

MATERIALS AND METHODS

The methodology used in this study involved a combination of descriptive and quantitative research. Questionnaire items were developed based on the previous literature and objectives. The questionnaire was revised with the help of experts with significant experience to examine the validity of the research model. A 5-point likert scale ranging from 1 as strongly disagrees to 5 as strongly agree was used for the measurement. A pretest for the reliability of the instrument was conducted with 30 experts randomly chosen in Kerman shah province. It summarized requirements into one single variable, R. The computed Cronbach’s alpha for R. is 88%, which indicated the high reliability of the questionnaire.

The research population included all the experts who are members of agricultural and natural resources engineering organization (ANREOI) in Ilam province (N=1700). Using the stratified sampling technique and the results from the pilot test 313 experts were surveyed.
Ilam Province is one of the 31 provinces of Iran. It is in the south-west of the country, bordering Iraq. Its provincial center is the city of Ilam and covering an area of 19, 086 square kilometers.

Agricultural and Natural Resources Engineering Organization of the Islamic Republic of Iran (ANREOI) which will be referred to as “ Organization ” is a non governmental and independent organization which according to the law approved by the Islamic National Assembly was established in month of June 2001. Graduates from agricultural and natural resources subjects and related courses from bachelor degree and higher can become members of the organization.

This research applied SPSS Software to analyze the data. Data was analyzed using the factor analysis. KMO index along with the Bartlett test verify appropriateness of the collected data for explanatory factor analysis.

RESULTS AND DISCUSSIONS

Descriptive statistics

Table-1 summarizes the demographic profile and descriptive statistics of experts.

Table-1. Demographic profile and descriptive statistics of experts.

Work experience	Mean = 8.9	S.D = 8.3
Gender	Female (28.8%)	Male (71.2%)
Age/year	Mean = 35.6	S.D = 9.7
level of education	Bachelor (66.8%)	Master (31.6), PhD (1.6)

Implementation of factor analysis summarizes all requirements into 5 factors given by Table-2.

Factor one is composed of the following requirements. Positive attitude of farmers towards LISA, Positive attitude of public towards LISA, communication between universities and planners regarding LISA, participation of farmers in LISA planning, Encouraging farmers who used LISA methods. These requirements are clearly related to cultural factor. So it was named cultural factor.

Factor two is composed of the following requirements. Providing the purchase of new equipment and machinery costs, providing the LISA research budgeting, providing premium marketing and higher prices for LISA products, supportive policies of LISA methods, and appropriate infrastructure for organic products. These five requirements are related to the LISA financial aspect. So it was named economical factor.

Factor three is composed of the following requirements. Holding field days, Preparation of extension programs to introduce LISA’s benefits, raising farmers LISA’s awareness through: community groups, field days, outlets, media, etc. the third factor was named extension methods.

Factor four is composed of the following requirements. Providing a face-to-face educational system, Holding training seminars, trade fairs, agricultural exhibitions to promote farmers' awareness and knowledge about LISA, holding educational classes regarding LISA. Factor four was labeled as educational methods.

Factor five is composed of the following requirements. Focus on needed infrastructures, and focus on LISA research. So it was named as technical factor.

Table-2 represents portion of each factor from the total common variance. As one may observe that about 65.5% percent of total common variance explained by these 5 factors, which the majority of it has been explained by the cultural factor.

Table-2. Factor analysis of LISA requirements.

Factor name	Explained common variance by factor
Cultural	23.9
Economical	19.1
Extension methods	9.0
Education methods	7.4
Technical	6.1
Total	**65.5**

CONCLUSIONS

Table-2 identified the cultural requirement as the most important requirement in LISA implementation. There is a clear need for a systematic redirection of investment, funding, research and policy focus towards sustainable agriculture. In the short term, this means that farmers switching from modern high-input agriculture to resource-conserving technologies can rarely do so without incurring some transition costs. In the long term, it means that sustainable agriculture will not spread widely beyond the types of localized success.

Sustainable agriculture can contribute significantly to increased food production, as well as make a significant impact on rural people's welfare and livelihoods. However, without appropriate policy support at a range of levels, these improvements will remain at best localized in extent or, worse, will wither away. A thriving and sustainable agricultural sector requires both integrated action by farmers and communities, and integrated action by policy makers and planners. It is also vital for farmer-to-farmer learning and sharing of experiences to be encouraged and facilitated. Sustainable agriculture needs to be mainstreamed into agricultural policy and practice to reach its full potential.

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