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Human Capital Specific, Entrepreneurial Behaviour and Integrated Maize Crop Management Adoption: Case of Small Scale Farmers in Bantaeng District, Indonesia

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Abstract: In Indonesia, maize is the second most important crop after rice and most of the maize production came from small scale farmer. Integrated Maize Crop Management (IMCM) is one of the approaches that recommended by the government to improve maize production. This research's aim addressed to examine relationship between human capital specific and entreprepreneurial behaviour and their effect on IMCM adoption at the small scale farmers in Bantaeng District, one of the centre maize production development areas in South Sulawesi Province, Indonesia. Respondent sample as much 83 small scale farmers were selected ramdomly. Collected data was analyzed using path analysis for testing hypothesis. This research result showed that human capital specific has significantly and positive effect on IMCM adoption at the small scale farmers, either directly or indirectly. The amout contribution of indirectly effect (through entrepreneurial behavior) is greater than its direct effect. This study provides new evidence on the relationship between human capital specific and entrepeneurial behaviour that play a critical role in influencing the small scale farmer's decision to adopt new crop technology completely (i.e., IMCM). For practically, this research provide a source of important information for the effort to improve maize crop production management and technology at the small scale farmers.

Key words: Human capital specific, entrepreneurial behaviour, integrated maize crop management, adoption, small scale farmer, technology

INTRODUCTION

In Indonesia, maize is the second most important crop after rice. The demand for maize as food and feed has been steadily increasing. Total national maize production has grown at 4.07% per annum in the last three decades and most of the production comes from small-scale farmers (Pakpahan, 1992). To increase the productivity and efficiency of maize croping in Indonesia, the government through the Ministry of Agriculture has recommended the application of the Integrated Maize Crop Management (ICM) that is one of the approaches to the improve management of maize croping by implementing the 5 crop component technologies that provide synergistic effects, are: Sukmaraga varieties, ATB1-4R Balitsereal Cropping Tool, Manure usage, Dosage of fertilization: 300 Urea+200 SP36+100 KCl, dan fertilization frequency 3 times. This application of the IMCM at the level of farmers has been shown to increase the productivity and efficiency of farming the corn which further gives effect to increase farmers' income and welfare (Subandi, 2002; Wahid *et al*., 2001). Hence, approach the IMCM has been recommended and deploying their applications on corn farmers since several years ago especially in areas central to the development of the maize production. Unfortunately, results of the application evaluation of the fifth component of the IMCM at the farmers, apparently the only component (1) and (2) that they have already applied, component (3) are being still in try, dan component (4) dan (5) are still not yet known by the farmers. Further, farmers who have implemented components (1) dan (2) as much 40.75% been used, 29% newly use, dan 30.25% interest/have not try (Margaretha and Syuryawati, 2010). Therefore, questions may be asked about why the compenen of the IMCM was not completely adopted by among farmers?

A large number of technology adoption studies on maize crop management have pointed out the influences of socioeconomic and agro-ecological variables, sources of farm information and farmers' attitude towards the improved maize varieties on adoption of improved maize crop technology. In Indonesia, study factors influenced technology adoption of improving maize crop management were socioeconomic (Gultom, 2009), mentoring from extention workers, capital to fund farming and sources of information (Pou *et al*., 2006), farmer

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internal factor viz., non-formal education, maize farming experience and information access and external factor viz access to financial capital, the availability of facilities and infrastructure, the intensity of the information, access to the market (Falo *et al*., 2011) and social capital (Bulu *et al*., 2009). The earlier research studies suggest that they generally were only concentrated on human capital and social capital in term of general human capital (not specific human capital) while the role of entrepreneurial capital has ignored (De Wolf *et al*., 2007). Given the widely accepted notion that entrepreneurial are the key to innovation (Plaschka and Welsch, 1990) and it drives innovation and technical change (Schumpeter *et al*., 2003). Hence, the objectives were formulated for the study: to examine relationship between human capital specific and entrepreneurial behaviour and their effect on IMCM adoption at the small scale farmers. Uncovering the factors are important and relevant for both research and policy. First, in contrast with a well established theoretical literature on new technology adoption in agriculture, empirical evidence on entrepreneurial behaviour and its impact to the new technology adoption of small scale farmers is very limited. Second, from the policy perspective, to the extent that a adoption of new technology is desirable, it is essential to understand whether human capital and entrepreneurial behaviour factors are likely to increase the adoption of new technology on small scale farmers.

Theoretical framwork

Farmers technology adoption: The literature on agricultural technology adoption mentioned that innovation adoption states that farmers go through five stages: awareness, interest, evaluation, trial and adoption (Rogers, 1995). The most often cited factors that have been used to explain the variability seen in agricultural technology adoption and its patterns of diffusion are those described by Roger (1995)'s that factors determinant rate of adoption of innovation (CA) are attributes of innovation: relative advantage, compatibility, complexity, trial ability, observability, innovation decision: optional, collective, authority communication channels: mass media or interpersonal, social system: norms, degree of network connection and extent of change agents promotion efforts. Pannell *et al*. (2006) viewed through a broad cross disciplinary lens, there is agreement that the adoption of agricultural technology depends on a range of personal, social, cultural and economic factors as well as on the characteristics of the innovation itself. Abdullah and Samah (2013) studied to explains the factors affecting technology usage in Malaysian farmers, concluded that farmers' perceptions and levels of education as well as extension-workers' knowledge, the management of the extension program and the physical conditions of the area, are all factors that affect technology adoption among farmers. Prokopy *et al*. (2008) shows that education levels, capital, income, farm size, access to information, positive environmental attitudes, environmental awareness and utilization of social networks are generally positively, associated with the adoption of best management practices. Sunding and Zilberman (2001) menekankan the role of structural farm factors such as size or land quality or the characteristics of farmers in terms of human capital on technology adoption among farmers.

Entrepreneurship and inovation: The association of entrepreneurship and inovation long been the accepted norm. For Joseph Schumpeter, who formed the concept of entrepreneurship and analyzed its impact on economic development entrepreneurship does not only lead to an increased national income by creating new jobs but it also acts as a positive force in economic growth by serving as a bridge between innovation and the marketplace. Therefore, the entrepreneur thus serves as the major link in the process of innovation development, economic growth and revitalization (Hatak, 2011). According to Drucker (1986), innovation is the specific instrument of entrepreneurship. It is the act that endows resources with a new capacity to create wealth. Whatever changes the wealth-producing potential of already existing resources constitutes innovation, innovation does not have to be technical, it is also an economic or social term, innovation can be defined as changing the yield of resources or defined in demand terms rather than in supply terms that is as changing the value and satisfaction obtained from resources by the consumer. Knight (1921) views the entrepreneur as an economic pioneer who initiates change or innovation by managing uncertainty and risk. Entrepreneurial behaviour is seen as behaviour that manages to combine innovation, risk-taking and proactiveness (Miller, 1983). Entrepreneurship is the initiation of change through creativity and innovation (Curran and Burrows, 1987). Drucker (1986) and Cohen (1977) proclaim that innovation is the tool of entrepreneurs, the means by which they exploit change as an opportunity. Rauch and Frese (2000) find cumulative evidence that indicates that entrepreneurs are more innovative by nature than other people and that innovativeness is positively correlated with success. Lumpkin (2007), in examining entrepreneurial psychology, notes that innovation is demanding in part because it requires organizations and individuals, to focus on the external environment and stay attuned to technological trends, competitive advances and shifts in consumer demands. Arrow (2000) point out that entrepreneurial people are always searching for better concepts, listening to their customers, investing in customer driven innovation. They are more learning oriented, searching for ideas and experience through informal inquisitiveness as well as formal education. And they are more collaborative, valuing relationships and willing to work closely with other companies as their partners in achieving a common objective. The study the effects of entrepreneurship on adoption of inovation and technology in agriculture, Kumar and Narayanaswamy (2000) studied to know the socio-economic characteristics and entrepreneurial behaviour of farmers who adopted sustainable agriculture in India and threy reported that farmers who adopted sustainable agriculture had high extension participation with high entrepreneurial behaviour index was differed significantly from medium and low extension participation groups. Balasaravanan and Vijayadurai (2012) studied to determines the level of entrepreneurial behavior among the farmers in India and found that the level of entrepreneurial behavior of the small farmers are lower than big farmers.

Human capital and innovation: The concept of human capital refers to knowledge, abilities and skills of the individuals that can be used in the activities that stimulate of the innovation process (Schuller, 2001) and it is a factor that complements innovation and is needed for both the adoption of existing innovations and the production of new ones (Tugores, 2006). As revealed by the literature, there are two types of human capital: general human and specific human capital. General human capital relates to factors expected to increase the individual's productivity and they which applicable to a specific domainas years of schooling and years of work experience and specific human capital as industry specific experience, self employment experience, leadership experience and self-employed father (Bruderl *et al.*, 1992; Cooper *et al.*, 1997). Sriyani (2010) catagorized human capital into three aspects as: firm-specific human capital, industry-specific human capital and individual-specific human capital refers to knowledge that is applicable to a broad range of firms and industries; it includes general managerial and entrepreneurial experiences, the level of academic education and vocational training and the individuals age. Popescu and Diaconu (2008) described three type of human capital. The first type-specific human capital refers to skills and knowledge that are valuable only within a certain firm. They are directly correlated with tradition, culture and its practice and they can be applied only within that company. Although, they can represent a competitive advantage for the firm that have them due to the fact that they cannot be transferred to other companies, the limited interaction and communication capacity attached to those abilities makes this type of human capital only have a limited impact on the innovative activity from a region or society. The second type-industry-specific human capital regards the knowledge resulted from experience specific to an industry. Further researches demonstrated that this type of human capital may play an important role in generation of innovative activities only if it takes place a knowledge, personnel and technology exchange within that industry. So, creating innovations can take place when new products or ideas result from the combination of communication among industry's partners, on one hand and knowledge present in existing technologies, on the other hand. The third type-individual specific human capital-refers to knowledge that can be used for a large range of firms and industries. This can include managerial and entrepreneurial experience, a certain level of education and vocational training and the total households. Nelson (2005) has condensed these into two schools of thought: accumulation theories and assimilation theories. The first envisage a direct effect of human capital on labour productivity as an explicit factor of production embodied in effective labour. This approach leads to the prediction that it is new investment in human capital that matters for economic growth. In contrast, the second school of thought explores the relation between the level of human capital and total factor productivity growth or technological change; the emphasis here is on the link between human capital and disembodied knowledge as manifested in technology. The study the effects of human capital specific on adoption of inovation and technology in agriculture, D'Souza *et al.* (1993) examined individual factors influence the adoption of sustainable agricultural practices, found that human capital characteristics such as a producer's age and experiences were found to be significant determinants of the adoption decision. Zepeda (1994) investigate the relationship between agricultural investment and productivity in developing countries, found that human capital specific has directly effect on agricultural productivity by affecting the way in which inputs are used and combined by farmers. Improvements in human capital specific affect on acquisition, assimilation and implementation of information and technology. Human capital specific has also affects on farmer's ability to adapt technology to a particular situation or to changing needs. Figure 1 presents the conseptual framework developed in this study. The conceptual framework which based on

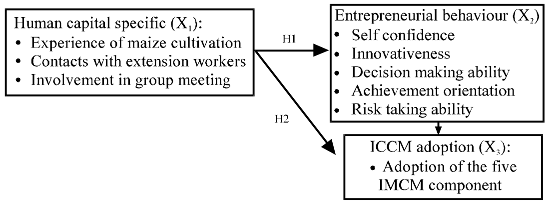

Fig. 1: Conceptual model linking human capital, entrepreneurial behaviour and IMCM adoption

review literatur proposes that human capital specific will have an effect on adoption components of the IMCM, both directly and also indirectly through entrepreneurial behaviour. Human capital specific is conceptualized as skills and knowledge that are valuable only within a maize farming. Such experience of maize cultivation, contacts with extension workers, involvement in group meeting. Entrepreneurial behaviour is conceptualized as self confidance, innovativeness, decision making ability, achievement orientation. Adoption of the IMCM is conceptualized as adoption of the five IMCM components. From the Fig. 1, researchers propose four hypothesis.

Hypothesis 1: Human capital specific has a significant positive effect on entrepreneurial behaviour.

Hypothesis 2: Human capital specific has a significant positive effect on IMCM adoption.

Hypothesis 3: Entrepreneurial behaviour has a significant positive effect on IMCM adoption.

Hypothesis 4: Human capital specific have a significant positive effect on IMCM adoption through entrepreneurial behaviour.

MATERIALS AND METHODS

This research was conducted in May to December 2013 in Bantaeng District which is one of the center of the development of maize production in South Sulawesi, Indonesia. According to context formularization problems and research purposes then method research used is quantitative method through field survey. Sample farmers selected randomly as much as 83 small scale farmers in term of land has an area of 0.5 ha less corn crop and is a participant of the program activities of the SL-IMCM. Data were collected through interviews are structured with respondent farmers use research instrument in the form of a questionnaire. Before using, the instruments of the research carried out test validity and reliability first.

Test results to the overall question of items on the human capital variables (4 items) were declared valid with cronbach alpha value-0.786, overall item questions on entrepreneurial behaviour variables (five items) declared valid with alpa-cronbach 0.842, overall variable adoption questions on items (1 items) were declared valid with a value of alpa-0.715 cronbach. In this research, human capital specific is conceptrualized as described by Popescu and Diaconu (2008), namely skills and knowledge that are directly correlated with practice and aplication for maize cultivation. This human capital specific is measured by long years of experience in the maize cultivation, the frequency of contact with extension officers and active involvement in group meeting. Entrepreneurial behaviour measured as a combination of components viz., self-confidance, innovativeness, decision making ability, achievement orientation, risk taking ability using a 5-point Likert type scale with the anchors 1 = 'not agree' and 5 = 'highly agree'. IMCM adoption is measured by the number of IMCM components has been adopted by farmer during they were participant of SL-IMCM. Data analysis was done with path analysis with SPSS Program 6. Before the data is analyzed, the data are ordinal measurement scale was transformed into a scale interval of data through the succeesive method of the interval (Al Rashid, 1993). In this study also used two testing the assumption that the classical assumptions of test and goodness of fit model test.

RESULTS AND DISCUSSION

Classical assumption test and Goodnes of Fit Model: Path analysis is closely related to multiple regression. Hence, classical assumption test of model should be employed. Based on a classic assumption test using SPSS Program Version 18.0, obtained results that all normal distributed data with data that is spread around the diagonal lines on " Normal P-Plot of Regression Standardized Residual"; the human capital variables and entrepreneurial behavior showed no symptoms of the relevant value of the VIF is <10 and greater tolerance of 0.10, homokedastisitas does not occur or is not the absence of a specific pattern on a scatter plot of the bound variable and there is no autocorrelation in regression models with a value of 2.159 DW located between the upper limit of (du) dan (4-du), du = 1,688.

The precision of the sample regression functions in estimating the actual value can be measured from its goodness of fit. Gooness of Fit Model performed using the coefficient of determination (R^2) and F-test. R^2 of the regression equation in the path model is 0.708. Which means that the ability of the human capital specific and

Tabel 1: ANOVA

Models	Sum of squares	df	Mean square	F-value	Sig.
Regression	414.288	1	414.288	147.649	0.000[a]
Residual	227.278	81	2.806	-	-
Total	641.566	82	-	-	-

[a]Predictors: (Constant), X_1, X_2; [b]Dependent variable: X_3

Tabel 2: t-scores for testing hypotesis in Path Model

Structure relation	Path coeficient	Direct effect	t-scores	t-table
X_1 to X_2	0.804	0.646	12.151*	2.00
X_1 to X_3	0.391	0.153	3.894*	2.00
X_2 to X_3	0.499	0.249	4.974*	2.00

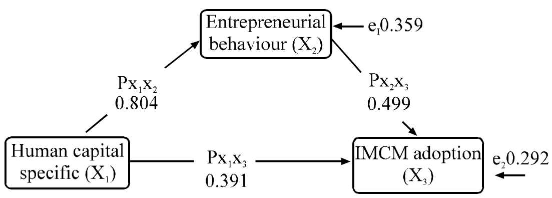

Fig. 2: The structural digram in Path Model

entrepreneurial behavior variables to explain variations in the IMCM adoption variables is 70.8% while the rest is 29.2% explained by the unspecific variable. Futher, F-test result as shown in Table 1.

Table 1 shows that the F-ratio of 147.649 is significant, even at the 0.005 margin of error, implying that independent variables (X_1 and X_2) are a good fit of dependent variable (X_3) in Path Model. The path's coefficients in the path model were estimated as shown in Fig. 2.

Figure 2 shows the all of the path coefficients (the standarized regression coefficient) in path model are positive sign with arrow direction of human capital specific to IMCM adoption, both directly and underectly through entrepreneurial behaviour.

Testing hypothesis: Testing hypothesis to examine effect independent variables of human capital specific (X_1) and entreprepreneurial behaviour (X_2) on dependent variable of IMCM adoption partially used t-test (Table 2).

Table 2 shows the path coefficients indicating the significance of variables relating to human capital specific, entrepreneurial behaviour and IMCM adoption that can be described as follows.

Effect human capital specific on entrepreneurial behaviour: The effect human capital specific (X_1) on entrepreneurial behaviour (X_2) (Hypothesis 1), show that t score value is greater than t-table value (12.151>2.00) and its probability or $p<0.05$. These findings make it clear that human capital specific has significant dan positive effect on entrepreneurial behaviour with contribution of its direct effect is 80.4%.

This suggest that increase human capital specific is associated with increase entreprenurial behaviour of the small scale farmer. This result supported by opinion of Williams (2004) that individual with higher stocks of human capital and various skills are better able to make use of their resources in entrepreneurship than in a salaried job. Teece (2011) also agrees that there are strong links between entrepreneurship and human capital specific because the entrepreneurial ability to connect knowledge and opportunities requires a very specific set of skills and insight. Individuals with high actual human capital are more likely to pursue entrepreneurial activities. This result also support previous studies which indicates individuals with high human capital are more likely to pursue entrepreneurial activities compared to individuals with low human capital (Bayan, 2010). Therefore, hypothesis H1 is confirmed.

Effect human capital specific on IMCM adoption: The effect human capital specific (X_1) on IMCM adoption (X_3) (Hypothesis 2), show that t-score value is greater than t-table value (3.894>2.00) and its probability or p value is lower than 0.05 ($p<0.05$). This result suggest that human capital specific has significant and positive effect on adoption of IMCM, with contribution of its direct effect is 15.3%. This suggest that increase human capital specific of the small scale farmers is associated with increase many components of IMCM that they were adopted. This founding supported by Parvan (2011) in his reviewed literature agricultural adoption technology which he concluded that human capital specific variables are comprised of experience and contact with the technology or with extension worker positively correlated with innovators or early adopters farmer. Therefore, hypothesis H2 is confirmed.

Effect of entreprepreneurial behaviour on IMCM adoption: The effect of entrepreneurial behaviour (X_2) on IMCM adoption (X_3) (Hypothesis 3), show that t-score value is greater than t-table value (4.974>2.00) and its probability or $p<0.05$.

These findings make it clear that the behavior of entrepreneurial behaviour has significant and positive effect on the IMCM adoption with contribution of its direct effect is 24.90%. This suggest that increase enrepreneurial behaviour of the farmers is associated with increasing amout of the IMCM components that they were adopted. These findings support previous research results by Kumar and Narayanaswamy (2000) who found that there was close association between entrepreneurial behaviour and adoption of sustainable agriculture practices by farmers. Therefore, hypothesis H3 is confirmed.

Table 3: Directly and undirectly contribution effect of human capital specific on IMCM adoption

	Contribution effect (%)		
Structure relation	Direct	Undirect	Total
X_1 to X_3 through X_2	15.3	41.0	56.3
X_1 to X_3	24.9	-	-

Effect of human capital on IMCM adoption through entreprepreneurial behaviour: The effect of human capital specific (X_1) on IMCM adoption (X_3), showed that human capital specific affect directly and also indirectly via behavior does IMCM against entrepreneurship (Hypothesis 4). Calculation results of the magnitude of the contribution effect directly and indirectly of the human capital specific on the IMCM does can be seen in Table 3.

Table 3 shows that indirect effects of human capital specific (X_1) to the IMCM adoption (X_3) through entrepreneurial behaviour (X_2) is greater than its direct efffect (56.3>24.9%). These results give an indication that the human capital specific and entrepreneurial behaviour factors together are to increase the number of the IMCM components were adopted by small scale farmers. This finding is supported by the results of previous research by Kumar and Narayanaswamy (2000) who reported that the entrepreneurial behaviour of farmers who adopted sustainable agriculture differ significantly in different age groups but farmers with longer experiences in sustainable agriculture had high entrepreneurial behaviour index compare to shorter experince groups and big farmers had high entrepreneurial behaviour compare to small farmers. Further, farmers who had high organisational participation were also high in their entrepreneurial behaviour compared to medium and low groups and farmers with high extension and farmers who adopted sustainable agriculture had high extension participation with high entrepreneurial behaviour index was differed significantly from medium and low extension participation groups. Therefore, hypothesis H4 is confirmed.

CONCLUSION

The key findings from this study are: firstly, human capital specific has significantly and positive effect on entrepreneurial behaviour with its contribution of direct effect is 64.6%. Second, the human capital specific has significantly and positive effect on the IMCM adoption with contribution of its direct effect is 15.3%. Three, entrepreneurial behaviour has significantly and positive effect on the IMCM adoption with contribution of its direct effect is 24.9%. Fourth, human capital specific has undirect effect to the IMCM adoption through entrepreneurial with total contribution of undirect effect (56.3%) is greater than contributiom of its direct effect (24.9%). Limitations of this the research is that generalization ability is limited by the sample size and location. However, researchers believe that the findings reported here should be replicated to other province in Indonesia (and might be to other developing countries) because of the underlying level human capital specific and entrepneurship behaviour of the small scale maize farmer should be similar across province in Indonesia and across developing countries. Another limitation, this the research cannot detailly to identify effect each dimension of human capital specific and entrepreneurial behaviour on the IMCM adoption. Therefore, the future researchers should also use this model to empirically find out the strength of the interrelationships among the dimensions of each of the variables in the proposed conceptual model. For small scale maize farmers, researchers suggested so they should obtain human capital specific and increase entrepreneurial behaviour that are associated with their maize farming activity and have a more willingness to learn IMCM. Furthermore, extension workers should update their knowledge on entrepreneurship that will be trained to the farmers. They should also arrange suitable human capital specific and entreprepreneurial behaviour of the farmers and practice technology adoption together.

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