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Green Investment Model for Smallholder Oil Palm Plantation in Bengkalis Riau

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Abstract:

The level of smallholder oil palm productivity in the Bengkalis Regency is still low. From 2014 to 2018, the productivity level was between 1.3 tons/ha to 2.8 tons/ha. This study aims to design an investment model to enable farmers to obtain maximum and sustainable production results. The analysis used in this study was a prospective analysis. The results showed that there were eight factors identified that caused smallholder oil palm production to be unsatisfactory, such as the price of fresh fruit bunches, land fertility, use of fertilizers, labor, farmer education, farmer group interaction, conservation techniques, and use of superior seeds. The interaction between factors is an investment model that farmers need to consider before investing.

Keywords: green investment; smallholder; plantation; oil palm.

JEL Classification: Q15, O44, O13, P28, Q01.

Introduction

Investment in the agricultural sector has contributed significantly to the country's foreign exchange and is the only sector that was able to survive when the economic crisis occurred. The agricultural sector in Indonesia includes food crops, livestock, fisheries, forestry, and plantation sub-sectors (BPS 2007). The agricultural sector in the plantation sub-sector with potential in Indonesia, among others; sugarcane, tea, rubber, coffee, cloves, tobacco, coconut, and oil palm. The agricultural sector industry in the oil palm plantation sub-sector has a faster development compared to other plantations. In line with the intense political pressure from the environmental side, palm oil production continues to increase every year in line with the increasing demand in the world market. In 2014 total exports reached 24.37 million tons with a value of US$ 19.01 billion, in 2018 it increased to 29.67 million tons with a value of US$ 18.23 billion (Ditjenbun 2019).

Plantation investment with a green concept is part of sustainable economic development. Environmentally sound investment and green industry include efforts to realize a green economy. Environmentally sound investment needs to be in synergy with sustainable development policies and programs (Nurasmah 2015). Heretofore, the palm oil industry plays an important role and contributes significantly to economic growth, poverty alleviation, and improving household income distribution (Susila 2004). The problem faced in smallholder oil palm plantations is that the productivity and quality of production are still low (Kiswanto and Wijayanto 2008). The factor of declining oil palm production and productivity is due to the lack of knowledge of farmers about oil palm and also no household economic certainty for smallholder oil palm owners (Syahza *et al.* 2018). This is accompanied by low use of fertilizers and small farmers' lack of access to sources of fertilizers and pesticides, use of low-quality seeds, and poor production practices (Donough *et al.* 2010). Farmers who have ties to companies tend to be more productive than independent smallholders. The difference in yields of farmers who have ties to the company compared to independent farmers is estimated to be around 10-15% to 11-48% (Zen *et al.* 2016).

Most of Indonesia's palm oil is dominated by smallholder plantations with unfortunately low productivity. The low level of production and productivity of smallholder palm oil is an important issue for policy solutions. Indicators of suitable palm oil management Indonesia, ISPO (Indonesian Sustainable Palm Oil), through certificate ownership is expected to be a sustainable plantation solution. This certification system is expected to be an entry point for improving the management of smallholder oil palm plantations and lands that are currently being faced. Several problems faced by independent oil palm smallholders in implementing ISPO certification include: a) very complex land legality issues; b) the legality of the seeds is problematic because the origin of the seeds does not come from certified seed producers; c) knowledge of environmental management is still limited by smallholders; and land fires still occur frequently as a result of mismanagement of oil palm plantations (Purnomo *et al.* 2017). In this study, the proposed model for sustainable plantation investment is expected to be a solution to the problem of low community oil palm productivity in Bengkalis Regency, Riau.

1. Methodology

This study was conducted in smallholder oil palm plantations in Bengkalis Regency, Riau Province, Indonesia. the determination of the location was carried out purposively with the following considerations: a) The productivity of independent oil palm farmers located in the sub-district is still low as well as the low selling price of fresh fruit bunches; b) The age of the oil palm plantations in the plantations of the two areas is a mature plant; c) Around the development of oil palm plantations, many local communities carry out oil palm farming independently. This study was conducted from March 2019 to April 2020. The data needed in this study consisted of primary and secondary data. The primary data collection methods used were interviews, questionnaires, discussion, and field surveys with respondents in the research area. In-depth interviews with respondents were conducted using a structured or semi-structured questionnaire. Meanwhile, the opinion of the experts was obtained through interviews or Focus Group Discussion (FGD).

The number of attributes identified was 48 attributes, among others; a) The ecological dimensions included 10 attributes, among others: oil palm plantations damaged by floods, potential attack by plant pest organism, level of dryness of crop land, soil fertility level, land capability class, condition of the number of water sources, use of chemical fertilizers, intensity of land fires, expansion of new gardens, and level of land suitability; b) The economic dimension include 10 attributes, among others: welfare of oil palm farmers, labor costs, productivity, employment, marketing of fresh fruit bunches, fresh fruit bunches price, availability of farmer capital, farmers' income, land tenure area, and land ownership status; c) Social dimension includes 9 attributes, among others: garden legality, communication accessibility, transportation accessibility, number of farm laborers, farmer's educational level, farmer partnership opportunities, intensity of land conflict, level of independence, and the role of indigenous people; d) The technical dimension includes 10 attributes, among others: pest control, mastery of oil palm cultivation technology, availability of plantation database, plantation information system, use of superior seeds, application of conservation techniques, harvest time and method, use of agricultural machinery, standardization of the quality of palm products, and plant distance; e) The institutional dimension includes 9 attributes, among others, field extension workers, farmers who received counseling, accessibility of farmer group institutions, microfinance institutions, health service institutions, interaction between farmer group institutions, and management of economic institutions.

The number of respondents in this study was 150 independent smallholders and 23 experts consisting of experts in agriculture (Field Agricultural Extension), the Bengkalis Regency Plantation Service, Universities located in Bengkalis, Non-Governmental Organizations (NGOs). The sample of farmers was carried out randomly based on the ability of farmers to understand plantations, among others, a) oil palm farmers independently, and b) farmers who have carried out oil palm farming activities that have produced fresh fruit bunches. Meanwhile, secondary data were obtained from related agencies in Bengkalis Regency such as Agency for Regional Development, Environmental Agency, Plantation Service, and Statistics Indonesia Republic of Indonesia.

The data collected were analyzed descriptively qualitatively and analyzed using MDS (*Multi-Dimensional Scaling*). From the MDS analysis, it was obtained that sustainability status of smallholders' green investment in oil palm plantations, as well as important factors as sensitive levers to influence policies in oil palm plantation investment. The dominant factors, which are the key factors, are used to develop appropriate and implementable future policy scenarios. The software used in this analysis was IBM SPSS Statistics 22 which was modified by calculating prospective analysis.

2. Result and Discussion

2.1 Condition of Smallholder Oil Palm Farmers

Based on the results of the survey, the income level of smallholder oil palm farmers in Bengkalis is still below the regency minimum wage set. The results of the survey on the calculation of land area ownership for oil palm for the last 5 years owned by smallholders were on average 2.1 ha/farmer (household). The income of smallholder oil palm farmers received after deducting production costs is between IDR 59,000 – IDR 6,619,000 per month with an average total income of 18.7 million per year or IDR 1,559,000 per month per household. Meanwhile, the regional minimum wage of Bengkalis in 2018 was IDR 2.9 million. If UMK is used as a standard of living, it can be said that on average working as oil palm farmers in Bengkalis has not been able to cover the necessities of life. There must be other side jobs to cover the lack of monthly income then.

The income of oil palm farmers is closely related to the level of productivity. If the productivity of farmers is low, the income is low as well. Farming is said to be good if the production is increasing and can cover all production costs that have been incurred. Many factors affect the level of oil palm productivity, both in terms of soil properties and management of farm gardens.

2.2 Important Factors of Green Investment

Based on the results of data analysis on the preparation of a green investment model for smallholder oil palm plantations, 22 sensitive factors from 48 attributes were analyzed to increase the productivity of sustainable plantations. The 22 sensitive factors consist of 5 dimensions, including the ecological dimension, the economic dimension, the social dimension, the technological and infrastructure dimension, and the institutional dimension.

On the ecological dimension, there are a) conditions of the number of water sources, b) the use of chemical fertilizers, c) soil fertility level, d) intensity of land fires, e) the level of land dryness. On the economic dimension, there are a) the price of Fresh Fruit Bunches, b) Fresh Fruit Bunches marketing, c) employment, d) availability of farmer capital, and e) farmers' income. on the social dimension, there are a) partnership opportunities, b) farmer's education level, c) the level of independence of farmers, d) the role of indigenous peoples. On the technological dimension, there are a) application of conservation techniques, b) use of superior seeds, c) plantation information system, and d) database availability. On the institutional dimension, there are a) utilization of the financing service scheme, b) Microfinance Institutions (MFIs), c) farmers who receive counseling, and d) interaction between farmer group institutions. Table 1 is a recapitulation of the score entry from the expert analysis.

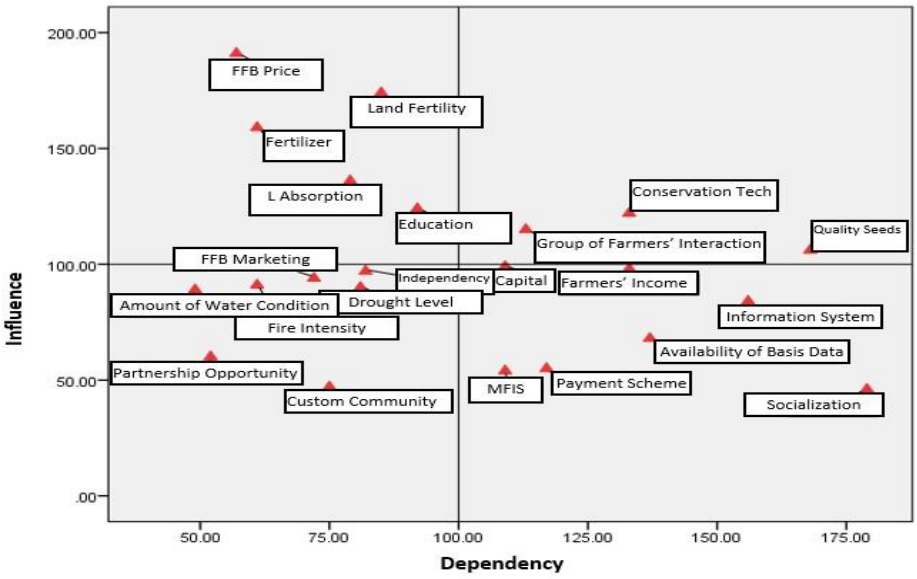
Based on table 1 above, a diagram of the influence and dependence of factors can be drawn up. This diagram presents the key factors that most influence the green investment of smallholder oil palm plantations. Factors that fall into quadrants I and II are key factors in a system that has strong influence characteristics with low/strong dependence on the system (Suwondo *et al.* 2011). From the results of the analysis, it can be concluded that eight key factors influence the green investment of smallholder oil palm plantations in the Bengkalis Regency as visualized in Figure 1 as follows.

Table 1. The value of the global influence and dependence of each factor that is sensitive to smallholder oil palm investment in the Bengkalis Regency

Level factor	Global influence	Global dependency	Direct influence	Direct dependency
Amount of water condition	18,00	9,83	0,89	0,49
Fertilizer	32,00	12,33	1,59	0,61
Land fertility	35,00	17,17	1,74	0,85
Fire intensity	18,33	12,33	0,91	0,61
Drought rate	18,17	16,33	0,90	0,81
Fresh Fruit Bunches Price	38,33	11,50	1,91	0,57
Fresh Fruit Bunches Marketing	19,00	14,50	0,94	0,72
L Absorption	27,33	15,83	1,36	0,79
Capital	19,83	21,83	0,99	1,09
Farmer's income	19,67	26,83	0,98	1,33
Partnership opportunity	12,00	10,50	0,60	0,52
Education	25,00	18,50	1,24	0,92
Independency	19,50	16,50	0,97	0,82
Custom community	9,50	15,00	0,47	0,75
Conservation tech	24,50	26,67	1,22	1,33
Quality seeds	21,33	33,83	1,06	1,68
Information system	17,00	31,33	0,84	1,56
Availability of basis data	13,67	27,50	0,68	1,37
Payment Scheme	11,17	23,50	0,55	1,17
MFIS	10,83	22,00	0,54	1,09
Socialization	9,33	36,00	0,46	1,79
Group of Farmers' interaction	23,17	22,83	1,15	1,13
Total	442,67	442,67		
Average	20,12	20,12		

Source: Researcher Data, 2020.

Figure 1. Key factors influence the green investment of smallholder oil palm plantations



Source: Researcher Data, 2020.

Based on Figure 1, it can be seen that the factors that influence smallholder oil palm plantation investment have a high influence with a low level of factor dependence and a high level of dependence (quadrant I and quadrant II). By taking into account the position of these variables, there are 8 (eight) key factors included in quadrant I and

quadrant II, including 1) Fresh Fruit Bunches price, 2) soil fertility, 3) use of fertilizers, 4) employment, 5) farmer's educational level, 6) farmer groups interaction, 7) application of conservation techniques, and 8) use of superior seeds. Quantitatively, the number of these key variables is included in the good category. Bourgoise (2007) stated that an adequate number of key variables in a prospective analysis ranged from 4-8 variables. More than 8 variables will be difficult to create scenarios, while less than 4 variables will result in very simple scenarios and a lot of information that is not accommodated.

3. Green Investment Model

The green investment model for smallholder oil palm plantations is an interaction of functions such as Fresh Fruit Bunches prices (h), land fertility (s), fertilizer use (p), employment (t.k), farmer educational level (d), group interaction (i), application of conservation techniques (k), and use of superior seeds (b). To realize these functions, this can be done through the following methods and strategies:

[1] **Fresh Fruit Bunches Prices (P)** are indicated by price developments over the last 5 years showing unstable fresh fruit bunches prices due to Fresh Fruit Bunches prices not referring to Minister of Agriculture Regulation No. 1 of 2018 concerning Guidelines for Determining the Purchase Price of Fresh Fruit Bunches. Hitherto, oil palm farmers still sell their products to existing buyers (middlemen) at low prices. Thus, the government's role is needed to assist smallholder farmers through the application of regulations and easy access to partnerships to become plasma farmers. Thus, the marketing of smallholder Fresh Fruit Bunches can be controlled. Furthermore, the domestic downstream industry must be improved to take the prices to be better and more stable.

[2] **The Level of Land Fertility (F)** or the availability of nutrients is important for the growth and production of oil palm plantations. Currently, oil palm productivity is still low. Thus, various methods and treatments are carried out in the plantation area to increase productivity. Water management control is a key factor in realizing a sustainable palm oil land management system, construction of embankments, ditches, and canals is appropriate and effective management to maintain the level of soil fertility. The better the implementation of water management, the better the level of agricultural productivity. The level of soil fertility is also influenced by the nature of the acidity or alkalinity of the soil which is expressed by the pH value. To reduce the acidity of the soil, it is necessary to use good processing techniques. Peat soil has high acidity; thus, it is necessary to limit the soil. More than 50 percent of the land in Bengkalis Regency is peat soil. The productivity of oil palm plantations on peatlands is lower than the average productivity on other mineral lands (Suwondo *et al*. 2011). Soewandita (2008) stated peat soil has a pH value of less than 4 and managed peat soil has a pH of more than 4. Thus, it is necessary to pay attention to the management. Therefore, the soil becomes fertile and the productivity level can meet the expectations.

[3] **Fertilizer Use (U),** the effectiveness and efficiency of fertilization are determined by proper fertilization management. Effective and efficient fertilization refers to the 4R concept, namely, the right type, the right dose, the right time, and the right way. Through proper fertilization, it is one of the efforts to increase productivity to increase oil palm production. The basic considerations used in determining the type of fertilizer include plant age, symptoms of nutrient deficiency, land conditions, and fertilizer prices (Poeloengan *et al.* 2003). The basis for formulating fertilizer recommendations is the result of leaf analysis, soil type, nutrient status, and production potential. One of the factors that influence the time of application of fertilizer is the climate (rainfall). The difficulty of implementing timely fertilization is mainly due to the occurrence of climate deviations (rainfall) that are difficult to predict, namely the water content in the soil that does not meet the requirements for fertilization applications (Adiwiganda 2007). Optimum fertilization is done when the rainfall is 100-200 mm/month and the minimum is at 60 mm/month. Fertilization is stopped and fertilization can be carried out again if it has rained 50 mm/10 days (Panggabean & Purwono 2017).

[4] **Labor Absorption (L)**, for the last 5 years the absorption of labor in oil palm plantations is very small, and even more, people prefer to be Indonesian migrant workers rather than cultivating their plantations. This is because, in addition to the low price of fresh fruit bunches (unprofitable), the production is also low. The decline in production yields can be caused by various factors including the low quality of human resources, lack of knowledge of planters, the lack of extension activities that directly tough farmers due to the limited quantity and quality of agricultural extension workers. Syahza *et al.* (2018) stated the need for skilled labor has increased in line with the changing orientation of the agricultural sector from subsistence to commercial. The need for skilled and knowledgeable workers is increasingly needed to be able to compete. The workforce needed not only masters science and technology but is also able to overcome various problems at work.

[5] **Farmer Educational Level (E)**, to maximize farmers' production and productivity level, can be overcome by increasing the participation of farmers in various training extension activities and various other non-formal activities to understand and master technology. Apart from that, the level of agricultural education (plantation) needs to be introduced to school students. Thus, students know the potential of existing natural resources that should be developed. If this is not done, the community does not know the potential of oil palm and even thinks about the negative impacts of existing plantations without a clear source of information.

[6] **Farmer Group Interaction (I)**

Farmer group interaction is one of the efforts or means of cooperation between groups to achieve group goals. Farmer groups play an important role as learning media for farmers to increase farm productivity. Farmer groups are formed based on solving farmers' problems independently. The interaction between members and administrations is manifested in group activities in the form of group meetings, counseling activities, knowledge transfer processes, group administration management, and infrastructure improvements. Strengthening farmer groups can grow by increasing the synergistic relationship between farmer groups and the social environment. The results of the field survey at the research location show that the majority of smallholder oil palm farmers do not have access to capital for the smooth running of their farming capital. More than most of 87.3 percent of oil palm farmers in Bengkalis do not have access to capital in financial institutions at various levels of education. This is an indication that the interaction between farmers and the interaction between farmer groups must be improved again. Thus, communication between other institutional groups does not break.

[7] **Application of Conservation Techniques (C)** is an effort that can be done by farmers to thrive plants. Solid and Water Conservation is an effort to protect, restore, improve, and maintain soil functions on land following the ability and land use to support sustainable development and sustainable life (*UU No. 37*, 2014). Idjudin (2011) grouped two soil conservation methods, namely mechanical conservation methods and vegetative conservation methods. Mechanical conservation methods in the form of building erosion prevention and mechanical manipulation of soil and soil surface. Meanwhile, the vegetative method is aimed at reducing the energy of raindrops hitting the soil surface, reducing runoff velocity, increasing infiltration capacity, and reducing soil water content. The seriousness of technology users in carrying out soil conservation techniques will determine the success of increasing degraded dry land. Therefore, it is necessary to apply good and correct conservation techniques to increase oil palm production and productivity. Education and knowledge of conservation techniques by field extension workers need to be strengthened as an additional insight into sustainable agricultural practices.

[8] **Use of Superior Seeds (S),** the problem will oil palm plantations in community plantations is that they still use uncertain seeds on the grounds of cheap seed prices. The use of uncertain seeds can affect the level of production and the quality of farmers' crops is not optimal. Oil palm farmers who use certified superior seeds can produce 66.34 percent higher productivity than non-certified/fake seeds (22.2 tons of Fresh Fruit Bunches/ha/year and 13.3 tons of Fresh Fruit Bunches/ha/year) and also the rate of return on investment in superior seeds is faster than uncertain feeds (Kariyasa, 2015). Several things that become the basis of consideration for farmers in buying seeds include affordable prices, guaranteed quality, and ease to get. Purchases of fake and poor-quality seeds can occur due to a lack of information and knowledge for farmers and the existence of counterfeit seeds. In obtaining oil palm seeds, there are two ways for farmers to obtain them, namely buy buying, and by producing their own. Based on the sample analysis of independent smallholders in the field, most farmers obtain seeds by producing their own, namely using seeds from oil palm seeds that bear large and dense fruit. Therefore, it is advisable to increase productivity through the use of certified superior seeds as a priority of oil palm farmers to replace old/uneconomical plants. The role of government through field extension training is very necessary because it is a place to get information for farmers to get higher quality seeds.

The green investment model of the Bengkalis smallholders oil palm plantations can be realized by making improvements to the dominant key factors which can be formulated in the functional relationship as follows:

$$GI = f\ (p, i.f, u, l, e, i, c, s)$$

Whwew: GI - green investment model of people's plantation; f - interaction function; p - fresh fruit bunches price; i.f - land fertility; u – fertilizer; l – labor; e - farmers' education; I - interaction of farmers' group; c - conservation technique; s - quality seeds.

Conclusion

Smallholder oil palm plantations in Bengkalis Regency need serious management improvements. Based on the results of the prospective analysis, there are 8 (eight) factors that dominantly affect the level of low productivity as follows. Fresh Fruit Bunches prices are unstable because the middleman's game is taken into consideration before continuing investment; the level of soil fertility is still low due to immature soil management techniques and drainage systems; the use of fertilizers that are not yet effective and efficient because they do not fully refer to the 4R (right type, right dose, right time, and right method); Labor absorption is still low because of low human resources skills, the income of working as an oil palm farmer is low and the motivation is also low; The level of education is still minimal, although almost most (48.7%) have graduated from senior high school, but the lack of knowledge of goof and correct farming methods will also result in minimal results; Farmer group interaction is still weak causing a lack of knowledge on everything related to plantation development; the application of conservation techniques is still low will result in a low level of land fertility; and the use of certified seeds is still minimal, which affects the minimum production results that will be obtained. Therefore, improving the key factors of the green investment model as described will create sustainable oil palm plantations.

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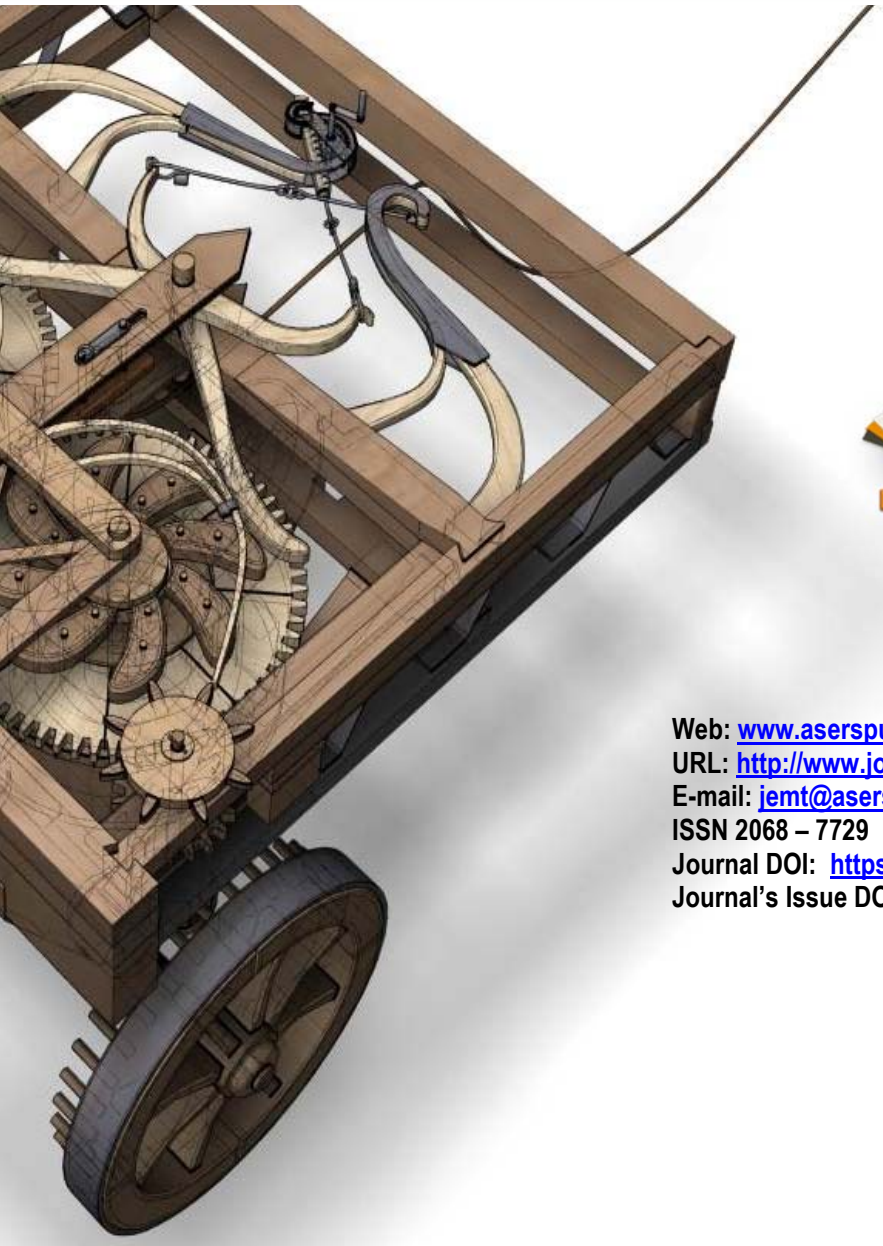

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