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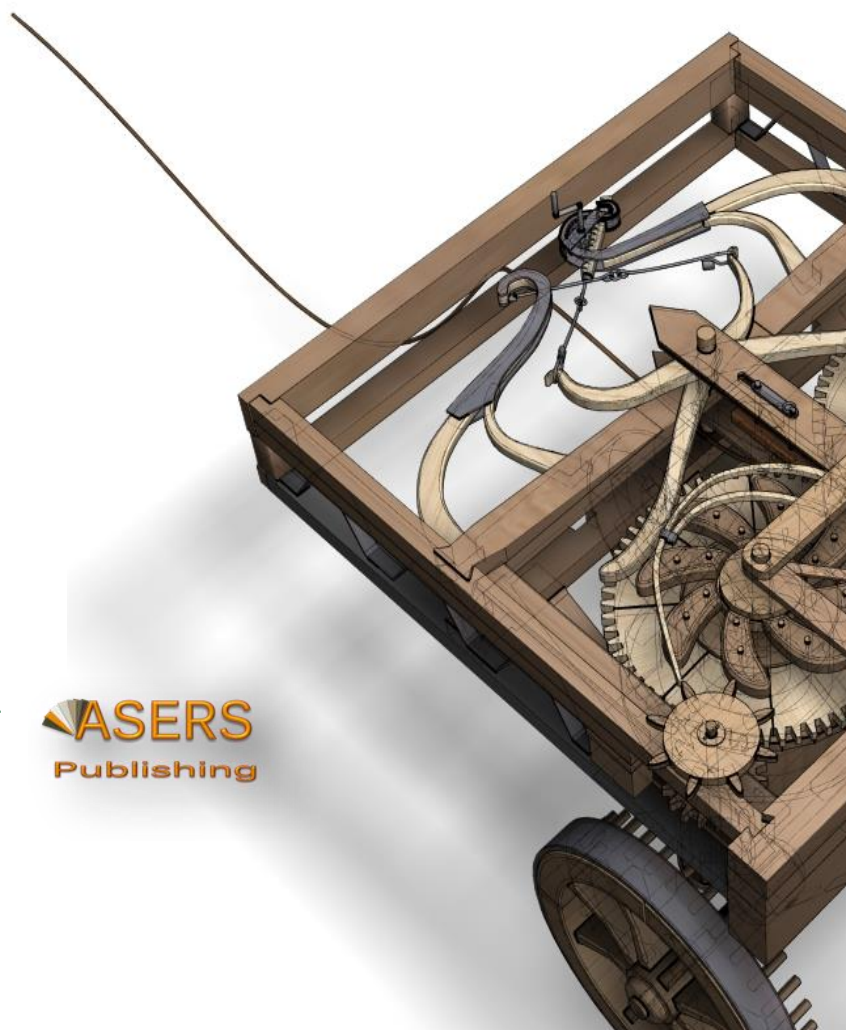
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Table of Contents:

	Methods of Combating Offenses in the Field of Ecology	
1	Rostyslav SHCHOKIN, Vasyl OLIINYK, Oleksandr AMELIN, Yevhen BONDARENKO, Vitaliy MAZIYCHUK, Dmytro KYSLENKO	5
	The Use of Garden Plants - A Form of Balinese Local Wisdom in the Conservation	
2	Anak Agung Ketut DARMADI, Ni Luh WATINIASIH, Anak Agung Gde Raka DALEM, Ni Made GARI	16
	The Extent of Considering Environmental Crimes as a Manifestation of Economic Crimes	
3	Mohamad ALSHIBLE, Hamzeh ABU ISSA, Tareq AL-BILLEH	23
	Study of the Current State, Problems and Potential of the Waste Management System Affecting the Development of the Green Economy of the Region	
4	Sergey BESPALYY, Yelena GRIDNEVA, Gulnar KALIAKPAROVA	32
	Participation in Household Hazardous Waste Management: A Case Study of the Dam Community, Northeast of Thailand	
5	Sariya INTASIN, Nuchanart SRAKAT, Wachirakiat BAOTHONGCHAN, Suttiwan INTAKANOG, Phajongjid PRATUMCHAD, Sasithorn PECHRSAN, Ananya POPRADIT	44
	“Green Products”: A Review with the Consumer Buying Process Framework	
6	Yanghai CAO	52
	Biofuel Production from Animal Waste in Northeastern of Libya: Experimental and Simulation Investigations	
7	Monaem ELMNIFI, Abdelnaser OMRAN, Magdi ALMOSMARY, Rahel G. RAHEL	67
	Impact of State and Legal Regulation on the Sustainable Development of Agricultural Territories and Improving the Standard of Living of the Population	
8	Pavel A. KALASHNIKOV, Arslan KULANOV, Erkin N. NESIPBEKOV, Assel KAISHATAYEVA, Shyrin M. KANTARBAYEVA	82
	The Extent of Constitutionalizing the Environmental Rights as One of the Anchors to Keep a Healthy, Clean Environment: A Difficult Balance between the International Agreements and the Jordanian Constitution's Restrictions	
9	Ali AL-HAMMOURI, Tareq AL-BILLEH, Abdullah ALKHSEILAT	89
	Modeling Lasolo Watershed Sedimentation and Mangrove Root Growth at the Lasolo Coast in North Konawe, Indonesia	
10	Nurul KHAKHIM, Farid YASIDI, Djati MARDIATNO, Agung KURNIAWAN	98
	Springs Distribution and Biophysical Mapping as a Strategy to Preserve Water Sources in Semarang City, Indonesia	
11	Nana Kariada Tri MARTUTI, Dewi Liesnoor SETYOWATI, Margareta RAHAYUNINGSIH, Nur Kusuma DEWI, Wahid Akhsin Budi Nur SIDIQ, Dhita Prasisca MUTIATARI	113
	Improving the Environmentally Oriented Activities of Entrepreneurship	
12	Aina AIDAROVA, Tazhikul MASHIROVA, Ainur ABILKASSYM, Aliya ATENOVA, Zhanna SHUGAIPOVA, Yerzhan ZHUSSUPOV	126
	Urban Ecosystem Network. Standardization's Effects upon Development of Green Open Spaces in the Arosuka River Flow Area	
13	G. GUSMAL, Agus IRIANTO, Susi EVANITA	143
	Role of Microfinance in Mitigating Disasters in Pakistan	
14	Hafiz Waqas KAMRAN, Abdelnaser OMRAN	150

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15	Green Banking Tools for the Implementation of a State's Environmental Policy: Comparative Study	160
	Bayanslu MARKHAYEVA, Alisher Serikbolovich IBRAYEV, Madina BEISENOVA, Gaukhar SERIKBAYEVA, Milton ARRIETA-LÓPEZ	
16	The Role of the Environment Committees in the Nineteenth Parliament for the Year 2020 in Studying Matters Related to Environmental Affairs in Jordan	168
	Tareq AL-BILLEH, Hamzeh ABU ISSA	
17	Environmental Pollution Crime	176
	Noor ALHENDI, Muamar SALAMEH	
18	Environmental and Socio-Economic Development Strategy of Depressed Regions	181
	Dana AKISHEVA, Kanat ADILBAYEV, Zhibek ABYLKASSIMOVA, Aigul ADILBAYEVA, Zauresh NURGALIEVA	
19	Circular Economy in Ukraine on the Way to European Integration: Directions for Sustainable Management during the War and Post-War Recovery	194
	Viktoriia SHVEDUN, Volodymyr BULBA, Liubov BOZHKO, Lesia KUCHER, Valentyna KHOLODOK, Oleksandr IHNATIEV	
20	Maintaining Environmental Sustainability through Public Financing. Insights from Kazakhstan	207
	Anar KURMANALINA, Galiya TURMAKHANBETOVA, Zagira ISKAKOVA, Abzal MUKUSHEV, Nazgul KHAMITKHAN, Ruslana ICHSHANOVA	
21	Sustainable Development of Rural Areas in the Conditions of Globalization: Ukrainian Realities	217
	Tetiana LISOVA, Svitlana SHARAPOVA, Viktoriia BREDIKHINA, Liudmyla LEIBA	
22	Climate Change Impacts and Environmental and Water use Behaviors, Beliefs and Perceptions	225
	Ismail BANO, Nirmala DORASAMY, Faizal BUX	
23	Overview of Projects Challenges to Achieve Transformations in Food Industry	236
	Laura BAIZHANOVA, John CHRISTIANSEN, Duissekul KUNANBAEVA	
24	The Role of Press Tours in the Development of Park Recreation Complexes	249
	Olesia DOLYNSKA, Ihor SMYRNOV, Inna SHOROBURA, Volodymyr MERCHANSKYI, Ihor TSURKAN	
25	Developing Nature Interpretation and Alternative Management Strategies to Promote Pro-Environmental Behaviors among Visitors to Thailand's National Parks	261
	Pitoon AMORNWITTHAWAT, Noppawan Tanakanjana PHONGKHIEO, Thawan NIEAMSUP	
26	Ecotourism Routes in Ugam-Chatkal State Natural Park and Their Organization	272
	Ulugbek NARMANOV, Otabek NARMANOV, Mirzaeva AZIZAKHAN	
27	The Amount of Tourist Waste in the Altai Mountains. Mongolia and Kazakhstan Cases	283
	Badyelgaj YERBAKHYT, Bauyrzhan KAPSALYAMOV, Gulnur SASPUGAYEVA, Amarjargal MUNKH-ERDENE, Zhazgul TUSSUPOVA	

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Journal of Environmental Management and Tourism is an interdisciplinary research journal, aimed to publish articles and original research papers that should contribute to the development of both experimental and theoretical nature in the field of Environmental Management and Tourism Sciences.

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The Use of Garden Plants - A Form of Balinese Local Wisdom in the Conservation

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Abstract:

Plants grown in the yard of a private home create a comfortable atmosphere and maintain human relations with the environment. Yard plants are often used for decoration, protection, ceremonies, fruits, vegetables, spices and medicine (family medicinal plants). Utilization of garden plants is a form of Balinese local wisdom in the conservation of a plant called *Tri Hita Karana*. This research, therefore, examines the use of homestead plants in Banjar Angga Sari, Bukit, Jimbaran, Badung, Bali, Indonesia. Giving attention to local Balinese culture, the study examines locations that have been converted from fields to housing. Interviews and field observations were used to collect data. In Banjar Angga Sari, yard plants are grown for the following purposes, which are presented with their corresponding utility values: ornamental (16%), protection (14%), fruit (13%), ceremonies (12%), vegetables (10%), medicine (8%), anti-pollution (7%), spices (6%), anti-mosquitoes (5%) and animal feed (4%).

Keywords: diversity; garden plant species; use value; urban area; conservation.

JEL Classification: O13; Q26; Q57; R11.

Introduction

The activity of planting plants in the yard of a private home is often called "gardening". Gardening is advantageous, as it helps people produce meaningful amounts of quality food, increase food security (Porter 2018) and improve their health (e.g., by increasing their levels of physical activity and their intake of fruits and vegetables). For Balinese people, gardening is one way to apply the *Tri Hita Karana* teachings – the three teachings of virtue by which the Balinese live: the relationship between humans and their creators or God Almighty, the relationship between humans and others and the relationship between humans and their

environment. Gardening is part of the human relationship with the environment (i.e., plants, soil and global ecosystems). According to Bijkerk *et al.* (2018) the current gardening trend in urban areas is to create a 'green city' atmosphere, consume organic garden products and maintain the human relationship with the environment. The species which residents choose to plant in their yards may be intended for various purposes: medicine, protection, decoration, ceremonies or produce (e.g., fruits, spices or vegetables). Suciwati *et al.* (2021) once reported on the Tidung Tribe, a tribe that lives in North Kalimantan, Indonesia using several species of plants to meet their basic needs, namely for food (ngakan), shade (baloy), health / medicine (sihat), traditional ceremonies, and clothing (memana). Often, each plant offers several benefits. For example, some ornamental plants can also be used as medicinal plants, and some protective plants may be used for medicinal, ornamental or ceremonial purposes. Prerna *et al.* (2015) have studied 20 species of ornamental plants that can be used as medicinal plants, including *Adhatoda vasaka*, *Bryophyllum calycinum*, *Coleus aromaticus*, *Hibiscus rosasinensis*, *Jasmine officinale*, *Jasminum sambac*, *Nelumbo nucifera*, *Nyctanthes bortristis*, and *Rosa centifolia*.

In urban areas with narrow yards, plants often serve decorative purposes. People seeking ornamental plants often choose shrubs or other plants in the shrub category. Shrubs usually grow to less than 5 metres, so they suit narrow yards. Kato *et al.* (2017); Darmadi *et al.* (2019) report that the plants planted in the front of a house – an area of the yard that is called 'telajakan' in Bali – are usually herbs, shrubs or trees. In several Balinese villages (e.g., Cengkilung Denpasar and Penglipuran Village, Bangli, Bali), the community uses plants grown in the telajakan of houses as decorations, as part of the family economy, for ceremonies, for protection and for medicine. In these two villages, the herbs, bushes and trees grown in the telajakan are dominated by Japanese lawn grass (*Zoysia japonica*), garden balsam ('red flower'; *Impatiens balsamina*), croton ('wide leaf'; *Codiaeum variegatum*), dwarf umbrella trees (*Schefflera grandiflora*), cabbage trees (*Cordyline australis*) and Cananga trees (*Cananga odorata*).

Often, people who do not have large yards but still want to plant a garden to obtain produce, plant their plants in pots. Residents with larger yards usually grow plants that are useful for protection, fruit and medicine.

1. Methodology

Structured interviews served as this study's main data collection method. The following questions were posed:

1. What plants do you know are in your yard?
 2. How would you sort those plants from most useful to least useful?
 3. What benefits can you obtain from these species?
 4. How would you rank those benefits from most important to least important?
- Once these values had been obtained, they were entered into a matrix for analysis.

To gather representative data, several form-making models were used, all of which were extracted from the models developed by Sheil (2004); Yuliati *et al.* (2009); Putri *et al.* (2014).

Figure 1. Location: Banjar Angga Sari, Bukit, Jimbaran, Badung, Bali, Indonesia (Samsung Map)

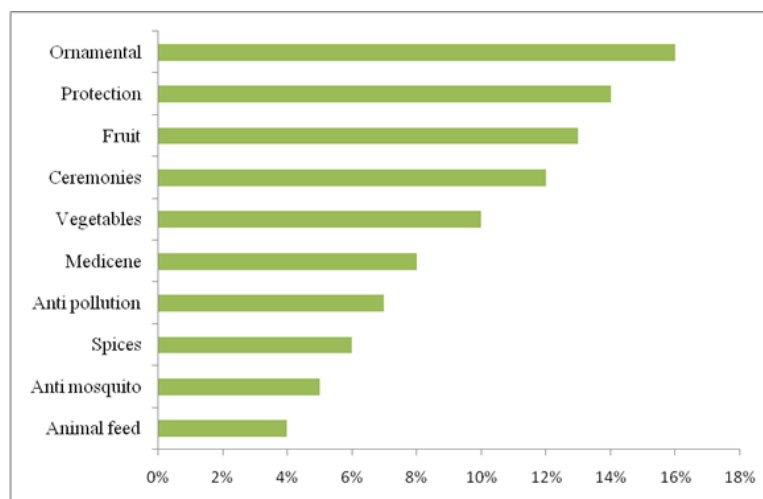


This data collection method was intended to provide an overview of the most crucial plant species in the sampled area by weighting the relative importance of the most important plant taxa listed for each use category (up to ten per category).

2. Results and Discussion

The results found that 127 different plant species have been planted in the yards of private homes by the residents of Banjar Angga Sari, Bukit, Jimbaran, Badung, Bali, Indonesia. These 127 species were planted for ten different uses: ornamental (16%), protection (14%), fruit (13%), ceremonies (12%), vegetables (10%), medicine (8%), anti-pollution (7%), spices (6%), anti-mosquitoes (5%) and animal feed (4%) (Figure 2)

Figure 2. Some benefits of the plants planted by the residents of Banjar Angga Sari, Bukit, Jimbaran, Badung, Bali, Indonesia



Ornamental plants were planted most often by the sampled residents because their yards are an integral part of their homes, which are located on plots that are only around 40m². Given the size of the home locations, most plants were shrubs or members of the shrub family, such as desert rose (*Adenium obesum*), rose periwinkle (*Catharantus roseus*), flamingo lily (*Anthurium andraeanum*), tail flower (*Anthurium crystallinum*), wave of love (*Anthurium plowmanii*), Chinese evergreen (*Aglaonema crispum*), Macarthur palm (*Ptychosperma macarthurii*), and caricature plant (*Graptophyllum pictum*) (Table 1). Dominance of ornamental plants planted in the yard by the balinese community has been reported by researchers before. Kato *et al.* (2019) is a plant planted in telajakan aimed at aesthetic, economic and ritual. One of the benefits of gardening by planting ornamental plants is to get aesthetic (Davoren *et al.* 2016; Chalmin-Pui *et al.* 2021)

Table 1. The species of ornamental plants planted by the residents of Banjar Angga Sari Bukit Jimbaran Badung Bali are sorted from the most to the least common species

No	Local name	Growth rate category	Species name	Family name
1	Desert rose	shrub	<i>Adenium obesum</i>	Apocynaceae
2	Rose periwinkle	shrub	<i>Catharantus roseus</i>	Apocynaceae
3	Flamingo lily	shrub	<i>Anthurium andraeanum</i>	Araceae
4	Tail flower	shrub	<i>Anthurium crystallinum</i>	Araceae
5	Wave of love	shrub	<i>Anthurium plowmanii</i>	Araceae
6	Chinese evergreen	shrub	<i>Aglaonema crispum</i>	Araceae
7	Caricature- plant	shrub	<i>Graptophyllum pictum</i>	Acanthaceae
8	Frangifani	tree	<i>Plumeria acuminata</i>	Apocynaceae
9	Macarthur Palm	tree	<i>Ptychosperma macarthurii</i>	Arecaceae
10	Coconut	tree	<i>Cocos nucifera</i>	Arecaceae

The roots of shrubs are not so large that they do not interfere with house building. Banjar Angga Sari has a lot of land converted into residential areas, lodging or villas for tourism. The residents' houses are not very large with a narrow yard, house area ranges from 100 - 300 m². According to Irwan and Sarwadi (2017), the dominant plants planted in urban areas with narrow yard areas are ornamental plants.

In addition to ornamental plants at the shrub or shrub level, there are also ornamental plants at the tree category level, namely frangipani (*Plumeria acuminata*). The species of this plant consist of various kinds, such as Bali white frangipani, Bali Red frangipani, Orange frangipani, Sandalwood frangipani and others. This plant is planted because of the fragrant smell of the flowers, the color of the flowers is colorful, the shape of the stem when it is old has an artistic shape. This plant is also planted in Bali because the flowers can be used as material for Balinese Hindu religious ceremonies (Tabel 1, Figure 3). According to Sanjaya *et al.* (2020) identified in Bali, there are about 38 varieties of frangipani plant species based on the characteristics of their stature, stems, leaves, and flowers. Ornamental plants are planted because of their attractive, colorful flowers as well as their stature shape, interesting stems, and leaves. According to Dey and Mukherjee, (2015) the frangipani plant with its aesthetic value so that this plant is not only a decoration, but the flowers are also often used as a gift to the gods.

Plants grown in the Banjar Angga Sari area are not only ornamental plants but also function as protection. This is in accordance with the topography of the Banjar Angga Sari area with calcareous soil and hot temperatures so that it needs large plants or in the tree category as protection or shade from a large number of leaf branches. Besides being an ornamental plant, the Frangipani is not only an ornamental plant because of its artistic stems, which is getting older with bigger and more artistic stems, as well as other vegetative tools such as twigs, leaves that can be used as protection, but often these plants are faced with nutrient-poor habitat conditions and climate which is not supportive. Plant species that are widely planted as protection are Tropical almond (*Terminalia catappa*) (Figure 3), fig trees (*Ficus indica*), cashew (*Anacardium occidentale*), agathi (*Sesbania grandiflora*). Tropical almond (*Terminalia catappa*) can be used as a shade plant and ornamental plant in the garden because this plant can reduce environmental temperature and provide coolness (Marjenah *et al.* 2021). Ficus plants spread over several heights. This plant is often used as animal feed, habitat restoration or forest restoration (Cottee-Jones *et al.* 2016; Susilowati *et al.* 2021). Besides serving as shade, the protective plants can also be used as vegetables or forage for livestock. Shade plants can help reverse some of the adverse social, economic and environmental impacts of urbanization. According to Aguiar *et al.* (2019) protective plants are also beneficial for the growth and survival of other species in an ecosystem.

Fruit plants are also planted in the yard of Banjar Anggra Sari residents. Fruit crops are grown to take advantage of their edible fruit. Based on the 10 most fruit tree sequences planted in a row are coconut (*Cocos nucifera*) 23% (Figure 3), Papaya (*Carica papaya*) 19%, Mango (*Mangifera indica*) 18%, Banana (*Musa x paradisiaca*) 13%, sugar apple (*Annona squamasa*) 13%, Guava (*Psidium guajava*) 4%, water apple (*Syzygium aqueum*) 3%, soursop (*Anona muricata*) 3%, Pomelo (*Citrus maxima*) 2%, Kaffir lime (*Citrus hystrix*) 2% (Figure 4, Table 2).

Figure 3. a. Frangipani (*Plumeria acuminata*), b. Tropical almond (*Terminalia catappa*), c. Coconut (*Cocos nucifera*)



Figure 4. Percentage of fruit trees planted by Banjar Angga Sari Residents

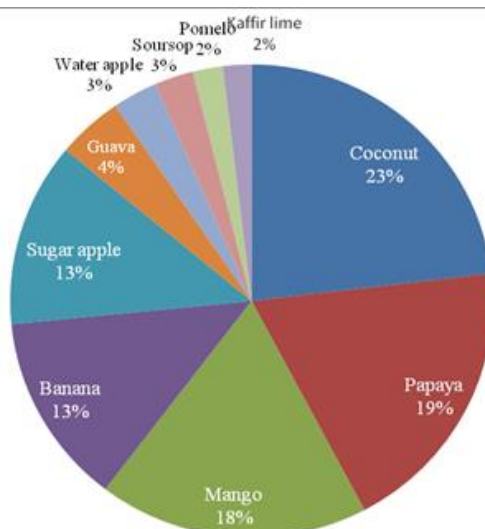


Table 2. Fruit plant species planted by the people of Banjar Angga Sari Bukit Jimbaran Badung Bali, according to 10 species from the most to the least common species

No	Local name	Species name	Family
1	Coconut	<i>Cocos nucifera</i>	Arecaceae
2	Papaya	<i>Carica pepaya</i>	Caricaceae
3	Mango	<i>Mangifera indica</i>	Anacardiaceae
4	Banana	<i>Musa paradisiaca</i>	Musaceae
5	Sugar apple	<i>Anona squamosa</i>	Annonaceae
6	Guava	<i>Psidium guajava</i>	Myrtaceae
7	Water apple	<i>Syzygium aqueum</i>	Myrtaceae
8	Soursop	<i>Anona muricata</i>	Annonaceae
9	Pomelo	<i>Citrus maxima</i>	Rutaceae
10	Kaffir lime	<i>Citrus hystrix</i>	Rutaceae

Fruit plants grown in the yard can increase family income, they can also be eaten alone compared to buying them at high prices at the fruit shop. The fruit plants planted often also function as ceremonial plants.

Figure 5. Coconut fruit and coconut leaves (janur) are used in Balinese Hindu religious ceremonies. A. Coconut leaves (janur), B. Coconut fruit



The coconut plant besides the fruit to be eaten, the fruit is also used as a ceremonial ingredient. Other parts other than fruit such as leaves (*janur*) as a ceremony material (Figure 5). Coconut water contains various minerals and is often used as an energy drink for athletes. while the kernel contains carbohydrates, proteins, fats, vitamins and phytochemicals (Parmar *et al.* 2020). Papaya plants (*Carica papaya*) contain phytochemical compounds, namely

phytosterols, tocopherols, flavonoids, alkaloids, and carotenoids. These phytochemical compounds can be used to treat inflammation, hyperglycemia, fertility-related complications hypertension and has anticarcinogenic activity (Dotto and Abihudi 2021).

Conclusion

Plants have an important meaning for the people of Banjar Angga Sari Bukit Jimbaran Badung Bali. This is evidenced by the existence of plants planted by residents even though the area of the plant is getting narrower due to the influence of changes in land use from fields to residential land due to the influence of tourism. Most of the plants planted by Banjar Angga Sari residents are used for decoration. Some plants have a dual function, in addition to being ornamental plants, they also function as protective or ceremonial plants. This is in accordance with changes in land use, topography, and the culture in which the plant is planted.

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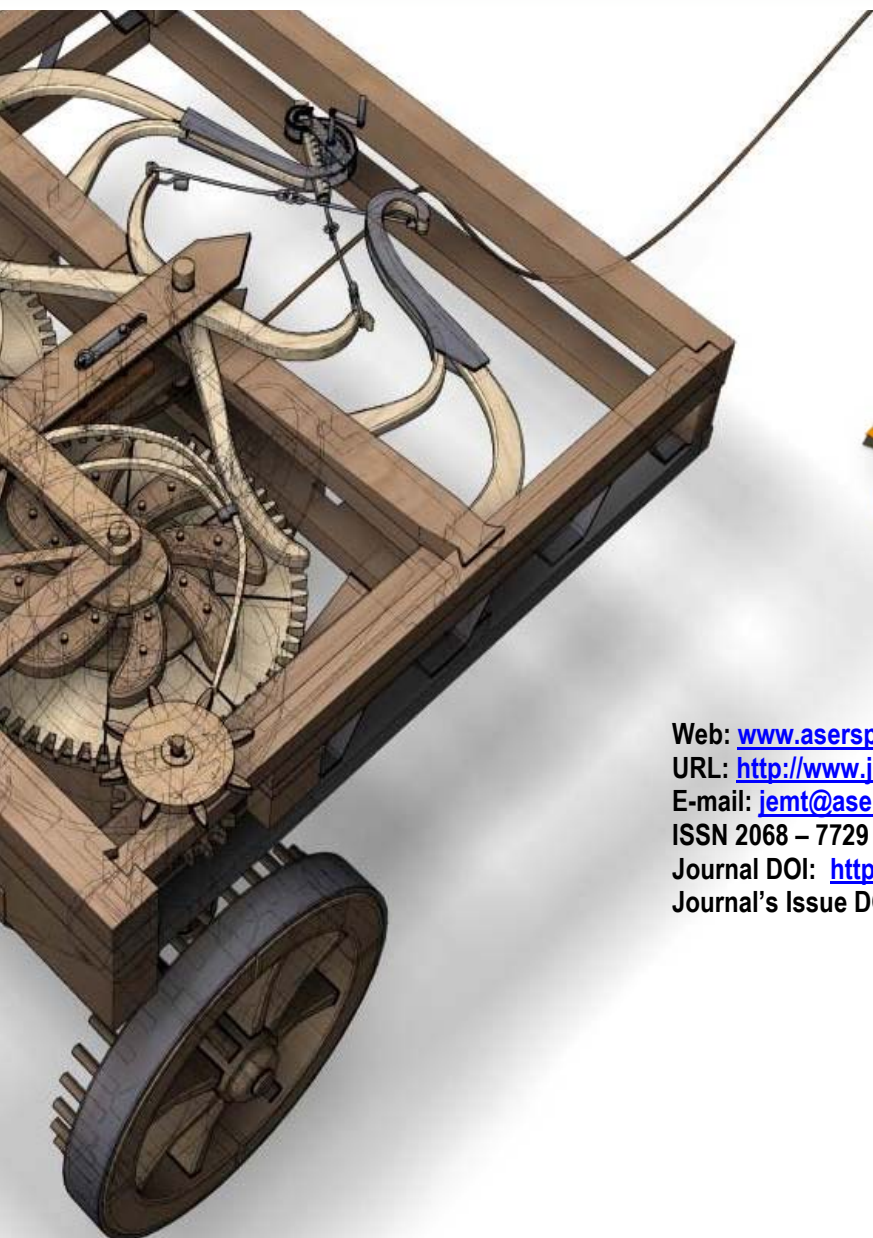
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