Al-Azhar Journal of Agricultural Engineering 7 (2024) 47

Contents lists available at Egyptian knowledge Bank (EKB)

Al-Azhar Journal of Agricultural Engineering

journal homepage: https://azeng.journals.ekb.eg/

Full length article

Rediscovering Siwi palm pruning products and available servicing technology for sustainable rural development

Ahmed M.A. [a, *], Shetawy M.A. [b], Elkaoud N.S.M. [c]

[a] Department of Agricultural Structures and Environmental Control Engineering, Faculty of Agricultural Engineering (Assuit Branch), Al-Azhar University, Assuit, Egypt.
[b] Department of Agricultural Structures and Environmental Control Engineering, Faculty of Agricultural Engineering, Al-Azhar University, Cairo, Egypt.
[b] Department of Agricultural Machinery and power Engineering, Faculty of Agricultural Engineering (Assuit Branch), Al-Azhar University, Assuit, Egypt.

ARTICLE INFO

Handling Editor - Dr. Mostafa H. Fayed

Keywords:
Self-belayed climbing
Fronds
Midrib
Petioles.

Agricultural Structures and Environmental Control Engineering

ABSTRACT

This manuscript aimed to rediscover Siwi palm pruning products and available servicing technology for sustainable rural development. Three commercial date palm plantations were selected in Assiut Governorate and the cities of Dakhla and Kharga in New Valley Governorate. Cultivars in the plantation were Siwi (Saidi). Results indicated that the average heights of the trunk ranged from 4.5 to 5 m and the average values of its diameters ranged from 65.5 to 85.5 cm. The rate of trunk elongation ranged from 24.5 to 39.4 cm/year for the Siwi (Saidi) cultivar. The palm trees were mostly not curvature, in addition, the trees had good steps for labor climbing. Professional workers were available to climb and prune palm trees using self-belayed climbing with a single-harness technique. Total operation time ranged from 15 to 30 minutes per palm. Labor productivity ranged from 2 to 4 palm/hr and operation costs ranged from 15 to 25 LE per one palm. The palm tree provides four main types of pruning products (Fronds, Petioles, Spadix stems, and coir). The largest percentage was palm fronds, as it represented more than 60%, followed by petioles at a rate of up to 20%. Annual production of pruning products for the Siwi cultivar ranged from 58.15 to 67 kg/palm with an average of 62 kg/palm for date palm plantations. The coir contains the lowest moisture content compared to other pruning products where it ranged from 15.5 to 17.4 %. While the average moisture content of the other products was fairly close and ranged from 40.6 to 56.1 %.

1. Introduction

The date palm has been honored in the heavenly books and the Prophetic hadiths. It is a blessed tree. Man has worked to cultivate it since ancient times. It is the basic food for desert dwellers. Therefore, attention must be paid to serving and preserving it and conducting many research studies aimed at strengthening the industries based on it. Egypt occupies first place in the world in date production, with a productivity of up to one million seven hundred thousand tons annually, as Egypt is the first in date production in the world, equivalent to about 18% of global production, and it is distributed in Siwa, the Bahariya Oasis, the New Valley, and Aswan, because Egypt It has a wealth of palm trees estimated at 15 million fruitful palm trees, in addition to the largest date farm in the world, which was established on an area of 40 thousand acres and includes 2.5 million palm trees, making Egypt one of the first countries in the world to produce and export of dates in the world (Adm et al., 2023). Palm trees are a type of evergreen plant belonging to the Arecaceae family. Its scientific name is Phoenix dactylifera L. It is a large palm tree, 15 to 30 m high, with a cylindrical stipe (often called trunks or stems) these stems are covered with fibers and mesh, bearing a crown of leaves (fronds). Ahmed, et al. (2021)

* Corresponding authors.
E-mail address: mahmoudaliahmed2210@gmail.com (Ahmed M.A.)

https://doi.org/10.21608/azeng.2024.290255.1015
Peer review under responsibility of Faculty of Agricultural Engineering, Al-Azhar University, Cairo, Egypt.
Received 16 May 2024; Received in revised form 25 May 2024; Accepted 26 May 2024
Available online 1 July 2024

reported that date palm tree requires particular care processes, such as thinning, pruning, de-thorning, clusters arrangement, pollination, spraying, positioning of anti-breakage-supports, covering and, finally harvesting and bagging. All these operations are still carried out manually at most farms, which requires a lot of time and cost, as well as the danger of palm climbing. Palm properties possible for use in date palm mechanization are age, tree height, crown height, trunk diameter, distribution in the field and cutting resistance of the leaves. Traditional methods of servicing palm trees are still considered the easiest and fastest method. Traditional climbing of palm trees for servicing purposes was considered the most efficient method. Bekheet and El-Sharabasy (2015) reported that the Siwi cultivar is considered one of the most important and most numerous date palm cultivars grown in Egypt. The total number of productive Siwi cultivar date palms is estimated at 1,822,419 female trees. The pruning process is one of the most important operations that are conducted to serve and maintain the palm and includes cutting the fronds and then processing it for craft industries or advanced industries, including the removal of fronds and thorns, and the process of Takreeb (petiole removing operation), which includes the maintenance of the trunk of the palm and the preparation of grades to climb it (specialized workers) leaves behind other by-products in large quantities such as the bases of the fronds (petioles). Also, the annual pruning process removes the dry leaves to provide better access for harvesting, reducing the risk of catching fire and saving more nutrition for the fruits. Thus, the pruning process produces waste that has economic value and is used in various craft and rural industries. The annual pruning of the date palm results in huge quantities of byproducts (e.g. midribs, leaflets, petioles, leaf sheaths fibers, and spadix stems) most dominantly treated as waste in palm plantations. Therefore, it is essential to find new avenues of economic utilization of these huge quantities of renewable materials (EL-Mously et al., 2023). Hamriri, et al. (2024) reported that From November to January, after harvesting, all date palm producers used to remove the palm dry leaves and leaf bases. There is a growing understanding that recycling and circular economy strategies may transform waste into valuable resources (Kurniawan et al., 2022). Life Cycle Thinking provides a thorough understanding of the environmental impact at every stage by considering the entire life cycle of agricultural waste from its origin through final recycling or disposal (Puspita et al., 2023). Life-cycle assessment (LCA) is a robust framework that directs research and has an ambitious purpose and clear objectives. The LCA technique analyzes the entire life cycle of agricultural waste recycling (Gilani et al., 2023). Sumiyati, et al. (2024) said that the core idea of "sustainability" is life cycle thinking, an original and comprehensive strategy that goes beyond conventional linear evaluations. Sustainable agriculture can potentially help create a more sustainable and resilient global future. Palm trees produce large quantities of palm leaves. Each palm tree annually produces about 20 kg of dry leaves as waste. The burning of leaves waste is a common practice in some places, resulting in environmental pollution (McKendry, 2002). The use of date palms, rather than burning them, is very important for the environment and also has economic benefits. The waste of palms, if not used properly, can cause environmental problems. This waste is a renewable resource that can have significant economic benefits (Saidik, et al., 2010). Jonoobi et al. (2019) explained that one of the largest organic waste products in oases is dry date palm leaves, which remain attached to the tree until they are pruned. In recent years, they have been abandoned in fields, which can cause insect and disease infestation, or burnt, which can cause other environmental issues, especially accidental fires. According to evidence, leaving raw materials from date palm waste for a long time is prone to be highly flammable.

2. Materials and methods

2.1. Materials

2.1.1. Date palm plantations

Three commercial date palm plantations randomly were selected in Assiut Governorate and the cities of Dakhla and Kharga in the New Valley Governorate as a random sample to reveal the current status and the available avenues for handling pruning products of date palm plantations. The palm plantations namly:

1. Al-Sharif farm in the Assiut Valley, New Assiut City;
2. Al-Ashwal farm in Al-Kharga city and 3. Al-Hindao farm in the Al-Dakhla city. Cultivars in the three farms were Siwi (Saeedi). General details about these farms are shown in Table 1.

Surveying and field measurements were carried out during November and December 2021 and 2022 seasons. The Siwi cultivar Fig. 1 considered one of Egypt's top cultivars of semi-dry dates. This cultivar is one of the most widespread cultivars in most of palm plantations. Field data collection was conducted during the palm pruning season in these farms to determine the amount and description of the pruning products and track agricultural practices towards these products. The behavior of plantation owners and the methods of product handling were monitored to give a realistic indication of the utilization extent of the pruning products within palm plantations.

Table 1
General details about the date palm plantations.

Details	Al-Sharif	Al-Ashwal	Al-Hindao
Location	New Assiut City 27.222565, 31.372591	Al-Kharga city 25.612657, 30.643646	Al-Dakhla city 25.547443, 29.004818
N. of trees	300	420	320
Production of date kg/tree	65	80	85
Density of planting (palm/fed)	60	70	64
Number of offshoots/palm	up to 4 offshoots/palm with an average one offshoot/palm		
Offshoots prunning	wihtout climbing		

Fig. 1. Siwi (Saeedi) palm trees with pruning products.

2.1.2. Traditional climbing to carry out the pruning process

Traditional method used to climb up the trunk of palm trees was self-belayed climbing with a single-harness technique as shown in Fig. 2.

Fig. 2. Description of tools used in traditional climbing and pruning process.

There was a special tree climbing harness which was basically a loop of rope with a back support that allowed climbing with the climber weight leaning backward. Date palm workers climb up and down using long rope or straps over a limb and ascending the fallen end using a friction knot. So that it is in the form of a closed loop between the climber and the tree trunk. By using hands and legs the climber can move upward and down.

2.1.3. Palm tree pruning products

Fig. 3 and shows a sample of palm trees pruning products inside the Al-Ashwal plantation after completing the pruning process. Fig.4 shows Date Palm tree before prunig and after pruning.

2.2. Methods

The study included collecting data on palm plantations and the characteristics of palm trees. Data collection activities included:

2.2.1. Determining field conditions for palm plantations

1) Palm tree plantation size and soil conditions
2) Trees age
3) Irrigation systems
4) Cultivation method

2.2.2. Determination of the most important characteristics of palm trees related to the pruning process

1) Trunk height
2) Trunk diameter.
3) Trunk steps and climbing conditions.
4) Palm tree trunk curvature and tilt orientation.

2.2.3. Performance of palm pruning process.

1) Availability of labor and technology.
2) Labor exhaustible level.
3) Labor productivity.
4) Operation cost.

2.2.4. Palm pruning products

1) Product types.
2) Average productivity in kg per palm tree
3) Moisture content
4) Practices for handling pruning products

Fig. 3. Pruning products inside Al-Ashwal plantation after the pruning process.

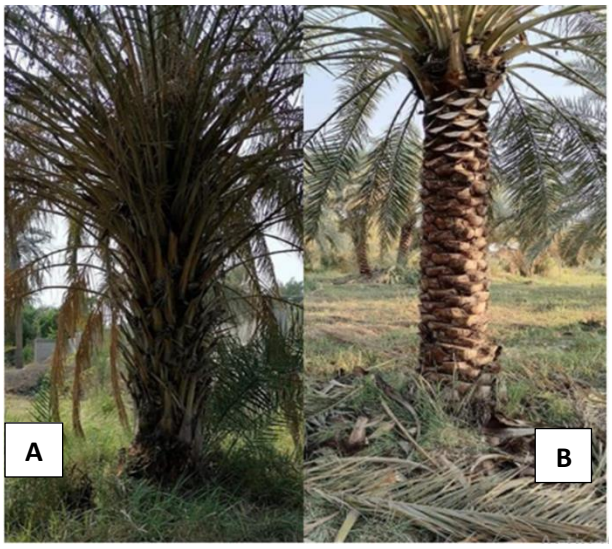

Fig. 4 (A) Date Palm tree before prunig. (B) A Date Palm tree after pruning.

3. Results and discussions

3.1. Determining field conditions for palm plantations:

Data was collected from three commercial date palm plantations. It was classified and arranged as indicated in Table 2.

The data showed that the irrigation method on the Al-Ashwal and Al-Hindao farms was surface irrigation, while the irrigation method at the Al-Sharif farms was drip irrigation. The ages of the farms were 10 years. On the Al-Ashwal and Al-Hindao plantations, palm trees were planted randomly, while on the Al-Sharif plantation, palm trees were planted on square corners 8 × 8 m. Productions of date were 65, 80, and 85 kg/one palm for Al-Sharif, Al-Ashwal and Al-Hindao plantations respectively. The pruning operation was done in November and done annually.

3.2. Determination of the most important characteristics of palm trees related to the pruning process

Data were collected from a random sample of 100 palm trees from each farm. The most important characteristics of trees related to the pruning process as shown in Table 3. The length of the palm tree varies depending on the soil type, the service quality, the addition of nutrients, and the pruning level (Excessive pruning will increase the elongation rate of the palm trunk). The data indicated that the average heights of the trunk were 5, 4.7, and 4.5 m for Al-Sharif, Al-Ashwal, and Al-Hindao plantations respectively. The greatest circumference was measured at the tree middle. The average values of trunk diameters were 65.5, 85.2, and 85.5 cm for Al-Sharif, Al-Ashwal, and Al-Hindao plantations respectively. The rate of trunk elongation ranged from 24.5 to 39.4 cm/year for the Siwi (Saeedi) cultivar. The trees within plantations were mostly not curvature, in addition, the trees had good steps for labor climbing to carry out the pruning process.

3.3. Performance of palm pruning operation

A summary of the results obtained for the performance of the palm pruning process is shown in Table 4. The results showed that professional workers were available to climb and prune palm trees using self-belayed climbing with a single-harness technique. The traditional climbing process is considered an arduous process that exposes the worker to risks, so it is recommended to use alternative climbing techniques that are safer and less stressful. Service time depends on the condition of each palm tree and how comfortable the worker is performing the task. The total operating time included the time of climbing and climb down, in addition to the time of servicing process. In general, total operation time was ranged from 15 to 30 minutes per one palm. Labor productivity ranged from 2 to 4 palm/hr and operation costs ranged from 15 to 25 LE per one palm.

Table 2

Determining field conditions for palm plantations.

The conditions of the palm field	Al-Sharif	Al-Ashwal	Al-Hindao
Plantation size (fed)	5	6	5
Soil conditions	Loam	Sand	Sand
Cultivation method	Square 8×8 m	Random	Random
Irrigation	Drip	Surface	Surface
Age, year	10	10	10

Table 3

Characteristics of palm trees related to the pruning process.

Characteristics	Al-Sharif	Al-Ashwal	Al-Hindao
Trunk height (m)	From 3.7 to 6.4, 5 average	From 4.1 to 5.6, 4.7 average	From 4.2 to 5.5, 4.5 average
Trunk diameter (cm)	From 62.3 to 73.5, 65.5 average	From 79.6 to 91.5, 85.2 average	From 72.2 to 93.3, 85.5 average
Elongation rate (cm/year)	From 24.5 to 31.4, 27.5 average	From 29.5 to 40.1, 34.8 average	From 31.5 to 39.4, 35.1 average
Trunk steps and climbing conditions	Good steps for labor climbing		
Trunk curvature	Mostly no curvature		
Pruning time	The pruning operation was done annually.		

Table 4

Performance of palm pruning process.

Performance	Al-Sharif	Al-Ashwal	Al-Hindao
Climbing method	Professional workers were available to climb and prune palm trees using self-belayed climbing with a single-harness technique		
Labor exhaustible level	An exhausting process that exhausts effort and is more vulnerable to risk		
Total operation time min/palm	20	30	15
Labor productivity, palm/hr	3	2	4
Operation cost LE/palm	25	15	20

3.3 Palm pruning products

The data shown in Table 5 indicates the average annual productivity of pruning products in date palm plantations. The results showed that the palm tree provides four main types of pruning products (Fronds, Petioles, Spadix stems, and coir) collected from the seasonal palm pruning process as a basic agricultural practice. The average values of productivity were 58.15, 61.1, and 67 kg of palm pruning products that will be obtained per palm annually in Al-Sharif, Al-Ashwal, and Al-Hindao plantations respectively. This quantity of palm pruning products was made up of 52% midribs, 21% leaflets, 15.8% spadix stems, 9.4% petioles, and 1.8% coir in Al-Sharif plantation. As for Al-Hindao, palm pruning products were made up of 42.5% midribs, 16.5% leaflets, 18.8% spadix stems, 20.5% petioles, and 1.7% coir. These percentages were very close to the Al-Hindao plantation. These results clearly showed that the largest percentage of pruning products was palm fronds, as it represented more than 60%, followed by petioles at a rate of up to 20%. Also, the results indicated that annual production of pruning products for the Siwi cultivar ranged from 58.15 to 67 kg/palm with an average of 62 kg/palm for date palm plantations. Accordingly, if Egypt has a wealth of palm trees estimated at 15 million fruitful palm trees, (Adm et al., 2023), the annual production volume of palm pruning products will range from 0.87 to 1 million tons with an average of 0.9 million tons annually.

Table (5

Average annual productivity of pruning products in date palm plantations

Types of pruning products		Al-Sharif		Al-Ashwal		Al-Hindao	
		(kg/tree)	%	(kg/tree)	%	(kg/tree)	%
Fronds	Midribs	30	52	26	42.5	29	43.5
	Leaflets	12.2	21	10	16.5	10.5	15.5
Spadix stems		9.4	15.8	11.5	18.8	12.5	18.5
Petioles		5.5	9.4	12.6	20.5	14	21
Coir		1.05	1.8	1.0	1.7	1.0	1.5
Total (kg/palm)		58.15	100	61.1	100	67	100
No. of palm trees		300		420		320	
Total quantity of palm pruning products (tons/farm)		17.44		25.66		21.44	

Fig. 5 shows the average annual productivity of one palm (Siwi) in palm plantations.

The results indicated that there was not clear difference in the average values of productivity that will be obtained per palm annually in Al-Sharif, Al-Ashwal, and Al-Hindao plantations. This may be because the palm plantations have the same palm cultivar and are of similar age.

The moisture content of palm pruning products was estimated immediately after the pruning process. Fig. 6 shows the average moisture content on a wet basis for palm pruning products. The results showed that the coir contains the lowest moisture content compared to other pruning products where it ranged from 15.5 to 17.4 %. While the average moisture content of the other products was fairly close and ranged from 40.6 to 56.1 %.

3.4 Practices for handling pruning products

The data shown in Table 6 indicates the handling of pruning products and the practices applied in a sample of palm plantations. Fronds are considered one of the most important pruning products that can generate income for farm owners if managed economically. The mechanical process of fronds, whether separating leaflets or chopping, will directly affect the economic value. Biochar and compost are among the most important biological products that manufacture palm pruning products (Fronds and petioles). It is also noted that there is no clear vision for utilization of spadix stems although it includes very strong fibers that can be used as raw materials for many industries. Palm coir is characterized by being a strong fibrous product, and until now ropes made from coir compete with other types. Therefore, it is recommended to innovate new techniques that help in advancing the manufacture of ropes from coir.

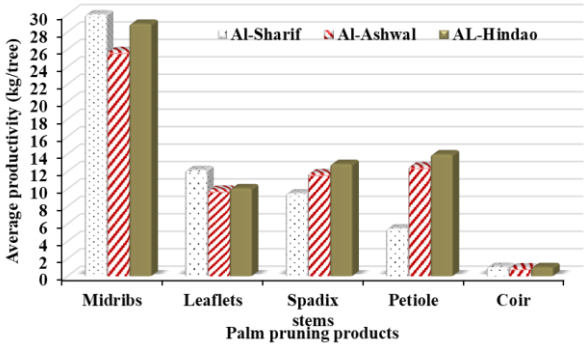

Fig. 5. Average annual productivity of one palm tree (Siwi) in date palm plantations.

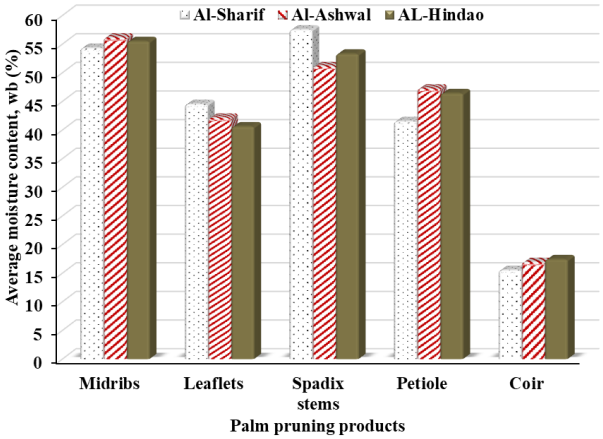

Fig. 6. Average moisture content on a wet basis for palm pruning products.

Table 6

Practices for handling pruning products in palm plantations.

Pruning Products	Al-Sharif	Al-Ashwal	Al-Hindao
Fronds	Sold 0.5 LE/Frond	Used to build a pergola and the rest will be burned after it dries	Used to build a pergola, and the rest will be chopped to be used as fodder, mulching, compost, etc.
Midribs	Sold 1.0 LE/midrib	Valueless	Sold 0.8 LE/midrib
Leaflets	Sold to carina factories 150 LE/tons	Valueless	Given free to handmade product makers
	Spadix stems	Valueless	
Petioles	Valueless	Sold to biochar factories 150 LE/tons	Will be chopped to be used as compost
Coir	Sold to a merchant and is used to make ropes and stuff furniture. 30 LE/Quintal (45kg)	Used to make ropes and stuff furniture.	

4. Conclusions

Palm pruning products are promising sustainable raw materials that can generate income if managed efficiently. Analyzing the results, it can be said that the annual production volume of palm pruning products in Egypt ranged from 0.87 to 1 million tons with an

average of 0.9 million tons annually. With the expansion of palm cultivation, Egypt will have a wealth of palm pruning products estimated at 1 million tons annually. The largest percentage of pruning products was palm fronds, as it represented more than 60%, followed by petioles at a rate of up to 20 % so,it is recommended that Development of new technology for mechanical process of palm fronds to maximize its utilization.

References

Adm, H., Abdelsalam, H., and Mahmoud, A. (2023). An economic study of date palm production in Aswan governorate. Aswan University Journal of Sciences and Technology, 3(1), 235-254. https://doi.org/10.21608/aujst.2023.312946.

Ahmed, M. I. M., Elkaoud, N. S. M., Arif, E. M., and ElSharabasy, S. F. (2021). Study the Physical and Mechanical Properties affecting on Date Palm Tree Mechanical Serves. Journal of Soil Sciences and Agricultural Engineering, 12(5), 357-362. https://doi.org/10.21608/JSSAE.2021.179008.

Bekheet, S. A., and El-Sharabasy, S. F. (2015). Date palm status and perspective in Egypt. Date Palm Genetic Resources and Utilization: Volume 1: Africa and the Americas, 75-123.

EL-Mously, H., Midani, M., and Darwish, E. A. (2023). Date Palm Byproducts in Enzymes, Food, Beverage, Pharmaceuticals, Cosmetics and Natural Wax. In Date Palm Byproducts: A Springboard for Circular Bio Economy (pp. 93-102). Singapore: Springer Nature Singapore https://doi.org/10.1007/9.

Gilani, H. R., Ibrik, K., and Sanchez, D. L. (2023). Techno-economic and policy analysis of hydrogen and gasoline production from forest biomass, agricultural residues and municipal solid waste in California. Biofuels, Bioproducts and Biorefining, 17(4), 988-1002. https://doi.org/10.1002/bbb.2492.

Hamriri, K., Atmani, M., Abidar, A., Aziz, L., Fagroud, M., and Bouamri, R. (2024). Sustainable oases agriculture: A journey through Morocco's date palm production system https://doi.org/10.24425/jwld.2023.148457.

Jonoobi, M., Shafie, M., Shirmohammadli, Y., Ashori, A., Zarea-Hosseinabadi, H., & Mekonnen, T. (2019). A review on date palm tree: Properties, characterization and its potential applications. In Journal of Renewable Materials (Vol. 7, Issue 11, pp. 1055–1075). https://doi.org/10.32604/jrm.2019.08188.

Kurniawan, T.A., Othman, M.H.D., Hwang, G.H., Gikas, P., (2022). Unlocking digital technologies for waste recycling in Industry 4.0 era: A transformation towards a digitalizationbased circular economy in Indonesia. J. Cleaner Prod., 131911: 1-16 (16 Pages). https://doi.org/10.1016/j.jclepro.2022.131911.

McKendry, P. (2002) "Energy production from biomass (part 1): overview of biomass" Bioresour. Technol. 83 (1): 37–46

Puspita, A. S., Budihardjo, M. A., and Samadikun, B. P. (2023). Evaluating coconut fiber and fly ash composites for use in landfill retention layers. Global Nest J, 25(4), 1-7. https://doi.org/10.30955/gnj.00.

Saidik, M. W.; El-Shaer, H. M.; and Yakot, H. M. (2010) "Recycling of agriculture and animal from wastes into compost using compost activator in Saudi Arabia", J. Environ. Appl. Sci. 5 (3): 397–403. https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=112087836bd1a559f3bb68d3b20c03f012f84efe.

Sumiyati, S., Samadikun, B. P., Widiyanti, A., Budihardjo, M. A., Al Qadar, S., and Puspita, A. S. (2024). Life cycle assessment of agricultural waste recycling for sustainable environmental impact. Global Journal of Environmental Science and Management, 10(2), 907-938. https://doi.org/10.22034/gjesm.2024.02.30

إعادة اكتشاف منتجات تقليم النخيل السيوي وتكنولوجيا الخدمة المتاحة للتنمية الريفية المستدامة

محمود علي أحمد علي [١]، محمد أحمد شتيوي[٢]، نبيل شعبان القاعود [٣]

[١] قسم هندسة المنشآت الزراعية والتحكم البيئي، كلية الهندسة الزراعية، جامعة الأزهر (فرع أسيوط)، أسيوط، مصر.
[٢] قسم هندسة المنشآت الزراعية والتحكم البيئي، كلية الهندسة الزراعية، جامعة الأزهر، القاهرة، مصر.
[٣] قسم هندسة القوى والآلات الزراعية، كلية الهندسة الزراعية، جامعة الأزهر (فرع أسيوط)، أسيوط، مصر.

الملخص العربي

يهدف هذا البحث إلى إعادة اكتشاف منتجات تقليم النخيل السيوي وتكنولوجيا الخدمة المتاحة لتحقيق التنمية الريفية المستدامة. تم اختيار ثلاث مزارع تجارية لنخيل التمر في محافظة أسيوط ومدينتي الداخلة والخارجة في محافظة الوادي الجديد كعينة عشوائية لمزارع النخيل وذلك للكشف عن الوضع الحالي والسبل المتاحة للتعامل مع منتجات التقليم في مصر. وكانت الأصناف في المزارع الثلاثة هي السيوي (الصعيدي). وقد أشارت النتائج إلى أن متوسط ارتفاعات الجذع تراوحت بين ٤,٥ إلى ٥ م، ومتوسط قيم أقطاره قد تراوحت بين ٦٥,٥ إلى ٨٥,٥ سم. وتراوح معدل استطالة الجذع من ٢٤,٥ إلى ٣٩,٤ سم/سنة بمتوسط 32.47 سم/سنة للصنف السيوي (الصعيدي). وكانت أشجار النخيل داخل المزارع في الغالب غير منحنية، بالإضافة إلى أن الأشجار لديها خطوات جيدة لتسلق العمالة للقيام بعملية التقليم. يتوفر عمال محترفون لتسلق أشجار النخيل وتقليمها باستخدام التسلق الذاتي باستخدام تقنية الحزام الواحد. قد تراوح إجمالي وقت عملية التقليم والخدمة من ١٥ إلى ٣٠ دقيقة لكل نخلة بمتوسط ٢١,٧ دقيقة لكل نخلة ، كما تراوحت إنتاجية العامل من ٢ إلى ٤ نخلة/ساعة بمتوسط ٣ نخلة /ساعة ، وتكاليف التشغيل تتراوح من ١٥ إلى ٢٥ جنيهًا بمتوسط ٢٠ جنيهاً للنخلة الواحدة. وقد تبين أن أشجار النخيل توفر أربعة أنواع رئيسية من منتجات التقليم (السعف، والأعناق (الكرناف)، وسيقان Spadix ، والليف)، وكانت النسبة الأكبر من منتجات التقليم هي سعف النخيل حيث تزيد عن ٦٠٪، وتليها نسبة الأعناق (الكرناف) بنسبة تصل إلى ٢٠٪. وقد تراوح الإنتاج السنوي لمنتجات التقليم للصنف السيوي من ٥٨,١٥ إلى ٦٧ كجم/نخلة، وبمتوسط ٦٢ كجم/نخلة. وقد أظهرت النتائج أن الليف يحتوي على أقل نسبة رطوبة مقارنة بمنتجات التقليم الأخرى حيث تتراوح بين ١٥,٥ إلى ١٧,٤٪. بينما كان متوسط المحتوى الرطوبي للمنتجات الأخرى متقارباً إلى حد ما وتراوح بين ٤٠,٦ إلى ٥٦,١٪. ويعتبر السعف من أهم منتجات التقليم التي يمكن أن تدر دخلاً لأصحاب المزارع إذا تمت إدارتها بشكل إقتصادي. إن المعالجة الميكانيكية للسعف سواء من خلال فصل الخوص أو الفرم سوف يؤثر بشكل مباشر على القيمة الاقتصادية.