



**The Production Processes of Eucalyptus Private Forests
Case Study: Nertitei and Zalingei Localities - Central Darfur State – Sudan**

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Abstract

This study was conducted at Nertitei and Zalingei localities during 2015-2017. The aim of this study was to determine the production processes of *Eucalyptus* private forest in the study area by means of determine the production types, determine the production rotation and to measure the average annual productivity.

Research population consisted of 101 *Eucalyptus* private forests classified into three categories according to area as followed: The first category (small size sample) 0 – 1 feddan .The second category (medium size sample) 1- 4 feddan. The third category (large size sample) 4- 10 feddan. The research population represented by a sample consisted of 6 forests. Each category area represented by a sample consisted of 2 even age forest. Descriptive statistical approach was used for data analysis where Excel statistical programme and simple production tables used. The study found that the dominant *Eucalyptus* species in the private forest were *Eucalyptus citriodora*, *Eucalyptus ambalata* and *Eucalyptus camaldulensis*. The commercial production type in the private forests was the building poles, which are Korki (< 7-10cm) diameter and Rossass (11-17 cm) diameter. The forest managed under technical rotation , trees selected and felled when it reach the desirable size . The harvest felling system in the private forest in the study area is the selection felling system. All the forest started to give production after 4 years from the establishment, then the production continued annually. The average production for private forest of the study area was 607 building poles/feddan. Category three (Large size sample) enquired the highest average annual productivity among the three area categories. The study recommendations including: conducting advance trainings to the owners on the technical and administration of their forests, establishment of demonstrative forests well distributed in the study area. Raise the awareness of the decision makers in the State and localities governments about the environmental and economic high importance of the private forests; introduce the fire wood production in the productive rotation and establishment of private forests owner societies similar to gum Arabic producer societies.

Keywords: Private forest, Production processes, Constraints, Eucalyptus species.

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Introduction

Community forestry had been defined as “any situation which intimately involves local people in a forestry activities” (FAO, 1992). FRA (2015), defined private forest as “forest own by individuals and families”. Moreover, Sudanese Social Forestry Society (2003), defined Community Forestry as “the involvement of the different sectors of the society in planning, management and protection of forests”

In general, scholars differentiate between three main strategies of community forestry activities: communal forests, farm forests for household/market, and publicly managed forests for local community development. The first two strategies involve tree growing by rural people, while the last category is related to the management of state forest lands (FAO,1994; FAO, 1985 and Wiersum, 1991). Meanwhile, FAO (1989), defined farm forests as “ the practice of growing trees on privately owned agricultural land and waste land, including degraded forests”. The farm forest is further divided into two categories namely; one for subsistence and the other for market.

Moreover, Chaudhary *et al* (2016), defined Private Forest as “is the forest which is planted, or conserved in any private land owned by an individual under current law”.

Nevertheless, FRA (2015), defined the private forest as “forest owned by individuals and families”. Ajay S. (2012), mentioned that, Private forest means any forest which is not the property to government.

The early beginning of rural forestry program in Jabal Marra Rural Development project (JMRDP) was in season (1981-1983) by production of *Faidherbia elbida*.

Seedlings for of *Faidherbia elbida* trees threaten to be extinct. Fuel Wood Assessment was carried during the season (1982-1983) and as a result of this assessment (JMRDP) involve in the program of collective woodlots in some villages by planting of Eucalyptus trees. The two experiment did not gave a mentioned success so (JMRDP) carried another assessment to evaluate the experiments in the beginning of 1985. Its result showed that the local community does not prefer the collective work because they have a negative impact about the experiment of the cooperative mills in their village, most of them clear that they prefer to plant the trees privately, so the program changed to encourage the individuals to plant Eucalyptus and *ziziphus spp* trees privately in or around their farms or in or around their houses yard.

The program began with limited number of villages but it expand at the end of 1980s when the first pioneers produced their first product of eucalyptus poles and gained profitable revenue that encourage the others to follow them. (Abdel Hameed, 1998).

According to Kona and Makki (2005), the production is a process of converting the things from its present form to other form of more efficiency to saturate the utility.

Every society must deal with three fundamental economic questions. Given it's a limited endowment of productive resources and unlimited wants that they must serve, a society must somehow make decisions about:

- Which good and services, of the almost infinite variety that it is technically possible

to produce with their resources, will actually produced, and in what quantities.

- Which of the producing each goods and services will be adopted in each case.
- How the goods and services produced will be distributed among member of the society (Daowei and Peter, 2011).

In Jabel Marra eucalyptus was introduced in year 1958 for production of poles, fuel wood and watershed management in deep volcanic soils (Bayoumi, 1985).

However, there are some problems and difficulties hindered the development of the private forest, conflict in Darfur was the most notable among these constraints and due to that most people lost their income resources, as a result they practice illegal cutting of trees and charcoal making. More wise, there is a lack of studies regarding this issue.

The main objective of this study was to determine the processes of *Eucalyptus* Private Forests in Nertitei and Zalingei localities – Central Darfur State.

Materials and methods:

The study area consists of Zalingei and Nertite localities and located at east of the Central Darfur State (Zalingei office, 2015). The soil is sandy loam and the area dominated by the volcanic complex of Jebel Marra (Abdel Hameed, 1998). The water system consists of many permanent streams coming down from Jebel Marra Mountain. The rainy season begins in june and extends to october with an annual rainfall ranges between 370-725 mm (Abdel Magid, T.D. and Elsiddig, E.A., 2002 and Zalingei Meteorological Station, 2014). The

dominant species in the area are: *Albizia amara*, *Balanites egyptiaca*, *Azanza garkeana*, *Acacia seiberiana*, *Acacia milifera*, *Acacia grandii*, *Acacia nilotica*, *faidherbia albida*, *Ziziphus spp*, *Combretum spp*, *Boswellia papirifera*, *Bohinia roffisen* and *Eucalyptus spp*. The main economic activity of people in the area is agriculture, and mainly produces Sorghum and millet crops (FNC West Darfur, 2008).

This study conducted during period 2015-2017: The research area consists of Zalingei and Nertite Localities which located at east of central Darfur State. The research followed the descriptive statistic method. Primary data collected by means of field observation, interviews and questionnaire while secondary data were obtained from FNC and relevant institutions, records and reports, references and internet).

Research population consisted of 101 forest classified in to three categories according to area as followed:

Category one (small size sample) 0-1 feddan.

Category two (Medium size sample) 1-4 feddan.

Category three (large size sample) 4- 10 feddan.

The study population represented by 6 forest, each area category represented by 2 even age forests.

The data of each area category analyzed separately, the result of the categories compared with each others, then concluded. Descriptive statistical approach used for data analysis, where Excel statistical programme and simple production tables used.

Results and Discussion

The summary of production analysis of the small sample size.

Table :(1) production analysis of the small sample size:

Year	Production grade	Quantity produce
1996	Korki	355
	Rossass	350
	Total	705
1997	Korki	115
	Rossass	160
	Total	275
1998	Korki	320
	Rossass	200
	Total	250
1999	Korki	418
	Rossass	112
	Total	530
2000	Korki	428
	Rossass	122
	Total	550
2001	Korki	435
	Rossass	115
	Total	550
2002	Korki	450
	Rossass	120
	Total	570
2003	Korki	450
	Rossass	110
	Total	560
2004	Korki	460
	Rossass	115
	Total	575
2005	Korki	475
	Rossass	105
	Total	580
2006	Korki	465
	Rossass	125
	Total	590
2007	Korki	480
	Rossass	115
	Total	595
2008	Korki	462
	Rossass	103
	Total	565
2009	Korki	473
	Rossass	102
	Total	575
2010	Korki	453
	Rossass	92
	Total	545
2011	Korki	462
	Rossass	93

	Total	555
2012	Korki	442
	Rossass	88
	Total	530
2013	Korki	447
	Rossass	83
	Total	530
2014	Korki	426
	Rossass	84
	Total	510
2015	Korki	425
	Rossass	85
	Total	510
2016	Korki	385
	Rossass	85
	Total	470
2017	Korki	337
	Rossass	71
	Total	408
Total of period (19966-2017)		11798

Table (2) Detail of production grade

Grade	Total quantity produced	Percentage	Average Quantity produced per one year
Korki	9163	78%	416
Rossass	2635	22%	120
Total	11798	100%	536

The results of table (1) revealed the following points:

The production going successively giving of year a high production. Followed by a year of low production then again a year a high production and so on the owner organized this system to insure sustainable and continuous desirable production grades.

The highest production appeared in the first production year = 705 building poles.

The first production performed after 4 years from establishment.

The lowest production appeared in the second production year 275 building poles. The production are classified into two major grades of building pole which are, korki with diameter(< 7 cm up to 10 cm)and Rossass with diameter from 11 up to 15 cm.

These results in line with study of Elsiddig,E.A. (1996) who reported,

Eucalyptus in reserved forest at age of 6-7 years produced light and heavy building poles. And in line with the study of Venugopal (1988) who showed that plants of *Eucalyptus* in Kolar District list main uses include: firewood, charcoal, poles and timber. Also consistent with studies of Kenya Forest Service (2007) which revealed that, three *Eucalyptus* enterprises involving production of construction poles, transmission poles, and firewood.

The table (2) revealed that most of the production 78% of the total production were korki grade while 22% Rossass, because the technical ration aimed to produce small diameter a according to market demand to use it as local building materials .

The summary of production analysis of the medium size sample

Table (3) production analysis in average per feddan:

Year	Quantity produced/poles		
	Korki	Rossass	Total
2001	408	317	725
2002	153	157	310
2003	475	265	740
2004	235	85	320
2005	575	185	760
2006	252	88	340
2007	583	192	775
2008	275	88	360
2009	615	190	805
2010	286	89	375
2011	634	196	830
2012	293	77	370
2013	634	161	795
2014	295	55	350
2015	642	133	775
2016	274	56	330
2017	629	114	743
Total	7258	2445	9703
percentage	74.8%	25.2%	100%

The result of the table (3) revealed the following points:

The forests of the sample give production after four years from establishment year then the production going annually.

The production grade size were Korki and Rossass according to the market demand, used as building poles.

Korki (7 – 10 cm) in diameter and Rossass (11 – 17 cm) in diameter.

The annual production continued successively giving a high production year, then a year of low production and then again a year of a high production and so on , so as to insure sustainable desirable production size.

The highest production acquired in the 11th production year (830 poles), while the lowest production appeared in the second production year (310 poles).

the average of annual production per feddan 571 poles.

The establishment costs had been completely paid back in the third production year so the forest began to give a real profit.

These findings consistent with study of Elsiddig, E.A. (2007) who stated that, in Jabal Marra *Eucalyptus* reserved forest produce 300/400 stems/hectare every two years. And in line with study of MEWNR(2013) who mentioned, the rotation length from 5-7 years for *Eucalyptus* grown for transmission poles, saw logs, construction poles and firewood. Also in line with study of Kingomo *et al* (2010) whom mentioned, the *Eucalyptus* forests owned by local communities produce a wide range of forest products that include firewood, commercial logs, and charcoal.

The summary of large sample size production

Table (4) The production details of large sample size during production period:

Year	production grade	Average production per Fadden
2009	Korki	425
	Rossass	380
	Total	805
2010	Korki	115
	Rossass	110
	Total	225
2011	Korki	613
	Rossass	262
	Total	875
2012	Korki	420
	Rossass	148
	Total	568
2013	Korki	695
	Rossass	200
	Total	985
2014	Korki	475
	Rossass	110
	Total	585
2015	Korki	758
	Rossass	167
	Total	925
2016	Korki	495
	Rossass	105
	Total	600
2017	Korki	798
	Rossass	162
	Total	960

Table (4) showed the annual production and unit price of the yield then calculate the income, the table analysis revealed the following results.

The forest sample size specified on building poles mainly of production grade korki (< 7-10 cm) diameter and Rossass (11-17 cm) diameter. The production began after four year from establishment year (first production year 2009) then the production going annually, giving a year of high production then a year of low production and so on.

Yield unit price varies annually corresponding production grade variation.

The highest production appeared in the ninth production year (2017).

The lowest production appeared in the second production year (2010).

The average of annual production per feddan during production period (2009-2017) was 715 light building poles detailed as follow:

$$\begin{aligned} \text{Korki} &= 531 \\ \text{Rossass} &= \frac{183}{715} \end{aligned}$$

These results consistent with study of Luzar,J.(2007) who revealed that, in Portugal and Spain *Eucalyptus* have been planted in basis of sawmilling, charcoal, fuel wood, firewood and fence posts. Also it is in line

with study of Joshua, K.C. (2016) who reported that, tree species of *Eucalyptus* produce various products that include firewood, poles, saw logs, charcoal and pulpwood depending on the rotation age and as by products.

Conclusions and Recommendations:

Conclusions

All the forests were rainfed. *Eucalyptus* is the only tree that planted in the private forests for commercial value.

The dominant *Eucalyptus* species in the private forests are: *Eucalyptus citriodora*, *Eucalyptus ambalata* and *Eucalyptus camaldulensis*.

Selection felling was the trees felling system which used in harvesting

The most important constrains that hindering the private forest development include:

- A. Lack of security is the most severe problem.
- B. The expensive government fees have a bad effect upon the production.
- C. Luck of agricultural registration to protect the land and the farmer.

The production rotation is a technical rotation, the first production earned after four years from the establishment year, then the production continued annually.

The owners manage their annual production to give a year of a high production then a year of a low production then a gain a year of high production so as to insure sustainable and desirable production grade.

The forests produce building poles according to the market and population demand.

The average annual production in study area = 607 poles/ feddan.

The highest annual production was earned in the large category

The year of the lowest production in the three samples (small, medium and large) was the second production year because the yield of the first two years production from the origin stem then in the next years the yield produced from the coppices .

The production began to deteriorate from 13th production year.

Recommendations

The forest extension must play an important roles in diffusion and adoption of private forest idea among the community, conduct advanced trainings to the forest owners in the technical and financial administration for their forest and raise the awareness of the decision makers in the state and locality governments about the environmental and economical high importance of the private forest.

Establish demonstrative forests and distributed in the study area.

Introduce fire wood production in the productive rotation.

Exclude the new established forest of the forest royalties in the first three production years.

Establish forest owner societies similar to Gum Arabic production societies.

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العمليات الانتاجية لغابات البان الخاصة-دراسة حالة- محليتي نيرتتي وزالنجي
ولاية وسط دارفور- السودان

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المستخلص:

اجريت هذه الدراسة بمحليتي نيرتتي وزالنجي بولاية وسط دارفور خلال الفترة من 2015-2017 . كما تهدف هذه الدراسة إلى تحديد العمليات الإنتاجية لغابات الكافور الخاصة بمنطقة البحث بواسطة أهداف تفصيلية هي : تحديد نوع الإنتاج ، تحديد الدورة الإنتاجية ، وقياس المتوسط السنوي للإنتاجية. مجتمع البحث يتكون من 101 غابة قسمت إلى ثلاث فئات حسب المساحة هي : الفئة الصغرى 0-1 فدان ، الفئة المتوسطة 1-4 فدان ، والفئة الكبرى 4-10 فدان . مجتمع البحث مثل بعينة مكونه من 6 غابات ، كل فئة مساحة مثلت بغابتين متساويتين العمر. استخدمت الدراسة المنهج الاحصائى الوصفى لتحليل البيانات عن طريق برنامج اكسل الاحصائى مع جداول الانتاج البسيطة. الدراسة توصلت إلى نتائج أهمها : أنواع الكافور السائدة في هذه الغابات هي كافور سيتريودورا ، كافور امبلاتا ، وكافور كمالديولينسس. أعمدة البناء هي الإنتاج التجاري لهذه الغابات وتضم كوركي بمقاس قطر > 7 سم - 10سم ورمصاص بمقاس قطر 11سم-17سم. بدأت الغابات إنتاجها الأول بعد أربعة سنوات من تاريخ الإنشاء ثم استمر الإنتاج بعد ذلك سنوياً. تُدار الغابات بالدورة الفنية حيث يتم انتخاب الأشجار التي وصلت إلى الحجم المرغوب تجارياً ثم تحصد. متوسط الإنتاجية السنوية 607 عمود بناء للفدان ، فئة المساحة الكبرى حققت أعلى إنتاجية هي 715 عمود بناء للفدان . اوصت الدراسة بعمل تدريب متقدم للملاك عن: الادارة الفنية للغابات، عمل غابات ايضاحية، رفع وعى متخذى القرار عن اهمية الدور البيئى والاقتصادى للغابات الخاصة، ادخال انتاج حطب النار فى الدورة الانتاجية، وعمل جمعيات شبيهة بجمعيات منتجى الصمغ العربى.