# Economic performance of private and public sugar estates, Sudan, 1990-2008

**Selwa Ahmed M. A. Elzebair[1],Mudather Ali Ahmed[1], and Abbas Elsir M. Elamin[2]**

[1] Department of Agricultural Economics, University of Gezira,Wad Medani, Sudan.
[2] Agricultural Economist, Agricultural Research Corporation,Wad Medani, Sudan.

## ABSTRACT

Local sugar production is considered an important import substitution strategy. The government policies encourage expansion in sugar production. As a result, many sugar estates are established under private and public systems. This study was aimed at assessing the economic efficiency of the sugar estates. Purposive sampling was used to select three sugar estates namely; Kenana as a private estate, Guneid as a public estate operated by tenants and Sennar as a public estate operated by direct labor. Secondary data from the records of these estates were used to achieve the stated objectives. Descriptive statistics, frequencies and benefit cost ratio were the main analytical tools used in this study. Results showed apparent increase in the cultivated area, yield and production of sugar during the last decade. Also, results showed that Kenana is attaining the highest yield, relatively lower cost, highest revenues and the highest benefit cost ratio, indicating more efficiency in sugar production than Sennar and Guneid during the period (1990-2008).

# INTRODUCTION

Sugar cane cultivation as a cash crop in the Sudan was realized in 1962 with the establishment of Elguneid sugar factory, with a total area of 20,000 feddan and an annual designed capacity of 60,000 tons of cane sugar. The main objective of this factory was to satisfy part of the local demand for sugar. The success of Guneid sugar cane scheme encouraged the government to expand sugar cane production in other areas. Accordingly, sugar cane factories came into operation at New Halfa (1965/66), with a total area of 22,000 feddan and an annual designed capacity of 75,000 tons, North West Sennar (1976/77), with an area of 22,000 feddan and an annual designed capacity of 110,000 tons, Assalaya (1979/80), with an area of 17,000 feddan and an annual designed capacity of 110,000 tons, and Kenana (1980/81), with a total area of 100,000 feddan and an annual designed capacity of 400,000 tons (Elhajwa, 2000). With the exception of Kenana sugar factory which is a joint multienterprise, the other factories are publicly owned.

Local sugar production is considered an important strategy since the domestic production will reduce sugar imports. Government policies affecting sugar production are likely to have different impacts on producers and consumers. Because of these policies, the Sudan sugar production increased from about 0.5 million tons in 1997 to about 0.7 million tons in 2003, of which, Kenana production accounts for about 55% of the total production. It is worth noting that this production has exceeded the designed capacity of 655000 tons.

Good research work have been done on sugar production in the Sudan, but none attempted to measure the efficiency of the private system represented by Kenana Sugar Company and public production represented by Guneid, Sennar, New-Halfa and Assalaya. The public sector schemes have direct labor or tenancy relations. This study was aimed at investigating the economic performance of Guneid, Kenana and Sennar sugar estates during the period of 1990 to 2008.

# MATERIALS AND METHODS

**Sampling and data collection**

Purposive sampling was used to select three sugar estates namely; Kenana to represent the private estate, Guneid to represent the public estate that operates by tenants and Sennar to represent the public estates that operate by direct labor. Secondary data collected from the records of the different sugar estates as well as other relevant studies were used to achieve the stated objectives. Descriptive statistics, frequencies and benefit cost ratio were the main analytical tools used to measure the efficiency of the different sugar estates.

**Benefit- cost ratio (BCR)**

The benefit-cost analysis (BCA) is a technique for evaluating a project or investment by comparing the economic benefits with the economic costs of the activity **(**Gerald and Galopin, 2008**)**. It is the

ratio of the discounted value of incremental benefits over the discounted value of incremental costs. The benefit-cost ratio (BCR) is calculated as the net present value (NPV) of benefits divided by the net present value of costs:

$$BCR = \sum_{r=1}^{r} \frac{B_t}{(1+r)^r} \Big/ \sum_{r=1}^{r} \frac{C_t}{(1+r)^r}$$

where $B_t$is the benefit in time *t* and $C_t$is the cost in time *t*, *r* is the discount rate

The minimum requirement for a project or investment to be judged worthwhile is that its benefit-cost ratio should at least be equal to unity (Gittinger, 1982). This means that the benefits equal or exceed the costs of the project.

The cost data for the three sugar estates consists of both the running (variable) costs and the annual fixed costs. The fixed costs include depreciation, permanent labor and employees, land rent, taxes and any other fixed costs while the variable costs include inputs, casual and seasonal labor, spare parts, management costs, electricity consumption, canalization clearance, other production operational costs and cost of finance. The interest rate of finance in the Sudan is 15%, that is why 15% is chosen as the discount rate in this study (Central Bank of Sudan, 2010).

## RESULTS AND DISCUSSION

**Production performance for the three sugar estates**

Simple statistics for the period 1990-2008 showed that Kenana was the best factory in terms of the mean of cultivated area, cane and sugar yield per feddan and sugar production, followed by Guneid and Sennar (Table1). These items have been subjected to apparent increase during the 2000's period compared with the 1990's. During this period, cultivated area increased by 1782 feddan in Kenana (2.3% increase), followed by 1662 feddan in Sennar (8.1% increase) and 792 feddan in Guneid (4.2% increase). On the other hand, the average sugar yield per feddan increased from 3.7 to 5 ton/feddan in Kenana (1.3 ton or 35.1% increase), from 2.7 to 4.3 ton/feddan in Guneid (1.4 ton or 59.3% increase) and from 2.3 to 3.6 ton/feddan in Sennar (1.3 ton or 56.3% increase) ( Table1).

Regarding the productivity for the period of the study, Kenana had the highest average cane yield (40.6), followed by Guneid (39.1) and Sennar (32.7) tons/feddan. At the same time, Kenana had the highest average sugar yield (4.4), followed by Guneid (3.8) and Sennar (3.0) tons/feddan. It worth noting that Kenana uses long furrow irrigation, which adds more cultivated area than short furrow irrigation used by the other two estates. This increase in the cultivated area and yield has resulted in apparent increase in total sugar production in the three estates. The average sugar yield per estate increased from 289,677 to 398,002 tons in Kenana (108,343 ton or 37.4% increase), from 49,773 to 84,438 tons in Guneid (34,665 ton or 69.6% increase) and from 41,865 to 77,691 ton/feddan in Sennar (35,826 tons or 85.6% increase) (Table1).

Table 1. Performance of the three sugar estates, 1990-2008.

| | Kenana Sufar Company | | | | Guneid | | | | Sennar sugar factory | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Items | Area (fed) | Cane yield (ton/fed) | Sugar prod (tons) | Sugar yield (ton/fed) | Area (fed) | Cane yield (ton/fed) | Sugar prod (tons) | Sugar yield (ton/fed) | Area (fed) | Cane yield (ton/fed) | Sugar prod (tons) | Sugar yield (ton/fed) |
| | | | | | 1990 – 1999 | | | | | | | |
| Min | 75,077 | 27.6 | 249,005 | 3.2 | 14,834 | 23.9 | 40,207 | 2.2 | 18,829 | 24.7 | 5,879 | 1.9 |
| Max | 79,160 | 44.3 | 365,000 | 4.6 | 21,176 | 34.3 | 69,550 | 3.4 | 22,135 | 34.9 | 55,565 | 2.7 |
| Mean | 77,222 | 34.2 | 289,677 | 3.7 | 18,750 | 27.4 | 49,773 | 2.7 | 20,629 | 27.7 | 41,865 | 2.3 |
| STD | 1,320 | 6.4 | 48,093 | 0.6 | 1,911 | 3.4 | 9,313 | 0.4 | 1,082 | 3.2 | 15,060 | 0.3 |
| | | | | | 2000-2008 | | | | | | | |
| Min | 78,209 | 45.1 | 376,039 | 4.7 | 18,700 | 35.2 | 71,697 | 3.6 | 21,000 | 31.3 | 62,206 | 2.9 |
| Max | 80,009 | 48.8 | 427,865 | 5.3 | 20,942 | 46.5 | 94,170 | 4.5 | 23,796 | 42.6 | 92,039 | 4.0 |
| Mean | 79,004 | 47.1 | 398,020 | 5.0 | 19,543 | 43.7 | 84,438 | 4.3 | 22,291 | 37.7 | 77,691 | 3.6 |
| STD | 691 | 1.4 | 14,372 | 0.2 | 784 | 4.0 | 6,025 | 0.3 | 960 | 3.8 | 9,825 | 0.3 |
| Increase | 1,782 | 12.9 | 108,343 | 1.3 | 793 | 16 | 34,665 | 1.6 | 1,662 | 10 | 35,826 | 1.3 |
| Increase % | 2.3 | 37.7 | 37.4 | 35.1 | 4.2 | 59.5 | 69.6 | 59.3 | 8.1 | 36.1 | 85.6 | 56.5 |
| | | | | | 1990-2008 | | | | | | | |
| Min | 75,077 | 27.6 | 249,005 | 3.2 | 18,700 | 25.9 | 43,524 | 2.2 | 18,829 | 24.7 | 5,879 | 1.9 |
| Max | 80,009 | 48.8 | 427,865 | 5.3 | 20,942 | 46.5 | 94,170 | 4.5 | 23,796 | 42.6 | 92,039 | 4.0 |
| Mean | 78,113 | 40.6 | 343,849 | 4.4 | 19,612 | 39.1 | 75,201 | 3.8 | 21,460 | 32.7 | 59,778 | 3.0 |
| STD | 1,373 | 8.1 | 65,520 | 0.8 | 669 | 8.0 | 16,386 | 0.8 | 1,310 | 6.2 | 22,179 | 0.7 |

Source: Kenana Sugar Company (2008); Guneid sugar factory ( 2008);Sennar sugar factory(2008).

**Benefit cost analysis**

The share of sugar revenue was almost 99.9% for the three estates during the period of study with less than 1% for the benefit from molasses and other by-products. The total revenue is higher for Kenana followed by Guneid and Sennar. In terms of sugar cane production, Guneid produces more than Sennar and thus more revenues because the tenants give more attention for the production operations, produce more cane and hence increase their revenues. In this case, the tenant relation seems to be better than the direct labor but, on the other hand, this increases the costs for the factory because they sell cane at higher prices than the cost of production when using the direct labor (Table 2).

Table 2. Average revenues per one thousand feddan (SDG)

| Factory | Sugar | Molasses | Other revenues | Total revenues |
|---|---|---|---|---|
| Guneid | 5,264,156 | 11,754 | 16,052 | 5,291,962 |
| | (99.5) | (0.2) | (0.3) | |
| Sennar | 4,294,748 | 11,309 | 18,567 | 4,324,624 |
| | (99.3) | (0.3) | (0.4) | |
| Kenana | 6,158,906 | 1,752 | 8,110 | 6,168,768 |
| | (99.8) | (0.03) | (0.1) | |

Source: author's computation

Numbers between brackets represent the percentage of revenue from to the total revenues

Regarding the detailed cost, results showed that Guneid had the highest cost of agricultural operation (49%), Kenana had the highest cost of administration (47%) and Sennar had the highest processing cost (21%) relative to the total expenditure (Table 3).

Table 3. Average cost per one thousand feddan (SDG)

| Factory | Agric. cost | Factory cost | Workshop | Admin. | Total cost |
|---|---|---|---|---|---|
| Guneid | 2,264,270 | 641,360 | 380,510 | 1,308,375 | 4,594,515 |
| | (49.3) | (13.9) | (8.3) | (29.3) | |
| Sennar | 1,067,291 | 644,065 | 326,771 | 1,033,367 | 3,071,494 |
| | (34.7) | (21) | (10.6) | (33.6) | |
| Kenana | 1,177,115 | 548,844 | 195,873 | 1,710,401 | 3,632,233 |
| | (32.4) | (15.1) | (5.4) | (47.1) | |

Source: author's computation.

Numbers between brackets represent the percentage of each department cost to the total costs.

Results showed that Kenana had the highest yield, net return with moderate cost and highest net revenues. Despite the fact that Guneid had the highest yield, but due to higher costs resulted in lower revenues compared with Sennar Sugar Company . Analysis of the benefit cost ratio of the three sugar estate using a discount rate of 15% showed that Kenana, Sennar and Guneid realized a cost benefit ratio of 1.8, 1.4, and 1.2, respectively (Table 4).

Table 4. Benefit cost ratio for the three sugar estates, 2000-2007

| Year | Total benefits | Total costs | Benefits at discount factor 15% | Costs at discount factor15% | Benefit cost ratio |
|---|---|---|---|---|---|
| | | | Guneid sugar factory | | |
| 2000 | 3,855,125 | 2,522,481 | 3,353,959 | 2,194,559 | |
| 2001 | 4,257,781 | 322,535 | 3,218,882 | 2,438,391 | |
| 2002 | 4,611,204 | 3,601,509 | 3,034,172 | 2,369,793 | |
| 2003 | 4,925,150 | 4,869,903 | 2,817,186 | 2,785,585 | |
| 2004 | 6,047,677 | 5,780,146 | 3,005,696 | 2,872,733 | |
| 2005 | 5,978,362 | 5,278,130 | 2,582,653 | 2,280,152 | |
| 2006 | 5,985,466 | 4,689,565 | 2,250,535 | 1,763,276 | |
| 2007 | 6,674,930 | 5,789,000 | 2,182,702 | 1,893,003 | |
| Total | 42,335,694 | 35,756,119 | 22,445,784 | 18,597,491 | 1.2 |
| | | | Sennar sugar factory | | |
| 2000 | 3,367,313 | 1,593,024 | 2,929,562 | 1,385,931 | |
| 2001 | 3,270,813 | 2,494,615 | 2,472,734 | 1,885,929 | |
| 2002 | 3,154,411 | 2,395,472 | 2,075,602 | 1,576,221 | |
| 2003 | 3,476,791 | 3,158,252 | 1,988,725 | 1,806,520 | |
| 2004 | 4,818,703 | 4,430,993 | 2,394,896 | 2,202,204 | |
| 2005 | 5,166,465 | 4,397,466 | 2,231,913 | 1,899,705 | |
| 2006 | 5,451,132 | 305,910 | 2,049,626 | 1,150,233 | |
| 2007 | 5,891,364 | 3,043,000 | 1,926,476 | 995,061 | |
| Total | 34,596,991 | 24,571,952 | 18,069,533 | 12,901,803 | 1.4 |
| | | | Kenana sugar factory | | |
| 2000 | 4,674,412 | 2,368,992 | 4,066,738 | 2,061,023 | |
| 2001 | 4,975,454 | 2,220,001 | 3,761,443 | 1,678,321 | |
| 2002 | 4,662,992 | 2,662,641 | 3,068,249 | 1,752,018 | |
| 2003 | 6,312,748 | 3,698,058 | 3,610,892 | 2,115,289 | |
| 2004 | 9,276,788 | 3,954,479 | 4,610,563 | 1,965,376 | |
| 2005 | 7,020,951 | 4,449,098 | 3,033,051 | 1,922,010 | |
| 2006 | 6,026,345 | 4,342,608 | 2,265,906 | 1,632,821 | |
| 2007 | 6,400,452 | 5,362,000 | 2,092,948 | 1,753,374 | |
| Total | 49,350,141 | 29,057,877 | 26,509,790 | 14,880,232 | 1.8 |

Source: Author computation.

## CONCLUSION

Guneid had higher costs than the other two factories, and Sennar had the lowest costs. Kenana was more efficient than Sennar and Guneid for attaining the highest yield, relatively lower cost, the highest revenues and the highest benefit cost ratio indicating the efficiency in terms of sugar production than the other two factories. Although Guneid had higher yield and thus higher total revenues compared with Sennar, however, this could compensate for the higher cost incurred in the agricultural operation and thus resulted in lower net revenues and lower benefit cost ratio (1.2) than Sennar (1.4) indicating that the latter was more efficient than Guneid Sugar Company.

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# الأداء الاقتصادي لقطاعات انتاج السكر الخاصة والعامة في السودان 1990-2008

**سلوى أحمد محمد[1] ومدثر علي أحمد[1] وعباس السر محمد الأمين[2]**

كلية العلوم الزراعية, جامعة الجزيرة, وادمدني, السودان.
2 هيئة البحوث الزراعية, وادمدني, السودان.

**الخلاصة**

يعتبر إنتاج السكر المحلي إستراتيجية مهمة لوقف استيراده. ولذلك تشجع السياسات الحكومية التوسع في إنتاج السكر بالقطاعات الخاصة والعامة. هدفت هذه الدراسة إلي تقييم الكفاءة الاقتصادية لقطاعات السكر وتم اختيار شركة سكر كنانة ممثلة للقطاع الخاص ومصنع الجنيد كمثال للقطاع العام الذي يعمل بواسطة المزارعين ومصنع سكر سنار كمثال للقطاع العام ـأيضاً ولكنه يعمل بالعمالة المباشرة . للوصول إلي هدف هذه الدراسة تم جمع معلومات ثانوية من التقارير والسجلات الموجودة في الثلاث مصانع والدراسات الأخرى ذات الصلة, استخدم التحليل الإحصائي الوصفي وتحليل العائدات والتكاليف لتحليل البيانات ، أوضحت نتائج هذه الدراسة أن هنالك زيادة في المساحة المزروعة بالقصب وزيادة في انتاج وإنتاجية السكر في كل القطاعات خلال العقد الماضي ,وأن كنانة تنتج أعلي انتاجية مع أقل تكاليف وبها أعلي ايراد أيضاً وأن معدل العائد على التكاليف كان أعلى في كنانة وهذا يدل علي أن كنانة أكثر كفاءة من سنار والجنيد في إنتاج السكر في الفترة من 1990 إلي 2008.