

Contribution of Wild fruits to household income, expenditure and livelihood in western sector localities of South Kordofan state, Sudan

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Abstract: Collection and marketing of wild fruits, *Balanites aegyptiaca*, *Zizphus spina- Christi*, *Adansonia digitata*, *Tamarindus indica* and *Grewia tenax*, contribute to farmers' income and household expenditure in study area in drier seasons. The current study aimed at investigating collected quantities of wild fruits, estimated contribution to household income and expenditure as well as identifying the factors affecting their collection. The study was conducted in western sector localities of South Kordofan State, which comprises *Abyii*, *Elsalam*, *Elsanout*, *Lagawa*, *Elmerum* and *Keilack* localities. About 200 households were selected purposively through field survey in 2013/2014 season. Regression was used to estimate regression coefficients of wild fruits return and factors affecting wild fruits collection, such as fruits costs, prices and fruits distance. Partial budgeting analysis also was used to estimate the wild fruits returns. Household economy approach was used to estimate household annual income and expenditure and food security situation. Results revealed that according to regression analysis, the estimated models R^2 was 0.76 which indicates that, 76% of variation in the fruits return was determined by fruits costs, prices and collection distance. The estimated models have indicated that, the model was highly significant ($p \leq 0.000$) in explaining the return variation of fruits collection at this level. Partial budgeting indicated that, all fruits quantities gave positive returns. The fruits collection filled the labor gap amongst production seasons. Producers gross margin were found to be SDG 342.89, 380.48, 986.12, 242.87 and 138.83 for Desert date, Christ thorn, Baobab, Tamarind and Goddeim,

respectively which was equal to SDG 2091.45. At localities level, whereas total gross margins of the fruits quantities were found to be SDG 2661.36, 3048.83, 2980.21, 3077.63, 684.15, 1150.69 and 2502.16 for *Abyii, Elsalam, Elsanout, Lagawa, Elmerum, Keilack* and whole area Localities, respectively. Results showed that, the contribution of wild fruits to household income and expenditure was found to be 72% and 153%, respectively. It was concluded that fruits collection is the most important source of cash income and employment for the people in the study area. The study recommended that important fruits trees should be adopted and domesticated in remote areas.

1. Introduction

Western sector localities is located between latitudes 12° 76- 9° 85 N and longitudes 29° 6 8- 32° 51 E., covering an area of 123700 km². The total number of the populations of the sector localities was estimated as 538486 people scattered in an area about 71.045 km² (13). The main job for the people is agricultural activity (crops and animal production) and local trading. Non-timber forest products (NTFPs) are regarded as a source of cash income during the dry seasons. **References (5), (16)** stated that NTFPs are products that extracted from forest which utilized within the use of household, marketing value or have social, cultural and significance impact. Reference (6) added that NTFPs is a good of biological origin, as well as services derived from forest or any land under similar use. References (10), (15) reported that attention has been focused upon how to improve the environment from degradation due to neglect and misuse. The collection days reduce unemployment in the dry seasons. Reference (14) reported that majority of rural and urban households in Nigeria depend on forest products to meet their households' nutritional needs and incomes generation. Thus wild fruits harvesting enable rural communities to diversify their cash income sources. Moreover, fruits collection is most important cash income generater in drought and famine time, (7), (11) reported that wild fruits can be used as substitutes of seed grains to reduce hunger and alleviate poverty. The area lies within savannah and semi-arid regions, previous studies revealed that these regions were important source for wild fruits collection and marketing (4). Moreover the study area is limited in livelihoods options and employment opportunities, which suggesting alternative sources of cash income generating from wild fruits (2). The fruits are source of cash income for people in western and central Sudan as well as Sahara regions. **They are consumed either fresh or dried, and the sweet pulp of the fruit were dried to produce powder (7).** Tamarind is a multipurpose tropical fruit tree, used primarily for its fruit, which

are eaten fresh or processed as a seasoning spice. Reference (1) reported that most fruit collectors in *Rashad* locality were women and children, and the mean of total annual cash income generated were US\$ 331.73, 336.52 and 11.9 to 701.4 for, *Z. spina-christi*, *A. digitata*, and *B. aegyptiaca* fruits, respectively. Reference(4) documented that NTFPs are contributed to household income by 30%, 25%, 45% and 20% in *Rashad*, *Abu Gubeiha*, *Talodi* and *Dilling* provinces, respectively. Forest and farm trees make significant contributions for food security of rural populations, supply essential nutrient, especially when food sources unavailable (15). Nevertheless, contribution of wild fruits trade in rural community livelihoods and expenditures is not yet well-documented for the study area. The current study aims at estimating the contribution of wild fruit collection and marketing to household income and expenditure as well as identifying the factors affecting their collection and trade.

2. Materials and method

Field survey was conducted to collect primary data through interviewing fruits' collectors using a structured questionnaire. About 200 of fruit collectors were selected purposively from 20 villages out of six localities (*Abyii*, *Elsalam*, *Elsanout*, *Lagawa*, *Elmerum*, *Keilack*). Ten collectors were selected purposively from each village. Secondary source of data were also used.

2.1. Descriptive statistic:

In descriptive statistic analysis, frequency distribution was used to explain the sample farmers' demographic and economic characteristics, to test the means and percentages.

2.2 Regression analysis:

Regression method was used to estimate regression coefficients of wild fruits return and factors affecting wild fruits collection, such as fruits costs, prices and fruits distance (3).

The regression general formula;

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + \dots + b_nX_n + e$$

Mathematical formula;

$$Y = a + b_1 \ln X_1 + b_2 \ln X_2 + \dots + b_n \ln X_n + e \quad (3.3)$$

Where Y = the average return of wild fruits quantities (dependent variable)

a= Constant

b= LN (elasticity)

X_1 = Fruits prices

X_2 = fruits distance

X_3 = fruits costs

X_1 , X_2 and X_3 = independent variables.

Regression analysis measures the relationship between fruits return and factors affecting fruits quantities (fruits costs, distance and prices) as dependents variables.

2.3. Partial budget:

Partial budgeting analysis was also used to estimate the wild fruits returns which based on the average price and quantities /kg. The total variable costs were calculated by summing up the different variable costs of quantities/kg. The average price multiplied by the average quantities/kg/tree equal to the gross returns and the fruits net returns equal the difference between gross return and total variable costs/kg (9).

2.4. Household economy analysis

It was used to estimate household annual income and expenditure and household food security situation.

3. Results and discussion

As presented in Table 1, 58% and 42% of fruits collectors were males and females, respectively. While the most of fruits collectors were within productive age (25-55 year). About 67% and 51% of them have received formal education, and 63% of them were married. Family size was of 6- 10 persons, 60% and agriculture is the main occupation for 70.5% of them. This presumably implied that collection of wild fruits was done by powerful family members Fruit collectors that own Land constituted 94.5%, while 63.5% of them depended on themselves in fruit collection.

Table 1. Sex, age, education level, family size and marital status profiles of wild fruits collectors (% of interviewees in each class).

Variable attribute	Class	% of collectors (n= 200)
Sex	Male	58
	Female	42
Age	< 25 year	7
	25- 35 year	11.5

	36-45 year	31.5
	46-55year	33
	56 and more years	17
Education	Illiteracy	49.5
	Khalwa	19.5
	Primary	20
	Secondary and above	11
Family size	2-5	34.5
	6-10	50
	11 and above	15,5
Marital status	Married	63
	Unmarried	19.5
	Divorced	5.5
	Widowed	12

Source: Study field survey, 2013.

N= number of interviewees.

Regression analysis result:

According to regression result, the estimated models R^2 were 0.76 Indicating that 76% of variation in the fruits return was determined by the estimated models (fruits costs, selling prices and distance). As shown in Table 2. Similar results were reported by [reference \(3\)](#) that regression method was used to estimate regression coefficients. However calculated F-value in contrast to F- tabulated implied that the models is highly significant ($P \leq 0.000$) in explaining fruit returns variation at this level; hence the variables have **right sign** except Desert date and Goddeim prices coefficients. The estimated equation was found to be as: $Y = -1268.90 - 7.65hp + 67.22sp - 19.93gp + 37.65bp + 106.69tp + 5.44fd + 6.98cf$

Whereas;

Y = fruits return in SDG

Hp =Desert date price (*Balanities aegyptiaca*)

Sp = Christ thorn price (*Zizyphus spina Christi*)

Gp =Goddeim price (*Grewia tenax*)

Bp = Baobab price (*Adansonia digitata*)

Tp = Tamarind price (*Tamarindus indica*)

Fd = Fruits distances

Cf = Costs of collecting

materials and methods

Table 2, Coefficients of the costs, fruits distances and fruits prices

Model	Coefficients	Stand. error	Significance
Constant	-1268.901	285.878	0.000a
Coefficient of Desert date price	- 7.653	34.583	0.825
Coefficient of Christ thorn price	67.216	30.530	0.029
Coefficient of Baobab price	37.650	4.285	0.001
Coefficient of Tamarind price	106.694	10.804	0.002
Coefficient of Goddeim price	-19.931	33.857	0.000a
Fruit distance	5.442	18.383	0.768
Costs of fruit collecting	6.981	0.324	0.000a
R square (coefficient of determination)	0.756		
R adjusted	0.747		
F	84.825		0.000a

Source: Study Field survey, 2013.

Fruit returns in the localities of the study area:

The area is endowed with wild fruits trees, hence the fruits are available for collection and marketing. According to study results some people in some localities were famous for collecting and marketing Baobab, Tamarind and Christ thorn fruits and others were outstanding for Goddeim and Desert date fruits collection. Study revealed in table (3) that Desert date fruits quantity was 259.2 kg whereas Christ thorn, Baobab, Tamarind, and Goddeim fruits were 229.848, 90, 184.023 and 19.47 kg, respectively. However, the collection days for the abovementioned fruits were 20, 18, 14, 17 and 8 days, respectively which was equal to 77 days. This result reconciles with [reference\(4\)](#) that, [previous studies revealed that](#) these area localities were important source for wild fruits collection and marketing. It has apparently indicated that collection days fill the gap between production seasons where farmers badly need alternative income sources. Similar results were reported by [references \(2\), \(4\), \(11\) and \(12\)](#) that fruits collection is most important cash income generation in drought and famine time. In view of that, wild fruits can reduce hunger and alleviate poverty. Moreover, fruits collection activity reduces unemployment in the dry seasons by availing extra opportunities for family members to earn money. The gross margins for the aforementioned quantities were found to be SDG 342.89, 380.48, 986.12, 242.87 and 138.83, respectively which was equal to SDG 2091.45. [References \(5\),](#)

(16) reported that NTFPs are products that extracted from forest and utilized within the use of household, marketing value or have social, cultural and of significant impact on rural community livelihoods. Moreover, reference (6) added that (NTFPs) is a good of biological origin, as well as services derived from forest or any land under similar use. Fruits collection activity generates income and reduces unemployment rate in some study area localities. However, the area norms and traditions make some people skeptical to collect wild fruits. Some collectors complained from security unrest situations and scarcity of local markets for low activity of fruits collection. It worth noting, that most of the fruits collectors rely on their family members for fruits collecting.

Table 3. Fruits average returns in study area in western sector localities

Fruits	Desert date	Christ thorn	Baobab	Tamarind	Goddeim	Total
Collected quantity kg	259.2	229.848	90	184.023	19.47	
Collecting days	20	18.23	14.3	16.79	8.2	77.52
Productivity Kg / tree	151.59	103.176	64.204	153.646	2.596	
Fruit price SDG / kg	1.67	2.08	12	1.72	10	
Fruit gross output SDG	432.86	478.08	1080	316.52	194.7	2502.16
Total variable cost of fruit/SDG	89.71	97.6	93.88	73.65	55.87	410.71
Fruit gross margin/ SDG	342.89	380.48	986.12	242.87	138.83	2091.45

Source: Study Field survey, 2013.

Collector net profit depends on the fruits collected quantities costs and their selling prices. Table (4) revealed that the fruits gross output were SDG 2661.36, 3048.83, 2980.21, 3077.63, 684.15, 1150.69 and 2502.16 for *Abyii, Elsalam, Elsanout, Lagawa, Elmerum, Keilack* and whole area Localities, respectively. This agreed with references (4), (1) who documented that the NTFPs were the sole source for income generating during dry seasons. Fruits gross margin for the above Localities were SDG 2040.81, 2502.11, 2497.21, 2647.55, 456.14, 902.71 and 2091.45, respectively. However, the collection days for fruits at these localities were 56.7, 75.5, 108, 88.4,

44.6, 44.6 and 77.5 day, respectively. Indicating that, fruits collection has contributed to household income in range between SDG1145.62- 3073.83. Furthermore, it bridged the labor gap between production seasons covering a period of about 3.6 months. It was also shown that fruits returns contribute to family daily expenses and education fees. Moreover, it supported rural people food security, enterprises and met environmental objectives. In this respect, (10), (15) have pointed out that attention has been focused upon how to improve the environment from land and forest degradation due to neglect and misuse. Reference (14) reported that most of rural and urban households in Nigeria depend on forest products to meet their households' nutritional needs and incomes generation.

Table 4. Fruits returns, costs and collection days in area localities

Locality	Gross return	The costs	Collection days	Net return
Abyii	2661.36	620.55	56.7	2040.81
Elsalam	3048.83	546.72	75.5	2502.11
Elsanout	2980.21	483	108	2497.21
Lagawa	3077.63	430.08	88.4	2647.55
Elmerum	684.15	228	44.15	456.14
Keilack	1150.69	247.97	44.6	902.71
While Area Localities	2502.16	410.71	77.5	2091.45

Source: Study field survey, 2013

Table 5. Household net income and contribution of NTFPs to Household expenditure and income in the west sector localities of South Kordofan state

Variable attribute	Abyii	Elsalam	Elsunut	Lagawa	Kailek	Elmeirum	All Localities
Agric. Production	7,700	7,902	8,650	10,202	12,333	7,500	9,048
NTFPs	18,286	27,319	16,246	14,021	2,676	2110	22993
Total	25,986	25,221	24,896	24,223	15,009	9610	32,041
Expenditure	16,795	14,455	16,746	15,745	22,229	16,913	14,979
Net H-H income	9,191	10,766	8150	8,478	(7220)	(7202)	2,414
Contribution Of NTFPs to H-H Expenditure	109%	189%	97%	89%	18%	12%	153%
Contribution Of NTFPs to H-H income	70.5%	108%	65%	58%	(48%)	22%	72%

Source: Study Field survey, 2013

The main sources of income for household were agricultural production (crop production) and collection of NTFPs. When those sources of income were considered, the household average total annual income for the different localities in the year found to be SDG25,986, 38,461, 24,896, 24,223, 15,009, 9,425 and 14,979 for *Abyii*, *Elsalam*, *Elsunut*, *Lagawa*, *Kailek*, *Elmeirum* and the whole area localities, respectively (Table 5). The contribution of NTFPs to household income was found to

be 70.5, 71, 65, 58, 18, 20 and 67% for the above localities, respectively (Table 5). The result was in line with reference (7) that the fruits are source of cash income for people in western and central Sudan as well as Sahara regions. Similar result was reported by reference (4) who indicated that NTFPs have contributed to household income by 30%, 25%, 45% and 20% in Rashad, Abu Gubeiha, Talodi and Dilling provinces, respectively. Therefore, wild fruits collection significantly contribute to household expenditure and income for the people of the study area. Fruits gross margin participated in education and health care services and other family expenses. The problems of fruits collection were exemplified in fires, remote distances, trees cutting, fruits pests and over-grazing as well as shortage in storage facilities and transportation. The study recommended that *Balanites*, *Zizyphus*, *Adansonia*, Tamarind and *G. tenax* fruits trees should be adapted and diversified in some remote areas, adoption and domestication of those trees should be practiced to foster and sustain fruits collection activity, through forests conservation from fires and over-grazing. Also it suggested that awareness should be raised to support fruit collectors to expand their income sources. Wild fruits collection should be improved, through selecting desirable fruits for human and animal use.

4.conclusion

Study showed that 76% of variation in the fruits return was determined by the fruits costs, selling prices and collection distance. Partial budgeting revealed that, all fruits trees quantities gave positive returns. Collection period has bridged the gap of economical activities to earn money by rural communities in drier seasons. According to the annual income and expenditures, the net household income found to be positive for the study area localities.

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