

DIVERSIFICATION OF LIVELIHOODS THROUGH DATE PALM PRODUCTION IN AGRO-PASTORAL AREAS OF AFAR REGION, ETHIOPIA

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ABSTRACT

Background: Date palm is the oldest fruit tree which is mostly cultivated in arid and semi-arid areas. This study aims to assess the contribution of date palm production in livelihood promotion of agro-pastoral regions of Afar, Ethiopia. The primary data were generated from questionnaires, interviews, focus group discussions and observation. Date palm producers were selected purposively while individuals were selected randomly from 117 samples households. Secondary data were also used.

Results: For the purpose of analysis, descriptive statistics for quantitative and narration for qualitative data were applied for analysis. Date palm production covered about 10-30 % of the food demands of 95,5 % households in the study area where most of the date palm producing households (88,9 %) consumed about 0,25-1,99 gm of date palm per day. Moreover, the primary income source for the majority of date palm producers is obtained from date palm production. Palm trees and its different parts are used to construct houses, bed frames, bridges and especially the leaves are used as a raw material to make baskets, fans, ropes, sacks and other materials.

Conclusion: Capacity building on the economic importance and agronomic and management practices of date palm to all stakeholders is recommended.

KEYWORDS

date palm, production, livelihoods, agro-pastoral, Afar region

CLASSIFICATION

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INTRODUCTION

Date palm fruit is very nutritious and contains carbohydrates, proteins, fibres, fats, various vitamins and minerals. The highest sugar content makes date palm fruit one of the most nourishing natural foods available to man. The water content is between 15 % to 30 % depending on the variety and on the maturity stage of the fruit [1]. Moreover, date fruits provide excellent taste to the final product when used in baking. It is also used as a component in food preparations like sweets, snacks, confectionery, baking products, institutional feeding and health foods. Date juice, syrup, liquid sugar, protein yeast and vinegar and fermentation products like wine, alcohol, organic acids, etc. can be derived from date palm fruits.

According to Zaid and de Wet [2], date palm is cultivated in arid and semi-arid regions which are characterized by long and hot summers and no or at most low rainfall. Moreover, it requires very low relative humidity especially during the ripening period. If irrigation is available high temperatures up to 56 °C are also well tolerated by date palm. Rain during the flowering and harvest season is likely to cause some damage to the fruits. Rainfall immediately after pollination is detrimental since it washes the pollen grains and thus reduced fruit set. Moreover, rainfall may reduce temperature that is necessary for fruit set and flower's receptivity [3]. Generally, the amount of rainfall is less important than the conditions under which it occurs. Light shower accompanied by prolonged periods of cloudy weather and high relative humidity may cause more damage than heavy rainfall followed by clear weather and dry winds. Date palm can be planted in a wide range of soils with varying amounts of organic and mineral nutrients. Date palm is known to tolerate salinity more than any other cultivated fruit crop.

It is believed that date palm has been introduced to Ethiopia from Middle East countries about 200 years ago by traders from Yemen and Sudan [4]. Its production is generally not well developed in Ethiopia. Date palm is cultivated mainly by agro-pastoralists in Afar, Somali, Gambella, Dira Dawa and Benishangul-Gumuz regions. Especially in Afar Region the production of date palm has long history where it is established as wild crop in Afambo, Aysaita, Gewane and Amibara districts along the Awash River. The environmental and edaphic conditions in these areas are especially suitable for date palm production, since it is located within the Danakil Depression and Awash River basin. Although the annual production of date palm is not known, the quantity required is generally quite lower than the demand of the product in the country [5]. To satisfy this demand the government of Ethiopia imports annually about 1715 tons of date palm [6].

The agro-pastoralists in Afar Region produced date palm fruit mainly for their own consumptions and in some extent for local market to improve their livelihood. The production practices of date palm employed by agro-pastoralists are traditional which is characterized by improper cultural practices, use of inferior varieties and poor postharvest handling and marketing of date palm. As the result, date palms produced in the country are low in quantity as well as poor in quality. On the other hand, date palm production contributes a lot to food security, reduction of malnutrition and poverty and source of additional income generation for the poor agro-pastoralists. Moreover date palm plays significant role in the control of desertification and means of land reclamation in the country at large and in Afar Region in particular. The aim of this study was, therefore, to assess the contribution of date palm production for livelihood diversification in Afambo and Aysaita districts of Afar Region.

THE RESEARCH AREA AND METHODS

DESCRIPTION OF THE STUDY AREA

The present study was conducted in Afambo and Asaiyta districts which are categorized as Awsa Kee Gewane livelihood with average altitude ranging from 330 to 350 meter above sea

level [7]. The area has an average annual rainfall of 122 mm with bimodal rainy seasons. The first season is from February-March (*sugum* rains) while the second rainy season is from July-September (*karma* rains). The Awash River is the main source of water for irrigated crop production in the area. The vegetation in the region is a mix of shrubs, bushes and pasture land. Moreover, invasive weeds, particularly that of *Prosopis juliflora*, are the major threat of the range lands in the region. Large-scale farms owned by the government and private investors are found in the region where Tendaho and Middle Awash Agriculture Development farms are the main state farms providing casual employment opportunities to the local communities and immigrant workers [7]. The total population of Aysaita and Afambo districts is 90 398. Of that number 48 747 are males and 41 651 are females. The annual population growth rate is about 2,9 % [8].

SAMPLING TECHNIQUES AND PROCEDURES

From four districts where date palm is mainly produced in Afar Regional State Afambo and Aysaita Districts were purposively selected because of their long experience in the production of date palm. Among the total of 19 pastoral associations found in Afambo and Aysaita districts, the three pastoral associations namely *Alasabolo*, *Humadoyta* and *Berga* were selected based on their experiences in production and consumption of date palm. The total number of households was determined according to the formula described by Kothari [9] with 95 % confidence interval while the number of households in different pastoral associations and agro-climatic zones was calculated based on the population size ratio formula described by Cochran [10] as indicated further in the text. The individual households in each pastoral association was however selected randomly. Accordingly a total of 117 households were selected with 57, 30, and 30 households in *Alasabolo*, *Humadoyta* and *Berga kebeles*¹, respectively.

Both primary and secondary data were collected in the study. The primary data were generated through household surveys using semi-structured questionnaires, key informant interviews and focus group discussions. In focus group discussions local knowledgeable peoples in the *kebeles* were participated. Furthermore direct observations were made to generate primary data on physical conditions of date palm production in the study area and photos were taken. In addition, literatures related to the study area such as published and unpublished documents, governmental and non-governmental reports and other similar relevant documents were reviewed.

METHOD OF DATA ANALYSIS

Qualitative data were summarized and narrated. Quantitative data collected from the household survey were entered and analysed using SPSS (Statistical Package for Social Sciences). Descriptive statistics such as frequency distribution, percentages and cross tabulation were applied for analysis. Moreover, the results were summarized in the form of tables and figures.

RESULTS AND DISCUSSIONS

GENERAL DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

Sex and marital status

The household head sex and marital distribution are presented in Table 1.

As is indicated, sex distribution of household heads influenced the participation of agro-pastoralists on date palm production in the study area. Accordingly, 64,1 % of the households

Table 1. Sex distribution and marital status of the respondent households in the study area.

Sex of the household head	Category	Frequency	%
	Male-headed	75	64,1
	Female-headed	42	35,9
	Total	117	100,0
Marital status of the household respondents	Category	Frequency	%
	Single	9	7,7
	Married	97	82,9
	Divorced	6	5,1
	Widowed/widower	5	4,3
	Total	117	100,0

participating in date palm production were male headed while the remaining 35.9% were female headed. The reason is probably in that male agro-pastoralists have easier access to land while female headed agro-pastoralists may have difficulties to access land suitable for date palm production. These findings are generally in line with the findings of many researches which revealed that female-headed households and women in general have poor access and control over resources especially in agro-pastoral communities [11].

The marital status also influenced the participation of the agro-pastoralists in date palm production. Most of the respondents (82,9 %) in the study area were married while 7,7 % were single and the remaining 9,4 % were either divorced or windowed. Marriage is essential to facilitate farming and household activities under agro-pastoralists. Moreover according to the clan leaders as key informant divorcing is not the acceptable phenomena in agro- pastoral society. In case of disagreements, the clan leaders and elderly people including the family members of the couples are trying to resolve the problems occurred among the couples.

Age distribution and educational level

Age distribution and educational level of the respondents are presented in Figure 1 and Table 2, respectively. According to the survey results, the majority of the household heads (91,5 %) participated in date palm production were at working ages which is probably associated with the fact that production and management activities of crops including date palm is a hard work job which requires physically matured personnel.

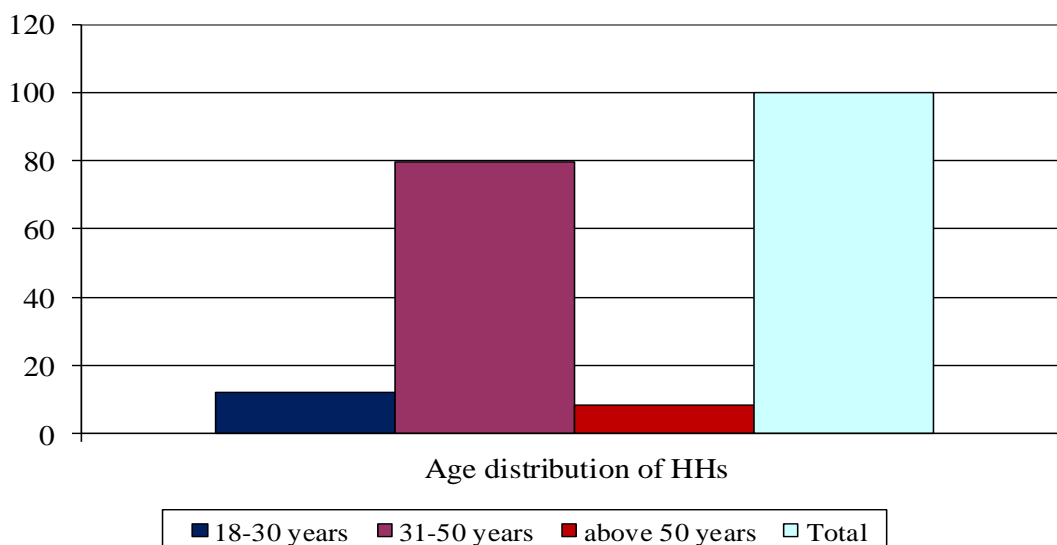


Figure 1. Age distribution (%) of the respondent households in the study area.

Table 2. Educational level of the respondent households in the study area.

Category	Frequency	%
Illiterate	83	70,9
Primary school	9	7,7
Middle school	0	0,0
High school and above	3	2,6
Informal education	22	18,8
Total	117	100,0

As Table 2 shows, most of the respondents (70,9 %) were illiterate. While 18,8 % of the households had informal education, only 9,3 % of the respondents visited formal education system. The level of education plays an important role in the introduction, distribution and adoption of improved agronomic and management practices which are necessary for increased production and productivity of crops including date palm. Moreover education helps to improve the knowledge, skills and attitudes of the farming communities and thus to create changes in human behaviours. Therefore, extension services, awareness creation and expansion of infrastructures such as schools, roads electricity are necessary in the study area.

AREA ALLOCATED FOR THE DATE PALM PRODUCTION

Area allocated for date palm production and the experience of the sample households are presented in Table 3.

Table 3. Production area allocated date palm production in the study area.

Category	<i>Kebele</i>							
	Berga		Alassabolo		Humodoyta		Total	
	HH frequency	%	HH frequency	%	HH frequency	%	HH frequency	%
≤ 0,59	10	33,3	39	68,4	16	53,3	65	55,6
0,6-0,9	16	53,3	17	29,8	12	40	45	38,5
1,0-1,9	3	10,0	1	1,8	2	6,7	6	5,1
2,0-3,0	1	3,3	0	0,0	0	0,0	1	0,9
Total	30	100	57	100	30	100	117	100

The size of date palm production area in the sample *kebeles* is relatively different. Most of the sample households in *Alassabolo* (68,4 %) and in *Humodoyta* (53,3 %) *kebeles* allocated less than 0,59 ha cultivated land. However, about 53,3 % of the agro-pastoralists in *Berga kebele* allocated about 0,6-0,9 ha of cultivated land for date palm production. Generally, about 94,1 % of the sample households in the study area produced date palm on less than one hectare of cultivated land which is low compared to other countries where individual farmer owned more than ten hectares of land covered by date palm tree. Date palm plantation in Afambo and Aysaita districts is mostly concentrated around Awash River, shown in Figure 2.

Afar Regional State is one of the regions in Ethiopia having historical experience in irrigated agriculture. Crop production in the region is generally practiced on about 84,358 hectare of land, of which about 80.8% is irrigated. The Region has also long experience in the production of date palm especially in Afambo and Aysaita districts as indicated in the Table 3 and Figure 2. Generally, the research results revealed that about 77.8% of the respondents in the study area had 21-40 years of experiences in the production of date palm. However, the management practices employed by growers are traditional which have been acquired from their parents through time. According to the respondents no trainings and extension services have been given by respective stakeholders about the agronomic, management, and postharvest handling practices.



Figure 2. Date palm trees grown at Awash River bank in Alassabolo *Kebele* of Afambo District (photo taken during observation of the production area).

Table 4. Experience of date palm production in the study area.

Experiences, year								
10-20	8	26.7	4	7.0	2	6.7	14	12.0
21-40	21	70.0	45	78.9	25	83.3	91	77.8
41-60	1	3.3	8	14.0	3	10.0	12	10.2
Total	30	100	57	100	30	100	117	100

CONTRIBUTIONS OF DATE PALM PRODUCTION FOR AGRO-PASTORAL LIVELIHOOD IN THE STUDY AREA

The major livelihood activities of agro-pastoral livelihood in Afambo and Aysaita districts is mixed farming where irrigated and rain-fed crop production is combined with livestock rearing- mainly cattle and shoats (sheep/goats). Casual labourers employment both in state and private agricultural farms is an important income source for casual labourers and other wealth groups in some areas. Moreover date palm production is also one of the major components of livelihood for agro-pastoralists in the area [7].

Date palm had multiple benefits in the agro-pastoral livelihoods. It has excellent contributing potential to economic, social and cultural aspects in the areas. It is a multipurpose tree in providing various primary and secondary products which diversify its importance to the economic and social security of the people. Date palm cultivation helps to generate considerable employment opportunities and to facilitate eco-restoration that ensures livelihood and food security. Date palm production can be one of the best alternatives for developmental endeavours of the Afambo and Aysaita districts if promoted in a systematic manner.

Major crop production in Afambo and Aysaita districts

The major crops that were being produced in the area include date palm, maize, onion, tomato and cotton crops. The production of these crops is entirely dependent on the availability of irrigation water [7].

The major crops produced in the study areas are presented in Figure 3.

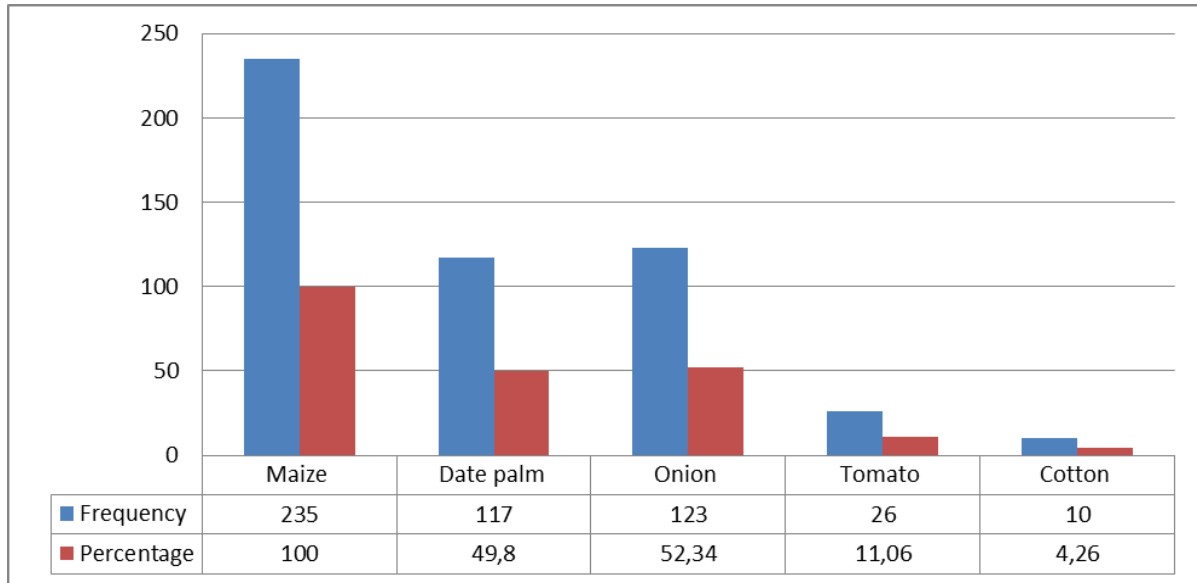


Figure 3. Major crops produced in the study area.

According to the respondent, they households produced different types of crops. Almost about 100% of respondents produced maize while about 52,34 %, 49,8 %, 11,06 % and 4,26 % of the households produced onion, date palm, tomato and cotton, respectively.

Crop area coverage and contribution as food source of households in the study area

The size of land holding refers to the pieces of land owned and cultivated by agro-pastoralists and their families. It is generally considered that agro-pastoralists hold small pieces of land to be used for crop production [12]. According to the survey results, few of date palm producers (16,2 %) and non-producers (18,2 %) have a crop land at the range of more than 3 ha. However, more than half of the date palm producers (56,4 %) have 2-3 ha of land covered by different types of crops. In non-date palm producers, only 45,8 % of the respondents have such amount (2-3 ha) of land which is covered by different crops.

In agro-pastoralist, there are different food sources in the study area. Crop production is one of the major sources of food in Afambo and Aysaita districts [7]. Based on the survey results about 55,6 % of date palm producers covered about 20-40 % of their food demand from crop

Table 5. Crop area coverage and contribution as food source of HHs in the study area.

Crop area coverage						
Area, ha	Producer		Non-producer		Total	
	Frequency	%	Frequency	%	Frequency	%
< 0,99	3	2,6	2	1,7	5	2,1
1-1,99	29	24,8	40	33,9	69	29,4
2-3	66	56,4	54	45,8	120	51,1
> 3	19	16,2	22	18,6	41	17,4
Total	117	100,0	118	100,0	235	100,0
Crop production as food source						
< 20	37	31,6	8	6,8	45	19,
20-40	65	55,6	33	28,0	98	41,7
41-60	15	12,8	77	65,3	92	39,
	0	0,0	0	0,0	0	0,0
Total	117	100,0	118	100,0	235	100,0

production (Table 5). But in case of non-date palm producers, 41-60 % of the food demand of the 65,3 % of the household is covered from crop production. The results showed that crop production had proportional contribution as food sources for both date palm producers as well as non-date palm producers. However, for most of date palm producers (87,2 %) only up to 40 % of their food demands are covered by crop production where the remaining food demand (60 %) may probably be covered by date palm and/or products from livestock. In case of non-date palm producers, about 60% of the food demand of 93,3 % of the respondents is covered by crop production in both districts. But, as Table 5 indicated below, in Afambo district 42,7 % of households covered about 20-40 % of their food demand from crop production and 39,1 % of households covered about 20-40 % of their food demand from crop production in Aysaita district which indicates crop production could be the importance of the sector other than date palm production to satisfy the food demand of such agro-pastoralist.

Table 6. Contribution of crop production as food source in Afambo and Aysaita districts.

Crop production as food source	Afambo		Aysaita		Total	
	Frequency	%	Frequency	%	Frequency	%
< 20	35	20,5	10	15,6	45	19,1
20-40	73	42,7	25	39,1	98	41,7
41-60	63	36,8	29	45,3	92	39,1
61-80	0	0,0	0	0,0	0	0,0
Total	117	100,0	118	100,0	235	100,0

Contribution of date palm as food source in Afambo and Aysaita districts

Date palm is one of the most important sources of food for agro-pastoral communities including Afambo and Aysaita districts. The community can dry the fruits and store up to one year that can be used as a source of food especially during dry season.

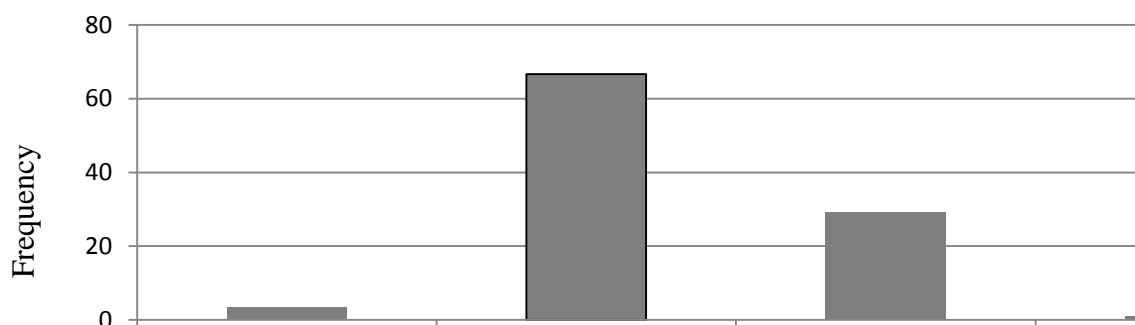


Figure 4. Food source contribution of date palm for agro-pastoralists in the study areas.

In Figure 4, 10-30 % food demands of the 95,8 % household are covered by date palm production sector of agriculture in the study area. The result indicates that date palm production in low land areas of the Region like Afambo and Aysaita districts is an important activity that helps to improve the food security in such rainfall scarce areas.

Primary income sources of agro-pastoralists in Afambo and Aysaita districts

Livelihood diversification plays a significant and relevant role in improving food security and incomes of pastoral and agro-pastoral community including those in the study area [13].

According to Figure 5, the primary income source of the majority date palm producers (71,8 %) is sourced from date palm production and their products and some small amount of this group of people (3,4 %) gets their income from trade or other business. In the case of non-date palm producers, other crop production and animal production is the main sources of

incomes of the majority of the people (80,5 %). This indicates that date palm production is most important source of primary cash income of date palm producing. They earn cash income directly through selling the fruit and indirectly through selling of handcrafts, household utensils and mate which they make out of the leave of date palm tree.

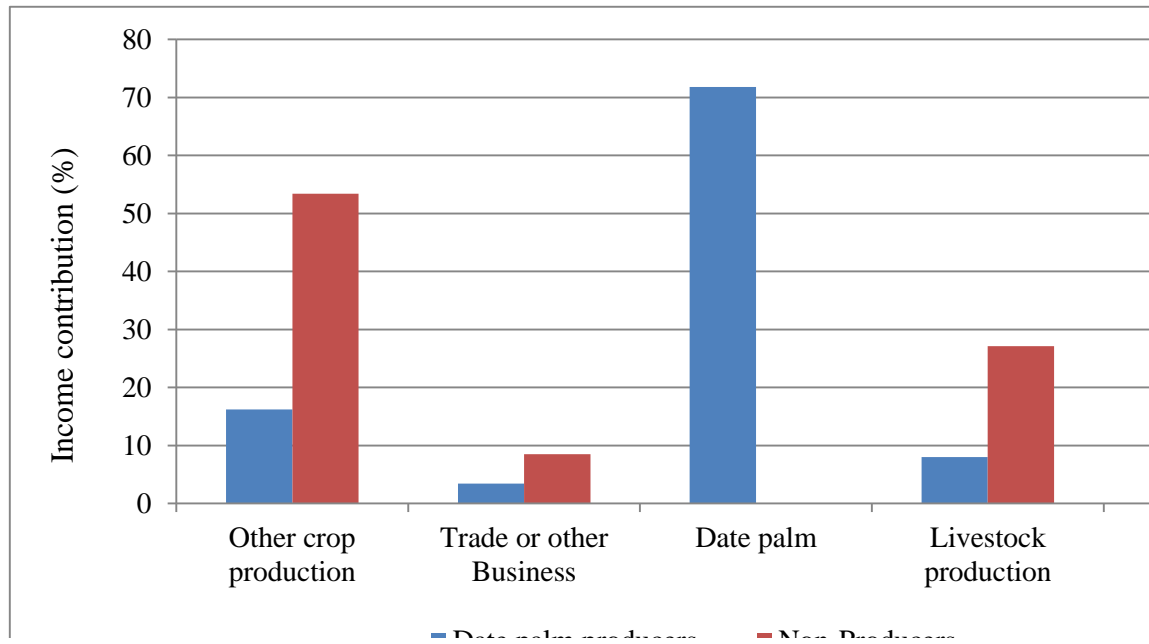


Figure 5. Primary sources of income of the households in the study area.

Secondary income sources of agro-pastoralists

The secondary source of incomes of the majority date palm producing households (60,7 %) incomes sourced from livestock and their products (Table 7). Similarly, the majority of non-date palm producing households (80,5 %) in the study area get their income from selling of livestock and their products. This result also similar with the research findings of Salman [11] who reported that livestock rearing was the secondary source of income in South Punjab of Pakistan.

Table 7. Secondary income sources of the households in the study area.

Secondary source of income	Producer		Non-producer		Total	
	Frequency	%	Frequency	%	Frequency	%
Crop production	19	16,2	3	2,5	22	9,4
Petty trade	6	5,1	11	9,3	17	7,2
Date palm	13	11,0	0	0,0	13	5,5
Remittances	0	0,0	1	0,8	1	0,4
Livestock production	71	60,7	95	80,5	166	70,6
Agricultural labour	2	1,7	5	4,2	7	3,0
Non farming activities	2	1,7	1	0,8	3	1,3
Sale of fire wood and charcoal	4	3,4	2	1,7	6	2,6
Total	117	100,0	118	100,0	235	100,0

Income sources of agro-pastoralists at the time of drought (shock, stress, ...)

Agro-pastoral households are vulnerable to different types of problems, shocks, stresses, and changing trends. Thus, vulnerability analysis is important to identify coping mechanisms of the community during shocks and stresses [14]. Survey results of the study area in this regard are presented in Figure 6.

According to the research results, selling of date palm fruits and other date palm products is the main source of income for the majority of date palm producing respondents (86.3%) during drought or other stressing conditions. On the other hand the main source of income for the majority of non-date palm producing respondents (71%) to cope up the stressing conditions is selling of assets such as cattle, shoots and camel and others. Moreover, some of the people in this group seek additional employment opportunities and start business to increase their sources of incomes and thus, to alleviate the problems associated with such drought or stressing conditions.

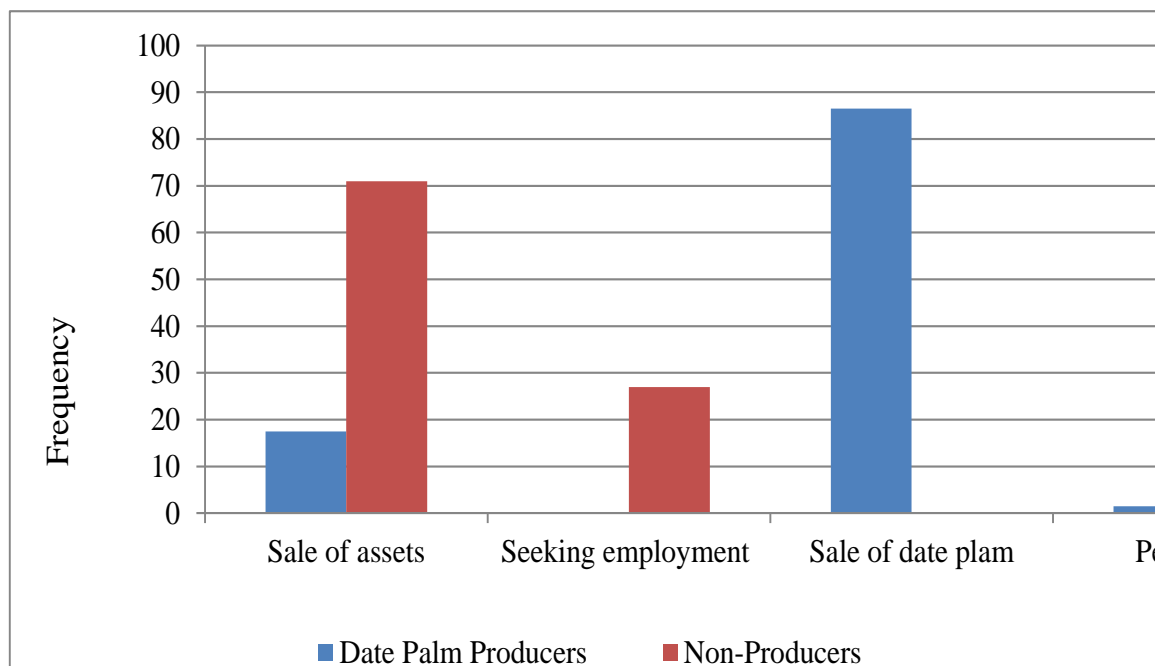


Figure 6. Income sources of households during drought conditions in the study area.

DAILY CONSUMPTION OF DATE PALM IN THE STUDY AREA

As discussed previously date palm is one of the main food sources of pastoral and agro-pastoral communities in Afar Region where the daily consumption of date palm is presented in Figure 7. Accordingly 43,6 % date palm producing households in the study area consumed about 0,25-0,99 g of date palm per day whereas about 45,3 % of them consumed 1-1,99 g/day. However, most of non-date palm producers (65,3 %) consumed date palm less than 0,25 g/day. Only some of non-date palm producing respondents (31,4 %) consumed about 0,25-0,99 g/day date palm. Low consumption of non-date palm producers in the study area is obviously associated with the unavailability of date palm in their farm in both districts. Therefore, this group of people should buy date palm from the market which incurs additional expense in their food expenditure.

In Afambo district about 38,0 % households consumed about 0,25-0,99 g of date palm per day while about 35,9 % of the households in Aysaita district consumed about 0,25-0,99 g of date palm per day per person as indicated in Table 8.

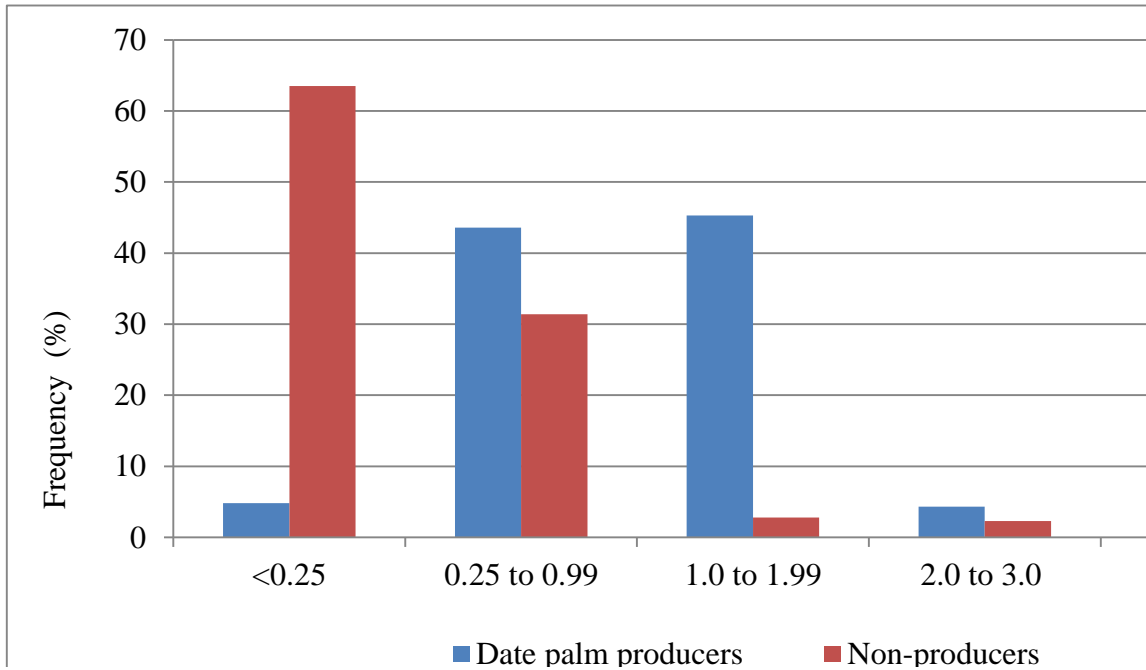


Figure 7. Daily date palm consumption of the respondents in the study area, in grams per day per person.

Table 8. Daily date palm consumption of the HHs in each district.

Daily date palm consumption, g per day per person	Afambo		Aysaita		Total	
	Frequency	%	Frequency	%	Frequency	%
< 0,25	61	35,7	21	32,8	82	34,9
0,25-0,99	65	38,0	23	35,9	88	37,4
1,00-1,99	43	25,1	14	21,9	57	24,3
2-3	2	1,2	4	6,2	6	2,6
> 3	0	0,0	2	3,1	2	0,9
Total	117	100,0	118	100,0	235	100,0

As per Table 9, there is statistically significant difference on primary source of income between producers and non-producers ($U = 5913,5, p < 0,05$). The mean rank for date palm producers is found to be higher (126,46) than the mean rank of non-producers (109,61). There is also statistically significant difference in income of date palm producers and non-producers during drought conditions ($U = 3290,00, p < 0,05$). The mean rank for date palm producers is found to be higher (148,88) than the mean rank of non-producers (87,38). Moreover, there is statistically significant difference on date palm daily consumption between date producers and non-producers ($U = 1651,00, p < 0,05$). The mean rank for date palm producers is found to be higher (162,89) than the mean rank of non-producers (73,49).

Table 9. Mann-Whitney U-test values. Results are significant to 5 %.

Variable	<i>U</i>	Sig.
Primary source of income	5913,50	0,046
Income during drought	3290	0,00
Date palm daily consumption	1651,00	0,00

These results tell us there is annual date palm production and yield obtained by agro-pastoralists in Afambo and Aysaita districts. These surplus date production enables agro-pastorals to sell their products and earn extra incomes. Moreover, the results indicated

the drought resistant ability of date palm fruit trees in Afambo and Aysaita districts. So agro-pastoralists can harvest yield and sell their product during normal and drought season which protect them to sell their livestock asset. Moreover, consuming date palm as food sources for date palm producing pastoralists in Afambo and Aysaita districts is common while non-producers first should buy the date palm fruit for consumption.

MARKET OUTLETS AND ANNUAL INCOMES OF HOUSEHOLDS FROM DATE PALM PRODUCTION

Agro-pastoralists in Afambo and Aysaita districts use different marketing chain to sale their fruits. Accordingly, most of the respondents (69,2 %) sell their fruits to retailers in the study area (Table 10). While 13,7 % of the respondents sell the fruits produced directly for consumers about 17,1 % of them sell their fruits to wholesaler.

Table 10. Market outlets and annual income of date palm fruits produced in the study area.

Market centre	Frequency	Percentage
Consumer	16	13,7
Wholesaler	20	17,1
Retailer	81	69,2
Total	117	100,0

The respondents in the study area have different income sources. One of the income sources of the producers in the study area is sales obtained from date palm fruits and other materials which are made from parts of date palm trees. The annual income of date palm producers obtained from sales of date palm fruits and byproducts in the study area is summarized in Table 11 below. Accordingly, most of date palm producing respondents (64,9 %) earned about 5 001,00-20 000,00 Eth-Birr per year. While 32,5 % of the date palm producers earned less than 5 000,00 Eth-Birr per year about 14,5 % of the earned Eth-Birr at the range of 15 000,00-20 000,00 per year. But the average annual income of the producers was 8 166,68 Eth-Birr per year which is very low compared to the potential of the area. The findings of the research are similar with that of Salman [11] where date palms are important income sources. The income sourced from the sale of date palm fruits and byproducts can be used to purchase different materials such as food items, cloths, agricultural inputs and different services like medication and school fee for their children. These results show that date palm production helps to earn extra income which can be used to improve the living standards of the agro-pastoralists in Afambo and Aysaita district.

Table 11. Annual income of agro-pastoralists from date palm production.

Annual income, birr	Frequency	Percentage
< 5 000	38	32,5
5 001-10 000	59	50,4
15 000-20 000	17	14,5
≥ 25 000	3	2,6
Total	117	100,0

In general agro-pastoralist in Afambo and Aysaita districts have different sources of livelihood where date palm production is an important one. Therefore, the contribution of date palm production to the total livelihood/annual income of the date palm producers in Afambo and Aysaita districts is summarized as follows:

Annual income from crop production other than date palm	378 810
Annual income from date palm production	955 502
Annual income from livestock production	206 210

Annual income from Agricultural jobs our	62 310
Annual income from Trade	107 140
Total	1503 760,00

The annual contribution of date palm production to the total income of the agro-pastoralists is therefore 63,54 %.

Use of date palm tree other than source of food

A date palm has different uses for agro-pastoralists in Afambo and Aysaita districts. In addition to fruit production, leaves are used to make various products which help to improve the incomes of the agro-pastoralists. According to the respondents during focus group discussion in the study area date palm is used to construct houses, bed frames, bridges and other materials. Leaves are used to made baskets, fans, ropes, sacks and other materials. Moreover, the respondents believed that date palm trees are important for environmental protection since they considered the plant as trees. According to the household’s date palm are useful to protect desertification, soil and erosion and sandstorm and stabilize micro-climate. This result shows that beside of food and income source date palm is multipurpose fruit tree which contributions of economic, social and environmental security of agro-pastoralists in both districts.

Constraints of date palm production in the study area

Date palm production in Afar Region is concentrated at banks of rivers and seasonal streams without any cultural and management practices necessary for improved production and productivity. They are mostly neglected crops and grow as wild. Even in smallholder farms and relatively organized plantations, the agronomic practices employed are inappropriate for the production of date palm. The constraints of date palm production in the study area are generally summarized and presented in Table 12.

Table 12. Major constraints of date palm production in the study area.

Category	Frequency of households	%
Inappropriate agronomic & management practices	71	60,7
Shortage of quality planting materials	13	11,1
Diseases & insect pests problems	14	12,0
Poor postharvest handling practices	11	9,4
Lack of marketing linkage	8	6,8
Total	117	100,0

According to the survey results, the majority of the respondents (60.7%) perceive that the major constraint of date palm production in the study area is poor agronomic and management practices necessary for maximum yield of date fruit. The reasons for poor cultural practices are among others lack of knowledge and skills necessary for the production of date palm. According to the respondents high incidence of diseases and insect pests and their poor management were the second constraint of the sector in the study area. The knowledge and skills of agro-pastoralists about insect pest management options are extremely low. Moreover pesticides are not available in the study area.

Moreover the absence of improved date palm varieties and use of inappropriate propagation method were the other constraint of date palm production in the study area. Propagation of date palm in the study area was exclusively through seed which results low quantity and quality of date palm fruits. In addition poor postharvest handling practices such as poor storage, absence of curing, sorting, grading and packaging and lack of market linkage between producers and customers were also considered as a problem of the sector in the

study area. Date palm harvesting practice is done manually by cutting and collecting of the fruit bunches from the ground which incurs damages and thus decreases the shelf life and increases postharvest loss of date fruits.

LIVELIHOOD OUTCOME OF AGRO-PASTORALISTS

Livelihood outcomes are the results of combination of different assets. It could be desirable due to opportunities and undesirable due to challenges as indicated elsewhere [11]. Well managed date palm production can improve the livelihoods of agro-pastoralists positively by increasing production and productivity. Based on the results of the present study about 39.1% of the households recognized that date palm has high production and productivity which can increase the food and incomes of agro-pastoralists (38.7%). Moreover, about 22.1% of households believed that date palm production improves food security of agro-pastoralists in both districts (Table 13). In Afambo district on the other hand, 40.4% of households said that date palm can increase food and incomes while in Aysaita district about 34.4% of households believed that date palm production increases food and incomes agro-pastorals. Generally, the results of the present study showed that date palm production contributed to the outcomes of livelihoods of agro-pastoralists by increasing production and productivity and increasing food and incomes and thus help to improve food security of the pastoral communities in Afar Region of Ethiopia.

Table 13. Livelihood outcome of agro- pastoralists.

Livelihood outcome	Afambo		Aysaita		Total	
	Frequency	%	Frequency	%	Frequency	%
High production & productivity	63	36,8	29	45,3	92	39,1
Increased food & income	69	40,4	22	34,4	91	38,7
Improved food security	39	22,8	13	20,3	52	22,1
Total	64	100,0	171	100,0	235	100,0

CONCLUDING REMARKS

Date palm production has a long history in Afar Region. It is mostly cultivated by agro-pastoralist living along the Awash River. However, its production practice is more of traditional which is inherited from generation. About 20 % to 40 % of the food demands of date palm producing agro-pastoralists were covered by livestock production while non-date palm producers (41-80 %) covered their food demand from livestock production. The primary income source of date palm producers was sourced from sale of date palm fruits and other byproducts of date palm trees while the production of other crops was the primary sources of incomes of the majority of non-date palm producing households. The secondary income sources of date palm producers as well as non-producers were selling of livestock and their products. Moreover, date palm is an important source of income and food during drought or stressing conditions as the tree is resistant to drought. Generally, date palm production has important contributions for the environment, social and economic development by creating employment opportunity, protecting desertification, soil erosion and sandstorm and stabilizing micro-climate in Afar Region.

Although date palm is an important food security crop, its production in Afar Region is constrained by inappropriate agronomic and management practices, shortage of quality planting materials and high incidence of diseases and insect pests which requires due attention of the government and other developmental stakeholders.

REMARK

¹Kebele is a grass-root level administrative unit equivalent to a parish or local community.

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