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Status of Date Palm (*Phoenix dactylifera* L.) Production Practices and Post-Harvest Handling in Afar, Ethiopia: Results of Baseline Survey

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Abstract: Date Palm (*Phoenix dactylifera* L.) is one of the anciently known cultivated fruit trees. The fruit composed of very nutritive minerals like potassium, calcium, iron, chlorine, phosphorus and magnesium. In Ethiopia, it is grown in Afar, Dire Dawa, Somali, Gambella and Benishangul Gumuz regions. However, there is scanty information available on the production status, management practices, post-harvest handling practices and production constraints. In view of this the survey was carried out in 2019 cropping season in Afar Regional State (Afambo and Aysaita districts) because of their long experience to produce date palms. Multi stage sampling techniques were used to select the respondents. Developed questionnaire were completed by personal interviews of 103 respondents. The data were collected and subjected to statistical analysis using SPSS version 22. The result showed that agronomic practices of date palm production viz. propagation, irrigation frequency, spacing between plants and rows were by far less than the scientific recommendation. In another way, few of respondents were pollinating date palm manually, whereas 70.6% of respondents were not. They were using local varieties that are low yielders, late maturing types, too giants and as well as low in quality. Moreover, the postharvest handling practices they were implementing were not suitable for the production of high quality date fruits. Furthermore, date palm production in Afar Region is constrained with lack of knowledge and skill of production, lack of improved varieties, high incidence of diseases and insect pests. Thus, continuous training and extension services, research and developmental interventions in the cultivation, pre and post-harvest management of date palm trees and date fruits by the responsible stakeholders are recommended to improve the incomes and livelihoods of the agro pastoralists in the study area.

Key words: Agro Pastoralist · Afar Region · Date Fruit · Date Palm

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) belongs to Arecaceae or Palmae family, which is an important species cultivated mostly in arid areas of the world. It is perennial and dioecious with female (fruit bearing) and male (pollen bearing) plants growing separately. Date palms were cultivated 6000 years ago in the Mesopotamian region (present day Iraq) [1-3]. For the people living in the dessert, the date palm trees supply an average of two thirds of their income by selling its fruit and also using the various parts of the tree for making different packing materials. During Ramadan, the annual month of fasting for Muslims, the daily fast is broken with a few dates and then a few sips of water [4]. In fact, Date palm, which is an irreplaceable tree in irrigable dessert lands, provides protection to under-crops from heat, wind and even cold weather and plays a big role to minimize desertification and to give life to dessert areas. It tolerates relatively harsh climatic and soil conditions under which no other crop may give reasonable returns. Dates may therefore be expected to fight hunger for ever-increasing population of the country and to minimize the rapid expansion of desertification problem.

Date palm has been cultivated for long years in Ethiopia particularly in Afar, Dire Dawa, Gambella, Benishangul Gumuz and Jijjiga areas traditionally and/or as wild fruit. In Afar region, Afambo, Asaiyta, Gewane,

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Afdera, AmaSabure, Meteka, Ayrolle, Harrisa and Amibara are the main growing areas. However, there is scanty information available on the production status, management practices, post-harvest handling practices and production constraints as well as its cost and returns of growing. In view of this the survey was assessed and generated base line information of date palm production status, indigenous management practices, opportunities and production constraints.

MATERIALS AND METHODS

Description of the Study Area: The survey was conducted in Afar region, Awsi Rasu (Zone 1) specifically, Afambo and Asaiyta districts of the region. The altitude ranging from 330 to 350 meters above sea level and an average annual rainfall of 122 mm with bi-modal rainy seasons. The first rain is from February to March (*sugum* rains) while the second is from July to September (*karma* rains). The Awash River is the main source of water for irrigated crop production, whereas Tendaho and Middle Awash Agriculture Development farms owned by the government of Ethiopia are the biggest farm in the area. The agro pastoralists in these districts have long years' experience in the production of date palm.

Sampling Procedure and Sample Size: The survey study was carried out in 2019 cropping season in Afar Regional State. Amongst four districts with an experience of date palm production, Afambo and Asaiyta districts were purposely selected because of their long experience to produce date palms. The population of study comprises growers of date palm. Multi stage sampling techniques were used to select the respondents for the study, to get a true representative of the population. Seven kebeles were addressed, *viz.* Alasabolo and Humadoyta from Afambo district, Keredura, Berga, Mamule, Kerebura and 01 Kebeles from Asaiyta district based on their experiences and consumption habits. The numbers of household heads (HHs) in each kebeles were chosen in argument with the respective district agricultural offices by taking into account kebeles expansion, nearness, ease of access and the ease use of a reasonable number of orchards in the kebeles. The individual household heads in each kebele was selected from the lists provided from office of agriculture randomly.

Data Collection and Analysis: Questionnaire prepared were completed by personal interviews. Information about the cultivation and pre and post -harvest practices of date palm were included in the questionnaire. The information of date palm planting, application of inputs, orchard management, harvesting, drying, storage, post- harvest, marketing, facing problems were collected. The data collected were subjected to descriptive statistics using SPSS version 22. The descriptive statistics like frequency counts, means and percentages were used.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Agro-Pastorals: During the survey totally 103 agro-pastorals engaged in date palm production was interviewed. Among the households 78.6% were males, while 22.4% were females (Tables 1.). Most of the owners' of the date palm orchards were male households. The majority of agro-pastorals were 43.68% illiterate, followed by traditional and cultural education, while the lowest frequency respondents were grade 5-8 which nearly coincide with grade 9 and above. The result indicated that there was low level of education level. Study by Fikadu and Gebre [5] found that the sets of the high formal education and high productivity of horticultural crops overlap. However, agro pastoralists of the area love the date palm for various issues among which cultural and spiritual celebration ceremony during fasting has great impression in Afar. They were redundantly spoke the fruits was as a gift for them from Allah. Thus, training the agro pastoralist has to be done to encourage their interest as well to feed them.

Cultural Practices of Date Palm Production in Afar Agro Pastoralists

Land Preparation and Planting: According to the survey result, the highest frequency of the respondents 48.5% had no practices to prepare land and plough to plant date palms as (Table 2). This might be due to the expansion of date palm following Awash river bank. Whereas, 26.2% of agro-pastorals were responded as they were plough/dig out hole once to establish an orchard nearby their residents. Most the agro pastoralists (70.6%) responded to plant date palm during the spring season, while 29.4% of them plant during the autumn. This is related with the soil moisture during the spring and an availability of seeds date during an autumn. As indicated on Table 2, 94.5% and 90.3% percentage of respondents were not having any information about spacing between rows and plants, respectively. This might be as result of their production system is followed by Awash River, where they own naturally grown date palm fields. They responded weeds were not the major problem in the production area. However, they were practicing to cut

Table 1: Sex and education level of respondent house hold head at Zone 1 (Awsi Rasu) of afar region

Variables		Frequency HH (n=103)	Percent
Sex	Male	81	78.6
	Female	22	21.4
Education level	Illiterate	45	43.68
	Grade 1-4	14	13.59
	Grade 5-8	9	8.73
	Grade 9 and above	10	9.7
	Quran	24	23.30

Table 2: Interviewee responds to plough date palm field, season of planting and spacing between rows and plants at Zone 1 (Awsi Rasu) of afar region

Variables	Response	Frequency HH (n=102)	Percent
Seasons	Spring	72	70.6
	Autumn	30	29.4
Plough repetition	No plough	50	48.5
	1 times	27	26.2
	2 times	16	15.5
	3 times	9	8.7
Spacing between rows (meter)	No spacing	97	94.2
	1	2	1.9
	2	1	1.0
	3	2	1.9
	7	1	1.0
Spacing between plants (meter)	No spacing	93	90.3
	1	4	3.9
	2	3	2.9
	3	1	1.0
	4	1	1.0
	5	1	1.0

Prosopis juliflora here after *prosopis* during flowering and fruit picking in which 86.3% of respondents frequently responded in order to facilitate manual harvesting. That is why 48% of agro pastoralists were responded as they were not weeding; having an assumption of Awash river bank itself control the weeds. This indicates that as they are not practicing cultural management practice needed for date palm production.

Field Managements

Irrigation: Abdul Salam and Al Mazrooei [6] reported that annual crop water requirement, irrigation requirement and net irrigation requirement of date palm at Kuwait University as 2685 mm, 2553 mm and 2563.9 mm, respectively. Even-though, date palm is drought tolerant crop supplementary irrigation is very crucial in arid and semi-arid regions, especially during flowering and fruit setting. Among the interviewed respondents 84.3% of them responded to irrigate their field, while 15.7% were not. Majority (46.1%) of them irrigate during the drought period, of which 22.5% specifically irrigate at morning of the day. The highest percentages 27.5%, 25.5% and 19.6% respondents of interviewed agro-pastorals were irrigate date palm with less frequent irrigation interval once per two months, once per month and once a week, respectively. Whereas, few of them 7.8% and 3.9% irrigates once in two weeks and once in three weeks, respectively as Table 3. In the study area still there is a gap with the irrigation frequency. Thus, further study should be done to meet the crop water requirement.

Pruning and Pollination Practice: Correctly pruning any plant or tree can benefit the growth and health of the plant. However, pruning of all green fronds produce the food needed to grow may damage the plant. Among the interviewed date palm owner's 21.6% did not respond to practices pruning, while 78.4% of them were pruning their date palm fronds (Table 4). They were pruning mainly for the purpose of shelter and fencing, for income generation through selling and handcraft, wood, making mats and hand bags either than management for fruit yield and productivity. Thus, there was also a misunderstanding about pruning as they were considering pruning increase productivity by avoiding productive fronds.

Table 3: Responses of the interviewee in date palm irrigation and its frequency

Variables	Responses	Frequency HH (n=103)	Percent
Practicing irrigation	No	16	15.7
	Yes	86	84.3
Irrigate frequency	Once a week	20	19.6
	Once in two weeks	8	7.8
	Once in three weeks	4	3.9
	Once a month	26	25.5
	Once per two month	28	27.5
	Total	86	84.3
Missing	System	16	15.7

Table 4: The response of agro pastoralists practicing pruning and pollination

Variables	Responses	Frequency HH (n=102)	Percent
Pruning	No	22	21.6
	Yes	80	78.4
Pollination	Other	72	70.6
	Manual	30	29.4

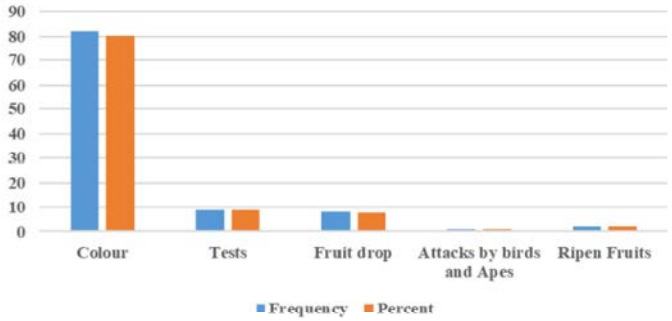

Fig. 1: The response of agropastoralists to inside date palm maturity

Table 5: Respondents' actions in post-harvest handling of date palm

Variables	Responses	Frequency HH (n=102)	Percent
Sorting	No	25	24.5
	Yes	77	75.5
Washing fruit	Cold water	56	54.9
	Hot water	14	13.7
Missing	System	32	31.4
Grading	No	31	30.4
	Yes	71	69.6
Packaging	No	61	59.8
	Yes	41	40.2
Curing	No	19	18.6
	Yes	83	81.4

Date palm is dioeciously, having female (fruit bearing) and male (pollen bearing) plants growing separately. Hence, pollination is a critical process in date palm production, which may affect fruit quality, development and yield [7]. According to the survey result 29.4% of the respondents were pollinate date palm manually, whereas 70.6% of respondents were not. The result indicated that most of the agro pastoralists have no awareness about pollination system of date palm. Therefore, there should be training how to pollinate to increase productivity of the date fruit.

Harvesting and Post-harvest Handling of Date Palm: Most of the agro pastoralists in the study area harvest their date fruit at Tamar stage. The fruit at this stage are dark brown in color and have moisture less than 10% and its structure is firm. Moreover, the growth of microorganisms on such fruits is reduced and the shelf life is prolonged which is suitable for long distance transport. As indicated below Figure 1, the frequency and percentages of the agro pastoralists responded as color is the most indicator of maturity followed by testing the firmness and fruit drop. They also notice maturity by seeing fruit ripening, attacks by bird and apes.

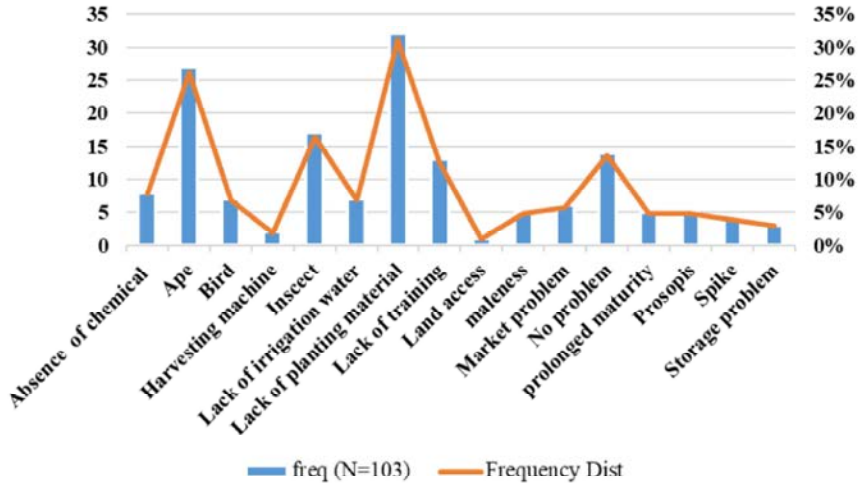

Fig .2: Major date palm production constraints at Zone 1 (Awsi Rasu) of afar region

Postharvest handling practices such as sorting, washing, curing, grading and packaging were practiced by the respondents as below Table 5. However, the shelf life and quality of fresh date palm fruits produced by the respondents are very low and experienced very high postharvest losses. They cannot store more than a month. This might be due to the lack of sophisticated package materials and unavailability of appropriate storage condition. Most of the respondents use sacks to store date fruits and dry in the sun. According to Glasner *et al.* [8] and Ashraf and Hamidi-Esfahani [9] date palm fruits should be stored in clean, cool and dry condition to prolong their shelf life and thus to reduce postharvest losses. Moreover, drying of date palm fruits improves the shelf life.

Major Challenges of Date Palm Production: Date palm production in Afar Region has a long history and is mostly concentrated at banks of rivers and seasonal streams. The crop is neglected and grown for long period of time as wild plant without any agronomic and management practices. Currently, it is produced by agro pastoralists in relatively organized small farms with inappropriate cultural and management practices. Constraints of date palm production in the study area are generally summarized and presented in Figure 2. According to the survey results, the majority of the respondents (31%) perceived that the major constraint of date palm production in the study area is lack of planting material. This might include the absence of improved variety that attracts their attention. Lack of improved date palm varieties and their planting materials as well as use of inappropriate propagation methods were the other constraints of date palm production in the study area. Apes were also the major wild animal inhibit date palm production. The agro pastoralists lack appropriate knowledge and skills necessary for the improvement of production and productivity. Propagation of date palm is carried out exclusively through use of seed which results in prolonged maturity, low quantity and quality of date palm fruits. Additionally, poor harvesting due to the absence of harvesting machine, prosopis invasion and risky of the spike high postharvest loss occurred. Date palm fruits were collected from the ground after cutting the fruit bunches which incurs damage and thus decreases the shelf life and increases the postharvest loss of date fruits. Poor storage, absence of packaging material and lack of market linkage between producers and customers were also major problems of the sector in the study area. Generally, absence of high-performing cultivars, lack of technological know-how about date palm cultivation and inadequate and inappropriate irrigation. Furthermore, socioeconomic constraints like lack of credit facilities and training sessions are the other problems for the development of commercial date palm production in the area.

CONCLUSION AND RECOMMENDATIONS

The agronomic practices of date palm production such as propagation and irrigation methods and plant spacing employed by agro-pastoralists were traditional and inappropriate for the production of date palm which is inherited from generation. They are using local varieties

that are low yielders, late maturing types, too giants and as well as low in quality. Moreover, the postharvest handling practices they are implementing were not suitable for the production of high quality date fruits. Furthermore, date palm production in Afar Region is constrained with lack of improved varieties, high incidence of diseases and insect pests. Thus, continuous training and extension services, research and developmental interventions in the cultivation, pre and post-harvest management of date palm trees and date fruits by the responsible stakeholders are recommended to improve the incomes and livelihoods of the agro-pastoralists in the study area.

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