



PAT June, 2012; 8 (1): 164 -174; ISSN: 0794-5213

Online copy available at

www.patnsukjournal.net/currentissue

Publication of Nasarawa State University, Keffi



Mango (*Mangifera Indica* L.) Fruit Production and Production Constraints In Gboko Local Government Area of Benue State

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ABSTRACT

A study to identify mango fruit production and production constraints in Gboko Local Government Area (LGA) of Benue State was undertaken in 2008. Data was collected from a total of 50 mango growers in the LGA through the use of semi-structured questionnaires and analyzed by means of frequencies and percentages. Results indicated that most of the respondents belonged to the age class of 41-50 (50%) and 51-60 (34%). An overwhelming percentage of growers was male (90%) and had formal education (76%). Varietal distribution and preference was in favour of Julie, Peter and Hindi in that order. Majority of respondents (58%) do not apply fertilizer on their farms. Of those applying fertilizers, 61.9% use artificial (inorganic) fertilizers while 38.1% use organic materials. All respondents do not water their trees while 86% carry out tree pruning. Most growers harvest fruits unripe or partially ripe. All the respondents agreed that mango fruit culture was profitable. The most frequently cited source of information on improved mango production was fellow farmers, then extension agent and radio. Problems of mango production in the order of importance were pests and diseases, high perishability of fruit, inadequate farm labour, low price and poor yield. While it is obvious that mango fruit production is going on well in the study area, improvements are nevertheless needed in such aspects as fertilizer application, irrigation and pest and disease control.

Key words: Mango fruit, *Mangifera indica*, Production, Constraints, Varieties

Introduction

The mango is an erect, branched, medium to large-sized tree with alternately arranged evergreen or nearly evergreen leaves, with a wide crown and inflorescences having numerous flowers (van Ee, 1997; Morton, 1987; Samson, 1980). The species, which belongs to the family Anacardiaceae is native to Asia, particularly eastern India, Burma and Andaman Islands from where it spread to other parts of the world. But while the Persians introduced it to East Africa in the 10th Century, the Portuguese were responsible for its introduction to West Africa in the 16th Century (Morton, 1987). Mango came to Nigeria in the 20th Century through itinerant merchant missionaries and colonialists where it has become an integral part of indigenous cropping systems

(Aiyelaagbe, 2002; Nyishir, 2004). The guinea and sudan savanna zones of Nigeria are credited with producing greater percentage of the fruit in Nigeria (Olaniyan, 2004), with Benue state topping the list (Avav and Uza, 2002). Unfortunately, the history of mango production in the state is not very clear. Reports however indicate that improved mango varieties were introduced to Yandev Farm Centre by the early Agricultural Officers from Zaria and Ibadan in the 1950s (Nyishir, 2004).

The mango tree produces a fruit with great diversity with respect to form, size, colour and quality (Morton, 1987). The fruit can be put to a number of uses. For instance, ripe fruits can be made into juice and preserves, while unripe fruits can be processed into pickles and chutney (Samson, 1980). However, in Nigeria, most of the fruit produced is consumed as fresh fruit. Although Nigeria occupies the 9th position among the ten leading mango producing countries of the world, she does not feature among the ten leading mango fruit exporters (FAOSTAT, 2007). The fruit pulp which makes up 60-75% of fresh fruit weight contains 15% sugars, high amounts of vitamin A and some quantities of vitamins B and C (Samson, 1980). Sale of mango fruits and seedlings is a source of income to Benue farmers (Nyishir, 2004). In fact, the state is a major supplier of fresh mango fruits to consumers in other states of the Federation (Ajayi and Nyishir, 2006).

It is evident from the foregoing that mango is of great nutritional and economic importance to rural households. However, there has been little or no information regarding important aspects such as cultivars been cultivated, production practices and constraints in this important mango producing zone. Such information could help in assessing the production situation in the state vis-à-vis other production zones, as well as determining ways of improvement where necessary. This study was therefore embarked upon to:

1. Identify mango varieties in cultivation in the study area
2. Determine the prevailing practices in the production of mango fruits by growers
3. Identify key constraints to mango fruit production in the study area.

Methodology

Gboko Local Government Area is one of the 23 Local Government areas in Benue State with a population of 2, 920, 481. It lies between latitudes 7.15° – 7.30°E and longitude 8.45° – 9.00°S with a land area of 13, 240 sq km. The area was selected for the study due to its popularity in mango fruit production and the presence of a College of Agriculture which is believed to have played a crucial role to the development of Agriculture in the area and beyond. The local Government originally had five districts namely, Mbatyav, Mbatierev, Mbayion, Ipav and Yandev.

Data collection was by means of semi-structured questionnaires. In each of the five districts, 10 mango fruit farmers were randomly selected and the questionnaires administered. A total of fifty questionnaires were administered in the whole Local Government. The questionnaires were designed to obtain required information including mango varieties under cultivation and varietal preference among farmers, production practices and constraints.

Data collected were analyzed using percentages, frequency distribution and arithmetic means

Results and Discussion

Socio-economic Characteristics of Respondents

Socio-economic characteristics of the respondents are summarized in Table 1. Majority of those involved in mango fruit production fall within the age range of 41-50 (50%), followed by the age bracket 51-60 (34%). The least age brackets were 21-30 and those over 60 years of age. In agricultural production, age is considered important especially where manual labour is involved. Since only 2% of the age class 21-30 is involved in mango fruit production, it means that at this age, they may still be involved in pursuing formal education or show preference for white collar jobs or menial jobs in urban settlements.

There is a strong gender disparity in mango fruit production. An overwhelming percentage (90) of the farmers was male, while the remaining percentage (10) was female majority of who were widows who probably took over the orchards from their deceased husbands. An interesting twist is that from casual observations, mango fruit retail marketing in the study area seems to be exclusively a female affair. It is also probable that women could be more involved in the cultivation of vegetables and arable crops. A greater proportion (90%) of those engaged in mango fruit production were married, followed by those who were widowed (8%) while only 2 % represented the unmarried. This is an indication of the significant role played by this enterprise in the economic life of families. It could even be that married people were attracted into it as a way of supporting their expanding families. With respect to educational attainment, 24% had no formal education while the bulk of the respondents had either primary or post primary education. A few (6.0%) attained tertiary education. This high literacy level has pleasant implications for extension work as enlightened farmers are known to be more open to adoption of new or improved technologies than those without formal education (Williams *et al.*, 1984)

Farm Characteristics

Entries in Table 2 shows that majority of the farmers sampled had trees in the range of 21-30. Those having over 50 trees were few. This result indicates that much of the

mango fruit production in the study area is still small scale. Most of the farms were 11 years or older while majority of the farmers did not pay any special attention to tree spacing. In many cases, mango stands are used as boundary markers, sometimes enclosing a citrus orchard or stands are found here and there inside a citrus orchard. However, tree spacing appears to be an important consideration in mango production (Olaniyan, 2004; Samson, 1980). A greater proportion (62%) of the respondents got their planting material from fellow farmers and not formal institutions while the remaining percentage (38) got theirs from such institutions. A study by Ajayi and Nyishir (2006) found that Akperan Orshi College of Agriculture Yandev, was the primary source of improved mango varieties to growers within the study area and its immediate vicinity. The finding here shows that once such varieties become established on farmers' fields, the farmers themselves embark upon nursery seedling production such that further spread or cultivation of such varieties does not depend exclusively on the above named higher institution of learning.

Varietal Distribution and Preference among Growers

Table 3 presents the distribution profile of mango varieties in the study area. The first three varieties listed in the order of importance are Julie, Peter and Hindi. Among varieties grown by sampled farmers, John Peter came last. Similarly, most of the farmers preferred Julie, followed by Peter and then Hindi (Table 4). No preference was expressed for John Peter and Zill even though they were cultivated. This result closely aligns with that of Ajayi and Nyishir (2006) except that in their case adoption and preference rating of Peter was higher than that of Julie. This slight discrepancy could be attributed to differences in scope of study area and sample size, as in the case under contrast, two LGAs (Gboko and Makurdi) were selected and a total of 20 farmers from each LGA sampled. In the study reported here, only Gboko LGA was involved although with a higher sample size of 50 mango growers. Table 5 contains reasons for mango varietal preference. Much of the preference expressed for Julie is in terms of its taste and yield – though it also scored higher than others in terms of marketability – while that for Peter is with respect to fruit size followed by yield. Yield and taste were the main criteria for farmers' preference for Hindi. The high preference rating of Julie variety by mango growers is evidently well informed as apart from reasons cited by growers, the variety is credited with good flavor, high and regular yield as well as resistance to the dreaded pest – the mango fruit fly (Morton, 1987).

The most popular varieties in international trade have been named as Kent, Tommy Atkins, Haden and Keitt (Evans, 2009) although Spore (2009) has mentioned Julie in addition to the four varieties earlier mentioned. Among qualities qualifying these varieties for such status is their suitability for long distance transportation (Saucó,

2004), a point corroborated by mango fruit sellers with respect to Julie which they say can stay for relatively long time without spoiling (Ajayi and Nyishir, 2006). Unfortunately, apart from Julie, none of the other varieties has been identified in the study area, although there is evidence of the presence of Tommy and Keitt in Benue State (Ajayi and Nyishir, 2006). Currently, Nigeria is not on the list of mango exporting countries (FAOSTAT, 2007). To change the situation, varieties that have export potential needs to be introduced and those already present popularized.

Mango Fruit Production Practices

Production practices adopted by respondents for mango fruit are presented in Table 6. The greater percentage (58) of respondents do not apply fertilizer to their farms at all, 36 % apply it on irregular basis while the remaining 6% apply it on a yearly basis. Among the respondents that applied fertilizer on their farms, the majority (61.9%) use inorganic fertilizer while the remainder (38.1%) resorts to organic fertilizer. More than half of this farmers apply fertilizer in ring form within drip margin, followed by those who do ring application at drip margin. The rest either broadcast or do ring application outside drip margin. Yearly uptake of large amounts of nutrients necessitates fertilization to at least compensate for those nutrients (van Ee, 1999). In the least NPK should be applied progressively from the first to the 6th year after which application could be stabilized at the annual rate of 700 gN, 400gP₂O₅ and 750gK₂O/tree and applied at the drip margin (Olaniyan, 2004). Johnson and Parr (2006) recommend ring application of fertilizer at a distance of 2m from the trunk. Application of fertilizers of organic sources to tree crops is, among others, credited with providing more balanced nutrition, adding organic matter to the soil and reducing the risk of tree damage (van Ee, 1999). Organic matter and compost in particular releases nutrients slowly over an extended period of time and improves soil moisture retention capacity (Verheij, 2004). That 38% of farmers sampled use organic materials to fertilize their trees is commendable and needs to be encouraged especially in the face of rising costs and limiting availability of inorganic fertilizers as well as mounting environmental concerns.

With respect to irrigation, none of the farmers sampled agreed to the watering of their trees even in the dry season. A greater percentage (86) prunes their trees as the need arises while the remainder do so on a yearly basis. However, from literature available, there appears to be a consensus on watering of young trees especially during the dry season (van Ee, 1999; Olaniyan, 2004; Samson, 1980). Older trees may not be watered except where conditions compel such activity to avoid fruit abortion (Samson, 1980). Generally, pruning in mango has been recommended (van Ee, 1999) and has been associated with better aeration, easier farm operations (Olaniyan, 2004) and increased tree productivity (Johnson and Parr, 2006).

Responses to harvest method were also variable. Majority (64%) of the respondents claimed that they harvest their fruits in such a way as to prevent them hitting the ground; 22% are indifferent to whether the fruits hit the ground or not while only 14% do not go to the pains of ensuring that harvested fruit do not hit the ground surface. Most of the farmers also harvest their fruit when partially ripe or unripe (52%) or partially ripe fruit only (46%) as a strategy against fruit spoilage. The standard way of harvesting fruits is to ensure that they do not hit the ground surface. This is assured by climbing the tree and handpicking fruits into a bag or using special picker consisting of a pole to which a knife and a collecting bag have been attached (Samson, 1980). Allowing fruits to fall on the ground could cause bruising and later spoilage (Morton, 1987). The harvesting of mango fruits in unripe or partially ripe form is corroborated by report of mango sellers that this was the forms they normally buy fruits as a way of safeguarding quick spoilage (Ajayi and Nyishir, 2006). However, precise picking standards for the local fruit industry would need to be specified to ensure that fruit quality is not seriously compromised in the attempt to prolong shelf life of fruit.

Table 8 is a summary of the profitability, marketing and sources of extension information on mango fruit within the study area. All the farmers interviewed agreed that mango fruit production was profitable. Apart from consumers within locality, most of the sales are to customers outside Benue State. Mango fruit sale to traders within the immediate community and those outside the State form a smaller proportion of mango fruit trade. This gives credence to the significant role played by tree crops in the economic well being of individuals and families.

The greatest source of information on improved mango fruit production within the locality is the farmers themselves, followed by extension agent and then radio. Newspaper and bulletin were not found to be of any assistance in this regard. This could be attributable to the high cost of newspaper these days. The relative low rating of radio as an extension outlet could be due to the commercialization of radio stations in Nigeria which limits the use of this media for extension of scientific information to farmers (Arokoyo, 1998).

The major problems encountered by mango producers are pests and disease incidence and high perishability of produce. Inadequate farm labour, low price and poor yield were also mentioned, but they had relatively low scores (Table 9). Most of the farmers (60%) do not control pests on their farms at all while some (40%) do with the use of insecticides or pesticides. In the study by Ajayi and Nyishir (2006), pests and diseases had the highest frequency of problems encountered by farmers in mango fruit production. It is disturbing that majority of farmers do not control pests and diseases on their farms, leaving them at the mercy of these enemies. This may be due to non-availability of control strategies within the reach of the farmer or such strategies could

be available but the farmer may not be aware of it. This is a challenge to both researchers and extension agents. Generally, there is evidence of reasonable level of mango fruit production in the study area. However, scientific improvements are required in areas such as spacing, fertilization, irrigation, pests and disease control, fruit harvest and introduction/popularization of varieties with high export potential. Performance of extension needs to be upgraded.

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Table 1. Socio-economic characteristics of the respondents

Characteristics	No. of respondents	Percentage (%)
Age (Years)		
11-20	0	0
21-30	1	2
31-40	6	12
41-50	25	50
51-60	17	34
>60	1	2
Sex		
Male	45	90
Female	4	10
Marital Status		
Single	1	2
Married	45	90
Widowed	4	8
Educational Background		
No formal Education	12	24
Primary	16	32
Pos-primary	19	38
Tertiary	3	6

Table 2. Characteristics of mango farms of respondents in Gboko LGA of Benue State.

Farm Characteristics	No. of respondents	Percentage (%)
Size of Farm by No. of Trees		
11-20	9	18
21-30	26	52
31-40	4	8
41-50	8	16
51-60	1	2
>60	2	4
Age of Farm (in Years)		
1-10	7	14
11-20	20	40
21-30	23	46
Plant Spacing		
Regular Between- and Within-row spacing	22	44
Irregular Between- and Within-row spacing	28	56
Source of Planting Material		
Institution	19	38

Persons/Private Farms

31

62

Table 6. Mango fruit production practices adopted by farmers in the survey area

Production practice	No. Respondents	Percentage (%)
Fertilizer Application		
Never	29	58
Irregular	18	36
Once a year	3	6
Type of Fertilizer Applied		
Organic	8	38.1
Inorganic	13	61.9
Method of Application		
Ring application at drip margin	7	33.3
Ring application outside drip margin	1	4.8
Ring application within drip margin	12	57.1
Broadcasting	1	4.8
Dry Season Watering		
Not watered	50	100
Irregularly watered	0	0
Watered once a week	0	0
Watered twice a week	0	0
Pruning Interval		
Once a year	7	14
Pruned according to need	43	86
Method of pruning		
i. Cut branches touching the ground only	1	2
ii. Cut dead/diseased/dry/unproductive branches	0	0
iii. Cut middle new branches only	0	0
iv. i and ii combined	44	88
v. i, ii and iii combined	5	10
Harvesting Method		
Plucked fruit hit the ground	7	14
Plucked fruit not allowed to hit the ground	34	64
Plucked fruit may/may not hit the ground	11	22
Harvesting Method to Delay Fruit Ripening and Improve Storability		
Harvesting partially ripe fruit only	23	46
Harvesting unripe fruit only	1	2
Harvesting partially ripe/unripe fruit	26	52

Table 7. Problems encountered in mango production in Gboko Local Government Area of Benue State.

Problem Encountered	No. of Respondents	Percentage
Diseases	41	82
Pests	50	100
Low Price	10	20
Lack of Market	0	0
High Perishability	47	94
Inadequate Farm Labour	11	22
Poor Yield	1	2