BIBLIOGRAPHY

KILILIT, DELMAR C. October 2007. Performance of Meyer Lemon (*Citrus limon* L.) Under Different Irrigation and Fertilizer Schedules in Pine-based Agroforestry System in Mankayan, Benguet. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

This study was conducted to determine the performance of Meyer lemon (*Citrus limon* L.) under different irrigation schedules (farmers' practice-rain fed, and weekly, fortnightly and monthly irrigation) and fertilizer application schedules (farmers practice-no fertilizer applied, monthly fertilization, quarterly fertilization, semi-annual fertilization at recommended rates (Triple 14 at 500 g per tree/year and chicken manure at three shovelfuls per tree/year) under pine-based agroforestry system; and the interaction between fertilization and irrigation was also determined.

There were significant differences in the growth performance of Meyer lemon as affected by the rates of fertilizer and irrigation schedules. Plants treated with semi-annual fertilization recorded the longest period (days) from treatment application to first harvest; duration of flower development and duration of fruit development. Semi-annual fertilization also resulted to the highest average number of flowers; percent fruit set; number of fruit developed; average length of shoots; rind thickness; polar diameter; equatorial diameter; average weight per fruit, and average yield per tree but had the lowest percent of flower drop.

In a similar manner, Weekly irrigation resulted to the highest yield, most number of flowers and fruits developed, high percent fruit set, albeit longer duration of flower and fruit development. It also recorded comparatively high average weight per fruit, equatorial diameter, polar diameter and rind thickness. Percent flower drop was the lowest on plants subjected to weekly irrigation. The yield of intercrop was also highest under weekly irrigation.

The interaction between fertilization and irrigation schedule is significant on the days from treatment application to first harvest, duration of flower development, duration of fruit development, average number of flower, percent of fruit set, number of fruit development, percent of flower drop, average length of shoots, rind thickness, polar diameter, equatorial diameter, average weight per fruit, average yield per tree, yield of inter crop.

Farmers' practice of fertilizer application and irrigation (no fertilizer application and rain fed irrigation, respectively) whether independently or combined, resulted to the shortest period from treatment application to harvest and the fastest flower and fruit development. However, the percent fruit set was significantly low and the fruit quality was inferior.

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INTRODUCTION

Agroforestry can be defined as combinations of plants, either trees or shrubs, on the same land management unit with agricultural crops, grass, and/or animals, in some form of spatial or temporal arrangement or in sequence. Thus, there are four main components of these systems: trees, crops, grass, and animals. Usually the key criterion in a classification of agroforestry systems is the type of components involved in the system. Based on that, it is possible to define three broad subdivisions: agrisilvicultural, silvopastoral, and agrosilvopastoral (Combe and Budowski, 1979).

Farmers have practiced agroforestry for years. Agroforestry focuses on the wide range of working trees grown on farms and in rural landscapes. Among these are fertilizer trees for land regeneration, soil health and food security; fruit trees for nutrition; fodder trees that improve smallholder livestock production; timber and fuel wood trees for shelter and energy; medicinal trees to combat disease; and trees that produce gums, resins or latex products. Many of these trees are multipurpose, providing a range of benefits (Nair, 1985).

According to PCARRD (1999), citrus is one of the most important fruit trees in the Philippines. It contributes about Php 80M as income to many farmers dependent on this industry for their livelihood. Although its commercial production is an important source of income for growers, the yield of citrus in the country is relatively low due to the prevailing stiff competition with luxury fruits imported from other countries, lack of water during dry season, inefficient harvesting, poor post-harvest-handling, and unsystematic market strategies.

In the Cordillera, particularly in Benguet and Mountain Province, citrus production like lemon has become important despite the limited area devoted to its production compared to the other regions in the country. Lemon could be one alternative product to vegetable industry. Nowadays, the prices of vegetables are declining because some vegetable products are being imported. According to Ricardo et al., (2004), records of the Bureau of Agricultural Statistics in 1995 showed that the Cordillera Region ranks first in lemon Production with 680,000 kilograms.

Lemon tree yields vary considerably with the cultivar, the location and weather conditions. A yield of 3 boxes per tree is commercially satisfactory. A six-year-old tree bore 966 fruits and, at 9 years of age, had produced a total of 3,173 fruits (Morton, 1987).

The lemon (*Citrus limon* L.*)* is one good source of income for gardeners, who want a steady supply of fruits all year round. Lemons, limes and lemonades can be used to make lemon bread, lemon meringue pie, fresh lemonade and juices. The fruit are cultivated primarily for their juice, though the pulp and rind (zest) are also used, primarily in cooking or mixing. Lemon juice is about 5% citric acid, which gives lemons a sour taste and a pH of 2 to 3. This acidity makes lemon juice a cheap, readily available acid for use in a lot of educational chemistry experiments. Citrus trees are becoming more and more popular as landscaping plants, offering not only fruit but an attractive form of year-round, glossy, deep green foliage, and fragrant flowers (Morton, 1987).

Irrigation is one of the most important needs of lemon to produce good quality of fruits. It has been demonstrated that pest control, pruning, and fertilization improvement do not lead to high yield if irrigation practice is inferior (PCARRD, 1987).

Galves (1955) as cited by Wardouski and Grierson (1986), reported that the pH, calcium and magnesium content of the soil receiving heavy application of ammonium sulfate in five to six years dropped appreciably while the amount of manganese increased by as much as ten times. It was predicted that as a consequence of these changes in the soil, problems will likely to appear in the orchard if this fertilization practice is continued. Notable in these studies was a complete fertilizer application which resulted in good growth and increased yield of the trees (Bachelor and Webber, 1968).

The formulation of a sound and economical fertilization program, are not enough, even more important is the information on the effect of fertilizer on the crop itself. Until now, there has not been any published data to show the extent of influence upon the growth and yield of the grown citrus varieties (PCARRD, 1987).

The results of the study may used by the farmers as guide in producing lemon fruits, especially where major water stress is encountered. In addition, the information gathered could be used by students and researchers.

This study aimed to determine the effects of irrigation and fertilization on the performance of Meyer lemon. Specifically, this study aimed to determine the: effect of time of irrigation on the growth, yield and fruit quality of Meyer lemon; effect of time of fertilizer on the growth, yield and fruit quality of Meyer lemon and, combined effect of time of irrigating and fertilizing on the growth, yield and fruit quality of Meyer lemon.

The study was conducted from October, 2006 to April, 2007 at Patpat, Tabio, Mankayan, Benguet.

REVIEW OF LITERATURE

The origin of the name *"lemon"* is through Persian, akin to the Sanskrit nimbuka. They were cultivated in Genoa in the mid-fifteenth century, and appeared in the Azores in 1494. More recent research has identified lemons in the ruins of Pompeii. Lemons were once used by the British Royal navy to combat scurvy, as they provided a large amount of vitamin C (Morton, 1987).

Meyer lemon (*Citrus Limon* L.*)* responds to irrigation and fertilization to induce flowering and to advance maturation of fruits. Through proper timing of the application of fertilizer and irrigation, lemon fruits can be produced off-season to hit a better price when some of lemon plantations are non-bearing (Coronel, 1983).

Meyer is a hybrid, possibly lemon X mandarin orange, introduced into the United States as S.P.I. #23028 by the agricultural explorer Frank N. Meyer, who found it growing as an ornamental pot-plant near Peking, China in 1908. Its fruit is obovate, elliptical or oblong, round at the base, occasionally faintly necked and furrowed or lobed; apex rounded or with short nipple; of medium size, 2 1/4 to 3 in (5.7-7.5 cm) wide and 2 1/2 to 3 1/2 in (6.25-9 cm) high; the peel light-orange with numerous small oil glands, 1/8 to 1/4 in (3-6 mm) thick; the pulp pale orange-yellow, usually in 10 segments with tender walls, melting, juicy, moderately acid with medium lemon flavor; seeds small, 8 to 12. The tree tends to be ever bearing but fruits mostly from December to April. It is small, with few thorns, prolific, cold-resistant; produces few water sprouts, and is only moderately subject to greasy spot and oil spotting. It is easily and commonly grown from

cuttings. Does well on sweet orange and rough lemon rootstocks; is not grafted onto sour orange because it is a carrier of a virulent strain of tristeza (Morton, 1987).

Citrus can be harvested four to nine months from flowering depending on the variety, environment and cultural management practices employed (RP-German Fruit Tree Project, 1995).

Richter (1916) stated that without question (but also without showing data) all the blooms of the lemon could be protected from insect visitation without the slightest reduction in set of mature fruit. Webber (1930) also concluded that pollination by bees was probably a negligible factor in the production of citrus fruits, at least for the 'Eureka' and 'Lisbon' lemons, the 'Valencia' and 'Washington Navel' oranges, and the 'Marsh' grapefruit. However, Webber et al. (1943) stated that although self-pollination occurs rather commonly without insects, seedlessness sometimes results, and seedlessness is rather generally a handicap to setting of fruit. Lemon is an early maturing, and cold-hardly species that sets fruits parthenocarpically (Morton, 1987).

However, where numerous tests have been conducted on caged citrus trees, Glukhov (1955) stated that lemon trees isolated from bees produced only one-fourth as much fruit as trees exposed to cross- pollination by bees. Burnaeva (1956) reported that lemons receiving supplemental pollen from other cultivars or citrus species, produced more than trees not exposed to cross-pollination. Zavrashvili (1964) reported that lemon trees caged without bees produced 42.5 percent less than open-pollinated trees, whereas the trees caged with bees produced only 10 percent less, indicating that bees contribute by distributing the self- pollen on the tree. Randhama et al., (1961) obtained four mature 'Malta' lemon fruit from 25 cross-pollinated flowers but none from 50 selfed flowers.

Irrigation after a dry spell has been observed to induce flowering in Lanzones, Citrus, and Durian. It was observed to flower when a day spell of 7-21 days is followed by even the lightest shower or rain. Rain in excess of 3 mm can insure blossoming adequate supply of water, however, is needed for the flower to develop. It also appears that a period of water stress even for a short period of time is necessary for coffee and Lanzones trees before irrigation to induce heavy flowering (Bautista et al., 1983).

Reuther (1973) as cited by Tipayno (1989) pointed out that under arid and semi arid conditions, water is regarded as the life-blood of citrus production. Without water in sufficient quantity and acceptable quality, there would be no citrus production. This is quite a discouraging statement to those who can not afford the benefit of mechanized irrigation. To them, any effort to venture in citrus production would be fruitless.

Coronel (1983) concluded that irrigation on different fruit production induces flowering and was shown to increase fruit size during fruit development.

In some observations, farmers fail to produce lemon fruits especially on dry areas where water is very expensive that they only depend on rain for irrigation. This may be one reason why the Philippines is one of the lowest producers of lemon in the world (Talbert, 1973).

MATERIALS AND METHOD

Three-year-old marcotted lemon trees planted in a private citrus orchard in Patpat, Tabio, Mankayan, Benguet were used in this study. Soybean and papaya were planted as intercrop. The area has an elevation of approximately 1000 meters above sea level with a slope of 75% or 33.75 º, but the area that was planted with citrus has less than 15% or 6.75 º slopes. The soil type is clay loam. The site has an average temperature of 25 º C, annual rainfall of 2,664 mm, and Type I climate classification with two distinct seasons: the Dry and Wet seasons. The average sunshine hours in the area is 10 ½ hours (6:30 am – 5:00 pm).The surroundings are planted with oranges (*Citrus sinensis* L), pummelo (*C. grandis* L.), and trees such as mahogany (*Swietenia sp.*), and alnus (*Alnus sp.*). The upper slope is naturally regenerated with Benguet Pine that had been declared a watershed and is the source of irrigation in the area.

Description of the Lemon Trees

The trees are neither fertilized nor irrigated. They are slightly normal, some of the leaves are yellowish in color, and fruits are small and few during dry the season. The flowers are few sometimes more flowers produce but they fall down. The yield is very low, they only produce good yield during rainy season.

Land Preparation

Cleaning the area was done before cultivating the base of the trees. Fertilizer was applied within the radius of the root zone. Complete fertilizer (14-14-14) and decomposed chicken manure was used in the treatments at the rate of 500 grams and 2-3

shovelfuls per tree/year, respectively as mentioned by Tipayno (1989) applied as described in the treatments. Soybean was planted as alley crop where farmer's practice was applied.

Care and Maintenance

The plant was irrigated directly around the base of the trees by flooding. The fertilizers were applied before irrigating. Weeding was also done. "Rono" or "bel-lang" (*Miscanthus sinensis)* leaves were used as mulch to minimize water evaporation from the soil and prevent weed growth around the base of the lemon trees. Weeds removed from alleys were used as mulch. Appropriate pest management measures were observed.

Treatments

Sixteen lemon trees were randomly selected, and each tree was designated as the treatment replication. They were tagged to serve as permanent base of observations up to harvesting. The experiment used the Randomized Complete Block Factorial Design (RCB-Factorial). The treatments were as follows.

Factor A (fertilizer application schedule)

F_0= No fertilizer applied (farmers practice)

F_1= monthly fertilization with Triple 14 (500 g per tree/year) and chicken manure (2-3 shovelfuls per tree/year)

F_2= quarterly fertilization with Triple 14 (500 g per tree/year) and chicken manure (2-3 shovelfuls per tree/year)

F_3= semi-annual fertilization with Triple 14 (500 g per tree/year) and chicken manure (2-3 shovelfuls per tree/year)

Factor B (Irrigation schedule)

I_0= rain fed irrigation (farmers practice)

I_1= weekly irrigation (irrigated until soil is saturated).

I_2= fortnightly irrigation (irrigated until soil is saturated).

I_3= monthly irrigation (irrigated until soil is saturated).

Data Gathered

Data gathered are as follows:

Vegetative Parameters

1. Soil analysis. The pH of the soil in the area was obtained through soil sampling.
2. Days from treatment application to first harvest. The number of days from treatment application to the first harvest was counted and recorded.
3. Duration of flower development. The number of days from flower bud emergence to 50% fruit set was counted and recorded.
4. Duration of fruit development. The number of days from fruit set to 50% maturity was counted and recorded.
5. Average number of flowers. The number of flowers developed was recorded from sample trees per treatment replication.
6. Percent fruit set. The number of fruits developed was counted then divided by the total number of flowers produced and then multiplied by 100
7. Percent of flower drop. This was obtained using the formula:

$$= \frac{\text{Number of flowers formed - number of fruits}}{\text{Total number of flowers formed}} \times 100$$

8. Average number of new shoots. The number of new shoots/branches developed after treatment application was counted and recorded.
9. Average length of shoots (cm). The average shoot length was measured using a foot rule.

Yield

10. Fruit quality. The polar and equatorial peel/rind and diameter of the fruit were measured using a caliper from 10 sample fruits per treatment.
    A. Rind thickness (mm). The thickness of the rind was measured using caliper from 10 sample fruits.
    B. Average size of fruit (cm). The size of the fruit in terms of polar and equatorial diameters was measured using a caliper from 10 sample fruits.
11. Fruit yield (kg). The yield per tree was recorded.
    A. Average weight per fruit. The average weight per fruit was recorded.
    B. Average yield per tree. The average yield per tree was recorded.
12. Yield of intercrop. The total yield of soybean intercrop was recorded; areas of intercrop were taken from 3 square meters per tree.

RESULTS AND DISCUSSION

Soil Analysis

Soil pH was obtained after the experiment from aggregate soil samples through the use of portable pH meter. The pH of the soil in the area was 5.5 (slightly acidic), which is a normal pH for growing of lemon. The pH was taken after the experiment.

Days from Treatment Application to First Harvest

Effect of fertilizer. The number of days from treatment application to first harvest is shown in Table 1. Farmers' practice, (F_0 = no fertilizer application) resulted to significantly earlier harvesting with a mean of 143.33 days as against the semi-annual fertilization (F_3), which produced harvestable fruits in a 185.50 days. Monthly (F_1) and Quarterly fertilization (F_2) with means of 154.92 and 170.08 days, respectively, were comparable to either the farmers' practice (F_0) or semi-annual fertilization (F_3).

Effect of irrigation. The rain fed lemon trees (I_0 = Farmers' practice) resulted to the least number of days to first harvest with a mean of 129.08 days, followed by fortnightly (I_2) and monthly irrigation (I_3) with a mean of 168.58 and 174.83 days, respectively. The weekly irrigation (I_1) had the longest number of days to first harvest with a mean of 181.33 days.

Table 1. Days from treatment application to first harvest as affected by fertilization and irrigation

TREATMENT	MEAN (Days)
Fertilizer Schedule	
F_0 = No fertilizer applied (Farmers' Practice)	143.33[b]
F_1 = Monthly Fertilization	154.92[ab]
F_2 = Quarterly Fertilization	170.08[ab]
F_3 = Semi-annual Fertilization	185.50[a]
Irrigation Schedule	
I_0 = Rain fed irrigation (Farmers Practice)	129.08[b]
I_1 = Weekly irrigation	168.58[a]
I_2 = Fortnightly irrigation	174.83[a]
I_3 = Monthly irrigation	181.33[a]

Means with the same letter superscripts are not significantly different at 5% level by DMRT

Interaction effect. A significant interaction effect between the time of fertilizer application and irrigation on the number of days to produce lemon fruits (Appendix Table 1) was revealed by statistical analysis. Figure 1 shows the graphical illustration of the combined effect of time of fertilizer application and irrigation schedule on the number of days to first harvest. The combination of farmers' practice (no fertilizer application + rain fed irrigation) or F_0I_0 resulted to the lowest number of days to first harvest with a mean of 51.00 days. Semi-annual fertilization + weekly irrigation (F_3I_1) and semi-annual fertilization + fortnightly irrigation (F_3I_2) took the longest to produce harvestable fruits,

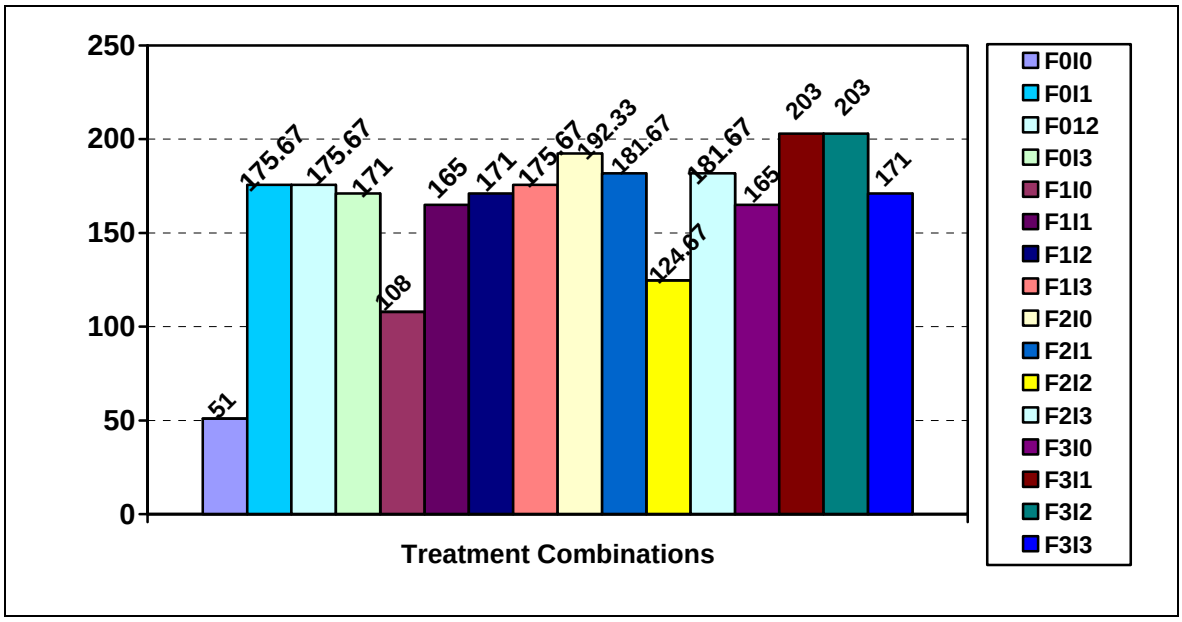

Figure 1. Number of days from treatment application to first harvest as affected by fertilization and irrigation

both with a mean of 203.00 days. All other treatment combinations were comparable to farmers' practice (F_0I_0) or semi-annual fertilization + weekly irrigation (F_3I_1).

The result indicates that fertilizer and irrigation schedules influence the earliness of harvesting of fruits. Lemon trees need greater amount of water especially during dry months of the year to improve their root environment and have better crop yield, corroborating the study of Coronel (1983).

Duration of Flower Development

Effect of fertilizer. Table 2 shows the effect of time of fertilizer application on the duration of flower development. Shorter duration of flower development was effected by Farmers' practice (F_0 = no fertilizer application) with a mean of 20.33 days, which is significantly lower than semi-annual fertilization (F_3) with a mean of 27.67 days. Meanwhile, monthly fertilization (F_1) and quarterly fertilization (F_2) had means of 24.75 and 26.33, respectively, which are comparable to either F_0 or F_3.

Effect of irrigation. Farmers' practice (I_0 = rain fed irrigation) effected the fastest flower development with a mean of 19.25 days, which is significantly lower than weekly irrigation (I_1) and monthly irrigation (I_3) which had means of 27.92 and 26.58 days, respectively. Fortnightly irrigation (I_2) was comparable to all treatments.

Table 2. Duration of flower development as affected by fertilization and irrigation

TREATMENT	MEAN (Days)
Fertilizer Schedule	
F_0 = No fertilizer applied (Farmers' Practice)	20.33^{b}
F_1 = Monthly Fertilization	24.75^{ab}
F_2 = Quarterly Fertilization	26.33^{ab}
F_3 = Semi-annual Fertilization	27.67^{a}
Irrigation Schedule	
I_0 = Rain fed irrigation (Farmers Practice)	19.25^{b}
I_1 = Weekly irrigation	27.92^{a}
I_2 = Fortnightly Irrigation	25.33^{ab}
I_3 = Monthly Irrigation	26.58^{a}

Means with the same letter superscripts are not significantly different at 5% level by DMRT

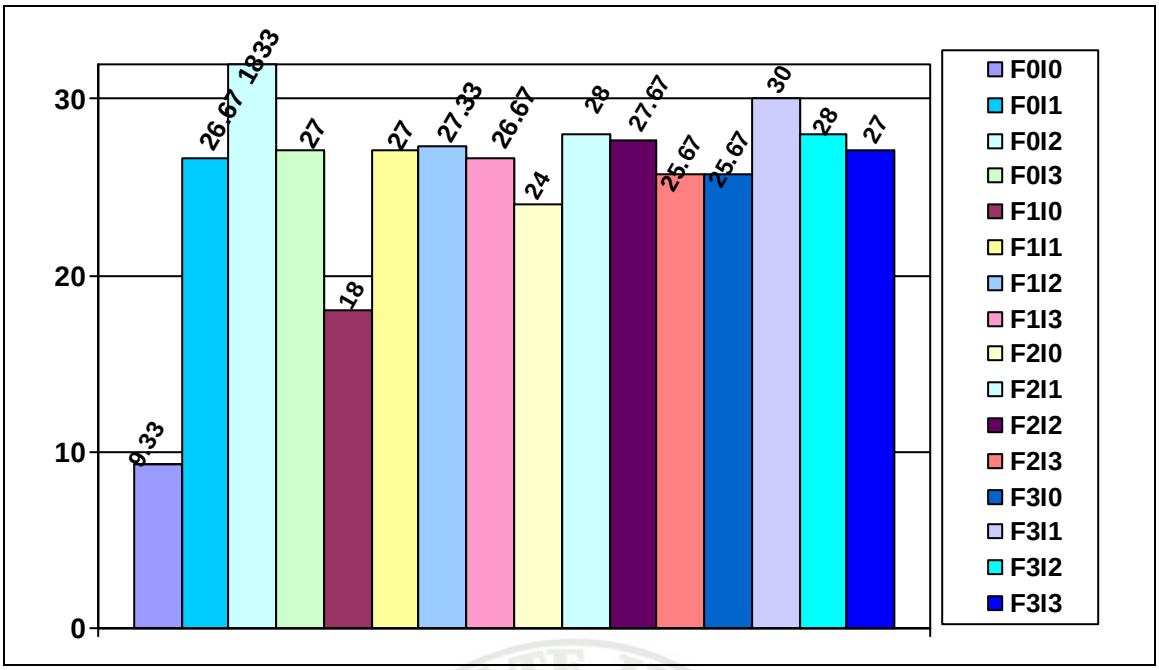

Figure 2. Duration of flower development as affected by fertilization and irrigation

Interaction effect. Figure 2 shows the graphical illustration of the interaction effect of time of fertilizer application and irrigation on the duration of flower development. Statistical analysis showed no significant differences resulting from the interaction between the time of fertilizer application and irrigation on the duration of flower development (Appendix Table 2). However, semi-annual fertilization + weekly irrigation (F_3I_1) resulted to the longest duration of flower development with a mean of 30.00 days. Nevertheless, most of the flowers developed to produce harvestable fruits as shown in Figure 6. The shortest duration of flower development was observed in plants treated farmers' practice (F_0I_0 = no fertilization + rain fed irrigation) with a mean of 9.33 days, which produced the least number of harvestable fruits as shown in Figure 6.

Duration of Fruit Development

Effect of fertilizer. The effect of time of fertilizer application on duration of fruit development is presented in Table 3. Statistical analysis revealed that there was no significant effect. However, semi-annual fertilization (F_3) resulted to the longest duration of fruit development with a mean of 12.0 days, compared to farmers' practice (F_0 = no fertilizer applied) which had the lowest mean of 10.33 days. Quarterly fertilization (F_2) and monthly fertilization (F_1) had means of 11.583 and 11.83 days, respectively. Nevertheless, semi-annual fertilization resulted to the most fruits developed (Table 6), and bigger size of fruits (Tables 10 and 11).

Table 3. Duration of fruit development as affected by fertilization and irrigation

TREATMENT	MEAN (Days)
Fertilizer Schedule	
F_0 = No fertilizer applied (Farmers' Practice)	10.33[a]
F_1 = Monthly Fertilization	11.83[a]
F_2 = Quarterly Fertilization	11.58[a]
F_3 = Semi-annual Fertilization	12.00[a]
Irrigation Schedule	
I_0 = Rain fed irrigation (Farmers Practice)	9.42[b]
I_1 = Weekly irrigation	12.08[ab]
I_2 = Fortnightly Irrigation	10.17[ab]
I_3 = Monthly Irrigation	14.08[a]

Means with the same letter superscripts are not significantly different at 5% level by DMRT

Effect of irrigation. In terms of effect of irrigation, plants that were rain fed (I_0=Farmers' practice) had the developed fruits within the shortest duration with a mean of 9.42 days, as against the monthly irrigation (I_3) with a mean of 14.08, followed by weekly irrigation (I_1) and fortnightly irrigation (I_2) with means of 12.08 and 10.17 days, respectively. Statistical analysis revealed significant differences on the duration of fruit development.

Even though fruits developed longer in weekly irrigation, weekly irrigation (I_1) and fortnightly irrigation (I_2) produced comparatively bigger fruits (Tables 10 and 11), which confirms Coronel's findings (1983) that more water will increase fruit size during fruit development.

Interaction effect. Figure 3 shows the graphical illustration of the interaction effect of fertilizer and irrigation on the duration of fruit development which means that the semi-annual fertilization + weekly irrigation (F_3I_1) combination took fruits longer to develop with a mean of 15.33 days, but with less fruits drop. On the other hand, the shortest duration of fruit development (8.0 days) was observed in farmers' practice (F_0I_0 = no fertilizer applied + rain fed irrigation) although fruit set was only 0.53% as shown in Figure 5.

Shorter duration of fruit development and the occurrence of small fruit were probably caused by low water availability during dry months.

Statistical analysis shows significant interaction between fertilization and irrigation on duration of fruit development.

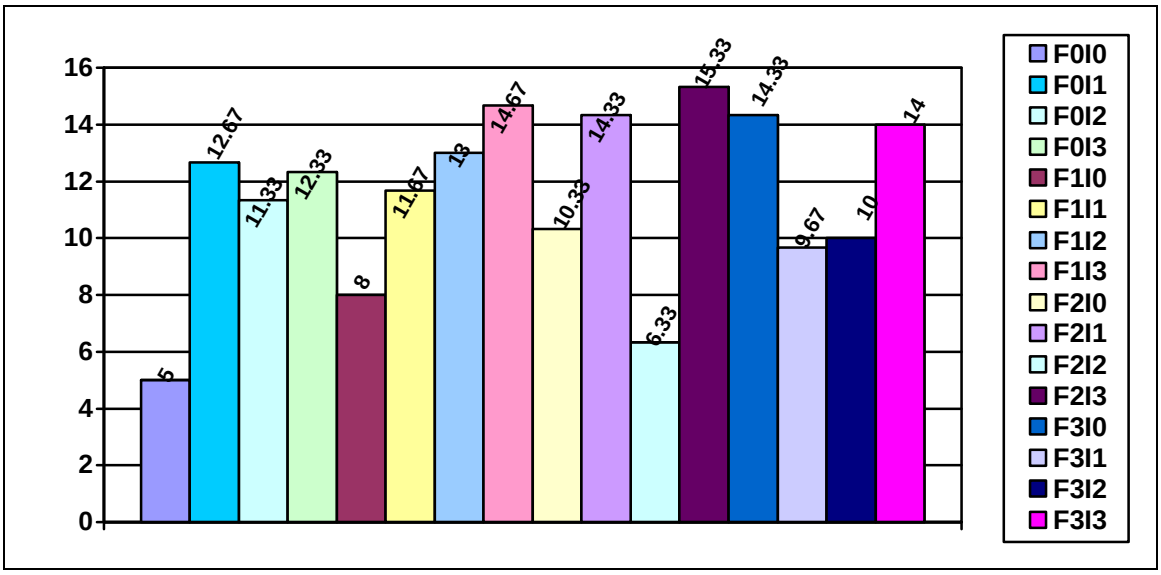

Figure 3. Duration of fruit development as affected by fertilization and irrigation

Average Number of Flower

Effect of fertilizer. The farmers practice (F_0 = no fertilizers applied) were significantly lower in the average number of flower produce with a mean of 57.67, as against the semi-annual fertilization (F_3), which produce more flowers with a mean of 138.42 (table 4), followed by monthly fertilization (F_1) and quarterly fertilization (F_2) with a mean of 91.92 and 89.08 respectively as shown in Table 4.

Effect of irrigation. Table 4 showed no significant effect on the average number of flower, the farmers practice (I_0 = rain fed irrigation) had the lowest with a mean of 71.75 compare with weekly irrigation (I_1) with a mean of 117.83 average numbers of flowers.

Table 4. Average number of flower as affected by fertilization and irrigation

TREATMENT	MEAN
Fertilizer Schedule	
F_0 = No fertilizer applied (Farmers' Practice)	57.67^{b}
F_1 = Monthly Fertilization	91.92^{ab}
F_2 = Quarterly Fertilization	89.08^{ab}
F_3 = Semi-annual Fertilization	138.42^{a}
Irrigation Schedule	
I_0 = Rain fed irrigation (Farmers Practice)	71.75^{a}
I_1 = Once a week irrigation	117.83^{a}
I_2 = Fortnightly Irrigation	97.92^{a}
I_3 = Monthly Irrigation	89.58^{a}

Means with the same letter superscripts are not significantly different at 5% level by DMRT

Interaction effect. Figure 4 shows the graphical illustration of the interaction effect of fertilizer and irrigation on the average number of flowers. Combination of semi-annual fertilization + weekly irrigation (F_3I_1) result a higher average number of flowers produce with a mean of 178. While (F_0I_0 = no fertilizers applied + rain fed irrigation) was the lowest average flowers produce with a mean of 18.33, respectively; this result was due to lack of water and fertilizer on trees.

This clearly indicates that application of irrigation and of fertilization during dry months helps in the initiation of more flowers as noted by Wardowski and Grierson (1986) in their study of citrus flowering.

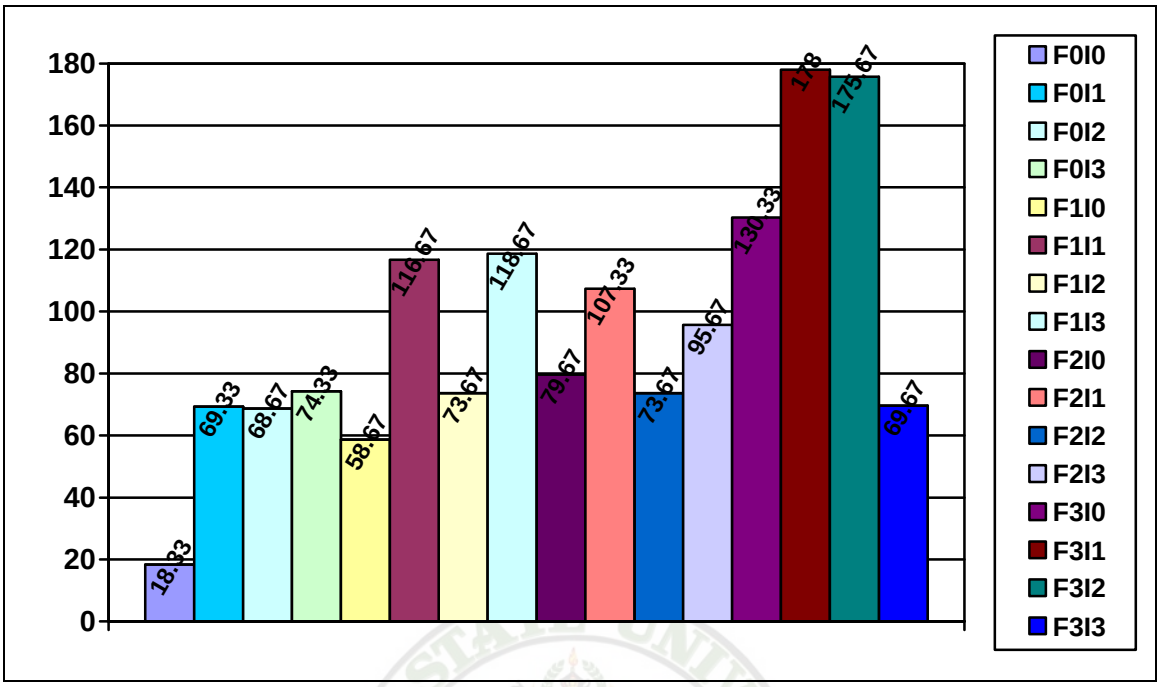

Figure 4. Average number of flower as affected by fertilization and irrigation

Statistical analysis shows the significant interaction effect between fertilization and irrigation on the average number of flowers.

Percent Fruit Set

Effect of fertilizer. Statistical analysis shows the significant effect of fertilization on percent fruit set as shown in Table 5. Semi-annual fertilization (F_3) had the highest percentage of fruit set with mean of 34.90%, followed by monthly fertilization (F_1) and quarterly fertilization (F_2) with a mean of 22.18% and 21.79 %, while the Farmers practice (F_0 = no fertilizer applied) was the lowest percentage of fruit set with a mean of 14.70%.

Effect of irrigation. The percentage of fruit set produced by the plants is shown in Table 5. The plant treated with weekly irrigation (I_1) produce significantly higher percentage of fruit set with a mean of 35.87 %, followed by fortnightly irrigation (I_2) and

Table 5. Percent fruit set as affected by fertilization and irrigation

TREATMENT	MEAN (%)
Fertilizer Schedule	
F_0 = No fertilizer applied (Farmers' Practice)	14.70^{b}
F_1 = Monthly Fertilization	22.18^{b}
F_2 = Quarterly Fertilization	21.79^{b}
F_3 = Semi-annual Fertilization	34.90^{a}
Irrigation Schedule	
I_0 = Rain fed irrigation (Farmers Practice)	10.34^{c}
I_1 = Weekly irrigation	35.87^{a}
I_2 = Fortnightly Irrigation	26.02^{ab}
I_3 = Monthly Irrigation	21.33^{bc}

Means with the same letter superscripts are not significantly different at 5% level by DMRT

monthly irrigation (I_3) with a mean of 26.02% and 21.33%, while the plants treated with farmers practice of rain fed irrigation (I_0) produce the lowest percentage of fruit set with a mean of 10.34% percent.

Interaction effect. Statistical analysis shows that the interaction between fertilization and irrigation on percent fruit set is not significant (Figure 5). However, semi-annual fertilization + weekly irrigation (F_3I_1) had the highest percentage on fruit setting with a mean of 50.82, as against the no fertilizer applied + rain fed irrigation (F_0I_0) with 0.53% of mean. All other treatments combination were comparable to either the semi-annual fertilization + weekly irrigation (F_3I_1) or the farmers' practice (F_0I_0 = no fertilizer applied + rain fed irrigation).

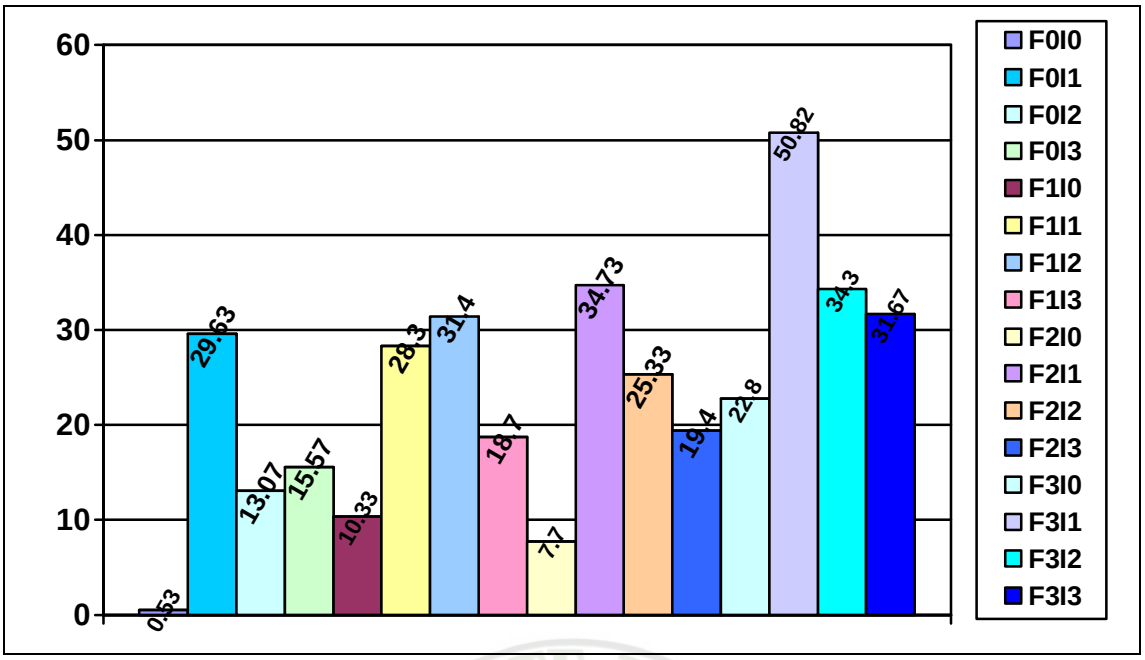

Figure 5. Percent fruit set as affected by fertilization and irrigation

This indicates that fertilization and irrigation still affects fruit setting of lemon to a certain extent. The low percentage was generally attributed to the nature of citrus species having high flowering ability but tends to be less successful in fruit setting as indicated in this study. According to Batchelor and Webber (1968), although citrus trees usually bloom heavily, a comparative small percentage of flowers and flower buds drop before fruit is set.

Statistical analysis revealed that the interaction effect did not significantly affect the fertilization and irrigation on the percentage of fruit setting. Figure 5 shows the graphical illustration of the interaction effect of fertilizer and irrigation on the percent fruit set.

Number of Fruit Developed

Effect of fertilizer. Semi-annual fertilization (F_3) is significant higher in the number of fruits developed with a mean of 43.75, compare from monthly fertilization (F_1) with a mean of 22.75, followed by quarterly fertilization (F_2) and farmers practice (F_0 = no fertilizer applied) with a mean of 20.42 and 9.92.

Effect of irrigation. The final number of fruit developed is shown in Table 6. The effect of irrigation on the number of fruit developed is significant. The treatments with irrigation are significantly different from rain fed irrigation. The weekly irrigation (I_1) had the highest number of fruit developed with a mean of 41.92, followed by fortnightly

Table 6. Number of fruit developed as affected by fertilization and irrigation

TREATMENT	MEAN
Fertilizer Schedule	
F_0 = No fertilizer applied (Farmers' Practice)	9.917^{b}
F_1 = Monthly Fertilization	22.75^{b}
F_2 = Quarterly Fertilization	20.42^{b}
F_3 = Semi-annual Fertilization	43.75^{a}
Irrigation Schedule	
I_0 = Rain fed irrigation (Farmers Practice)	9.25^{c}
I_1 = Once a week irrigation	41.92^{a}
I_2 = Fortnightly Irrigation	27.92^{b}
I_3 = Monthly Irrigation	17.75^{bc}

Means with the same letter superscripts are not significantly different at 5% level by DMRT

irrigation (I_2) and monthly irrigation (I_3) with a mean of 27.92 and 17.75 respectively. The rain fed irrigation (farmers' practice) (I_0) had the lowest number of fruit developed with a mean of 9.25.

Interaction effect. Figure 6 shows the graphical illustration of the interaction effect of fertilizer and irrigation on the number of fruit developed. Application of fertilizer two times a year with the weekly irrigation (F_3I_1) produce more fruits developed that is harvestable with a mean of 86.33, as against the farmers' practice (F_0I_0 = no fertilizer applied + rain fed irrigation) produce less fruits with a mean of 1.67.

Statistical analysis shows the significant affect of interaction between fertilization and irrigation on number of fruit developed.

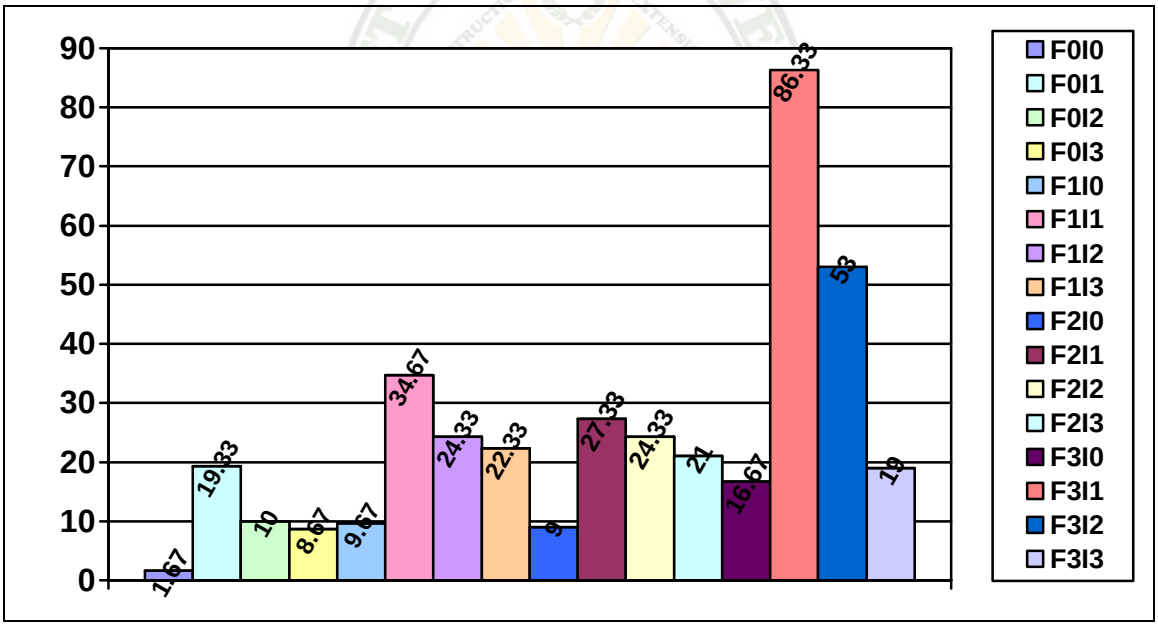

Figure 6. Interaction effect of fertilization and irrigation on the number of fruit developed

Percent of Flower Drop

Effect of fertilizer. The percent of flower drop by the plants on fertilization is shown in Table 7. The plant treated with semi-annual fertilization (F_3) produce

significantly lower percentage of flower drop with a mean of 65.02 percent, the farmers practice (F_0 = no fertilization applied) has the higher percentage of flower drop with a mean of 80.80 %, followed by quarterly fertilization (F_2) and monthly fertilization (F_1) with a mean of 78.16 and 76.29 percent.

Effect of irrigation. Irrigation has a significant effect on the percentage of flower drop (Table 7). Weekly irrigation (I_1) had the lowest percentage of flower drop with a mean of 64.50%, followed by fortnightly irrigation (I_2) with a mean of 71.51%. Farmers practice (rain fed irrigation) (I_0) had the highest percentage of flower drop followed by monthly irrigation (I_3) with a mean of 85.95% and 78.78%.

Table 7. Percent of flower drop as affected by fertilization and irrigation

TREATMENT	MEAN
Fertilizer Schedule	
F_0 = No fertilizer applied (Farmers' Practice)	80.80^{a}
F_1 = Monthly Fertilization	76.29^{a}
F_2 = Quarterly Fertilization	78.17^{a}
F_3 = Semi-annual Fertilization	65.02^{b}
Irrigation Schedule	
I_0 = Rain fed irrigation (Farmers Practice)	85.95^{a}
I_1 = Once a week irrigation	64.50^{c}
I_2 = Fortnightly Irrigation	71.51^{bc}
I_3 = Monthly Irrigation	78.78^{ab}

Means with the same letter superscripts are not significantly different at 5% level by DMRT

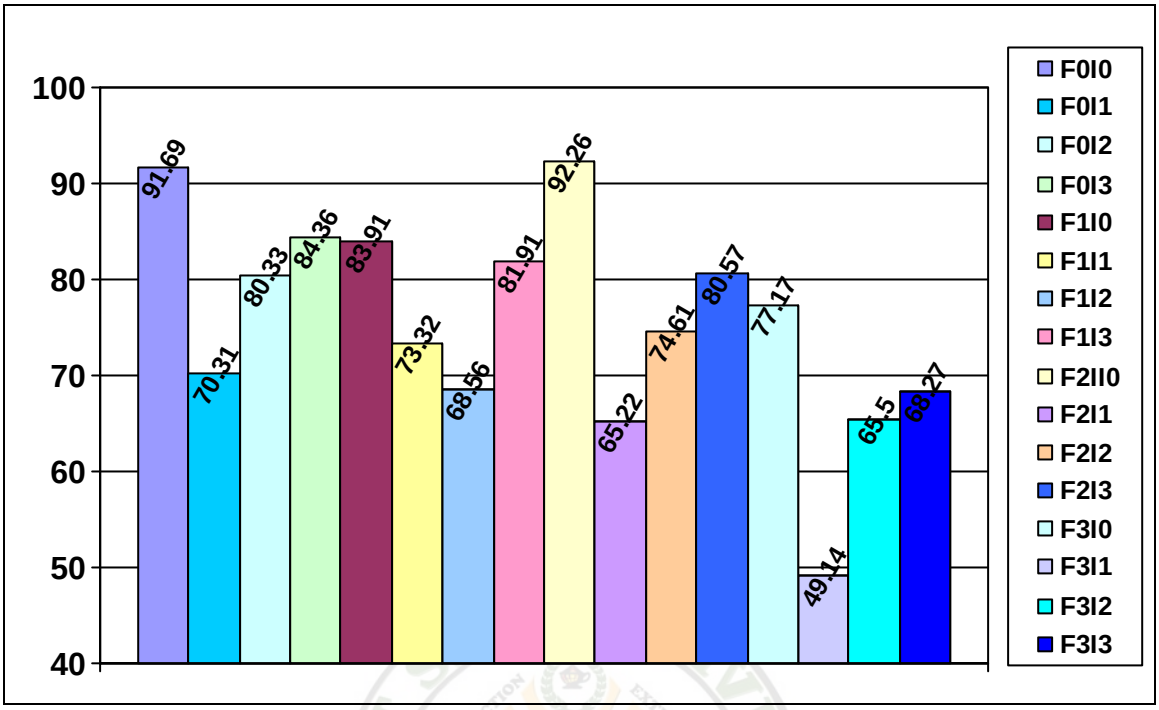

Figure 7. Percent of flower drop as affected by fertilization and irrigation

Interaction effect. Figure 7 shows the graphical illustration on the effect of fertilizer and irrigation on the percent of flower drop. Statistical analysis showed that the quarterly fertilization + farmers' practice irrigation (F_2I_0) were the highest percentage of flower drop with a mean of 92.26 % followed by (F_0I_0 = no fertilizer applied + rain fed irrigation) with a mean of 91.69%. Finally, the semi-annual fertilization + weekly irrigation (F_3I_1) gave the lowest of percentage on flower drop with a mean of 49.14%, respectively.

Statistical analysis showed no significant interaction between fertilization and irrigation on percent of flower drop.

Average Length of Shoots (cm)

Effect of fertilizer. Statistical analysis shows that fertilization has significant effect on average length of shoots (table 8). Semi-annual fertilization (F_3) had the highest mean of 166 cm followed by quarterly fertilization (F_2) with a mean of 134 cm, respectively. Farmer's practice (F_0 = no fertilizer applied) had the lowest average length of shoots with a mean of 82.50 cm followed by monthly fertilization (F_1) with a mean of 95.73 cm, respectively.

Effect of irrigation. The effect of irrigation on the average length of shoots is significant as revealed by statistical analysis. Weekly irrigation (I_1) had the highest mean

Table 8. Average length of shoots as affected by fertilization and irrigation

TREATMENT	MEAN
Fertilizer Schedule	
F_0 = No fertilizer applied (Farmers' Practice)	82.50^{b}
F_1 = Monthly Fertilization	95.73^{b}
F_2 = Quarterly Fertilization	134.00^{a}
F_3 = Semi-annual Fertilization	166.00^{a}
Irrigation Schedule	
I_0 = Rain fed irrigation (Farmers Practice)	85.08^{b}
I_1 = Once a week irrigation	143.00^{a}
I_2 = Fortnightly Irrigation	133.58^{a}
I_3 = Monthly Irrigation	116.57^{ab}

Means with the same letter superscripts are not significantly different at 5% level by DMRT

average of 143 cm, as against the rain fed irrigation (I_0) with a mean of 85.08 cm; Fortnightly irrigation (I_2) and monthly irrigation (I_3) had a mean of 133 cm and 116.57 cm, respectively.

Interaction effect. Figure 8 shows the graphical illustration effect of fertilizer and irrigation on average length of shoots. Maintaining of water present and available of nutrients from fertilizer on the root zone of lemon especially during dry months helps the growth of lemon. In this study, treated with semi-annual fertilization + weekly irrigation (I_1F_3) were the highest average length of shoots with a mean of 203.67 cm, as against the farmers' practice (I_0F_0 = no fertilizer applied + rain fed irrigation) with mean of 58.67 cm.

Statistical analysis showed a significant interaction between the fertilization and irrigation on average length of shoots, which means that using both fertilization and irrigation effect significant on growth performance of lemon.

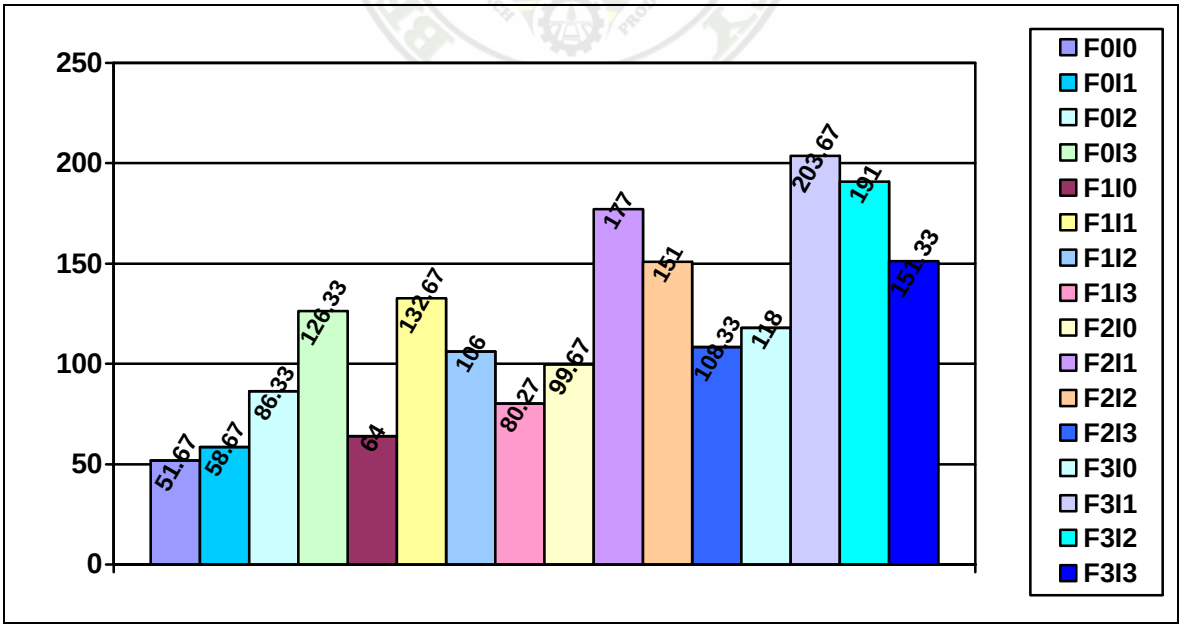

Figure 8. Average length of shoots as affected by fertilization and irrigation

Rind Thickness (mm)

Effect of fertilizer. The effect of fertilization on rind thickness is significant as revealed by statistical analysis. Semi-annual fertilization (F_3) of lemon trees had the highest mean rind thickness with 0.42, followed by the monthly fertilization (F_1) and quarterly fertilization (F_2) with 0.36 and 0.34 mm. The farmer's practice (F_0 = no fertilizer applied) had the lowest mean of 0.33 mm.

Effect of irrigation. Table 9 shows significant effect of irrigation on rind thickness. The rain fed irrigation (I_0) was significantly lower in the rind thickness of fruits with a mean of 0.26 mm, as against the monthly irrigation (I_3) which has thicker

Table 9. Rind thickness (mm) as affected by fertilization and irrigation

TREATMENT	MEAN
Fertilizer Schedule	
F_0 = No fertilizer applied (Farmers' Practice)	0.33^{a}
F_1 = Monthly Fertilization	0.36^{a}
F_2 = Quarterly Fertilization	0.34^{a}
F_3 = Semi-annual Fertilization	0.42^{a}
Irrigation Schedule	
I_0 = Rain fed irrigation (Farmers Practice)	0.26^{b}
I_1 = Once a week irrigation	0.42^{a}
I_2 = Fortnightly Irrigation	0.33^{ab}
I_3 = Monthly Irrigation	0.43^{a}

Means with the same letter superscripts are not significantly different at 5% level by DMRT

rind with a mean of 0.42750 mm. Weekly irrigation (I_1) and fortnightly irrigation (I_2) of lemon trees gave a mean of 0.42 mm and 0.33 mm. however, this did not differ significantly from either the monthly irrigation (I_3) or farmer practice irrigation (I_0).

Interaction effect. Statistical analysis shows the significant interaction effect of fertilization and irrigation on rind thickness of the fruit (Appendix Table 9). Figure 9 shows the graphical illustration on the effect of fertilizer and irrigation on rind thickness. The highest mean number of 0.48 mm was obtained from no fertilizer applied + monthly irrigation (F_0I_3) while the lowest was noted from the plants using farmers' practice (F_0I_0 = no fertilizer applied + rain fed irrigation) with a mean of 0.15 mm.

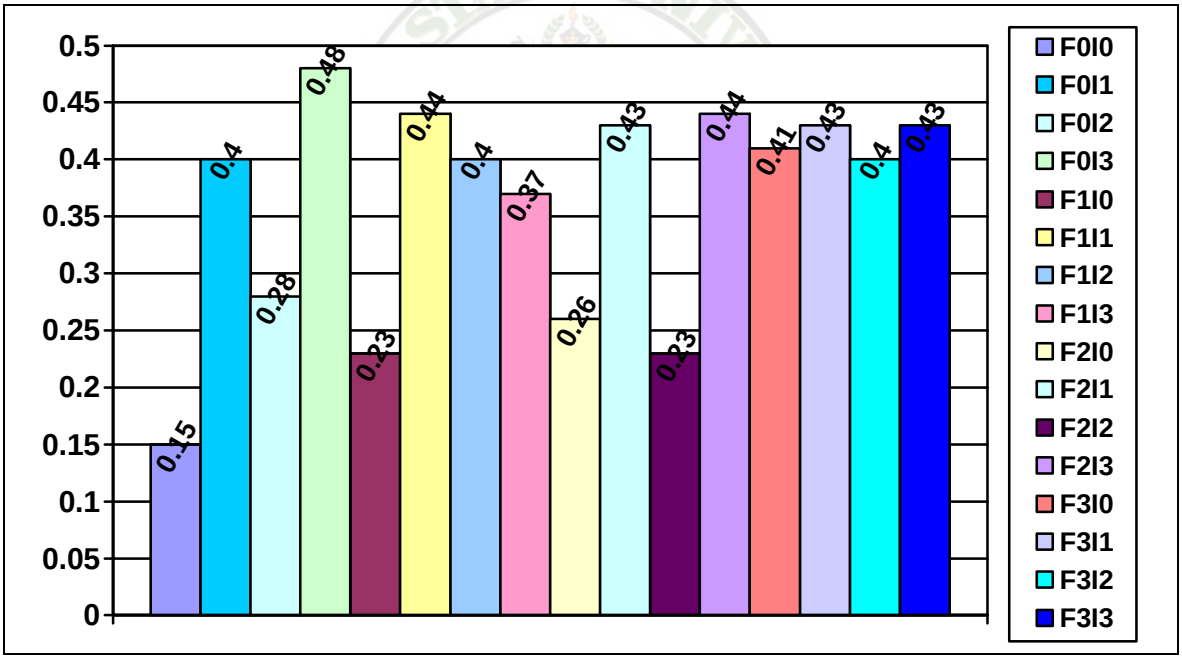

Figure 9. Rind thickness (mm) as affected by fertilization and irrigation

Polar Diameter (cm)

Effect of fertilizer. Statistical analysis shows the not significant effect of fertilization on polar diameter (Table 10). Semi-annual fertilization (F_3) had the highest with 6.32 cm, followed by monthly (F_1) and quarterly (F_2) irrigation with a mean of 5.35 cm and 5.09 cm polar diameter. (F_0 = no fertilizer applied) had the lowest with 4.59 cm polar diameter.

Effect of irrigation. Polar diameter as affected by irrigation is shown in Table 10. The results revealed that irrigation significantly affected the polar diameter. The plants treated with monthly irrigation (I_3) obtained the highest number of polarity diameter with

Table 10. Polar diameter (cm) as affected by fertilization and irrigation

TREATMENT	MEAN
Fertilizer Schedule	
F_0 = No fertilizer applied (Farmers' Practice)	4.59[a]
F_1 = Monthly Fertilization	5.36[a]
F_2 = Quarterly Fertilization	5.09[a]
F_3 = Semi-annual Fertilization	6.32[a]
Irrigation Schedule	
I_0 = Rain fed irrigation (Farmers Practice)	3.95[b]
I_1 = Once a week irrigation	6.11[a]
I_2 = Fortnightly Irrigation	4.99[ab]
I_3 = Monthly Irrigation	6.31[a]

Means with the same letter superscripts are not significantly different at 5% level by DMRT

a mean of 6.31 cm followed by weekly irrigation (I_1) and fortnightly irrigation (I_2) had a mean of 6.11 and 4.99 respectively, while the lowest mean number of 3.95 cm was obtained from plants treated with rain fed irrigation (I_0).

Interaction effect. Interaction effects between the fertilization and irrigation schedule had no significant affect on the polar diameter. Figure 10 shows the graphical illustration effect of fertilizer and irrigation on polar diameter. Plants treated with farmers' practice, no fertilizer applied + monthly irrigation (F_0I_3) combination obtain the highest with a mean of 6.80 cm. the lowest mean with 2.09 cm was noted from the plants treated with (F_0I_0 = no fertilizer applied + rain fed irrigation).

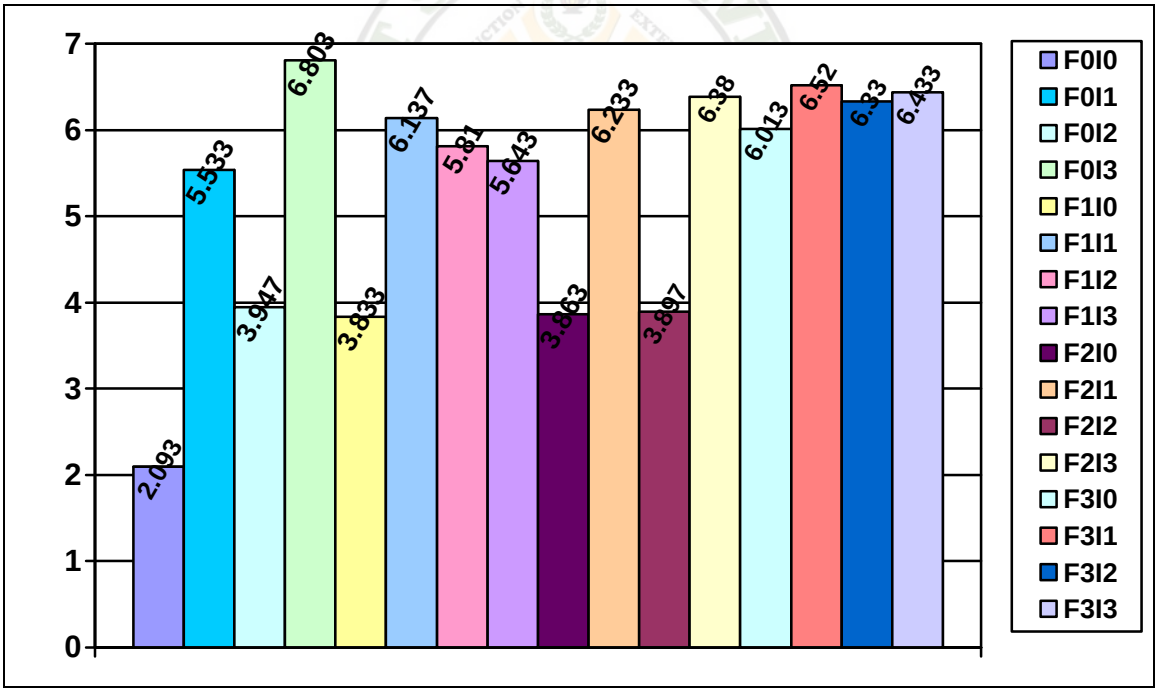

Figure 10. Polar diameter (cm) as affected by fertilization and irrigation

Equatorial Diameter (cm)

Effect of fertilizer. The effect of fertilization on equatorial diameter is not significant with the semi-annual fertilization (F_3) having 5.43 cm, monthly fertilization (F_1) with 4.59 cm, quarterly fertilization (F_2) and farmer's practice (F_0 = no fertilizer applied) with 4.34 and 4.04 cm, respectively (Table 11).

Effect of irrigation. The equatorial diameter in irrigation schedule is showed in Table 11. The effect of irrigation on equatorial diameter is significant with monthly irrigation (I_3), weekly irrigation (I_1) and fortnightly irrigation (I_2) with a mean of 5.37 cm, 5.27 cm and 4.32 cm, respectively. Rain fed irrigation (I_0) had the lowest mean with 3.4442 cm.

Table 11. Equatorial diameter (cm) as affected by fertilization and irrigation

TREATMENT	MEAN
Fertilizer Schedule	
F_0 = No fertilizer applied (Farmers' Practice)	4.04[a]
F_1 = Monthly Fertilization	4.59[a]
F_2 = Quarterly Fertilization	4.34[a]
F_3 = Semi-annual Fertilization	5.43[a]
Irrigation Schedule	
I_0 = Rain fed irrigation (Farmers Practice)	3.44[b]
I_1 = Once a week irrigation	5.27[a]
I_2 = Fortnightly Irrigation	4.32[ab]
I_3 = Monthly Irrigation	5.37[a]

Means with the same letter superscripts are not significantly different at 5% level by DMRT

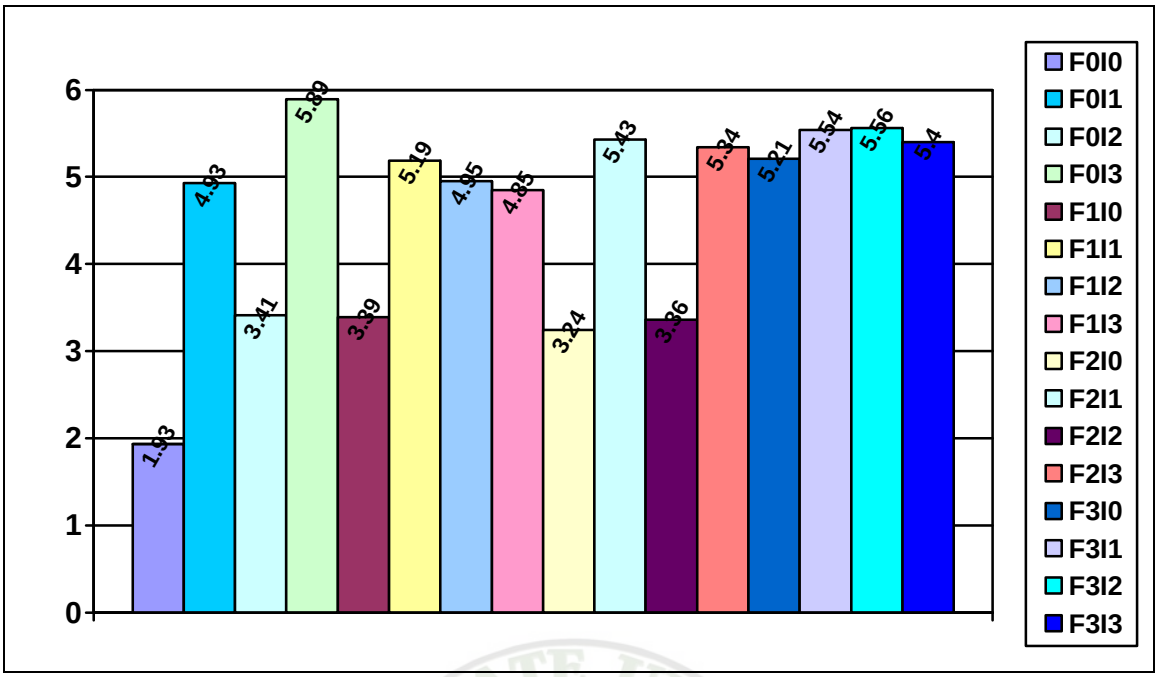

Figure 11. Equatorial diameter (cm) as affected by fertilization and irrigation

Interaction effect. Statistical analysis showed no significant interaction between fertilization and irrigation on equatorial diameter. Figure 11 shows the graphical illustration effect of fertilizer and irrigation on equatorial diameter. However, plants treated with farmers' practice, no fertilizer applied + monthly irrigation (F_0I_3) obtained the highest mean of 5.89 cm on equatorial diameter, while the lowest mean of 1.93 cm was noted from the (F_0I_0 = no fertilizer applied + rain fed irrigation).

Average Weight per Fruit (g)

Effect of fertilizer. Table 12 shows that the effect of fertilization on average weight per fruit is not significant with the semi-annual fertilization (F_3) with 92.86 g, followed by quarterly fertilization (F_2) and monthly (F_1) fertilization with a mean of 69.17 g and 68.08 g. Farmer's practice (F_0 = no fertilizer applied) had the lowest with a mean of 67.70 g respectively.

Table 12. Average weight per fruit (g) as affected by fertilization and irrigation

TREATMENT	MEAN
Fertilizer Schedule	
F_0 = No fertilizer applied (Farmers' Practice)	67.70[a]
F_1 = Monthly Fertilization	68.08[a]
F_2 = Quarterly Fertilization	69.17[a]
F_3 = Semi-annual Fertilization	92.86[a]
Irrigation Schedule	
I_0 = Rain fed irrigation (Farmers Practice)	56.25[b]
I_1 = Weekly irrigation	82.83[ab]
I_2 = Fortnightly Irrigation	69.67[ab]
I_3 = Monthly Irrigation	89.05[a]

Means with the same letter superscripts are not significantly different at 5% level by DMRT

Effect of irrigation. The effect of irrigation on average weight per fruit is significant. Rain fed irrigation (I_0) with 56.25 g had the lowest mean. While, monthly irrigation (I_3) with a highest mean of 89.05 g, followed by weekly irrigation (I_1) and fortnightly irrigation (I_2) with a mean of 82.83 g and 69.67 g, respectively.

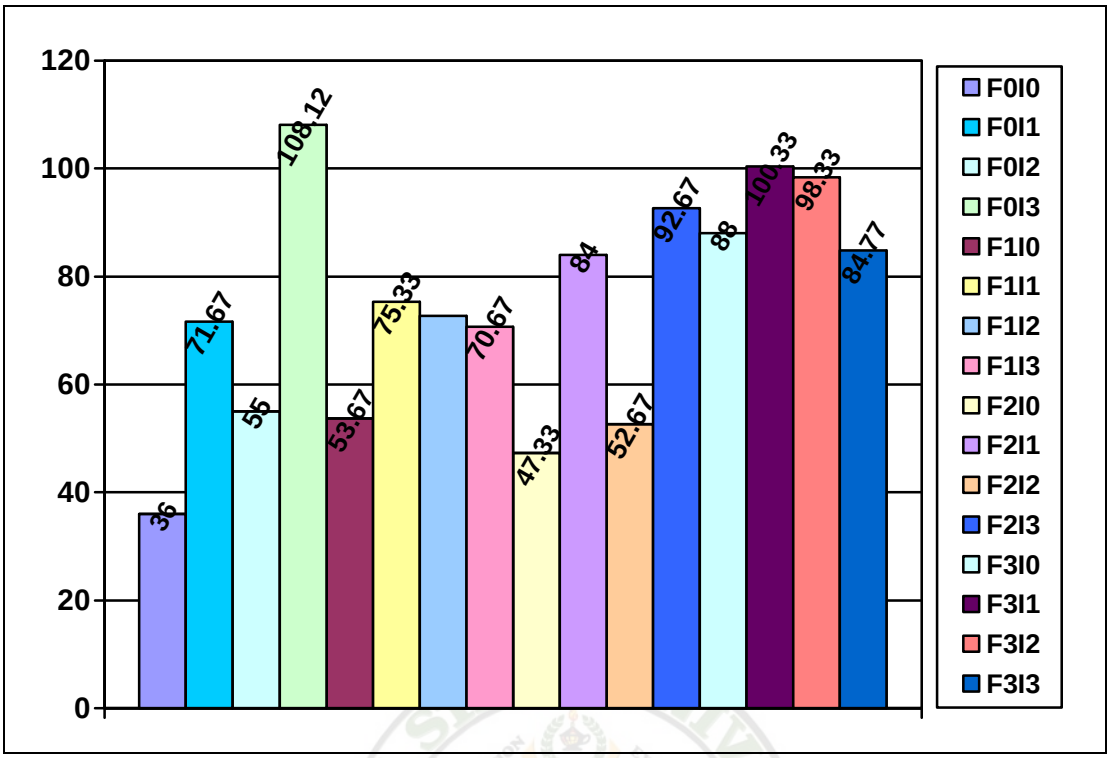

Figure 12. Average weight per fruit (g) as affected by fertilization and irrigation

Interaction effect. There was significant interaction effect between fertilizer and irrigation on the average weight per fruit. Figure 12 shows the graphical illustration effect of fertilizer and irrigation on average weight per fruit. The lowest average weight per fruit was obtained from (F_0I_0 = no fertilizer applied + rain fed irrigation) with a mean of 36.00 g. The highest average weight per fruit was noted from the no fertilizer applied + monthly irrigation (F_0I_3) with a mean of 108.12 g.

Average Yield per Tree (kg)

Effect of fertilizer. The effect of fertilization on the average yield per tree is shown in Table 13. lemon trees that were not fertilized (F_0 = Farmers' practice-no fertilizer applied) yielded a mean of 3.03 kg, which is significantly lower than those fertilized with semi-annually (F_3) with a mean of 15.25 kg fruits per tree. Monthly (F_1) and quarterly fertilizer schedule (F_2) yielded a mean of 9.42 kg and 7.21 kg, respectively, comparable to either the farmers' practice or the semi-annual fertilization.

Table 13. Average yield per tree (kg) as affected by fertilization and irrigation

TREATMENT	MEAN
Fertilizer Schedule	
F_0 = No fertilizer applied (Farmers' Practice)	3.03^{c}
F_1 = Monthly Fertilization	9.42^{b}
F_2 = Quarterly Fertilization	7.21^{bc}
F_3 = Semi-annual Fertilization	15.25^{a}
Irrigation Schedule	
I_0 = Rain fed irrigation (Farmers Practice)	2.95^{c}
I_1 = Weekly irrigation	15.58^{a}
I_2 = Fortnightly Irrigation	10.59^{ab}
I_3 = Monthly Irrigation	5.78^{bc}

Means with the same letter superscripts are not significantly different at 5% level by DMRT

Effect of irrigation. Weekly irrigation (I_1) resulted to a mean yield per tree of 15.58 kg compared to monthly irrigation (I_3) and rain fed (I_0) with a mean of 5.78 kg and 2.95 kg, respectively.

Interaction effect. Statistical analysis showed significant interaction of fertilizer and irrigation schedule on average yield per tree. Figure 13 shows the graphical illustration effect of fertilizer and irrigation schedule on average yield per tree. Figure 13 further shows that the semi-annual fertilization + weekly irrigation (F_3I_1) were the highest average yield per tree with a mean of 31.17 kg after harvesting, while the (F_0I_0 = no fertilizer applied + rain fed) was the lowest average mean of 0.15 kg. This was due to the rates of fertilizer applied and irrigation schedule.

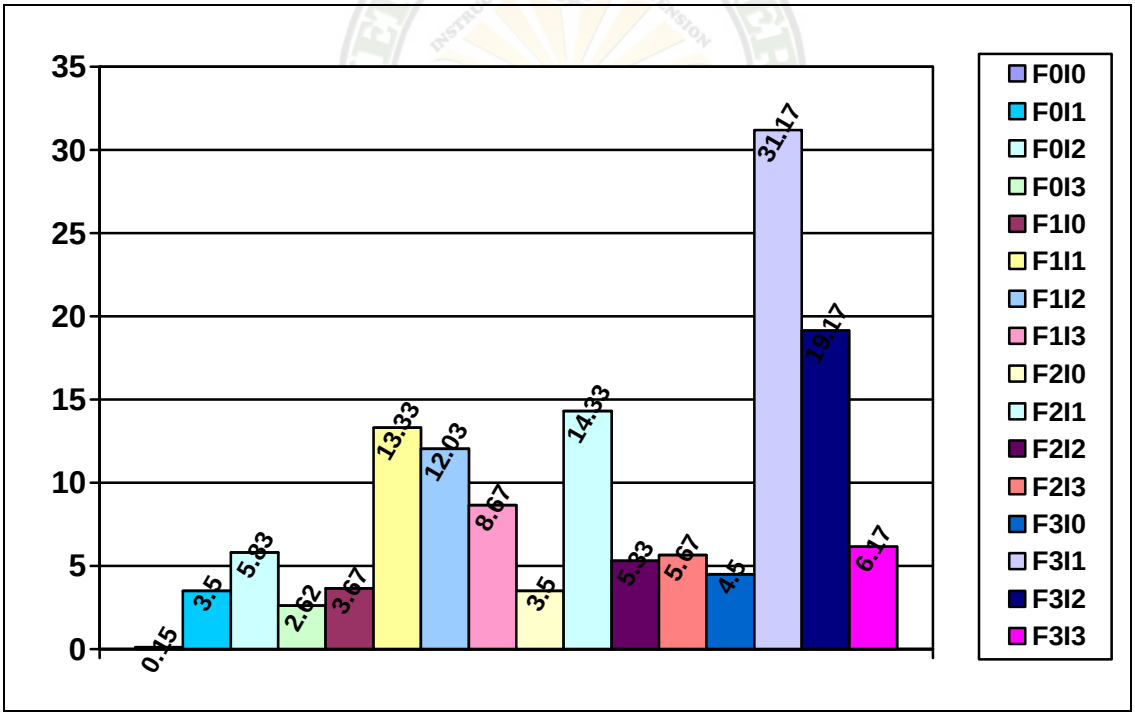

Figure 13. Average yield per tree (kg) as affected by fertilization and irrigation

Yield of Intercrop

Effect of fertilizer. Statistical analysis shows no significant effect of fertilization on yield of intercrop (Table 14). However, monthly fertilization (F_1) had the highest mean with 1.02, followed by farmers' practice (F_0 = no fertilizer applied) and semi-annual fertilization (F_3) with a mean of 0.94 and 0.93, respectively. Quarterly fertilization (F_2) has the lowest mean with 0.92.

Effect of irrigation. The rain fed irrigation (I_0) is significantly lower in term of yield in three square meters around on yield of intercrop during irrigation schedule with a mean of 0.68, Compared from weekly irrigation (I_1) has higher mean with 1.10, followed

Table 14. Yield of intercrop as affected by fertilization and irrigation

TREATMENT	MEAN
Fertilizer Schedule	
F_0 = No fertilizer applied (Farmers' Practice)	0.94^a
F_1 = Monthly Fertilization	1.02^a
F_2 = Quarterly Fertilization	0.92^a
F_3 = Semi-annual Fertilization	0.93^a
Irrigation Schedule	
I_0 = Rain fed irrigation (Farmers Practice)	0.68^b
I_1 = Weekly irrigation	1.10^a
I_2 = Fortnightly Irrigation	1.01^a
I_3 = Monthly Irrigation	1.02^a

Means with the same letter superscripts are not significantly different at 5% level by DMRT

by monthly irrigation (I_3) and fortnightly irrigation (I_2) with a mean of 1.02 and 1.01, respectively.

Interaction effect. Statistical analysis showed significant interaction between fertilizer and irrigation schedule on yield of intercrop. Figure 14 shows the graphical illustration effect of fertilizer and irrigation schedule on yield of intercrop. The highest mean of 1.47 was obtained from the plants treated with monthly fertilization + weekly irrigation (F_1I_1). The lowest mean of 0.50 was observed from plants treated with monthly fertilization + rain fed irrigation (F_1I_0).

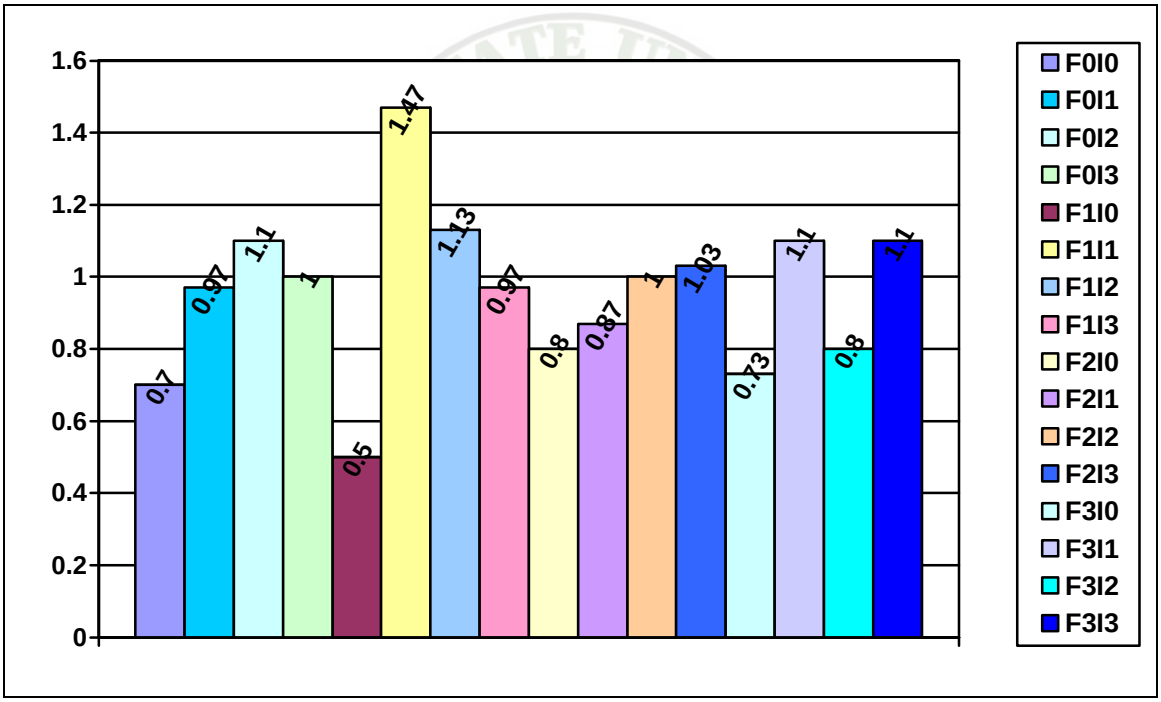

Figure 14. Yield of intercrop as affected by fertilization and irrigation

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study aimed to determine the effect of irrigation and fertilization on the performance of Meyer lemon, independently or in combination, on the growth, yield and fruit quality of Meyer lemon; effect of fertilizer on the growth, yield and fruit quality of Meyer lemon, and effect of irrigating and fertilizing Meyer lemon on the yield of soybean intercropped. The study was conducted from October 2006 to April 2007 at Patpat, Tabio, Mankayan, Benguet.

The schedules of fertilizer application using 14-14-14 with chicken manure, and irrigation at different intervals were evaluated. The Randomized Complete Block (RCB) design in a factorial arrangement was used in the experiment. The parameters for evaluating the effects of the treatments were: days from treatment application to first harvest, duration of flower development, duration of fruit development, average number of flowers, percent fruit set, percent of flower drop, average no. of new shoots, average length of shoots, rind thickness, size of the fruit, average weight per fruit, average yield per tree, yield of intercrop.

Fertilizer application significantly improved flower development, number of flowers, fruit set, and number of fruit developed, flower drop, length of shoots, rind thickness, polar diameter, equatorial diameter, weight of per fruit, and yield per tree but had no significant effect on fruit development and yield of intercrop. However, it took plants fertilized semi-annually significantly longer to produce flowers and harvestable fruits. Fruit development, fruit setting to maturation also took longer; but percentage of

flower and fruit drop was lowest. Farmers' practice (no fertilizer applied) resulted to earlier harvesting, shorter duration of flower and fruit development, and low fruit setting due to high percentage of flower and fruit drop. Fruit size and yield were also significantly reduced. Monthly and quarterly fertilization were comparable to both the farmers' practice and semi-annual fertilization.

Meanwhile, weekly irrigation significantly lengthened the period from treatment application to first harvest, duration of flower and fruit development, and increased the number of flowers, fruit set, number and size of fruits developed, length of shoots, rind thickness, polar diameter, equatorial diameter, weight per fruit, yield per tree and yield of intercrop but reduced flower drop.

Weekly irrigation and semi-annual fertilization resulted to the longest duration of flower and fruit development, and gave the highest number and percentage of fruit set. However, monthly irrigation and no fertilizer applied resulted to significantly higher mean on rind thickness, polar diameter, equatorial diameter and weight per fruit. On the other hand, it was observed that the plants treated with farmers' practice (no irrigation and no fertilizer applied) combined to produce the least number of fruit, high percentage of flower and fruit drop, and some plants not setting fruit.

Conclusion

The result of this study concluded that irrigation enhances the number of flowers and fruit developed and fruit set, especially on the growth of the plant. On the other hand, fertilization improves the number of fruits developed; fruit set and improve the growth and yield of the plant. Apparently, the combination of irrigation and fertilization is most

effective for improving lemon trees, especially during dry months of the year when water is needed to dissolve nutrients needed by the plants.

Recommendation

This study recommends weekly irrigation be adapted during dry months to maintain the required volume of water for normal growth and development combined with semi-annual fertilization to supplement the essential elements in the soil to increase economic return from harvest. In addition pest and diseases control should be also observed.

This study, however, recommends further related studies particularly on the yield of the intercrops.

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APPENDICES

APPENDIX TABLE 1. Days from treatment application to first harvest as affected by fertilization and irrigation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
I_0F_0	0	0	153	153	51
I_0F_1	153	0	171	324	108
I_0F_2	203	171	203	577	192.33
I_0F_3	153	171	171	495	165
Sub-Total	509	342	698	1549	129.08
I_1F_0	171	153	203	527	175.66
I_1F_1	171	171	153	495	165
I_1F_2	171	171	203	545	181.66
I_1F_3	203	203	203	609	203
Sub-Total	716	698	762	2176	181.33
I_2F_0	153	171	203	527	175.66
I_2F_1	171	171	171	513	171
I_2F_2	0	171	203	374	124.66
I_2F_3	203	203	203	609	203
Sub-Total	527	716	780	2023	168.58
I_3F_0	171	171	171	513	171
I_3F_1	153	171	203	527	109
I_3F_2	203	171	171	545	181.66
I_3F_3	171	171	171	513	171
Sub-Total	698	684	716	2098	158.16
Grand Total	2450	2440	295	7846	163.46

ANOVA TABLE

SOURCE OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	FREQUENCY VALUE	Pr > F
Model	17	78304.41666667	4606.14215686	2.63	0.0100
Rep	2	10883.16666667	5441.58333333	3.11	0.0594
Irig	3	19881.75000000	6627.25000000	3.78*	0.0205
Fert	3	12092.41666667	4030.80555556	2.30*	0.0972
Irig x Fert	9	35447.08333333	3938.56481481	2.25*	0.0464
Error	30	52533.50000000	1751.11666667		
Total	47	130837.9166667			

* - Significant Coefficient of Variation = 25.60062 %

APPENDIX TABLE 2. Duration of flower development as affected by fertilization and irrigation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
I_0F_0	0	0	28	28	9.33
I_0F_1	25	0	29	54	18
I_0F_2	27	28	29	84	28
I_0F_3	31	29	30	90	30
Sub-Total	83	57	116	256	21.33
I_1F_0	28	22	30	80	26.66
I_1F_1	22	31	28	81	27
I_1F_2	27	28	29	84	28
I_1F_3	31	29	30	90	30
Sub-Total	108	110	117	335	27.91
I_2F_0	25	30	0	55	18.33
I_2F_1	30	27	25	82	27.33
I_2F_2	27	28	28	83	27.66
I_2F_3	28	28	28	84	28
Sub-Total	110	113	81	304	25.33
I_3F_0	28	27	26	81	27
I_3F_1	25	28	27	80	26.66
I_3F_2	27	22	28	77	25.66
I_3F_3	24	33	24	81	27
Sub-Total	104	110	105	319	26.58
Grand Total	397	381	411	1166	24.29

ANOVA TABLE

SOURCE OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	FREQUENCY VALUE	Pr > F
Model	17	1267.31250000	74.54779412	1.33	0.2430
Rep	2	28.16666667	14.08333333	0.25	0.7801
Irig	3	527.72916667	175.90972222	3.13*	0.0403
Fert	3	366.22916667	122.07638889	2.17*	0.1122
Irig x Fert	9	345.18750000	38.35416667	0.68ns	0.7189
Error	30	1687.16666667	56.23888889		
Total	47	2954.47916667			

* - Significant
ns – Not Significant

Coefficient of Variation = 30.27455 %

APPENDIX TABLE 3. Duration of fruit development as affected by fertilization and irrigation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
I_0F_0	0	0	15	15	5
I_0F_1	13	0	11	24	8
I_0F_2	0	17	14	31	10.33
I_0F_3	14	14	15	43	14.33
Sub-Total	27	31	55	113	9.41
I_1F_0	12	11	15	38	12.66
I_1F_1	9	9	17	35	11.66
I_1F_2	14	13	16	43	14.33
I_1F_3	10	10	9	29	9.66
Sub-Total	45	43	57	145	12.07
I_2F_0	18	16	0	34	11.33
I_2F_1	9	14	16	39	13
I_2F_2	0	11	8	19	6.33
I_2F_3	7	13	10	30	10
Sub-Total	34	54	34	122	10.16
I_3F_0	13	12	12	37	12.33
I_3F_1	15	14	15	44	14.66
I_3F_2	14	17	15	46	15.33
I_3F_3	19	8	15	42	14
Sub-Total	61	51	57	169	14.08
Grand Total	167	179	203	549	11.44

ANOVA TABLE

SOURCE OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	FREQUENCY VALUE	Pr > F
Model	17	460.47916667	27.08700980	1.02	0.4690
Rep	2	42.00000000	21.00000000	0.79	0.4639
Irig	3	157.39583333	52.46527778	1.97*	0.1399
Fert	3	20.56250000	6.85416667	0.26ns	0.8556
Irig x Fert	9	240.52083333	26.72453704	1.00*	0.4591
Error	30	799.33333333	26.64444444		
Total	47	1259.81250000			

* - Significant
ns – Not Significant

Coefficient of Variation = 45.13072 %

APPENDIX TABLE 4. Average number of flowers as affected by fertilization and irrigation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
I_0F_0	25	0	30	55	18.33
I_0F_1	28	0	148	176	58.66
I_0F_2	16	83	140	239	75.66
I_0F_3	124	29	238	391	130.33
Sub-Total	193	112	556	861	70.74
I_1F_0	106	48	54	208	69.33
I_1F_1	93	107	150	350	116.6
I_1F_2	243	51	28	322	107.33
I_1F_3	171	94	269	534	178
Sub-Total	613	300	501	1414	117.81
I_2F_0	53	153	0	206	68.6
I_2F_1	35	115	71	221	73.66
I_2F_2	15	122	84	221	73.6
I_2F_3	254	126	147	527	175
Sub-Total	357	516	302	1175	97.71
I_3F_0	112	96	15	223	74.33
I_3F_1	60	183	113	356	118.6
I_3F_2	50	131	106	287	95.66
I_3F_3	157	19	33	209	69.66
Sub-Total	379	429	267	1075	89.56
Grand Total	1542	1357	1626	4525	94.27

ANOVA TABLE

SOURCE OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	FREQUENCY VALUE	Pr > F
Model	17	82115.02083333	4830.29534314	0.99	0.4895
Rep	2	2367.54166667	1183.77083333	0.24	0.7853
Irig	3	13171.72916667	4390.57638889	0.90ns	0.4509
Fert	3	39854.06250000	13284.68750000	2.73*	0.0611
Irig x Fert	9	26721.68750000	2969.07638889	0.61ns	0.7778
Error	30	145768.45833333	4858.94861111		
Total	47	227883.47916667			

* - Significant
ns – Not Significant

Coefficient of Variation = 73.94244 %

APPENDIX TABLE 5. Percent fruit set as affected by fertilization and irrigation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
I_0F_0	0	0	1.6	1.6	.53
I_0F_1	14.2	0	16.8	31	10.33
I_0F_2	0	9.6	13.5	23.1	7.7
I_0F_3	16.9	44.8	6.7	68.4	22.8
Sub-Total	31.1	54.4	93	124.1	10.34
I_1F_0	21.6	22.9	44.4	88.9	29.63
I_1F_1	25.8	20.5	38.6	84.9	28.3
I_1F_2	20.9	33.3	50	104.2	34.73
I_1F_3	53.8	56.3	42.37	152.47	50.82
Sub-Total	122.1	133	175.37	430.47	35.87
I_2F_0	30.1	9.1	0	39.2	13.06
I_2F_1	34.2	41.7	18.3	94.2	31.4
I_2F_2	0	23.7	52.3	76	25.33
I_2F_3	17.3	55	30.6	102.9	34.3
Sub-Total	81.6	129.5	101.2	312.3	26.02
I_3F_0	16	4.1	26.6	46.7	15.56
I_3F_1	21.6	21.3	13.2	56.1	18.7
I_3F_2	6	18.3	33.9	58.2	19.4
I_3F_3	24.2	31.5	39.3	95	31.66
Sub-Total	67.8	75.2	113	256	21.31
Grand Total	302.6	392.1	428.17	1122.87	23.39

ANOVA TABLE

SOURCE OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	FREQUENCY VALUE	Pr > F
Model	17	7557.28369375	444.54609963	2.55	0.0121
Rep	2	522.48166250	261.24083125	1.50	0.2393
Irig	3	4046.93847292	1348.97949097	7.75*	0.0006
Fert	3	2543.39197292	847.79732431	4.87*	0.0071
Irig x Fert	9	444.47158542	49.38573171	0.28ns	0.9742
Error	30	5224.10493750	174.13683125		
Total	47	12781.38863125			

*- Significant Coefficient of Variation = 56.41013%

ns- Not Significant

APPENDIX TABLE 6. Number of fruit developed as affected by fertilization and irrigation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
I_0F_0	0	0	5	5	1.66
I_0F_1	4	0	25	29	9.66
I_0F_2	0	8	19	27	9
I_0F_3	21	13	16	50	16.66
Sub-Total	25	21	65	111	9.25
I_1F_0	23	11	24	58	19.33
I_1F_1	24	22	58	104	34.66
I_1F_2	51	17	14	82	27.33
I_1F_3	92	53	114	259	86.33
Sub-Total	190	103	210	503	41.91
I_2F_0	16	14	0	30	10
I_2F_1	12	48	13	73	24.33
I_2F_2	0	29	44	73	24.33
I_2F_3	44	70	45	159	53
Sub-Total	72	161	102	335	27.92
I_3F_0	18	4	4	2	8.66
I_3F_1	13	39	15	67	22.33
I_3F_2	3	24	36	63	21
I_3F_3	38	6	13	57	19
Sub-Total	72	73	68	189	17.75
Grand Total	359	358	445	1162	24.21

ANOVA TABLE

SOURCE OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	FREQUENCY VALUE	Pr > F
Model	17	19282.37500000	1134.25735294	4.22	0.0003
Rep	2	311.79166667	155.89583333	0.58	0.5658
Irig	3	7113.58333333	2371.19444444	8.83*	0.0002
Fert	3	7231.58333333	2410.52777778	8.97*	0.0002
Irig x Fert	9	4625.41666667	513.93518519	1.91*	0.0884
Error	30	8057.54166667	268.58472222		
Total	47	27339.91666667			

*- Significant Coefficient of Variation = 67.69799%

APPENDIX TABLE 7. Percent of flower drop as affected by fertilization and irrigation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
I_0F_0	100	X	83.37	183.33	61.11
I_0F_1	85.71	X	83.10	168.81	56.27
I_0F_2	100	90.36	86.42	276.78	92.26
I_0F_3	83.06	55.17	93.27	231.5	77.16
Sub-Total	368.77	145.53	328.16	860.42	71.7
I_1F_0	78.30	77.08	55.55	210.93	70.31
I_1F_1	74.19	79.43	61.33	214.95	71.65
I_1F_2	79.01	66.66	50	195.67	65.22
I_1F_3	46.19	43.61	57.62	147.42	49.14
Sub-Total	277.69	266.78	224.5	768.97	64.08
I_2F_0	69.81	90.84	X	160.65	53.55
I_2F_1	65.71	58.28	81.69	205.68	68.56
I_2F_2	100	76.22	47.61	223.83	74.61
I_2F_3	82.67	44.44	69.38	196.49	65.49
Sub-Total	318.19	587.97	198.68	786.65	65.55
I_3F_0	83.92	95.83	73.33	253.08	84.36
I_3F_1	78.33	78.68	88.72	245.73	81.91
I_3F_2	94	81.68	66.03	241.71	80.57
I_3F_3	75.79	68.42	60.60	204.81	68.24
Sub-Total	332.04	324.61	288.68	945.33	78.77
Grand Total	1296.69	1006.7	1057.98	3361.37	70.03

ANOVA TABLE

SOURCE OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	FREQUENCY VALUE	Pr > F
Model	17	6140.77110942	361.22182997	2.17	0.0350
Rep	2	1064.61976165	532.30988082	3.20	0.0568
Irig	3	2824.67161990	941.55720663	5.65*	0.0039
Fert	3	1668.83193247	556.27731082	3.34*	0.0340
Irig x Fert	9	582.64779540	64.73864393	0.39ns	0.9301
Error	27	4497.05005502	166.55740945		
Total	44	10637.82116444			

*- Significant
ns- Not Significant

Coefficient of Variation%

APPENDIX TABLE 8. Average length of shoot (cm) as affected by fertilization and irrigation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
I_0F_0	53	81	42	176	58.66
I_0F_1	47	51	94	192	64
I_0F_2	46	143	110	299	99.66
I_0F_3	81	158	115	354	118
Sub-Total	227	433	361	1021	85.08
I_1F_0	80	36	60	176	58.6
I_1F_1	159	108	131	398	132.66
I_1F_2	175	146	210	531	177
I_1F_3	140	210	21	611	203.66
Sub-Total	554	500	422	1716	142.98
I_2F_0	107	105	47	259	86.33
I_2F_1	149	70	99	318	106
I_2F_2	134	167	152	453	151
I_2F_3	253	122	198	573	191
Sub-Total	643	464	496	1603	133.58
I_3F_0	187	108	84	379	126.33
I_3F_1	98	103.8	39	240.8	80.26
I_3F_2	89	90	146	325	108.33
I_3F_3	104	206	144	454	151.33
Sub-Total	478	507.8	413	1398.8	116.56
Grand Total	1902	1904.8	1932	5738.8	119.56

ANOVA TABLE

SOURCE OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	FREQUENCY VALUE	Pr > F
Model	17	94689.17666667	5569.95156863	3.20	0.0026
Rep	2	34.32666667	17.16333333	0.01	0.9902
Irig	3	23324.25666667	7774.75222222	4.47*	0.0104
Fert	3	51676.09000000	17225.36333333	9.90*	0.0001
Irig x Fert	9	19654.50333333	2183.83370370	1.26*	0.3008
Error	30	52192.90000000	1739.76333333		
Total	47	146882.07666667			

*- Significant Coefficient of Variation = 34.88713%

APPENDIX TABLE 9. Rind thickness as affected by fertilization and irrigation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
I_0F_0	0	0	.46	.46	.15
I_0F_1	.32	0	.36	.68	.22
I_0F_2	0	.4	.37	.77	.25
I_0F_3	.41	.43	.39	1.23	.41
Sub-Total	.73	.83	1.58	3.14	0.25
I_1F_0	.42	.35	.43	1.2	.4
I_1F_1	.48	.46	.37	1.31	.43
I_1F_2	.42	.43	.44	1.29	.43
I_1F_3	.42	.44	.44	1.3	.43
Sub-Total	1.74	1.68	1.68	5.1	0.42
I_2F_0	.43	.42	0	.85	.28
I_2F_1	.37	.38	.44	1.19	.39
I_2F_2	0	.37	.33	.7	.23
I_2F_3	.43	.32	.44	1.19	.39
Sub-Total	1.23	1.49	1.21	3.93	0.32
I_3F_0	.46	.43	.55	1.44	.48
I_3F_1	.39	.31	.4	1.1	.36
I_3F_2	.53	.36	.42	1.31	.43
I_3F_3	.46	.45	.37	1.28	.42
Sub-Total	1.84	1.55	1.74	5.13	0.42
Grand Total	5.54	5.55	6.21	17.3	0.36

ANOVA TABLE

SOURCE OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	FREQUENCY VALUE	Pr > F
Model	17	0.44082083	0.02593064	1.39	0.2083
Rep	2	0.01842917	0.00921458	0.49	0.6146
Irig	3	0.23407500	0.07802500	4.19*	0.0137
Fert	3	0.05527500	0.01842500	0.99ns	0.4111
Irig x Fert	9	0.13304167	0.01478241	0.79ns	0.6245
Error	30	0.55877083	0.01862569		
Total	47	0.99959167			

*- Significant
ns- Not Significant

Coefficient of Variation = 37.86617%

APPENDIX TABLE 10. Polar diameter (cm) as affected by fertilization and irrigation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
I_0F_0	0	0	6.28	6.28	2.09
I_0F_1	5.52	0	5.98	11.51	3.83
I_0F_2	0	5.67	5.92	11.59	3.86
I_0F_3	5.66	6.32	6.06	18.04	6.01
Sub-Total	11.18	11.99	24.24	47.42	3.94
I_1F_0	5.7	4.99	5.91	16.6	5.53
I_1F_1	6.22	6.45	5.74	18.41	6.13
I_1F_2	6.44	6.03	6.23	18.7	6.23
I_1F_3	6.45	6.76	6.35	19.5	6.52
Sub-Total	24.81	24.23	24.23	73.21	5.38
I_2F_0	6.14	5.70	0	11.84	6.52
I_2F_1	6.05	5.79	5.59	17.43	5.81
I_2F_2	0	5.88	5.81	11.69	3.89
I_2F_3	6.29	6.05	6.65	18.99	6.33
Sub-Total	18.48	23.42	18.05	59.95	5.63
I_3F_0	6.75	6.76	6.9	20.41	6.80
I_3F_1	5.84	5.64	5.45	16.93	3.94
I_3F_2	7.43	5.97	5.74	19.14	6.38
I_3F_3	6.12	7.1	6.08	19.3	6.43
Sub-Total	26.14	25.47	24.17	75.78	5.88
Grand Total	80.62	85.11	90.69	2566.42	53.47

ANOVA TABLE

SOURCE OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	FREQUENCY VALUE	Pr > F
Model	17	87.31688125	5.13628713	1.31	0.2527
Rep	2	3.18735000	1.59367500	0.41	0.6699
Irig	3	43.02415625	14.34138542	3.65*	0.0234
Fert	3	19.03118958	6.34372986	1.62*	0.2064
Irig x Fert	9	22.07418542	2.45268727	0.62ns	0.7666
Error	30	117.76165000	3.92538833		
Total	47	205.07853125			

*- Significant Coefficient of Variation = 37.08921%

ns- Not Significant

APPENDIX TABLE 11. Equatorial diameter (cm) as affected by fertilization and irrigation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
I_0F_0	0	0	5.8	5.8	1.93
I_0F_1	4.81	0	5.37	10.18	3.39
I_0F_2	0	4.72	5.01	9.73	3.24
I_0F_3	4.91	5.41	5.3	15.62	5.20
Sub-Total	9.72	10.13	16.18	41.33	3.44
I_1F_0	4.98	4.54	5.27	14.79	4.93
I_1F_1	5.02	5.42	5.13	15.57	5.19
I_1F_2	5.53	5.33	5.43	1.29	5.43
I_1F_3	5.28	5.99	5.36	16.63	5.54
Sub-Total	20.81	21.28	21.19	48.28	5.27
I_2F_0	5.22	5.01	0	10.23	3.41
I_2F_1	5.27	4.87	4.71	14.85	4.95
I_2F_2	0	5.09	4.98	10.07	3.35
I_2F_3	5.53	5.57	5.57	16.67	5.55
Sub-Total	16.02	20.54	15.26	51.82	4.31
I_3F_0	5.57	6	6.1	17.67	5.89
I_3F_1	5.01	4.94	4.59	14.54	4.84
I_3F_2	6.1	4.99	4.92	16.01	5.33
I_3F_3	5.12	6	5.08	16.2	5.4
Sub-Total	21.8	21.93	20.6	64.42	5.36
Grand Total	68.35	73.88	78.62	220.85	4.60

ANOVA TABLE

SOURCE OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	FREQUENCY VALUE	Pr > F
Model	17	62.45897708	3.67405748	1.23	0.2993
Rep	2	3.30252917	1.65126458	0.55	0.5804
Irig	3	29.50795625	9.83598542	3.30*	0.0337
Fert	3	12.75362292	4.25120764	1.43*	0.2545
Irig x Fert	9	16.89486875	1.87720764	0.63^{ns}	0.7624
Error	30	89.40567083	2.98018903		
Total	47	151.86464792			

*- Significant
ns- Not Significant

Coefficient of Variation = 37.52025%

APPENDIX TABLE 12. Average weight per fruit (g) as affected by fertilization and irrigation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
I_0F_0	0	0	108	108	36
I_0F_1	67	0	94	161	53.66
I_0F_2	0	67	75	142	47.33
I_0F_3	71	102	91	264	88
Sub-Total	138	169	368	675	56.24
I_1F_0	77	52	86	215	71.66
I_1F_1	6	87	73	226	75.33
I_1F_2	60	93	99	252	84
I_1F_3	107	102	92	301	100.33
Sub-Total	250	334	350	994	82.83
I_2F_0	89	76	0	165	55
I_2F_1	91	60	67	218	72.66
I_2F_2	0	79	79	158	52.66
I_2F_3	101	87	107	295	98.33
Sub-Total	281	302	253	836	69.66
I_3F_0	107	126.6	90.75	324.35	108.11
I_3F_1	79	76	57	212	70.66
I_3F_2	140	80	58	278	92.66
I_3F_3	68	103.3	83	254.3	84.76
Sub-Total	394	385.9	288.75	1068.65	89.03
Grand Total	1123	1190.9	1259.75	3573.65	74.45

ANOVA TABLE

SOURCE OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	FREQUENCY VALUE	Pr > F
Model	17	20418.57442708	1201.09261336	1.12	0.3846
Rep	2	584.40197917	292.20098958	0.27	0.7641
Irig	3	7652.18682292	2550.72894097	2.37*	0.0903
Fert	3	5435.20265625	1811.73421875	1.68 *	0.1917
Irig x Fert	9	6746.78296875	749.64255208	0.70^{ns}	0.7068
Error	30	32292.47302083	1076.41576736		
Total	47	52711.04744792			

*- Significant
ns- Not Significant

Coefficient of Variation = 44.06758%

APPENDIX TABLE 13. Average yield per tree (kg) as affected by fertilization and irrigation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
I_0F_0	0	0	0.450	0.54	0.15
I_0F_1	4	0	7	11	3.66
I_0F_2	0	8	2.5	10.5	3.5
I_0F_3	7	4	2.5	13.5	4.5
Sub-Total	11	12	12.45	35.54	2.95
I_1F_0	2	4	4.5	10.5	3.5
I_1F_1	30	5	23	58	19.33
I_1F_2	16	19	8	43	14.33
I_1F_3	30	22	41.5	93.5	31.16
Sub-Total	78	50	77	205	17.08
I_2F_0	4.5	13	0	17.5	5.83
I_2F_1	12	15.6	8.5	36.1	12.03
I_2F_2	0	11	5	16	5.33
I_2F_3	15	22.5	20	57.5	19.16
Sub-Total	31.5	62.1	33.5	77.1	10.58
I_3F_0	7	0.380	0.480	7.86	2.62
I_3F_1	12	12.5	1.5	26	8.66
I_3F_2	0.420	6	10.6	17.02	5.67
I_3F_3	12	0.520	6	18.52	6.17
Sub-Total	31.42	19.4	18.58	69.4	5.78
Grand Total	151.92	143.5	141.62	437.04	9.11

ANOVA TABLE

SOURCE OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	FREQUENCY VALUE	Pr > F
Model	17	2789.04986042	164.06175650	4.30	0.0002
Rep	2	26.57686250	13.28843125	0.35	0.7089
Irig	3	1109.72473958	369.90824653	9.69*	0.0001
Fert	3	934.35677292	311.45225764	8.16*	0.0004
Irig x Fert	9	718.39148542	79.82127616	2.09*	0.0629
Error	30	1145.29627083	38.17654236		
Total	47	3934.34613125			

*- Significant *coefficient of Variation =70.79088%

ns- Not Significant

APPENDIX TABLE 14. Yield of intercrop as affected by fertilization and irrigation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
I_0F_0	.9	.9	.3	2.1	0.7
I_0F_1	.7	.5	.3	1.5	0.5
I_0F_2	1.4	.8	.4	2.6	0.86
I_0F_3	1.2	.5	.5	2.2	0.73
Sub-Total	4.2	2.7	1.5	8.4	0.69
I_1F_0	1.1	1.2	.6	2.9	0.96
I_1F_1	2	1.1	1.3	4.4	1.46
I_1F_2	1.4	.8	.4	2.6	0.86
I_1F_3	1.4	1.1	.8	3.3	1.1
Sub-Total	5.9	4.2	3.1	13.2	1.0
I_2F_0	1.5	.8	1	3.3	1.1
I_2F_1	1.8	.7	.9	3.4	1.13
I_2F_2	1.3	1.1	.6	3	1
I_2F_3	1.2	.6	.6	2.4	.8
Sub-Total	5.2	3.2	3.1	12.1	4.03
I_3F_0	1.3	1.3	.4	3	1
I_3F_1	1.1	1.8	2.9	.9	6
I_3F_2	1.2	1	.9	3.1	1.03
I_3F_3	1.1	1.8	.4	3.3	1.1
Sub-Total	4.7	5.9	4.6	10.3	9.13
Grand Total	20.6	14.9	10.3	45.8	0.95

ANOVA TABLE

SOURCE OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	FREQUENCY VALUE	Pr > F
Model	17	5.56041667	0.32708333	4.34	0.0002
Rep	2	3.32791667	1.66395833	22.10	0.0001
Irig	3	1.23083333	0.41027778	5.45*	0.0041
Fert	3	0.06416667	0.02138889	0.28^{ns}	0.8365
Irig x Fert	9	0.93 7550000	0.10416667	1.38*	0.2392
Error	30	2.25875000	0.07529167		
Total	47	7.81916667			

*- Significant
ns- Not Significant

Coefficient of Variation = 28.75737%