

## USE OF PINEAPPLE CROWNS IN RAPID MULTIPLICATION OF PROPAGULES FROM ENUGU STATE COMMERCIAL AGRICULTURE DEVELOPMENT PROJECT

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### **Abstract**

*Agricultural Education trains the pupil-agriculturist on the need to take agriculture as a career, emphasizing the importance and uses in various areas. The oil boom in the Nation, notwithstanding, will get exhausted one day and the relevance of agriculture will come again. Repositioning agricultural technology in its rightful place through the use of Pineapple Crowns in rapid Multiplication of propagules from Enugu State Commercial Agriculture Development project is the focus of this study. Three purposes of the study were formulated, among which are the determination of growth parameters of pineapple crown splits after 6months stay in nursery; growth parameters of propagules derived from the crown splits and propagule proliferation using pineapple crowns, The experiments were conducted at Enugu State University of Science and technology Agricultural Education Demonstration Farm. Experimental design was used for the study. The propagules were sixty four for the initial trial. The propagules were split in groups of four, six, eight, ten and twelve on the whole. The growth parameters experimented on were the number of days to 50% sprouting, weight of plantlets in grains at harvest, the number of leaves at 6 months in nursery among others. The findings were that sprouting of the quartered propagules, the ones cut into six, the splits of 8 and 12 at the primary plantlets were 100% successful. It took a range of 37 to 52 days for all the various splits to sprout and in the secondary plantlets the vigorous nature of the plantlets were declining with the number of splits. Another finding amongst others were that one crown produced 74 plantlets using octeting system. Conclusively rapid multiplication of pineapple propagules could help the nation provide sufficient plantlet materials instead of going to neighbouring countries to import from. Recommendations include that vocational agriculture is entrepreneurship based and should be the heart throb of the nation and the government, hence they should be quick in revitalizing the dying economy, by giving heartfelt attention to the agricultural sector.*

**Keyword:** *Repositioning, propagules, primary plantlets, crown splits, pineapple propagation.*

### **Introduction**

Agriculture has been variously described as the main stay of most economies in the 'third world' countries including Nigeria. It provides food for the nation and has the most vital factor of influencing the standard of living of any nation. The advent of oil boom

reduced the proportion of earnings from foreign trades largely because attention was shifted from agriculture to oil and petroleum. Foreign exchange earnings of Nigeria depended on the export of agriculture and forest raw materials in the fifties and sixties (Udensi (2017)). Agricultural education is therefore the panacea for providing the nation with the purchasing power and materials needed for industrialization and thus, repositioning the country into the technological age of post-oil boom economy.

Agriculture is a dynamic activity, connoting development, and improvement, and its evolution is driven by scientific and technological advancements (Aquaah, (2005)). Science and art of producing crops and animals under supervision of humans in specific location is taking an evolutionary processes and has eventually transformed plants from being independent wild progenitors to fully dependent and domesticated cultivars, like pineapple, *Ananas comosus* (Pamphona-Roger, 2016).

Pineapple (*Ananas comosus*) is becoming more important for commercial and subsistent production. Globally, pineapple is the third most important commercial tropical fruit after citrus and banana (Ubi and Ubi, 2017). Development of pineapple production in Nigeria is becoming popular following increased local consumption as desert in farms, homes, schools, markets, catering institutions and by commuters. Expansion in pineapple development in Nigeria is also as a result of high demand by other countries, processing firms and canning industries.

The planting materials of pineapple is referred to as vegetative propagules and are produced from the plant parts other than the seed, Ubi and Ubi (2017). Among the propagules are suckers, ratoon, crown, hapas that is shoots that develop at the pineapple peduncle, and slip.

The greatest constraints to pineapple production in Nigeria among others include lack of valuable varieties acceptable at global market, scarcity and high cost of suckers, which

constitutes 50 percent of the total cost of production. Propagules most used were obtained from suckers, crowns and slips. The insufficiency of these desired propagules has led the nation to sourcing them from Cote D'Ivoire and the Camerouns. Double or triple row spacing demands high plant population. The following plant spacing, are used with the subsequent plant population as 30cm x 30cm x 90cm. The population required amount to 55, 555 propagules per hectare while the spacing of 50cm x 60cm x 90cm would require 26,667 propagules.

In propagules production, inventions and research results show that production of pineapple at commercial quantities require improved technologies. The propagules production, which are the vegetative planting materials like the crownlets, slips, hapas, suckers and ratoons are perpetuated utilizing the innovation of doubling, quartering, octecting or cutting the propagules into many parts that produce shoots in nursery after which transplanting is done.

Lee and Tee (2008) demonstrated the use of crown-leaf-bud plantlet quartering techniques in a bid to increase the production of pineapple propagules and plantlets. According to Agogbua and Osuji (2011), split crown technique for mass propagation of smooth cayenne pineapple indicated that crown split in four had the highest number of suckers than crown split into two during the period of their study. They also suggested the technologies of invitro techniques in that there are two advantages- it could be used to produce large number and uniform propagules in a relatively short period of time (Firoozabady, Heckert and Gutterson(2013) and can be used to improve plant performances.

Macropropagation, Tissue culture and Octeting are other techniques. The major advantage of macropagation technique is that it is not highly technical and does not require specialized

skills (Baiyeri & Aba, 2015). It is also very cost effective and can be used to produce large scale uniform material in a relatively short period of time (Adelaja, 2010)

Firoozabady, Heckett and Gutherson (2013) agreed that unlike bananas, suckers in pineapple usually develop at various axils along the stem after harvest indicating the dormancy of most auxiliary buds, a situation generally attributed to apical dominance. Udensi (2017) reported the use of crown, sucker, stump and slips to generate pineapple seedlings and recommended crown as the most promising when original source is limited or scarce. Malo and Campbell (2016) described how an old pineapple stump could be used to produce young pineapple propagules and plantlets. In all, this study is a direct follow up of exploring rapid generation of pineapple plantlets and propagules to reposition agricultural education and production in a post-oil boom economy through the use of propagules in Enugu State Project Development of Commercial pineapple production.

### **Purpose of the study**

The general purpose of this study is the repositioning of agricultural technology to boost the national economy through the use of pineapple crowns in rapid multiplication of propagules for pineapple production. Specifically, the study sought to determine:

1. growth parameters of pineapple crown splits, after 6 months stay in nursery;
2. growth parameters of propagules derived from the crown splits;
3. propagule proliferation using pineapple crowns.

### **Materials and Methods**

The design was experimental. The study was carried out in Agricultural Education Demonstration farm of Enugu State University of Science and Technology. Pineapple crowns

weighing appropriately 350grams each were collected from those harvested fruits in Amoli and Nenwenta pineapple farm locations in Awgu Local Government Area and from Emagu Edem and Edem Agu farm locations of Nsukka in Enugu State. The farm locations cultivated mainly smooth cayenne variety of the *Ananas comosus*. Sixty four (64) crowns from the top of the pineapple fruits were selected. Twenty five (25) were cut in four each, 17 were cut into six each. 13 were cut into eight each while 9 were cut into twelve each. The four groups were made up to 100 pieces each and sown in black polythene bags measuring 50cm by 30cm when laid flat. Sterilized loamy top soil was used in filling the bags and set out in 25 stands of double rows as nursery lots. Rose cans were used in watering the propagules when necessary. Complete inorganic fertilizer N,P,K 15:15:15 was added to each plantlet three months after sprouting. Cultural practices were duly carried out. Six months after sowing, the plantlets grew to points and they were uprooted and harvested. Their growth measurements were taken and recorded from each of the four lots, taking into account sprouting percentages, number of days to 50% sprouting, fresh weight of the propagules, number of leaves, number of days to 50% sprouting, fresh weight of the propagules, number of leaves, number of roots and length of the longest root in centimeters. The plantlets groups were again planted in the field as treatments and allowed to grow for 6 months after which fresh weight of plantlets, number of leaves, number of roots and length of longest roots were measured. Lastly, records of the propagules obtained from the crowns in a year split into 6, 8 and 10 and grown for another 6 months.

The plantlets derived from the original crown splits of 4, 6 and 8 were harvested and placed according to their groups. Out of the harvests, three groups were formed. One group was shared into these three formed group making up nine lots. Therefore the first lot of the original 4- split crown had the plantlets shared into 6-splits, 8-splits and 10-splits.

## Results

The crowns weighing approximately 350g which were split into quarters, six, eight and twelve, the sprout was significantly early giving 100% success.

**Table 1**

**Growth Parameters of Pineapple Crown Splits**

Item statements		Statistical figures			
1	No of splits per crown	4	6	8	12
2	No of days to 50% sprouting	37	40	43.5	52
3	Weight of plantlets @ harvest in (g)	355	350	300	200
4	No of leaves	32	28	27	25
5	No of roots	40	46	41	38
6	Length of longest root in cm	42	45	43	42

**Table I** exhibited that the crowns with 4 splits first sprouted followed by the crown with six splits and in that sequence, the 12 splits sprouted at above 50 days. These propagules uprooted after six months of stay in the nursery had a fresh weight pattern similar to the progression in sprouting. The plantlets from quartered crown weighed 355g, the plantlets from crowns divided into six weighed 350, that from crowns divided into eight weighed 300g while 12 splits weighed 200g. The number of leaves possessed by the different groups showed that group with 4-splits produced 32 leaves, 6-splits produced 28, 8-splits group produced 27 while 12 splits had 25 leaves. The number roots were carefully counted and plantlets from 4-split crowns had 40 roots, plantlets from 6-split crowns showed 46 roots, plantlets from 8-split crown exhibited 41 roots and 12-split crown plantlets possessed 38 roots. In each group,

the length of the roots of 4-split crown plantlets was 42cm, 6-split crown plantlet showed 45cm, that of 8-split crown plantlet was 43 While that of 12-split plantlet was 42.

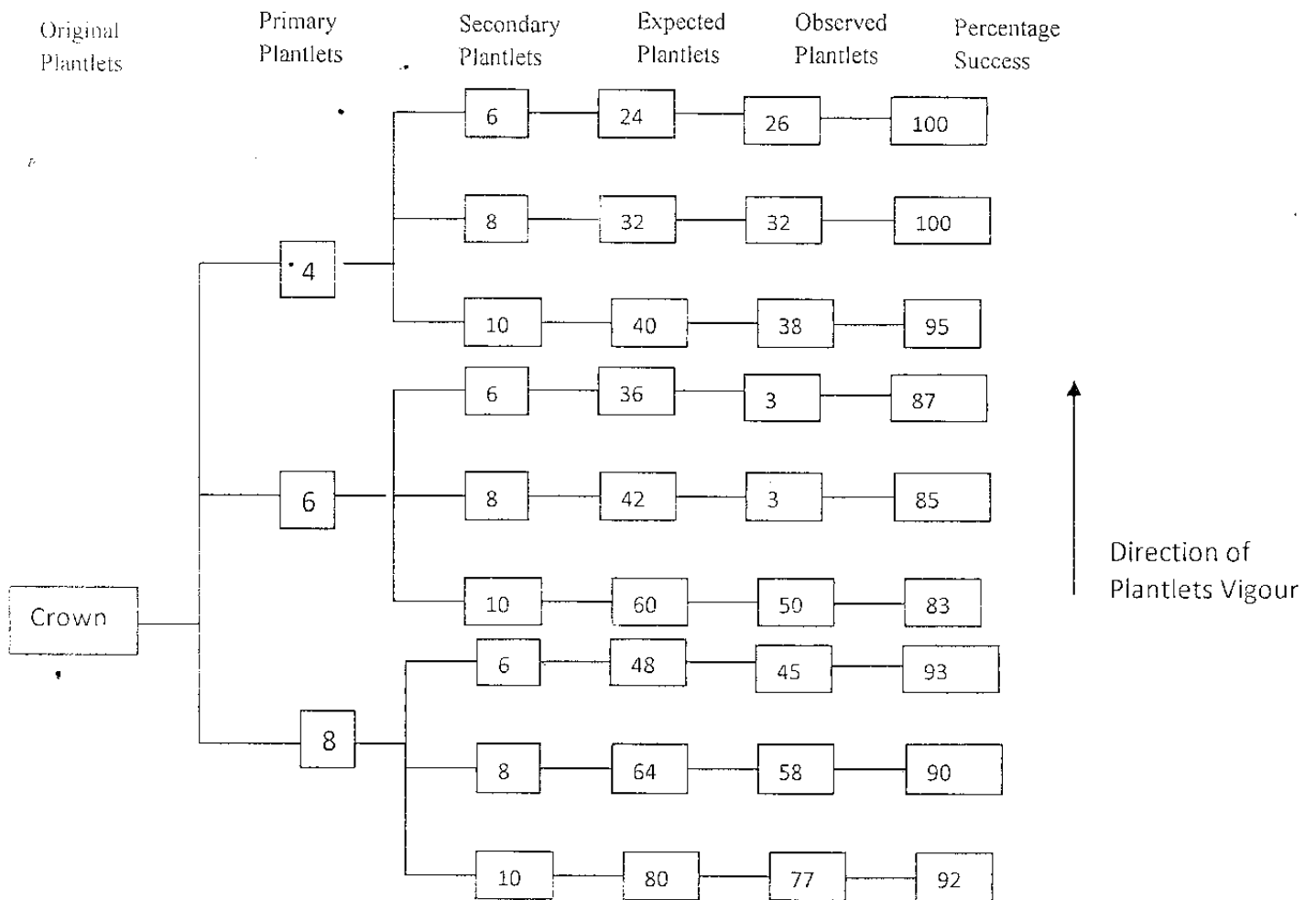
**Table 2:**

**Growth parameters of propagules derived from the crown splits as secondary plantlets.**

S/N	Item statements	Statistical figures								
7	Plantlets	4	4	4	6	6	6	8	8	8
8	Weight in g of plantlets	200	130	117	77	96	66	50	57	60
9	Sprouting percentage	100	100	95.0	87.0	85.0	83.0	93.0	900	92.0
10	No of leaves	24	20	16	15	13	11	14	13	13
11	No of Roots	25	22	15	14	11	14	10	11	12
12	Length of longest root (cm)	23	21	19	13	10.6	8.7	9.7	9.7	20
13	Crown planet split of secondary planets	6	8	10	6	8	10	6	8	10

Fresh weights of plantlets of 6-split and 8-splits had 100% sprouting and declined in the further splits as shown in Table 2, to 95.5% in the 10-split. The number of leaves at the 6-split, 8-split and 10-splits had 24, 20 and 16 respectively at the old 4-split crown, while the 6-split, 8 split and 10-split of the old 6-split crown yielded 15, 13 and 11 leaves after six months of planting. The roots of 6-split, 8 split and 10 split at item number 10 in the table showed 25, 26 and 15 while the rest had 14 as their highest number of roots and 10 the least. Other parameters are shown in the Table.

### Concept Map of Pineapple Proliferation using Crown



The diagrammatic representation is a schedule of rapid multiplication of propagules of pineapple, using crowns of smooth cayenne. The crowns had lots of these various splits. In the diagram are depicted the crowns used for the experiments. Some were 4-split, 6-split and 8-split in the primary plantlets. They gave rise in the secondary plantlets to 6-splits, 8-splits and 10-splits. With the 6-8 and 10-splits experiencing quartering, the 6-, 8- and 10-splits experiencing octeting, the sprouting percentages would yield a minimum of 24 propagules and a maximum of 74 propagules from one crown in a year.



## **Discussion of results**

Item statements in **table 1**, showed the growth parameters of pineapple crown longitudinal splits. The crown splits were made using a crown to produce four plantlets by splitting, another six plantlets by splitting another eight plantlets and yet another twelve plantlet longitudinally cut. The sprouting was a 100% success for 4- splits and 6- splits. This observation is in tandem with the experience of Agogbua and Osuji (2011) whose study was split crown technique for mass propagation of smooth cayenne. They reported that crown split in four had the highest number of suckers, than crown split into two.

The weights of the plantlets after six months in the nursery are similar to the average weight of the crowns. Agogbua and Osuji (2011) had in their study the weights of the propagules derived from the quartered splits the average weights of 300g, the difference in weights could emanate from the age of the plantlets in the nursery, as well as the treatments given to them. It is observed that the number of leaves ranged from 25 to 32 while the number of roots where from 38 to 46. The 4- split crown plantlet had the highest number of leaves while the 6- split crown plantlet had the highest number of roots. The implication of these relative numbers are probably connected with quick establishment of these plantlets. Udensi (2017) had earlier recommended the use of crown, sucker, stump and slips to generate pineapple seedlings, but stressed that crowns are the most promising propagule for generating seedlings when original source is limited or scare. The length of the longest roots fell in the range of 42cm to 45cm at the age of six months. The roots are the major avenues through which nutrient absorption to the plantlets are done. The longer the roots the more nutrient they would reach and subsequently influence the plantlets.

The fresh weights of plantlets seem to be influenced by the initial weights of the plantlets at split time. The attainment of the average weight of original source at six months in nursery is

observed, and could be the ideal time to harvest the plantlets for secondary splitting to obtain more plantlets. The weight of each original planting material contained enough carbohydrate reserve to sustain the emerging buds.

In table 2 the plantlets were derived from the original crown pieces. The 6- split, 8- splits and 10- splits of the 4- split of primary plantlets showed 100 to 95% sprouting, and started declining sprouts and growth differences, as the splits increased per plant. The leaves that developed in all the splits from the 4- split lot ranged from 16 to 24 while declining set in with increasing number of roots. They followed the same pattern in declining. It was observed that most of the plantlets at this stage had been established but showed the vigorousness of the propagules were increasing with fewness of the splits. The vigour found in plantlets from 4-split primary plants were higher than the one found in plantlets from 6-split primary plantlets. The plantlets from 8-split primary plantlets were weak in comparison with the 4-split and 6-split counterparts. The number of leaves possessed by the plantlets are important. They would assist the plantlets in synthesizing food for emerging buds and contribute to the better performance of plantlets from large chunks of the original planting materials.

In the concept map, the original plantlets, which was divided variously had primary plantlets and secondary plantlets. The primary plantlets that were divided into four, were later divided into 6-splits, 8-splits and 10-splits as secondary plantlets and with 100% sprouting rate the expected plantlets would be 24, 32 and 40 respectively. The primary plantlets of six-splits• and eight splits which are the rest of the propagule proliferation, in their second plantlets divisions or splits were expected to produced a maximum of 80 plantlets. On the whole the largest number of 74 propagules were obtained from a single crown known as the original plantlet in one year, through 8 x 10 split, representing 92.5% of the expected number of plantlets. This experiment or trial is a means of repositioning agricultural production for post

oil boom economy. This could be achieved through rapid multiplication of pineapple propagules.

## **Findings**

The following findings include:

1. Sprouting of the primary plantlets were one hundred percent successful. -
2. That the number of days to 50% sprouting were in the range of 37 to 52 days depending on the number of splits.
3. That the number of leaves possessed by the primary plantlets ranged from 25 to 32, thereby influencing the performance of the propagules.
4. The sprouting percentage started declining in the secondary plantlet splits of 6, 8 and 10.
5. The vigour of the plantlets were declining with number of splits.
6. That at the secondary plantlet splits of 10, a maximum of 74 propagules were produced by one original plantlet crown.

## **Conclusions**

The rapid multiplication of pineapple propagules is a way out of the plantlets scarcity. The foreign reserve of the nation is conserved by embarking on projects that would produce the propagules massively, instead of importing them from Cote D'Ivoire and Cameroun, as had been the case. If the world pineapple production was 18 million tons in 2009 according to food and Agriculture report of 2011 and Nigeria is ranked 6th in the countries that produce pineapple in the world. everything should be done to sustain it if not do it better. Furthermore, when a maximum of 74 plantlets are targeted from a crown in a year the

success of producing transplantable plantlets are achieved. This will enhance agricultural productivities and reposition such for post-oil economy.

### **Recommendations:**

1. The plantlets in this trial were not all vigorous enough for immediate transplanting to the field and would probably require additional 4-6months of nursery growing to become real propagules.
2. The plantlets are as vigorous as others from any of the lower lets but superior to them in terms of number produced, hence in terms of ease of operation, number, plant vigour and time, splitting a crown into 8 pieces and re-splitting the plantlets after 6 months of nursing in each case is the recommended practice.
3. ‘Vocational agriculture is entrepreneurship based, and should be the heart throb of the nation and the government hence they should be quick in revitalizing the dying economy, by giving heartfelt attention to the agricultural sector.

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