NUTRITION AND FERTILIZATION OF COCONUT SEEDLINGS IN POLYBAGS*

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ABSTRACT

The coconut palm, just like other fruit trees, also passes through a nursery stage. It is at this stage where they are cared for and condi tioned before they are transferred to their permanent place in the field. Hence, the success in the establishment of coconut groves can b traced back to proper nursery management.

There are several nursery techniques which have been proven to give favorable results. This paper discusses two techniques: – the prac tice of raising the seedlings in polybags, and fertilization of coconut seedlings.

INTRODUCTION

The use of polybags and fertilizers is known as an effective means of promoting growth and maturity in plants. To practice these innovative techniques, however, means additional capital input. Polybagging and fertilization, therefore, are normally done only with increased capital input, and with the premise that the farmer can afford it.

With prices of generally all commodities bursting sky high, the adoption of these techniques might not be practical to a small coconut farmer. In this state of economic crisis, it is but rational that careful and thorough assessment of this nursery practice should be made.

To better understand polybagging and fertilization in coconut seedlings, a good working knowledge of the crops, its nutrition, as well as the properties of the soil medium, and the concept of polybagging practice, is necessary.

DISCUSSION

The concept of polybagging

Polybagging refers to the raising of coconut seedlings in a container made of polyethylene materials with a dimension of 18" x 18" x 0.008". The scheme was adapted from I.R.H.O. (Institute de Recherches pour less Huiles et Oleagineux), a coconut and palm oil research institution in the Ivory Coast where Mr. Yan Fremond was once a Research Director before becoming a coconut consultant in the Philippines in 1975.

The coconut seedlings are raised with the notion minimizing, if not totally eliminating, transplanting sho so that the metabolic processes within the seedlings main uninterrupted, unlike in the traditional nurse whereby absorption of nutrients and water from t soil is temporarily cut-off as a result of damage or p tial destruction of roots during transplanting. Anoth advantage of polybagging is it makes possible for seedlin to remain long in the nursery, even if the stored fo in the nuts are already consumed by the seedlings.

Observation of the floral initiation on orange dw palms by the Breeding and Genetics Division, Davao R search Center – Philippine Coconut Authority, showed t the palms raised in polybags flower earlier by nine mon compared to those raised in the conventional method.[1]

Though the practice has several favorable traits, ot disadvantages may be worth considering. Polyethylene i by-product of petroleum processing and as such it could costly. Also, with the size of the polybag, about 14.8 cu meter of soil medium is needed to raise coconut seedli for one hectare. With such a volume of planting materi additional expenses in bagging and hauling may be curred. Furthermore, difficulty in planting specially in h areas is something that should be looked into.

In connection with production performance of aforementioned orange dwarf population, the initial year data (Table 1) showed that the non-polybag-rai palms produced 13.5 nuts within 10 months period wh the polybag-raised palms had 12.9 nuts in 12 prod tion months. In terms of copra per nut and copra per pa

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[1]Personal communication with Mr. Carlos Carpio (Ce Manager, PCA-ARC).

the latter method gave a slightly higher yield over the former with 17 grams and 180 grams, respectively.

It is to be noted that this observation was only on orange dwarf palms. As different cultivars might have varying root sensitivity to injuries and on their rate of rejuvenation, a comparative study of this sort would further clarify matters on the issue of whether it is beneficial or not to raise coconut seedlings in polyethylene bags.

Table 1. Yield performance of palms from polybagged and non-polybagged seedlings.[1]

Nursery Method	Initial Production			
	Productive Months	Nuts/ Palm	Copra/ Nut	Copra/ Palm
	No.	No.	Gm	kg
Polybag raised seedling	12	12.9	149.9	1.93
Non-polybag raised seedling	10	13.5	132.9	1.79

The morphological and bio-chemical features of seednuts

The fruit of coconut is botanically known as a fibrous drupe, and popularly called nut. Internally, it consists of the solid endorsperm or kernel with the embryo embedded in it. The liquid endorsperm is known as coconut water. There is also a spongy growth known as haustorium which develops at germination. These three constituents are the most important parts of the seednuts because of their great role in the nourishment of the embryo. Through the absorbent function of the haustorium, food materials are absorbed, initially from the coconut water and later on from the kernel, and supplied to the young plant.

Menon et al., (1958) stated that meat or kernel is about 13 mm to 20 mm thick. He pointed out that coconut water is completely absorbed in about five months and about 60% of the kernel is still left in the nut as an available food reserve in 9 to 18 month-old seedlings under ordinary conditions.

According to Woodroof (1970) the kernel of ripe nuts has approximately 76.3% moisture, 4.08% protein, 37.29% fat and 11.29% carbohydrate. He gave the composition of coconut water as: 95.5% water, 0.05% nitrogen, 0.56% phosphoric acid, 6.60% potassium, 0.69% calcium oxide, 0.59% magnesium oxide, 2.9% calcium, 0.004% copper, 3.4% sulfur, 0.5% iron, 4.71% total solid, 0.80% reducing sugar, 2.08% total sugar, 0.62% of ash, 1.5% sodium, 3.0% magnesium, 3.7% phosphorus, and 18.3% chlorine.

It is interesting to note that fertilization of mother palms can apparently influence the germination and growth performance of seedlings. In the performance trial of seednuts from various fertilized and unfertilized palms, it turned out that seednuts/seedlings from fertilized mother palms had higher percentage germination rate and bigger girth circumference than those from unfertilized mother palms.[2]

Although it has been reported that the coconut seedlings have adequate amount of stored nutrients to support the growth and development of the embryos up to transplanting stage (Child, 1974), evidences indicate that the growth of coconut seedlings can be improved through proper fertilization. This may be due to the fact that the stored plant food in the seednuts might not be sufficient in some cases. There could be some varietal differences or variation in the subsequent cultural practice done on the mother palm. At this point, a study to determine the exhaustion period of the stored food in seednuts on different varieties or practices done with the mother palm is suggested. Results of this undertaking will be a good guide in scheduling the time of transplanting for specific variety or cultivar.

[1]Unpublished data, Breeding and Genetics PCA-DRC.

[2]Personal communication with Mr. Rogaciano A. Margate (Sr. Sci. Res. Specialist and concurrently OIC, Agro-Soils Division, PCA-DRC).

Moreover, the findings could help in making a definitive decision on whether to fertilize or not in the nursery stage.

In the meantime that the question on the sufficiency or insufficiency of stored food has not yet been resolved, it would be worthwhile to mention the natural phenomenon that takes place in the seednuts as has been reported. The growing seedlings produce the first roots six weeks after germination and as the roots reach the soil, the seedlings start growing rapidly with the help of food nutrients absorbed from the soil, and so the shoots soon emerge out of the husks (Menon et al., 1958).

Considering further the influence of fertilizers to coconut seedlings, Briones (1931) revealed that the addition of $(NH_4)_2SO_4$ with moderate amount of NaCl was beneficial to their growth and development. It was also found that the coconut seedlings are quite tolerant to heavy application of $MgSO_4$, a peculiarity which indicate a heavy demand of Mg or a heavy demand for SO_4 ions. Espino an Juliano (1924) stated that the addition of $(NH_4)_2SO$ causes a rapid absorption of the culture solution. Th study on the effect of N, P, and K nutrients revealed th the role of nitrogen in the growth of coconut seedlings more significant than phosphorus and potassium (Mathe et al., 1964). On the other hand, Bachy et al. (1962) ob served in West Africa that excess nitrogen has a depressin effect on the growth of the seedlings. They reported th the application of P-K-Mg fertilizers gave a highly signif cant improvement in the vigor of the plant.

In Davao, it was observed that Cl significantly in creased the growth of girth at 4 and 10 months fro initial fertilizer application (Magat and Prudente, 1974 Studies on the effect of KCl and NaCl on coconut see lings indicated that both could positively influence th growth and increase their resistance to disease particular

Table 2. Growth characters and leaf spot incidence on coconut seedlings as affected by S levels and source either with or without Cl.

Treatment		Girth (cm)	No. of Leaves	Height (cm)	Fresh Weight (cm)	Leaf Spot Rating[1]
S-level (g/seedling)						
0		14.3	9.2	107.9	1.24	1.467
5		14.3	9.0	110.7	1.20	1.472
10		14.4	9.1	114.1*	1.29	1.539
20		14.5	9.1	110.8	1.27	1.583
HSD	.05	NS	NS	5.598	NS	NS
	.01	–	–	NS	–	–
S – Source						
$(NH_4)_2SO_4$		14.4	9.1	110.4	1.25	1.488
K_2SO_4		14.4	9.1	111.4	1.25	1.479
$CaSO_4$		14.3	9.1	111.0	1.25	1.579
HSD	.05	NS	NS	NS	NS	NS
Cl – level /(g/seedling)						
0		14.1	9.1	110.0	1.03	1.686
30		14.6**	9.1	111.8	1.47**	1.344*
HSD	.05	0.285	NS	NS	0.097	0.120
	.01	0.376	–	–	0.129	0.160

NS – not significant
* – significant at 5% level
** – highly significant at 1% level
1 – leaf spot index: (Analysis based on transferred values = Log x + 7)
0 – normal, leaf spot absent in all frond
1 – slight, 1-2 fronds infected
2 – moderate, 3-4 fronds infected
3 – severe, 5 or more fronds infected

Table 3. Interaction effect between S and Cl levels on leaf spot incidence.

Cl – level	S – level				Cl – level Mean
	0	5	10	20	
0	1.711[a]	1.700[a]	1.767[a]	1.567[ab]	1.686
30	1.222[c]	1.244[c]	1.311[bc]	1.600[abc]	1.344
S – level MEAN	1.467	1.472	1.539	1.583	1.515

Note: Means having the same letter(s) subscript, are not significantly different at 5% level.

leaf spots (Abad et al., 1975 and Magat et al., 1976).

Likewise, fertilizer requirement of coconut seedling study on three major coconut soils of Davao revealed that chlorine increase the girth of seedlings grown on Tugbok and Padada soils, while on Talomo sand, the positive response was due to potassium (Maravilla et al., 1976). The better growth and development of seedlings fertilized with ammonium sulfate than those fertilized with urea, was attributed to the S component of the ammonium sulfate (Magat et al., 1978). On the importance of sulfur, Bidwell (1974) claimed that the shortage of sulfur-containing amino-acid leads to metabolic disturbance and as a consequence the plant is unable to synthesize protein. Soluble nitrogen tends to accumulate and nitrogen-rich amino-acids like glutamine and arginine reach high concentrations which may lead to urea and ammonium production in an acute sulfur deprivation. Although a considerable quantity of sulfur is added with precipitation a similar amount is absorbed directly by growing plants (Brady, 1974).

Nutritional studies on coconut seedlings at Davao Research Center, PCA

To date, 11 fertilization studies on coconut seedlings using both the inorganic and organic fertilizers have been initiated since 1974 in the Davao complex of the Philippine Coconut Authority. From various studies undertaken the following has been established: 1) below seven months old, (at emergence of shoot from husk) coconut seedlings from Bago-Oshiro population have sufficient coconut endosperm to support its normal growth up to six months; 2) NaCl, which is much cheaper than KCl, could be used as fertilizer in coconut seedlings; 3) the critical level of leaf Cl for coconut seedlings is from 0.70% to 0.80%; and 4) chlorine helps seedlings develop resistance to pests and diseases, especially leaf spots.

Sulfur fertilization of coconut seedlings

The study dealt on the role of sulfur on the growth of coconut seedlings and its relationship with other elements. The soil used belong to the Tugbok clay loam type and seedlings of the tall "Laguna" type. The study was carried out in a 4 x 3 x 2 factorial in RCB with four levels of S (0, 5, 10, and 20 g/seedlings), three sources of S (ammonium sulfate, K_2SO_4, and $CaSO_4$) and 2 levels of Cl (0 and 30g/seedlings in the form of NaCl). Urea was applied to plants receiving lower ammonium sulfate levels to equal the amount of N supplied by the highest ammonium sulfate treatment.

As shown in Table 2 sulfur fertilization improved significantly the seedling height while Cl greatly improved the girth and fresh weight of the vegetative parts. Sources of S did not produce any variation in the vegetative growth as well as leaf spot infection of the seedlings. Chlorine application was effective in minimizing leaf spot if applied together with 10 g S or less per seedling, but not beyond this rate (Table 3). Likewise, Cl was effective in minimizing leaf spots occurrence when combined with either ammonium sulfate or K_2SO_4 (Table 4).

Sulfur fertilization improved K, Ca, and S content of the leaves but depressed N, P, and Cl, while chlorine fertilization increased P, Ca, Mg, Na, Cl, and S, but depressed N and K. Potassium sulfate improved only K, but depressed Mg contents, while calcium sulfate significantly improved Ca content of the leaves (Table 5).

Response to increasing rates of sodium chloride and ammonium sulfate fertilizers of coconut seedlings grown on three soils of the Philippines

This was initiated to determine the appropriate and economical rate of NaCl and $(NH_4)_2SO_4$ for accelerated growth/development of coconut seedlings and to evaluate the optimum leaf level of plant nutrients Cl and S for three soil types.

The typical soils used were the Guinobatan sandy loam soil (an Inceptisol) in Albay Research Center (ARC), the Tugbok clay loam (an Alfisol) in Davao Research Center (DRC), and the San Ramon sandy loam soils (an Entisol) in Zamboanga Research Center (ZRC). The seedlings used

Table 4. Interaction effect between S — sources and Cl — levels on leaf spot incidence.

S – Source	Cl – level 0	Cl – level 30	S – Source Mean
$(NH_4)_2SO_4$	1.725[a]	1.250[c]	1.488
K_2SO_4	1.700[a]	1.258[bc]	1.479
$CaSO_4$	1.633[a]	1.525[ab]	1.579
Cl – level mean	1.686	1.344	1.515

Note: Means having the same letter(s) subscript, are not significantly different at 5% level.

Table 5. The effect of S sources and rates either with or without Cl on the leaf nutrient content, leaf rank 3 (% dry matter exc B which is ppm).

Treatments		N	P	K	Ca	Mg	Na	Cl	S	B
S – levels										
0		2.597	0.149	1.917	0.639	0.286	0.105	0.903	0.152	10.500
5		2.359**	0.142	2.064**	0.693**	0.297	0.116	0.820*	0.197**	9.906
10		2.306**	0.141*	2.080**	0.689**	0.299	0.114	0.826	0.205**	9.767
20		2.352**	0.144	2.078**	0.655	0.291	0.105	0.796**	0.219**	10.589
HSD	.05	0.121	0.008	0.102	0.038	NS	NS	0.083	0.011	NS
	.01	0.149	–	0.126	0.047	–	–	0.103	0.014	–
S – source										
$(NH_4)_2SO_4$		2.441	0.143	1.996	0.654	0.299	0.112	0.825	0.195	10.142
K_2SO_4		2.385	0.143	2.101**	0.667	0.285*	0.107	0.843	0.197	9.954
$CaSO_4$		2.385	0.147	2.007	0.687*	0.297	0.111	0.840	0.188	10.475
HSD	.05	NS	NS	0.082	0.031	0.014	NS	NS	NS	NS
	.01	–	–	0.104	NS	NS	–	–	–	–
Cl – level										
0		2.436	0.142	2.197	0.645	0.281	0.055	0.425	0.189	10.467
30		2.371*	0.147*	1.873**	0.693**	0.306**	0.165**	1.247**	0.197*	9.914
HSD	.05	0.066	0.003	0.054	0.020	0.009	0.014	0.043	0.006	NS
	.01	–	–	0.072	0.027	0.011	0.019	0.057	–	–

* – significant at 5% level
** – highly significant at 1% level
NS – Not Significant

in the three Centers were the Laguna tall population. Fertilizers used were NaCl (50% Cl) and $(NH_4)_2SO_4$ (21% N, 24% S) as source of Cl and S, respectively. The rate of (a) NaCl at 0, 30, 60, and 90 g/seedling and (b) $(NH_4)_2SO_4$ at 0, 25, 50, and 75 g/seedling were tested following a 4 x 4 factorial design in RCB (Table 6).

NaCl increased girth and fresh weight of "tops" of seedlings on the three soils. The response of seedlings girth was manifested at the second NaCl level (30 g/seedlings) in Albay and Zamboanga soils, while on Davao soils, it was at the third level (60 g/seedling). Also, significant improvements in height, number of leaves, and roots were observed in Albay and Davao soils (See Figures 1, 2, 3, for the succeeding text).

Ammonium sulfate significantly improved practically all growth parameters in the three locations, except in Albay whereby seedling girth and leaves did not respond significantly and the root growth (fresh weight) was significantly depressed even at the lowest level (25 g/seedling).

On leaf nutrients, NaCl increased leaf Cl and Na in the three locations, but depressed leaf K in Albay and Zamboanga seedlings. Application of $(NH_4)_2SO_4$ increased leaf S in Albay and Davao seedlings and leaf Ca increased in Albay seedlings only, but depressed leaf Cl and Mg in Zamboanga and Albay seedlings, respectively. Correlation matrix indicate that in Albay, leaf Cl is positively correlated with all growth parameters and so with leaf Na, except on the number of living leaves. In Davao, both elements were likewise correlated with all growth parameters while in Zamboanga, correlation was manifested only in the number of leaves and fresh weight of tops. Leaf N and S were positively correlated with girth, height, fresh weight of tops, and fresh weight of roots. In Zamboanga, positive correlation were observed only between leaf N and girth.

Effect of Agrispon, Nitrophoska and Tablet Fertilizer on coconut seedlings

The objective of this study is to explore the efficacy and usage of new fertilizer product such as nitrophoska, agrispon, and tablet fertilizers on the growth of coconut seedlings.

The description of the fertilizer used are as follows:

1. Nitrophoska contains the three primary nutrients: Nitrogen, phosphorus, and potash. Phosphate is in the form of water-soluble ammonium phosphate and is available to the plants right from the moment of application. The remaining phosphate, in the form of dicalcium phosphate which is citrate-soluble, ensures an adequate supply of phosphate throughout the growing season. Potash is completely water-soluble. It also contains traces of minor elements like boron, manganese, zinc, and cobalt. Nitrophoska grade used in this study had an analysis of 13-13-21-0.1 (boron).

Table 6. **Correlation coefficient (r) of growth parameters and leaf S, Mg, Ca and with leaf Cl, S, N, and Na.**

Nutrient	Location	Girth	Height	No. of Leaves	Fresh Weight Veg. Parts	Fresh Weight Roots	Leaf S:	Leaf Mg:	Leaf Ca	Leaf K
Cl	ARC	0.434**	0.462**	0.376**	0.648**	0.692**	0.346*	0.628**	0.397**	
	DRC	0.493**	0.286*	0.665**	0.320*	0.340*	–	–	0.437**	– 0.328*
	ZRC	–	–	0.471 **	0.361*	–	–	–	0.304*	–
S	ARC	–	–	–	–	– 0.541**	–	–	0.351*	–
	DRC	0.450**	0.442	–	0.373**	0.304*	–	–	–	–
	ZRC	–	–	–	–	–	–	0.499**	–	–
N	ARC	–	–	–	–	0.695**	0.746**	–	0.459**	–
	DRC	0.454**	0.417**	–	0.397**	0.299**	0.697	–		–
	ZRC	0.237*	–	–	–	–	–		–	0.456
Na	ARC	0.480**	0.442**	–	0.595**	0.612**	–0.374**	–0.618**	–0.339*	–0.441**
	DRC	0.354*	0.297*	0.402**	0.316*	0.357**	–	–	0.411**	–0.412**
	ZRC	–	–	0.477**	0.394**	–	–	–	–	–

Tabular value: * .05 = 0.284 ** .01 = 0.369

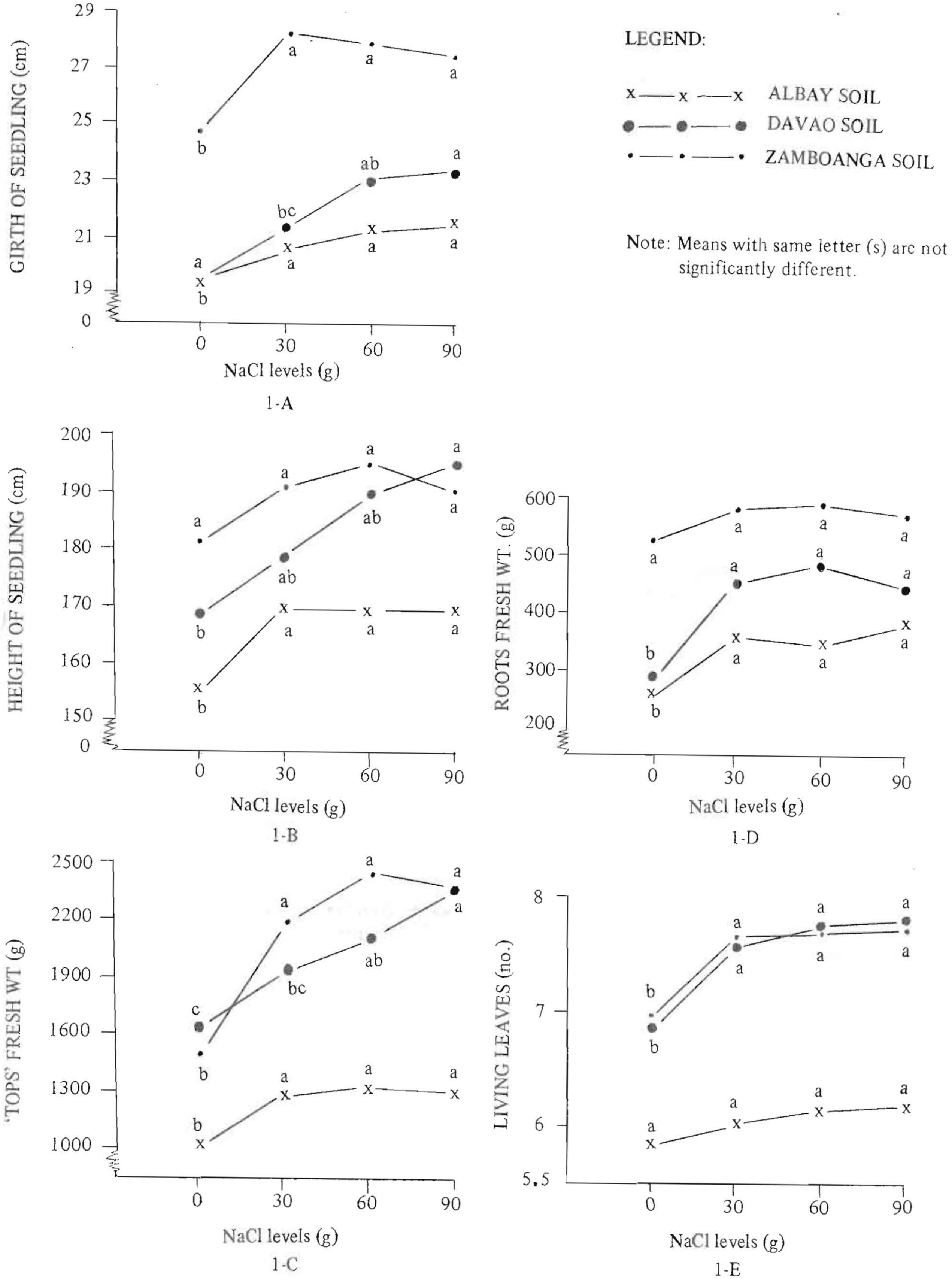

Figure 1. Effect of different levels of sodium chloride on the growth of coconut seedlings.

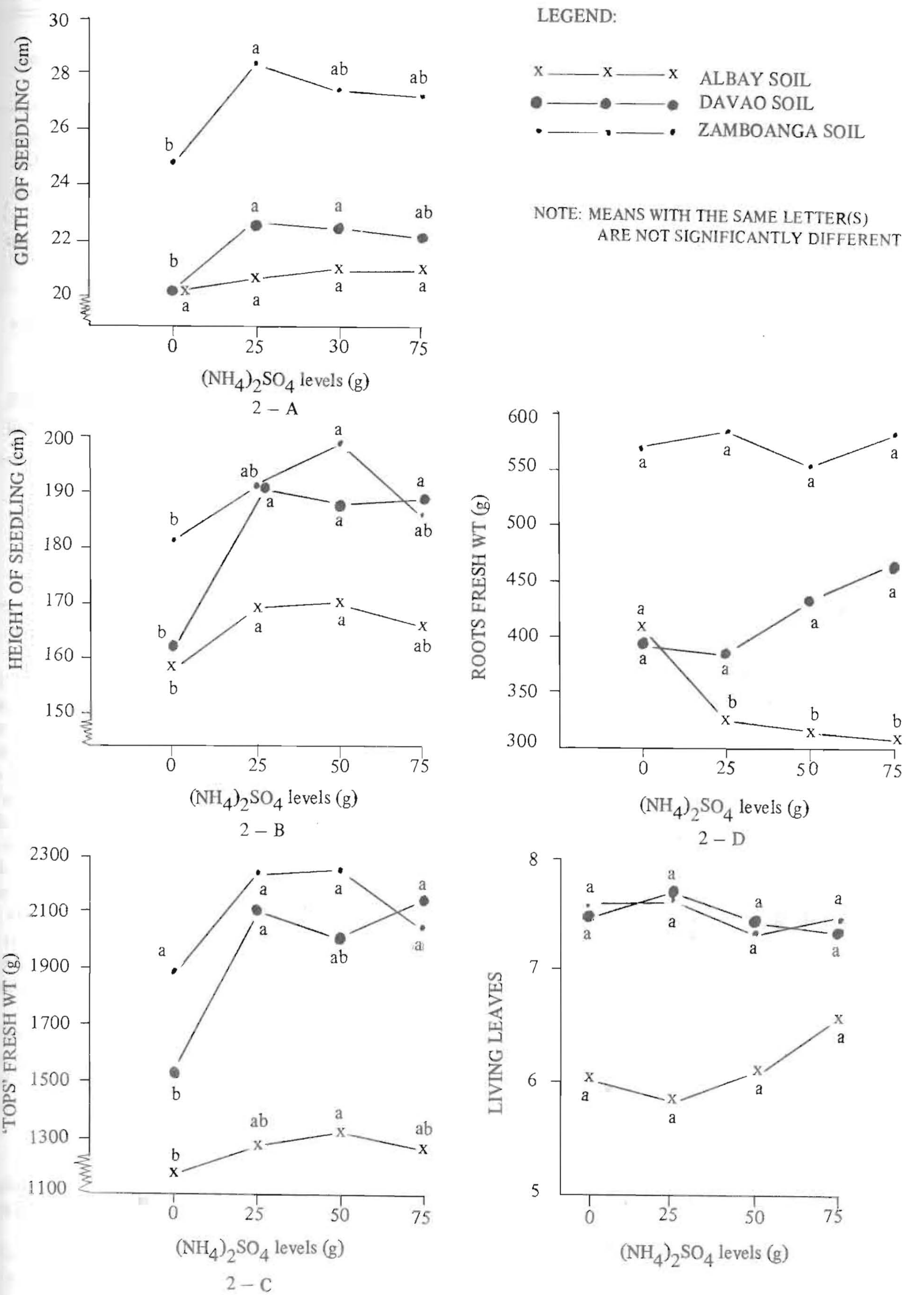

Figure 2. Effect of different levels of ammonium sulfate on the growth of coconut seedlings.

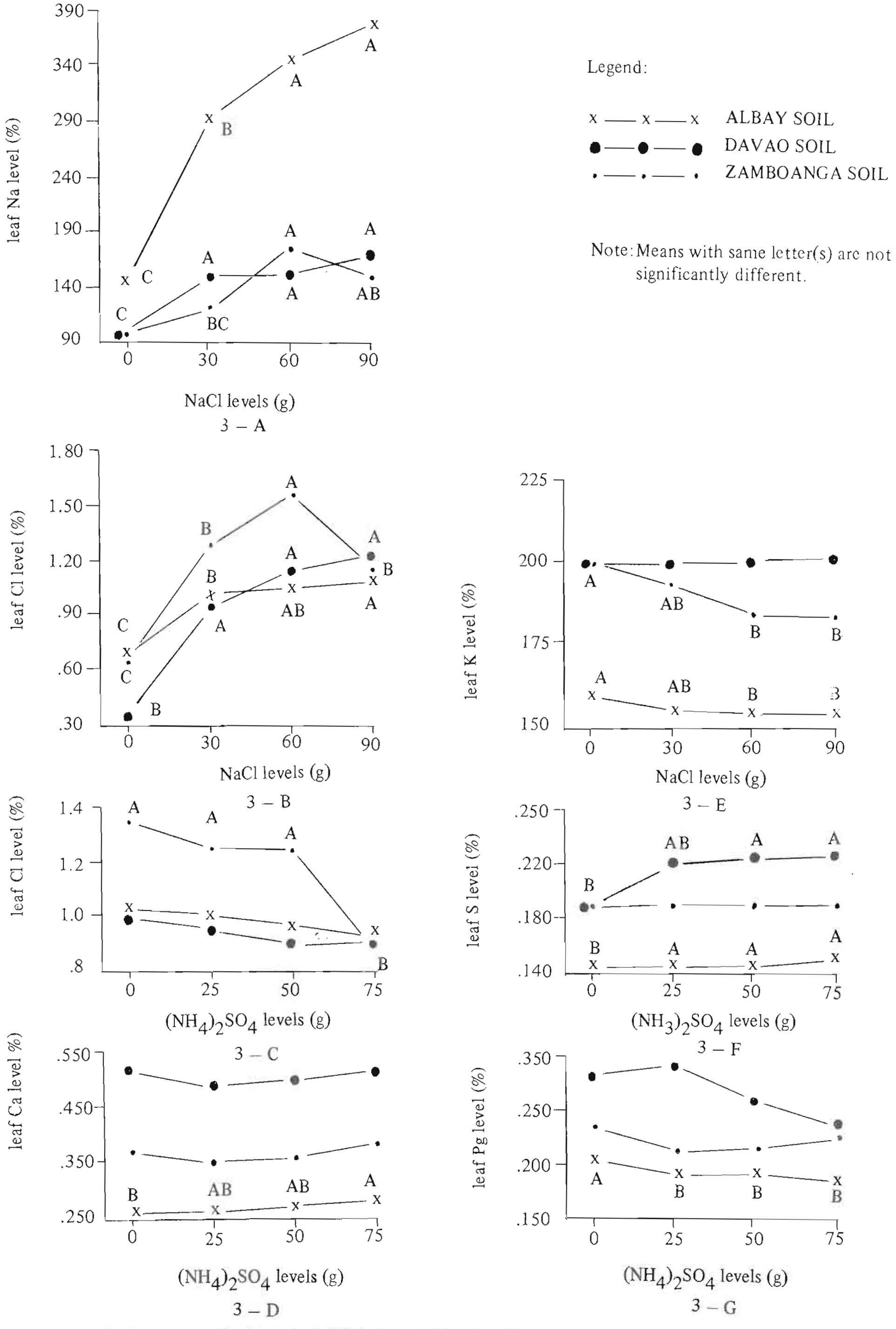

Figure 3. Response of leaf nutrient (%) to increasing rates of NaCl and $(NH_4)_2SO_4$.

Table 7. Effect of fertilizer treatments on growth of coconut seedlings.

Treatment		Girth (cm)	Leaf Production (No.)	Height (cm)	Leaflet (No.)	Fresh Weight (g)
CONTROL		19.470[b]	11.677[a]	118.100[b]	20.677[b]	1,291.800[b]
AGRISPON (10^{cc})		20.410[ab]	11.990[a]	127.550[ab]	31.370[ab]	1,472.200[ab]
NITROPHOSKA (40 grams)		24.357[a]	12.380[a]	152.013[a]	23.160[a]	2,163.500[a]
TABLET FERTILIZER (2 tablets)		21.760[ab]	12.297[a]	134.910[ab]	21.787[ab]	1,644.800[ab]
INTERIM FERTILIZER (60g $(NH_4)_2SO_4$ + 70g KCl)		24.290[a]	12.660[a]	147.670[a]	22.333[ab]	2,092.033[a]
HSD	0.5	4.122	–	25.147	2.009	0.760
	0.1	5.589	–	–	–	–
C.V. (%)		6.62	4.04	6.55	3.26	15.54

Note: Means having the same letter(s) are not significantly different.

2. Agrispon – is an inoculant claimed to stimulate the natural processes in the soil. It supposedly helps increase organic matter, build up humus, and accelerate the nitrogen cycle vital to plant growth. It is thought to be a living culture of microorganisms that include fungi, algae, and associated soil bacteria, many of which are in spore forms. It is said to be totally natural, safe, and is designed to help protect and conserve our natural resources.

3. Tablet fertilizer – the nutrient content are as follows: 20% nitrogen, 15% phosphorus acid (P_2O_5), 10% potash (K_2O), 1.5% magnesium, and 2% of the trace elements (iron, boron, manganese, zinc, copper, and molybdenum). The nutrient compounds of the tablets are decomposed slowly and regularly in the soil in about three years.

Results of the study show (Table 7) that nitrophoska gave a significant improvement in girth, height, number of leaflets, and fresh weight of tops over the control.

Utilization of Eucheuma spinosum as fertilizer for coconut seedlings

This study was conducted to explore the potential of the by-product of Eucheuma as fertilizer and hopefully as substitute for potassium chloride. Used in the study is the by-product of Eucheuma spinosum, a red algae locally known as "gozo" in Visayas. It is found to contain potassium and chloride at 51% and 40%, respectively. Four levels of Eucheuma: 0, 60, 90, and 120 g per seedling with a blanket application of ammonium sulfate (21% N) were tested on three cultivars: "Mawa" hybrid, Laguna tall, and "Catigan" dwarf

Results of the study (Table 8) show that the application of 90 g Eucheuma with 60 g ammonium sulfate, increased significantly the growth performance of the seedlings in terms of girth, height, number of functional leaves and, leaflets, with Mawa hybrid responding more significantly than Laguna tall and Catigan dwarf.

The potential of giant ipil-ipil leaves as fertilizer for coconut

The study was conducted to explore the potential of giant ipil-ipil leaves, as fertilizer for coconut seedlings. Materials used in the study were the Tugbok clay loam soil, seednuts of the Catigan dwarf, dried giant ipil-ipil leaves containg 4.5% nitrogen by dry weight, and ammonium sulfate with 21% nitrogen.

The experiment was laid out in a randomized complete block design with six treatments, replicated four times with 12 seedlings per plot. The treatments are as follows:

a) control
b) 60 g $(NH_4)_2SO_4$ + 70 g KCl
c) 250 g ipil-ipil
d) 500 g ipil-ipil
e) 250 g ipil-ipil + 70 g KCl
f) 500 g ipil-ipil + 70 g KCl

Table 9 shows a highly significant growth response observed on seedlings applied with 60 g ammonium sulfate + 70 g KCl and also on 500 g ipil-ipil leaves + 70 g KCl (treatment b and f respectively). The application of ipil-ipil alone at 500 g also improved significantly the girth, number of leaflets, and fresh weight of vegetative part but not as effective as when combined with KCl. On leaf nutrient, ipil-ipil application slightly increased leaf N, K, Ca, and B.

Farmers' practice

With the exception of big plantations, field observations tend to show that only the NCRP/CP program recipient farmers practice the raising of coconut seedlings in polybags and fertilization. This set-up is favorable to the recipient farmers apparently because the polybags and fertilizer are provided free together with the hybrid seednuts.

Table 8. **Effect of *Eucheuma Spinosum* fertilization on the growth of coconut seedlings.**

		Girth (cm)	Height (cm)	Functional Leaves (No.)	Total Leaves Produced (No.)	Leaflets Leaf No. 3 (No.)
VARIETY						
MAWA		25.39^{a}	178.80^{a}	7.67^{a}	9.53^{c}	35.55^{b}
LAGUNA		22.24^{b}	162.23^{b}	6.33^{b}	9.62^{bc}	35.75^{ab}
CATIGAN		19.78^{c}	133.84^{c}	5.32^{c}	10.57^{a}	37.06^{a}
Statistical significance		**	**	**	**	*
S.E.		0.399	4.682	0.171	0.104	0.388
HSD	.05	1.380	16.199	0.591	0.359	1.342
	.01	1.743	20.460	0.747	0.454	1.645
FERTILIZER						
Control + 70g AS		19.53^{b}	138.66^{b}	4.80^{c}	9.81	34.49^{b}
60g E + 70g AS		22.61^{a}	159.26^{a}	6.52^{b}	9.87	36.21^{a}
90g E + 70g AS		24.18^{a}	171.23^{a}	7.38^{a}	10.10	37.29^{a}
120g E + 70g AS		23.57^{a}	164.02^{a}	7.06^{ab}	9.83	36.49^{a}
Statistical significance		**	**	**	NS	**
S.E.		0.460	5.406	0.197	0.120	0.447
HSD	.05	1.752	20.596	0.750	–	1.703
	.01	2.175	25.570	0.931	–	2.114
VARIETY + FERTILIZER		NS	NS	NS	NS	NS
S.E.		0.797	9.364	0.341	0.208	0.775
C.V. (%)		7.93	13.23	11.85	4.69	4.80

NS – Not Significant E – Eucheuma
AS – Ammonium Sulfate

* Significant at 5% level
** Highly Significant at 1% level

Table 9. Effect of giant ipil-ipil leaves and agrispon on the growth of coconut seedlings.

Treatment	Girth (cm)	Height (cm)	Living Fronds (No.)	Total Leaves Produced (No.)	Leaflets (No.)	Vegetative Parts (kg/seedlings)
1 – CONTROL	23.02^{d}	201.03^{b}	7.07^{cd}	11.52^{b}	49.60^{d}	22.00^{d}
2 – 60g AS + 70g KCl	31.97^{a}	248.38^{a}	8.39^{a}	12.32^{a}	63.02^{a}	40.45^{a}
3 – 250g IPIL-IPIL LEAVES	23.67^{cd}	212.67^{b}	6.87^{d}	11.90^{ab}	52.93^{bcd}	25.07^{bcd}
4 – 500g IPIL-IPIL	26.64^{bc}	229.50^{ab}	7.51^{bcd}	11.97^{ab}	55.50^{bc}	30.57^{b}
5 – 250g IPIL-IPIL + 70g KCl	27.47^{b}	212.01^{b}	7.39^{bcd}	11.67^{ab}	55.37^{bc}	30.62^{b}
6 – 500g IPIL-IPIL + 70g KCl	28.93^{ab}	242.59^{a}	7.97^{ab}	11.97^{ab}	56.35^{b}	36.65^{a}
STATISTICAL SIGNIFICANCE	**	**	**	*	**	**
S.E.	0.625	4.694	0.176	0.140	0.782	1.209
HSD .05	3.050	22.906	0.858	0.683	3.816	5.899
HSD .01	3.625	27.225	1.020	–	4.535	7.012
C.V. (%)	4.76	4.29	4.73	2.36	2.88	8.26

* Significant at 5% level

** Highly significant at 1% level

Note: Means having the same letter(s) are not significantly different

If this is the case with the replanting program, the government will need to infuse high capital input to pursue its objective.

There is no need however to develop a new technology; it is just a matter of modifying the system which would be less expensive to the government. Evidently, the stored food in seednuts can support the normal growth and development of the embryo coconut seedlings at the early stage, and transplanting it at six months or less will thus eliminate the use of polybag and minimize fertilization in the nursery. As practiced in a well-managed plantation, only seedlings intended for use in replanting are polybagged and fertilized in the nursery.