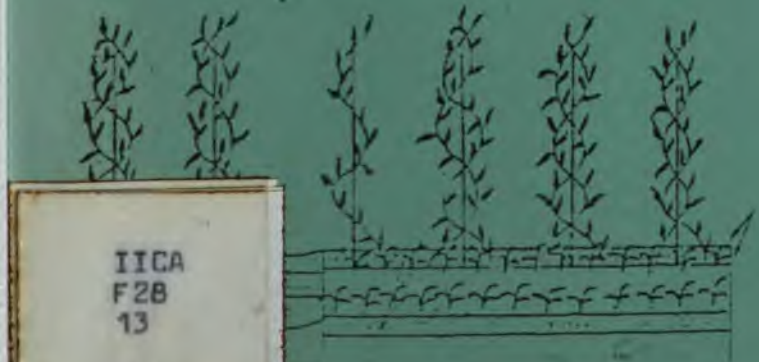
HIGHLIGHTS OF THE PILOT HILLSIDE AGRICULTURAL PROJECT AT ALLSIDES



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JAMAICA OFFICE

HIGHLIGHTS OF THE

PILOT HILLSIDE AGRICULTURAL PROJECT

AT ALLSIDES

BY

ABDUL H. WAHAB, ET AL

1980

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F O R E W A R D

In December 1976 the Allsides Pilot Hillside Agricultural project was initiated by an agreement between the Government of Jamaica and IICA/Jamaica.

The project was officially evaluated just prior to the completion of its first phase on June 30, 1980.

During the first phase of the project the main objectives as spelled out in the project document were attained. The results and experiences gained from it have assisted in the generation of such projects as the US/AID Pindars - Two Meetings Project (the Second Integrated Rural Development Project) costing (J)$26 million. They also assisted in the development of the UNDP/FAO/Norway/GOJ project for Watershed Management, costing approximately (J)$4.5 million and provided an important basis for the preparation of the "Pilot Hillside Agricultural Project" (PHILAGRIP) which is estimated to cost approximately (J)$15 million.

Much of the success of the project is due to the dedication of Dr. Abdul Wahab, who directed it.

We are very proud to present these "Highlights" of the project for ready reference. Much of the data is already published by IICA/Jamaica and will continue to be extended for the benefit of the small Hillside farmers in particular and Jamaica in general.

DR. PERCY AITKEN-SOUX
DIRECTOR

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AGRICULTURE IN JAMAICA

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1977 - 1978

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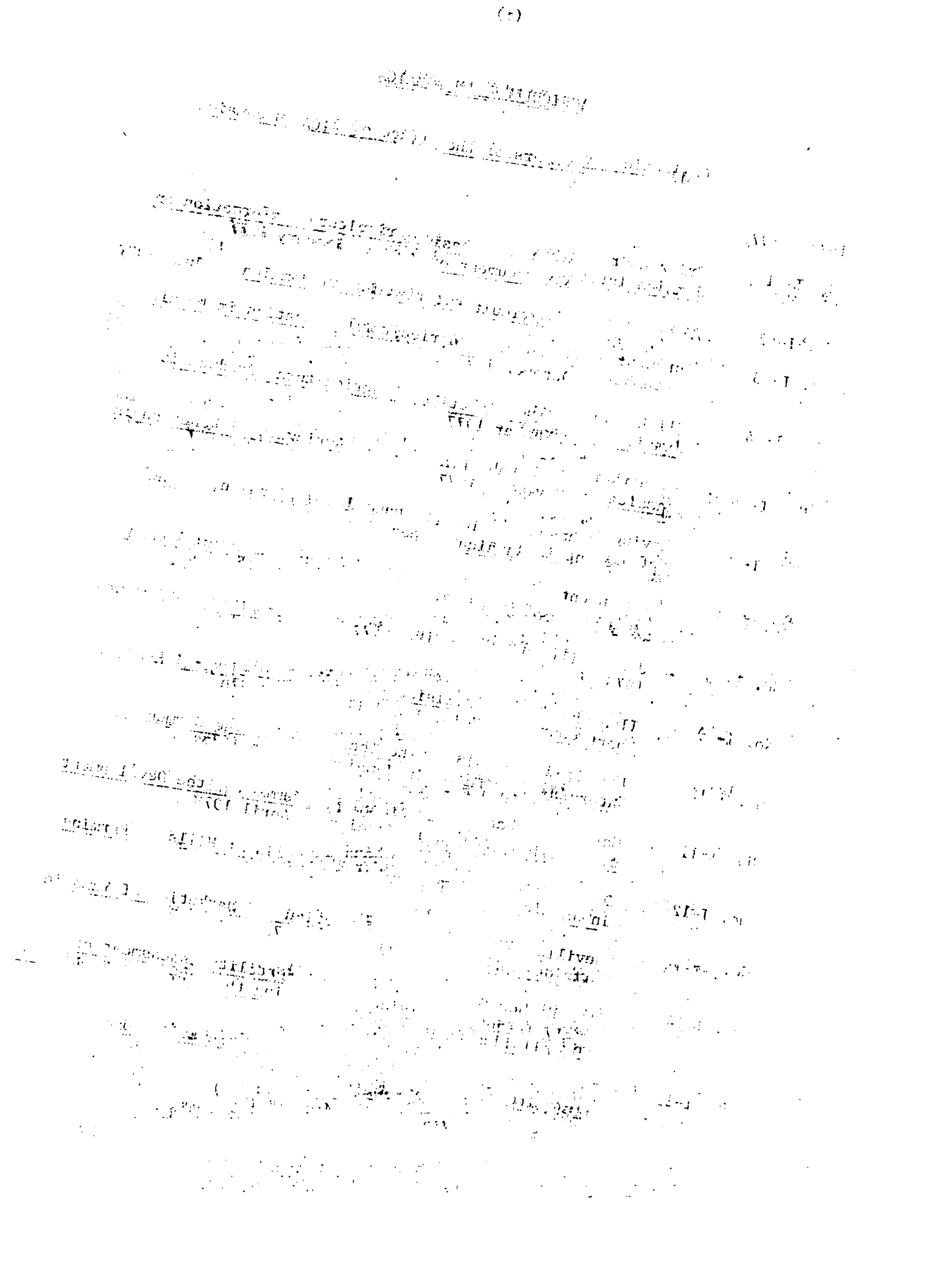

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No. IV-11 IICA/Jamaica "Pilot Hillside Agricultural Project" (PHILAGRIP), Project Document. Volumes I, II, and III. June 1980.

No. IV-12 A. Wahab, I, Johnson, P. Aitken, H. Murray and H. Stennett "Highlights of the Pilot Hillside Agricultural Project At Allsides", July 1980.

HIGHLIGHTS OF THE PILOT HILLSIDE AGRICULTURAL PROJECT AT ALLSIDES AND LOWE RIVER, SOUTHERN TRELAWNY [1]

by

Abdul H. Wahab, Irving E. Johnson, Percy Aitken, Bo-Myeong Woo [2]
Howard Murray & Henry Stennett [3]

INTRODUCTION

During the period 1969 - 1973 the Government of Jamaica with the assistance of FAO conducted a Soil Studies Project at Cascade, Hanover. The principal objectives of this project were to:

(i) ascertain the magnitude of soil loss when yam was grown on hilly lands in the absence of any soil erosion control measures;

(ii) assess the comparative advantages of several erosion control measures; and

(iii) recommend appropriate methods of conserving soil and water resources for the uplands of Jamaica with special reference to yam cultivation.

These studies resulted inter alia in the following main conclusions:

(a) An average soil of 136 t/ha/yr (54 t/acre/yr) farm unprotected yam plots having a 17° slope and an accompanying reduction in soil fertility and productivity.

(b) A comparable soil loss of 10 t/ha/yr (7.3 t/acre/yr) from bench-terraced plots with an accompanying improvement of soil fertility and productivity.

As a consequence of these findings the Government of Jamaica embarked on an ambitious programme of soil conservation in which terracing was the favoured erosion control measure to be adopted for hilly lands having slopes of 7° - 25°.

1/ Joint project of the Ministry of Agriculture, Government of Jamaica and The Inter American Institute of Agricultural Sciences (IICA-OAS)

2/ Specialists IICA/Jamaica Office

3/ Project Agronomist and Director, Soil Conservation Division respectively, Ministry of Agriculture

Notwithstanding the direct soil and water conservation benefits, terracing is a costly proposition. For this reason it is a sine qua non that appropriate production practices be developed and implemented for the effective and efficient utilization of bench terraces. Concomitantly, efforts to identify soil conservation measures that are less costly than bench terraces and suited to Jamaica's conditions must be pursued. To this end, in 1977 the "Allsides Pilot Hillside Agricultural Project" was launched. This project represents a joint effort of the Government of Jamaica and the Inter American Institure of Agricultural Sciences.

THE PROJECT

The project encompasses 251 ha (622 ac) and addresses itself to a target group of 234 farms families with each farming an average of one ha of hilly land. A detailed topographic survey of the area indicates that over 55% of the area is characterized by slopes 15^{o} and above.

The predominant soil type of the area is Wirefence Clay Loam (Map No. 32), an Ultisol which is inherently low in fertility. Soil reaction is very highly acidic (pH of 4.9) and levels of available N, P and K are medium, low and very low, respectively.

Annual precipitation averages 1980 mm (78 inches) and is characterized by a bimodal distribution pattern with wettest months being May and September.

Yam (Dioscorea Spp) an important staple in Jamaica, is grown by every farm family who generally cultivate the crop on individual hills or mounds in the virtual absence of any erosion control measures.

The overall objective of the project is to develop a body of knowledge on hillside farming and cropping systems conducive to changing the traditional pattern of hilly land farming.

Specifically, it is expected that inter alia the project would evolve production systems which could result in:

(a) increased levels of production and productivity;
(b) increased farm income;
(c) enhanced nutritional profiles of farm families, and
(d) increased opportunities for rural employment

Following ~~two years of project implementation~~ another objective was added viz., to identify an alternative and less costly soil conservation measure than bench terracing. To this end work has started at Olive River in the Lowe River area, Southern Trealwny.

STRATEGY FOR ACHIEVING THE PROJECT OBJECTIVES

Following construction of bench terraces, the farmers' hillside plot is now rendered flat and can be cultivated with more ease and intensity than before terracing. For instance, terraced land can be used to great advantages in cropping systems in which yam grown on continuous mounds is intercropped with other row crops such as potatoes, ginger, peanuts and red peas. Such a multiple cropping system has the added advantage of substantially reducing splash erosion because of the continuous crop cover resulting from the crops selected for the system. More importantly however, is that a system of intercropping in the context of Jamaica hillsides ensures optimal exploitation of the dimensions of:

(a) space;
(b) available soil moisture;
(c) Available soil nutrients and applied fertilizers;
(d) incoming solar radiation; and
(e) available farm labour

Thus the strategy employed in achieving the project objectives was to:

(i) test and identify farming systems which are suited to the edaphic and climatic conditions of Allsides, Trelawny where farming is done entirely under rainfed conditions;
(ii) determine the financial feasibility of those systems of production which have been identified as being agronomically and nutritionally suitable for the area,and;
(iii) ascertain the feasibility of maintaining a combination of small (goats) and large (cattle) livestock from the forage produced on the risers of the terraced plot;

(iv) conduct adaptive research aimed at solving problems of soil and crop management e.g., fertility, liming, and crop variety trials;

(v) conduct soil loss studies on run-off plots which have been treated with inexpensive soil conservation measures;

(vi) produce seed material for distribution to producers and adoptors of the improved technology; and

(vii) train national technicians in the areas of watershed management and research techniques with special emphasis on farming systems for hillsides.

Concomitantly, a vigorous programme of on-farm soil and water conservation works is conducted on plots operated by the target group.

EXPERIMENTAL APPROACH AND METHODOLOGY

Consistent with the strategy spelled out above, research and developmental work was conducted inter alia on a total of 20 systems of production during the crop years 1977/78 and 1978/79. Beginning in October 1978 and again in March 1979 and 1980 respectively, work begun on the further refinement and economic viability of eight of the more promising cropping systems.

Presented in Figures 1 through 5 are the cropping patterns which have undergone and continue to undergo evaluation. For each cropping system the dates of planting and harvest of the respective component crops are plotted on scale. For example, in Figure 4, the planting and harvest dates of System 2, are as follows:

Yams - March 3, 1979 and February 13, 1980;
Irish Potato - April 20, 1979 and July 11, 1979;
Radish - July 17, 1979 and August 27, 1979 and
Peanut - September 20, 1979 and January 23, 1980

Following construction of terraces in early 1977 and prior to crop establishment, lime in the form of marl and poultry manure each at the rate of 3 t/ha (1.2 t/ac) were applied to ameliorate soil acidity and fertility due to low organic matter content. Irrespective of whether

yellow yam (Dioscorea cayenensis), the principal crop of the area is grown as a sole crop or in association with other crops, the density is kept constant at 10,000 plants/ha (4,050/ha). As shown in Figure 6, yams are planted on continuous mounds with rows spaced 1.5 m apart and at 0.67 m within the row. This requires approximately 8,000 kg of yam "heads" and 2,500 wooden stakes per ha for sowing and staking of yam vines.

Irish potato planted with yam at the beginning of the crop cycle (Figure 7) is sown in rows spaced 0.75 m apart and 0.25 m within the row. This results in a crop density of 53,000 plants/ha (21,500/ac) and requires approximately 2 t/ha of seed material.

Peanut when grown as an intercrop with yam at the commencement of the crop cycle and thereafter at six months(Figures 8 and 9) is seeded in consecutive and peripheral (with respect to yam) rows respectively, spaced 0.4 m apart and 0.1 m within the row. This results in a crop density of 250,000 and 125,000 plants/ha during the first and latter halves respectively of the crop cycle. The spacial arrangement used for red pea (Phaseolus sp. and Vigna sp.) at the beginning of the crop cycle (Figure 10), is rows 0.4 m apart and 0.15 m within the row. This results in a population of 165,000 plants/ha. Cropped with yam during the latter half of the crop year, sowing is done in rows peripheral to two consecutive yam rows at a density of 83,000 plants/ha.

Ginger when grown with yam for most of the crop year is sown in rows 0.4 m apart and 0.21 m within the row (Figure 11), giving a crop density of 125,000 plants/ha.

Field observations included:

(a) Crop adaptability ;
(b) crop yields both total and marketable;
(c) crop performance as affected by various planting dates;
(d) response of crops to varying rates of N. P. K. and lime;
(e) time-motion data on discrete operational variables involved in the production of each of the eight promising cropping systems inclusive of land preparation; and

(f) variable costs of materials required for production of the crops.

To identify soil conservation measures that are less costly than terracing, a series of eight soil run-off plots each of 1/250 ha (1/100 ac) in size have been constructed on a 20° slope. These "troughs" are each connected to two soil - water collecting drums positioned in series. Following each heavy rainfall period, the quantity of soil lost is estimated. The four soil conservation treatments which have been replicated twice are as follows:

(i) Yams planted on individual mounds as traditionally practiced on the hillsides of Jamaica (check treatment);

(ii) Yams planted on individual mounds interrupted by a hillside ditch erected mid-way down the run-off plot;

(iii) Yams planted on continuous mounds spaced 1.5 m apart and separated by a hillside ditch erected midway down the run-off plot; and

(iv) Yams planted on continuous mounds as at (iii) and separated by a grass (napier) buffer strip mid-way down the run-off plot

The run-off plots became operational in April/May 1980 following their erection in the early months of this year.

PRINCIPAL RESULTS AND ACCOMPLISHMENTS

Presented in Table 1 are equivalent yields of each crop component and cropping system tested during the 1977/1978 crop year. Yam yields were excellent when compared with those obtained by farmers in the project area (10 - 15 t/ha of marketable tubers); yields ranged from a low of 26.565 t/ha in the cropping system where sweet potato and red pea were included to 39.899 t/ha when ginger and sweet potato were grown in association with yam.

It was observed (Table 1) that with the exception of cropping system number 8 (yams grown in association with sweet potato followed by red pea) there was an appreciable increase in total yam output by

every other treatment over the check treatment (system No. 1). Further, Irish potato of the red pontiac variety sown together with yam and harvested 85 days thereafter produced a yield of over 9 t/ha of good quality tubers. Also, it was significant that other component crops such as onion, corn, pumpkin, cabbage, carrot, cassava, ginger and sweet potato performed poorly. This was attributed to several factors viz., (i) poor seed quality which resulted in extremely poor crop stand in the case of onion and ginger; (ii) inability of the soil to supply adequate quantities of magnesium for acceptable corn growth and yield; (iii) inability of the cassava and sweet potato cultivars to accumulate carbohydrates despite excellent top growth; (iv) a high population of cabbage looper which rendered a high percentage of the heads unmarketable and (v) significant loss in carrot crop stand due to seed loss from yam mounds consequent to heavy rains prior to seedling emergence.

The encouraging yams, potato and red pea yields coupled with the direct soil conservation benefits to be gained from yam cultivation on mounds and the demonstration of an improved farm cash flow situation which could accrue to the small hillside farmer stimulated further work at identifying viable systems of production.

During the 1978/1979 crop year, corn was again tested and new crops such as the 'dwarf determinate' variety of pigeon pea (UWI - 17), bodie bean (vigna spp), peanut and lettuce were included in the crop mixes as presented in Figure 2.

The yield data for each cropping system are presented in Table 2. Except for System 6 in which yams were grown with peanut and sweet potato an increase in saleable yam tuber yield over the yam monoculture was recorded for each of the other systems tested. Further, 7.15 t/ha, 3.06 t/ha and 2.13 t/ha of saleable products were obtained from those systems in which yam was intercropped with Irish potato, ginger and peanut respectively during the first half of the cropping cycle. Again, as was observed in the 1977/1978 crop. Yam, corn, onion, sweet potato and carrot performed poorly as intercrops. The pigeon pea crop performed poorly

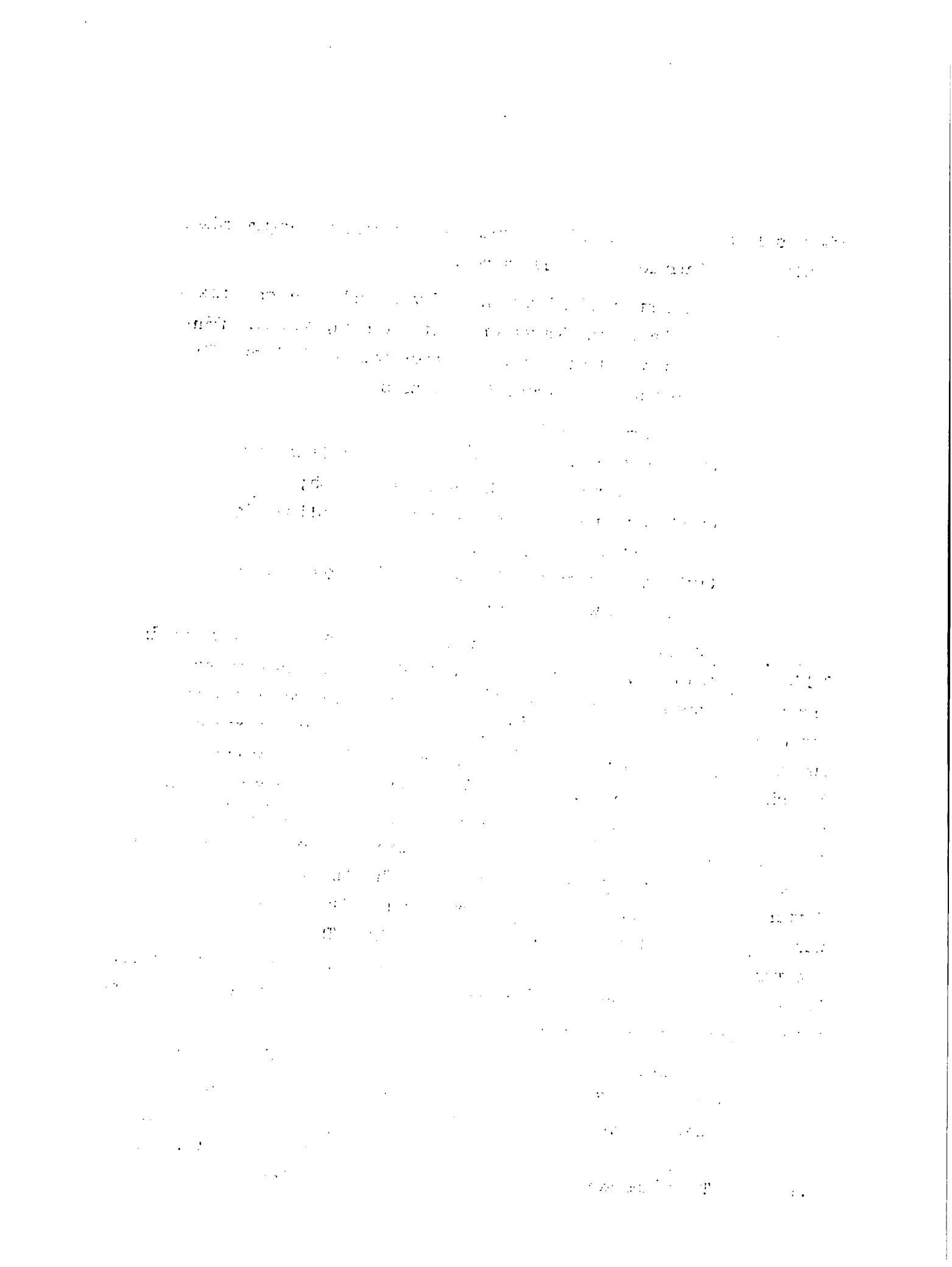
whereas lettuce seeds failed to germinate. Overall the legume mixes resulted in a fair level of performance.

To ascertain yield response of yams and other crop mixes when established during the September - October rainy season, four production systems were tested on semi-commercial sized plots. The crop mixes are presented in Figure 3 and consisted of:

(i) yam as a sole crop;
(ii) yam grown together with peanut followed in sequence by Irish potato and radish;
(iii) yam grown together with peanuts followed by Irish potato; and
(iv) yam grown together with African red pea and followed by peanut.

The yield data of yams and each component crop are shown in Table 3. Yam tuber yield was highest (27 t/ha) when this crop was grown as a monoculture and yield, declined by an average of 23% as other crops were intercropped with yam. Notwithstanding, periods of sustained drought conditions which could have led to the overall lowering of yam yields, peanut performed well on both terraces which had been planted to this crop together with yam in the first half of the cropping year. Yields of whole sound kernels expressed at a moisture content of 10% averaged 1.45 t/ha and 8.78 t/ha during the first and latter half respectively of the yam crop cycle. The Irish potato crops were severely affected by early and late blight. This resulted in immature ripening of the crop and as a consequence, tuber size was small. The radish crop performed well and when viewed in the context of its short maturity period (5 - 6 weeks) appears promising.

Following a detailed review of the cropping systems data obtained from April 1977 to February 1979, it was decided to establish eight crop mixes on whole terraces thereby simulating farmers plots in size. These terraces varied in hectarage from 0.02 to 0.07 ha (0.05 to 0.17 ac). The mixes were selected on the basis of their:



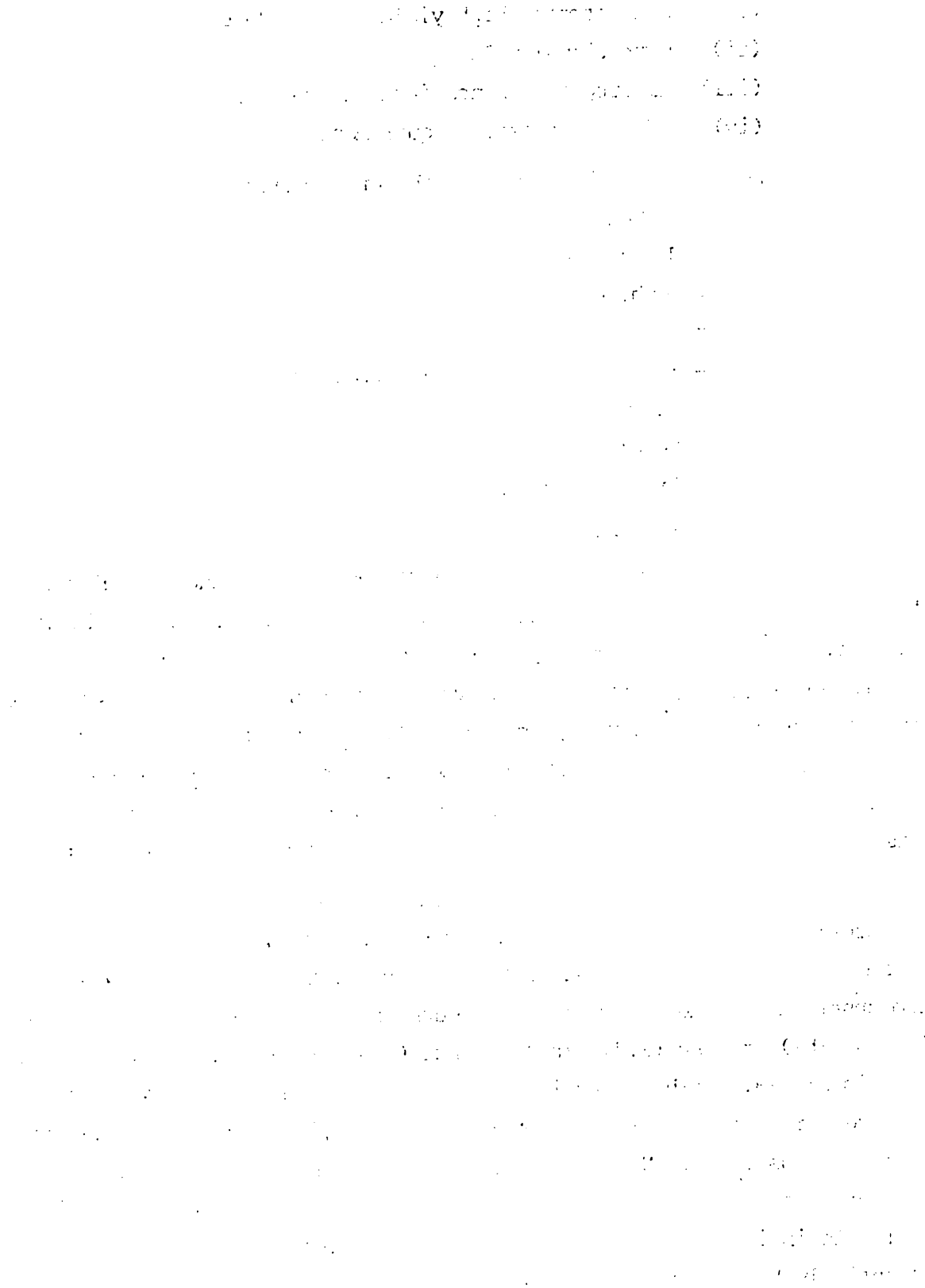
(i) demonstrated high yielding potential;
(ii) nutritional values;
(iii) ability to enhance farm income; and
(iv) labour intensive requirements

As indicated in Figure 4, the crops were:

- Yellow yam
- Irish potato
- Radish
- Peanut
- Red pea (Phaseolus and Vigna spp)
- Ginger
- Sweet potato
- Grain corn; and
- Cabbage

The crop cycle commenced in March 1979 and ended in February 1980. As previously stated, records were kept of all production inputs inclusive of costs of chemicals, fertilizers, and all the labour requirements put into effecting the various farming operations from field preparation through planting, crop care, harvesting and delivery of produce at farm gate. Outputs were measured on total and saleable or edible yields and farm gate revenue was calculated by multiplying saleable yield by prices which prevailed at the time of crop harvest.

Crop yield data are shown in Table 4. Compared with the two previous years, yam tuber yields were low and averaged 18.1 t/ha of saleable materials for all eight cropping systems. However, there is compensation for these low yields through the good yields of Irish potato (13.25 t/ha), radish (1.27 t/ha), peanut (2.51 t/ha), cow pea (1.5 t/ha) and ginger (13.87 t/ha). Again, crops such as corn, sweet potato and cabbage failed to perform well whereas red pea yields improved somewhat from previous years. Notwithstanding the fact that yam yields were greater than those obtained from traditional practices, the information available indicates that there are factors which have limited the potentially higher yields. These are:



(i) inter-crop competition particularly when yam is inter-cropped with sweet potato;

(ii) sustained periods of unseasonably heavy rains which resulted inter alia in leaching of applied fertilizers and other available soil nutrients

(iii) a build-up in the levels of yam nematodes both in the yam tubers which resulted in a high percentage of unmarketable tuber material; and

(iv) late staking of yam vines (12 - 14 weeks after planting) due to unavailability of yam stakes at time of sprouting.

These are important aspects which must be taken into consideration in devising crop mixes, improving the performance of intercrops and providing a satisfactory basis for projecting revenue.

Summarized in Table 5, are the input costs incurred in producing each system, the outputs derived from each crop component and the net returns per hectare. In three of the eight systems viz., 2, 4 and 5, net farm income increased over the yam monoculture system by 111, 5 and 90%, respectively. Total output realized from the sale of crops exceeded those of the sole yam crop in six of the seven crop mixes. However, relatively high production costs were associated with a number of investigatory and improvement aspects. Adjustments must be made to ensure that they do not inappropriately negate the economic benefits which could have been obtained. These increased production costs are being reduced through:

(i) improved effeciency in field tillage, crop sowing and harvesting operations;

(ii) rationalization of the pest control programme; and

(iii) rationalization of the soil - crop management programmes.

Based on the edible product yields of the 1979/1980 commercial trials, food energy, protein and carbohydrate values were computed for each of the cropping systems. These values are presented in Table 6. The changes in energy yield and food values relative to the yam monoculture

are shown in Table 7. Figure 12 is a graphical representation of energy and food protein values obtained from each of the eight cropping systems. In terms of total nutritional energy, five of the seven crop mixes yielded more than the yam monoculture, the exceptions being yam intercropped with sweet potato and yam and red pea and cow pea. The energy contents varied from 57.25 $\times 10^6$ kilojoules for yam alone, to 102.15 $\times 10^6$ kilojoules when yam was intercropped with Irish potato, radish, and peanut, an increase of 78% (Tables 6 and 7) . Again protein and carbohydrate values were lowest (0.20 t/ha and 2.12 t/ha, respectively), for the yam/sweet potato system and among the highest (0.69 t/ha and 5.51 t/ha, respectively), when yam was intercropped with Irish potato, radish and peanut. Protein and carbohydrate values for the yam monoculture were 0.31 t/ha and 3.14 t/ha, respectively. As expected the legume mixes viz., yam + peanut + red pea, and yam + cow pea + peanut produced the highest protein yields. Values were 0.76 and 0.67 t/ha, respectively and when compared to the yam monoculture outyielded it by 143% and 113%, respectively.

One of the project objectives was to demonstrate the potential employment which could be derived from a rational system of crop and soil management for the Allsides area where farm income is traditionally considered to be low.

Presented in Table 8 are the observed monthly labour inputs required for the establishment and maintenance through to crop maturity of the eight cropping systems, evaluated on whole terraces during the 1979/1980 crop year. When contrasted with the traditional practices adopted by farmers there is little difference in the total labour required for yam as the sole crop produced on continuous mounds on the terraces, although there is variation on a monthly basis. Again, although farmers claim that they use more labour than that required by the project, for every cropping system used the labout requirements have been much greater than for the traditional farming practices. Another important consideration is related to the direct soil conservation benefits which will accrue from the use of continuous mounds on terraced land in such a system, i.e. a recorded soil loss of 18 t/ha/yr compared to 136 t/ha/yr sustained by farmers on plots having a 17° gradient. Systems 2 and 5

which produced the highest farm gate revenues and quantities of energy and protein were also shown to have high employment potentials. These findings are even more meaningful when cognizance is taken of the labour distribution over the 12-month cropping cycle.

The possibility of converting forage produced on the risers of terraces into animal protein was stated earlier in this report. It has been successfully demonstrated over the period 1977/1980 that two heads of large livestock (cattle) and three heads of small livestock (goats) can be maintained by zero grazing from the napier grass produced on a total riser area of 0.07 ha (.18 ac).

Hence in addition to serving principally to stabilize risers, napier grass could be used to significant advantage in enhancing farm income and increasing the availability of animal protein to the population of Jamaica. It is most important that the grass be zero-grazed to protect the risers from destruction by the animals. The labour involved in zero-grazing should be recorded and appropriately changed.

RESULTS OF THE OLIVE RIVER SOIL LOSS STUDIES

Since these studies began in April 1980, a total of four measurements were made following periods of heavy rainfalls.

Presented in Figure 13, are the quantities of soil loss over this period. Treatment 1 (individual hills planted to yam without any conservation practices) resulted in the highest soil loss which amounted to 439 kg of over dried soil. In contrast, plots on which yams were intercropped with Irish potato on continuous mounds with a grass (napier) buffer strip placed midway down the plot (Treatment 4) resulted in the lowest soil loss of 64 kg. In other words there was a reduction in soil loss of 85% compared to the check plot. It is also significant that by introducing a hillside ditch on individual hills and inter-cropping yam with potato, there was a substantial reduction in soil loss of 54% compared to the check plot.

Further, thus far there does not appear to be any significant difference between the effectiveness of Treatments 4 and 3 (continuous mounds with hillside ditches on which yams were intercropped with Irish potato).

Also shown in Figure 13, are the amounts of rainfall recorded between sampling intervals. Over the 50-day period, during which recordings have been made there were 21-rainy days during which a total of 417 mm (16.4 inches) of precipitation was recorded.

These high soil loss data should not be regarded as necessarily an accurate reflection of the situation which normally obtains, because following construction of the various measures the top-soil was disturbed and has not yet settled completely. For this reason it would be premature to make definite conclusions before one to two years of soil loss measurements.

June 8, 1980.

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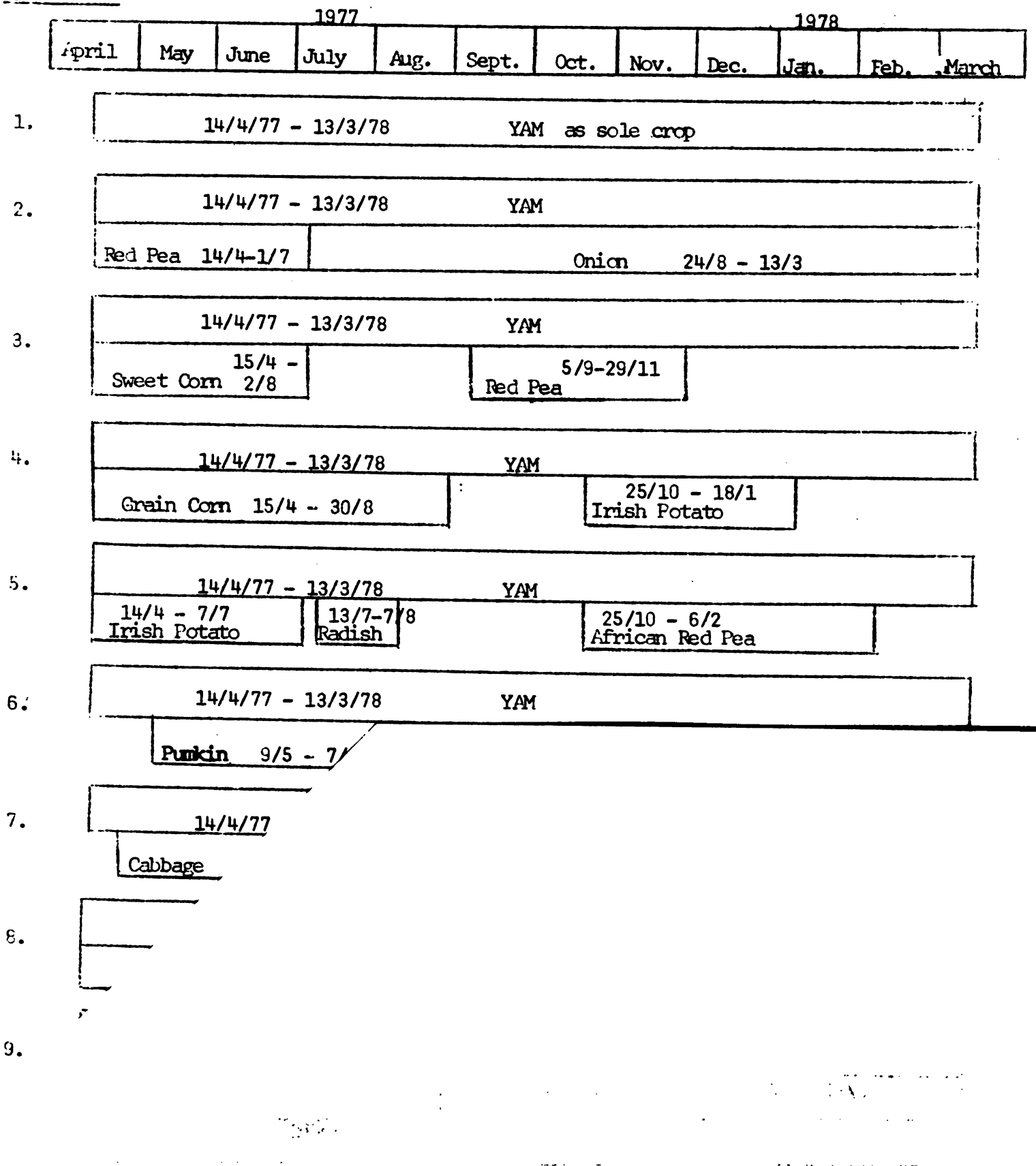
Figure 1: - CROPPING SYSTEMS ESTABLISHED AT ALLSIDES DURING PERIOD APRIL 1977 TO MARCH 1978



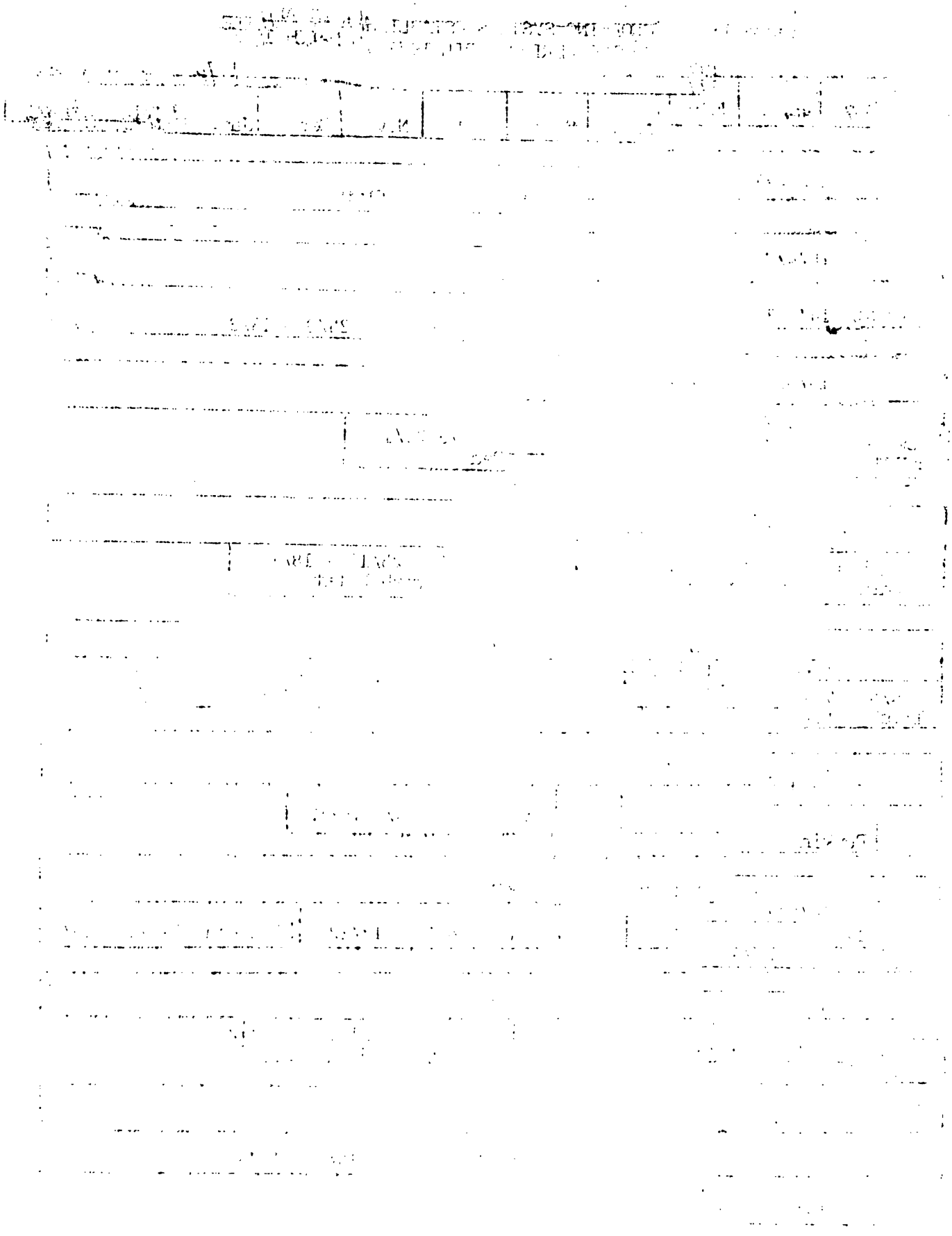
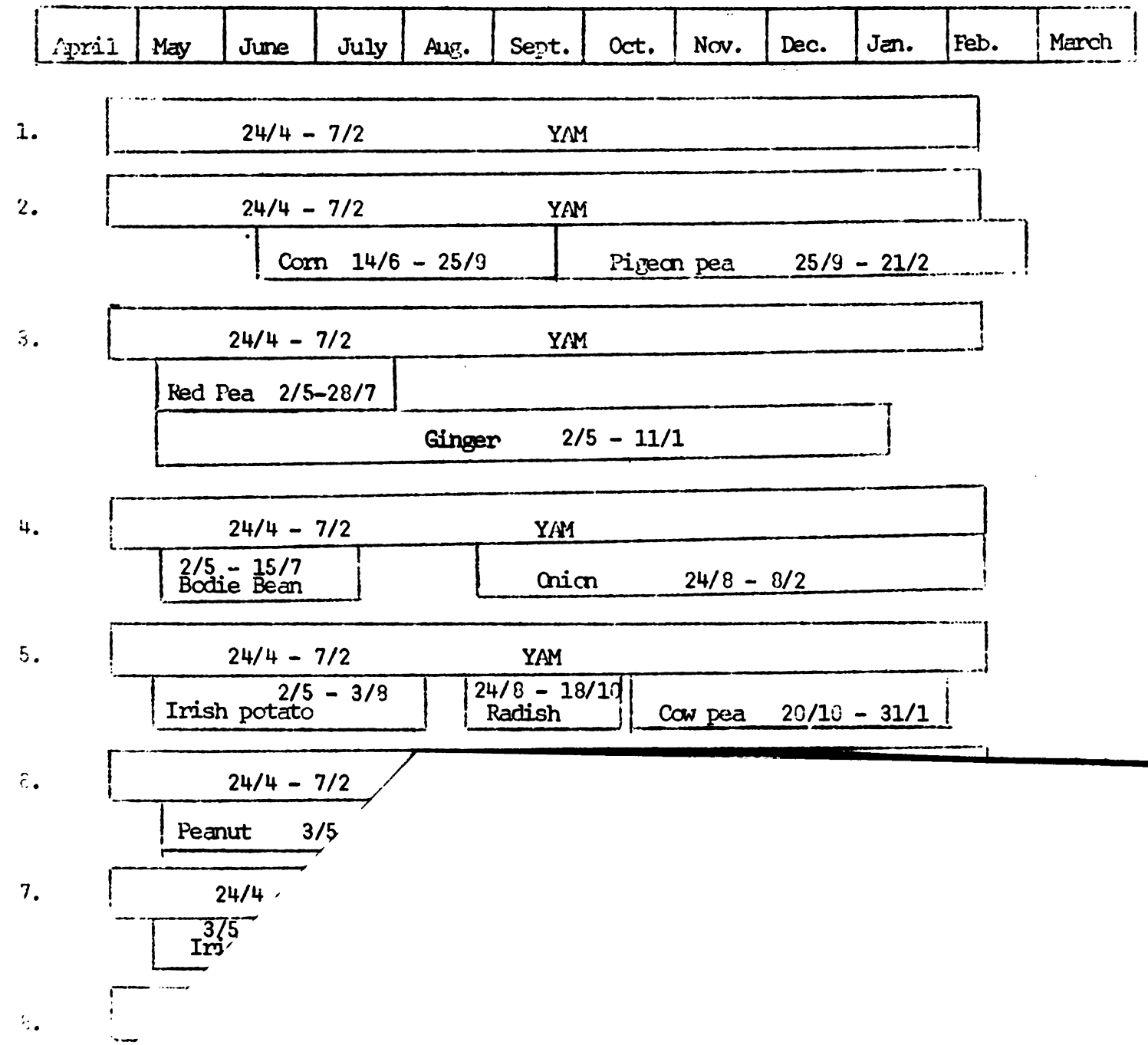


Figure 2:- CROPPING SYSTEMS ESTABLISHED AT ALLSIDES DURING PERIOD APRIL 1978 TO FEBRUARY 1979



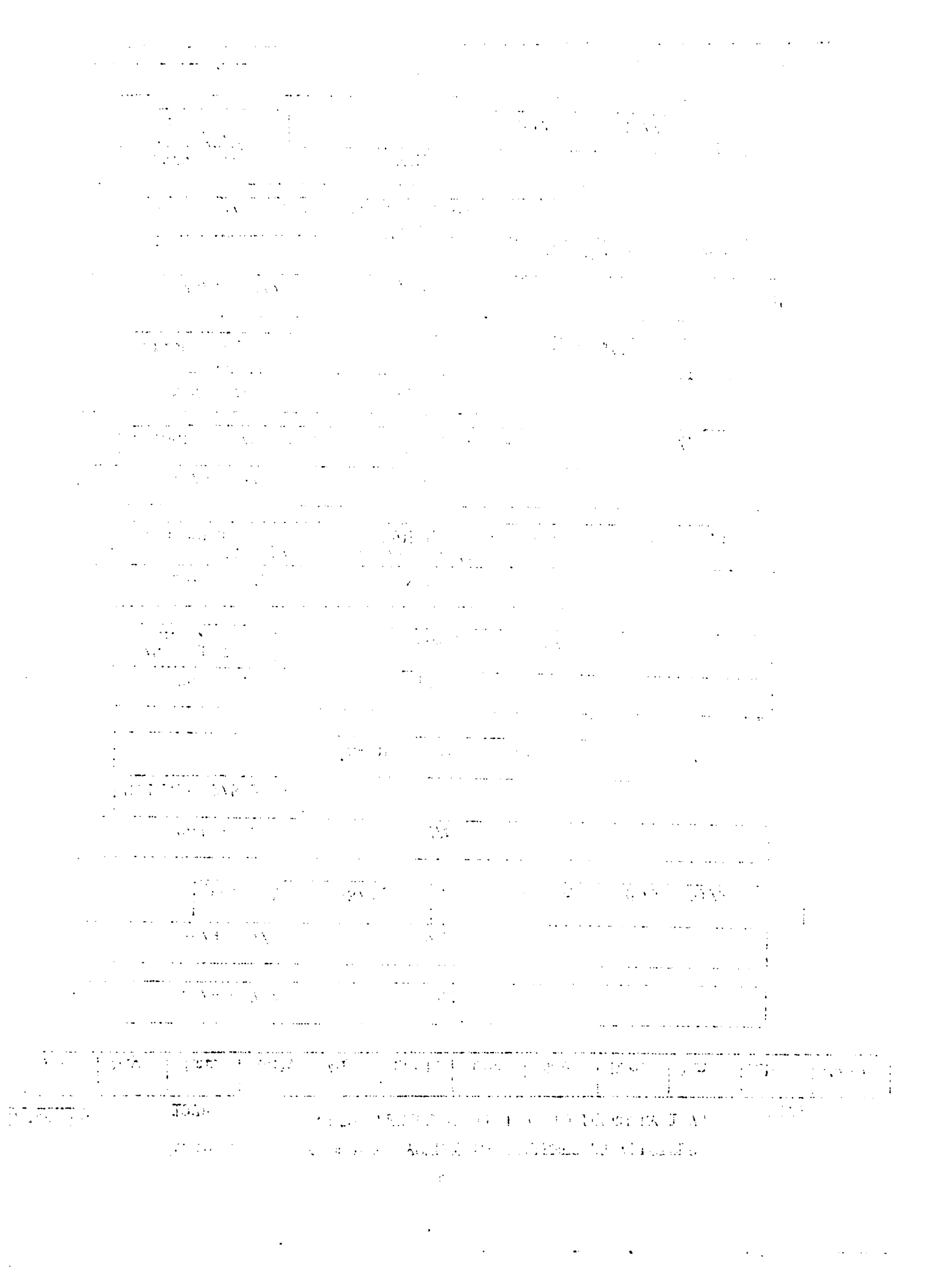


Figure 3.-

Cropping Systems Tested At ALLSIDES P
Site II '78-'79

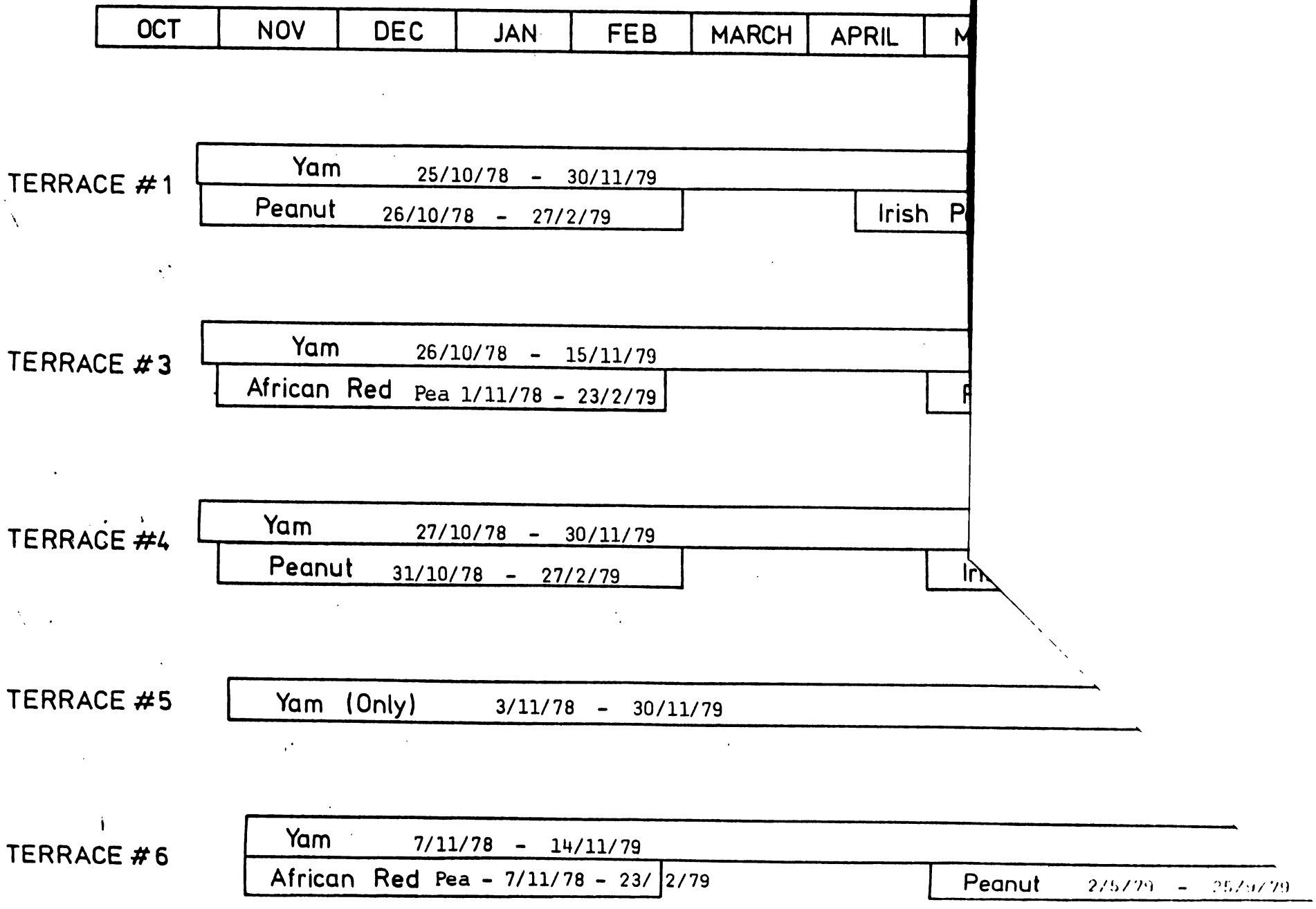
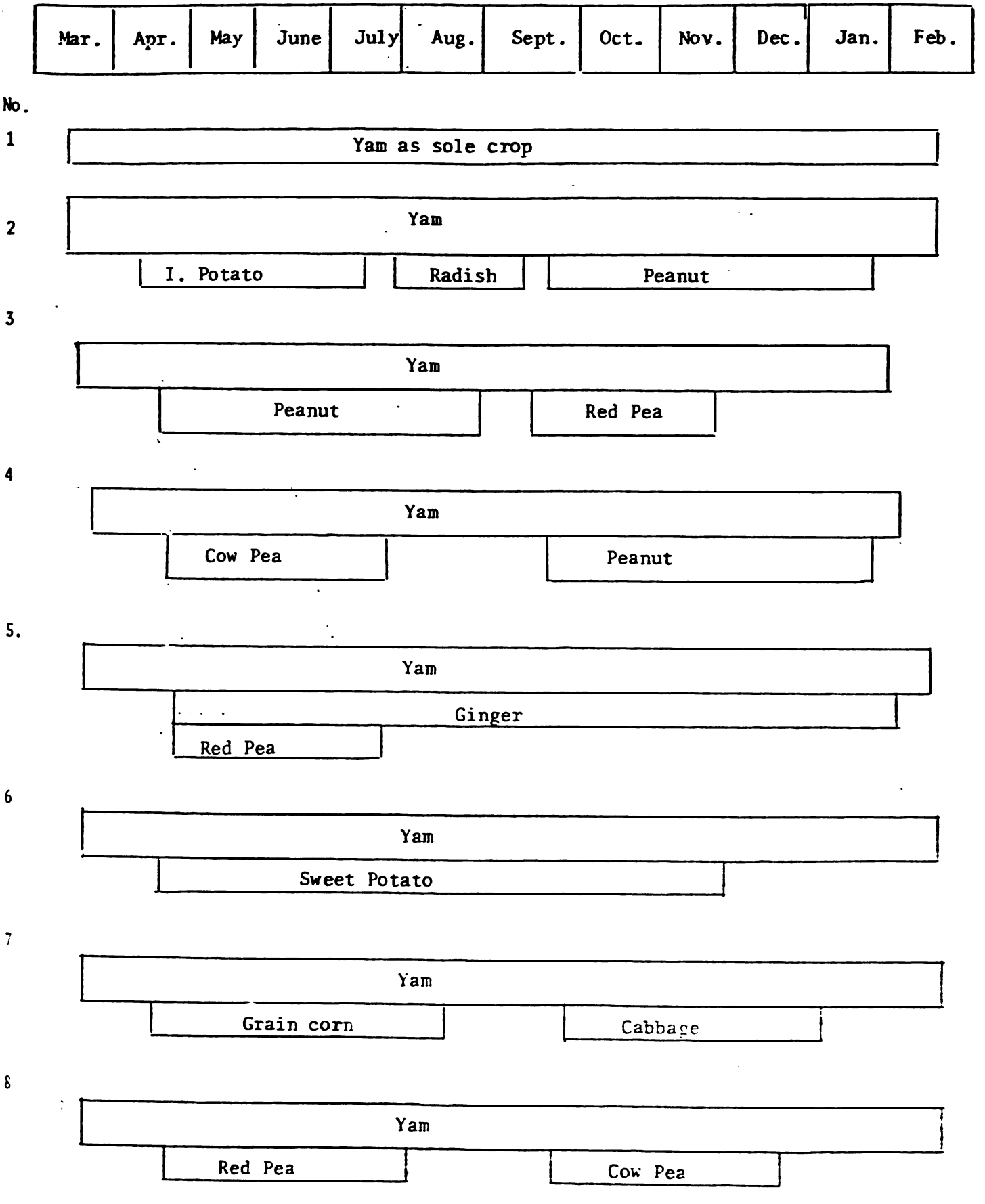


Figure 4

CROPPING SYSTEMS ESTABLISHED
AT ALLSIDES (SITE 1) DURING PERIOD MARCH 1979 TO FEBRUARY 1980



ALLSIDES PILOT DEVELOPMENT PROJECT

CROPPING SYSTEMS (SITE I)

1980-1981 CROP YEAR

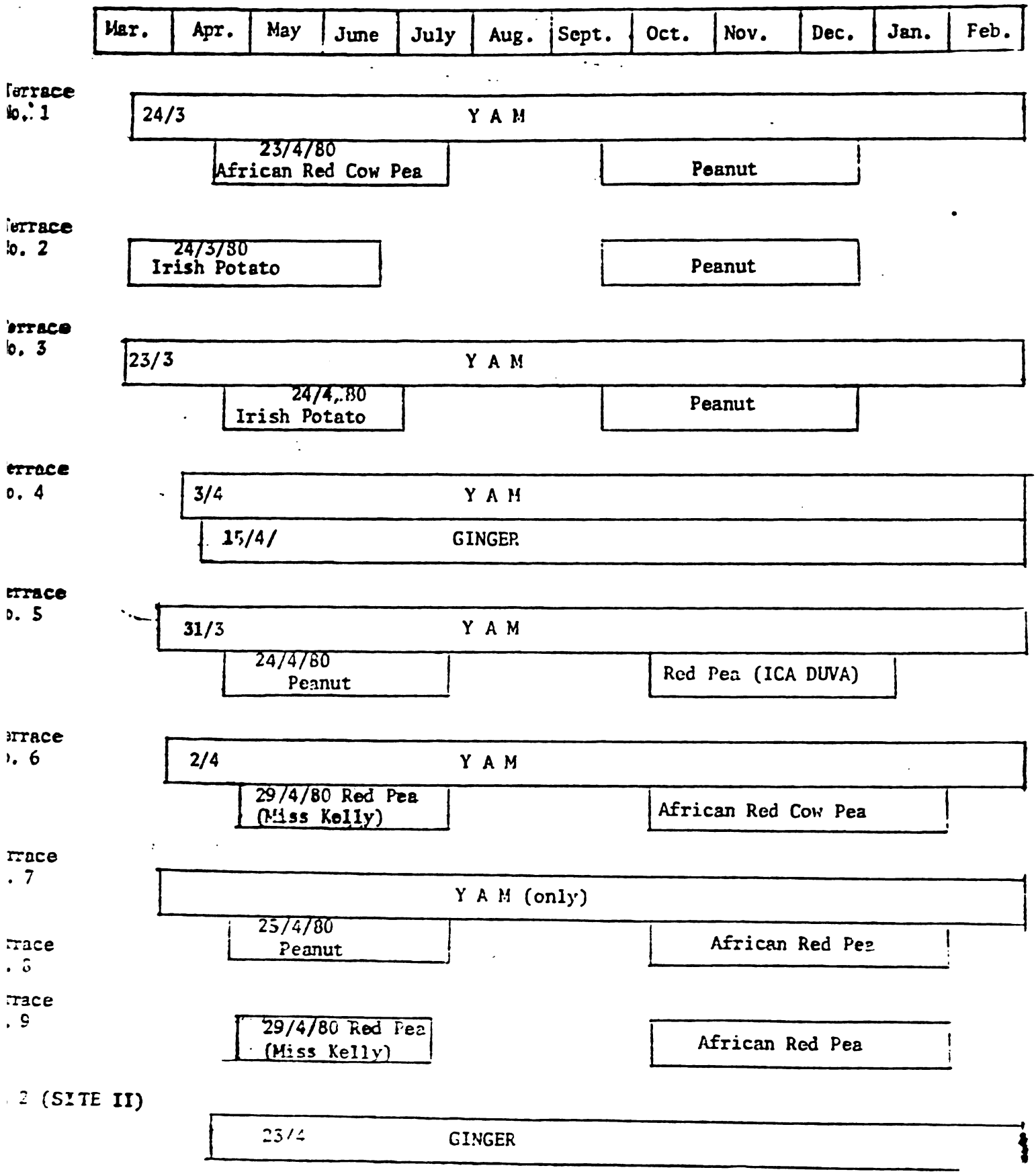
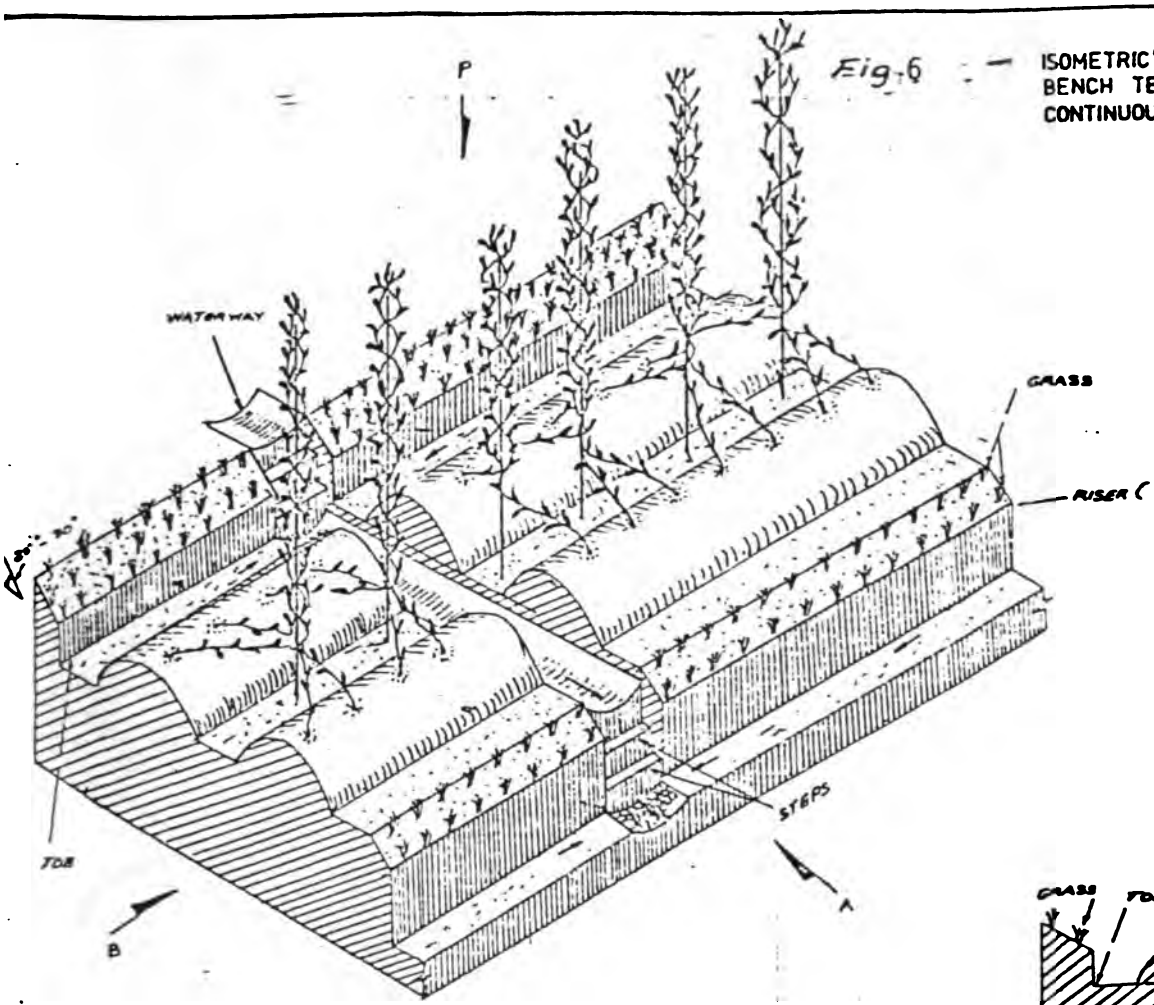
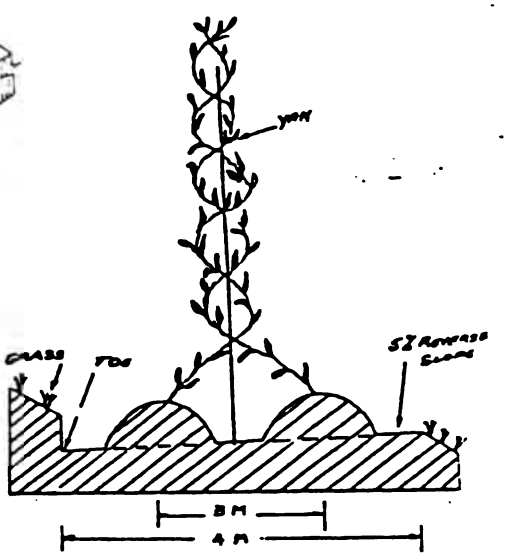


Fig. 6 — ISOMETRIC & SECTIONAL VIEWS OF A BENCH TERRACE WITH YAMS GROWN CONTINUOUS MOUNDS. ALLSIDES/JAMAICA





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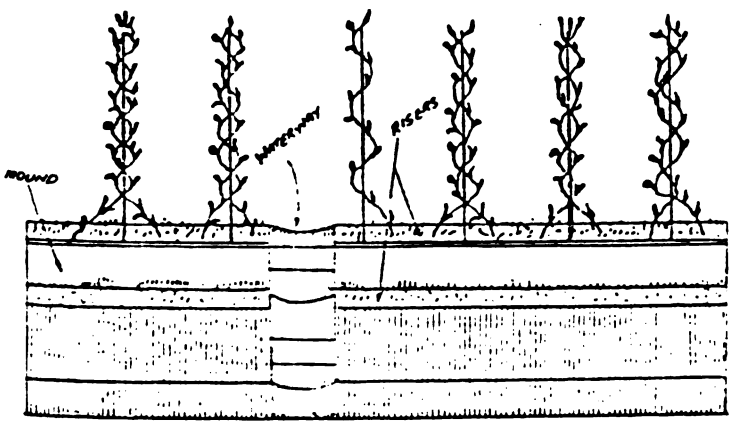

VIEW FROM A

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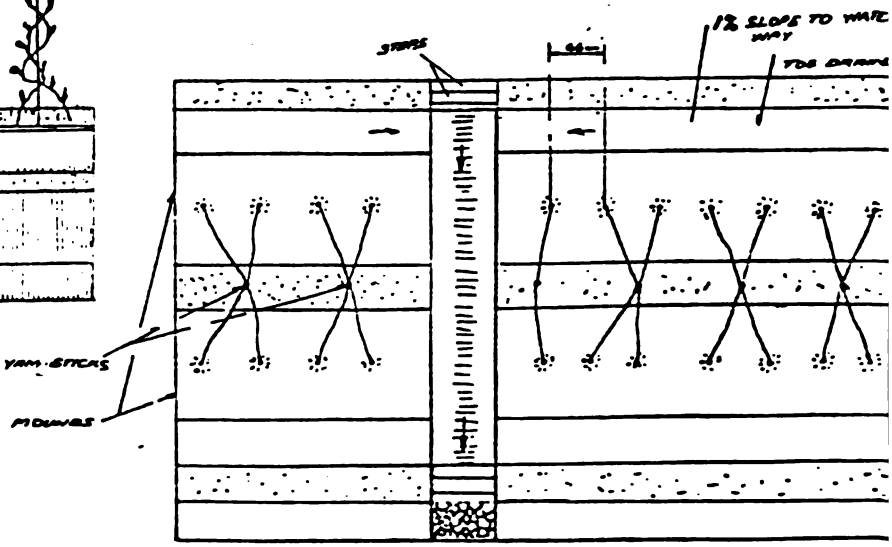
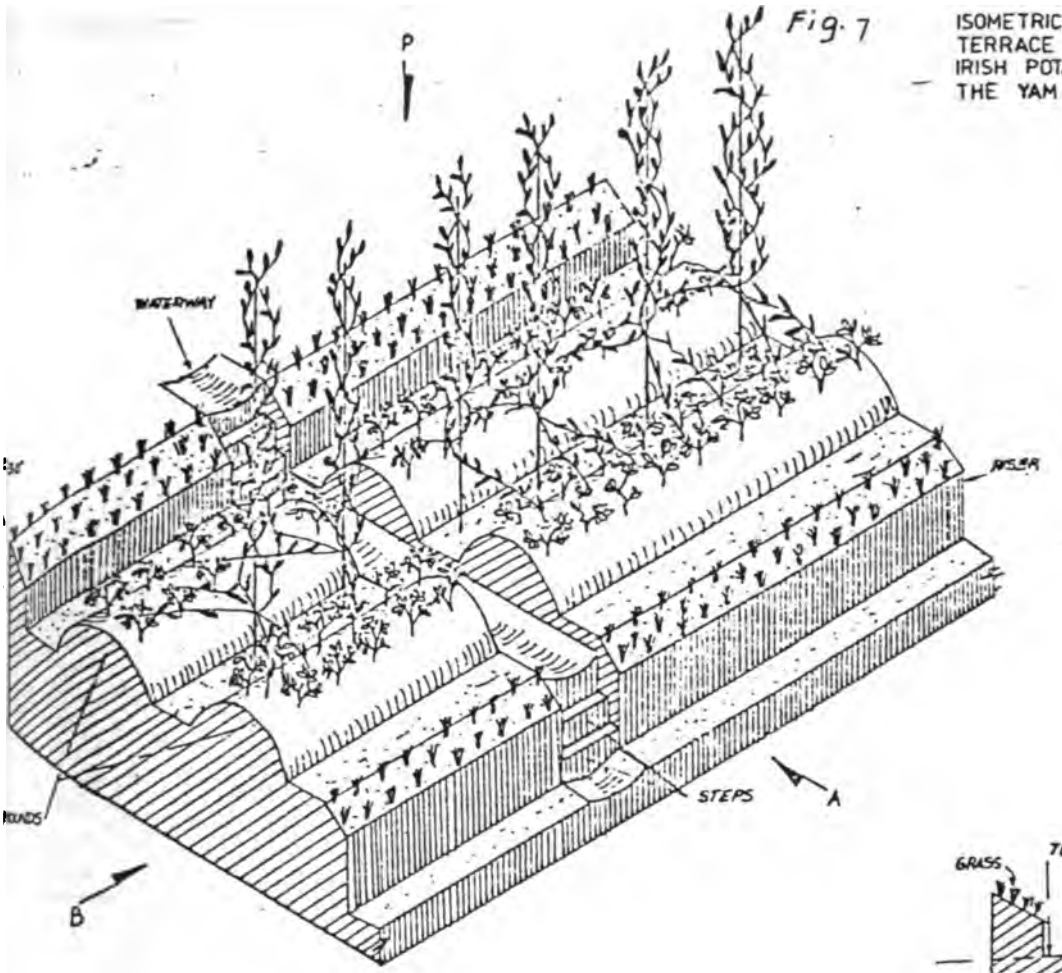
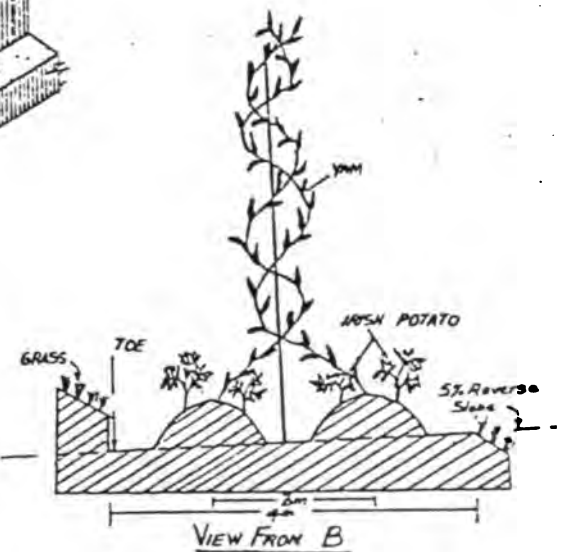


VIEW FROM P

Fig. 7 ISOMETRIC & SECTIONAL VIEWS OF A BENCH TERRACE SHOWING YAMS INTERCROPPED WITH IRISH POTATO DURING THE FIRST HALF OF THE YAM CROP CYCLE. (11 Months)





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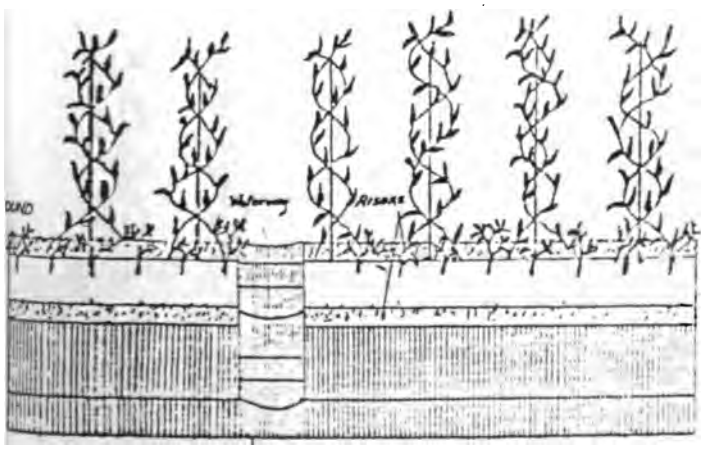

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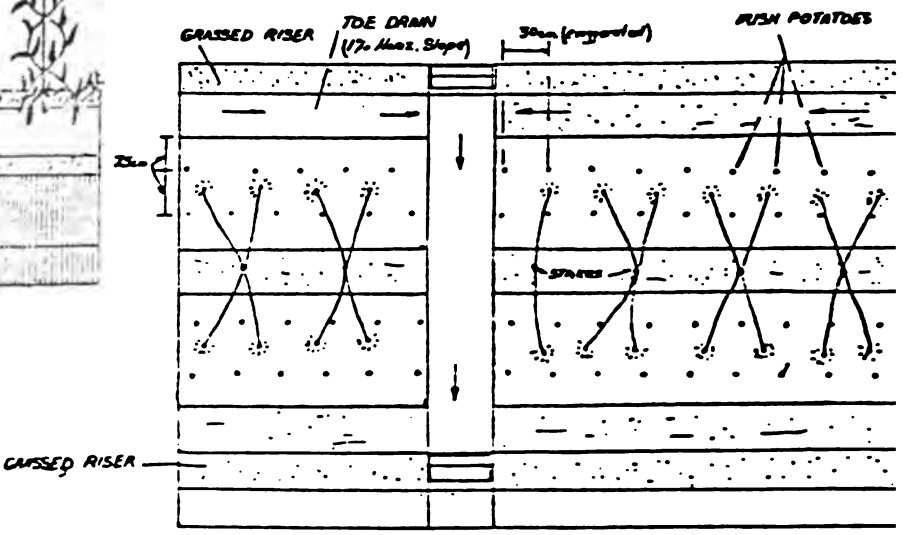

VIEW FROM P

SCALE 1:50
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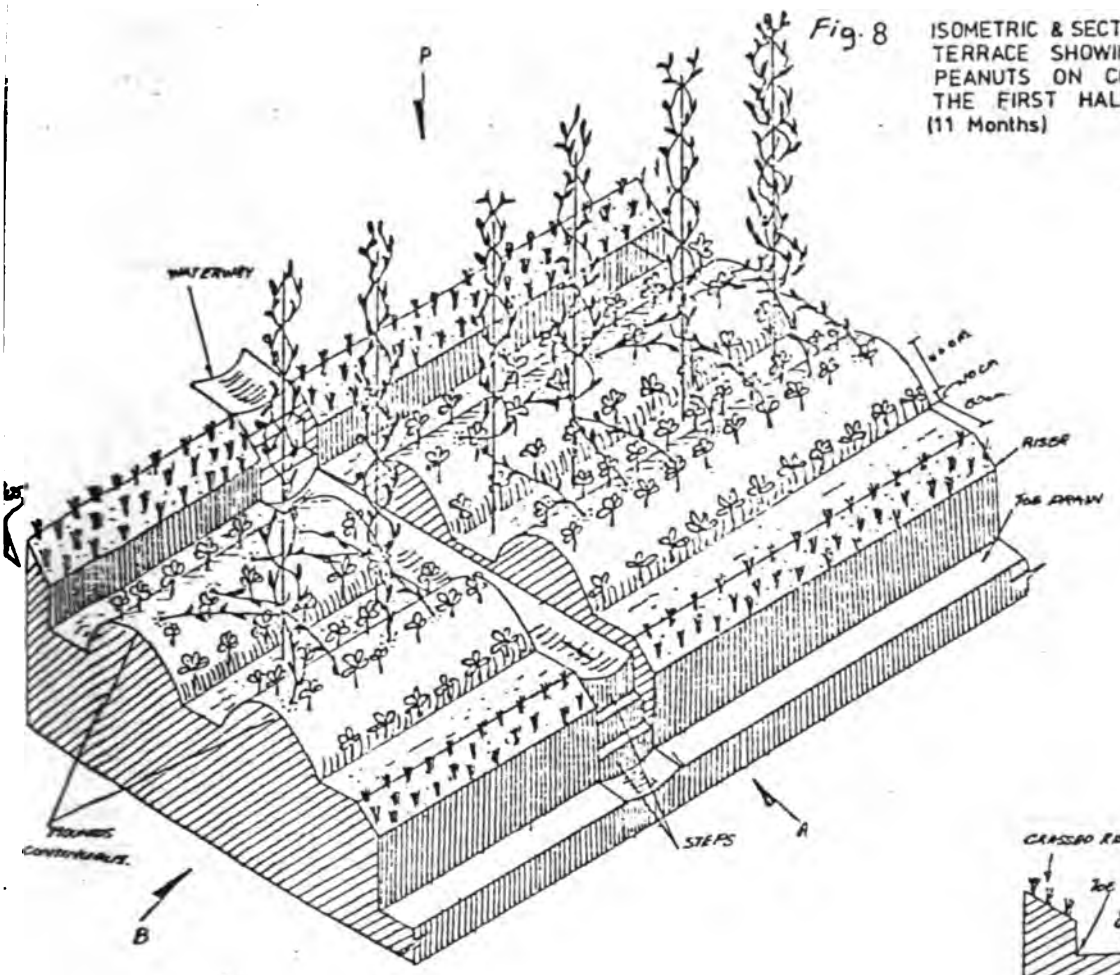
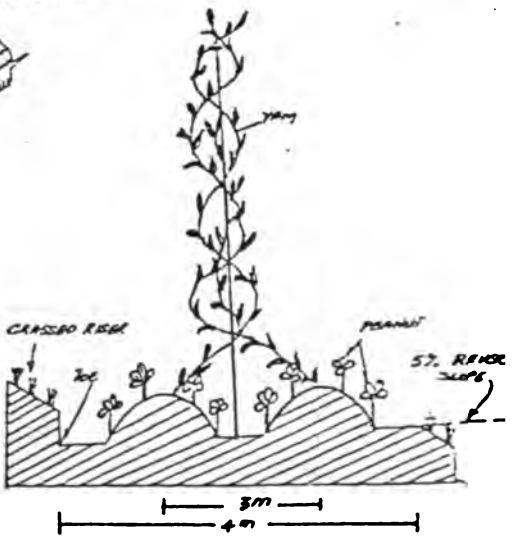
Fig. 8 ISOMETRIC & SECTIONAL VIEWS OF A BENCH TERRACE SHOWING YAMS INTERCROPPED WITH PEANUTS ON CONTINUOUS MOUNDS DURING THE FIRST HALF OF THE YAM CROP CYCLE (11 Months)





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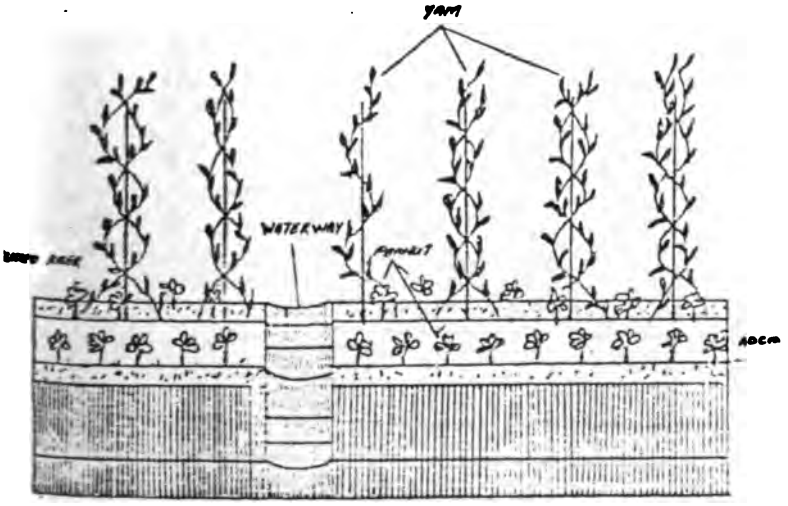

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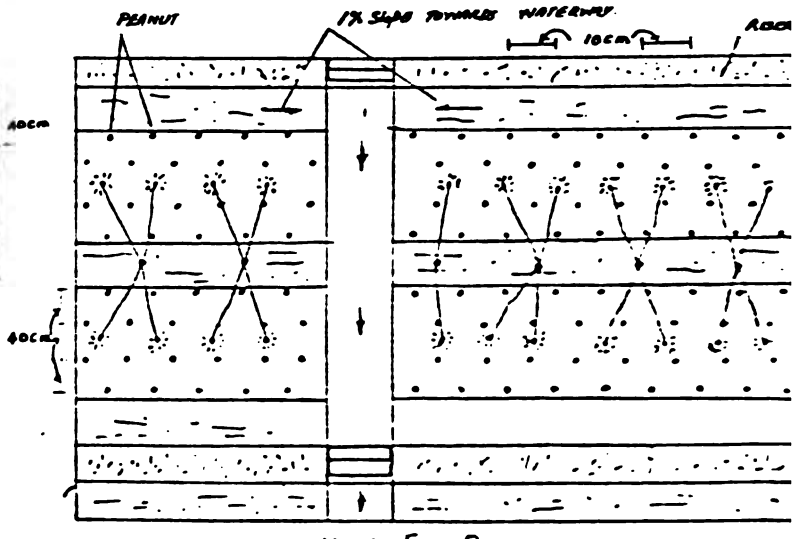

View From D

SCALE 1:50
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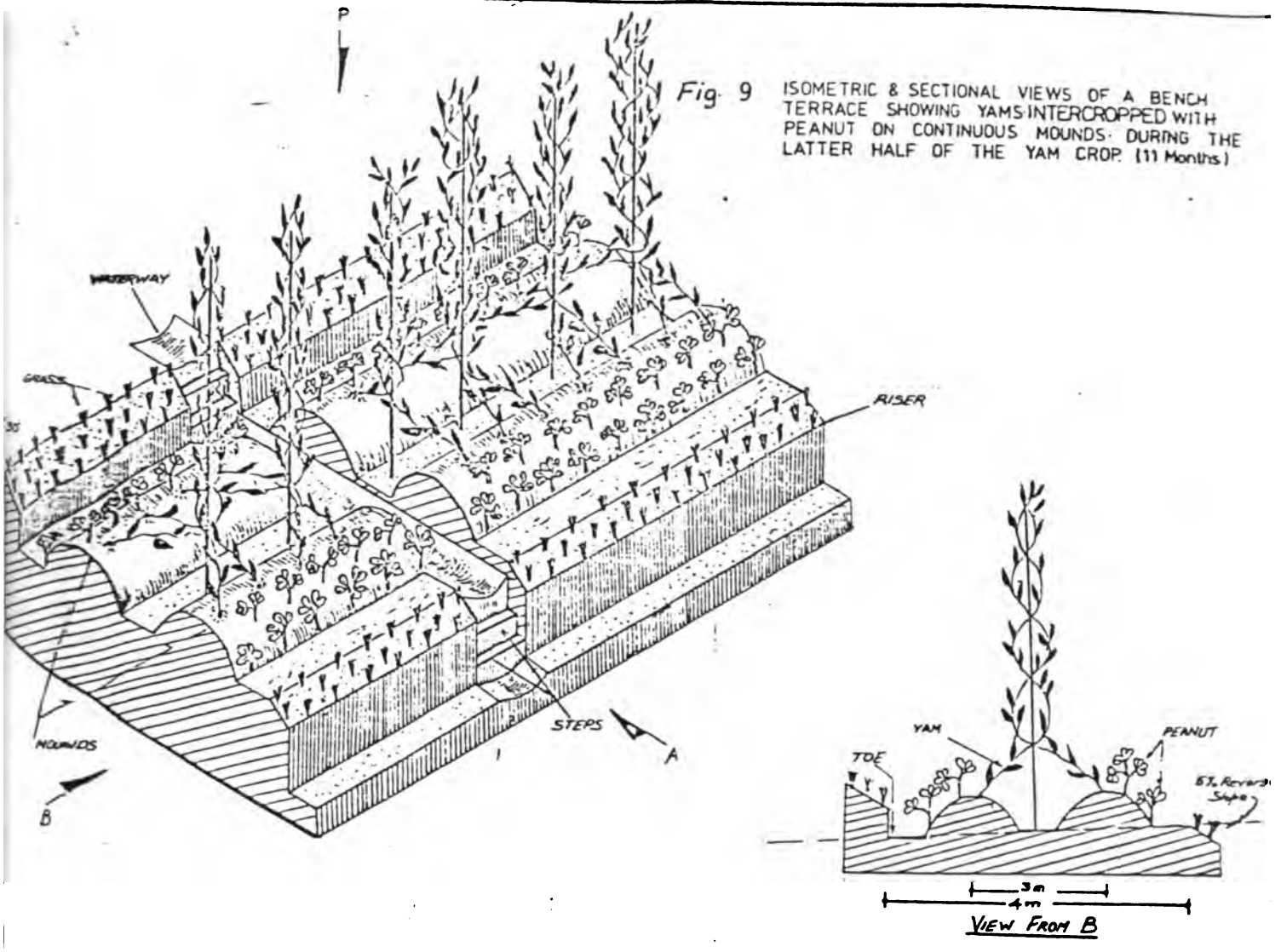
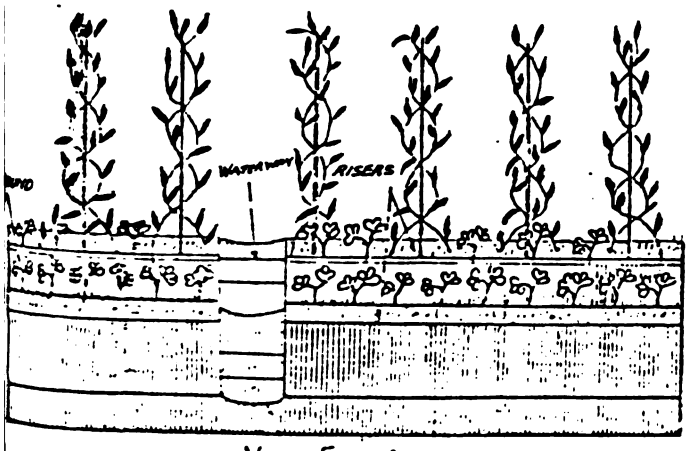
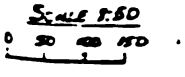


Fig. 9 ISOMETRIC & SECTIONAL VIEWS OF A BENCH TERRACE SHOWING YAMS INTERCROPPED WITH PEANUT ON CONTINUOUS MOUNDS DURING THE LATTER HALF OF THE YAM CROP. (11 Months)





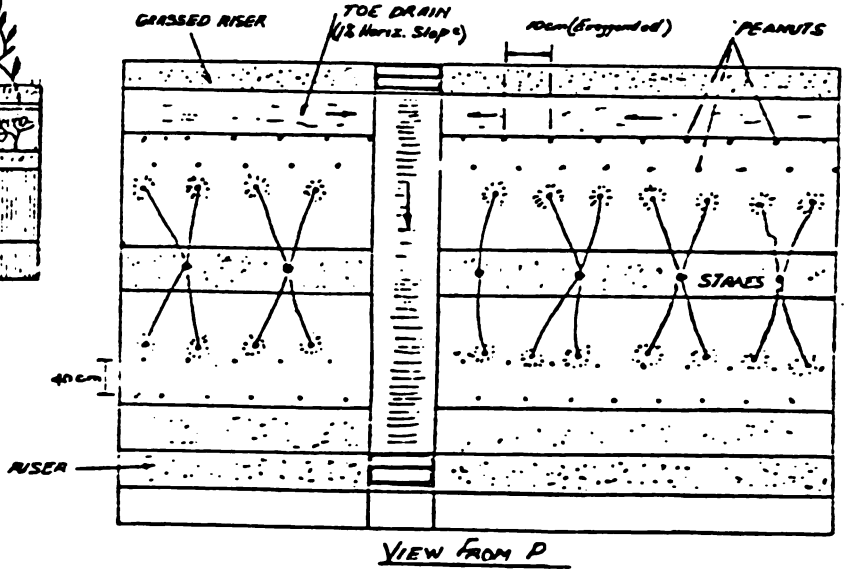
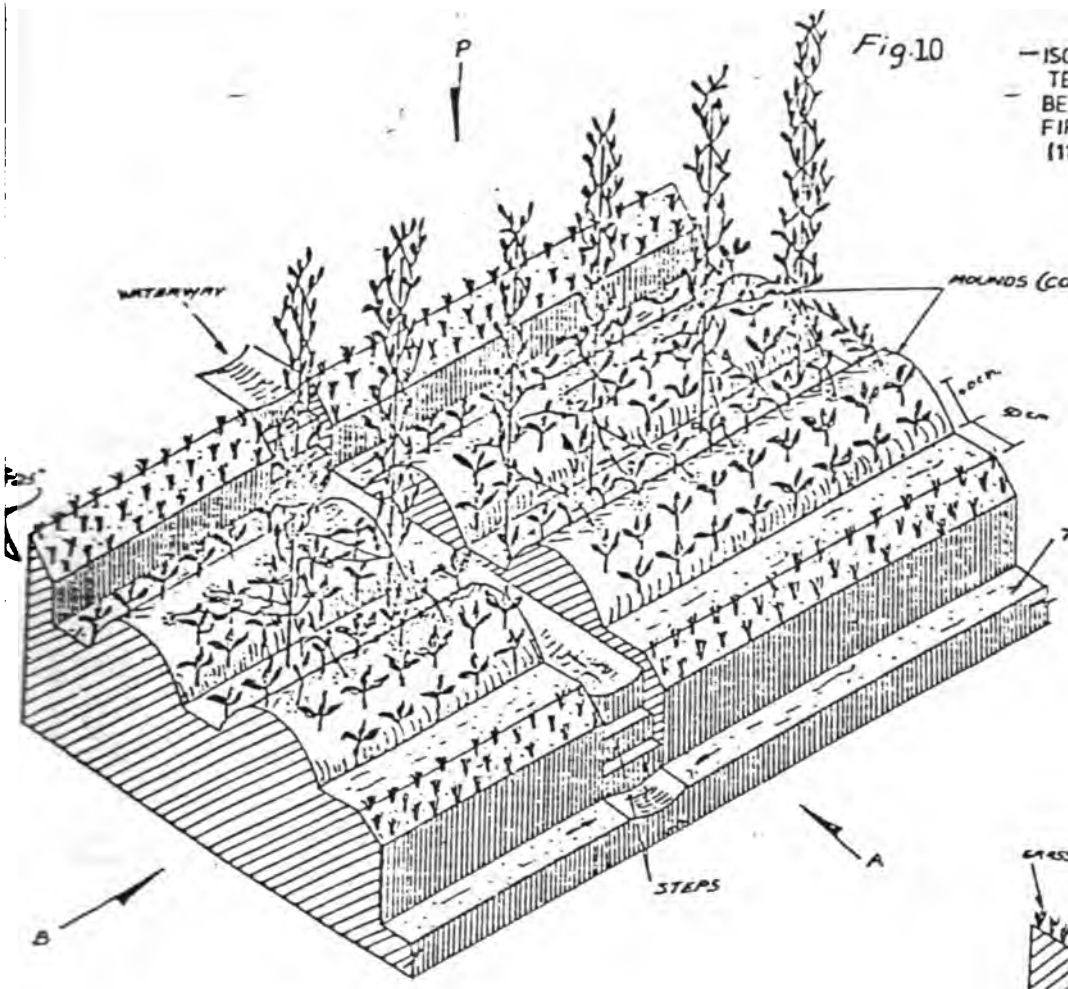
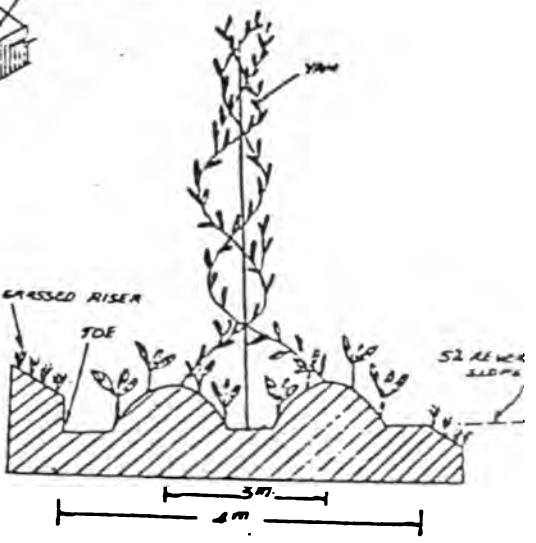
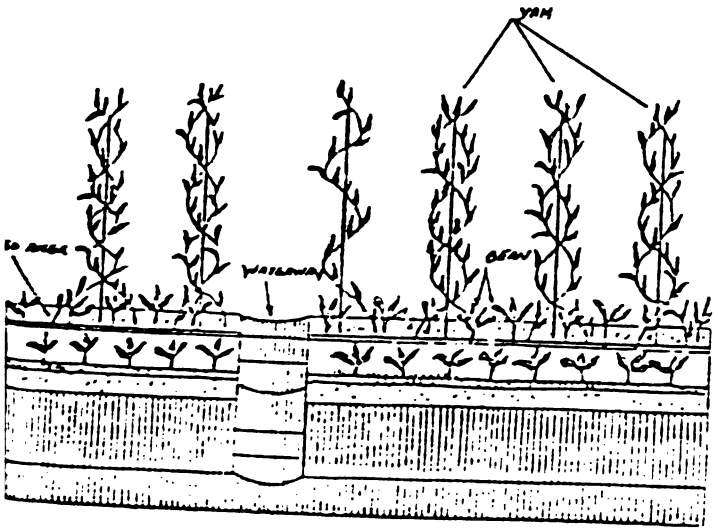


Fig.10 — ISOMETRIC & SECTIONAL VIEWS OF A BENCH TERRACE, SHOWING YAMS INTERCROPPED W BEAN ON CONTINUOUS MOUNDS. DURING THI FIRST HALF OF THE YAM CROP CYCLE (11 MONTHS)





View From B



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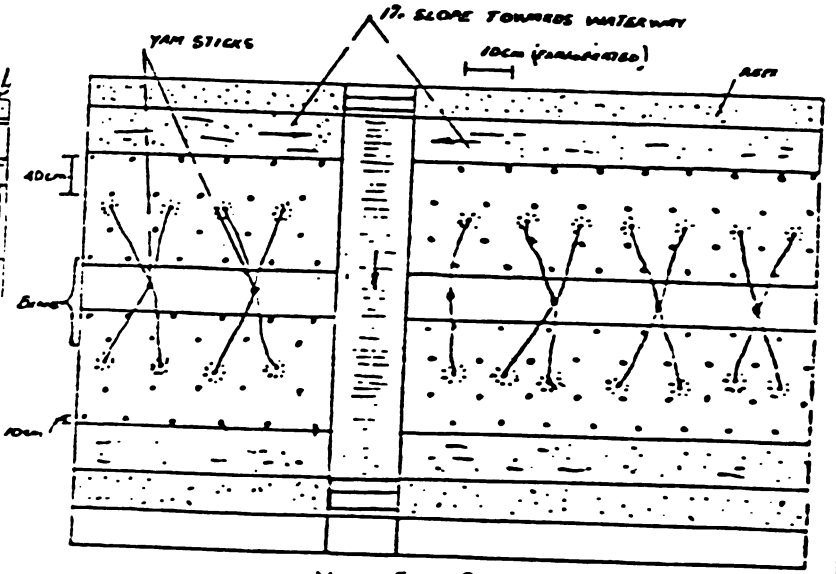

View From D

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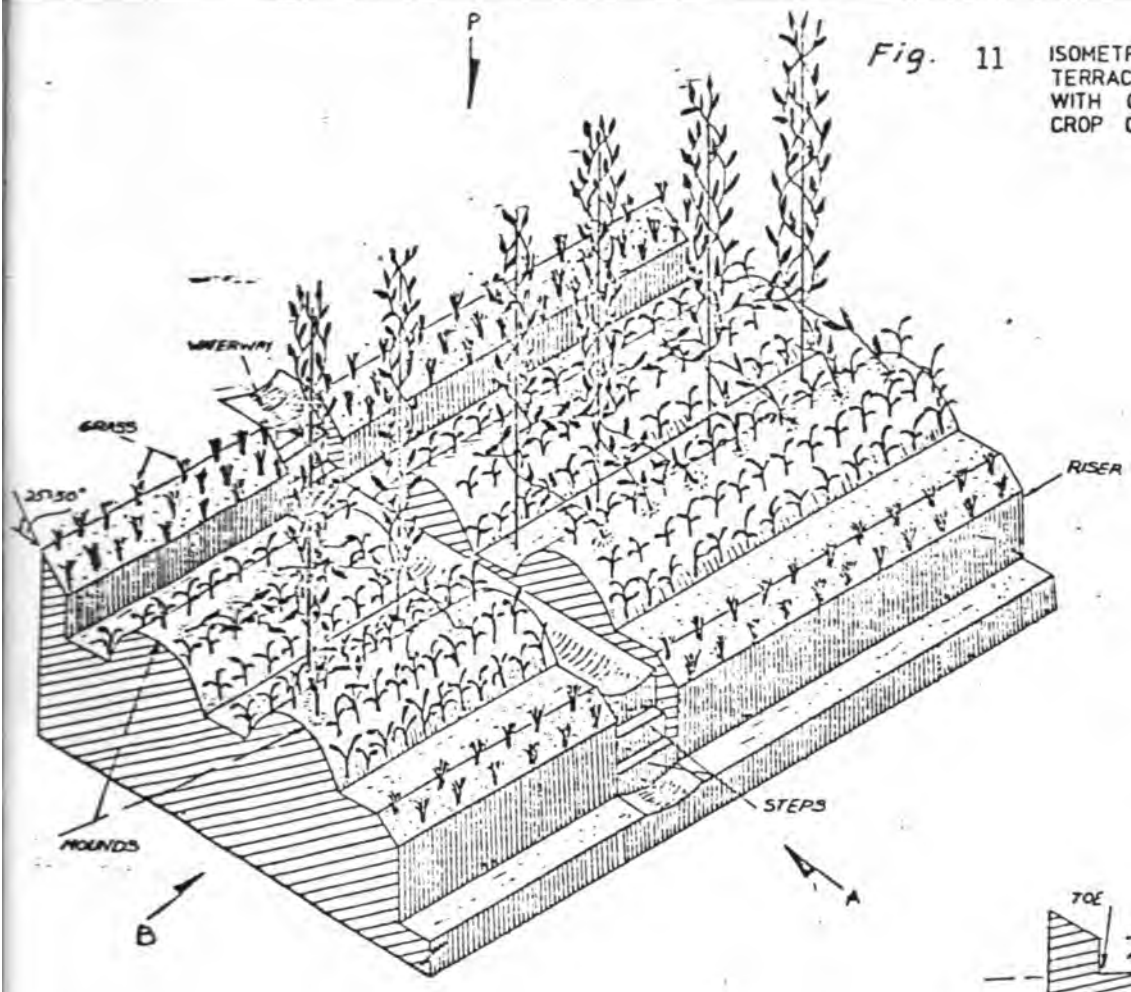
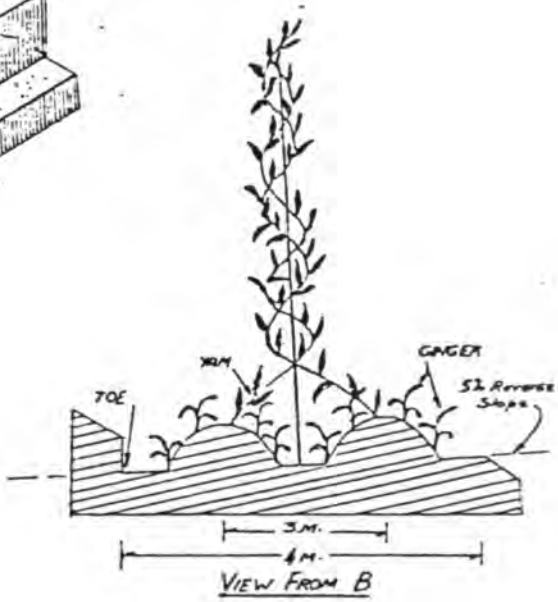
Fig. 11 ISOMETRIC & SECTIONAL VIEWS OF A BENCH TERRACE SHOWING YAMS INTERCROPPED WITH GINGER FOR MOST OF THE YAM CROP CYCLE. (11 Months)





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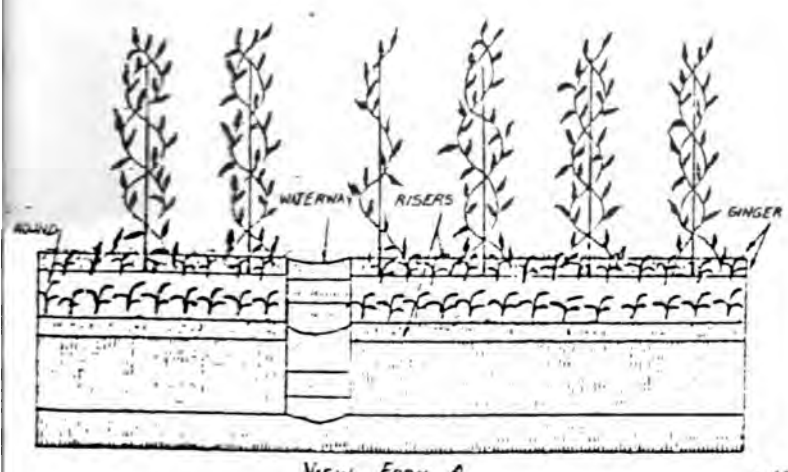

VIEW FROM A

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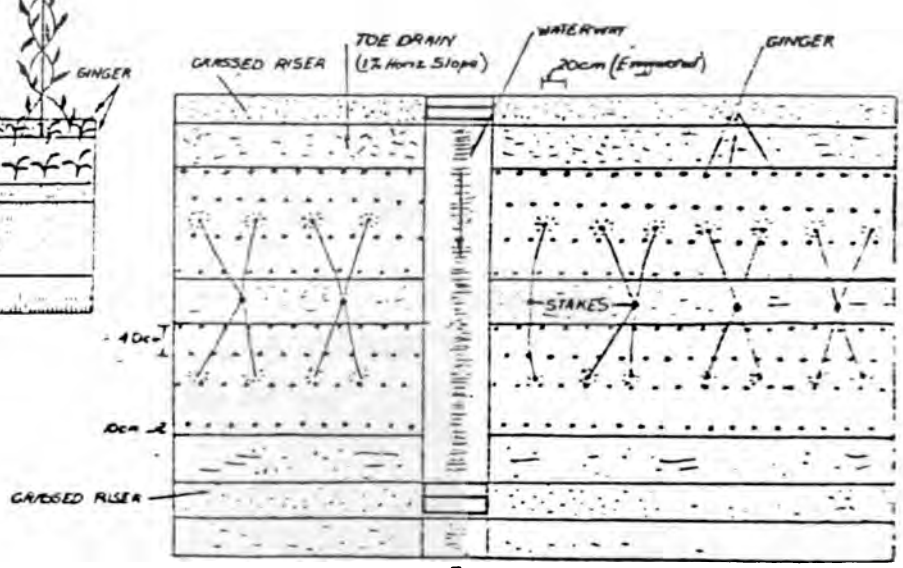

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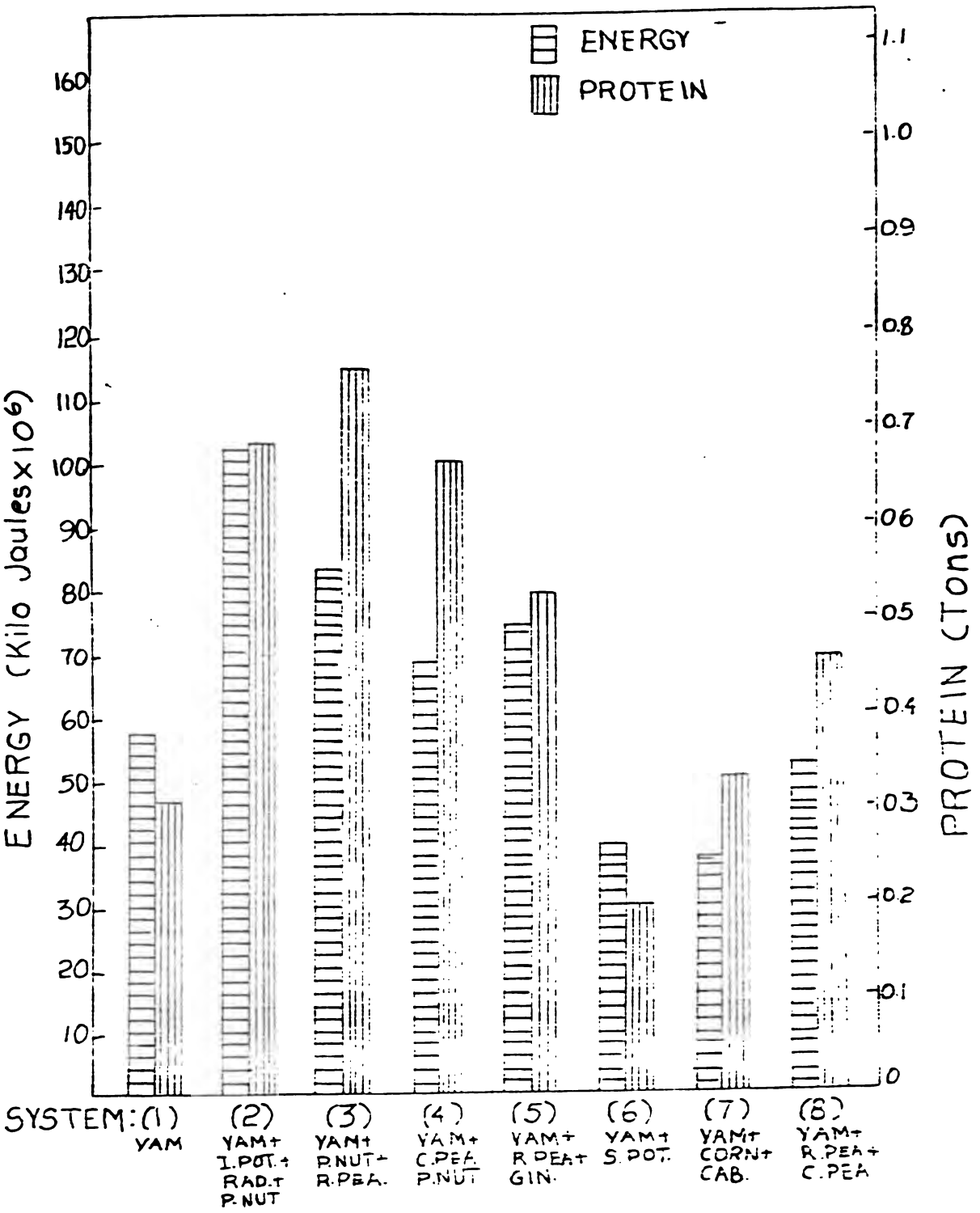

FIG. 12 ENERGY AND PROTEIN VALUES BASED ON MARKETABLE YIELDS PER HECTARE IN 1979-80 OF YAM AS MONOCROP SYSTEM (1) AND SEVEN INTERCROP SYSTEMS (2-8)

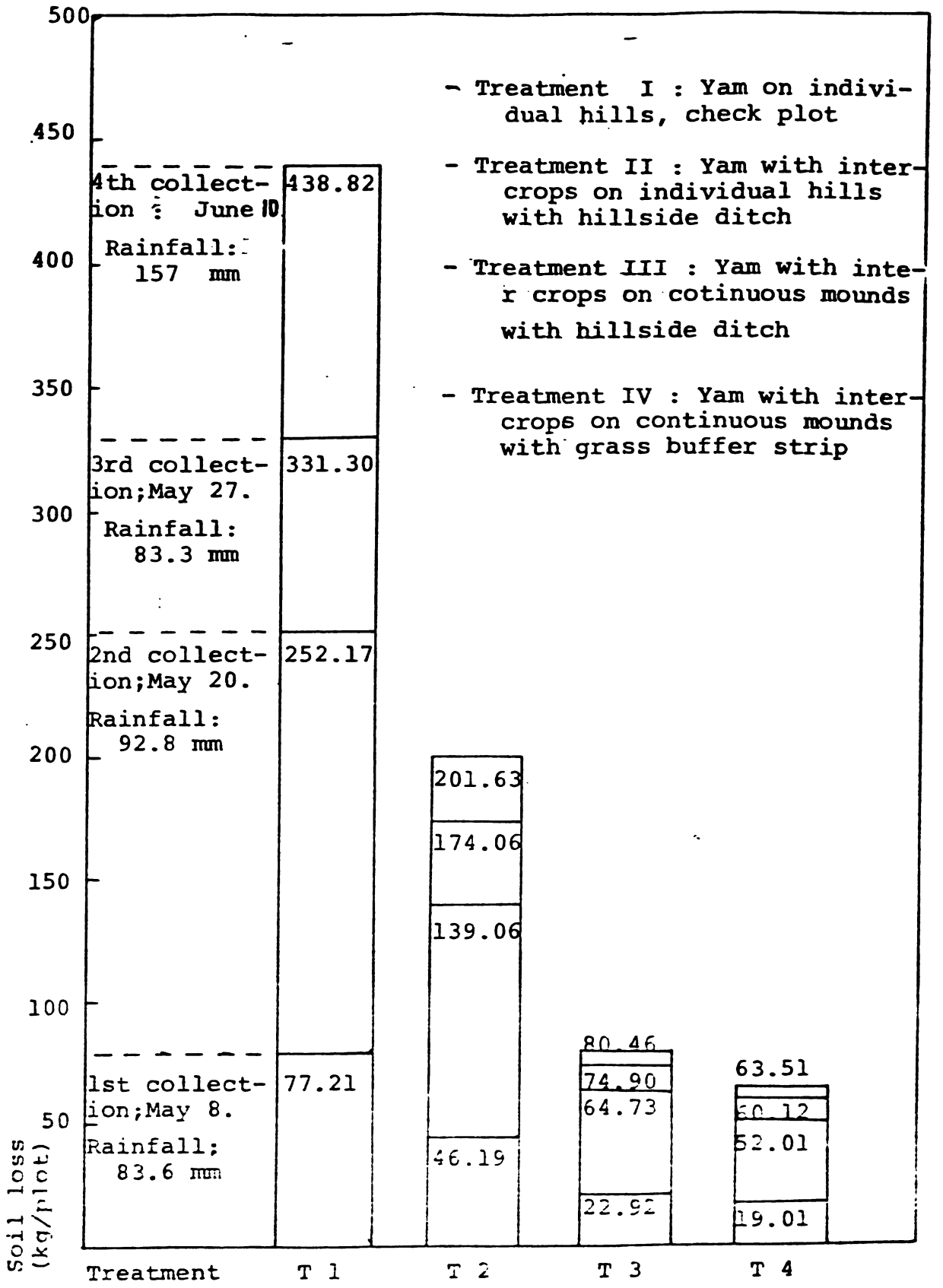

Fig.13 Cummulative soil loss(oven-dry weight) recorded over a two month period from four soil conservation treatments being tested at Clive River, Trelawny

TABLE 1 - MARKETABLE YIELDS OF YELLOW YAM (DIOSCOREA CAYENENSIS) AND OTHER CROPS GROWN ALONE AND IN A POLYCULTURE SYSTEM AT ALLSIDES, KRELAWNY, DURING THE 1977/1978 CROP YEAR

Cropping System	Crops	Marketable Yield (t/ha)	New Yam "Head" Yield (t/ha)	Change in total yam yield over monocrop (%)
1	Yam alone	31.502	16.917	0
2	Yam	36.794	16.692	10.46
	Red Pea	0.552		
	Onion	0.053		
3	Yam	38.752	17.274	15.71
	Sweet Corn	7500*		
	Red Pea	0.124		
4	Yam	35.441	16.713	7.71
	Grain Corn	0.761		
	Irish potatoes	0.489		
5	Yam	34.480	17.289	6.92
	Irish potatoes	9.286		
	Radish	1.587		
	Africa			
6	Ya			
7				

TABLE 2 - MARKETABLE YIELDS OF YELLOW YAMS (DIOSCOREA CAYENENSIS) AND OTHER CROPS GROWN ALONE AND IN A POLYCULTURE SYSTEM AT ALLSIDES, TRELAWNY DURING THE 1978/1979 CROP YEAR

Cropping Systems	Crops	Marketable Yield (t/ha)	New Yam "Head" Yield (t/ha)	Change in Total Yam Yield over Monocrop (%)
1	Yam alone	10.90	10.40	0
2	Yam	14.08	10.74	16.5
	Corn	0.304		
	Pigeon Pea	0.125		
3	Yam	15.82	11.16	26.7
	Red Pea (Ms.Kelly cv)	0.455		
	Ginger	3.058		
4	Yam	12.60	9.78	5.1
	Bodie Bean	2.470 *		
	Onion	0.131		
5	Yam	13.37	8.83	4.2
	Irish Potato	6.15		
	Radish	0.312		
	Cowpea (African red)	0.298		
6	Yam	10.32	9.18	-8.5
	Peanut			
	Sweet			
7	Ya			
8				

TABLE 3 - MARKETABLE YIELDS OF YELLOW YAMS (DIOSCOREA CAYENENSIS) AND OTHER CROPS GROWN ALONE AND IN A POLYCULTURE SYSTEM AT SITE II, ALLSIDES, DURING THE OCTOBER 1970 - NOVEMBER 1979 CROPPING PERIOD

Cropping Systems	Crops	Marketable Yield (t/ha)	New Yam "Head" Yield (t/ha)	Change in Total Yam Yield over Monocrop (%)
1	Yam alone	14.79	12.11	0
2	Yam	9.79	9.42	-28.6
	Peanut	1.46		
	Irish potato	2.47		
	Radish	1.59		
3	Yam	10.56	8.02	-30.9
	Peanut	1.43		
	Irish Potato	2.13		
	Yam	15.16	9.12	-9.7
	Red Pea (African red cv)	0.337		
	Peanut	0.78		

TABLE 4 - MARKETABLE YIELDS OF YELLOW YAM (DIOSCOREA CAYNENSIS) AND OTHER CROPS GRWON EITHER ALONE OR IN A SYSTEM OF POLYCULTURE AT ALLSIDES, TRELAWNY DURING THE PERIOD MARCH 1979 - FEBRUARY 1980

Cropping System	Crops	Marketable Yield (kg/ha)	New Yam "Head" Yield (kg/ha)	Change in Saleable Yam Yield (%)
1	Yam as sole crop	13.03	9.85	0
2	Yam +	9.80	9.88	-14.3
	Irish potato +	13.25		
	Radish +	1.27		
	Peanut	0.77		
3	Yam +	7.53	8.71	-29.3
	Peanut +	2.51		
	Red pea (Ms.Kelly)	0.40		
4	Yam +	8.22	9.06	-24.5
	Cow pea (African red)+	1.50		
	Peanut	0.45		
5	Yam +	9.50	8.02	-23.4
	Red pea (Tom red)	0.34		
	Ginger	13.87		
6	Yam +	7.33	5.12	-45.6
	Sweet potato	1.31		
7	Yam +	13.08	9.92	0.52
	Grain corn +	0.28		
	Cabbage	0.00		
8	Yam +	7.95	8.25	29.2
	Red pea (IICA/Duva)+	0.73		
	Cow pea (African red)	0.43		

TABLE 5 - TOTAL INPUTS, OUTPUTS AND NET BENEFITS OF EIGHT CROPPING SYSTEMS VALIDATED AT ALLSIDES, TRELAWNY DURING THE PERIOD MARCH 1979 - FEBRUARY 1980

Cropping System	Cropping Pattern	Input Costs/System/ha			Outputs by crop component/ha	Return from System 1	% Increase (Decrease) over yam monocrop
		Labour	Materials	Total			
1	Yam as sole crop	3,320.65	8,499.03	11,729.68	17,277.65	5,547.97	)
2	Yams +				15,165.68		
	Irish Potato +				9,110.00		
	Radish +				2,797.81		
	Peanut				1,689.70		
	Total for System	6,520.96	10,527.20	17,048.16	28,763.39	11,715.23	111
3	Yam +				12,643.31		
	Peanut +				5,536.14		
	Red Pea				2,194.50		
	System totals	7,161.22	9,897.66	17,058.88	20,373.95	3,315.07	-4
4	Yam +				13,407.06		
	Cow pea +				6,600.00		
	Peanut				984.74		
	System totals	6,019.73	9,125.46	15,145.19	20,991.80	5,846.61	5
5	Yam +				13,335.62		
	Red pea +				1,881.00		
	Ginger				15,271.87		
	System totals	5					
6	Yam +						
	Sweet potato						
	System totals						
7	Yam +						
	Corn						
	Ca						
	Syst						
8							

1 kcal (kilocalorie) = 4.184 kJ (kilojoules)

Table 6 - Nutritional values based on Marketable yields per hectare of eight cropping systems established at Allsides (Site 1) 1979-1980

		Crop yield (tons)	kJx10^6	kcalx10^6	Protein yield (tons)	Carbo-hydrate yield (tons)
System I	Yam	13.03	57.25	13.68	0.31	3.14
System 2	Yam	9.79	43.01	10.28	0.24	2.36
	Irish Potato	13.25	45.46	10.63	0.27	2.52
	Radish	1.27	1.06	0.25	0.01	0.53
	Peanut (shelled)	0.58	13.57	3.24	0.17	0.11
	Total		102.10	24.40	0.69	5.51
System 3	Yam	7.53	33.08	7.91	0.18	1.82
	Peanut (shelled)	1.89	44.48	10.63	0.49	0.34
	Red Pea	0.40	5.63	1.35	0.09	0.24
	Total		83.19	19.99	0.76	2.40
System 4	Yam	8.22	36.11	8.63	0.20	1.98
	African Red Cowpea	1.50	23.79	5.69	0.38	0.88
	Peanut (shelled)	0.35	8.14	1.95	0.09	0.06
	Total		68.04	16.27	0.67	2.92
System 5	Yam	9.50	41.74	9.98	0.23	2.29
	Red Pea	0.34	4.82	1.15	0.08	0.21
	Ginger (fresh)	13.87	27.28	6.52	0.22	1.25
	Total		73.84	17.65	0.53	3.75
System 6	Yam	7.33	32.20	7.697	0.18	1.767
	Sweet Potato	1.31	6.41	1.53	0.02	0.359
	Total		38.61	9.22	0.20	2.12
System 7	Yam	13.08	34.93	13.73	0.31	3.15
	Sweet Corn	0.47	1.89	0.45	0.02	0.10
	Cabbage	-				
	Total		36.82	14.18	0.33	3.25
System 8	Yam	7.95	34.93	8.35	0.19	1.92
	Red Pea	0.73	10.26	2.45	0.16	0.44
	African Red Cowpea	0.43	6.79	1.62	0.11	0.05
	Total		51.98	12.42	0.45	2.41

Notes.

Values given were computed from (i) C.F.N.I., 1974 Food Composition Tables For Use in the English-Speaking Caribbean; and, for African Red Cowpea only from (ii) Research and Development Department, Ministry of Agriculture. (Jamaica) 1980, Legume Seminar. The Nutritive Value of Legumes pp 26-32

1 kcal (kilocalorie) = 4.184 kJ (kilojoules)

TABLE 7 - COMPARING NUTRITIONAL VALUES OF MARKETABLE CROP YIELDS PER HECTARE OF YAM MONOCROP SYSTEM WITH THOSE OF SEVEN OTHER CROPPING SYSTEMS

Cropping System	% Increase over yam monocrop in quantity of: Energy	Protein	Carbohydrate
2. Yam + Irish Potato + Radish + Peanut	78	118	76
3. Yam+Peanut+Red Pea	46	143	-23
4. Yam+Cowpea (African Red)+Peanut	19	113	- 7
5. Yam+Red Pea+Ginger	29	68	19
6. Yam+Sweet potato	-33	-38	-32
7. Yam+Sweet corn+Cabbage	4	6	4
8. Yam+Red pea+Cowpea (African red)	-9	45	-23

Table 8 : Comparison of Monthly Labour Inputs (man-days) per Hectare for Cropping Systems Established at Allsides During the 1979-1980 Crop Year and those of Farmers

Month	Farmers *	CROPPING SYSTEM 1	2	3	4	5	6	7	8
March	55	147	147	147	147	147	147	147	147
April	50	54	90	203	68	120	69	81	111
May	20	18	31	18	41	18	18	24	18
June	31	0	11	6	3	4	19	3	21
July	0	12	140	16	150	67	12	18	218
August	0	0	44	157	0	22	0	4	0
September	25	17	49	54	53	17	17	31	85
October	6	6	7	8	6	6	6	6	9
November	24	9	10	41	11	9	16	9	14
December	0	0	1	0	2	0	0	0	31
January	50	1	57	52	109	1	1	1	1
February	62	52	52	0	0	86	52	52	52
Total	323	316	639	700	590	497	357	376	707

* Traditional practices

CROPPING SYSTEMS:

1. Yam as sole crop
2. Yam & Irish potato & Radish & Peanut
3. Yam & Peanut & Red pea
4. Yam & Cow pea (African red) & Peanut
5. Yam & Red pea & Ginger
6. Yam & Sweet potato
7. Yam & Corn & Cabbage
8. Yam & Red pea & Cow pea

FECHA DE DEVOLUCION