NVO-269-35
HEALTH AND
SAFETY

RADIOLOGICAL SURVEY OF PLANTS, ANIMALS, AND SOIL IN MICRONESIA

NOVEMBER 1975

By
Victor A. Nelson

JANUARY 1979

UNIVERSITY OF WASHINGTON
COLLEGE OF FISHERIES
LABORATORY OF RADIATION ECOLOGY
SEATTLE, WASHINGTON 98105

PREPARED FOR THE U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
UNDER CONTRACT NO. EY-76-S-08-0269

DISCLAIMER

ABSTRACT

In 1974 the Laboratory of Radiation Ecology began a program to determine the radionuclides found in foods, plants, animals, and soils of the Central Pacific. As part of this program the present study was undertaken to determine radionuclides found in the common foods and soils in areas of Micronesia other than those areas receiving local fallout from the test sites at Bikini or Enewetak atolls. Areas sampled in 1975 were Majuro Atoll in the Marshall Islands, Truk and Ponape in the Caroline Islands, Guam in the Marianas Islands and Koror and Babelthaup in the Palau Islands.

All samples were analyzed for gamma-emitting radionuclides while some were also analyzed for ^{90}Sr or $^{239,240}Pu$. Results of the analyses indicate that naturally occurring ^{40}K is the predominant radionuclide in the biological samples. Cesium-137 in amounts less than 1 pCi/g (dry) was the only fallout radionuclide detected in most of the biological samples. Soil samples usually contained ^{90}Sr, ^{137}Cs, ^{238}U and $^{239,240}Pu$, while soil from Truk, Palau, and Ponape also contained isotopes of radium and thorium. Soil from Guam also contained ^{210}Pb and ^{235}U in addition to the above radionuclides. Considering only the fallout radionuclides, the values for ^{90}Sr, ^{137}Cs, and $^{239,240}Pu$ in samples from Guam, Palau, Truk, Ponape, and Majuro are less than the values for these radionuclides in similar samples from atolls such as Utirik, Rongerik, and Ailinginae in the northern Marshall Islands, and are much less than values of these radionuclides in samples from Bikini and Rongelap atolls.

TABLE OF CONTENTS

PAGE NO.

ABSTRACT i

INTRODUCTION 1

SAMPLING PROGRAM 1

ANALYTICAL METHODS 5
- GAMMA-RAY SPECTROMETRY. 5
- STRONTIUM-90 AND PLUTONIUM ANALYSES 7
- ERROR LIMITS. 7
- LIMITS OF DETECTION 7

RESULTS AND DISCUSSION 8
- FISH. 8
- COCONUT CRABS 11
- PLANTS. 12
- SOIL. 12

SUMMARY AND CONCLUSIONS. 14

REFERENCES 16

APPENDIX TABLES. 17

DISTRIBUTION LISTS 29

FIGURES

FIGURE

1. SAMPLING LOCATIONS IN MICRONESIA, NOVEMBER 1975 2

2. LOCATIONS SAMPLED AT PONAPE, TRUK, GUAM, AND PALAU IN DECEMBER, 1975. 3

3. LOCATIONS SAMPLED AT MAJURO ATOLL IN NOVEMBER, 1975 4

TABLE OF CONTENTS (CONTINUED)

TABLES

TABLE		PAGE NO.
1.	DISPOSITION OF SAMPLES COLLECTED ON THE NOVEMBER, 1975 TRIP TO MICRONESIA	6
2.	COMMON NAMES AND WET WEIGHT TO DRY WEIGHT RATIOS OF SOME MICRONESIAN ORGANISMS	9

APPENDIX TABLES

1.	PREDOMINANT RADIONUCLIDES IN FISH COLLECTED IN MICRONESIA IN NOVEMBER, 1975	17
2.	SOME RADIONUCLIDES IN PLANTS COLLECTED ON MAJURO ATOLL IN NOVEMBER, 1975.	19
3.	SOME RADIONUCLIDES IN PLANTS COLLECTED IN PONAPE DISTRICT IN NOVEMBER, 1975	20
4.	SOME RADIONUCLIDES IN PLANTS COLLECTED IN TRUK DISTRICT IN NOVEMBER, 1975	21
5.	SOME RADIONUCLIDES IN PLANTS COLLECTED IN THE PALAU ISLANDS IN NOVEMBER, 1975	22
6.	SOME RADIONUCLIDES IN PLANTS COLLECTED IN GUAM IN NOVEMBER, 1975.	23
7.	SOME RADIONUCLIDES IN SOIL COLLECTED ON MAJURO ATOLL IN NOVEMBER, 1975	24
8.	SOME RADIONUCLIDES IN SOIL COLLECTED IN THE PONAPE DISTRICT IN NOVEMBER, 1975	25
9.	SOME RADIONUCLIDES IN SOIL COLLECTED AT TRUK IN NOVEMBER, 1975.	26
10.	SOME RADIONUCLIDES IN SOIL COLLECTED IN THE PALAU ISLANDS IN NOVEMBER, 1975	27
11.	SOME RADIONUCLIDES IN SOIL COLLECTED ON GUAM IN NOVEMBER, 1975.	28

INTRODUCTION

From 1946 to 1962 atomic devices were detonated by the United States under water, over water, on land or in the atmosphere over the water of the central Pacific. France and Great Britain also conducted atmospheric nuclear tests in the Central and South Pacific which have released radioactivity to the environment of this area. Most of these tests took place at Bikini and Enewetak atolls in the Marshall islands and some at Johnston Island and Christmas Island further east. The distribution of radionuclides produced by the U. S. tests has been studied extensively, especially at Bikini and Enewetak atolls. The present study is part of a Laboratory of Radiation Ecology program begun in 1974 and described in a previous report (Nelson, 1977). The purpose of this study was to determine qualitatively and quantitatively, radionuclides presently found in common foods and soils in areas of Micronesia other than those areas receiving local fallout during the test periods. Areas sampled were Majuro Atoll in the Marshall Islands, Truk and Ponape in the Caroline Islands, Guam in the Marianas Islands and Koror and Babelthaup in the Palau Islands. Data from samples collected in these areas will provide a comparison with the amounts and kinds of radionuclides found in similar samples from Bikini and Enewetak atolls.

SAMPLING PROGRAM

The areas mentioned above were visited in November 1975. In Figure 1 these areas are shown in relationship to the test sites at Bikini and Enewetak atolls, while in Figures 2 and 3 the collection sites within these areas are shown. The trip was a joint survey with personnel from Brookhaven National Laboratory (BNL) who took radiation survey readings with sodium iodide (NaI) scintillation detectors and a pressurized ion chamber. The results of the survey readings will be given in a separate BNL report. Personnel from our

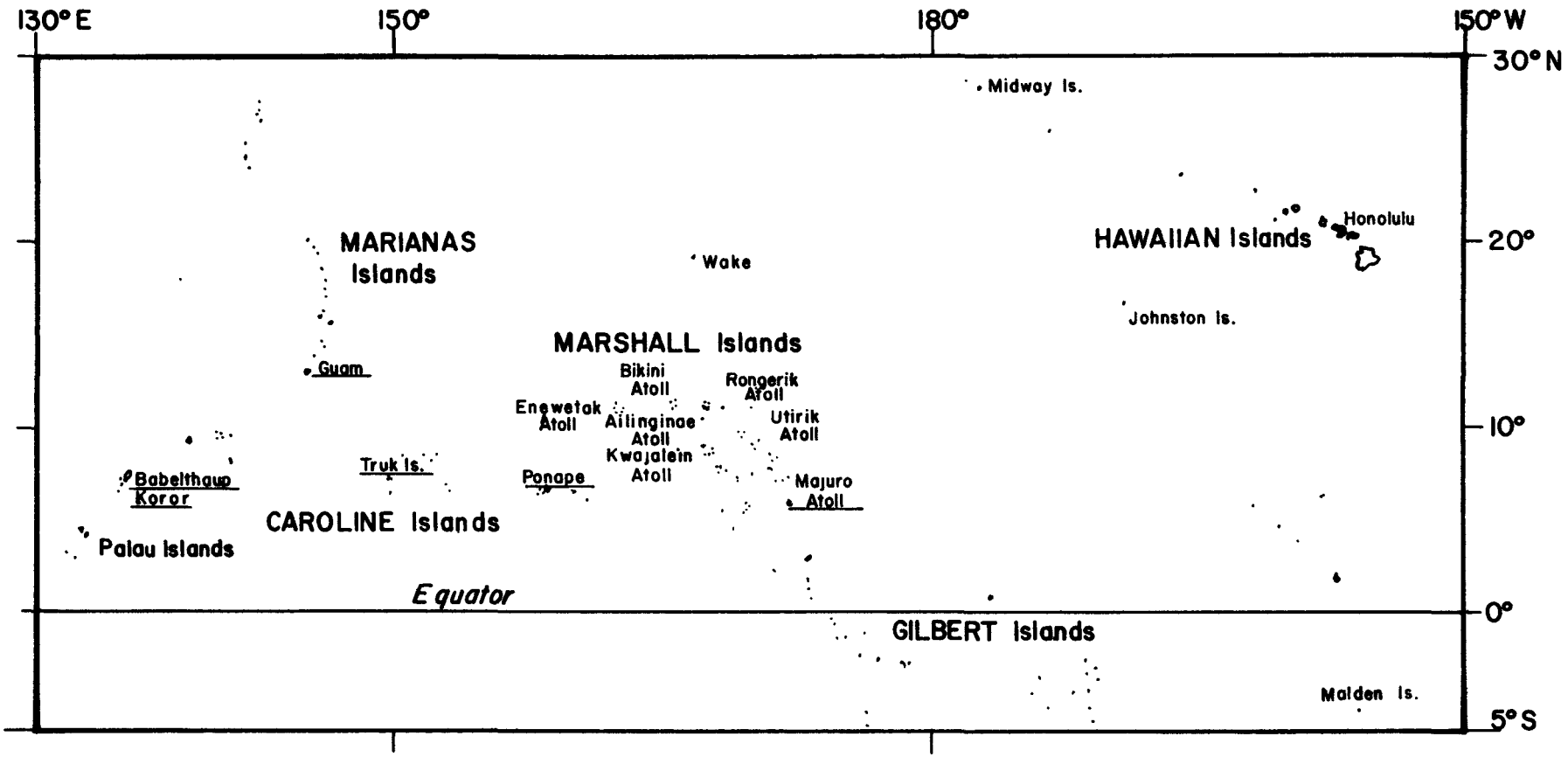

Figure 1. Sampling locations (underlined) in Micronesia, November 1975.

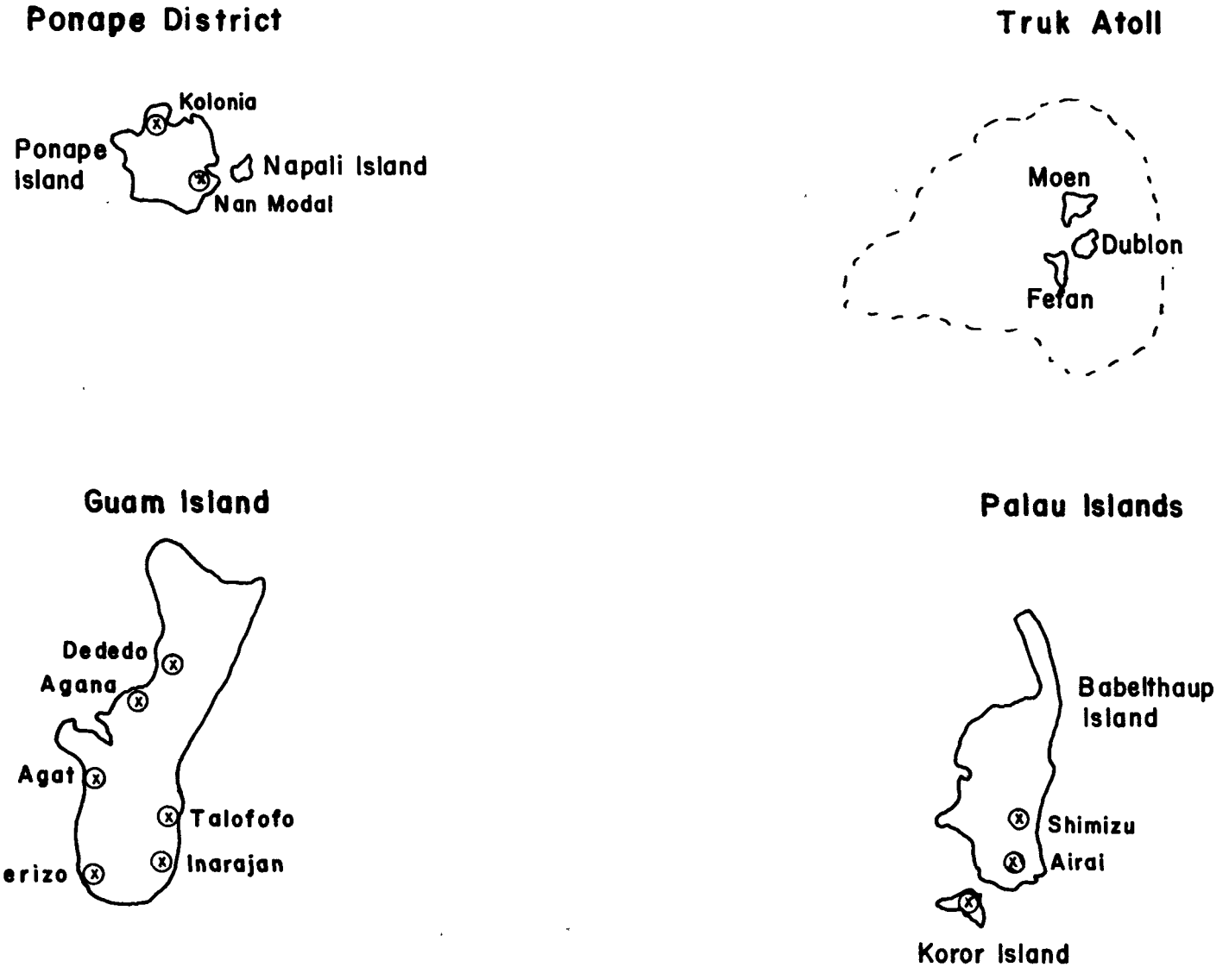

Figure 2. Locations sampled at Ponape, Truk, Guam and Palau in November 1975.

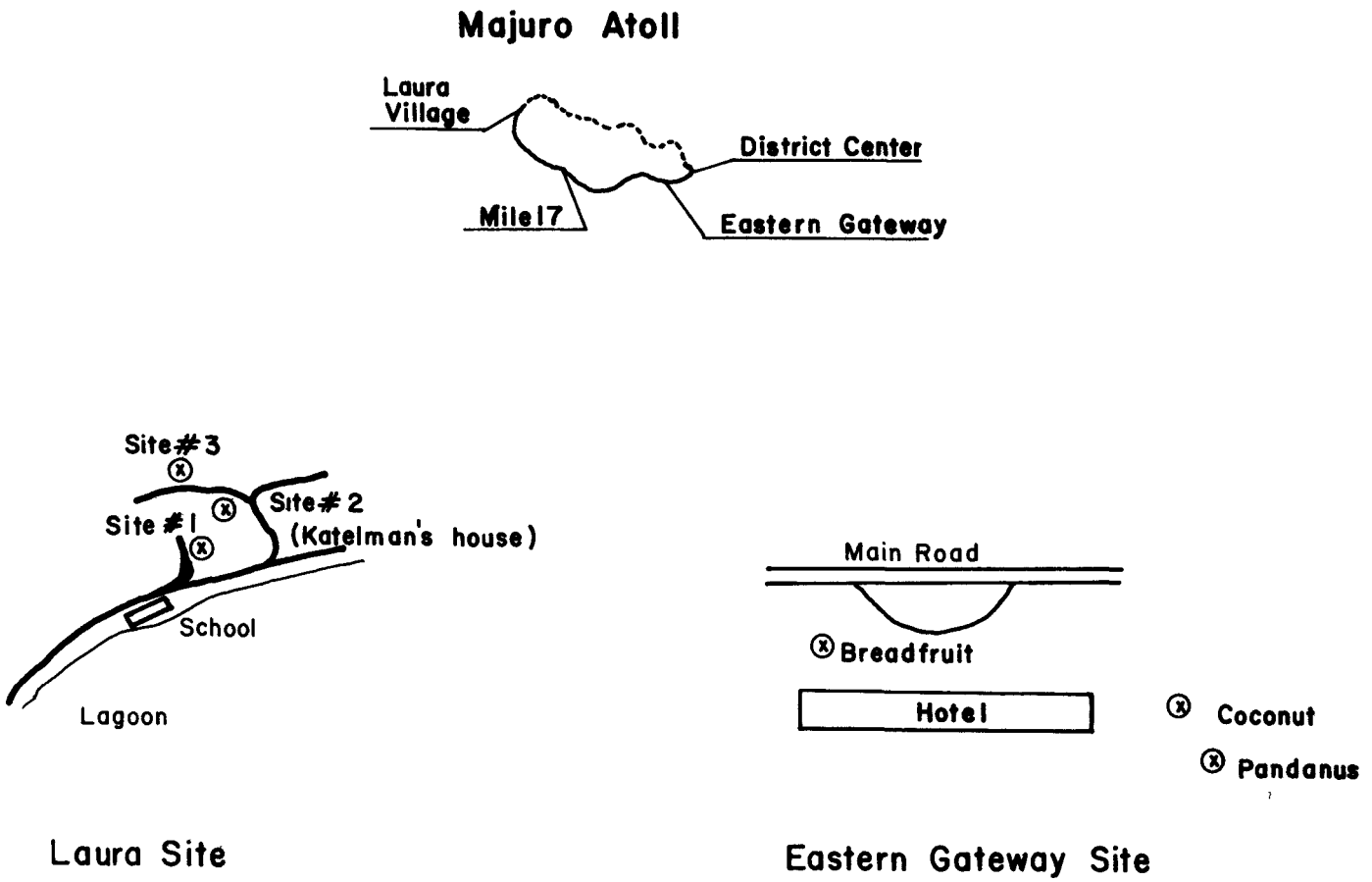

Figure 3. Locations sampled at Majuro Atoll in November 1975.

Laboratory collected representative biological and soil samples with emphasis on food items common to the diet of the Marshallese people (i.e., fish, coconut, pandanus, breadfruit, coconut crabs, etc.) although nonedible portions of these items were also collected and analyzed. Soils were collected to provide data for estimation of future distribution and quantities of radionuclides in the environment and biota.

The number of samples, after division into tissues or soil fractions, is shown in Table 1. Seventy percent of the samples were biological - plants, fish, and coconut crabs - and thirty percent were soils - surface (0-2.5cm) and profile (0-50+cm). Approximately equal numbers of samples came from each of five major collection areas.

ANALYTICAL METHODS

Gamma-Ray Spectrometry

All of the samples were analyzed by gamma-ray spectrometry, either with a 3" X 3" sodium iodide (thallium-drifted) crystal and 200-channel, pulse-height analyzers or with a germanium (lithium-drifted) diode detector and 4096-channel, pulse-height analyzer. Soil samples were analyzed on the Ge(Li) system, and the biological samples were analyzed on both systems.

All samples were oven-dried, ground and a portion compressed into sample holders of polyvinyl chloride (PVC) pipe 2 inches in diameter and either 1/2 or 1 deep for radionuclide measurement. Fifty grams of tissue or 68 grams of soil could be compressed into the 2" X 1" holder. The densities of the biological and soil samples were 1.0 and 1.35, respectively. These samples were then analyzed for gamma-emitting radionuclides.

The gamma-emitting radionuclides in the samples counted on the NaI crystal were determined by a method of least squares. The radionuclides values for samples counted on the Ge(Li) detector were calculated either manually or with

Table 1. Disposition of Samples Collected on the November 1975 Trip to Micronesia.

Sampling Location	Samples Processed[a]			Samples Analyzed		
	Plants	Soil	Fish	γ	^{90}Sr	$^{239,240}Pu$
Majuro	29	12	8	47	26	18
Ponape	23	13	14	50	30	17
Truk	31	14	1	46	14	12
Guam	31	13	5	49	16	7
Palau[b]	25	15	3	43	23	13
Total	139	67	31	235	109	67

a. The number given is the total after the samples have been divided into tissues or increments of soil depth.

b. Three coconut crabs were also collected on an island south of Koror. The muscle, exoskeleton, and hepatopancreas from these crabs were pooled and analyzed for γ-emitting radionuclides plus ^{90}Sr and $^{239,240}Pu$.

a computer by adding the counts in an energy range of five channels under a peak in the spectrum, subtracting the appropriate background counts, and applying correction factors to convert counts to picocuries (pCi). A set of previously reported reference spectra for the type of sample holder and radionuclide was used. All values were corrected for decay to the date of collection.

Strontium-90 and Plutonium Analyses

To measure ^{90}Sr content, ^{90}Y was chemically separated from ^{90}Sr, collected on a filter paper and counted with a low-level beta counting system. Plutonium was extracted by ion exchange, electroplated on platinum discs, and analyzed by alpha spectrometry with systems using surface barrier alpha detectors and pulse-height analyzers. Chemical yield was determined by use of ^{242}Pu as a tracer.

Error Limits

For a single sample, the errors given for all radionuclides listed are two-sigma, propagated, counting errors. The error term for the mean of more than one sample is one standard deviation and disregards counting error.

Limits of Detection

Many factors influence the limit of detection, including the type of detector and analyzer, the presence of other radionuclides, the duration of the counting period, the size and density of the sample, and the geometry relationship of the sample and detector. Hence, the limits of detection varied considerably for various radionuclides and types of samples, but can be summarized by stating that detection limits were approximately as follows:

By gamma detection

^{40}K	2.1 pCi/g or less
^{238}U	0.41 " "
^{102m}Rh, ^{125}Sb, ^{137}Cs, ^{210}Pb, ^{226}Ra, ^{228}Th, ^{232}Th	0.12 pCi/g or less

By beta detection

^{90}Sr	0.2 pCi/g or less

By alpha detection

$^{239,240}Pu$	0.02 pCi/g or less

RESULTS AND DISCUSSION

Data are presented in Appendix Tables 1 through 11 for the results of the analyses of the samples collected by LRE in Micronesia in 1975. All data are given as picocuries per gram of dry weight (pCi/g, dry), except where expressly noted. Table 2 gives the mean wet weight to dry weight ratios for the biological samples. Thus the pCi/g, dry values may be converted to pCi/g, wet for purposes of computing dietary uptake of the measured radionuclides. Since there are greater differences in the radioactivity values between sample types than area of collection, other than soil, the results will be discussed by sample type.

Fish

Seven species of fish were collected from one or more of the five districts. Goatfish, mullet and parrotfish were the most common fish available and they were collected at three sites each. As shown in Appendix Table 1, naturally occurring ^{40}K was the only radionuclide measured in fish tissues at a concentration greater than 0.6 pCi/g, dry and the average value was 4.6 pCi/g, of dry tissue. Cesium-137 was detected in only 6 of 31 samples. The maximum concentration of ^{137}Cs measured was 0.59 pCi/g, dry in the viscera of goatfish from Ponape. Strontium-90 was detected in 1 of 15 tissue samples analyzed,

Table 2. Common Names and Wet Weight to Dry Weight Ratios of Some Micronesian Organisms.

Species	Number of Samples	Tissue	Mean Wet/Dry Ratio	Deviation
		FISH		
Mullet	(4)	Eviscerated Whole	3.31	± .30
"	(4)	Viscera	4.66	± .99
"	(1)	Entire	3.55	
Parrotfish	(2)	Muscle	4.30	± .11
"	(2)	Viscera	4.96	± .97
"	(2)	Remainder	3.45	± .15
Goatfish	(6)	Eviscerated Whole	3.57	± .15
"	(5)	Viscera	4.31	± .82
Snapper	(1)	Viscera	4.25	
"	(1)	Eviscerated Whole	3.76	
Flagtail	(1)	Viscera	3.72	
"	(1)	Eviscerated Whole	3.09	
Convict Surgeon	(1)	Viscera	5.94	
" "	(1)	Eviscerated Whole	3.53	
Jack	(1)	Entire	3.92	
		PLANTS		
Breadfruit	(12)	Edible	6.12	± 2.27
"	(12)	Inedible	6.24	± 1.48
"	(13)	Leaves	4.28	± .64
Pandanus	(12)	Edible	7.28	± 1.43
"	(13)	Inedible	4.22	± .81
"	(16)	Leaves	3.56	± .97
Coconut	(11)	Meat	2.60	± .97
"	(13)	Leaves	2.21	± .20
"	(2)	Copra	1.12	± .02
Taro	(5)	Edible	2.71	± .53
"	(2)	Leaves	7.90	± .20
"	(2)	Stems	14.70	± 1.56
Papaya	(7)	Edible	12.19	± 3.82
"	(7)	Inedible	10.49	± 2.44
"	(7)	Seeds	6.32	± 1.38
Cassava	(1)	Root	2.58	
Banana	(1)	Edible	5.17	

Table 2. (continued)

Species	Number of Samples	Tissue	Mean Wet/Dry Ratio	Deviation
		INVERTEBRATES		
Coconut crab	(1)	Exoskelton	1.53	
" "	(1)	Hepatopancreas	2.86	
" "	(1)	Muscle	4.90	

while $^{239,240}Pu$ was not above the limits of detection in any of the eight samples analyzed.

The amount of ^{137}Cs in these fish was less than the amount measured (Nelson, 1977) in fish from Utirik, Rongerik, and Ailinginae atolls in the northern Marshall Islands which have low radiation levels, but which did receive some local fallout during the testing at Bikini and Enewetak atolls. The amount of ^{137}Cs in the few (6 of 31) fish samples which contained ^{137}Cs in quantities greater than our limits of detection was similar to ^{137}Cs concentrations in fish from Amchitka Island in the Aleutians (Nelson and Seymour, 1977), and in fish collected from Japanese coastal waters in 1974 and 1975 (NIRS, 1975).

The concentrations of ^{90}Sr and $^{239,240}Pu$ was near or below the limits of detection in fish samples from the three atolls noted above and in the fish samples analyzed for this report.

Coconut Crabs

Three coconut crabs from Palau were dissected and the tissues pooled for analysis. Results of these analyses are shown below in pCi/g, dry.

Tissue	^{40}K	^{60}Co	^{137}Cs	^{90}Sr	$^{239,240}Pu$
Exoskeleton	17.0 ± 11	2.2 ± 0.83	1.5 ± 0.09	1.7 ± 0.2	<0.002
Hepatopancreas	ns[a]	ns	0.17 ± 0.09	<0.25	<0.004
Muscle	5.1 ± 1.1	ns	0.30 ± 0.09	<0.23	<0.004

a. ns = not significant.

The values for ^{90}Sr and ^{137}Cs in these crabs are less by a factor of ten than amounts in coconut crabs from Rongerik and Ailinginae atolls and are similar to amounts found in crabs from Kwajalein Atoll, which did not receive any appreciable local fallout from the testing at the Pacific Test Sites.

Plants

Four species of plants, pandanus, coconut, breadfruit and papaya, were collected from one to three sites within each of the five major collection locations. In addition bananas, taro and cassava were collected at a few sites. Results of the analysis of these samples are given in Appendix Tables 2 through 6.

Naturally occurring ^{40}K was the most abundant radionuclide measured in the plant samples. Of the fallout radionuclides only ^{137}Cs was detected in more than 50 percent of the samples. Most values of ^{137}Cs were less than 1 pCi/g, but a value of 18 pCi/g was measured in the edible portion of a pandanus fruit from Guam. The inedible portion of this fruit also had a high ^{137}Cs value, 16 pCi/g. If these high unexplained values of ^{137}Cs are excluded, the ^{137}Cs values in plants from Guam are similar to values in plants from Palau and Truk where the lowest values were measured. Ponape had slightly higher amounts of ^{137}Cs in the plants, while plants from Majuro had the highest average amount of ^{137}Cs. About 50 percent of the ^{137}Cs values in the plants from Majuro were above 1 pCi/g. Strontium-90 values in plants followed a similar pattern, while $^{239,240}Pu$ values were above the limits of detection in one sample of copra from Majuro and in two samples of breadfruit from Ponape.

The values for ^{137}Cs and ^{90}Sr in plants from Guam, Palau, Ponape, and Truk were less than values for the same plants from the Marshall Islands, (Nelson, 1977) but were similar to values found in food plants from Japan (NIRS, 1976) and Washington State (Nelson and Seymour, 1975).

Soil

Surface (0-2.5 cm) soil samples and shallow soil profiles were collected from several sites in each district. Results of the analysis of these samples

are presented in Appendix Tables 7 through 11. Soil from the coralline atoll, Majuro, generally contained small (< 1 pCi/g) amounts of ^{90}Sr, ^{137}Cs, ^{238}U, and $^{239,240}Pu$, while soils from the volcanic islands of Ponape, Truck, Guam, and Palau, in addition to these radionuclides, also contained naturally occurring isotopes of radium and thorium. The soil from Guam also contained ^{210}Pb and ^{235}U in addition to ^{137}Cs, ^{226}Ra, ^{232}Th, and $^{239,240}Pu$ (no analyses for ^{90}Sr were made on the soils from Guam). No major differences in the amount of ^{137}Cs, ^{90}Sr or $^{239,240}Pu$ found in the soil samples were noted between the five districts.

Soil from the northern stations on Guam had much higher values of ^{210}Pb, ^{226}Ra, ^{232}Th and ^{235}U than did the soil samples from the other station on Guam or from the other districts. For instance, the ^{226}Ra values from these northern sites were two orders of magnitude higher than ^{226}Ra from other districts, while the ^{232}Th values were one order of magnitude higher. Lead-210 and ^{235}U were not detected in soils from any district other than Guam. The range of values for the radionuclides in the soils from Guam were as follows: ^{137}Cs (ns to 1), ^{210}Pb (ns to 22), ^{210}Ra (ns to 78), ^{232}Th (ns to 5) and ^{235}U (ns to 5.6).

Results of the analyses of the soil profiles indicated that the concentration of the fallout radionuclides ^{137}Cs and ^{90}Sr decreased with depth, while the concentration of the naturally occurring radionuclides remained relatively constant up to the depth of our deepest samples. Most of the ^{137}Cs and ^{90}Sr was present in the top 5 cm of the soil profiles.

Considering only the fallout radionuclides, the values for ^{90}Sr, ^{137}Cs and $^{239,240}Pu$ in soils from Palau, Guam, Truk, Ponape and Majuro are less than values for these radionuclides in soil from atolls in the northern Marshall Islands such as Utirik, Rongerik, and Ailinginae, and are much less than values for soils from Bikini and Rongelap atolls (Nelson, 1977).

SUMMARY AND CONCLUSIONS

This study of radionuclides in plants, fish, and soil from five districts in Micronesia was one part of LRE's Pacific Radioecology Program. The general purpose of this part of the program is to determine the kinds and amounts of radionuclides in biological and environmental samples from the Central Pacific. The specific purpose of this study was to measure the radionuclides presently found in common foods and soil from areas of Micronesia which did not receive appreciable local fallout from the tests at Bikini and Enewetak atolls. Approximately 240 samples for this study were collected during November 1975, and 235 γ-spectrum, 109 strontium-90, and 67 plutonium-239,240 analyses were performed.

Results of the analyses indicate that naturally occurring ^{40}K is the predominant radionuclide in the biological samples. Cesium-137 was the only fallout radionuclide detected in most of the biological samples. Amounts of ^{137}Cs present in the biota were usually less than 1 pCi/g of dry tissue, although plants from Majuro had slightly greater amounts of ^{137}Cs than the plants from the other districts.

Soil samples from all districts usually contained less than 1 pCi/g of ^{90}Sr, ^{137}Cs, ^{238}U, and $^{239,240}Pu$, while soil from Truk, Palau, and Ponape, also contained less than 2 pCi/g naturally occurring isotopes of radium and thorium. Soil from Guam contained the above fallout and naturally occurring radionuclides and in addition contained ^{210}Pb and ^{235}U. Amounts of the naturally occurring radionuclides in the Guam soils were much higher than amounts of fallout or naturally occurring radionuclides from the other districts.

Considering only the fallout radionuclides, the values for ^{90}Sr, ^{137}Cs, and $^{239,240}Pu$ in fish, plants and soils from Palau, Guam, Truk, Ponape, and Majuro are less than values for these radionuclides in similar samples from atolls such as Utirik, Rongerik and Ailinginae in the northern Marshall Islands,

and are much less than values of these radionuclides in samples from Bikini and Rongelap atolls.

REFERENCES

National Institute of Radiological Sciences. 1975. Radioactivity survey data in Japan. NIRS-RSD-40. Chiba, Japan.

_____, 1976. Radioactivity survey data in Japan. NIRS-RSD-41. Chiba, Japan.

Nelson, V. A. 1977. Radiological survey of plants, animals, and soil at Christmas Island and seven atolls in the Marshall Islands. NVO-269-32. University of Washington, College of Fisheries, Laboratory of Radiation Ecology. 69 p.

Nelson, V. A., and Seymour, A. H. 1975. Preliminary Radiological Surveillance Program, Washington Public Power Supply System Reactor Site #3, Annual Report to EBASCO Services, Inc. University of Washington, College of Fisheries, Laboratory of Radiation Ecology. 44 p.

_____, 1977. Amchitka radiobiological program progress report January 1976 to December 1976. NVO-269-31. University of Washington, College of Fisheries, Laboratory of Radiation Ecology. 49 p.

Appendix Table 1. Predominant Radionuclides in Fish Collected in Micronesia in November, 1975.

Collection Site	Species	Tissue	Radionuclide concentration in pCi/g, dry[a]			
			^{40}K	^{137}Cs	^{90}Sr	$^{239,240}Pu$
Majuro Atoll/Majuro I.	Mullet	Viscera	2.9 ± 1.6	ns[c]	na[c]	na
"	"	Evisc. whole[b]	4.3 ± 1.2	ns	< 0.07	na
"	Goatfish	Viscera	8.3 ± 4.7	ns	< 0.9	na
"	"	Evisc. whole	2.8 ± 0.9	ns	< 0.19	< 0.004
"	Snapper	Viscera	ns	ns	na	na
"	"	Evisc. whole	6.0 ± 1.2	ns	na	na
"	Flagtail	Viscera	6.6 ± 2.0	ns	na	na
"	"	Evisc. whole	2.8 ± 0.4	ns	na	na
Truk/Moen I.	Parrotfish	Evisc. whole	6.6 ± 0.8	ns	na	na
Ponape/Kitti	Goatfish	Viscera	5.7 ± 2.4	ns	< 0.2	na
"	"	Evisc. whole	2.4 ± 0.4	ns	< 0.1	na
"	"	Viscera	16 ± 4.7	0.59 ± 0.30	na	na
"	"	Evisc. whole	4.7 ± 0.7	0.09 ± 0.04	< 0.1	na
"	"	Viscera	ns	ns	na	na
"	"	Evisc. whole	2.5 ± 1.0	ns	< 0.25	< 0.002
"	Mullet	Entire	4.6 ± 2.8	ns	< 0.35	< 0.007
"	"	Viscera	5.8 ± 3.2	ns	< 0.43	na
"	"	Evisc. whole	2.8 ± 3.2	ns	< 0.25	< 0.002
"	Convict Surgeon	Viscera	9.5 ± 2.6	ns	< 0.43	na
"	"	Evisc. whole	ns	ns	0.05 ± .02	< .04
"	Parrotfish	Muscle	4.0 ± 1.2	0.07 ± 0.05	na	< 0.03
"	"	Viscera	3.4 ± 2.3	ns	< 0.9	na
"	"	Remainder	3.2 ± 1.7	ns	na	na

Table 1. (Continued)

Collection Site	Species	Tissue	Radionuclide concentration in pCi/g, dry[a] ^{40}K	^{137}Cs	^{90}Sr	$^{239,240}Pu$
Palau/Malakal I.	Jack	Entire	8.3 ± 1.4	0.20 ± 0.9	< 0.3	< 0.004
"	Goatfish	Evisc. whole	5.5 ± 0.1	0.06 ± 0.04	< 0.23	< 0.003
"	"	Evisc. whole	3.3 ± 1.1	0.04 ± 0.03	na	na
Guam	Parrotfish	Muscle	4.5 ± 3.2	ns	na	na
"	"	Viscera	14 ± 3.4	ns	na	na
"	"	Remainder	2.4 ± 1.1	ns	na	na
"	Mullet	Viscera	7.5 ± 5.3	ns	na	na
"	"	Evisc. whole	2.8 ± 2.1	ns	na	na

a. The error values are two-sigma, propagated, counting errors for a single sample.

b. Evisc. whole = eviscerated whole fish, e.g. the entire fish less the viscera.

c. ns = not significant; the net sample count is less than the two-sigma propagated counting error. na = not analyzed.

Appendix Table 2. Some Radionuclides in Plants Collected on Majuro Atoll in November 1975.

Collection Site	Sample Type	Radionuclide concentration in pCi/g, dry[a]			
		^{40}K	^{137}Cs	^{90}Sr	$^{239,240}Pu$
Eastern Gateway	Pandanus, edible fruit	4.0 ± 1.6	1.9 ± 0.1	<0.02	na[b]
" "	" inedible fruit	5.1 ± 1.6	2.0 ± 0.2	na	na
" "	" leaves	2.7 ± 2.3	0.51 ± 0.15	na	na
Laura Village	" edible fruit	2.3 ± 1.0	4.6 ± 0.19	na	<.001
" "	" inedible fruit	ns[b]	3.2 ± 0.17	<.24	<.002
" "	" leaves	1.3 ± 0.5	0.82 ± 0.03	<.09	<.001
Mile 17.3	" edible fruit	na	na	0.66 ± 0.32	<.001
" "	" inedible fruit	6.5 ± 1.3	1.5 ± 0.11	na	na
" "	" leaves	8.9 ± 1.5	0.72 ± 0.06	na	na
Eastern Gateway	Coconut, meat	6.6 ± 1.7	0.74 ± 0.07	<.08	na
" "	" milk	39.0 ± 9.8	5.9 ± 5.9	<.76	na
" "	" leaves	12.0 ± 1.9	0.41 ± 0.06	na	na
Laura Village	" meat	na	na	na	na
" "	" milk	32.0 ± 11	ns	na	na
" "	" Leaves	5.9 ± 2.1	0.20 ± 0.06	<.14	<.003
Mile 17.3	" meat	13.0 ± 1.9	0.97 ± 0.08	<.07	na
" "	" milk	72.0 ± 9.9	4.0 ± 0.51	<.62	na
" "	" leaves	4.3 ± 0.3	0.60 ± 0.02	na	na
Laura Village	" copra	7.4 ± 0.7	0.27 ± 0.04	<.02	0.13 ± 0.02
Eastern Gateway	Breadfruit, edible portion	9.8 ± 1.8	1.5 ± 0.1	0.07 ± 0.06	na
" "	" inedible portion	10.0 ± 0.1	1.4 ± 0.1	na	na
" "	" leaves	6.4 ± 2.1	1.0 ± 0.2	na	na
Laura Village	" edible portion	18.0 ± 2.0	0.73 ± 0.07	<.19	<.001
" "	" inedible portion	17.0 ± 1.9	0.53 ± 0.07	0.28 ± 0.22	<.001
" "	" leaves	8.1 ± 1.4	2.0 ± 0.13	0.15 ± 0.10	<.001
" "	Papaya, edible fruit	19.0 ± 1.9	1.8 ± 0.12	0.79 ± 0.05	<.001
" "	" inedible fruit	21.0 ± 2.6	2.3 ± 0.17	na	na
" "	" seeds	22.0 ± 7.5	4.0 ± 0.40	na	na
" "	Banana, edible fruit	17.0 ± 2.0	0.05 ± 0.04	<.05	<.001

a. The error values are two-sigma, propagated, counting errors for a single sample.

b. ns= not significant; the net sample count is less than the two-sigma counting error. na= not analyzed.

Appendix Table 3. Some Radionuclides in Plants Collected in Ponape District in November 1975.

Collection ite	Sample ype	Radionuclide concentration in pCi/g, dry[a]			
		^{40}K	^{137}Cs	^{90}Sr	$^{239,240}Pu$
Kolonia	Pandanus, edible fruit	9.6 ± 1.6	1.9 ± 0.13	0.27 ± 0.02	na[b]
"	" inedible fruit	10.0 ± 0.6	1.2 ± 0.6	0.11 ± 0.02	na
"	" leaves	5.1 ± 1.7	0.73 ± 0.10	0.61 ± 0.07	na
Napali I.	" edible fruit	7.8 ± 2.3	0.23 ± 0.06	<.10	na
"	" inedible fruit	8.6 ± 2.1	0.18 ± 0.13	na	na
"	" leaves	2.9 ± 0.4	ns[b]	na	na
Kolonia	Breadfruit, edible fruit	15.0 ± 1.9	0.73 ± 0.13	<.07	.027 ± .006
"	" inedible fruit	8.7 ± 0.5	0.47 ± 0.04	na	na
"	" leaves	13.0 ± 2.0	0.77 ± 0.10	na	na
"	" edible fruit	11.0 ± 1.8	2.3 ± 0.12	<.17	.003 ± .002
"	" inedible fruit	11.0 ± 2.1	2.5 ± 0.18	<.35	na
"	" leaves	3.5 ± 1.2	0.73 ± 0.09	1.4 ± 0.1	na
Nan Modal	" leaves	9.2 ± 0.7	0.53 ± 0.04	0.10 ± 0.6	na
Kolonia	Coconut, meat	5.8 ± 1.3	0.38 ± 0.06	<.09	<.002
"	" milk	54.0 ± 31	2.6 ± 1.2	<.85	<1.1
"	" leaves	3.9 ± 0.3	0.25 ± 0.02	na	na
Nand	" leaves	ns	0.26 ± 0.06	0.23 ± 0.08	na
Kolonia	" copra	5.4 ± 1.6	0.30 ± 0.05	<.06	<.001
"	Papaya, edible fruit	19.0 ± 2.1	0.25 ± 0.05	0.20 ± 0.04	<.001
"	" inedible fruit	22.0 ± 2.9	0.25 ± 0.08	na	na
"	" seeds	18.0 ± 2.6	0.23 ± 0.08	na	na
"	Banana, edible fruit	19.0 ± 2.2	0.05 ± 0.04	<.09	na
"	Taro, root	2.4 ± 1.1	0.31 ± 0.07	1.3 ± 0.1	<.001

a. The error values are two-sigma, propagated, counting errors for a single sample.

b. ns= not significant; the net sample count is less than the two-sigma counting error. na= not analyzed.

Appendix Table 4. Some Radionuclides in Plants Collected in Truk District in November 1975.

Collection Site	Sample Type	Radionuclide concentration in pCi/g, dry[a]			
		^{40}K	^{137}Cs	^{90}Sr	$^{239,240}Pu$
Fefan I.	Pandanus, edible fruit	16.0 ± 1.0	0.15 ± 0.05	0.06 ± 0.03	na[b]
"	" inedible fruit	10.0 ± 0.8	0.14 ± 0.05	na	na
"	" leaves	2.2 ± 0.6	0.06 ± 0.03	na	na
Moen I.	" edible fruit	7.3 ± 0.1	0.25 ± 0.03	<.11	na
"	" inedible fruit	9.5 ± 0.6	ns[b]	na	na
"	" leaves	8.1 ± 0.7	ns	na	na
Dublon I.	" edible fruit	17.0 ± 0.4	0.23 ± 0.03	<.12	<.001
"	" inedible fruit	12.0 ± 0.5	0.06 ± 0.03	na	na
"	" leaves	13.0 ± 0.5	0.08 ± 0.03	na	na
Fefan I.	Breadfruit, edible fruit	12.0 ± 0.5	ns	na	na
"	" inedible fruit	19.0 ± 0.9	0.06 ± 0.05	na	na
"	" leaves	9.5 ± 1.3	0.11 ± 0.08	<.14	na
Moen I.	" edible fruit	5.4 ± 0.7	1.2 ± 0.1	<.12	<.002
"	" inedible fruit	9.5 ± 0.6	1.5 ± 0.1	na	na
"	" leaves	5.3 ± 1.3	1.2 ± 0.1	1.1 ± 0.4	na
Dublon I.	" edible fruit	13.0 ± 0.4	ns	<.07	na
"	" inedible fruit	21.0 ± 0.7	ns	na	na
"	" leaves	12.0 ± 0.7	ns	na	na
Fefan I	Coconut, meat	1.4 ± 0.5	0.18 ± 0.03	<.07	na
"	" milk	2.2 ± 0.1	0.09 ± 0.01	na	na
"	" leaves	8.8 ± 0.5	0.26 ± 0.03	na	na
Moen I.	" meat	3.8 ± 0.3	0.36 ± 0.02	<.09	<.001
"	" leaves	4.4 ± 0.4	0.03 ± 0.02	na	na
Dublon I.	" meat	3.6 ±	0.04 ± 0.04	<.07	na
"	" leaves	4.2 ± 3.3	ns	na	na
Fefan I.	Papaya, edible fruit	21.0 ± 2.4	0.71 ± 0.08	<.18	<.001
"	" inedible fruit	23.0 ± 1.0	0.61 ± 0.07	na	na
"	" seeds	19.0 ± 1.0	0.78 ± 0.07	na	na
Dublon	" edible fruit	11.0 ± 0.4	1.9 ± 0.03	<.07	<.001
"	" inedible fruit	12.0 ± 1.2	2.1 ± 0.1	na	na
"	" seeds	15.0 ± 0.6	3.0 ± 0.1	na	na
"	Coconut copra	1.8 ± 0.7	ns	<.07	na

a. The error values are two-sigma, propagated, counting errors for a single sample.

b. ns= not significant; the sample count is less than the two-sigma counting error. na= not analyzed.

Appendix Table 5. Some Radionuclides in Plants Collected in the Palau Islands in November 1975.

Collection Site	Sample Type	Radionuclide concentration in pCi/g, dry[a]			
		^{40}K	^{137}Cs	^{90}Sr	$^{239,240}Pu$
Babelthaup I.	Pandanus, edible fruit	8.5 ± 1.7	0.67 ± 0.07	<0.34	<0.001
"	" inedible fruit	4.0 ± 0.5	0.23 ± 0.03	<0.07	na[b]
"	" leaves	4.5 ± 0.7	0.06 ± 0.05	<0.10	na
Koror I.	" edible fruit	13.0 ± 0.6	0.53 ± 0.04	0.36 ± 0.18	<0.001
"	" inedible fruit	10.0 ± 0.7	0.23 ± 0.05	na	na
"	" leaves	8.6 ± 2.5	0.24 ± 0.07	0.16 ± 0.10	na
Babelthaup I.	Breadfruit, edible fruit	14.0 ± 0.5	0.06 ± 0.03	<0.07	<0.002
"	" inedible fruit	15.0 ± 0.8	0.07 ± 0.04	<0.09	na
"	" leaves	5.4 ± 0.8	ns[b]	na	na
Koror I.	" edible fruit	18.0 ± 0.5	0.13 ± 0.03	<0.07	<0.001
"	" inedible friut	14.0 ± 0.6	0.04 ± 0.03	na	na
"	" leaves	16.0 ± 0.5	ns	na	na
Babelthaup I.	Coconut, meat	13.0 ± 1.7	0.17 ± 0.05	<0.07	na
"	" leaves	8.7 ± 0.5	0.10 ± 0.03	na	na
"	" meat	18.0 ± 0.8	ns	na	na
"	" leaves	5.7 ± 0.4	ns	na	na
Koror I.	" meat	7.4 ± 0.5	0.05 ± 0.03	<0.07	<0.001
"	" leaves	4.7 ± 0.5	ns	<0.07	na
Babelthaup I.	Papaya, edible friut	14.0 ± 0.5	0.12 ± 0.03	<0.22	<0.001
"	" inedible fruit	18.0 ± 0.6	0.13 ± 0.04	na	na
"	" seeds	20.0 ± 4.2	ns	na	na
"	Taro, root	8.4 ± 0.7	ns	<0.07	<0.002
"	" stem	28.0 ± 0.9	0.24 ± 0.05	<0.14	na
"	" leaves	26.0 ± 3.3	0.26 ± 0.23	<0.26	na
"	Cassava, root	4.9 ± 0.7	ns	<0.12	na

a. The error values are two-sigma, propagated, counting errors for a single sample.

b. ns= not significant; the sample count is less than the two-sigma counting error. na= not analyzed.

Appendix Table 6. Some Radionuclides in Plants Collected on Guam in November 1975.

Collection Site	Sample Type	Radionuclide concentration in pCi/g, dry[a]			
		^{40}K	^{137}Cs	^{90}Sr	$^{239,240}Pu$
Agana	Pandanus, edible fruit	17.0 ± 0.6	1.1 ± 0.04	< 0.23	<0.001
"	" inedible fruit	11.0 ± 1.8	0.84 ± 0.10	na[b]	na
"	" leaves	13.0 ± 2.5	1.0 ± 0.10	na	na
Agat	" edible fruit	22.0 ± 0.7	ns[b]	<0.55	<0.001
"	" inedible fruit	15.0 ± 2.0	ns	na	na
"	" leaves	12.0 ± 0.4	0.04 ± 0.02	na	na
Dededo	" edible fruit	6.1 ± 1.7	18.00 ± 0.26	<0.85	<0.001
"	" inedible fruit	6.6 ± 1.0	16.00 ± 0.17	0.16 ± 0.06	na
"	" leaves	4.0 ± 1.0	1.6 ± 0.08	0.58 ± 0.12	na
Merizo	Breadfruit, edible fruit	16.0 ± 0.4	ns	<0.11	na
"	" inedible fruit	22.0 ± 0.4	ns	na	na
"	" leaves	9.7 ± 0.5	ns	na	na
Dededo	" edible fruit	18.0 ± 0.6	0.35 ± 0.03	<0.12	<0.001
"	" inedible fruit	24.0 ± 0.7	0.51 ± 0.05	<0.07	na
"	" leaves	17.0 ± 2.1	0.74 ± 0.08	0.49 ± 0.09	na
Inarajan	" edible fruit	12.0 ± 0.4	ns	<0.07	na
"	" inedible fruit	20.0 ± 2.0	ns	na	na
"	" leaves	9.3 ± 1.6	ns	na	na
Agana	Coconut, meat	3.0 ± 1.1	0.20 ± 0.05	<0.07	<0.002
"	" leaves	4.7 ± 0.5	0.13 ± 0.04	<0.08	na
Dededo	" meat	3.7 ± 1.6	0.28 ± 0.05	<0.06	na
"	" milk	0.8 ± 0.2	ns	na	na
"	" leaves	ns	0.19 ± 0.05	na	na
Agana	Papaya, edible fruit	44.0 ± 3.4	0.41 ± 0.21	<0.71	na
"	" inedible fruit	40.0 ± 4.2	ns	na	na
Inarajan	" edible fruit	40.0 ± 1.5	ns	<0.42	<0.001
"	" inedible fruit	40.0 ± 1.6	0.12 ± 0.10	na	na
"	" seeds	26.0 ± 0.7	ns	na	na
Dededo	Taro, root	5.6 ± 0.3	0.05 ± 0.02	<0.18	<0.001
"	" stem	38.0 ± 1.4	ns	na	na
"	" leaves	29.0 ± 1.4	0.24 ± 0.08	na	na

a. The error values are two-sigma, propagated, counting errors for a single sample.

b. ns= not significant; the sample count is less than the two-sigma counting error. na= not analyzed.

Appendix Table 7. Some Radionuclides in Soil Collected on Majuro Atoll in November 1975.

Collection Site	Sample Depth in cm	Radionuclide concentration in pCi/g, dry[a]			
		^{90}Sr	^{137}Cs	^{238}U	$^{239,240}Pu$
Eastern Gateway	Surface composite	1.3 ± 0.38	0.11 ± 0.03	ns[b]	0.022 ± 0.020
" "	0 - 2.5	0.20 ± 0.10	0.07 ± 0.04	ns	0.14 ± 0.09
" "	2.5 - 5	<0.25	0.06 ± 0.04	0.78 ± 0.24	na[b]
" "	5 - 10	0.19 ± 0.08	ns	0.33 ± 0.25	0.009 ± 0.006
" "	10 - 15	na	ns	0.56 ± 0.23	na
" "	15 - 25	na	ns	ns	na
" "	25 - 50	na	ns	0.47 ± 0.21	na
Laura Village	0 - 2.5	0.19 ± 0.12	0.09 ± 0.04	0.75 ± 0.41	0.014 ± 0.006
" "	2.5 - 5	na	ns	0.77 ± 0.41	na
" "	5 - 10	na	ns	ns	na
" "	Surface composite	0.49 ± 0.07	0.08 ± 0.04	1.3 ± 0.55	0.004 ± 0.002
Mile 17	" "	<0.19	0.19 ± 0.04	0.88 ± 0.25	0.018 ± 0.006

a. The error values are two-sigma, propagated, counting errors for a single sample.

b. ns= not significant; the net sample count is less than the two-sigma counting error. na= not analyzed.

Appendix Table 8. Some Radionuclides in Soil Collected in the Ponape District in November 1975.

Collection Site	Sample Depth in cm	Radionuclide concentration in pCi/g, dry[a]						
		^{90}Sr	^{137}Cs	^{226}Ra	^{228}Th	^{232}Th	^{238}U	$^{239,240}Pu$
Nand	Surface composite	<0.19	0.49 ± 0.08	0.56 ± 0.06	1.5 ± 0.12	0.94 ± 0.26	0.54 ± 0.39	na[b]
Napali I.	0 - 2.5	1.2 ± 0.3	0.09 ± 0.03	ns[b]	ns	ns	ns	0.03 ± 0.02
"	2.5 - 5	<0.19	0.19 ± 0.04	0.13 ± 0.06	ns	ns	1.2 ± 0.5	0.008 ± 0.004
"	5 - 10	na	0.16 ± 0.05	0.09 ± 0.06	ns	0.30 ± 0.19	0.62 ± 0.19	na
Kolonia	0 - 2.5	na	0.28 ± 0.05	0.60 ± 0.05	1.5 ± 0.12	0.92 ± 0.23	1.3 ± 0.45	<0.004
"	2.5 - 5	na	0.14 ± 0.04	0.49 ± 0.04	0.89 ± 0.08	0.98 ± 0.17	0.78 ± 0.29	<0.018
"	5 - 10	na	0.09 ± 0.04	0.53 ± 0.05	0.97 ± 0.09	0.66 ± 0.13	0.80 ± 0.47	na
Kolonia	0 - 2.5	na	0.78 ± 0.09	0.68 ± 0.06	1.5 ± 0.11	1.3 ± 0.23	1.1 ± 0.36	0.014 ± 0.004
"	2.5 - 5	<0.07	0.74 ± 0.08	0.68 ± 0.07	1.5 ± 0.11	1.4 ± 0.24	1.4 ± 0.63	na
"	5 - 10	na	0.24 ± 0.06	0.52 ± 0.06	0.60 ± 0.29	1.2 ± 0.25	0.60 ± 0.29	na
"	10 - 15	na	0.14 ± 0.05	0.45 ± 0.06	0.98 ± 0.11	0.81 ± 0.24	0.77 ± 0.58	na
"	15 - 25	na	0.12 ± 0.04	0.51 ± 0.05	1.1 ± 0.09	1.2 ± 0.20	1.3 ± 0.48	na
"	25 - 50	na	0.04 ± 0.03	0.69 ± 0.05	1.2 ± 0.09	0.88 ± 0.17	0.80 ± 0.32	na

a. The error values are two-sigma, propagated, counting errors for a single sample.

b. ns= not significant; the net sample count is less than the two-sigma counting error. na= not analyzed.

Appendix Table 9. Some Radionuclides in Soil Collected at Truk in November 1975.

Collection Site	Sample Depth in cm	Radionuclide concentration in pCi/g, dry[a]						
		^{90}Sr	^{137}Cs	^{226}Ra	^{228}Th	^{232}Th	^{238}U	$^{239,240}Pu$
Fefan I.	0 - 2.5	0.16 ± 0.16	0.41 ± 0.06	0.41 ± 0.06	0.49 ± 0.11	0.32 ± 0.13	ns[b]	0.092 ± 0.008
"	2.5 - 5	0.52 ± 0.32	0.34 ± 0.06	0.51 ± 0.06	0.62 ± 0.09	0.76 ± 0.23	0.71 ± 0.29	0.007 ± 0.002
"	5 - 10	na	0.28 ± 0.05	0.45 ± 0.06	0.82 ± 0.10	0.78 ± 0.28	0.83 ± 0.59	na
Moen I.	0 - 2.5	na	0.10 ± 0.04	0.28 ± 0.05	0.28 ± 0.07	0.36 ± 0.20	0.97 ± 0.27	< 0.02
"	2.5 - 5	na	0.07 ± 0.04	0.14 ± 0.05	0.21 ± 0.08	0.45 ± 0.26	1.3 ± 0.05	0.005 ± 0.002
"	5 - 10	na	0.16 ± 0.05	0.28 ± 0.05	0.42 ± 0.08	0.51 ± 0.25	0.99 ± 0.27	na
"	10 - 15	na	0.13 ± 0.05	0.42 ± 0.06	0.53 ± 0.10	0.74 ± 0.27	1.8 ± 0.59	na
"	15 - 25	na	0.11 ± 0.05	0.89 ± 0.07	0.34 ± 0.09	0.49 ± 0.22	1.4 ± 0.33	na
"	25 - 35	na	0.07 ± 0.04	0.30 ± 0.06	0.20 ± 0.09	0.59 ± 0.22	1.2 ± 0.57	na
"	Surface composite	na	0.24 ± 0.05	0.22 ± 0.06	0.13 ± 0.09	0.41 ± 0.21	1.5 ± 0.53	na
Dublon I.	" "	na	0.35 ± 0.06	0.38 ± 0.05	0.55 ± 0.07	0.53 ± 0.21	0.76 ± 0.29	0.022 ± 0.005
"	0 - 2.5	na	0.15 ± 0.05	0.27 ± 0.06	0.34 ± 0.09	0.97 ± 0.29	1.3 ± 0.58	0.004 ± 0.001
"	2.5 - 5	na	0.16 ± 0.04	0.27 ± 0.05	0.28 ± 0.10	0.39 ± 0.29	1.3 ± 0.58	na
"	5 - 10	na	0.19 ± 0.04	0.24 ± 0.05	0.42 ± 0.08	0.60 ± 0.19	1.2 ± 0.45	< 0.002

a. The error values are two-sigma, propagated, counting errors for a single sample.

b. ns= not significant; the net sample count is less than the two-sigma counting error. na= not analyzed.

Appendix Table 10. Some Radionuclides in Soil Collected in the Palau Islands in November 1975.

Collection Site	Sample Depth in cm	Radionuclide concentration in pCi/g, dry[a]				
		^{90}Sr	^{137}Cs	^{226}Ra	^{232}Th	$^{239,240}Pu$
Koror I.	Surface composite	<0.12	0.19 ± 0.04	0.24 ± 0.05	0.60 ± 0.19	na[b]
"	0 - 2.5	na	0.19 ± 0.04	ns	ns	na
"	2.5 - 5	na	0.22 ± 0.03	ns	ns	na
"	5 - 10	na	0.22 ± 0.05	0.12 ± 0.04	ns	na
Babelthaup I.	Surface composite	0.14 ± 0.08	0.60 ± 0.07	0.11 ± 0.05	ns	0.012 ± 0.003
"	0 - 2.5	<0.12	0.69 ± 0.08	0.39 ± 0.05	0.27 ± 0.24	0.006 ± 0.003[c]
"	2.5 - 5	<0.10	0.42 ± 0.06	0.40 ± 0.06	ns	0.010 ± 0.002
"	5 - 10	na	0.17 ± 0.05	0.18 ± 0.05	0.40 ± 0.23	na
Babelthaup I.	0 - 2.5	<0.18	0.33 ± 0.06	0.15 ± 0.04	ns	0.006 ± 0.003[c]
"	2.5 - 5	na	0.30 ± 0.06	0.15 ± 0.05	ns	na
"	5 - 10	na	0.21 ± 0.04	0.16 ± 0.07	0.33 ± 0.23	na
"	10 - 15	na	0.07 ± 0.04	0.13 ± 0.07	ns	na
"	15 - 25	na	0.04 ± 0.03	0.11 ± 0.07	0.56 ± 0.26	na
"	25 - 35	na	ns	0.14 ± 0.03	ns	na
"	35 - 50	na	ns	ns	ns	na

a. The error values are two-sigma, propagated, counting errors for a single sample.

b. ns= not significant; the net sample count is less than the two-sigma counting error. na= not analyzed.

c. These two samples were pooled for the $^{239,240}Pu$ analysis.

Appendix Table 11. Some Radionuclides in Soil Collected on Guam in November 1975.

Collection Site	Sample Depth in cm	Radionuclide concentration in pCi/g, dry[a]					
		^{137}Cs	^{210}Pb	^{210}Ra	^{232}Th	^{235}U	$^{239,240}Pu$
Agana	0 - 2.5	0.24 ± 0.06	20.0 ± 7.2	78.0 ± 0.4	4.4 ± 0.8	5.6 ± 0.1	0.010 ± .004
"	2.5 - 5	1.0 ± 0.2	22.0 ± 5.7	ns	ns	ns	0.003 ± .002
"	5 - 10	ns[b]	11.0 ± 6.6	69.0 ± 0.4	1.2 ± 0.3	5.1 ± 0.3	0.003 ± .002
Dededo	0 - 2.5	ns	10.0 ± 3.5	42.0 ± 0.3	4.8 ± 0.6	4.8 ± 0.6	na
"	2.5 - 5	ns	9.4 ± 5.7	44.0 ± 0.3	4.2 ± 0.6	4.0 ± 0.1	na
"	5 - 10	ns	16.0 ± 5.8	44.0 ± 0.3	4.2 ± 0.6	4.0 ± 0.1	na
"	10 - 15	ns	8.4 ± 3.5	43.0 ± 0.3	4.5 ± 0.6	3.8 ± 0.1	na
"	15 - 25	ns	6.2 ± 5.8	46.0 ± 0.3	4.9 ± 0.6	3.6 ± 0.1	na
"	25 - 35	ns	16.0 ± 3.5	43.0 ± 0.4	5.0 ± 0.6	3.5 ± 0.1	na
"	35 - 50	ns	14.0 ± 3.6	43.0 ± 0.3	4.6 ± 0.6	3.4 ± 0.1	na
Talofofo	0 - 2.5	0.35 ± 0.05	ns	0.6 ± 0.1	0.4 ± 0.2	0.1 ± 0.3	na
"	2.5 - 5	0.38 ± 0.05	ns	0.6 ± 0.5	0.5 ± 0.2	0.1 ± 0.3	na
"	5 - 10	0.46 ± 0.05	ns	0.7 ± 0.1	0.6 ± 0.2	0.1 ± 0.04	0.012 ± .004

a. The error values are two-sigma, propagated, counting errors for a single sample.

b. ns = not significant; the net sample count is less than the two-sigma counting error. na = not analyzed.

DISTRIBUTION LIST

DOE-HQ, Washington

L. Joe Deal, OES
Tommy McCraw, OES (20)
James Liverman, AES
William Burr, BER
Bruce Wachholz, BER
Helen McCammon, BER
Walter Weyzen, BER
Maj. Gen. Joseph Bratton, MA
Gordon Facer, MA

DOE, NV, Las Vegas

Paul Dunaway, TRO
Bruce Church, OSD (2)
Ernest Campbell, PLSD
Paul Mudra, OSD
John Stewart, OSD
Don Martin, SD
Elwood M. Douthett, PLSD
Dave Jackson, OPA
Technical Library (3)
Roger Ray, APO

DOE, Enewetak, MI

ERSP Project Manager (6)

DOE, PASO, Honolulu, HI

Wm. Stanley

DOE, Tech. Info. Center, Oak Ridge

For Standard Distribution, Health and
Safety Category (UC-41) - 251 copies

LLL, Livermore

William Robison (3)
John Koranda
Paul Gudiksen
Victor Noshkin
H. Wade Patterson (2)

LASL, Los Alamos

John Hopkins
John Malik
Harry Jordan (2)

Sandia Labs, Albuquerque

George C. Tucker, Jr. (2)
Mel Merritt, Org. 1151

University of Hawaii

Phil Helfrich, Univ. of Hawaii, Honolulu
Ernst Reese, Kaneohe, HI (20)
Mike de Gruy, MPML, Enewetak (5)

EPA, EMSL - Las Vegas

George Morgan (3)
Charles Costa (2)
Donald Hendricks (2)

Eberline Inst. Co.

Al Doles, Santa Fe, NM

Desert Research Institute
% DOE, Las Vegas

Bert Friesen

EG&G, Inc.

W. John Tipton, Las Vegas

Battelle - PNL, Richland, WA

William Bair (2)

Brookhaven National Lab

Robert Conard
Hugh Pratt
Nathaniel Greenhouse
Charles Meinhold

Defense Nuclear Agency

Director, DNA, Wash., D. C.
Commander, FC/DNA, Albuquerque, NM (2)
Commander, JTG, DNA, Enewetak, MI (3)

Trust Territory of the Pacific Islands

Adrian Winkel, High Commissioner, Saipan
DISTAD, Marshall Islands, (Oscar de Brun)
Majuro, MI (3)

William E. Ogle, ESI, Anchorage, AK