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(NOTE.—"The Kalo in Hawaii," No. IX, was received too late for insertion in this number.)

DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN

FORESTER & AGRICULTURIST

VOL. XI. MARCH, 1914. No. 3

"Root Borers and Other Grubs in West Indian Soils," by H. A. Ballou, entomologist of the Imperial department of agriculture for the West Indies, has been issued in the pamphlet series of that department. It is concise in its descriptions and illustrated with more than a score of figures.

An exchange tells of ironbark foliage destroyed by insects, the Lerp (*Psyllidae*), aphis-like insects which attack eucalyptus trees, suck up the sap and construct delicate shell-like coverings called "lerps," under which they grow, moult several times and then appear as minute four-winged insects, which lay the eggs noticed on the leaves, from which fresh broods soon hatch. Generally only temporary damage of the trees, during the season of prevalence, is caused by the insects. Minute chalcid wasps are parasites of the Lerp insects, checking their unlimited increase.

INTENSIVE FARMING.

Half a page of the Washington Herald was lately taken by an article to magnify intensive farming, the author being Truman G. Palmer, student and writer on agricultural subjects. It is in reply to an interview with Thomas Nixon Carver, of the federal Department of Agriculture, which held that "intensive farming is expensive farming." Referring to a statement by Mr. Carver that the 16,000 acres which had been said was formerly required to support an Indian and his family would now provide farms of 160 acres each for 100 white families, Mr. Palmer says that the "unrepealable law of nature" that drove the Indian out "is equally applicable when comparing the one family which 160 acres will support by 'extensive' agriculture and the four families it will support by applying 'intensive' agriculture." He argues at length that intensive farming will cheapen the cost of living to the consumer while yielding the farmer a greater revenue per acre. Further, Mr. Palmer gives definite instructions in a plan of rotation of crops, to show what he means by intensive farming. Instead of sowing four fields of 25 acres each to cereals annually, the intensive farmer sows three to grain, planting some root crop in the

fourth. This one he plows deeply after fertilizing it heavily, and having prepared his seed bed with care plants it to any kind of a hoed root crop. He cultivates and hoes it thoroughly during the early part of the season, thus killing off the weeds and other noxious growths. The following year a cereal follows the root crop, while one of the first three grain fields is devoted to root cultivation, precisely in the manner of the original field of such crop, and so on, the process being repeated from cycle to cycle of four years indefinitely.

In Hawaii, where land for general farming is exceeding scarce, there can be no question that intensive farming is the only kind for the homesteader and truck gardener.

THE SPINELESS CACTUS.

An Australian correspondent of the *Tropical Agriculturist* (Ceylon) says of the spineless cactus:

"This really wonderful plant is not yet much known and it would prove invaluable to stock owners and others, more especially in poor or dry districts, where vegetation of any kind is grown with difficulty. It is easily grown from the heavy leaves or slabs in any class of dry soil, and after the first year will yield according to conditions from 100 to 200 tons of succulent and nutritious fodder which can be fed to all kinds of stock and more especially dairy cattle. By analysis one ton thereof is equal in feeding value to three-fourths that of lucerne [alfalfa], which is the richest fodder plant grown. During the hot summer months this plant would be luxuriant, and being of a rich juicy nature would also greatly allay thirst and would therefore prove the salvation of stock owners. Some of the species yield 8 tons of well-flavored fruit per acre, which makes excellent jams and jellies, etc., and growers have made up to £160 [about $800] per acre. The young fleshy leaves are a good and wholesome vegetable when fried like egg-plant or boiled as greens, etc., and they also make good pickles. This very useful plant should prove a very great boon to residents in the East Indies, as not only is it the heaviest yielding fruit and fodder plant yet known, but it will thrive where hardly any vegetation will exist and requires but little attention. Stock owners particularly would find it useful."

A bulletin of the agricultural department of Trinidad and Tobago gives an estimate of the profit in making paper from the megass furnished in cane sugar factories. It takes into account the cost of a paper mill—roughly $100,000 for one of 40 or 50 tons of paper capacity per week—with interest thereon, repairs, depreciation and difference of value between coal and megass as

fuel for the sugar factory, and finds a profit of about $6.50 per ton of megass converted into paper. It is premised that there should be a local demand for the unbleached wrapping and packing papers contemplated to be produced. Hawaii imports about a quarter of a million dollars' worth of paper not specified in the more expensive classes each year from the mainland, and probably a large portion of this "all other" item consists of the unbleached qualities in question. With a development of miscellaneous fruits trade, no doubt the demand for packing papers would greatly increase.

Last year Hawaii shipped to the U. S. mainland canned pineapples to the value of $4,054,711 and pineapple juice to the value of $106,510. In the same period its exports to foreign countries of all kinds amounted to $989,730, as compared with $532,666 in 1912, or an increase of nearly 86 per cent., much of which is due no doubt to the pineapple industry. To the United States the shipments of canned pines have nearly doubled in the past two years.

Rubber Day at the rubber and tropical products exhibitions in London has been fixed for June 24. Prince Arthur of Connaught will open the exhibitions, of which King George is the patron, and the Right Hon. Lewis Harcourt, M. P., secretary of state for the colonies, will deliver an address on the occasion. Nothing appears to be doing toward having Hawaii represented with its rubber and other tropical products in these exhibitions.

Entomologist Ehrhorn, in his report for February, relates a highly humorous incident occurring in the inspection of packages from Japan.

Official reports from the State of New York indicate that the regulation of dairies there, with regard both to tuberculosis control and general sanitation, is far behind the conditions achieved on this island of Oahu through the coöperation of the territorial and the municipal authorities. If Dr. Norgaard has his way, the conditions on all the islands will ere long equal those on Oahu.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, March 16, 1914.

The Honorable the Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I regret to state that my health has continued highly unsatisfactory during the greater part of the past month, the swollen condition of my feet (dermal neuritis) compelling me to keep to my room unless important business during the absence of my assistant in the country made it imperative that I attend to it in person.

In spite of this I have given full time to the work of the division, a number of important reports having been received from various federal and state authorities, principal among which are the "Proceedings of the American Veterinary Medical Association" at its 50th anniversary meeting in New York last fall, and which contains a number of valuable papers on the eradication of bovine tuberculosis and its relation to tuberculosis among children.

It is also gratifying to learn that the intradermal tuberculin test, which we have now used here between three and four years, is finally gaining recognition and that several states have now adopted it for official tuberculosis work. California especially has given much thought and work to the problem and mentions the favorable results obtained in this Territory.

In regard to the susceptibility of children to bovine tuberculosis, it would now seem to be definitely settled that the danger to children from tuberculous milk is very great. Following the Tuberculosis Congress in Washington in 1908, where Prof. Koch again asserted his opposing views, Dr. Park, the director of the laboratories of the board of health, started to work on this subject, and has now demonstrated that in the city of New York upward of three hundred children die every single year from bovine infection—three hundred fatal cases occur each year in the single city of New York. Dr. Park estimates that this number amounts to about 12½ per cent of all the fatal cases of tuberculosis in children, and adds, "Surely we need no better evidence than that to demand of us the protection of human beings against bovine tuberculosis."

Dr. Park has also collected figures from all parts of the world, and these are very interesting. He says: "In adults 787 cases have been examined, of which 777 show human infection and 10 show bovine infection. The conclusion is that, so far as we can judge, adults are probably fairly immune to bovine tuberculosis infection. Coming to children from five years of age to sixteen years of age, we have 153 cases, 117 of which were of human and 36 of bovine origin. Coming to children five years old and

under, we have 280 cases, 215 of which were human and 65 bovine, coming very close to the figures taken from clinical work in England, from which we get the best information on this subject, namely, that from about 23 to 25 per cent of the fatal cases of tuberculosis in children are due to bovine infection. And these figures do not include the numerous non-fatal cases which produce only more or less permanent and more or less severe deformities of the skeleton—hipjoint disease, psoas abscesses, enlarged glands of the neck, etc. When we come to take these into account it seems fairly evident that 30 per cent of the cases of tuberculous children are due to bovine infection." Another eminent authority, Dr. Stiles of Edinburgh, has come to the conclusion from clinical evidence that most of these cases of bone and joint tuberculosis were of bovine origin. Being called into consultation once he made a diagnosis of bovine tuberculosis in a child who was too far gone to be helped and died within a few days. The father said the infection could not be bovine as he kept his own cow, and she had been tuberculin tested. The cow was killed and found to be simply riddled with tuberculosis—a far advanced case, such as frequently fail to react to the test. The father was so impressed that he then and there gave a large sum of money for an investigation, the results of which have just been published, and some of which are interesting enough to be quoted here: "Seventy cases were examined, these being children most of which have not died. Forty-one of these showed the bovine bacillus, and 23 human; three showed both bovine and human bacilli. Sixty-seven of these cases were children twelve years or under, and three adults between 24 and 30 years. Forty-seven were children five years old or under and of these 32 were infected with the bovine bacillus and 15 with the human, a percentage of 68." Dr. Stiles goes on to say: "When we come to examine the family history of these cows, we find some very impressive facts. In 21 cases there was a family history of tuberculosis. Of these, 15 gave human cultures and 6 bovine. That is 71 per cent showed human infection, whereas, in the 52 cases where there was no family history of tuberculosis, 9 prove to be human and 43 bovine; in other words 83 per cent of these cases were due to bovine infection. The final conclusions to this very valuable contribution to our knowledge of the importance of the bovine tuberculous infection to children, are to the effect that "nobody can deny the great danger to human health from bovine tuberculosis." "It is a black spot on the reputation of our civilization at the present time, to permit this preventable disease to continue to reap a harvest of over one million deaths every single year. In the United States alone over 200,000 of our fellow citizens every year go down to their graves from a preventable disease."

I have taken the liberty to quote these figures at length for the reason that the local sanitary authorities, as well as the Anti-

Tuberculosis League of Hawaii, do not seem to realize the immense importance of this source of infection to human beings and especially to children. That there has been a decided decrease in the mortality from tuberculosis among children under five years of age in the district of Honolulu during the past year coincident with the elimination of the tuberculous cow from this same district, while at the same time infantile tuberculosis has been increasing in all other parts of the Territory, is admitted by the Anti-Tuberculosis League. It would therefore seem that no time should be lost in extending the bovine tuberculosis eradication to the other islands, especially as will be seen from the appended letter from the superintendent of the Anti-Tuberculosis League to the effect "that our records show infantile mortality from tuberculous meningitis and other forms of this disease to be far greater on Kauai than on any other island." This information has been communicated to the deputy Territorial Veterinarian on Kauai with a request for information in regard to the prevalence of bovine tuberculosis on that island and what steps are being taken for its suppression. As I expect to visit the island of Maui this coming week I shall look into conditions there with a view to inaugurating an active campaign against the tuberculous cow.

Dr. Fitzgerald reports that glanders has again made its appearance among a certain bunch of horses, through which one plantation mule became infected. By the speedy application of the intradermal mallein test to all exposed animals the infected ones were located and destroyed and it is believed that the outbreak has been suppressed. This matter will, however, have my personal attention, especially as this is the first opportunity to try the new ophthalmic mallein test which has been adopted by the federal Bureau of Animal Industry for use in inter-state shipments of horse stock.

The correspondence pertaining to both the outbreak on Maui and to the new test is herewith appended.

A number of inquiries have been received in regard to the continuation of the quarantine of hogs on the island of Oahu, to which I have replied that the embargo cannot safely be removed for some time yet.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Feb. 31, 1914.

Dr. Victor A. Norgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to report as follows for the month of February:

Tuberculosis Control.

The following herds have been subjected to the intra-dermal tuberculin test:

	T.	P.	C.
Charles Lucas	82	80	2
T. F. Farm	40	35	5
F. Medeiros	21	21	0
P. Miyakawo	15	15	0
K. Inouye	17	17	0

The total number injected is 175, out of which 168 have been passed and 7 condemned and branded. It was surprising and also discouraging that five cows were condemned at Farm's dairy, but considering the fact that Mr. Farm has never followed our instructions in regard to disinfecting after each test the result could not have been otherwise. He now intends to remove all the old feed boxes, replacing them with new ones and give his barn a complete and thorough disinfection.

Importation of Live Stock.

Feb. 2—S. S. Sierra, San Francisco. 4 crates poultry.

Feb. 2—S. S. Matsonia, San Francisco: 16 crates poultry; 1 dog, Mrs. J. M. Senni.

Feb. 4—S. S. Missourian, Seattle: 17 horses; 200 hogs (slaughter), 77 hogs (breeding), 5 crates poultry, A. L. McPherson.

Feb. 6—S. S. Tenyo Maru, Orient: 6 crates pheasants, E. H. Paris.

Feb. 9—S. S. China, San Francisco: 1 dog, Wells Fargo Ex. Co.

Feb. 16—S. S. Ventura, San Francisco: 7 crates poultry; 1 dog, Nellie Adams.

Feb. 16—S. S. Mongolia, Orient: 1 dog, J. C. Collins.

Feb. 17—S. S. Wilhelmina, San Francisco: 29 crates poultry.

Feb. 20—S. S. Sonoma, Sydney: 1 cat, Mrs. C. D. Thomas.

Feb. 24—S. S. Honolulan, San Francisco: 2 Shorthorn bulls, Antonio Perry; 7 crates poultry.

Feb. 26—S. S. Niagara, Vancouver: 1 dog, Mr. Payne.

Respectfully submitted,

L. N. Case,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, Feb. 28, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the Division of Entomology work for the month of February, 1914, as follows:

During the month 34 vessels arrived at the port of Honolulu, of which 24 carried vegetable matter.

Disposal	*Lots*	*Parcels*
Passed as free from pests	683	15,276
Fumigated	1	27
Burned	41	43
Returned	4	42
Total inspected	729	15,388

Of these shipments 15,186 packages arrived by freight, 124 packages by mail and 78 packages as baggage of passengers and immigrants.

Rice Shipments.

During the month 18,005 bags of rice and 1721 bags of beans arrived from Japan and being found free from pests were passed for delivery.

Pests Intercepted.

Thirty-three packages of fruit and 4 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which, being prohibited from entry, was seized and destroyed by burning.

One lot of orchids from Costa Rica, Central America, came by local boats and in the packing were found a few Tenebrionid beetles and some ants. These plants were fumigated and the packing destroyed. A permit from the federal horticultural board accompanied the shipment.

Two cases of apples were returned to the storeroom of the transport Sherman, having been found infested with Codlingmoth.

Thirty-eight sacks of potatoes arrived from Sydney, Australia, and under a ruling of the federal horticultural board of the United States Department of Agriculture could not enter the Territory on account of not having the required permit and the shipment remained on board of the S. S. Marama.

Probably the most remarkable seizure ever made by the division took place in the postoffice. A package of twigs from Japan was held for our inspection and on opening the same the inspector

found tree twigs which were hollow, each opening plugged up with twisted grass. A closer examination disclosed the fact that each twig contained a good, fat, live borer. A letter was enclosed in the packages and the same, after having been translated, told the following story:

"Greetings: This time I am sending you some medicine, good for consumption. Open the twigs and you will find a worm (*Sabutori-mushi*) in each twig. Take out one and wrap it in sembi or ame and swallow it alive. The juice of the living worm is good for the disease. However, if the worms are dead, you can bake them until black and powder them up and drink it with sake. Those I send will constitute a dose for one week. When you take the worms please inform me if you digest the same. If you should find any such worms in Hawaii, continue taking same for some time," etc., etc.

The worms found in the twigs represent two distinct orders of insect. Some were the grubs of a large stem-boring beetle belonging to the Cerambicidae; the others the larvae of some stem-boring moth. The package was seized and the contents are now the property of the board museum, as alcoholic specimens. This illustrates another channel through which some serious pest might enter the Territory. Worm diet for the cure of the white plague might be all right in Japan but we have not as yet heard of this method being used here and we surely shall not allow a trial with imported borers such as were found in the mail package.

Hilo Inspection.

Brother Matthias Newell at Hilo reports the arrival of 7 steamers, all of which brought vegetable matter consisting of 91 lots and 1962 packages. Three sacks of turnips had to be cleaned of earth and 39 bags of potatoes were too scabby to land and as no one wanted to pay for the return freight, they were dumped at sea.

Inter-Island Inspection.

During the month of February 52 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	78	packages
Taro	960	bags
Fruit	18	packages
Vegetables	42	"
Total passed	1098	packages

The following packages were refused shipment on account of

being either infested with pests or having soil attached to the roots:

Plants	16	packages
Fruit	8	"
Vegetables	2	"
Total refused	26	"

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, Feb. 28, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows, the routine report of the Division of Forestry for February, 1914:

Forest Reserves.

On February 12 a public hearing was held by Governor Pinkham and the Board of Agriculture and Forestry to consider the setting apart as an addition to the Kaipapau forest reserve, of a part of the land of Hauula, and as a new forest reserve, of the upper portion of Kuliouou valley, both on Oahu. Objection being made by certain of the Hauula homesteaders to the location of the proposed makai boundary, Governor Pinkham postponed action by taking the matter under advisement. There being no objection to the reservation of Kuliouou, the Governor, on February 13, signed a proclamation officially setting this land apart. The area is 214 acres. It is the thirty-fifth forest reserve to be made in the Territory of Hawaii and brings the total area in the system up to 787,083 acres, of which 69 per cent., 541,091 acres, is government land.

Forest Fences.

Early in February I made a quick trip to Kauai to inspect the recently completed forest fence on the boundary of the Moloaa reserve and to make further arrangements in connection with the building of another fence on the government land of Wailua, mauka of Lihue. On February 20, Mr. A. M. Brown notified me of the completion of the fence on the Kula forest reserve boundary, Maui, required to be built under leases held by the

Cornwell Ranch. Mr. Brown further said that the tree planting called for under the same leases was going forward satisfactorily, the number of trees in the ground being up to the requirement for this time.

Considerable preliminary work was done during the month on other fence projects which will be reported on to the Board in the near future.

Special Reports.

Toward the end of the month several letters and brief reports were got ready containing recommendations on forest matters that had recently been referred to me for investigation. Also during February I prepared for the use of the Board a short report covering the routine work of the Division of Forestry for the calendar year, 1913.

Tree Planting and Seedling Distribution.

Good progress is being made in the tree planting on the slopes of Sugar Loaf, above Makiki valley, Honolulu, and recently the Division of Forestry has succeeded in making better provision for supplying seedling trees to homesteaders in several newly opened tracts in different parts of the Territory. Mr. Haughs' report, transmitted herewith as usual, gives additional facts and figures.

Forest Fire Service.

Owing to removal from Maui, Mr. A. K. Jones resigned early in February as district fire warden for Kahikinui and Honuaula, Maui. His resignation was accepted at a meeting of the Board held on February 26, 1914. No one has as yet been appointed in his stead.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, February 28, 1914.

R. S. Hosmer, Esq., Superintendent of Forestry.

Dear Sir:—Herewith I submit a report of the principal work done during the month of February, 1914:

Nursery.

Distribution of Plants.

	In Boxes Transplanted.	Pot Grown.	Total.
Sold	...	38	38
Gratis	250	2314	2564
	250	2352	2602

Collections.

On account of plants sold.....	$1.20
On account of seed sold.....	8.00
Total	$9.20

Plantation Companies and Other Corporations.

During the month we distributed 5500 seedlings in seed boxes, 400 in transplant boxes and 500 pot grown. Total, 6400. The species consisted of eucalyptus and casuarina.

Experiment Garden, Makiki.

The principal work done at this station during the month consisted of transplanting seedlings, mixing and sterilizing soil and doing other routine work.

Honolulu Watershed Planting.

Three extra men were engaged and started work on February 16th, making a gang of eight men altogether. Trees to the number of 458 were planted out. Other work done consisted of clearing off and making holes. The total number of trees planted on Sugar Loaf up to the end of February amounted to 2544, all of which are koa.

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, March 10, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during February, 1914, is submitted:

DROUGHT.

The rainfall during February was generally very light, with the result that all streams are very low. While all reports from other islands have not been received, indications point to the driest February in a long period of years. All streams on Oahu are at the lowest discharge recorded in the past three years.

Should the 1914 summer season follow its usual regime, indications point to a great shortage of water, and water users should plan for such a condition.

SERVICE RECORDS.

Daily service records of each employe are filed in the Honolulu office, and are available for inspection. The records show the location and services performed by the employe.

G. K. Larrison, Superintendent.

Twelve days were spent in the field, including a reconnaissance of Molokai from February 11 to 18. Further reconnaissance was made of the Haiku, Kahana, and Punaluu valleys, on Oahu, with H. Kimble, Assistant Engineer, who will begin the construction of clock register stations on these streams, March 4. The rest of the month was spent on estimates, computations, and general supervision work.

J. C. Dort, Office Engineer, Oahu.

Five and one-half days were spent in the office, 31 stream-gaging stations and one rain-gaging station were visited, and two stream measurements made. The greater part of the month was spent on computation and compilation work in connection with the 1913 Progress Report.

C. T. Bailey, Assistant Engineer, Maui.

Twenty-five days were spent in the field, including a reconnaissance of Molokai from February 11 to 18 with the Superintendent. Nine stream-gaging stations were visited on Maui, and

eight measurements were made. Two and one-half days were spent on an investigation of the water supply of Wailuku.

H. Kimble, Assistant Engineer, Kona and Oahu.

February 6 to 13 were spent on the special Kona investigation in measuring the capacity of one of the typical water holes in South Kona. At the time the field work of this investigation was being made, wet weather conditions prohibited the measuring of the capacities of the typical water holes of Kona. This work was consequently postponed until dry weather was reported.

Mr. Kimble spent three days on Maui on construction work on the new clock register station on the Halawaliilii Stream. The last five days of the month were spent on stream gaging and construction work on Oahu.

W. V. Hardy, Field Assistant, Kauai.
D. E. Horner, Field Assistant, Kauai.

Mr. Hardy spent the greater part of the month collecting, checking, and copying Kauai rainfall and run-off data for the 1913 Progress Report. The Stevens clock register station on the Kalihiwai River was completed—all except installing the register on its pedestal. This will require about one-half day's time. Construction on the new trail from Lumahai to the new station site (about five miles long) was started. Mr. Hardy spent ten and one-half days in the field, visited ten stream-gaging stations, and made one stream measurement.

Mr. Horner spent all 28 days in the field, visited seven stream-gaging stations, and six mountain rainfall stations. Fourteen days were spent on the construction of the Kalihiwai Station.

H. A. R. Austin, Field Assistant, Oahu.

Eighteen days were spent in the office on computations, checking, etc., and four days in the field. Twenty-one stream-gaging stations and three rainfall stations were visited.

G. R. White, Field Assistant, Oahu and Maui.

Nine days were spent in the field on Oahu, and four days on Maui. Thirty-five stream-gaging stations were visited, and twenty-four stream measurements were made.

1913 PROGRESS REPORT.

All original data for the 1913 progress report are complete, and blue prints are being made preliminary to sending the original

data to the Washington office for publication. The services of Mrs. Dort and Mrs. Kennedy, who were employed in this work during the month, were dispensed with on February 28.

SUMMARY OF STREAM-GAGING STATIONS FOR MONTH.

Island.	At End of Month.	Est'd During Month.	Discont'd During Month.
Kauai	31	0	0
Oahu	40	2	0
Maui	43	0	0
Hawaii*	1	0	0
Total	115	2	0

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

KULIOUOU FOREST RESERVE.

On February 12, 1914, a public hearing was held by the Governor of the Territory of Hawaii and the Board of Commissioners of Agriculture and Forestry to consider the setting apart as a forest reserve of a small area of forest land at the east end of Oahu, near Koko Head. The tract is the upper portion of the half of Kuliouou valley owned by the government, 214 acres.

The purpose of creating this land a forest reserve is to afford better protection to the small stream that flows down the valley and waters the dry lower lands. No opposition developing to the project, Governor Pinkham on February 13 signed a proclamation officially setting the land apart. This is the first forest reserve to be made by him, the thirty-fifth in Hawaii.

Following is the report of the Superintendent of Forestry on Kuliouou. Elsewhere in this issue of the Forester appears the proclamation:

Report of the Superintendent of Forestry.

Honolulu, Nov. 12, 1913.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to recommend the setting apart as a forest reserve of the mauka section of the government land of Kuliouou in the Honolulu district, Island of Oahu.

Kuliouou is a small, detached government land at the east end

* Kona investigation station.

of this island. It comprises the east half of the valley of the same name, the remainder being in fee simple ownership, and now under the control of Judge Frank Andrade. The makai portion of Kuliouou was cut up into beach lots and disposed of something over a year ago. An area of grazing land, 173 acres, above these lots and running up to the line of the proposed forest reserve, was leased on November 8, 1913, to Mr. Andrade. This lease carries a provision that a fence must be built on the forest reserve boundary within one year.

The section now proposed to be set apart is the mauka end of the valley, an area of 214 acres. The line was determined after a personal visit made to the tract, when I was accompanied by Mr. W. E. Wall, the government surveyor.

The object of the proposed reserve is to protect the stream that runs intermittently in the upper portion of the Kuliouou valley. Water is said to be found in pools much of the time, above the reserve line. Below, the stream bed is dry, except during rains. With a dense forest cover restored there is good reason to think that this source of water could be made a much more dependable, though limited supply.

Efficiently to protect the valley of Kuliouou will require the coöperation of the owner of the west, or fee simple half. From conversations had with Mr. Andrade on this matter I believe it will be possible to effect this. A comparatively short stretch of fence across the fee simple land, from the end of the required government fence to a pali, would block cattle from getting mauka.

There are said to be goats on the ridge above Kuliouou, that work over from the adjoining fee simple land of Maunalua, on the east. Just how much damage they are doing I am not in a position to say.

Between Kuliouou and the east end of the Honolulu Watershed forest reserve, at Palolo, is a stretch of privately owned land, in part belonging to the Bishop Estate. On a good part of it provision has been made by the owners for forest protection. While part of this fee simple area is thus being treated as a forest reserve it has for various reasons not been considered advisable to include it in the present project. The Kuliouou forest reserve as proposed includes only the above described piece of unleased government land.

Accompanying this report is the official technical description of boundary, prepared by the Government Survey Office as C. S. F. No. 2363.

For the reasons set forth above I do now recommend that the Board approve the creation of the Kuliouou forest reserve and call upon the Governor of the Territory to cause the land to be so set apart.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

ALFALFA—A PROMISING FORAGE CROP FOR HAWAII.

By WILLIAM H. MEINECKE, Class of 1913.

(Continued.)

1. *Chilian* or *common* or *California alfalfa.*

The common alfalfa is distributed practically throughout North and South America and Hawaii, and is especially adapted to those sections of Southern California and the Western States, and also Hawaii, where the climate is mild and where there is a fair amount of rainfall or irrigation water. While it does fairly well in dry regions, it is best suited to those places where the water table is fairly high, and will respond wonderfully to proper irrigation. It can withstand fairly severe winters, but it is not considered the best variety for the northern conditions.

The many strains of this variety are commonly known by the name of the state or region from which the seed is obtained, e. g., Utah, California, Kansas, etc.

2. *Arabian alfalfa* (M. sativa arabianica).

As the name indicates, this variety was discovered in Arabia and was imported directly into the United States in 1902, and the first seed planted in Hawaii was obtained directly from Washington, D. C.

This variety is readily recognized by its thick succulent stems and large dark green hairy leaves. It is a very rapid grower and recovers quickly after cutting, the crop maturing within three weeks and in general one to two weeks earlier than the common variety. It cannot withstand frost or drought and is generally more susceptible to plant diseases than the other varieties, but will do very well in humid regions or where irrigation water is abundant.

3. *Turkestan alfalfa.*

Turkestan alfalfa was imported into the United States in 1898 and brought to Hawaii within the last decade. This variety is considered more resistant to cold and drought than the Chilian and has proven in South Dakota[1] to be more drought and cold resistant than Grim's alfalfa, but in North Dakota[2], with the temperature at 35° F. (1906-7), fifteen percent of the Turkestan plants were winter killed against five percent of those of the Grim

[1] U. S. D. A., B. P. I. Bul. 196.
[2] U. S. D. A., B. P. I. Bul. 185.

variety. (The intense cold was accompanied by a heavy snowfall, which undoubtedly saved most of the plants.)

During the tests made by the Hawaii Station in 1910-11, this variety did not yield as much seed or fodder as the Chilean and Arabian, but it may prove valuable in some other parts of the Territory where the conditions are warmer and dryer. It may be also interesting to note that the Turkestan "is decidedly inferior in the humid sections of the Mississippi River, but has given somewhat better results than the ordinary alfalfa in the semiarid portion of the great Plains and in the Columbia Basin."[3]

4. *Australian alfalfa.*

The so-called Australian variety is probably a strain of the Chilian, which has been grown in Australia. Its foliage is somewhat darker and slightly more dense and fine than the latter, but from all practical standpoints it is the same.

The College of Hawaii has a plot of an eighth of an acre planted to this strain, but it has not proven to be quite as productive as either the Utah or the Kansas strain.

5. *Peruvian alfalfa.*

Peruvian alfalfa is very much like the Arabian in its lack of ability to withstand cold and drought. It is more woody than the latter and has proved to be inferior to other varieties in the North Western States, but is highly recommended by the Department of Agriculture[4] for the Southwest.

It has been planted at the Hawaii Station, but no reports as to its merits have been published.

6. *Ecuador alfalfa.*[5]

The Ecuador variety originated in the mountains at about 9000 feet elevation. It starts a little slower than other varieties, but soon maintains a fast, steady, vigorous, erect growth. It is quite profusely covered with hairs and is readily distinguished by its very dark green color. The stems are coarser and more rigid than usual. It seems to be more woody than most of the others, with a less amount of foliage, and withstands well the changes in temperature but does not yield as well as the others.

7. *Tripoli or Algerian and Oasis.*

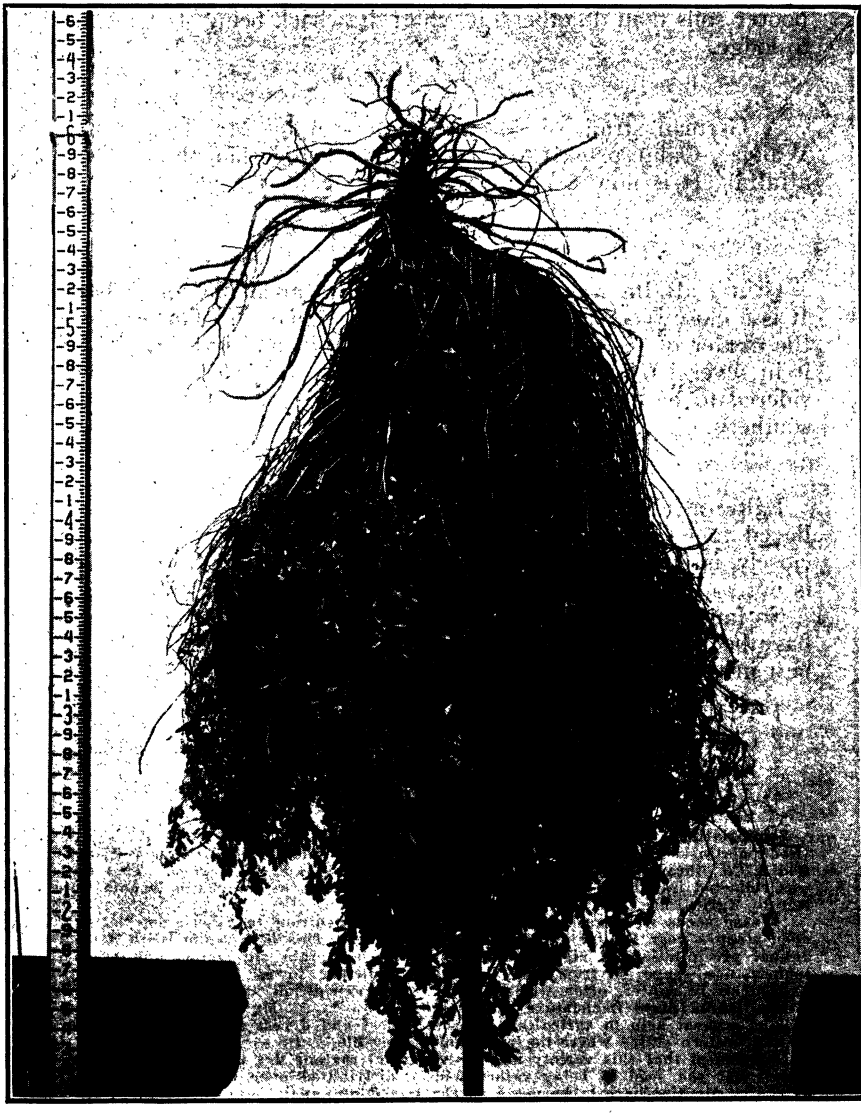
The Tripoli or Algerian and Oasis varieties are not easily winter killed, but grow very slowly and are of a pale, sickly color,

[3] Farmers' Bulletin 339.
[4] Nev. Sta. Report 1909.
[5] Nev. Sta. Report 1909.

indicating their inadaptability to the climate of the United States, especially that of the West.

8. *French or sand lucerne.*

French or sand lucerne has very pale purple flowers, some of them almost white. It is said to be a different species of alfalfa



Typical breeding plant of Alfalfa one year old (grown on shallow ground).

(M. media), but it is also believed to be a natural hybrid of M. sativa and M. falcata. It yielded well in Utah, Colorado, and Nebraska, but did not do very well in Nevada and Texas. There are numerous strains of this variety, chief of which are the German, Baltic, and the famous Grim's alfalfa.

The latter is one of the most hardy of all alfalfas. It will not only withstand intense cold and drought but will do well on poorer soils than do others, its chief drawback being its tendency to lodge.

9. *German strain.*

A German strain of M. medica grown by Mr. Isenberg at Waialae, Oahu, proved to succeed much better than the common alfalfa. It is now exclusively grown there.

10. *Grim's alfalfa.*

Grim's alfalfa was originated by Mr. Grim of North Dakota. It is a close second if not a better variety than the Turkestan in the matter of resistance to cold and drought and has out-yielded it in several trials made in South Dakota. It is generally considered to be better adapted to northern conditions than to the southern.

11. *Baltic alfalfa.*

Baltic alfalfa originated in Baltic, South Dakota, and is believed to be a strain of Grim's.[6] It resembles the latter very closely, is free from a bacterial disease common to all others, and is not so liable to lodge as the other strains of M. media.

So far as the writer can determine, only the following varieties have been grown in Hawaii thus far. They apparently succeed best in the order given:

1 Utah (Chilian)	5 German
2 California (Chilian)	6 Arabian
3 Kansas (Chilian)	7 Turkestan
4 Australian (Chilian)	8 Peruvian

Semipalatinsk Alfalfa. Since the above was written a new dry-land alfalfa (Semipalatinsk Alfalfa) has been introduced to the Islands by Messrs. H. Hackfeld & Co., through the efforts of their manager, Mr. J. F. C. Hagens. This seed was collected in Siberia in 1913 by Prof. N. E. Hansen of the South Dakota College of Agriculture. Of it, Prof. Hansen says:

"These seeds were gathered upon my fourth expedition to Siberia on the dry, open steppes near Semipalatinsk, Southern Siberia. This is a region with a total annual precipitation of eight inches, including both rain and snow, and with a temperature range of from 106 degrees in summer to 50 degrees below zero Fahrenheit in winter, often without snow. The expedition was authorized by the South Dakota State Legislature, March, 1913. * * * My opinion is that they will be a great help to agriculture on the highest and dryest uplands of a number of our western states where no irrigation is possible."

It is hoped that this variety may prove useful for our dry uplands. We understand that the seed is being rather widely distributed over the group and that extensive plantings are to be made on the Island of Lanai. F. G. K.

[6] Col. Sta. Report 1910.

CONDITIONS AFFECTING SUCCESS WITH ALFALFA.

1. *Climate and Soil.* Alfalfa is naturally adapted to a warm climate; in deep soils it is highly drought resistant, but is also well adapted to irrigation. In general it does not endure very severe winters and an excess of rainfall or irrigation is decidedly injurious. Regardless of its nature the soil must be well drained or the crop will fail, as alfalfa is a plant which cannot stand "wet feet."

It succeeds best on a neutral soil, and will adapt itself to an alkaline soil, but is an absolute failure where there is more or less acidity or "sourness." A clean, deep and well drained, light, loamy soil is best, but heavy clay soils may be so modified as to yield profitable crops, provided they are not permitted to become water-logged and sour. Calcareous soils in humid regions are very good, and even the chocolate colored river bottoms and maize and oat lands are well adapted to alfalfa.

Another essential for success with alfalfa is the presence of specific nitrifying bacteria in the soil and a fair amount of humus, since humus is necessary for the best growth of bacteria and the plants can not do well without their presence. The lack of these bacteria in the soils of the Eastern States in the early days has proved to be the principal source of failure of alfalfa or rather lucerne as it was then called.

2. *Treatment of the Soil.* Alfalfa is not stoloniferous and poliferation is so very rare that it practically cannot spread, and especially when young is unable to choke out other plants as do the grasses. It is therefore very essential not only to plow deeply in order to allow the long roots to penetrate deeply, but also to cultivate in such a way that the land will be practically free from weed seeds and in very good tilth before the seeds are sown.

If the land is lacking in lime, it should be *applied before plowing* at the rate of from one-half to one ton of burned lime, or twice as much ground limestone per acre. During the plowing the lime will then become thoroughly mixed with the soil and will therefore be more efficient. It is well also to add manure before planting and mix it thoroughly with the soil.

If the land is virgin to alfalfa or has not become thoroughly inoculated it is well also to add at this time about one-half ton of soil from a field known to produce good alfalfa plants whose roots are abundantly supplied with nodules. If such soil is not conveniently available, "canned bacteria" or "nitragin" (pure nitrifying bacteria) may be used instead.

A one-pound can of "nitragin" as put on the market commercially is sufficient to inoculate one acre. In purchasing nitragin, care should be taken to ask for "nitragin for alfalfa," as the varieties of this material are specific, and a variety for cow peas will not do for alfalfa.

Most of our soils in Hawaii are fortunately already inoculated

with bacteria and the need of inoculation is not very great. If a field of alfalfa does not do well after a few weeks or better a few months' growth, carefully dig up a few plants and wash away the soil. The absence of nodules on the rootlest is a sure indication to the need of inoculation. (Since the nodules are easily knocked off the roots, extreme care should be used in removing the plant and in washing the soil from it.)

3. *Kind and Quantity of Seed and Method of Planting.* With all other conditions supplied, there still remains the matter of good pure seed. This should be plump, of strong germination, and free from weed seeds. Much of the commercial seed sold in bulk contains dodder and other weed seeds which are difficult to separate from the alfalfa seed. If possible, seed should be secured from a source known to be free from dodder or carefully recleaned seed should be used. While it is somewhat difficult to separate the large seeded dodder from ordinary alfalfa seed it can be done by using a screen made of 20 x 20 mesh, No. 34 steel or iron wire on the W. & M. gauge; or, the same mesh of brass or copper wire, No. 32, English gauge. This should be stretched over a light wood frame about 12 inches square. A half pint of seed should be placed in the sieve at a time and thoroughly sifted until all dodder seed is removed. This will require a half minute vigorous shaking, and the results will well repay the trouble.[7] This one feature should not be slighted, for "Trouble with weeds has caused more alfalfa failures than any other one thing."[8] It is said that "an ounce of prevention is worth a pound of cure," but in the case of alfalfa it is not only worth a ton of cure, but is the deciding point between success and failure.

(To be continued.)

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[7] Hawaii Sta. Bul. 23.
[8] Indiana Sta. Cir. 27.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF HONOLULU, CITY AND COUNTY OF HONOLULU, ISLAND OF OAHU, TERRITORY OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, as amended by Act 65 of the Session Laws of 1905, and by Act 4 of the Session Laws of 1907, and of every other power me hereunto enabling, I. LUCIUS E. PINKHAM, Governor of Hawaii, with the approval of a majority of the Board of Commissioners of Agriculture and Forestry, having held the hearing of which notice has been duly given as in said Acts provided, do hereby SET APART as a forest reserve to be called the KULIOUOU FOREST RESERVE, that certain piece of government land in the District of Honolulu, City and County of Honolulu, Island of Oahu, Territory of Hawaii, which may be described roughly as being the mauka portion of the government half of Kuliouou Valley, and containing an area of 214 acres, more or less, more particularly described by and on a map made by the Government Survey Department of the Territory of Hawaii, which said map is now on file in the said Survey Department, marked "Government Survey Registered Map No. 2520," and "Kuliouou Forest Reserve," and a description accompanying the same numbered C. S. F. No. 2363, which said description, now on file in the said Survey Department, is as follows:

KULIOUOU FOREST RESERVE.
Kuliouou 1st, Kona, Oahu.
C. S. F. No. 2363.

Beginning at a pipe at the southwest corner of this reserve on the boundary between Kuliouou 1st and 2nd, the coördinates of said point referred to Government Survey Trig. Station "Koko Head" being 14704.1 feet North and 7428.8 feet West, as shown on Government Survey Registered Map No. 2520, and running by true azimuths:

1. 176° 37′ 6964.0 feet along the land of Kuliouou 2nd to the top of the ridge overlooking Koolau at a place called Ele lupe;
2. 313° 05′ 1718.0 feet along top of mountain range along the land of Waimanalo;
3. Thence down the top of the ridge along the land of Maunalua to an iron pipe, the direct azimuth and distance being 349° 10′ 5439.0 feet;
4. 76° 50′ 1917.0 feet along pasture land of Kuliouou 1st to the point of beginning.

Area, 214 acres.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

DONE at the Capitol in Honolulu, this 13th day of February, A. D. 1914.

LUCIUS E. PINKHAM,
Governor of Hawaii.

By the Governor:
E. A. MOTT-SMITH,
Secretary of Hawaii.

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