

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
WASHINGTON, D.C.

and the

HAWAII INSTITUTE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES
UNIVERSITY OF HAWAII
HONOLULU, HAWAII

NOTICE OF RELEASE OF 'TROPIC VERDE' GLYCINE

The United States Department of Agriculture, Soil Conservation Service, and the Hawaii Institute of Tropical Agriculture and Human Resources, University of Hawaii announce the release of Neonotonia wightii (Graham ex Arnott) Lackey cv. Tropic Verde. This is the first cultivar of this species to be released in the United States.

'Tropic Verde' will provide a much needed domestic source of glycine for ranchers and others for improving pastures, controlling erosion and other uses. Glycine seed has been imported from Australia, primarily for pasture improvement, but has been difficult to obtain since 1987 because of the indirect affect of the millet seed quarantine imposed by the USDA Animal and Plant Health Inspection Service (APHIS) to prevent certain seed born diseases from entering the United States.

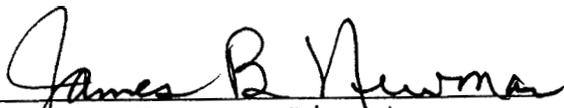
'Tropic Verde' is native to South Africa. It was tested under the numbers PI-224980, BN-11303-54 and HA-1129. It was compared to over 70 different accessions of glycine in observational trials and judged superior in overall growth characteristics. 'Tropic Verde' was further tested in replicated forage production trials, with and without irrigation, where it compared very favorably to 'Tinaroo', 'Cooper', and 'Clarence' from Australia.

'Tropic Verde' is a trailing, herbaceous, perennial legume. It has slender, well branched, twining stems. The runners frequently root at the nodes. The plant has a strong taproot. It normally grows to a height of approximately 24 inches (60 cm). The bright green leaves are pinnately trifoliolate with ovate leaflets 2 to 4 inches (5 to 10 cm) long and 1 1/2 to 2 1/2 inches (3 to 6 cm) wide. The lateral leaflets are usually broader on one side of the midrib than the other. Racemes bear clusters of creamy-white flowers with light purple streaks on the lower part of the standard. The flowers are approximately 1/4 inch (6 mm) long. Pods are hairy, straight or slightly curved, about 3/4 to 1 1/2 inches (2 to 4 cm) long and 1/8 inch (3 mm) wide, with 4 to 5 oblong-shaped seeds. Pods are dark brown to black in color and seeds are tan to black. Seeds are approximately 1/8 inch (3 mm) long and 3/32 inch (2 mm) wide. There are approximately 58,000 seeds per pound (128,000 per kg).

'Tropic Verde' was tested and developed primarily as a pasture or forage plant and ground cover for erosion control. It is a drought tolerant legume that combines well with companion grasses such as green panic, guinea, and buffel. It adds protein to the forage component and nitrogen to the associated grass. It is quite palatable to animals. As a permanent cover crop, it will enrich the soil and provide protection against erosion.

'Tropic Verde' is adapted to elevations ranging from sea level to 3,000 feet (900 m) in Hawaii and the Pacific Basin. It will grow in areas with annual rainfall from 15 inches (381 mm) to 80 inches (2032 mm). It is adapted to a wide variety of soils ranging from coarse to fine textured and at pH levels of 5.5 to 7.8. It is somewhat tolerant to low phosphate soils but responds favorably to phosphate applications.

Foundation quality seed of 'Tropic Verde' will be maintained by the Soil Conservation Service's Plant Materials Center, Hoolehua, Molokai, Hawaii. Seed is available to commercial producers and others for establishing their production fields.



James B. Newman, Director
Ecological Sciences Division
United States Department of
Agriculture
Soil Conservation Service
Washington D.C.

12/29/82
Date



Warren M. Lee
State Conservationist
United States Department of
Agriculture
Soil Conservation Service
Honolulu, Hawaii

11/27/92
Date



Kenneth G. Rohrbach, Acting Director
Hawaii Institute of Tropical
Agriculture and Human Resources
University of Hawaii
Honolulu, Hawaii

NOV 19 82

Date

DOCUMENTATION FOR THE RELEASE OF 'TROPIC VERDE' GLYCINE

Scientific Name: Neonotonia wightii (Graham ex Arnott) Lackey
Synonyms: Glycine wightii (Graham ex Arnott)
Verdc., Glycine javanica L.

Common Name: glycine

Cultivar Name: 'Tropic Verde'

Other Identification Used: PI-224980, BN-11303-54, HA-1129

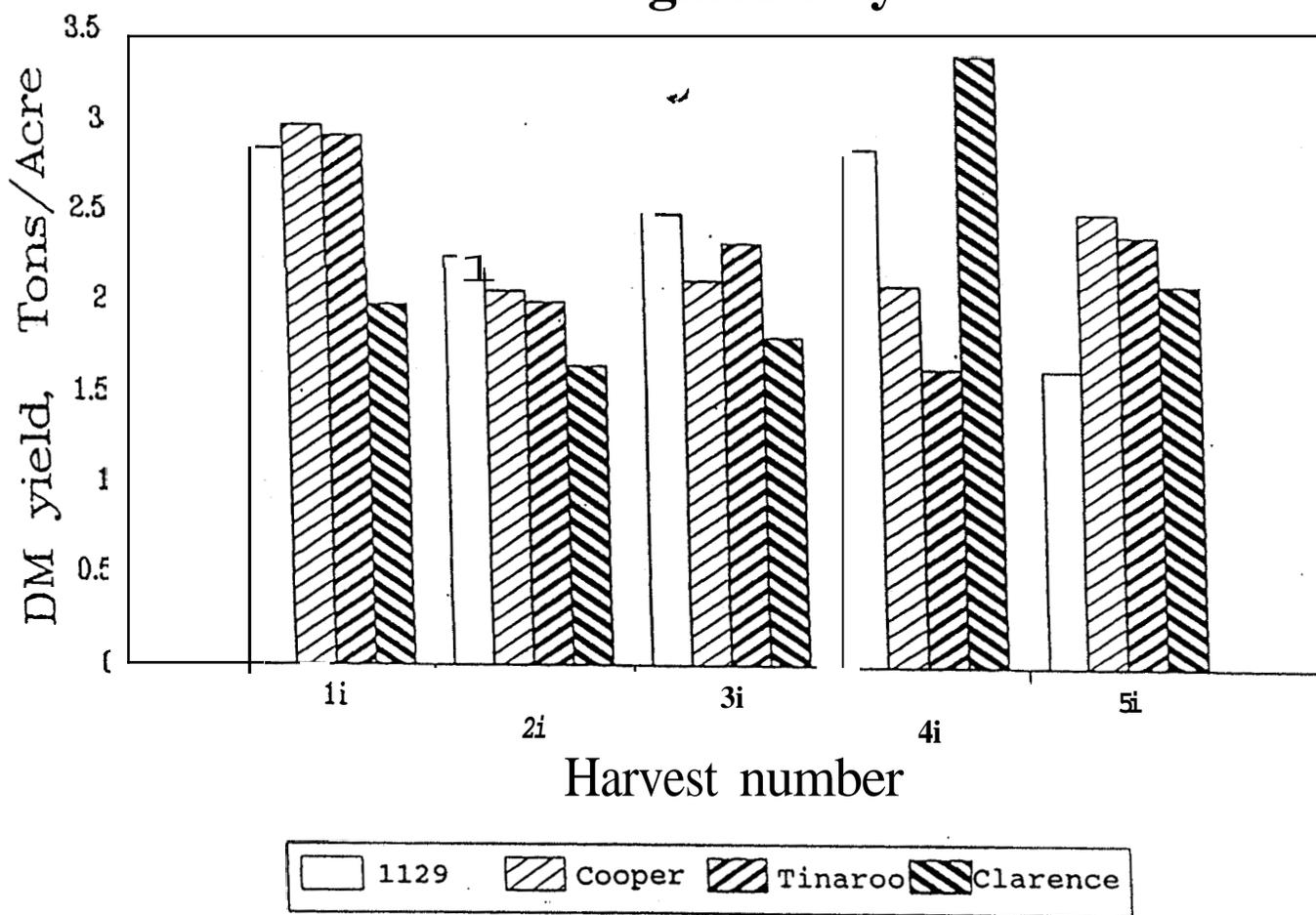
Origin: South Africa. Seed of this strain was received by the Soil Conservation Service Hawaii Plant Materials Center from the SCS National Plant Materials Center on February 9, 1961.

Description: A trailing, twining, herbaceous, perennial legume with slender, well-branched stems. If it has nothing to twine on, it normally grows about 2 feet (60cm) high and the runners frequently root at the nodes. It has a strong taproot. The bright green leaves are pinnately trifoliolate with ovate leaflets, 2 to 4 inches (5 to 10 cm) long and 1 1/2 to 2 1/2 inches (3 to 6 cm) wide. The lateral leaflets are usually broader on one side of the midrib than the other. Racemes bear clusters of creamy-white flowers with light purple streaks on the lower part of the standard, approximately 1/4 inch (6mm) long beginning about October. Pods are hairy, straight or slightly curved, about 3/4 to 1 1/2 inches (2 to 4 cm) long and 1/8 inch (3mm) wide with 4 to 5 oblong-shaped seeds which mature from about December to February. Pods are dark brown to black in color and seeds are tan to black. Seeds are approximately 1/8 inch (3mm) long and 3/32 inch (2mm) wide. There are approximately 58,000 seeds per pound (128,000 per kg).

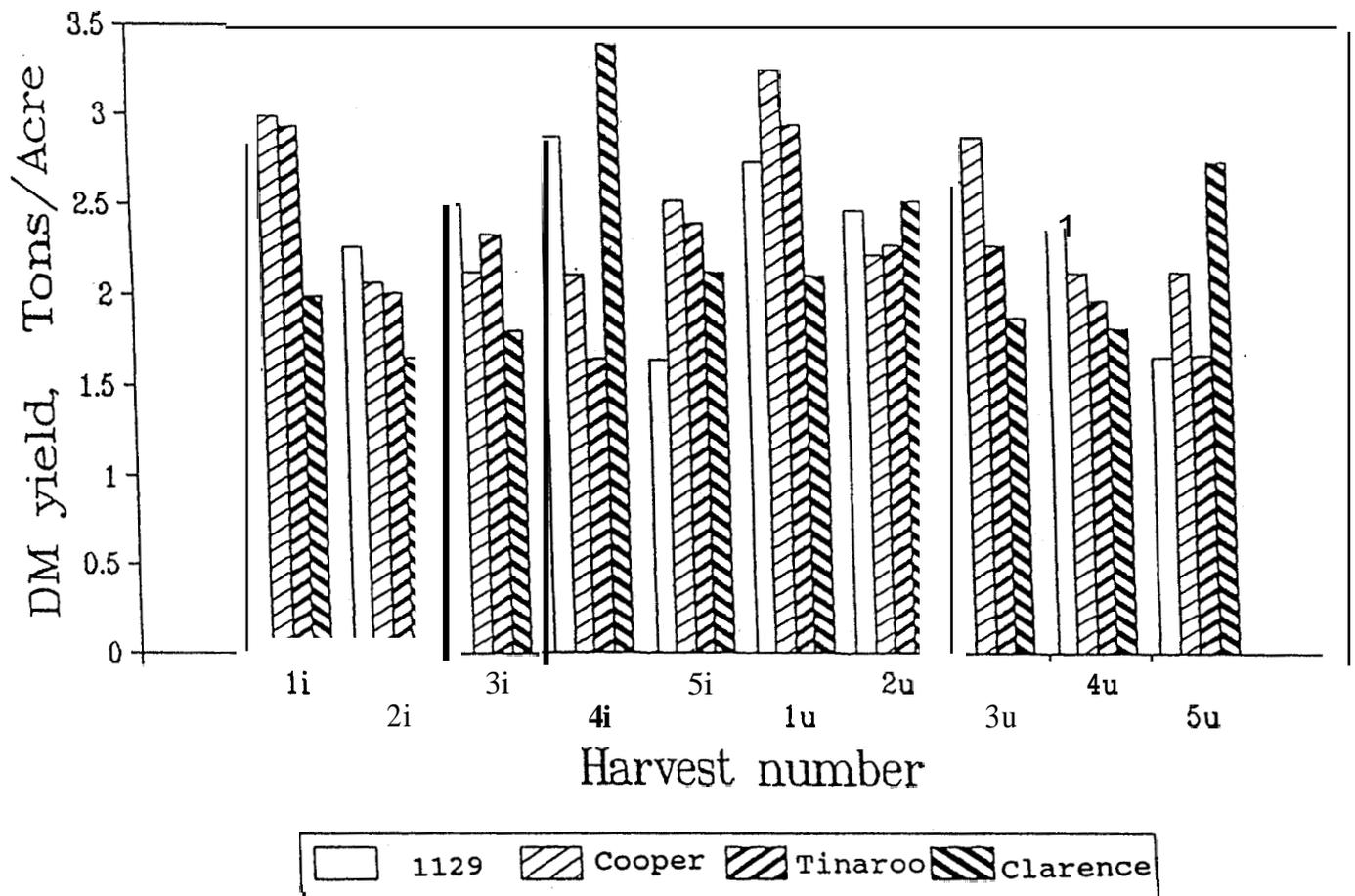
Method of Development: 'Tropic Verde' was compared and judged superior in growth characteristics to over 70 accessions of glycine in observation nurseries. It was further tested with other experimental and commercially available legumes for use as ground cover and pasture in secondary testing trials and Field Plantings representing various climates and soils.

Uses: Primarily for erosion control in low rainfall areas prone to erosion and for pasture improvement. It is a drought tolerant, high protein legume that is non-bloating and is relished by all classes of animals. It grows well with a variety of grasses such as buffel, rhodes, green panic, guinea, napier, pangola, and kikuyu. It is a good forage and seed producer. It has the ability to stand up well under grazing and hay production. It increases its stand once well established. It has good seedling vigor but

Figure 1. Glycine Yields Irrigated only



**Figure 3. Glycine Yields
Irrigated and Non-Irrigated only**



Mean dry matter yields over five harvests did not differ significantly for the four cultivars under irrigation. Mean yields were 2.42 (5.42), 2.35 (5.26), 2.26 (5.06), and 2.19 (4.90) tons per acre (T/ha) for HA-1129, 'Cooper', 'Tinaroo', and 'Clarence', respectively.

Mean dry matter yields over five harvests for 'Cooper' were significantly more than 'Tinaroo' and 'Clarence' but did not differ significantly from HA-1129 in the trial without supplemental irrigation. Mean dry matter yields were 2.52 (5.64), 2.39 (5.35), 2.22 (4.97), and 2.21 (4.95) tons per acre (T/ha) for 'Cooper', HA-1129, 'Tinaroo' and 'Clarence', respectively. Rainfall for the 26 month period (5/88 to 6/90) totaled 62.7 inches (1593 mm) for an average rainfall of 2.4 inches (61 mm) per month. The drought tolerance and deep tap root of the glycine cultivars enabled them to yield comparatively well with this amount of moisture.

Chemical Analysis: Forage from three harvests of the above mentioned trials was analyzed for percent crude protein by the University of Hawaii Agricultural Diagnostic Service Center. The data are presented in Tables 4 and 5 for the irrigated and unirrigated trials, respectively.

Table 4. Percent crude protein of four glycine cultivars grown under irrigation.

<u>HARVEST</u>	<u>CULTIVAR</u>			
Date	HA-1129	Cooper	Tinaroo	Clarence
1/90	18.8*	17.7	17.1	18.2
4/90	15.3	16.7	15.3	16.7
6/90	16.9	17.2	16.4	17.0
Mean	17.0	17.2	16.3	17.3

*Values are averages of five replications per harvest.

Table 5. Percent crude protein of four glycine cultivars grown without supplemental irrigation.

<u>HARVEST</u>	<u>CULTIVAR</u>			
Date	HA-1129	Cooper	Tinaroo	Clarence
1/90	14.9*	13.7	15.0	12.9
4/90	16.1	17.0	16.3	17.0
6/90	12.4	13.9	11.7	14.1
Mean	14.5	14.9	14.3	14.7

*Values are averages of five replications per harvest.

Forage samples of 'Tropic Verde' (HA-1129) glycine were sent to the **USDA-SEA** Poisonous Plant Research Laboratory, Utah State University for analysis in 1978. No poisonous compounds were found in toxic levels. The following data for 'Tropic Verde' and other plants analyzed were presented in the October 1978 issue of the "Poisonous Plant Newsletter", by M. Coburn Williams, Plant Physiologist:

Table 6. Analysis of Neonotonia, Vigna, Crotalaria, and Desmodium for toxic compounds.

Cultivar	Alkaloids %	NO ₂ mg/g	Soluble oxalates %	Tannins %	Cyanogenic glycosides %
<u>Neonotonia wightii</u> (HA-1129)	0.02	0.0	1.4	0.6	0.0
<u>Vigna hosei</u> (HA-3518)	0.04	0.0	1.6	0.0	0.0
<u>Crotalaria iuncea</u> (HA-6)	0.11	0.0	0.7	0.0	0.0
<u>Desmodium cinerascens</u> (HA-3669)	0.02	0.0	0.9	1.5	0.0
<u>Desmodium aparines</u> (HA-201)	0.07	0.0	4.4	3.3	0.0

In 1978 forage samples of 'Tropic Verde' (HA-1129) and various other legumes and grasses growing at the SCS Hawaii Plant Materials Center on Holomua silt loam soil were sent to the University of Hawaii for crude protein analysis. The following values were reported by Stanley M. Ishizaki, Associate Animal Analyst:

Table 7. Crude protein contents of various legumes and grasses.

<u>Species</u>	<u>% Crude Protein</u> <u>(oven-dried basis)</u>	<u>Remarks</u>
<u>LEGUMES</u>		
Glycine (<u>Neonotonia wightii</u>) (HA-1129, 'Tropic Verde')	17.6	Forage clipped from edge of a block of plants 9 months of age. Runners are up to 3 feet (.9m) long.

Con't Table 7

<u>Species</u>	<u>% Crude Protein (oven-dried basis)</u>	<u>Remarks</u>
<u>LEGUMES</u>		
Sarawakbean (<u>Vigna hosei</u>) (HA-3518)	19.1	Forage clipped from edge of a block of plants 18 months of age. Runners are up to 2 feet (.6m) long.
Desmodium (<u>Desmodium aparines</u>) (HA-201, 'Kuiaha')	17.4	Forage clipped from edge of a block of plants 3 months of age. Runners are up to 2 feet (.6m) long.
<u>GRASSES</u>		
Bungomagrass (<u>Entolasia imbricata</u>) (HA-3511)	15.3	Plants 34 inches (86cm) tall were clipped to a height of 10 inches (25cm) (top 24 inches, 61cm). Age of plants, 33 months.
Buffelgrass (<u>Cenchrus ciliaris</u>) (HA-4101, 'Biloela')	13.8	Plants 42 inches (107cm) tall were clipped to a height 12 inches (30cm) (top 30 inches, 76cm). Age of plants 6 months.
Green panicgrass (<u>Panicum maximum</u> var. <u>trichoglume</u>) (HA-716)	10.6	Plants 42 inches (107cm) tall were clipped to a height of 12 inches (30cm) (top 30 inches, 76cm). Age of plants 6 months.
Guineagrass (<u>Panicum maximum</u>) (HA-696)	10.6	Plants 42 inches (107cm) tall were clipped to a height of 12 inches (30cm) (top 30 inches, 76cm). Age of plants 6 months.

Planting Date: 11/75
Cooperator: Richard Cooke Jr.
Use: Horse pasture
Location: Kipu, Molokai
Elevation: 1,300 feet (390 m)
Annual Rainfall: 45 inches (1,143 mm)
Soil Series: Naiwa silty clay loam
Soil Reaction (pH value): (4.5 - 5.5) strongly acid in surface layer and strongly acid to very strongly acid in the subsoil.
Evaluations and Remarks (12/76): Fair to poor initial stand. Plant vigor is fair.

Planting Date: 1/78
Cooperator: Meadow Gold Dairies
Use: Pasture for dairy cows
Location: Kauai
Elevation: 320 feet (96 m)
Annual Rainfall: 35 - 40 inches (889 - 1,016 mm)
soil Series: Lihue silty clay
Soil Reaction (pH value): (5.5 - 6.6) strongly acid in surface layer and slightly acid to neutral in the subsoil.
Evaluations and Remarks (9/92): 'Tropic Verde' glycine has excellent performance. It is providing a high protein pasture for cows. Growing well with buffelgrass and green panicgrass.

Planting Date: 6/88
Cooperator: Palau Bureau of Resources and Development
Use: Pasture for goats and cattle
Location: Nekken Experiment Station, Babelthaup, Palau
Elevation: 50 - 100 feet (15 - 30 m)
Annual Rainfall: 145 inches (3,683 mm)
Soil Series: Ngatpang and Tabecheding silty clay loam
Soil Reaction (pH value): Ngatpang (4.5 - 4.7) and Tabecheding (3.2 - 4.0)
Comparison Plants: 'Cook' stylo and calopo
Evaluations and Remarks (6/90): Very few HA-1129 plants emerged and those that did soon died at the two sites planted for goat and cattle pasture. Glycine is apparently not adapted to these soils and climatic conditions. Stylo (Stylosanthes quianensis) and Calopo (Calopogonium mucunoides) performed very well.

Planting Date: 5/90
Cooperator: Hawaii State Highways Department
Use: Road-cut stabilization and beautification
Location: Kauai
Elevation: 155 feet (47 m)
Annual Rainfall: 75 inches (1,905 mm)
soil Series: Lihue silty clay
Soil Reaction (pH value): (5.5 - 6.5) this is primarily subsoil which is slightly acid.
Evaluations and Remarks (1/92): HA-1129 is performing well on this road-cut under dry weather conditions and low soil fertility. It was planted with 'Tropic Lalo' paspalum which was growing well also until the drought caused it to turn brown from lack of moisture.

Planting Date: 3/91
Cooperator: Mac Farms of Hawaii and Dr. Burt Smith, University of Hawaii
Use: Cover crop in Macadamia nut orchard/sheep pasture combination.
Location: Kona, Hawaii
Elevation: 2,000 feet (600 m)
Annual Rainfall: 50 inches (1,270 mm)
Soil Series: Puna extremely stony muck
Soil Reaction (pH value): Neutral in reaction
Comparison Plants: 'GrasslandMaku' trefoil, 'Haifa' white clover, calopo, 'Kuiaha' desmodium, 'Grassland Pitau' white clover, red clover.
Evaluations and Remarks (1/92): HA-1129 glycine is the only species surviving. The stand is poor but plants are established and with fair to good vigor. Sheep have grazed this area of the orchard. There has been practically no rain since planting and no irrigation on the cover crop plots.

Increase and Distribution: Breeder and foundation seed of 'Tropic Verde' glycine will be maintained by the Soil Conservation Service's Plant Materials Center, Hoolehua, Molokai, Hawaii. Seed will be available to commercial growers and others interested in establishing production seed fields.