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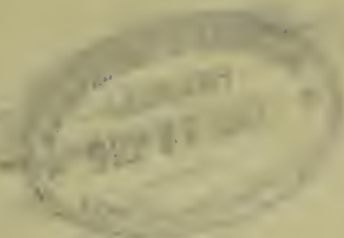
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## AIRPLANE SEEDING

## A Selected List of References

Compiled by Elinor E. Dunnigan, U. S. Dept. of Agriculture Library

March 17, 1947

Airplanes in farming. Nation's Agr. 21:22. Oct. 1946. 280.82-B89  
Includes brief description of seeding rice.

American farmers and ranchers will use airplane for many specialized agricultural operations and to transport perishables to distant markets.  
Du Pont de Nemours, E. I. & Co., Agr. News Letter 14: 23-26. Mar/Apr. 1946. 6 D92  
Includes brief description of seeding of stripped-over coal land.

Ashley, T. Planting by airplane. Southern Flight 23(3): 30-31, 72.  
Mar. 1945. Libr. Cong.

Description of Adams pellets and of Adams centrifugal planter. Planter shoots pellets downward in a row, or broadside. Machine for manufacturing pellets pictured, and company named. Size of grass-seed pellet is 1,920 to a pound. An acre of range is 22.69 pounds of seed, at 241 acres per minute.

Special pellet with metal projectile dropped into forest mulch, such as leaves.

Possibilities for plane planting almost unlimited, e. g. in Russia, by using military aircraft for revegetation.

Once growth is started it will lead to automatic reseeding by natural means.

Adams suggests aerial planting every ten years. Idea of pellets occurred to him in 1924.

Barnhill, O. H. Plants it from the air; burned-over land and flooded pastures made verdant again. Amer. Hereford J. 36(22): 64. Mar. 15, 1946.  
43.8 Am32

Pasture grass seed flows from Piper Cub venturi seeder, onto flares, which spread mixture over a 100-ft. swath. Alt.- 40 ft.

Barnhill, O. H. Revolution in range reseeding; pellet planting from airplane promises a new departure. Amer. Herford J. 36(18): 24. Jan. 15, 1946. 43.8 Am32

100,000 acres of Arizona public pasture lands, which USDI has arranged to have reseeded under direction of Dr. Lytle S. Adams. Seed, fertilizer and fungicides incorporated into pellet. Size, weight and distribution of pellet.

Similar information in: Farmer and Settler 41(11): 19. Apr. 12, 1946.  
23 F226

MAY 7 1947

(Over)

Bates, E. N. California rice land seeded by airplane. Agr. Engin. 11: 69-70. Feb. 1930. 58.8 Ag83

Also in Spanish in Hacienda 25: 262-263. June 1930. 6 Hll. Also in Russian in Sovkhoz, No. 6, p. 55-56. 1930.

Plan carried out by Crocker-Huffman Land and Water Company. Gives methods, costs, and results.

Boone, P. The farmer takes to the air; airplanes open another new era in rural life. Fla. Grower 54(6): 12-13, 16. June 1946. 80 F6622

Includes brief description of clay pellet sowing; and cost of sowing 10,000 pounds of grass seed on stripped-over coal land to be used for pasture.

CAI studies new field for returned war fliers. Civ. Aeronaut. J. 6: 5, 8. Jan. 15, 1945. 173 C49C

Crop dusting and seeding suggested. Statement on seeding, including rice seeding technique.

Carter, K. Speed farming; aerial agriculture fast but dangerous. Nebr. Farmer 88(14): 5. July 20, 1946. 6 N27

Includes aviation technique; commercial flyers fly at 10 ft. altitude for grass seeding.

Collier, G. A. Rice production and marketing in the United States. U. S. Dept. Agr. Misc. Pub. 615, 32 p. Washington, U. S. Govt. Print. Off., 1947. 1 Ag84M

Includes description of seeding rice from airplane in California (p. 7) About 90 percent of acreage is sown from the air. About 400 acres per day can be seeded by this method.

Dunn, H. H. Farmer takes to the air. Travel 53(5): 40-43. Mar. 1932. Libr. Cong.

Includes following information on seeding: Plane planted nearly 2,000 acres to wheat in 3 hours; Hawaii replanting native forests from the air - include's mention of chief tree seeds planted, from altitude of 2,000 feet; Planes with hoppers developed by USDA and corporations which maintain planes for this commercial use; Planting rye, vetch, clover, or mixture, on cut-over timber lands - seed spread at 200 to 500 ft. altitude - cost and method.

Farming by aeroplane. Jamaica Ag. Soc. J. 40: 294-295. May 1936. 8 J223  
From Le Journal de Moscou.

In New Zealand in 1919 the plane was first used to sow seed. In U. S. and Hawaii in 1922 and 1926-27 used for grass. In California in 1929 for rice. In USSR in 1930-31 its use began.

USSR plans include sowing in the thaw. Equipment is a hopper ending in a rotary distributor. Plane also to be used for planting forests.

- Farming takes to the air. Pop. Mechanics Mag. 74(3): 371-373, 120A-121A.  
Sept. 1940. 291.8 P81  
Crop dusting and planting done by commercial flyers. Best time is early morning and evening, because of less wind. Includes the technique of flying and a description of the hopper for seed.
- Gamper, V. Opyt poseva peschanogo ovsa s samoletov (Experiments in airplane sowing of oats in sandy soils). Melioratsiia i Torf 10(12): 43-44.  
Dec. 1931. (In Russian.) 20 M48  
Reports of experiments. Tables and statistics showing methods, formulae, and results.
- Gleason, C. H. Directions for sowing mustard for erosion control in burned areas of Southern California. U. S. Forest Service, California Forest and Range Experiment Station. Forest Research Notes, No. 37, 29 p., processed. Jan. 15, 1944. 1.9 F7626R  
"Sowing by plane", p. 8-9, includes equipment of plane.  
Appendix E, p. 19-22 - "Specifications and airplane service."  
Appendix I, p. 23 - "Method of calibrating seed hopper."
- Gordon, L. S. Materialy po arozevu risa (Material on sowing rice by airplane). Rukopis, NIISKHA
- Graham, E. H. Use of aircraft may be possible for seeding, topdressing on larger areas. Farmer & Settler 40(41): 16. Nov. 9, 1945. 23 F226  
New Zealand pasture seeds could be sown by aircraft.
- Hall, O. D. Wings over forest and field. Aero Digest 52(5): 39-41, 157.  
May 1946. DCPL  
Brief description of seed pellets and use.
- Haystead, L. 20,000 acres per hour. Fortune 31(6): 166, 168. June 1945.  
110 F772  
Sowing seed over large areas by use of seed pellets.  
Includes equipment, and costs.  
Includes mention of USDA-USDI bill to Congress asking for \$2,500,000 for renewing forage.
- Higgins, F. H. New plane loader speeds seeding. Rice J. 49(10): 10.  
Oct. 1946. 59.8 R36  
Description of Farris loader which saves time and labor in loading rice into plane hopper.
- Iarmolovich, B. K. Arozev semian eli (Airplane sowing of fir seeds). Lesnoe Khoziaistvo i Lesoeksploatatsiia, No. 5, p. 13-14. May 1935.  
(In Russian.) 99.8 L563  
Four different areas, in different conditions of soil and growth, sowed with fir seeds. Parts were on bad terrain, where airplane sowing was necessary. Type of airplane and hopper used, and method of signaling included.



- Ivanov, N. Samolet na sluzhbe sotsialisticheskogo l'novodstva (Airplane service in socialist flax-growing industry). Len i Konoplja 9(12): 19-20. June 1932. (In Russian.) 73.8 L54  
Includes mention of use of airplane in sowing rice and wheat, and importance of airplane in early planting of flax.
- Judd, C. S. Airplane seed sowing. J. Forestry 24: 931-932. Dec. 1926. 99.8 P768  
Tree seeds of many species sown broadcast over the Panaewa Forest Reserve on island of Hawaii, to reestablish a forest cover on a burned area. 700 pounds of seed were dropped from an altitude of 1,500 ft, with the plane flying at about 110 mph.
- Khorlikov, I. Iz opytov aeroloseva (From the experiments in airplane sowing in forests). Na Zashchitu Sel'skokhoz. Urozhaiia, No. 14, p. 17-18. 1932.
- Konovalova i Natal'in. Opyt aeroseva v Karatal'skom risosovkhozhe (Experiments in airplane sowing in the Karatal'sk rice-growing state farm). Tekh. Sots. Zeml., No. 8, p. 29. 1932.
- Korotkikh, G. Samolet - zveno sotsialisticheskoi sistemy mashin sel'skogo khoziaistva (The airplane as a link in the socialist system of agricultural machines). Mekhanizatsiia Sotsialist. Sel'sk. Khoz. 3(6): 25-27. June 1932. (In Russian.) 58.8 M46  
In 1931, rice, oats and alfalfa were sowed by airplane. In 1932 tried 20 varying crops, including wheat, medicinal herbs, algae, forage crops. Success of wheat crop in one year led to a larger sowing next year. In one state 90 percent of the wheat sowing was done by airplane. Preparation of soil advised. Sowing by rows important. Time of sowing; fir and pine sowing in thawing snows, in Moscow areas; April and May sowing of cereals and forage; early sowing of flax, to try to get two harvests a year.
- Kratzer, F. Rural aviation arrives. Western Farm Life 48(10): 3, 12. May 15, 1946. 6 R153  
Description of Adams seed pellets. Large plane needed in order to use successfully the centrifugal sowing machine of Adams.
- Lassetter, W. C. Airplanes for farm work. Prog. Farmer, Miss.-Ark.-La. Ed. 61(6): 12-13, 71. June 1946. 6 S081  
Work by commercial pilots. Method, costs, arrangement and size of fields. Includes planting of lespedeza, other grasses, rice, and cover crops in cotton.
- Lavrov, L. D. Osnovnye faktory, vliiaushchie na proizvoditel'nost' samoleta na posevakh (The chief factors affecting the labour efficiency of the airplane used for sowing seeds). Moscow. Vsesoiuznyi Nauchno-issledovatel'skii institut Sel'skokhoziaistvennoi i Lesnoi Aviatsii im Ia. A. Iakovleva. Sbornik, No. 1, p. 20-52. Leningrad, 1933. 333.9 M85  
English summary, 47.48.

Size of landing place, located near fields seeded; 6 men to load a single airplane; field must be cut into regular rectangles for airplane to fly over it; actual weight of seeds to be considered. Study based on seeding of grasses in spring & autumn of 1932.

Lindsay, C. M. Sowing rice seed from the air. *Rice J.* 35(2): 10. 1932.  
59.8 R36

Two planes sow about 600 acres per day in California rice field with the planes carrying 7 sacks of grain each trip. At alt. 25 ft., sow 30-ft. wide strips. Fields also sowed at right-angles. Fields flooded before sowing, to make rice grow quicker, keep seeds from being eaten.

Mahoney, M. Sky planting in the desert. *Travel* 87(5): 4-8, 30. Sept. 1946.  
Libr. Cong.

Seed pellets planted on Papago Indian Reservation, Sells, Arizona. The pellets fell approximately 1 per sq. ft. and each flight covered an acre per second. The altitude was 500 ft. Pellets are adaptable for row crops and reforestation seeding.

Mail pickup inventor sows seeds by plane. *Aviation News* 2(24): 15-16.  
Jan. 8, 1945. Libr. Cong.

Dr. Lytle Adams' pellets. Clay pellets ranging from size of a pea to about 1 inch in diameter, contain also rodent and insect repellents, covering seed which has been cleaned of husk and chaff. Pellets shot through rotating tubes.

Mikhailov-Senkevich, Ia. M. Tsentrobezhaia aeraseialka (Centrifugal machine for sowing seeds from airplanes). Moscow. Vsesoiuznyi Nauchno-Issledovatel'skii Institut Sel'skokhoziaistvennoi i Lesnoi Aviatsii im Ia. A. Iakovleva. Sbornik, No. 1, p. 53-60. Leningrad. 1933. 333.9 M85  
English summary, p. 60.

Machine consists of three main parts, tank into which seeds are loaded, directing cylinder into which seeds pass from the tank, and centrifugal scattering mechanism with paddles which distributes seed over a strip about 50 to 80 ft. wide.

Mark, F. A., and Roaf, J. R. Range seeding by airplane. *Soil Conserv.* 6: 270, 272. Apr. 1941. 1.6 S03S

Squaw Creek planting, Idaho. 2,500 acres planted with 5,875 pounds seed *Agropyron cristatum*. Distribution of seed checked by greased cards. Planes fly at alt. 300 to 500 ft. Best time for sowing - early morning and 4 P.M. until dusk.

Pavlenko, V. A. Arosev v usloviakh risovogo khoziaistva (Airplane sowing in rice culture). *Trudy, Vses. Tsent. Stantsii Risovogo Khoziaistva*, No. 1, p. 54-57. 1933.

Pickford, G. D. and Jackman, E. R. Reseeding Eastern Oregon Summer Ranges. *Oregon State Agri. Expt. Sta. Cir. No. 159*, p. 41. January 1944.

Coos County, Oregon airplane seeding. 12,000 acres seeded in 1936. Cost 21 cents per acre for use of plane. Seeded in 150 ft. strips from 500 ft. height at rate of 8 lbs. seed per acre. Costs comparable to hand broadcasting.

- Plummer, A. P., and Stewart, G. Seeding grass on deteriorated aspen ranges. U. S. Forest Service. Intermountain Forest and Range Experiment Station, Ogden; Utah. Res. Paper No. 11, 6 p., processed. Oct. 1944. 1.9622 I2R31  
Mentions briefly that airplane seeding is possible.
- Posev lesa s samoleta (Airplane sowing in forests). Na Zashchitu Sel'skokhoz. Urozhaiia, No. 9, p. 31. 1932.
- Prichard, A. M. Air sowing; application and limitations. New Zeal. J. Agr. 70: 117-120. Feb. 15, 1945. 23 M48J  
Prepared from a technical report on experiments conducted by the New Zealand Public Works Department.  
Lupin seed sown on sand dunes from altitude of 100 to 150 ft. Includes method, results, cost, and flight technique.
- Rafes, P. M. Aviatsionnyi posev risa (Airplane sowing of rice). Sotsialist. Pereustroistvo, No. 4, p. 116-121. 1931. (In Russian.) 281.8 So7  
U. S. sowing of rice by airplane led to trial in U. S. S. R. Through discussion of method and equipment: airplane, hopper, speed of plane, altitude, amount of grain used, time, and labor.
- Rafes, P. M. Posev s pomoshch'iu samoleta (Sowing from airplanes). Mekhanizatsiia Sotsialist. Sel'sk Khoz. 3(4): 5-7. Apr. 1932. (In Russian.) 58.8 M46  
Advantages of sowing from airplanes, forage plants and grasses, such as alfalfa, clover, winter mustard. Oats sowed in sands. Rice sowed in flooded fields. Advantages of this method given. Experiments of Institute of Agricultural Aviation. Describes the plane used, and the hopper.
- Rafes, P. M. Uzlovye voprosy tekhniki i organizatsii aëroseva (Basic problems of technics and organization of airplane seeding). Moscow. Vsesoiuznyi Nauchno-issledovatel'skii Institut Sel'skokhoziaistvennoi i Lesnoi Aviatsii im Ia. A. Iakovleva. Sbornik, No. 1, p. 5-19. Leningrad, 1933. 333.9 M85  
English summary, p. 18-19.  
USSR-acreage of fields seeded by airplanes amounted to 10,000 acres in 1931 and 150,000 acres in spring of 1932.  
Present status of technics and organization of airplane seeding discussed at length. Special airplane seeder is badly needed. Airplane speed- 63 m.p.h.; alt. 65 ft. For computing length of strip to be sown, and load of airplane, special formulae are used. Lists problems yet unsolved.
- Report NIISKHA ob aëroseve lesa (Report of NIISKHA on airplane sowing of forests). Biul. Sel'skokhoziaistvennoi i Lesnoi Aviatsii, No. 1, p. 9. 1932.
- Rickard, J. A. These aren't double-shovel days. Farm & Ranch 65(11): 9, 60-61. Nov. 1946. 6 T31  
General article on use of aircraft in agriculture.  
Includes description of rice planting on dry land, and description of pellet planting of seeds in California, with objections to this method.

Roesner, O. H. How the farmer uses planes. Calif. Cultiv. 82: 255. Apr. 27, 1935. 6 C12

Includes brief description of sowing rice and a brief statement on sowing clover seed.

Romanovich, I. K. Aviatsionnyi sev v inostranoi praktike (Sowing seeds from airplanes in foreign countries). Moscow. Vsesoiuznyi Nauchno-issledovatel'skii Institut Sel'skokhoziaistvennoi i Lesnoi Aviatsii im Ia. A. Iakovleva. Sbornik, No. 1, p. 61-65. Leningrad, 1933. (In Russian.) 333.9 M85

Brief description of early activities in sowing seeds from airplanes in New Zealand, United States, Hawaii, and USSR.

Samoilovich, G. G. Aerosev semian na lesnykh ploschadiakh (Airplane sowing of seeds in forest areas). Lesnoe Khoziaistvo i Lespeksploatatsiia, No. 3, p. 28. Mar. 1935. (In Russian.) 99.8 L563

Development of airplane sowing of agricultural seeds since 1931. Technique, and area covered. In forestry, still in experimental stage. Improvement of technique and equipment will lead to good reforestation. Experiments carried on with pine and fir. Brief statement on airplane reforestation in Hawaii in 1926 and in Oregon in 1927.

Smith, R. S. Flyin' the range; agriculture sets the pace in post-war aviation. Coastal Cattleman 12(6): 5-7. Aug. 1946. 43.8 C63

Includes statements on planting rice and pellets of seed.

Stailey, R. W. Flying Farmers. Ohio Farm Bur. News 25(4): 4-5, 31. Nov. 1945. 6 Oh34

General article on use of airplanes in agriculture. Includes brief mention of pellet seeding.

Stanbery, S. W. Giving wings to range grass. Natl. Live Stock Prod. 22(5): 6. Feb. 1944. 280.33 N21

In seeding by airplane hopper loaded with 1,000 pounds of seed used for 2,000 acres.

Stanton, C. V. Seeding of waste lands by airplane. Aviation 26: 243-245. Jan. 26, 1929. Libr. Cong.

Experiment in southern Oregon where "logged-over" lands are being seeded and converted into stock ranges. Development of early hopper.

Flying skill required, because of turns, low altitudes, and reloading.

Seeding most effective if it follows immediately after the fire that burns through the slashing.

Comparison of costs and labor needed, with hand and machine sowing.

U. S. Forest Service has been making careful check of results, such as: the stand of grass is heavier than usually obtained by hand sowing, although less seed is used and seed distribution is far more uniform. It is not known whether plane can supplant methods now used in sowing great grain fields..

Stupachenko, I. Opyty poseva sosny s samoleta (Experiments in sowing pines by airplane). Biul. Sel'skokhoziaistvennoi i Lesnoi Aviatsii, No. 6, p. 14-16. 1932.

- Sytin, V. Sotsialisticheskaiia sel'skokhoziaistvennaia i lesnaia aviatsiia . (Socialist agricultural and forest aviation). Mekhanizatsiia Sotsialist. Sel'sk. Khoz. 3(2): 7-8. Feb. 1932. (In Russian.) 58.8 M46  
Includes description of 1931 experiments in sowing by airplane of rice, clover, alfalfa, winter mustard and oats. Proved the technical possibilities of this method.
- Teutsch, W. L. Oregon tries sky planting. Ext. Serv. Rev. 8: 179-180. Dec. 1937. 1 Ex892Ex  
12,000 acres of burned-over ground seeded. Gives technique of sowing and a description of the grasses.
- Teutsch, W. L. Seeding range lands by airplane. Natl. Wool Grower 18(3): 29-30. Mar. 1928. 45.8 N21N  
1,000 acres of burned-over, logged-off land seeded in Coos County, Oregon. Flown twice; orchard grass and rye grass broadcast first time and alsike and white clover second time. 500 ft. alt.; 4,500 pounds of seed. Total cost \$420; was \$1080 less than estimate for hand broadcasting. Resulted in good distribution and excellent stand.
- Tontz, C. Planting bee pasture by plane. Gleanings Bee Cult. 73: 300. July 1945. 424.8 G47  
Adams clay pellets and lead pellets, like bullets, are good for burned-over mountain-sides.
- Vavilov, N. I. Posevy risa s aeroplanov (Rice sowing by airplane). Vestnik Znaniia, No. 5/6; p. 297-299. 1931.
- Whitlow, S. Texans to plant rice by plane. Farmer-Stockman 59: 272. May 1946. 6 Ok45  
Will plant sprouted rice on flooded fields.
- Winters, S. R. Plane planters. Flying 30(3): 48-49, 112. Mar. 1, 1942. Libr. Cong.  
At Squaw Creek Hills, Idaho, planes were used by the Federal Government to sow grass seed in mountainous areas and other inaccessible areas. Method: Flying 80 mph, alt. 300 ft., seeded 100-ft. wide strips. Cross-seeded at right-angles. Planting grass seed from planes over forest burns has been accomplished in the West by U. S. Forest Service.  
Description of plane and hopper for seeds, used in Oregon operations.  
August and September are best months for air seeding. U. S. Forest Service planting of mustard seed for erosion control in California, by airplane.
- Woodhead, H. How airplanes are now serving the farmers. Farmers Guide 102(4): 12. Feb. 15, 1946. 6 In2  
Includes brief description of sowing soaked rice seed on flooded fields; statement about seeding of grasses over grazing lands; and crops sown by air: wheat, oats, alfalfa, rice, and range grasses.

Young, A. W. Aerial farming; the airplane has many uses in agriculture.  
Amer. Brahman J. 1 (8): 17. Nov. 1946. 43.8 Am33

Commercial planes sow hay, pasture crops, and rice in the South. In the South West, range land reseeded by pellets.

Zelenukhin, (L). Zadachi aviatsii v sel'skom i lesnom khoziaistve i perspektivy ee primeneniia vo 2-iu piatiletku (Problems of aviation in agricultural and forest economy and the outlook for its utilization during the 5-year plan). 2. Vsesoiuzn. Aviokonf. po Bor'be s Vred. v Sel'sk. i Lesn. Khoz (Moskva, 1931) Tezisy Dok., p. 3-6. Moskva, 1931. (In Russian.) Libr. Cong.

Under the socialistic agricultural reconstruction of the Russian Union, the airplane will take its place with the tractor, combine, and automobile in large-scale production. At the present time, its use has been limited to crop pest control, malaria control, and for sowing... The report also discusses construction of planes, training of personnel, etc.

