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ECONOMICS OF FERTILIZER USE
(Preliminary)

National Fertilizer Development Center
Tennessee Valley Authority
Muscle Shoals, Alabama
August 1972

The abstracts in this publication were selected from the world's literature as reviewed in *Fertilizer Abstracts* for the period January 1968-August 1972. *Fertilizer Abstracts* is concerned with the newest advances in fertilizer technology, marketing, and use; it is selective in its coverage of technical journals, patents, and miscellaneous scientific and technical reports.

Three criteria were used in choosing the abstracts for this collection on the economics of fertilizer use. They were:

1. Abstracts that provided factual information about the costs and returns from the use of fertilizer.
2. Abstracts that provided general economic information about fertilizer use or factors that affect fertilizer use.
3. Abstracts that provided factual information about rates of fertilizer and responses thereto and which could be, but have not yet been, subjected to economic interpretations.

ECONOMIC RESPONSES

1

One Ton of Coffee Per Acre.

Jose Vicente-Chandler, Fernando Abruna, and Servando Silva (Agr. Res. Serv., U.S.D.A.).

World Farm. 11 (2), 29-6 (Feb. 1969).

Intensive management with Arabica coffee in Puerto Rico has resulted in yield of more than a ton/acre. The use of large quantities of fertilizer is economical since their application has increased yields 1000 lb/acre (over $400 on the world market). Mature coffee plantations should be fertilized with up to 2000 lb/acre 20-3-20 or similar grades containing S and micronutrients. S usually is added as 200 lb/ton magnesium sulfate and micronutrients (high in Zn) at the rate of 20 lb/ton. Application usually is in increments of 500 lb/acre in December or January, August, and for high yielding plantations April or May.

2

Nutrition of Glasshouse and Other Horticultural Crops.

G. W. Winsor (Glasshouse Crops Research Institute, Littlenampton, England).

Fertiliser Soc. Proc. 103, 55 pp. (1968).

With a total of about 6000 acres Britain has the second largest greenhouse industry in the world, being surpassed only by the Netherlands. Commercial greenhouse cultivation in Britain is discussed with emphasis on fertilization practices. The principal vegetable crop is tomatoes which accounts for 60% of the greenhouse vegetable acreage. The yield of tomatoes in greenhouses is relatively constant with a mean of 33.9 tons/acre in contrast with a range of 2.2-17.9 and a mean of 8.8 tons/acre for field-grown tomatoes. With this degree of uncertainty it is not surprising that the acreage used for field-grown tomatoes has decreased rapidly in recent years. In 1964, 2200 acres of greenhouse were planted in tomatoes; the average yield was 35.9 tons/acre and the value was $12,100/acre. For lettuce the greenhouse acreage was 1410, the average yield was 6.9 tons/acre and the value was $3160/acre. For cucumbers, 420 acres of greenhouse were planted, the yield was 70.7 tons/acre and the value was $20,200/acre. Capital cost for a heated greenhouse is about $60,000/acre. There are cogent reasons for selecting sites with a suitable top-soil and soil profile. Extremes of soil texture would not normally be used. Tests to determine fertilization requirements of greenhouse crops are necessarily much more limited than tests on field crops. Despite the relative shortage of basic data on nutritional requirements, general recommendations can be found for most greenhouse crops. (86 references)

3

Fertilizer, A Great Farm Input.

Farm Supplier 48 (1), 6 (Jan. 1969).

The fertilizer industry has encountered problems from over-production partially because of the unusual success the farmer has realized from fertilizer input. Fertilizer use has increased approximately 10% each year for several years. It is estimated the farmer receives a $2.00 return for each $1.00 invested in fertilizer. Physical distribution facilities and short period of time during which fertilizer can be used appear to be the bottleneck hampering increased usage at the present time.

4

Wheat Production in Eastern Anatolia; Investigations at Ataturk University, Erzurum, Turkey, 1967.

James G. Ross, Ahmet Akyurek, and Nazmi Oruc (Ataturk Univ.).

Plant Sci. Dept., Ataturk Univ., Erzurum, Turkey, 53 pp. (1968).

Three variety-fertilizer experiments were conducted in 1967 in Erzurum valley--one on irrigated land, one on dryland under fertile conditions at Ataturk University, and one at Taze Gul village on farmland which was poor in fertility and not irrigated. In the first two experiments, wheat varieties from the American midwest were compared with two varieties of Turkish origin recommended for Eastern Anatolia while in the last experiment the best Turkish variety was compared with the farmer's endemic strain. Under irrigation, fall application of N and P was combined and compared with spring application of N on all varieties. Under dryland only the fall application was made. At Taze Gul N and P were applied in the fall and also N in the spring. Under irrigation, Warrior yielded 582 kg/decare of grain with 60 kg ammonium sulfate and 30 kg superphosphate (17% P_2O_5)/decare. Under dryland Cheyenne at 396 kg/decare yielded more than any variety fertilized with 30 kg/decare ammonium sulfate and 30 kg/decare superphosphate. Under farm conditions at Taze Gul the village variety yielded 260 kg/decare and Turkey 305 only 197 kg/decare with the best fertilizer treatment. On the soil in the irrigation experiment, high P fixation occurred and no effect of P application was obtained. Spring application of 30 kg/decare of ammonium sulfate gave almost as high yields as fall application of 30 kg/decare of ammonium sulfate and 30 kg/decare of superphosphate. Combining grain and straw value, spring application of N gave a return of 7.84 TL for each TL invested, in comparison to 5.40 TL for fall application of N and P, and 4.73 TL for combined spring and fall application of N and fall application of P. Under dryland where fertility was high, fall application of N and P gave a significant increase in yield over the control but only a return of 2.41 TL for each TL invested. Under farm conditions at Taze Gul a return of 4.62 TL (only value of grain computed) was obtained for fall application of 20 kg/decare ammonium sulfate and 30 kg/decare of superphosphate. Returns from P by itself and N by itself were not as high. N and P applied together in the fall appear to give the best results under these conditions. Under irrigation, yields of 1000-1100 kg/decare are not impossible goals if the ideal cultural and soil conditions are combined with the correct strong-strawed adapted genotype. The yields presently obtained compare favorably with those obtained in the coastal areas from the new Mexican wheats and indicate the immense potential of the Eastern Anatolian region.

5

Economics of Smallholder Farming in Rhodesia.

B. F. Massell and R. W. M. Johnson.

Food Res. Inst., Stanford Univ., Stanford, Calif., 74 pp. (1968).

This monograph is an analysis of agricultural underdevelopment in Rhodesia. It is based on a sample survey of two areas that were comparable in soils and climate but differed markedly in farm size and other characteristics. In the Chiweshe area all land was held in tribal trust, family farms averaged nine acres of arable land plus grazing rights. In the Darwin purchase area, farmers had freehold tenure, their farms averaged 219 acres but only 23 were cultivated. Farmers in both areas produced the same principal crops--corn, peanuts, and millet--but labor and other inputs varied from crop to crop and between areas. Chiweshe family heads left their families frequently for off-farm jobs in cities but Darwin family heads

rarely left the farm. Darwin farmers, with their owned and larger farms, put in many more hours of labor and had greater returns to labor than Chiweshe farmers. Chiweshe definitely was an area of subsistence agriculture with little likelihood of change. Darwin, though still an area of smallholds, was market oriented. Land labor, and capital were used to the extent available. Marginal returns to these inputs provide an incentive to their increased use Labor already was at near maximum use and this limited the amount of land that could be farmed without further mechanization. The study showed that fertilizer use could be increased in the Darwin area. Returns were 2.94:1 for corn, compared with 1.69 1 in the Chiweshe area. Chemical fertilizer was not used on any other crop.

6

Response of Dwarf Wheats to Nitrogen.

J. P. Dubey, Y. M. Upadhyaya, and S. P. Kohli (College of Agr., Indore, IARI., New Delhi, India).

Indian J. Agr. Econ. 23 (4), 144-5 (Oct.-Dec. 1968).

Fertilizers are one of the most important factors in increasing crop yield. Dwarf wheats are highly responsive to higher doses of major plant nutrients, particulary N. Recommendations regarding optimum doses are to be decided taking into consideration the marginal input productivity and the out-input price ratio. Results of high fertility trials have, therefore, to be analyzed in the light of possible price ratios. The optimal N application levels for the recently introduced high-yielding varieties of wheat are outlined. The response data have been taken from the results of uniform high fertility trials conducted at 16 centers in eight states during the year 1966-67. The results relate to all-India mean responses in respect of Kalyan Sona, Sonalika, unselected S 227, Sonora 64, Lerma Rojo, and Punjab C 306. Kalyan Sona and Sonalike varieties have proved superior to the other types. Lerma Rojo does not stand very well in comparison with the other dwarf varieties; it alternates with the tall variety C 306 for the lowest place in the order of response. Kalyan Sona and unselected S 227 have shown their best response in Uttar Pradesh, while Sonalika and Sonora 64 have figured best in Rajasthan. Maharashtra has shown an almost flat response in respect of all the six varieties. In the face of adverse drought conditions, Bihar has proved quite responsive. The estimated maximum yields for four dwarf varieties are between 33-35 quintals/hectare, those for Lerma Rojo and C 306 are close to 29 quintals. Optimal levels (at grain prices between Rs. 70-Rs. 110/quintal) range from 132-144 kg N for Sonora 64, 106-118 kg N/hectare for the two best varieties Kalyan Sona and Sonalika, 101-112 kg for unselected S 227, 90-104 kg for Lerma Rojo and 77-88 for C 306.

7

Economics of Nitrogen Use in High-Yielding and One Indian Tall Variety of Wheat.

H. Singh (Ministry of Food, Agr., Community Develop. and Co-operation, New Delhi, India).

Indian J. Agr. Econ. 23 (4), 144 (Oct.-Dec. 1968).

The importance of the response of new technology to scarce inputs like fertilizer is immense for making as optimal allocation of resources as possible. The choice is no more restricted to the high-yielding varieties and the Indian tall variety. A number of newer blends of high-yielding varieties are now available. On the basis of the Results of the Co-ordinated Wheat Trials conducted in 1966-67, the author analyzes the response of two exotic – Lerma Rojo and Sonora 64F2, 3 blends (high-yielding varieties) – S 307, S 308, and Kalyan 227 and one Indian tall variety – C 306 to N. Quadratic response function of the second degree has been fitted to the data. The analysis shows that of all these varieties Kalyan 227 gives the highest total yield at 90 kg N/hectare. The additional yield due to N is highest in the case of S 307 in Punjab-Haryana-Delhi and Madhya Pradesh and Kalyan 227 in Uttar Pradesh and Bihar at 20-140 kg N/hectare. Sonora 64 ranks high in Rajasthan. The response of high-yielding strains of wheat is higher in Punjab-Haryana-Delhi, Uttar Pradesh, and Bihar as compared to the Indian tall variety C 306 at almost all the levels of N application from 20-140 kg N/hectare. Significantly enough, the quadratic response functions show diminishing average response at all levels of N application from 20 kg N/hectare onwards. On the basis of response functions, the optimum doses of N have been calculated at a net of different factors/product price ratios for fertilizer and wheat grain. At a price of Rs. 78/quintal of wheat, the optimum doses of N are generally higher than 90 kg N in the case of high-yielding strains.

8

Productivity and Allocation of Resources in the Production of Hybrid Bajra in Delhi Territory.

R. K. Patel, A. S. Sirohi, and B. M. Sharma (Indian Agr. Res. Inst., New Delhi, India).

Indian J. Agr. Econ. 23 (4), 146 (Oct.Dec. 1968).

A study was made to measure the producitivity of agricultural inputs used in the production of hybrid bajra in Union Territory of Delhi, and the possibility of resource adjustments to increase crop returns was examined. The data for this study were obtained from randomly selected 70 farmers engaged in hybrid bajra cultivation from five villages in the Delhi Territory. The survey was conducted in the year 1968 and the data relate to the year 1967-68. The empirical technique used for economic analysis was production function analysis. The Cobb-Douglas type of production function was used for estimation and comparison of marginal value products of inputs and determination of economic optimum levels of inputs with limited capital outlay for hybrid bajra and their comparisons with the existing mean levels. The results of the analysis revealed that the three input variables; namely, human labor, seed, and manures and fertilizers explained more than 50% of the variation in the output of hybrid bajra. In order to overcome the problem of multicollinearity, land and bullock labor inputs had to be dropped from the analysis. The marginal value products of human labor, seed, and manures and fertilizers were Rs. 8.35, Rs. 10.75, and Rs. 1.84, respectively. The farmers could increase their profit further by investing more in seed input. Although the marginal value productivity from manures and fertilizer input was the lowest, it should not be concluded that this factor is unimportant; the probable reason for getting the lowest value was that the farmers were already aware of the use of this input and were using it near optimum levels. Hybrid bajra crop had a greater capacity to employ farm labor and increase crop returns. Comparison between the optimal and existing mean levels of inputs indicated that reallocation of funds from manures and fertilizer input to the remaining inputs would result in increased crop returns by Rs. 156/acre.

9

Cost-Benefit Ratio of High-Yielding Paddy in Orissa.

P. N. Das (Bureau of Economics and Statistics, Orissa, Cuttack, India).

Indian J. Agr. Econ. 23 (4), 139-40 (Oct.-Dec. 1968).

Data collected in the Sambalpur district of Orissa where cultivation of high-yielding variety of paddy has made good progress, have been analyzed to determine the cost and income level. It was estimated that fertilizer accounted for 63.09% of

the operational cost, next in order of weightage was bullock labor, accounting for 14.84%, hired human labor accounted for 12.57%, whereas plant protection, seed, and irrigation charges accounted for 4.88, 2.69, and 1.73% of the operational cost, respectively. Though yield rate of the local paddy was lower in Orissa, the cost of cultivation/quintal of high-yielding paddy was lower than other states, possibly due to lower cost of all factors except fertilizer. Estimates of income from the main product as well as the by-product of high-yielding paddy provided a gross income of Rs. 1317 and a net income of Rs. 912/acre. Accordingly, the input-output ratio was 1:3.8 whereas cost-benefit ratio was 1:3.4. This indicated that 20% deflation adopted at present for netting the gross domestic product in agriculture sector is low. Variability in the cost and income structure of high output and low output lands growing these strains showed that while cost levels were at par, output in the former was 285% higher, possibly due to disparity in the levels of skill among the growers. Compared with the local variety and improved (local) variety, high-yielding paddy cultivation is a much more efficient economic enterprise.

10

Economic Aspects of High-Yielding Varieties Programme in West Godavari District – A Study of I.R.-8 in Kharif 1967-68.

T. R. Rao (Univ. Madras, Madras, India).

Indian J. Agr. Econ. 23 (4), 139 (Oct.-Dec. 1968).

The performance of I.R.-8 in the West Godavari district during the *Kharif* season of 1967-68 was studied. A sample of 100 cultivators was selected. Among them, 72 participants (I.R.-8 paddy cultivators) and 28 non-participants (not cultivating I.R.-8) were contacted with schedules to collect information about their holdings, other possessions, the source of finance, and opinion with respect to the new strain as compared with the local variety. The extent of participation was 14%, the per holding average area under the high-yielding variety of paddy and local paddy being 2.03 acres and 9.85 acres, respectively. All the 72 participants have applied fertilizers and almost all of them have used pesticides. The fertilizer usage was 40% of the recommended level and the pesticides used was worth Rs. 16.37 against the estimated cost of Rs. 25 of recommended dose. The absolute confidence in N fertilizers, non-availability of fertilizer component, and the high fertility of the soil were a few of the reasons for the low level of application of fertilizers. The per acre total expenditure incurred in cash on the cultivation of I.R.-8 paddy was Rs. 324.78, as against Rs. 169.68 for the local paddy. The average yield obtained was 2302 kg for I.R.-8 as against a minimum of 3000 kg expected from this variety The yield of I.R.-8 was a little more than one and a half times that of the local paddy. A sum of Rs. 4,000,000 under cash component as against the available amount of Rs. 11,900,000 was disbursed during the season by the cooperative societies under High-Yielding Varieties Program loans. The cumbersome procedures involved in the issue of fertilizer component, additional share capital for each borrowing, and the agreement to deliver the produce for the price fixed by the society have been mostly responsible for the low achievement. In spite of larger expenditure on high-yielding variety of paddy, the profit/acre was Rs. 900.63. Due to low yields of the local paddy, the profit for participants was Rs. 737.23 and Rs. 707.96 for non-participants. The grain of I.R.-8 is coarse and has a chalky abdomen. The variety is not acceptable to the local people. The price offered by millers for I.R.-8 paddy was Rs. 38.50/bag of 75 kg while that for SLO 13 was Rs. 43/bag. It is necessary to give a higher incentive price for I.R.-8 than for the local paddy, with assured marketing.

11

Foliar Fertilisation in Radish Fetches Good Returns.

R. N. Roy and J. Seth.

Indian Farming 18 (8), 29 (Nov. 1968).

Fertiliser News 14 (2), 44 (Feb. 1969).

A field experiment was conducted in 1965-66 at the farm of Agronomy Division, Indian Agricultural Research Institute, New Delhi, to study the efficiency of foliar fertilization method in radish crop. Fertilizer (urea) solutions were sprayed at 3% concentration by a high volume foot pump sprayer in three equal installments beginning from 27 days after sowing of the crop at an interval of five days. The rates of urea application were 133 and 266 kg, triple superphosphate 60 and 120 kg, and muriate of potash 50 and 100 kg/hectare. The radish variety sown was Japanese white. Results showed that the fertilizers when applied half in soil at sowing and the other half when sprayed on the foliar resulted in an additional yield of 68.6 quintals/hectare marketable radish when compared with the application of all the fertilizers to soil (539 quintals/hectare yield obtained with soil application). Application of urea at the higher dose (266 kg/hectare) resulted in an increased yield of radish of 109 quintals/hectare when compared with the application of urea at the lower dose (133 kg/hectare), the yield with lower dose being 518 quintals/hectare. The additional net profit due to the application of higher dose of urea was Rs. 772 when compared with the lower dose of urea.

12

Response of Some Mexican Red and Indian Amber Wheats to Nitrogen.

I. J. Singh and K. C. Sharma (U. P. Agr. Univ., Pantnagar, U. P., India).

Indian J. Agr. Econ. 23 (4), 86-93 (Oct.-Dec. 1968).

A three year fertilizer experiment was conducted on the U. P. Agricultural University farm with Sonora 63, Sonora 64, and Lerma Rojo wheats from Mexico and NP 876, NP 887, and C 306 wheats from India. N was applied in 40-kg/hectare increments to 200 kg. The Mexican red wheats had higher yields at all N levels than the Indian amber wheats. On the basis that N cost Rs. 2.65/kg, that Mexican wheat was worth Rs 74/quintal, and that Indian wheat was worth Rs. 61/quintal, the most profitable levels of N fertilization were 99, 127, and 111 kg/hectare for Sonora 63, Sonora 64, and Lerma Rojo wheats and 79, 74, and 63 kg/hectare for C 306, NP 876, and NP 887 varieties, respectively. Yields at these rates ranged from 2591 kg/hectare for NP 887 to 4104 kg/hectare for Sonora 63.

13

Prediction of Phosphate Requirements of Swedish Turnips from Soil Phosphate Values.

J. W. S. Reith, R. H. E. Inkson, and E. G. Williams (Macaulay Inst. Soil Res., Craigbuckler, Aberdeen, Scotland).

J. Sci. Food Agr. 20 (5), 265-71 (May 1969).

Yields from 199 field experiments, extending over about 15 seasons and covering six soil groups in northeast Scotland, were used to calculate correlation coefficients between the responses of swedish turnips to 120 lb P_2O_5/acre and readily soluble phosphate values for the soils, determined by six methods. There were marked effects of soil parent material and drainage on the correlations, which ranged from -0.05 to -0.74. The Morgan and bicarbonate methods were inferior to the NH_4F-HCl, fluog, acetic, and lactate methods; the last method was usually the best. By fitting a Mitscherlich equation to the yields, the optimum economic phosphate dressings were calculated for four combinations of fertilizer

and crop prices. The average profit from these was about 30 shillings/acre greater than from using the mean optimum rate for the soil group or from using a standard rate of 120 lb P_2O_5. Calculations and adjustments tested so far have shown no convincing benefit from using the soil values to recommend phosphate dressings for individual soils. Neither inclusion of other soil properties nor use of the logarithms of the soil phosphate values in multiple regressions produced any appreciable improvement in response predictions. The main reason for the generally rather poor correlations seems to be variations in site characteristics and agricultural factors, rather than soil chemical and textural properties, coupled with the fact that the optimum rates are not well defined. The present indications are that the main practical usefulness of the soil P values is in monitoring of the phosphate status to guide rotational manuring and ensure that adequate dressings can be given for sensitive crops, rather than in the precise prediction of optimum dressings for individual fields.

14

Results of a Fertilizer Trial in 66 Years Old Norway Spruce on a Typical Site on Upper Variegated Sandstone in the Black Forest.

K. Hausser and W. Wittich.

Allg. Forst Ztg. 140 (2), 25-99 (1969) (Ger).

Field tests were conducted in the Black Forest on 66 years old Norway spruce using treatment of Ca, PCa, N, NCa, and NPCa by application of two tons $CaCO_3$, one ton basic slag, and 3 X 0.4 ton lime-ammonium nitrate, respectively/hectare. During seven years observation, the amount of minerals cycling through the litter were about doubled for N and P and tripled for Ca in the NPCa treatment as compared with the control. Average additional increment, corrected for site quality and stocking of the controls, were at year 13: Ca 8, PCa 16, NCa 27, NPCa 40, and N 35%. The costs for fertilizing were exceeded by the value of the additional increment of 3-4 years inspite of the low prices and high logging costs in 1967. After 13 years, the most expensive fertilizer treatment, NPCa, had produced the greatest surplus. (17 figures, 19 tables, 43 references)

15

Actual and Optimal Use of Fertilizer.

Helio Tollini (North Carolina State Univ., Raleigh).

Thesis, 96 pp. (1969).

Regression analyses relating corn yields to N inputs by North Carolina farmers showed the marginal rate of return for applied N to be over 100%. Cost of the wrong decision was only $2.67/acre. Use of N/acre increased significantly with acreage of corn produced/farm. On the average, the farmers actually used about 50 pounds of N/acre less than the estimated optimal use.

16

Take a Look at Liquid Fertilizers.

Wallaces Farmer 95 (3), 28 (Feb. 14, 1970).

Time and labor savings with liquids may reduce cost per pound of applied nutrient to a figure below that for other forms. When fertilizing 640 acres at a high rate of application, liquid fertilizer – compared to anhydrous ammonia – required 18.5 fewer man hours to fill the applicator tanks, 60 fewer hours for application, and $115 less tractor fuel. Compared to bagged fertilizers, 20 fewer hours were required to fill the applicator tanks with liquid fertilizer. Mixing herbicides and pesticides with liquids also reduces the total number of trips across a field. Some pesticides cannot be mixed with liquids and time and depth of application also may not match.

17

High-Yielding Cereals and Fertilizer Demand.

D. A. Russel, D. M. Henshaw, C. E. Schauble, and R. B. Diamond (Tennessee Valley Authority, Muscle Shoals, Ala.).

National Fertilizer Development Center, Tennessee Valley Authority, Muscle Shoals, Ala., Bull. Y-4, 22 pp. (1970).

Yield responses to fertilizer are reviewed for high-yielding and native varieties of rice, wheat, maize, and grain sorghum. Universally, these cereals respond to N but less frequently to P and K. Generalized yield curves were computed for the response of high-yielding and native varieties of rice, wheat, maize, and grain sorghum to N but not to P or K because of the scarcity of data. The curves define no specific response of either type of variety for any country but are examples of expected relative responses between high-yielding and native varieties. Optimum rates of N fertilization for high-yielding varieties of rice and wheat are about three times greater than for native varieties. This difference is less with maize and grain sorghum. Yields at optimum levels of N fertilization are 1.5-2 times greater with high-yielding than native varieties. The monetary return to optimum fertilization of high-yielding varieties is about 1.5 times greater than for native varieties because of the greater marginal yield for initial increments of applied N. Thus, acceptance of high-yielding varieties satisfies the farmer's goal of maximum income as well as a country's goal of maximum production. The relative fertilizer requirement to produce a given quantity of grain from high-yielding and native varieties is determined by the amount of substitution of fertilizer for land. More grain may be produced with less fertilizer and less land with high-yielding than native varieties. But, as more fertilizer is suostituted for land and rates of fertilization approach optimum levels for high-yielding varieties, the fertilizer requirement to produce a given quantity of grain becomes greater with high-yielding than native varieties.

18

Determination of the Economic Doses of Nutrient in Fertilizer Experiments.

H. V Arruda.

Arq. Inst. Biol. 36 (1), 41-5 (1969).

Trop. Abstr. 25, 14.

The results obtained in Brazil in fertilizer experiments by using a formula proposed for calculating the economic rate of application of a certain nutrient were satisfactory and corresponded fairly well with those determined by the Mitscherlich method.

19

Response of Taichung (Native)-1 to Various Levels of Nitrogen and Phosphorus.

P. R. Sood, *et al.*

Riso 18 (3), 241-5 (1969).

Trop. Abstr. 25, 800.

A fertilizer experiment conducted in India showed that applications of 0, 60, 120, and 180 kg N/ha gave rice yields of 4422, 5277, 5897, and 5930 kg/ha. The highest net profit was obtained with 120 kg N/ha. Application of P, even up to 90 kg P_2O_5/ha, did not significantly increase rice yield.

20

Economic Analysis of Nitrogen Fertilization of *Capsicum Annum* L.

B. G. Khare and N. K. Umrani.

Indian J. Hort. 26 (1-2), 63-8 (Jan.-June 1969).

F.A.I. Abstr. Serv. 9, 1071.

Field tests were carried out at the College of Agriculture, Poona, between 1959 and 1961 with chili variety Sankeshwari to find the optimum rate of N fertilizer and the best method of application under rainfed conditions. Twelve combinations were made up of four levels of N (0, 22.4, 44.8, 67.2 kg N/ha) and three methods of application (full application at the commencement of flowering, split application half at the commencement of flowering and the other half three weeks later, application in three equal doses starting at the commencement of flowering). A production function approach was used to specify the rates valid for different fertilizer and crop prices. This approach was found superior to the conventional approach both in the interest of the farmer as well as the country as whole. A rate of 50 kg N/ha was recommended for the prevailing crop-fertilizer price structure. The entire quant: of fertilizer should be applied in a single dose at the commencement of flowering. Fertilizer rate greater than 56 kg N/ha was not recommended since the yield and profit were adversely affected.

21

Use of Nitrogenous Fertilizers on California Rangeland.

W. E. Martin and L. J. Berry (Univ. California, Davis).

Proc. Int. Grassland Congr., 11th, 817-22 (1970).

Nitrogenous fertilizers offer a practical means of increasing beef production on California winter ranges. Fifty-four fertilizer grazing tests were carried out during the past 15 yr. Production of rangeland has been measured through wt gains of grazing cattle on fertilized and unfertilized fields and evaluated as grazing income calculated from average prices of stocker and feeder cattle. Nitrogenous fertilizers were shown to produce much earlier forage. Range carrying capacity was increased from 93 up to 227 head day/ha. Average live wt gain was increased from 67 kg/ha on unfertilized up to 190 kg beef/ha the yr fertilizers were applied, as measured by wt gains of 2833 animals. Second-yr or carryover effects amount to 45% of the initial yr response to N. Each kilogram of N, with P and S where needed, produced an average of 1.7 kg extra beef the yr of application and 0.7 kg additional the second yr, an average total of 2.4 kg beef/kg N applied. Net grazing income the initial yr was increased from $23.70 on control up to $37.19/ha after deducting an average fertilizer cost of $34.39 plus stocking costs and interest. Maximum profits were found in the 30-80 cm of seasonal rainfall zone, while losses occurred with drought at less than 30 cm rain or with excess loss of N from over 80 cm of rainfall seasonally.

22

Crop Responses to Potassic Fertilizers Under Different Agro-Climatic and Soil Conditions.

S. K. Raheja, G. R. Seth, and S. R. Bapat (Inst. Agr. Res. Statistics, New Delhi, India).

Fert. News 15 (2), 15-33 (Feb. 1970).

A lack of response to added K has generally been reported in tests conducted in India up to 1950. However, in tests on fields initiated by All-India Coordinated Agronomic Experiments Scheme (I.C.A.R.) in 1953, a significant response to K was obtained in several areas. A further series of experiments involving combinations of N, P, and K was planned in 1958-59 and continued to 1966-67. Profitable responses to the application of K on the conventional varieties of various field crops were observed. The magnitude of the responses was generally moderate. Tests to study the effect of K when applied over a basal dose of N and P on the new high-yielding varieties of rice, wheat, jowar, maize, and bajra were conducted by the I.C.A.R. during 1967-68 and 1968-69 in a number of districts in the country. The responses obtained showed a profit ranging from Rs. 50-200/ha for a dose of 30 kg K_2O/ha. At the higher level of 60 kg K_2O/ha, larger returns were obtained although the percentage profit declined.

23

Response of Rice to Potassium in Relation to its Transformation and Availability Under Waterlogged Condition.

I. C. Mahapatra and Rajendra Prasad (Indian Agr. Res. Inst., New Delhi, India).

Fert. News 15 (2), 34-41 (Feb 1970).

Results from 665 trials conducted on fields with rice under the All-India Coordinated Agronomic Experiments Scheme are presented. About half of the trials were conducted with locally improved varieties. The trials covered alluvial (including coastal), red, red and yellow, red and black, and medium black soils. Although the yield levels were higher in rabi (dry) season, responses to K were higher in kharif (wet) season. High-yielding varieties, in general, gave higher responses to K than locally improved varieties. The average responses of high-yielding and locally improved varieties varied from 472 to 1353 and 29 to 654 kg (grain)/ha, respectively. Highest responses were obtained on red soils. On these soils return/rupee invested in K fertilization was Rs. 10.76 and 4.64 for high yielding and locally improved varieties respectively.

24

CRIFF 1969 Annual Report.

W. L. Pritchett and W. H. Smith (Univ. Florida, Gainesville).

Univ. Florida, Gainesville, 18 pp (Feb. 1, 1970).

Cooperative Research in Forest Fertilization (CRIFF) was organized in 1968 as a joint effort of southeastern forest industries, agricultural chemical companies, and the Univ. of Florida. The aim was to speed research in forest fertilization, soils, and nutrition. In 1969 a total of 150 tests were conducted, compared to 50 in 1968 and 200 planned for 1970. Early research results from trials on wet savannahs, imperfectly drained flatwoods, moderately well-drained flatwoods, and deep sand hills showed that fertilization for pulpwood provided 6.9 to 14.0% return on investment. Nutrient status of the soil and drainage conditions affected response to fertilizer. Increases in diameter and wt were better measures of response to N than height. Banded P was superior to broadcast P in increasing tree height.

25

Fertilizer Placement on Tobacco by Means of Sprinkler Irrigation.

W. C. Mixson and F. Clark (Univ. Fla., Gainesville).

Soil Crop Sci. Soc. Fla. Proc. 28, 174-86 (1968).

Various NPK mixtures were applied through the irrigation system. When 4-12-8 was applied at 1000 lb/acre at transplanting, 22% of the transplants had to be replaced as compared with 4% when only P_2O_5 was applied. Application of 100 lb N and 282 lb K_2O resulted in a significantly lower price/cwt of the crop.

26

Production Functions and Economic Optima in Fertilizer Use for Some Dwarf and Tall Varieties of Wheat.

I. J. Singh and K. C. Sharma (U. P. Agr. Univ.).

U. P. Agr. Univ., Pantnager, U. P., India, Res. Bull., No. 5, 22 pp (Feb. 1969).

Six rates of N, varying from 0-200 kg/ha by 40-kg intervals, were applied to Sonora 63, Sonora 64, Lerma Rojo (dwarf), C306, NP876, and NP887 (tall) varieties of wheat. The experiment was conducted for three yr. Plots were irrigated at

intervals of 20-25 days. Yield data were fitted to Cobb-Douglas quadratic and square root functions. The square root equation accounted for the maximum variation for all six wheat varieties in terms of R^2 but the quadratic equation contained a larger number of b and c constants and had nearly as high R^2 values. The quadratic function was selected as the best fitting and used in subsequent analyses. The dwarf varieties gave a higher response to N at all levels of N than the tall wheats. Yield maxima for the dwarfs occurred at N levels 20-40 kg N/ha higher than for tall varieties. Production/kg of N applied was nearly double when dwarfs were compared to tall varieties. Although tall varieties command a higher price at the market total revenues/ha, at optimum rates of N application, were 2.5 times higher for the dwarf wheats. Optimum rates of N application (100-125 kg/ha) were 1.5 times higher for dwarf than tall wheats.

27

Probelms Facing the Fertilizer Distribution Program in The Six Northern States.

C. K. Laurent.

CSNRD (Consort Study Nigerian Rural Development) 27, 1-91 (1969).

Trop. Abstr. 25, 516.

Attractive yield responses to superphosphate were observed in field trials with groundnut, cotton, and millets conducted in N. Nigeria. Returns were at least 80% on investment. Provided favorable cost/return ratios for these cash crops are maintained, there is a potential market for 200,000 tons $(NH_4)_2SO_4$ and for 150,000 tons superphosphate. Increasing use of fertilizers may be confidently predicted, but present distribution of fertilizers double the price from port to farmer. As a remedy the following recommendations are made: (1) a satisfactory system of credit; (2) fertilizer delivery before the wet season; (3) storage of fertilizer in larger villages; (4) centralized purchase of imported fertilizers; and (5) stable, similar fertilizer prices throughout the country. Details are comprehensively discussed.

28

Economic Analysis of Fertilizing Hybrid Maize.

I. J. Singh and K. C. Sharma (Uttar Pradesh Agr. Univ. Pantnagar, Nainital, India).

Fert. News (5), 42-5 (May 1970).

Tests were conducted at U. P. Agricultural University, Pantnagar during 1965-66 to determine the most profitable N rates for hybrid maize. Three hybrids (Ganga 101, Ganga 2, and Ganga 3) and five rates (0, 50, 100, 150, and 200 kg/ha) of N were used in the tests. Experimental data were analyzed by using the quadratic production function of the following form: $Q = a+b\ N-cN^2$ where Q = grain yield in kg/ha, N=kg N/ha applied, and a, b, and c are constants. The marginal products due to N were calculated by taking partial derivative of the equation at various levels of N. The most profitable level of N, grain yield, yield response, total revenue, total cost, and net profit due to N application is shown/ha for each of the three hybrid varieties.

29

Economics of Fertilizer Application to Wheat Crop: The Results of a Survey in Lyallpur District.

B. A. Quraishi (West Pakistan Agr. Univ., Lahore) and M. J. Khan (West Pakistan Agr. Development Corp., Lahore).

Pakistan Development Review 10 (1), 88-99 (Spring 1970).

In 1965-67 450 farms were surveyed in the Lyallpur district. They were selected from each of the five assessment circles in the district (villages possessing similar agricultural conditions and thus a uniform assessment rate make up an assessment circle) and then at random from each of three sizes of farms (small–less than five acres, medium–5–25 acres, and large–over 25 acres). It was found that 63% of the wheat growers applied fertilizer on 83% of the crop acreage. The proportion of fertilized acreage was 84, 89, and 77% for peasant proprietors, owner tenants, and tenants respectively. Among literate farmers, 82% used fertilizer but only 65% of the illiterate farmers used fertilizer. As many as 10 timings and 9 methods of application were used but 50% of the users applied fertilizer in December only and another 31% in December and January; 42% broadcast their fertilizer and 23% broadcast and applied fertilizer at the source of irrigation water. Although the optimum rate of application is about 115 nutrient lb/acre, average rate of application was 31 nutrient lb/acre. The average for peasant proprietors was 35, for owner tenants 27, and for tenants 26 nutrient lb/acre. The weighted average yield for fertilizer users was 19, 15, and 15 maunds/acre for peasant proprietors, owner tenants, and tenants respectively; for non-users average yields were 13, 9, and 9 maunds/acre (1 maund = 82 lb). The regression of yield on rate and time of application showed that one lb of nutrients increased yields 16 lb/acre when applied in December and 28 lb/acre when split between December and January. Maximum monetary returns were 17.16.1 at the subsidized cost of fertilizer (35%) when superphosphate and urea were used; the average return was 7.85:1.

30

Influence of Nitrogen on Economics of Wheat and Barley Under Late Sown Conditions in Punjab.

D. N. Rathore (Punjab Agr. Univ., Ludhiana, India).

Indian J. Sci. Ind. Sect. A 4 (1), 1-6 (1970).

Tests were conducted for two rabi seasons to study the influence of N on the economics of late sown wheat and barley. The most economical N rate for wheat C 281 and barley Type 4 was 33 kg N/ha; they gave a net return of 442.96 and 472.69 rupee/ha, respectively, over control. Further increase in N rate beyond 33 kg N/ha did not add to grain yield.

31

Nitrogen Fertilization Using Aircraft.

W. F. Hildebrand and G. H. Arnold (Cultuurtech. Afd., Rijksdienst IJsselmeerpolders, Kampen, Netherlands).

Stikstof 5 (59), 484-7 (1968) (Dut).

Field Crop Abstr. 23, 2826.

Newly reclaimed polder land in its first crop yr was sown from the air in August 1966 with winter rape. By spring 1967 the crop stand was rather thin but the land was too soft for surface application of fertilizers; 75 kg N/ha was consequently applied from the air at end-March, using plastic sheeting to provide untreated plots. Seed yield was 1450 kg/ha (9% moisture) on untreated plots and about 2300 kg/ha on aerially fertilized plots. The value of the increased yield was nearly four times the total cost of aerial fertilizing. Small-plot trials indicated that calcium ammonium nitrate might have been a more suitable fertilizer than urea.

32

The Effect of Nitrogen on Yield, Percent Sucrose, and Clear Juice Purity of Sugarbeets.

C. S. Baldwin and C. K. Stevenson (Ridgetown Coll. Agr.

Technol., Ridgetown, Ont., Canada).

J. Amer. Soc. Sugar Beet Technol. 15 (6), 522-7 (1969).

Nitrogen was side-dressed in 30-lb increments ranging from 0-210 lb/acre. Maximum extractable sugar was obtained when N was applied at 30 lb/acre. Sugar yield was reduced markedly when N was applied in excess of 90 lb/acre. There was a gradual reduction in clear juice purity over the entire range of N application. Beets harvested from the check plots had a 94.7% purity, and those harvested from plots receiving 210 lb N had a purity of 93.3%. Rate of N had little significant effects on beet root yields. The maximum yield of roots was obtained when N was applied at 90 lb/acre. However, this was only 1.5 tons greater than the yield from the plots that did not receive N. There was no reduction in percent sucrose until the 90 lb level of N. From the 90-210 lb rate a slight gradual reduction was obtained. The beets from the check plots contained 16.6% sucrose whereas beets that received 210 lb of N tested 15.6%. The highest yield of sugarbeet tops was obtained from plots that received the highest rate of N (210 lb/acre). Yield of beet stover increased approximately one ton/acre with every 30 lb increment of N added.

33

Variability in Optimum N Rates for Corn.

O. P. Engelstad (Tennessee Valley Authority, Muscle Shoals, Ala.) and W. L. Parks (Univ. Tennessee, Knoxville).

Agron. J. 63 (1), 21-3 (Jan.-Feb. 1971).

A study of corn (*Zea mays* L.) yield responses to N fertilizer was conducted to determine the variability in economically optimum rates over time. These responses were obtained at two locations in Tennessee covering the period 1962 to 1966. In each test, nine replicates of N response were available for each yr. The results of this analysis showed relatively little season-to-season variation in optimum rates of N to be fairly close to those for maximum yields at current prices of N. The study also showed that a fairly wide range in choice of N rate is possible without seriously affecting profit. This might be regarded as the "relevant range" of N application and one of more meaning to farmers than specific rates. Research should show where these ranges are for various crop-soil combinations.

34

Greater Productivity of the Oil Palm with Efficient Fertilizer Practices.

N. S. Kee (Rubber Res. Inst. Malaysia, Lumpur, Kuala, Malaysia).

Oleagineux 25 (12), 637-48 (Dec. 1970).

An integrated ecological-physiological approach to assess fertilizer requirements of the oil palm (*Elaeis guineensis* Jacq.) is described. The method incorporates the factors of crop physiology, soil type and nutrient status, nutrient composition of the palm, fertilizer tests, and leaf analysis. Such an approach is thought to eliminate any major nutritional limitation in fertilizer tests and thus enhances discriminatory fertilizer usage. Evidence is presented to demonstrate that in Malaysia, this approach has cast considerable new light on the manuring of palms. Recent Malaysian fertilizer tests show that early yield responses can be obtained by relatively high rates of manuring during immaturity. On the leached inland soils, significant responses to P (1.8 kg rock phosphate/palm/yr) and K (2.7 kg KCl/palm/yr) were already attained in the first two years' bunch production. There was also strong indication that in the sandy loam soils, about 1.3 kg kieserite/palm/yr was needed to satisfy Mg requirements. The presence of a vigorous leguminous cover masked any effects due to N application in the first two years but it was thought responses would be apparent in subsequent croppings. On the coastal alluvial soils, there was no response to P or Mg but K (2.7 kg KCl/palm/yr) had a significant effect at the 4th-5th yr of yield. On the riverine alluvial clay, a response to a moderate level of N (0.9 kg of $(NH_4)_2SO_4$ /palm/yr was also obtained at about the same stage of cropping. These responses were shown to be economic above a price of M$400/ton of oil. These results show a continual growth of fertilizer use on oil palms but the use growth in a particular area depends much on climate, soil conditions, and standards of agronomic practices.

35

Use of Field Investigation Data in Determining the Approach to Extension Program Program.

S. C. Dass and M. S. Dahiya (Nat. Dairy Res. Inst., Karnal, India).

Indian J. Sci. Ind., Sect. A 4 (3-4), 163-8 (1970).

Berseem clover with and without recommended establishment practices (seed inoculation and use of P fertilizer) was planted in 1/4-acre irrigated demonstration plots. Six farmers participated in the test by providing land, labor, and water. Economic considerations appeared to motivate them to cooperate in the project. In six cuttings, treated plots produced an average of 17.5 tons/ha (or 18.4%) more hay (green wt) than the untreated plots. A yield increase of 16% or more was required to pay the cost of the fertilizer and inoculation. Improved quality of the forage and consequent increase in milk production was not measured in the study but feeding the fodder for milk production was calculated to be more profitable than sale of the fodder. Extension workers should base their program on this latter approach but must recognize farmer limitations such as lack of cattle and buffalo, lack of credit, and poor knowledge of producing milk for sale.

36

Nitrogen Response of Rice: 1968 AICRIP-Trials.

R. W. Herdt.

Econ. Pol. Weekly (Rev. Agr.) 6 (13), A33-A36 (Mar. 27, 1971).

F.A.I. Abst. 10, 1719.

Results of tests conducted by the All India Co-ordinated Rice Improvement Programme (AICRIP) to measure the response of rice to N at a number of locations are given. The response to N was more favorable in the *rabi* season than in the *kharif* season in all but one location (local paddy, Coimbatore). The optimal dose from quadratic equation was found for IR8 variety to be 188 and 129 kg N/ha for *rabi* and *kharif* seasons respectively. The yield at these respective optimal rates and seasons was observed to be 74.5 and 50.8 q/ha. The response of rice per kg of N in IR8 was 19.7 and 11.5 kg for *rabi* and *kharif* seasons respectively. In contrast, the local varieties required less N at optimal dose, namely 103 and 99 kg N/ha for *rabi* and *kharif* seasons. The yields at these respective optimal levels and seasons were 46.5 and 38.5 q/ha. The yardsticks of production for local varieties were 14.5 and 11.0 kg grain/kg N for *rabi* and *kharif* seasons, respectively. The variety IR8 gave significantly higher yield than the local in both *kharif* and *rabi* seasons. The efficiency of fertilizer use as reflected in "yardsticks" was significantly higher for IR8 in *rabi* season but the difference was not significant in the *kharif* season. Comparison of profitability also indicated that IR8 was significantly more profitable in the *rabi* season, giving more than twice the return compared to the local variety. Net return from IR8 to fertilizer application amounted to Rs.1446 and Rs.751/ha for *rabi* and *kharif* seasons, respectively; as compared to these the net returns from the local varieties were Rs.544 and Rs.536/ha in the *rabi* and *kharif* seasons,

respectively. The rate of return (expressed as percent) to fertilizer was higher with IR8 (735 and 445 for *rabi* and *kharif* seasons, respectively) as compared to the rate of return of 476 and 365% obtained with local varieties in the *rabi* and *kharif* seasons, respectively.

37

Response of Some Sugarcane Varieties to Nitrogen Application in North India.

I. J. Singh and P. P Singh.

Int. Sugar J 72 (858), 167-9 (1970).

Trop. Abstr 26, 441.

Fertilizing of three sugar cane varieties, commonly grown in N. India, was studied to determine. (1) the response to various levels of N application, (2) the most profitable level of N application for all three varieties, and (3) total revenue, total cost and net profit, resulting from N application. Maximum production response was achieved with 200, 225, and 225 kg N/ha for Co 1148, Co 1305, and Bo 32, respectively. The most profitable N levels were 185, 208, and 186 kg, respectively; in this case, the net profits were US$290, 329, and 158, respectively.

38

Maximum Rates of Nitrogen for Sugarcane.

G. Husz (Agr. Res Inst. Casa Grande, Trujillo, Peru).

Bodenkultur 21, 219-30 (1970) (Ger).

Soils Fert. 34, 858.

In a field trial on a Peruvian soil (neutral silty loam of alluvial origin, containing 1-10% $CaCO_3$ and up to 3% organic matter) under a subtropical desert climate, and involving increasing applications of urea (up to 400 kg N/ha), maximum and economically-optimum yields of cane in a long growth cycle (22 months) were obtained with 373 and 318 kg N/ha, respectively.

39

Effect of Nitrogen and its Method of Application on Hybrid Bajra.

G. S. Shekhawat, M. M. Jain, and D. C. Sharma (Dep. Agr., Jaipur, Rajasthan, India).

Fert. News 16 (5), 45-7 (May 1971).

In a field test run to compare the utility of four levels of N applied to HB-1 variety of bajra by two different methods, it was found that N increased the grain and stover yield of bajra significantly. There was no difference in methods of application. Application of 80 kg N/ha applied to soil, half as basal plus half as topdressing, gave the maximum additional returns (Rs. 537.30/ha). On the other hand, application of 60 kg N/ha applied half through soil and half through foliage gave the next maximum additional returns of Rs. 532.45/ha.

40

Ureaforms in Horticulture.

B. L. James (Hercules Inc., Wilmington, Del.).

J. Agr. Food Chem 19 (5), 813-15 (Sept.-Oct. 1971).

Data from tests with turf and ornamental plants showed that ureaform was an excellent source of slow release N for these crops. Data from Spain, South Africa, and Ecuador indicated that ureaform also has a place in harvested fruit, forest, and vegetable crops Tomato plants treated with ureaform yielded $1400/ha more profit to the farmer than tomato plants fertilized with classical N sources. Higher yields and earlier production were significant. Seedlings of forest trees treated with ureaform produced more growth and survived transplanting significantly better than seedlings handled similarly without ureaform. Data from banana plantations treated with ureaform indicate yielded increases greater than 20% over plantations treated with equal amounts of N from urea applied in the usual way. Further testing should broaden even further the economic applications of ureaform.

41

Calculation of Nitrogen Rates for Quota Wheat.

M. L. Meaton (Dep. Agr., South Perth, Western Australia).

J. Agr., West Aust. 12 (4), 95-8 (Apr. 1971).

Wheat quotas in Western Australia are lower than previous production levels on many farms. Alternative uses for land saved by possible N fertilization of wheat determines whether or not to use the N fertilizer and how much to use. In the drier areas with barley as the most profitable alternative, use of 11.5 lb N/acre increases returns only 5¢/acre over no N and use of the N is thus of doubtful justification. In a high rainfall area with baby beef as the alternative, 46 lb N/acre would provide the highest returns to the farmer. Gross margin analysis was used to evaluate alternative uses of land and capital.

42

Prudent Fertilizer Use Boosts Yield of Summer Mung.

S. L. Choudhury and P. C. Bhatia.

Indian Farming 21 (1), 18-19 (Apr. 1971).

F.A.I. Abstr. Serv. 10, 1828.

During April-June of 1969 and 1970, Baisakhi mung was sown in sandy loam soils of low fertility at the I.A.R.I. farm to study the effect of phosphate fertilization and methods of application on the yield of mung. The treatments consisted of control (no N or P), 25 kg N/ha, 25 kg N + 32 kg P_2O_5/ha, and 25 kg N + 64 kg P_2O_5/ha applied as broadcast, drilled with the seeds, and placed 5-6 cm below the seeds. Ammonium sulfate and superphosphate were the sources of N and P, respectively. The spacings were 6-7 cm between plants and 30 cm between rows. Two irrigations (one preplanting and one a month after sowing) were given. All plant protection measures were adopted. The control yields were 4.2 and 5.3 q/ha in 1969 and 1970, respectively. Application of 25 kg N/ha increased the yields to 5.7 and 7.6 q/ha by broadcast method, 6.4 and 7.4 q/ha by drilling with seeds, and 7.4 and 8.8 q/ha by placement below the seeds in 1969 and 1970, respectively. Placement treatment increased the yield, on an average, by 22.7% over broadcast application. With 25 kg N + 32 kg P_2O_5/ha the yields in 1969 and 1970, respectively, were 7.7 and 9.0 q/ha by broadcast, 8.8 and 8.9 q/ha by drilling with seed, and 10.3 and 10.9 q/ha by placing fertilizers 5-6 cm below seeds. Placing the fertilizers increased the yields by 27.7% over broadcast application. Application of 25 kg N + 64 kg P_2O_5/ha further increased the yields in 1969 and 1970, respectively, to 9.7 and 9.2 q/ha by broadcast method, 9.7 and 9.4 q/ha by drilling, and 13.3 and 12.1 q/ha by placement method. Placement method was found to be superior to broadcast application by 35%. Economics of fertilizer application showed that there was a net return of Rs. 3/Rs. investment with 25 kg N + 64 kg P_2O_5/ha treatment by placement method.

43

Optimum Fertilizer Application to Potato (*Solanum tuberosum* L.).

M.B.J. Pushkarnath and V. P. Malhotra (Central Potato Res. Inst., Simla, India).

Indian J. Agr. Sci. 41 (2), 109-13 (Feb. 1971).

A study was made of the economics of N, P, and K application to 'Up-to-Date' variety of potato grown during 1964-67 at Jullundur (Punjab), Babugarh (Uttar Pradesh) and Patna (Bihar) experimental centers. A quadratic response surface was

found to be the best fit to the data. A linear cost function was used to determine the most economic combination of the three nutrients. About 200 kg N/ha was required for maximum returns at the three centers. Phosphorus application was without benefit at Patna, whereas 140 kg and 80 kg of P/ha were required at Babugarh and Jullundur, respectively, for maximum returns. At these rates, the net profits were Rs 850, Rs 3000, and Rs 7000 at Jullundur, Babugarh, and Patna, respectively.

44

Returns from Fertilizers on Farmer's Fields.

D. Singh *et al.*

Indian J. Agr. Econ. 25 (4), 25-39 (1970).

Trop. Abstr. 26, 2215.

Investigations conducted in the central, Indo-Gangetic, and southern region of India in 1967-68 and 1968-69 showed that the use of 60 kg N/ha was remunerative to only 45, 55, and 45% of the growers, respectively. With the recommended dose of 120 kg N/ha only 25-40% of the farmers had fair net returns. To ensure 80% of the farmers applying N at 60 kg/ha to rice not suffering losses, the cost of N would have to be brought down to US$0.175/kg, for example, half the present price level. For a wheat crop even at this price, 35% of the farmers in the central region would stand to lose.

45

The Effect of Ammonia Solution on Sugarcane as Compared with Solid Fertilizers.

H. El Gibaly and Z. A. Menshawi.

Beitr. Trop. Subtrop. Landwirt. Tropenveterinaermed. 8 (2), 123-8 (1970).

Trop. Abstr. 26, 2625.

In irrigated sugarcane in Egypt, various N fertilizers were applied at the rate of 230 kg N/ha. Liquid ammonia gave the same results in growth, cane and sucrose yields, and juice quality as the solid N fertilizers ammonium sulfate, ammonium nitrate, calcium nitrate, and ammonium-nitro sulfate. The cost of liquid ammonia per N unit, however, was only 20% of the cheapest solid N fertilizer, which meant savings of about US $ 7.50/ha in fertilizer costs.

46

An Agro-Economic Analysis of Experiments Carried out in Brazil, by the Production Function.

T. D. Teixeira *et al.*

Experientiae 11 (2), 45-134 (1971).

Trop. Abstr. 26, 2462.

Economic analyses of three maize experiments are presented, relating grain yield to the level of N fertilizer applied and to the plant population. The treatments were 0, 60, 120, or 180 kg N/ha, and populations of 20,000, 40,000, 60,000, or 80,000 plants/ha. The economic optimum level of production obtained at each site was: 5137 kg maize/ha at Sete Lagoas with applications of 47 kg N/ha on a plant population of 52,000/ha, 9,496 kg maize/ha at Capinopolis with 245 kg N/ha on 94,000 plants/ha, and 11,259 kg maize/ha with 310 kg N/ha and a plant population of 154,000/ha at Capinopolis. The maize price would have had a greater impact on the use of N and plant population than on the level of output.

47

Yield and Quality Response of Burley Tobacco to Nitrogen and Potassium.

Dale Colyer and G. G. Pohlman (West Virginia Univ., Morgantown).

Agron. J. 63 (6), 857-60 (Nov.-Dec. 1971).

Experiments by the Ohio Valley Experiment Station at Point Pleasant, West Virginia, were conducted over an 8-yr period to test for response to N and K fertilizer by burley tobacco (*Nicotiana tabacum* L.). Both yield and quality were affected by the level of fertilizer use, with the effects due to N more pronounced. Quality, as measured by price, is maximized with an average rate of 184 kg N/ha, a lower application rate than the 271 kg/ha required to maximize yield. The opposite prevailed for K fertilization with quality maximized with 330 kg K/ha and yield with 300 kg/ha. Average gross value of tobacco per ha would be maximized with 242 kg N and 322 kg K, while net returns would be greatest at 237 kg N and 308 kg of K.

48

Response of Sugarcane to Fertilizer and Manure Application.

J. R. Pawar (Coll. Agr., Poona, Maharashtra, India).

Agr. Situation, India 26 (1), 3-8 (Apr. 1971).

Forty-five randomly selected farms in Maharashtra were studied to determine the functional relationship between different plant nutrients and sugarcane yields and to determine marginal values and optimum levels of fertilizer use. Farmers sampled had adopted sugarcane cultivation 2-7 yr before the 1967-68 crop season. Average expenditures/acre for fertilizers and manure (FYM) were Rs 496.03 and 102.40, average cane yield was 53.2 mt/acre. Sugarcane responded to N, P, and FYM but not to K. The marginal values of these three inputs were greater than their unit costs, thus increased rates of application could be recommended. The rates of nutrient application which maximized yield when FYM was applied at the usual rate (8.53 cart loads/acre) were 198.09 kg N and 50.51 kg P_2O_5/acre at prevailing prices for N, P_2O_5, and FYM.

49

Aerial Application of Concentrated Urea Solution Increases Yield of Rain-Fed Rice and Wheat.

M. C. Rajat De *et al.*

Indian Farming 21 (2), 45, 47 (May 1971).

An area of 4800 ha of rain-fed rice in the Raipur and Bilsapur districts of M.P. and an area of 2000 ha of rain-fed wheat in the Kota district of Rajasthan were selected for aerial application of 20-23% solution of urea. The spraying was done in October 1969 on rice and in January 1970 on wheat (75-80 days after sowing of each crop). A considerable increase in grain yields of both rice and wheat was obtained. The increases in rice were 12.5 and 15.4% in Bilaspur and Raipur districts, respectively. There was a 31% increase in the yield of wheat, which was highly significant. This represented a return of 23.9 kg grain per kg N applied. Economically, the net return ranged between Rs 115 and 148 for rice and was Rs 125/ha for wheat. The return per rupee invested on urea and its aerial application ranged between Rs 2.2 and 3.6 for the two crops.

50

Effects of Nitrogenous Fertilizers on California Range as Measured by Weight Gains of Grazing Cattle.

W. E. Martin and L. J. Berry (Univ. California, Davis).

Calif. Agr. Exp. Sta., Univ. California, Davis, Bull. 846, 24 pp. (Sept. 1970).

During a 15-yr period 54 field tests were run to determine the effect of N fertilization on rangeland production. The weight gain of 7650 animals was measured; cattle grazing on fertilized and unfertilized fields during the same period were compared. The average carrying capacity was increased from 38 to 92 head days/acre, and beef production was increased from 60 to 170 lb/acre by fertilization. Benefits were greater where NS or

NP were needed than where N alone was required. During 2 yr the total extra beef/lb of N applied was 1.75 lb from N alone, 2.75 lb from NS, and 2.54 lb from NP. The average grazing income/acre was increased from $9.95 to $15.05 by fertilization in the first yr. Greatest profit was obtained in the 13-30 in. rainfall zone.

51

Fertilizer Trials on Cultivators' Fields in the Punjab. II. Cotton.

M. T. Saleem (Dep. Agr., Lyallpur, Pakistan), M. A. Bhatti, and M. D. Khan

J. Agr. Res. (Punjab) 9 (3), 180-96 (1971).

Results of 932 fertilizer trials conducted on cotton in farmers' fields in the Punjab during 1968-70 showed that best results were obtained with 75-40-0 and 75-40-30 (N-P_2O_5-K_2O in lb/acre). Yields were increased 32 and 52% by 50 and 75 lb N/acre. Responses to P and K were much lower. The value/cost ratio for all treatments generally was more than 5. Value/cost ratios fro 50 and 75 lb N/acre were 5.9 and 6.3; for 20 and 40 lb P_2O_5/acre, 5 0 and 4.7, and for 30 lb K_2O/acre, 3.8. The value/cost ratio for P_2O_5 at the subsidized rate was 7.0 and 6.7 for the two rates of application.

52

Nitrogen Fertilization of Ragi.

H.L.S. Tandon (European Nitrogen Serv. Prog., New Delhi, India).

Fert. News 16 (8), 30-2 (Aug. 1971).

Results from nine field experiments conducted at Bangalore and Mandya in Mysore State on the response of ragi (variety Poorna) to N application, efficiency of different N-fertilizers, and profitability of applied N are discussed. In seven trials, calcium ammonium nitrate and ammonium sulfate nitrate were statistically on par with other sources such as ammonium sulfate and urea and superior over urea in two trials. No significant increase in yield was obtained by applying N in two or three splits. The optimum level of N was found to be 102 kg/ha At this level, a response of 2087 kg/ha (20.5 kg grain/kg N) and net returns of Rs. 996/ha to N application were recorded. Data suggest that ragi can profitably use higher doses of N than the presently recommended quantities in Mysore State.

53

How to Invest in Fertilizer.

Charles E. Sommers (Crops and Soils Editor).

Successful Farming 66 (1), 42-3, 50 (Jan. 1968).

A given amount of fertilizer is economically justifiable as long as the added return exceeds the added cost of the fertilizer. Fertilizer usually returns $2-3 per $1 invested in the U. S. and returns even more on low-fertility soils. With limited funds for fertilizer purchase, use should be at or near the minimum recommended rate; with unlimited funds, use should be near the maximum or optimum recommended rate. Crop to be fertilized, when choice is necessary, should be one that combines highest acre value and good yield response. Deep, well-drained, nearly level soils of good texture and water-holding capacity generally provide the best response to fertilizer.

54

Profitability of Irrigation and Fertilization for Cotton.

Gene D. Sullivan, Willard F. Woolf, and Sherman A. Phillips (Louisiana State Univ., Baton Rouge).

Louisiana Agr. 11 (2), 12-13 (Winter 1967-68).

A 5-year study of costs and returns for cotton was conducted at the Macon Ridge Branch of the Northeast Louisiana Experiment Station. N rates were 0, 60, 120, and 180 lb/acre with and without supplemental irrigation. Irrigation alone was not profitable. N without irrigation was profitable at all rates; maximum return to labor and management was $122.48/acre with 120 lb/acre of N. Supplementing N with an average of 2 irrigations/year gave even higher returns. Maximum return was $169.32/acre, again at the rate of 120 lb/acre of N.

55

Response of Mexican Dwarf and Indian Tall Varieties of Wheat to Nitrogen Application.

P. N. Saxena and A. S. Sirohi.

J. Post-Graduate School, Indian Agr. Res. Inst. 5 (1), 123-48 (1967).

Trop. Abstr. 23, 466.

The responses of a number of Mexican dwarf and Indian tall varieties of wheat to N applications ranging from 45-225 kg/hectare were studied in field trials; demonstration plots were established at various locations in India representing five different agro-climatic zones. Whereas there was wide variation in optimal levels of N from zone to zone and from variety to variety, in general the highest responses were obtained with the Mexican dwarf varieties Sonora 63, Sonora 64, and Lerma Rojo. At current prices, the optimal N application over all zones for these three varieties averaged 120-125 kg/hectare, while the corresponding values for the Indian tall variety C.306 and the indigenous varieties were 91 and 51 kg/hectare, respectively. (9 references)

56

The Crucial Input - Fertilisers.

K. S. Mann (Desert Development Board, Jodhpur, Rajasthan, India).

Fertiliser News 13 (2), 15-18 (Feb. 1968).

Normal cropping patterns of Punjab at different levels of fertilizer supply highlighted the key role of fertilizers. The 1966-67 level of availability of fertilizers (47 kg of calcium ammonium nitrate and 3.5 kg of superphosphate) permitted a low intensity of land use, adoption of improved technology on only 10.9% of cropped land with a nominal acreage under high-yielding varieties, and a net return of only 1026 rupees/hectare. With fertilizer supplies improving to the expected level of 1970-71 (200 kg of calcium ammonium nitrate and 100 kg/hectare of superphosphate); intensity of cropping improved from 115% to 139%; coverage under the improved technology rose to 48.25% of the total cropped area; high-yielding varieties were used over 809,000 hectares; production of foodgrains was more than doubled; and net returns rose to 1841 rupees/hectare. This level appeared to be below the requirements. It was only in a situation of free market supply of fertilizers that a full exploitation of land and other fixed farm resources was possible. At this level cropping intensity could be raised to 155% and switch-over to improved technology and high-yielding varieties could be undertaken. Production of foodgrains could be increased to 20 million

tons and farmers could expect a net return of 3012 rupees/hectare. This would demand some major adjustments in cropping pattern in favor of food crops. The fertilizer needs totaled 663 kg/hectare of calcium ammonium nitrate and 282 kg/hectare of superphosphate or equivalent fertilizers. The requirements of the Punjab State alone were estimated at 528,900 tons of N and 176,000 tons of P_2O_5. This would be available from 2.58 million tons of calcium ammonium nitrate and 1.1 million tons of superphosphate, or from 1 million tons of urea and 383,000 tons of diammonium phosphate.

57

NPK-Balanced Fertilisers Give Higher Yield and Bigger Profits to Jute Growers.

Potash News Lett. (India) 3 (6), 2-4 (June 1968).

From 1963-64 to 1967-68 the Indian Potash Supply Agency completed 367 demonstrations (of 443 established) on jute in West Bengal, Orissa, and Assam. Demonstrations consisted of two treatments, cultivators' usual practice (CUP), and balanced fertilization, usually 30-20-30 (N-P_2O_5-K_2O). CUP averaged 9-3-4 in West Bengal and no fertilizer in the other states. Jute yields were about 50% higher on NPK plots than on CUP plots. For an investment of 63 rupees/acre in fertilizer, returns averaged 157 rupees/acre.

58

Nitrogen Response Curve and Economics of Fertiliser Application in Early Winter Rice Transplanted by Modified Techniques.

S. K. C. Verma and C. Thakur (Tirhut College of Agr., Dholi, Bihar, India).

Fertiliser News 13 (4), 36-40 (Apr. 1968).

Field experiments were conducted during 1963-65 to study five methods of transplanting rice and four rates of N application. Maximum economic response for conventionally transplanted rice was obtained with 50.3 kg N/hectare, net profit was 578.71 rupees/hectare. When seedlings were transplanted twice, optimum rate of N increased to 70 kg/hectare but net profit dropped to 414.40 rupees/hectare. Seedlings pulled and allowed to root essentially in a moist atmosphere for 25 days prior to planting responded linearly to rates of N up to 84 kg/hectare, the maximum used. This response was linear regardless of whether or not roots were pruned before setting into the field and whether or not pruned roots were treated with a rooting hormone. Maximum profit increased to 705-765 rupees/hectare for the modified methods of transplanting.

59

Effect of Two Phosphate Fertilizers on Yield, Financial Yield, and Wood Quality of Radiata Pine.

S. W. Gentle, R. K. Bamber, and F. R. Humphreys (Forestry Comm. of New South Wales, Sydney, Australia).

Forest Sci. 14 (3), 282-86 (Sept. 1968).

Pinus radiata fertilized at 8.5 years of age was clean harvested following a forest fire at 26 years of age. The stand was on an infertile site in the southern tablelands of New South Wales. Replicated treatments consisted of a control, superphosphate, and rock phosphate, each at the rate of 86 lb/acre applied 17.5 years ago. Yield of merchantable timber was significantly increased by the phosphate. Although yield with superphosphate was superior to that with rock phosphate, the difference was not significant. Most of this difference appeared to have occurred soon after treatment; superphosphate effects were waning while rock phosphate still was effective at the time of the fire. No differences of practical significance were measured between fertilized and nonfertilized wood with respect to such properties as basic density, latewood, or mean tracheid length. Net financial returns were over $100/acre for fertilized trees compared to $26/acre for the control trees.

60

Potash Response to "Mexican" Wheat in Punjab State.

Potash News Letter (India) 3 (9), 2-4 (Sept. 1968).

During 1967-68 the effect of 120-60-60 vs. 120-60-100 (N-P_2O_5-K_2O) was demonstrated on Mexican wheat in 54 cultivators' fields in Punjab State, India. The demonstrations consisted of two plots; both plots were treated with 60-60-60 at planting time. One plot was topdressed 30-40 days and again 70-80 days after sowing with 30 lb/acre of N at each topdressing. The other plot received 20 lb/acre of K_2O in addition to the N at each application. Yield increases due to the additional K were 93-386 (average 177) kg/acre or 4-16 (average 9) %. Net additional income from the 40 lb/acre of K_2O was 117.50 rupees/acre.

61

Potassium's Spectacular Economic Benefits.

Griffith W. McLellan (Sinton & Brown, Santa Barbara, Calif.).

Agrichem. West 11 (10), 6, 8, 10, 12, 14, 16 (Oct. 1968).

Analysis of plant samples from 4000 acres of alfalfa used for commercial dehydration showed that K deficiency was the most likely cause of yield variations. K was added as KCl brine through the sprinkler irrigation system and changes in yield and chemical composition were monitored. In three cuttings of alfalfa the equivalent of 300 lb/acre of KCl was removed from the soil. All data were programmed through a computor. An alternative cost simulation study showed that the company would have lost $70,800 in income in 1967 if the 4000 acres had not been fertilized with potash.

GENERAL ECONOMICS

62

New Forms of Fertilizer Use—Economic Evaluation.

H. G. Walkup (Tennessee Valley Authority, Muscle Shoals, Ala.).

Phosphorus Agr. 24 (55), 55-65 (June 1970).

New analytical techniques, grouped under the broad term systems analysis, promise to provide improved interdisciplinary approaches to the evaluation of new products generally. Herein lies the possibility for tracing the new P fertilizer in every stage of its progress through production-marketing-use channels, and, finally, of developing estimates of the quantities that will be utilized for various purposes—nonfertilizer and fertilizer. Costing procedures utilize the discounted cash-flow concept, which includes institutional considerations such as the income tax advantages

available on investment in plant and equipment through additional first-yr depreciation, accelerated depreciation, investment credit, and loss carryover–all of which are so important nowadays in planning succesful industrial operations. Since the approach is interdisciplinary and presumably would be guided by an interdisciplinary team comprising at the very least a chemical engineer, an agronomist, and an economist, the present tendency for naive assumptions and analytical methods to creep into analyses by single disciplines would be minimized. Systems analysis incorporates electronic computer use and provides the basic information required for simulation analysis of a dynamic nature through time. It allows the analyst to insert alternative conditions and circumstances and thus to determine their overall effect on the new product and the production-marketing-use system involved.

63

Who Profits Most from Fertilizer.

M. H. McVicar (Chevron Chem. Co.).

Agr. Chem. 25 (7-8), 15, 48 (July-Aug. 1970).

The farmer is the one man who must benefit from any fertilizer purchase. Unless he benefits, he cannot continue to be a repeat customer. Why do farmers purchase fertilizer? They are interested in increasing their profits through the use of fertilizers. Increased profit in use of fertilizer may come from an increase in yield, an improvement in quality, a hastening of maturity, a more uniform maturity, or from a combination of these or other favorable responses. Fertilizer by itself is not a magic ingredient that insures increases in yields and profits. Fertilizer, when properly programed, can return handsome dividends. Maximum profits come only when all things are "go" for top crop production. Scientific know-how must be put into practice to achieve precision. The quality of services that accompanies the fertilizer has the major impact on its true value.

64

Economic Aspects of the Fertilization of Protected Crops.

G. Patvelli (Univ. Catania, Catania, Italy).

Colloq. Fert. Protected Crops, Proc. Colloq. Int. Potash Inst., 6th, 50-54 (1968) (Fr).

The Institute of Agrarian Economy and Affairs surveyed fertilizer costs for three types of tomato culture in the province of Ragusa. For a crop grown in the open air, organic and inorganic fertilizers costs were 8.1% of the value of the marketable production. In the greenhouse costs were 6.2-9.0%, depending upon the use of disinfective treatments. Without sterilization, fertilizer costs were higher.

65

Can You Triple Income from Pastures?

J. E. Culp and Y. C. Smith (Tennessee Valley Authority, Muscle Shoals, Ala.).

Progr. Farmer, Florida Edition 85 (10), 24 (Oct. 1970).

The experience of a rancher in Gregg County, eastern Texas, is cited in which intensive fertilization of pasture increased profits in his cow-calf operation.

66

Technical and Socio-Economic Hindrances to the Use of Mineral Fertilizers in Senegal.

M. Ollagnier and P. Gillier (Stations Experimentales I.R.H.O., Paris, France).

Oleagineux 25 (12), 661-8 (Dec. 1970) (Fr).

The results of long-term fertilizer tests show that the grades and rates of fertilizer at present recommended are unquestionably effective and highly profitable. There is no reason for modifying either the doses or the formulas. Certain technical factors limit the effectiveness of the fertilizers; these are the low sowing density, the poor quality of the seed, the postponement of crop maintenance, bad distribution of the fertilizer, and the non-observance of rational rotations. The fall in the price of peanuts and the increased cost of fertilizers are vital psychological and economic factors which are the starting-point of the present situation. Measures are proposed at the agronomic research, extension, and governmental levels. The consumption of fertilizers in Senegal is down. Analyses of the causes of this regression and the means of righting the situation are presented.

67

Economics of Fertilizer Use.

S. P. Raychaudhuri (Planning Commission, New Delhi, India).

Bull., Indian Soc. Soil Sci., No. 8, 203-10 (1970).

In calculating the profits from the application of fertilizer, apart from the cost of fertilizer, consideration must be given to extra labor and expenditure involved in the application of the fertilizer, interest on investment on fertilizer, and uncertainties and risks associated with crop failures and weather conditions. The analysis of data led to the conclusion that an appreciable reduction in the fertilizer prices is most essential for wider use of fertilizers and consequent increase in agricultural productivity. It is also important that intensive research be carried out for more efficient use of fertilizer, so that the response per unit of nutrient applied will be increased to at least the same level as obtained in advanced countries like Japan, U.S.A., and U.K. There is need to conduct more tests on application of balanced nutrients, particularly N, P, K, to find out the optimum fertilizer rates on a sustained basis. In respect to economics of fertilizer use, stress has been placed on the cost-price ratios. The net profit can be increased by increasing the prices of foodgrains or by decreasing the prices of fertilizers.

FERTILIZER PER YIELD DATA

68

Effect of Boron on Yield of Cotton in a Drought Year.

M. G. W. Rodel.

Rhodesia Agr. J. 66 (1), 24-5 (1969).

Trop. Abstr. 24, 2244.

A trial was conducted in Rhodesia during 1967-68 to study the effect of Ca, Mg, B, and Zn on the yield of cotton growing on deep, well-drained, granite-derived sand. The extremely dry conditions occurring between planting and picking caused severe stunting of all plants. However, boll development on plots which had received B at a rate of 1.57 kg/hectare was significantly better than that on plots where no B was applied. For the small additional cost of the B fertilizing an increase in yield of 656 kg of seed cotton/hectare was obtained. It was concluded from these and earlier results that B should be applied to cotton growing on granite sandveld soil to ensure increased yields in years of high and low rainfall.

69

Foliar Application of Urea as Compared to its Broadcast Application in Capsularis Jute.

D. B. Dua.

Jute Bull. 31 (3), 79-81 (1968).

Trop. Abstr. 24, 2766.
Experiments conducted in India showed that the JRC 212 variety of jute responded well to foliar-applied urea, whereas the yield of JRC 321 was not affected. In JRC 212, a foliar spray of 16.5 kg N/hectare gave even a slightly higher fiber yield than 44.0 kg N/hectare applied to the soil. However, the combined soil and spray treatment, such as 16.5 kg N/hectare as foliar spray + 11.0 kg N/hectare as soil application, recorded the highest fiber yield (24% higher than the unfertilized control) and also proved to be economical.

70

Effect of Phosphatic Fertilization on the Yield and Composition of Sorgo Stalks.

A. Raafat, M. El-Kadi and A. H. Nour.
J. Bot. U. A. R. 11, 59-67 (1968).
Biol. Abstr. 51, 45853.
Applying calcium superphosphate at a rate of 100-150 kg/faddan gave the greatest yield of fresh and dry wt of stalks. Total soluble solids, sucrose and reducing sugars content of sorgo stalks increased by adding calcium superphosphate up to 150 kg/faddan. Highest P percentage in sorgo stalks was obtained with a high rate of P application, whereas maximum N concentration was attained with 100 kg calcium superphosphate/faddan. Phosphatic fertilizers had no signficant effect on K percentage. Nevertheless, the absolute amount of P, N, and K increased by adding calcium superphosphate up to 100 kg/faddan. Fertilizing plants with calcium superphosphate at a rate of 100-150 kg/faddan gave the highest yield of stalks as well as the highest sugar and mineral contents of stalks.

71

Effect of Different Forms of Nitrogenous Fertilizers on Yield and Quality of Tobacco.

T. A. Kacharava (Abkhazsk. Tabachn. Opytn. Stan., Sukhumi, U.S.S.R.).
Khimiya sel'. Khoz. 7 (9), 22-4 (1969) (Russ).
Field Crop Abstr. 23, 2683.
Tobacco given a basal dressing of 90 kg P_2O_5 + 100 kg K_2O/ha yielded 19.1 and 12.4 hkg dry leaves/ha in a dry and a wet yr, respectively. Application of 60 kg N/ha in three forms increased yields by 1.5-5.4 hkg/ha in the dry yr and by 5.6-9.7 hkg/ha in the wet yr and also improved tobacco quality in both yrs. Nitrogen as ammonium sulfate + urea was more effective than as ammonium sulfate, ammonium nitrate, or urea in the dry yr, but urea was the most effective in the wet yr.

72

Effect of K Fertilizing on Yield and Nutritive Value of Some Tropical Grasses.

A.P.M. Fernandes *et al.*
Experientiae 10 (7), 185-208 (1970) (Span).
Trop. Abstr. 26, 357.
Two tests were carried out in Minas Gerais, Brazil, to study the effect of K application on yield and nutritive value of *Melinis minutiflora*, *Panicum maximum*, *Hyparrhenia rufa*, and *Paspalum notatum*. Potassium was applied at rates of 0, 20, and 40 kg KCl/ha after each harvest together with $(NH_4)_2SO_4$ and superphosphate at the rate of 125 kg/ha. A favorable effect on yield and cellulose digestibility could be demonstrated. Field observation also showed a favorable effect on the resistance of the grasses to the attack of *Helminthosporium*. (33 ref)

73

Prediction of the Fertilizer Needs of Sugar Beet Grown on Fen Peat Soils.

A. P. Draycott and M. J. Durrant (Broom's Barn Exp. Sta., Higham, Bury St. Edmunds, Suffolk, U.K.).
J. Sci. Food Agr. 22 (6), 295-7 (June 1971).
The fertilizer requirements of sugar beet grown on fen soils were tested in 52 tests from 1963 to 1969. In some fields, N, P, K, and Na, and especially N and P, greatly increased yields, but the average responses obtained with the four elements were small. To help to predict where and how much fertilizer was needed for sugar beet, soils were grouped according to soil analysis and classified by loss on ignition. Sugar beet grown on soils with less than 20 μg P/ml (extracted with sodium bicarbonate) needed 150 lb/acre P_2O_5; with 21-45 μg P/ml, 75 lb P_2O_5/acre; and with more than 45 μg P/ml no fertilizer was required. Most soils contained high concentrations of K, with less than 100 μg K/ml (extracted with ammonium nitrate), 200 lb K_2O/acre was probably justified; with 100-250 μg K/ml, 100 lb K_2O/acre was needed. Most of the responses to agricultural salt were by crops on soils with exchangeable Na concentrations of less than 30 μg Na/ml. Loss on ignition was related to response to N fertilizer; when the loss was 14-25%, N increased yield by 600 lb sugar /acre and 120 lb N/acre fertilizer was needed and when the loss was 26-35%, the yield was increased by 350 lb/acre and 60 lb N/acre was needed. With greater losses there was little response.

74

The Effect of Fertilizer Nitrogen, Phosphorus, and Potassium on Yield of Soybean *Glycine max*, on Arakaka Clay Loam, Guyana.

H.A.D. Chesney (Minist. Agr. Nat. Resources, Matthew's Ridge, Guyana).
Agr. Res., Guyana 3, 105-7 (1969).
Field Crop Abstr. 24, 2098.
In a field test on newly deforested land in Northwest Guyana, soybeans cultivar 240/664 were given a basal dressing of limestone and all combinations of 0, 22, or 44 kg N; 0, 66, or 132 kg P; and 0, 44, or 88 kg K/ha. Seed yields were not affected by N or K, but were increased from 1299 kg/ha in plots given no P to 2117 kg/ha in those given 132 kg P/ha; the yield response was linear.