New Entries to IPNI Library as References

Mounicou S., J. Szpunar, D. Andrey, C. Blake, and R. Lobinski. 2010. Concentrations and bioavailability of cadmium and lead in cocoa powder and related products. Food Additives and Contaminants, 20:343-350.
Reference ID: 23049
Notes: H 8.1.4 #23049
Abstract: Concentrations and bioavailability of cadmium (Cd) and lead (Pb) were determined in cocoa powders and related products (beans, liquor, butter) of different geographical origins. Particular attention was paid to the fractionation of these metals, which was investigated by determining the metal fraction soluble in extractant solutions acting selectively with regard to the different classes of ligands. The targeted classes of Cd and Pb species included: water-soluble compounds, polypeptide and polysaccharide complexes, and compounds soluble in simulated gastrointestinal conditions. The bioavailability of Cd and Pb from cocoa powder, liquor and butter was evaluated using a sequential enzymolysis approach. The data obtained as a function of the geographical origin of the samples indicated strong differences not only in terms of the total Cd and Pb concentrations, but also with regard to the bioavailability of these metals. The Cd concentrations in the cocoa powders varied from 94 to 1833 µg kg-1, of which 10-50% was potentially bioavailable. The bioavailability of Pb was generally below 10% and the concentrations measured in the cocoa powders were in the 11-769 µg kg-1 range. Virtually all the Cd and most of Pb were found in the cocoa powder after the pressing of the liquor.

Stewart M. and P. Fixen. 2014. Encourage Growers to Do the Numbers before Reacting to Crop Prices. Better Crops with Plant Food, 98:8-9.
Reference ID: 23050
Notes: #23050e > S serial #20664e
Abstract: Changes in crop prices often generate questions about the economics of fertilization. Prices for many crops, particularly corn, have fallen considerably from the highs of the past few years. This shift has some asking questions such as, "should I reduce fertilizer rates in response to lower prices?" A detailed answer for a specific situation will depend on several factors, but a review of some fundamental principles can give us a foundation for addressing such questions.

Chuan L., P. He, M. F. Pampolino, J. Jin, S. Li, C. Grant, W. Zhou, and A. M. Johnston. 2014. Estimating Nutrient Uptake Requirements for Wheat. Better Crops with Plant Food, 98:10-12.
Reference ID: 23051
Notes: #23051e > S serial #20664e
Abstract: Over a decade's worth of data collected for winter and spring wheat in China revealed that most crop N uptake could be classed as luxury (excessive) consumption. Data for P showed a mix of both excessive and deficient crop uptake, while some K uptake data indicated a deficiency situation. These results collectively reflect the current status of fertilizer application practices in China-considerably less than site-specific. Field validation trials showed that the Quantitative Evaluation of the Fertility

of Tropical Soils (QUEFTS) model could be a practical tool for making balanced fertilizer recommendations in China.

Geisseler D. and K. M. Scow. 2014. Does Long-term Use of Mineral Fertilizers Affect the Soil Microbial Biomass? Better Crops with Plant Food, 98:13-15.
Reference ID: 23052
Notes: #23052e > S serial #20664e
Abstract: Analysis of 64 long-term crop fertilization trials from around the world found that application of mineral N fertilizer was associated with an average 15% increase in microbial biomass and 13% increase in soil organic carbon compared to an unfertilized control. The effect of fertilization on the microbial biomass is strongly pH dependent. Increases in microbial biomass were largest in studies with at least 20 years of fertilization.

Alvarado A., J. Fernandez-Moya, J. M. Segura, E. E. Vaides, M. Camacho, M. J. Avellan, and C. E. Avila. 2014. Nutrient Management Improvements in Forestry Species. Better Crops with Plant Food, 98:16-18.
Reference ID: 23053
Notes: #23053e > S serial #20664e
Abstract: Proper soil management and forest nutrition are key to maintaining the productivity of planted or natural forests. This article reviews related concepts and developments for Central American forests and focuses on relevant topics for forest managers including land evaluation, nutrient cycling, diagnosis of nutrient deficiencies, and limitations of general recommendations for liming and fertilizing.

Ciampitti I. A. and T. J. Vyn. 2014. Nitrogen Use Efficiency for Old versus Modern Corn Hybrids. Better Crops with Plant Food, 98:19-21.
Reference ID: 23054
Notes: #23054e > S serial #20664e
Abstract: An analysis of all known research (100 studies from around the world) that reported corn yields, N rates, plant densities, and whole-plant N uptake was performed to compare "Old" (1940 to 1990) versus "New" (1991 to 2011) corn hybrids for their yield relationship to whole-plant N uptake, and their associated N use efficiency (NUE). This summary confirmed that NUE gains in "New" hybrids were primarily achieved by increased grain yields per unit of N stored in the plant at maturity. The accompanying reduction in grain N concentrations over time suggests that future NUE progress in corn should not overlook nutritional quality of the resulting grains.

Johnston J., P. Fixen, and P. Poulton. 2014. The Efficient Use of Phosphorus in Agriculture. Better Crops with Plant Food, 98:22-24.
Reference ID: 23055
Notes: #23055e > Serial #20664e
Abstract: Data from vastly different soils located on two continents, and from both controlled experiments in England and derived state-wide aggregated data in the U.S., were merged to evaluate P use efficiency. The data suggest that there is an underlying "simple rule" for the behaviour of plant-available soil P in these soils, which can be related to a four-pools concept of inorganic soil P.

Hoffmann M. P., A. C. Vera, M. T. V. Wijk, K. E. Giller, T. Oberthür, C. Donough, A. M. Whitbread, and M. J. Fisher. 2014. Stimulating Potential growth and yield of oil palm with PALMSIM. Better Crops with Plant Food, 98:25-26.
Reference ID: 23056
Notes: #23056e > S serial #20664e
Abstract: The growing demand for palm oil can be met by reducing the gap between potential yield and actual yield. Simulation models can quantify potential yield, and therefore indicate the scope for intensification. A relatively simple physiological approach was used to develop PALMSIM, which is a model that simulates, on a monthly time step, the potential growth of oil palm as determined by solar radiation in high rainfall environments. The model was used to map potential yield for Indonesia and Malaysia. This map could be used to identify degraded areas that have high yield potential for oil palm.

Shahi V. B., S. K. Dutta, K. Majumdar, T. Satyanarayana, and A. Johnson. 2014. Nutrient Expert Improves Maize Yields while Balancing Fertilizer Use. Better Crops with Plant Food, 98:27-28.
Reference ID: 23057
Notes: #23057e > S serial #20664e
Abstract: Nutrient Expert® (NE) is a simple and rapid tool for generating field-specific fertilizer recommendations. Results from 17 on-farm sites in five districts of Bihar showed that NE significantly increased maize yields and economic returns compared to the generalized State Recommendation (SR) and Farmers' Fertilization Practice (FFP). NE's impact on fertilizer use in maize shifted N and K application upwards while also lowering P application rates.

Abail Z., O. I. Halima, H. Boulal, and M. E. Gharous. 2014. Fertilizer use patterns in the semi-arid, cereal producing region of Chaouia. Better Crops with Plant Food, 98:29-31.
Reference ID: 23058
Notes: #23057e > S serial #20664e
Abstract: Fertilizer use in Morocco must increase to ensure that soil nutrients are being replenished and to help reverse the current trends of low crop productivity and land degradation. The role of the agricultural extension centers in making fertilization related advice needs to be improved drastically to help in promoting best management practices.

IPNI. Planters' diary 2017. 2017. Singapore.
Reference ID: 23059
Notes: S 36 #23059

IPNI. Soil acidity evaluation & management. 1-31. 2013. IPNI.
Reference ID: 23060
Notes: H 3.1 #23060e
Abstract: Today's agriculture needs to follow the principles of sustainability that include building up and maintaining long-term soil productivity. Benefits of sustained, high soil productivity include efficient use of crop inputs, environmental protection, social benefits to stakeholders involved, and greater farmer profits. On soils, where acidity limits crop yields, soil and subsoil acidity amelioration constitutes an important part of best management practices (BMPs) to achieve sustainability.

Ruan J., R. Haerdter, and J. Gerendas. 2010. Impact of nitrogen supply on carbon/nitrogen allocation: a case study on amino acids and catechins in green tea (Camellia sinensis (L) O. Kuntze) plants. Plant Biology, 724-734.
Reference ID: 23061
Notes: H 8.1.6 #23061e
Abstract: The concentrations of free amino acids (AA) and polyphenols (PP) are important determinants of green tea quality. Levels of AA and PP are governed interactively by nitrogen (N) supply and carbon (C) status, so the impact of C/N allocation on green tea quality was investigated in saplings cultivated hydroponically with 0.3, 0.75, 1.5 or 4.5 mmol l (-1) N. Activities of glutamine synthetase (GS), phenylalanine ammonia lyase (PAL), and phosphoenolpyruvate carboxylase (PEPC) were determined, as were concentrations of AA, PP and soluble sugars. Concentrations of AA increased with increasing N supply, and the AA profile was shifted towards AA characterised by low C/N ratios (arginine, glutamine) and away from theanine, the unique non-protein AA that is abundant in Camellia sinensis. High N supply significantly reduced the concentrations of PP in young shoots, and was accompanied by lower levels of carbohydrates (soluble sugars). Analysis of the C and N status and selected enzyme activities, combined with path coefficient analysis of variables associated with C and N metabolism, demonstrated increasing deviation of C flux to AA under abundant N supply. Accumulation of AA and PP depended strongly on N status, and the balance shifted toward increasing synthesis of AA associated with enhanced growth, while investment of C in secondary metabolites did not change proportionally under the condition of ample N supply.

Hardter R., W. J. Horst, G. Schmidt, and E. Frey. 1991. Yields and Land-Use Efficiency of Maize-Cowpea Crop Rotation in Comparison to Mixed and Monocropping on an Alfisol in Northern Ghana. Journal of Agronomy and Crop Science, 166:326-337.
Reference ID: 23062
Notes: #23062e
Abstract: Results reported in the literature with regard to productivity of intercropping systems in comparison to sole cropping are very inconsistent. A field experiment was therefore conducted in the northern part of the Guinea Savanna in Ghana to compare the productivity of maize/cowpea mixed cropping, maize/cowpea relay intercropping with maize/cowpea rotation and maize monocropping over a 4-year period. The treatments included two levels of nitrogen (0 and 80 kg of N ha-1 y -1 as urea) and two levels of phosphorus application (0 and 60 kg of P ha-1 y-1 as Volta phosphate rock). At all levels of N and P application, maize yields of the intercropping systems, especially of maize/cowpea mixed cropping, were significantly lower than in sole cropping. Highest maize yields were obtained in maize/cowpea rotation, which in contrast to the other cropping systems did not show any reductions in yields over years. Cowpea yields were generally less affected by the cropping system, but were notably depressed when cowpea was relay-intercropped with maize. In treatments without fertilizer application (N and P) Land Equivalent Ratios (LER) and Area x Time Equivalency Ratios (ATER) generally indicated lower productivity of the intercropping systems as compared to sole cropping, with the maize/cowpea rotation showing the highest productivity. Conversely, fertilizer application resulted in higher productivity of the intercropping systems over the 4-year period. Productivity on the basis of ATER was generally lowest in maize/cowpea relay-intercropping as a consequence of the long time of land occupation. All of the parameters indicate low productivity of maize monocropping, clearly demonstrating that crop sequence as well as fertilizer

application must be considered as important for maintaining high production levels at this site.

Carlson K. M., J. S. Gerber, N. D. Mueller, M. Herrero, G. K. MacDonald, K. A. Brauman, P. Havlik, C. S. O'Connell, J. A. Johnson, S. Saatchi, and P. C. West. 2016. Greenhouse gas emissions intensity of global croplands. Nature Climate Change, 1-6.

Reference ID: 23063

Notes: #23063e

Abstract: Stabilizing greenhouse gas (GHG) emissions from croplands as agricultural demand grows is a critical component of climate change mitigation 1–3. Emissions intensity metrics—including carbon dioxide equivalent emissions per kilocalorie produced ('production intensity')—can highlight regions, management practices, and crops as potential foci for mitigation 4–7. Yet the spatial and crop-wise distribution of emissions intensity has been uncertain. Here, we develop global crop-specific circa 2000 estimates of GHG emissions and GHG intensity in high spatial detail, reporting the eeects of rice paddy management, peatland draining, and nitrogen (N) fertilizer on CH 4, CO 2 and N 2 O emissions. Global mean production intensity is 0.16 Mg CO 2 e M kcal -1, yet certain cropping practices contribute disproportionately to emissions. Peatland drainage (3.7 Mg CO 2 e M kcal -1)—concentrated in Europe and Indonesia—accounts for 32% of these cropland emissions despite peatlands producing just 1.1% of total crop kilocalories. Methane emissions from rice (0.58 Mg CO 2 e M kcal-1), a crucial food staple supplying 15% of total crop kilocalories, contribute 48% of cropland emissions, with outsized production intensity in Vietnam. In contrast, N 2 O emissions from N fertilizer application (0.033 Mg CO 2 e M kcal -1) generate only 20% of cropland emissions. We find that current total GHG emissions are largely unrelated to production intensity across crops and countries. Climate mitigation policies should therefore be directed to locations where crops have both high emissions and high intensities. The food system, including crop and livestock production, is responsible for up to a third of total anthropogenic GHG emissions 8. Land-use change, including cropland expansion into carbon-rich forests, was the dominant contributor to land-based emissions throughout the 1990s 9. International agreements, national policies, and private sector commitments now focus on reducing emissions from such agricultural expansion 10. From 2000–2010, global crop production growth (2% yr -1) outpaced harvested area expansion (0.8% yr -1) 11. During this time, expansion-related emissions stabilized while emissions from crop management grew by about 1% yr -1; by 2010, agricultural production emissions were greater than land change emissions 12. Since improving yields on existing croplands supports future food demand 13, GHG reduction strategies targeted to crop management practices are essential to address agriculture's contribution to climate change. Field investigations and meta-analyses indicate that changing management practices can increase crop yields with negligible growth or even reductions in GHG emissions 4, 5, 14, 15. Assessing the total climate abatement potential of such changes requires first identifying emissions intensity associated with diverse farming systems. Although the accuracy and scope of national-scale cropland emissions estimates are improving, the geographic distribution of these emissions remains relatively uncertain. With some exceptions 16,17 , most available global studies either report crop-specific emissions at the national level 11 or national to subnational emissions aggregated for many crops (Supplementary Discussion). We advance spatially explicit global GHG emissions accounting by coupling biophysical models with novel 5-arc-minute resolution data on land surface attributes and crop harvest

and management (Methods). We consider CH 4 emissions from paddy (flooded) rice cultivation, CO 2, N 2 O and CH 4 flux from agricultural peatland draining, and direct and indirect N 2 O emissions from synthetic N fertilizer and manure application. These fluxes account for the majority of GHG emissions from cropland agriculture 11, but exclude certain emissions sources (for example, energy for fertilizer manufacture, liming). Our approach provides a crop-specific subnational assessment of how agricultural management practices interact with biophysical characteristics to generate heterogeneous patterns of GHG emissions. We estimated emissions from 172 crops (Supplementary Data 1 and 2); here we focus on the ten food crops and world regions (nine countries plus Europe) that contribute the greatest total GHG emissions. In 2000, we find total global cropland GHG emissions of 1994 ± 2172 Tg CO 2 e (mean ± standard deviation), representing 4.5 ± 4.9% of anthropogenic emissions 18. This estimate excludes emissions from the livestock sector, land-cover change, and pre- and post-production emissions. Largely due to an updated N 2 O emissions model 16 and spatially explicit evaluation of peatlands under cultivation, our assessment suggests substantially lower total emissions than compiled assessments from comparable 2000-era studies, which range from 2294–3102 Tg CO 2 e yr -1 (Supplementary Discussion).

C & CI. Timor-leste forms coffee association in bid to boost farmer livelihoods. Coffee & Cocoa International, 28-31. 2016.
Reference ID: 23064
Notes: #23064e
Abstract: Stakeholders representing all segments of Timor-Leste's coffee industry have come together to form the first professional coffee trade association in the country's history.
The tiny island producer of Timor-Leste (East Timor) is well known within the coffee industry as the origin of the Hibrido de Timor variety, which is prized not only for its cup characteristics, disease resistance and productivity. However, like many smaller origins Timor-Leste is plagued by low productivity and underinverstment and a lack of organisation. Now, however, with the information of the Timor-Leste Coffee Association (Assosiasaun Cafe Timor- Leste or ACTL, in Tetun), which will be formally registered this year, that could change. Its members have a vision of becoming a voluntary association of members, working together for the Timor-Leste coffee industry in order to increase the volume, and improve the value of coffees sold for export and domestic consumption. In so doing- if it is successful- the ACTL could also help alleviate poverty in a country which is heavily dependent on coffee-growing for income. Coffee is Timor-Leste's largest non-oil export, and provides a primary source of income for approximately a quarter of Timorese households, most of whom live in poverty. In an effort to improve the wellbeing of the tens of thousands of families working in coffee, new emphasis is being placed on rehabilitation.

Phillips S. 2014. Precision Agriculture: Supporting Global Food Security. Better Crops with Plant Food, 98:4-6.
Reference ID: 23066
Notes: #23066e > S serial #20540e
Abstract: The global population is expected to surpass 9 billion people by 2050, and food security challenges are at the forefront of every discussion regarding agricultural production. According to most estimates, food production will have to increase 50 to 70% to meet global demand. The fertilizer industry will need to be a world leader in meeting this challenge as fertilizers are currently responsible for 50% of food

production and will likely be even more important in the future. Success can be best achieved using the evolving tools, technologies and information management strategies found in precision agriculture (PA).

Jensen T. 2014. Fine Tuning Remote Sensing Technologies for Nitrogen Application in Semi-Arid Cereal Crops. Better Crops with Plant Food, 98:7-8.
Reference ID: 23067
Notes: #23067e > S serial #20540e
Abstract: Sensor-based technologies have been researched and developed to the point that commercial technologies are now commonly used on the farm. Recent research focused on small grain systems of the semi-arid region of U.S. northwest indicates that refinements and technological advancements are leading towards more precise options to assess crop N status in these systems and guide fertilizer applications.

White P. J. 2014. Improving Potassium Acquisition and Utilization by Crop Plants. Better Crops with Plant Food, 98:9.
Reference ID: 23068
Notes: #23068e > S serial #20540e
Abstract: Dr. White recently highlighted some overlooked factors that influence K uptake by plants. There is considerable genetic variation between K efficiency factors among crop species.

Nosov V. V., O. A. Biryukova, A. V. Kuprov, and D. V. Bozhkov. 2014. Optimizing Maize and Soybean Nutrition in Southern Russia. Better Crops with Plant Food, 98:10-12.
Reference ID: 23069
Notes: #23069e > S serial #20540e
Abstract: Three years after the initiation of the IPNI Global Maize project in southern Russia, a local solution to an Ecological Intensification (EI) management system is proving to be successful model for demonstrating the potential for better yielding and high quality maize and soybean crops compared to those produced with common farm practice.

Li F. J., J. W. Lu, T. Ren, R. H. Cong, X. K. Li, and L. Zhou. 2014. Crop Straw Can Optimize Potassium Fertilization Strategies in Rice Cropping Systems. Better Crops with Plant Food, 98:13-15.
Reference ID: 23070
Notes: #23070e > S serial #20540e
Abstract: Generalized fertilizer recommendations for K in China exist partly because of a lack of local evidence disproving their use, and partly to address limited fertilizer K resources. This research demonstrates how making good use of the nutrient value of crop straw can help optimize fertilizer K application and reduce the reliance on strategies that promote generalized fertilizer recommendation systems across large areas.

Speirs S., M. Conyers, D. Reuter, K. Peverill, C. Dyson, G. Watmuff, and R. Norton. 2014. Development of an Australian Soil Test Calibration Database. Better Crops with Plant Food, 98:16-17.
Reference ID: 23071
Notes: #23071e > S serial #20540e

Abstract: Almost 6,000 fertilizer response experiments were collated and made available through a web-based tool. Advisers can use this tool to estimate soil test critical ranges by crop, region, soil type and nutrient.

Singh S. and R. N. Singh. 2014. Proper Timing and Placement of Boron and Lime Impacts Legumes on Acid Upland Soils. Better Crops with Plant Food, 98:18-19.
Reference ID: 23072
Notes: #23072e > S serial #20540e
Abstract: Soil acidity creates many serious crop production problems, and on the acid upland soils of Jharkhand State in India low plant-available B is a prominent concern. Use of in-furrow B and lime just prior to planting proved effective at producing better soybean, groundnut, lentil, pigeon pea, and gram crops—all of which are critical food and income sources for this region.

Gailans S. R. and M. H. Wiedenhoeft. 2014. Adapting Management of Nitrogen Sources and Weeds in Flax Systems of Central Iowa. Better Crops with Plant Food, 98:21-23.
Reference ID: 23073
Notes: #23073e > S serial #20540e
Abstract: Expansion of flax into the Midwestern U.S. has created a gap in regionalized knowledge on N source and weed management for this crop. Recent experiments in central Iowa found good responses across selected N sources, but results varied between the two very distinct growing seasons. Composted manure had the largest impact on reducing harvest index relative to other N sources in the initial year, but not the following, more challenging growing season. Weed competition had the most pronounced effect on flax yields compared to the effects of N source and rate. Weed biomass also increased with N rate, emphasizing the need for effective weed management in flax production systems.

Rusinamhodzi L., M. Corbeels, S. Zingore, J. Nyamangara, and K. E. Giller. 2014. Managing Degraded Soils with Balanced Fertilization in Zimbabwe. Better Crops With Plant Food, 98:24-27.
Reference ID: 23074
Notes: #23074e > S serial #20540e
Abstract: Results from a long-term study showed that maize yields on depleted soils were marginally increased with multi-nutrient fertilizer application, while N fertilizer application alone resulted in lower yields on both sandy and clay soils. However, largest maize yields after nine seasons were achieved with cattle manure + fertilizer N application.

IPNI. Nutrient Source specifics No.16 - Gypsum. 2016. IPNI.
Reference ID: 23075
Notes: #23075e
Abstract: Gypsum is a common mineral obtained from surface and underground deposits. It can be a valuable source of both calcium (Ca) and sulfur (S) for plants and may provide benefits for soil properties in specific conditions.

IFA, IWMI, IPNI, and IPI 2015. Managing water and fertilizer for sustainable agricultural intensification, IFA, IWMI, IPNI, IPI.
Reference ID: 23076
Notes: #23076e

Abstract: A reference guide to improve general understanding of the best management practices for the use of water and fertilizers throughout the world to enhance crop production, improve farm profitability and resource efficiency, and reduce environmental impacts related to crop production.

ICAR 2015. Black Pepper, ICAR (Indian Institute of Spices Research).
Reference ID: 23078
Notes: #23078e
Abstract: Black pepper (*Piper nigrum* L.) (Family: Piperaceae) is a perennial vine grown for its berries extensively used as spice and in medicine. India is one of the major producer, consumer and exporter of black pepper in the world. During 2013-14, 21250 tonnes of black pepper products worth Rs. 94,002 lakhs were exported to various countries. Black pepper is cultivated to a large extent in Kerala, Karnataka and Tamil Nadu and to a limited extent in Maharashtra, North eastern states and Andaman & Nicobar Islands. The crop is grown in about 201381 hectares with a production of 55000 tonnes annually (2012-13). Kerala and Karnataka account for a major portion of production of black pepper in the country.

Foster, H. L. Choice of oil palm tissue sample for diagnosis of nutrient status- A review. 1-7. 1975.
Reference ID: 23079
Notes: #23079e
Abstract: The nutrient status of oil palm, and hence its fertilizer requirement, is commonly assessed throughout the oil palm industry by tissue analysis. The MARDl Oil Palm Nutrition Team is currently reviewing in detail a selection of fertilizer trials, a primary objective being to determine the usefulness and limitations of foliar analysis as a guide to fertilizer requirement. The conclusions of the team which will be published at a later date, will be limited by the fact that they will be based entirely on analysis results for the standard leaf sample. In this paper the selection of frond 17 as the standard tissue to sample is discussed, and the possibility of sampling other tissues is considered.

Foster H. L. 1976. Yield response of oil palm to fertilizers in west Malaysia (I. Yield response functions). MARDI Research Journal, 4:44-63.
Reference ID: 23080
Notes: #23080e
Abstract: During the past ten years, an appreciable number of oil palm fertilizer trials have been carried out on a variety of soils in Peninsular Malaysia by different research organizations, and results from many of these trials were presented at the Third International Oil Palm Conference (Haw et al., 1973; Lo et al., 1973, TaN, 1973). The Oil Palm Nutrition Team of the Malaysian Agricultural Research and Development Institute (MARDI) has re-analysed the data from a selection of these trials by the method of multiple regression. Essential lyth is method of analysis summarises plot data in a single equation. As will be shown in this series of papers, such equations from which the effect of any combination of fertilizer treatments can be readily predicted, greatly facilitate the interpretation and comparison of results. In this initial paper, yield response functions calculated from fresh fruit bunch (F.F.B) yield data accumulated over a period of 4 5 years for the oil palm fertilizer trials selected for review, are presented and discussed. In the following papers, the relationships between these yield response functions and soil, meteorological, leaf nutrient and growth measurement data are explored.

Foster H. L. and C. K. Choong. 1976. Seasonal fluctuations in oil palm leaf nutrient levels. MARDI Research Journal, 5:74-90.
Reference ID: 23081
Notes: #23081e
Abstract: In West Malaysia, oil palms are generally sampled only once a year for diagnosis of nutrient status. If fluctuations in leaf nutrient levels during the year are large, then for a valid interpretation of a single sampling, leaf collection must be narrowly restricted to specific times of the year so that the factors which cause the fluctuations are always at a similar level, or the results must be adjusted-acording to the levels of the factors causing the fluctuations.
In Africa, where the climate is highly seasonal, marked leaf nutrient fluctuations in oil palm have been reported. SMILDE and CHAPAs (1963) and SMILDE and LEYRITZ (1965) found that in Nigeria, leaf N and P concentrations consistently decreased during the dry season and increased again during the rains. A similar effect has also been observed by Bnorsunnr (1956), HASsELo (1961) and OcHs and OLIvtN (1976) in other West African countries, but ScupropcxER and PREvoT (1954) and BnopsHART (1957) in a later experiment obtained contrary results. Strllroe and CHAPAS (1963) did not observe any consistent changes in the concentration of leaf bases, but BRoEsHART (1956, 1957) observed higher levels of leaf potassium and calcium in the dry season. On the other hand, OcHs and OrtvIN (1976) have reported that leaf K is lowest during the dry season in Dahomey. In the oil palm growing areas of West Malaysia seasons are less marked, but a similar pattern of change in leaf N has been recorded by MARTINEATJ et al., (1969), who found a level of 2.53Vo N at the end of a dry period, which increased to 2.74Vo when the rains returned. BoLLE-JoNES and RATNAsINcAM (1954) also found that for rubber trees in West Malaysia, the nitrogen concentration in leaves was significantly and positively related to the rainfall in the month preceding sampling. For leaf nutrient levels in oil palms in West Malaysia, Nc and THAMBoo (1966) and Socfrn Agricultural Department (1973) have reported considerable monthly fluctuations in all major nutrients, and RAJARATNAM (1972) has reported very appreciable weekly changes in boron. Thus leaf nutrient fluctuations appear to be important in Malaysia as well as in Africa, and the investigation reported in this paper was undertaken with the purpose of identifying the factors which cause fluctuations in Malaysia, so that in future they can be taken into account when interpreting results from a single sampling.

Raymond J., T. Fox, and B. Strahm. 2014. Can Enhanced Efficiency Fertilizers Affect the Fate of Nitrogen in Loblolly Pine Plantations? Better Crops with Plant Food, 98:4-6.
Reference ID: 23082
Notes: #23082e > S serial #20272e
Abstract: Field experiments with isotopically labeled fertilizer N in managed loblolly pine (Pinus taeda L.) forests across the southern U.S. showed total soil and tree system N recovery ranged from 58 to 100% the first year after fertilization. The forest floor still contained 40 to 80% of the applied N at the end of the first year. Volatilization losses were less with enhanced efficiency N fertilizers compared to urea.

Hochmuth G. 2014. Proper Fertilization Helps Turfgrass Fulfill its Role in Protecting the Environment. Better Crops with Plant Food, 98:7-8.
Reference ID: 23083
Notes: #23083e > S serial #20272e

Abstract: Based on requests for information about the science behind turfgrass BMPs, scientists in Florida reviewed the national literature to learn more about research on fertilization of turfgrass and potential problems with nutrient losses from turfgrass systems. One goal was to determine if there were scientific reports regarding a summer-restricted period against fertilization. The resulting paper "Urban Water Quality and Fertilizer Ordinances: Avoiding Unintended Consequences: A Review of the Scientific Literature" was published in Florida Extension literature (Hochmuth, G. et al. 2011), which was followed by a peer-reviewed article (Hochmuth, G. et al. 2012). This article summarizes some of the major findings of these papers along with a few of the major supporting publications.

Calvo N. R., H. E. Echeverria, H. S. Rozas, A. Berardo, and N. Diovisalvi. 2014. Can a Soil Mineralization Test Improve Wheat and Corn Nitrogen Diagnosis? Better Crops with Plant Food, 98:12-14.
Reference ID: 23084
Notes: #23084e > S serial #20272e
Abstract: A network of field studies determined that the traditional method for predicting soil N availability …a pre-plant nitrate test … can be combined with an indicator of soil N mineralization capacity to significantly improve the diagnosis for soil N availability for both wheat and corn.

Li S., D. Tuo, and Y. Duan. 2014. 4R Nutrient Stewardship for Sunflower Crops in Northwest China. Better Crops with Plant Food, 98:15-17.
Reference ID: 23085
Notes: #23085e > S serial #20272e
Abstract: Nutrient imbalance following over- and under-application of some nutrients has restricted sunflower production in Northwest China. A review of research demonstrates how the 4R Nutrient Stewardship approach can lead to better performing sunflower cropping systems.

Phonde D. B., P. S. Deshmukh, M. W. Pawar, P. V. Ghodake, B. V. Undare, H. S. Khurana, and A. Shcharbakou. 2014. Meeting the Nutrient Demands of Modern Sugarcane Varieties. Better Crops with Plant Food, 98:18-19.
Reference ID: 23086
Notes: #23086e > S serial #20272e
Abstract: Traditional practice within the average sugarcane field in Maharashtra is producing yields that are far below their potential. This study tests the current fertilization recommendation scheme with a modern crop variety to determine the viability of increasing the supply of nutrients that are commonly known to be either yield limiting or entirely avoided by growers.

Francisco E., G. Camara, C. Valter, and L. Prochnow. 2014. Increasing Soybean Yields: Brazil's Challenges. Better Crops with Plant Food, 98:20-23.
Reference ID: 23087
Notes: #23087e > S serial #20272e
Abstract: Average soybean yield has increased over recent decades in many areas of the world, but a plateau seems to have been reached in some situations, Brazil being a typical case. This article summarizes the main reasons why this has happened in the world's second largest soybean producing country, and what farmers need to overcome to break the current barrier. Also, a few lessons on general common practices contributing to high yields in the U.S. are outlined.

Chalker-Scott L. 2014. The Science Behind Biodynamic Preparations: A Literature Review. Better Crops with Plant Food, 98:24-25.
Reference ID: 23088
Notes: #23088e > S serial #20272e
Abstract: Major news outlets have featured biodynamic agriculture (biodynamics) as the newest version of organic agriculture.
With the high visibility and promotion of biodynamic products such as wines, farmers and gardeners alike are increasingly interested in biodynamics as an alternative agricultural practice. Dr. Chalker-Scott recently published an extensive, peer-reviewed summary of biodynamics, a condensed version is published here.

Yao L. X., G. L. Li, B. M. Yang, L. X. Huang, Z. H. He, C. M. Zhou, and S. Tu. 2014. Nutrient Uptake and Distribution in Lychee. Better Crops with Plant Food, 98:26-28.
Reference ID: 23089
Notes: #23089e > S serial #20272e
Abstract: Knowing how nutrients are distributed within fruit tree cultivars can lead to better nutrient source, rate, time and place decisions that, in turn, will support tree health and the nutritive value of their fruit. This study detected differences in nutrient need between two cultivars of widespread use, and identified some specific management strategies to address these differences.

Zorb C., M. Senbayram, and E. Peiter. 2014. Potassium in Agriculture: Status and Perspectives. Better Crops with Plant Food, 98:29-31.
Reference ID: 23090
Notes: #23090e > S serial #20272e
Abstract: A German research group recently published a review paper taking a fresh look at the behavior of K in soil and in plants. A few of their new findings are summarized here.

Smilde K. W. and M. J.-P. Leyritz. 1965. A Further Investigation on the Errors Involved in Leaf Sampling of Oil Palms. Journal of the Nigerian Institute for Oil Palm Research, 4:251-261.
Reference ID: 23091
Notes: #23091e
Abstract: In a previous paper (Smilde and Chapas, 1963) various methods of leaf sampling in oil palms were discussed and it was proposed to use the 17th leaf for routing sampling because the errors involved were smaller than those for leaf 1 or 25. In speacial potassium and magnesium nutritional studies, it was found to be advantageous to sample the 1st leaf as well because of the low coefficients of variation for these elements.

Nash D., P. Riffkin, R. Harris, A. Blackburn, C. Nicholson, and M. McDonald. 2014. Nitrogen Management that Maximizes Margins Improves Sustainability of Wheat Cropping. Better Crops with Plant Food, 98:4-5.
Reference ID: 23092
Notes: #23092e > S serial #20271e
Abstract: Flexible wheat cropping systems that maximize crop potential with minimal N application at sowing, were found to maximize both economic and environmental performance in southeastern Australia. A range of management combinations were used to estimate the impact of different combinations of initial soil N status and fertilizer strategies for wheat cropping in the Victorian high rainfall zone (Dunkeld, Victoria).

Dutta S., K. Majumdar, H. S. Khurana, G. Sulewski, V. Govil, T. Satyanarayana, and A. Johnston. 2014. Mapping Potassium Budgets Across Different States of India. Better Crops with Plant Food, 98:6-9.
Reference ID: 23093
Notes: #23093e > S serial #23271e
Abstract: Potassium input-output balances in different states of India were estimated and mapped using the IPNI NuGIS approach. Results showed negative K balances in most of the states suggesting deficit K application as compared to crop K uptake. Deficit application of K contributes to nutrient mining from soil, results in the depletion of soil fertility, and may significantly limit future crop yields.

Rens L. R., L. Zotarelli, and D. Cantliffe. 2014. Best Management Practices for Nitrogen Fertilization of Potatoes. Better Crops with Plant Food, 98:10-12.
Reference ID: 23094
Notes: #23094e > S serial #20271e
Abstract: With the tightening of profit margins and the desire to reduce environmental impacts, application timing and rates become an important strategy for growers to increase efficiency of fertilizer use and to reduce N-leaching. The potato research team at the University of Florida is developing BMPs to increase N use efficiency for potato production and to reduce N losses to the environment.

Esaulko A. N. and E. A. Ustimenko. 2014. Planning Winter Wheat Yields Based on the Environment and Nutrient Management. Better Crops with Plant Food, 98:13-15.
Reference ID: 23095
Notes: #23095e > S serial #20271e
Abstract: Results from field studies show that optimization of plant nutrition with N, P and K is an important factor in improving both yield and quality of winter wheat grown in Southern Russia. High yield goal-based NPK application resulted in grain yield increases of 87 to 93%. Two methods for calculating nutrient rates worked well for a yield goal of 4.0 t/ha. Yield goals of 5.0 t/ha and 6.0 t/ha were not attained, but a comparison of the approaches to yield planning suggests a slight advantage for one method over the other.

Prochnow L. 2014. Soil Acidity Evaluation and Management. Better Crops with Plant Food, 98:22-25.
Reference ID: 23096
Notes: #23096e > S serial #20271e
Abstract: Today's agriculture needs to follow the principles of sustainability that include building up and maintaining long-term soil productivity. On soils where acidity limits crop yields, soil and subsoil acidity amelioration constitutes an important part of best management practices (BMPs) to achieve sustainability. A major aspect of soil acidity management is the application of lime, but other practices may also be needed to correctly address the problem. Proper soil acidity management, among other benefits, increases the efficiency of applied fertilizers, improves the effectiveness of some herbicides, protects the environment, and enhances the profit potential for the farmer.

He P., J. Xie, Y. Li, Y. Wang, L. Jia, R. Cui, H. Wang, Y. Xing, and K. Sun. 2014. Economics of Fertilizer Application to Maize in North China. Better Crops with Plant Food, 98:26-28.
Reference ID: 23097
Notes: #23097e > S serial #20271e

Abstract: Results from field trials conducted for three years in seven provinces in North China's maize production area showed that average yield responses to fertilizer N, P and K were 1.89, 0.95 and 0.97 t/ha, respectively. Economic returns with N and P fertilization increased with increase in yield responses and fertilizer prices, but those with K fertilization decreased with increase in K prices. Use of Nutrient Expert® led to higher grain yields and farmer profits.

Nyombi K. 2014. Fertilizer Management of Highland Banana in East Africa. Better Crops with Plant Food, 98:29-31.
Reference ID: 23098
Notes: #23098e > S serial #20271e
Abstract: East African highland bananas showed substantial yield increases with balanced fertilizer application. However, very high fertilizer cost and low banana market value in the region resulted in only small returns on investment. This poses a challenge to fertilizer use in remote areas in Uganda at this time.

Xu X., P. He, J. Zhang, M. F. Pampolino, A. M. Johnston, and W. Zhou. 2016. Spatial variation of attainable yield and fertilizer requirements formaize at the regional scale in China. Field Crop Research, 203:8-15.
Reference ID: 23099
Notes: #23099e
Abstract: Understanding attainable yield, soil nutrient supply capacity and fertilizer requirements in current intensive maize (Zea mays L.) production at regional and national scales in China is essential in making informed decisions on policy, research and investment. In this study, results of a large number of on-farm experiments (n = 5893) were collected for the period 2001-2015 from the main maize production areas in China to study the spatial variability of attainable yield, relative yield (RY) and fertilizer requirements by coupling geographical information system with the Nutrient Expert for Hybrid Maize system. We found strong spatial variation in attainable yield across all sites, with a coefficient of variation (CV) of 25.5%. Mapping the spatial variability of RY indicated that 85.3%, 79.3% and 72.5% of RY for nitrogen (N), phosphorus (P) and potassium (K) of the study areas ranged from 0.68 to 0.87, from 0.83 to 0.95 and from 0.84 to 0.94, respectively. The RY was higher in North Central China than other regions. The RY can reveal the spatial heterogeneity of soil nutrient supply capacity, and has been integrated into crop management strategies for calculating fertilizer requirements using the Nutrient Expert for Hybrid Maize decision support system. Overall, there were large variations in N, P and K fertilizer requirements across all sites with CVs of 19.5%, 31.6% and 35.0%, respectively, and the ranges of 150-210 kg N ha-1, 50-90 kg P2O5ha-1 and 50-110 kg K2O ha-1 accounted for 72.0%, 81.7% and 81.5% of the study areas, respectively. The results of 605 field experiments in 10 provinces during 2010-2014 showed that the Nutrient Expert for Hybrid Maize system not only reduced N and P fertilizer application rates by 31.6% and 15.5%, respectively, but also increased maize yield by 3.3% compared with farmers' current practices. The combination of the fertilizer recommendation system and geographical information system with a large database of field trials provides a useful tool to identify spatial variation in fertilizer requirements in fields and regions, and contributes towards more efficient and effective fertilizer management.

Gupta U. C., W. U. Kening, and L. Siyuan. 2008. Micronutrients in Soils, Crops, and Livestock. Earth Science Frontiers, 15:110-125.
Reference ID: 23100
Notes: #23100e
Abstract: Micronutrient concentrations are generally higher in the surface soil and decrease with soil depth. In spite of the high concentration of most micronutrients in soils, only a small fraction is available to plants. Micronutrients, also known as trace elements, are required in microquantities but their lack can cause serious crop production and animal health problems. Crops vary considerably in their response to various micronutrients. *Brassicas* and legumes are highly responsive to molybdenum (Mo) and boron (B), whereas corn and other cereals are more responsive to zinc (Zn) and copper (Cu). Micronutrient deficiencies are more common in humid temperate regions, as well as in humid tropical regions, because of intense leaching associated with high precipitation. Soil pH is one of the most important factors affecting the availability of micronutrients to plants. With increasing pH, the availability of these nutrients is reduced with the exception of Mo whose availability increases as soil pH increases. In most plant species, leaves contain higher amounts of nutrients than other plant parts. Therefore, whenever possible, leaves should be sampled to characterize the micronutrient status of crops. Deficiency symptoms for most micronutrients appear on the younger leaves at the top of the plant, whereas toxicity symptoms generally appear on the older leaves of plants. As summarized by Deckers and Steinnes, micronutrient deficiencies are widespread in developing countries, which have much poorer soil resources than the fertile soils of Europe and North America. Many of these areas lie in the humid tropics with extremely infertile, highly weathered, and/or highly leached soils, which are intensely deficient in nutrients. The rest of such soils are in the semiarid and areas adjacent to the latter, where alkaline and calcareous soil conditions severely limit the availability of micronutrients to plants. Frequently, the Cu, iron (Fe), manganese (Mn), Zn, and selenium (Se) levels in forages, which are sufficient for optimum crop yields, are not adequate to meet the needs of livestock. Selenium is a trace mineral, which is not required by plants, and maximum forage yields can be obtained on soils with very low amounts of soil Se. However, if animals are fed feed crops and forages with low Se, they could suffer from serious muscular disorders and other diseases. White muscle disease caused by Se deficiency is the most common disorder and is found in calves and lambs. Sufficiency levels of micronutrients for crops have been discussed in relation to the animal requirement.

Moebius-Clune B., H. V. Es, and J. Melkonian. 2013. Adapt-N Uses Models and Weather Data to Improve Nitrogen Management for Corn. Better Crops with Plant Food, 97:7-9.
Reference ID: 23101
Notes: #23101e > S serial #20270e
Abstract: Optimal management of N for corn varies from year to year owing to differences in weather. The Adapt-N tool combines soil and crop models to predict the influence of weather on plant N demand, soil N supply, and soil N losses. On-farm validation of the tool in New York and Iowa has confirmed that its use leads to better choices for rate and time of application, improving profitability of fertilizer N use and reducing its environmental impact.

Chuan L., P. He, M. F. Pampolino, A. M. Johnston, J. Jin, X. Xu, S. Zhao, S. Qiu, and W. Zhou. 2013. Establishing a Scientific Basis for Fertilizer Recommendations for Wheat in China. Better Crops with Plant Food, 97:10-12.
Reference ID: 23102
Notes: #23102e > S serial #20270e
Abstract: Inappropriate application of fertilizers has become a common phenomenon in wheat production systems in China. This has led to nutrient imbalances, inefficient fertilizer use, and large losses to the environment. Using datasets from 2000 to 2011, this paper describes and validates a new fertilizer recommendation method for wheat in China based on yield response and agronomic efficiency (AE).

Boulal H., L. Sikaoui, and M. E. Gharous. 2013. Nutrient Management: A New Option for Olive Orchards in North Africa. Better Crops with Plant Food, 97:21-22.
Reference ID: 23103
Notes: #23103e > S serial #20270e
Abstract: North Africa's goal of expanding its olive sector has led to large orchard area expansion under both rainfed and irrigated systems. This summary of best management practices (BMPs) for nutrient application in olive describes the foundation that research must build upon to sustain olive production.

Saparov A., R. Eleshev, B. Suleimenow, G. Peskovki, and A. Shcherbakov. 2013. Effect of Potassium Chloride Application for Rice, Cotton and Potato in the Irrigated Zone of Kazakhstan. Better Crops with Plant Food, 97:23-25.
Reference ID: 23104
Notes: #23104e > S serial #20270e
Abstract: Over the past two decades a sharp deficit of all nutrients, especially K, has been observed in Kazakhstan. Field trial results indicated a strong positive response to KCl for potato and rice, and a modest response for cotton.

Walsh O., R. Christiaens, and A. Pandey. 2013. Local Data Improves Sensor-Based Nitrogen Recommendations. Better Crops with Plant Food, 97:26-27.
Reference ID: 23105
Notes: #23105e > S serial #20270e
Abstract: Sensor-based technologies facilitate assessment of crop nutrient status and account for spatial and temporal variability. This enables fertilizer rate adjustment according to site-specific conditions. Research in Montana shows that nitrogen (N) fertilization algorithms developed in other regions need adjustment using Montana data, for use in Montana.

Kumar R., S. Karmakar, S. Kumari, A. K. Sarkar, S. K. Dutta, and K. Majumdar. 2013. Improving Productivity and Profitability of the Maize-Wheat System in Jharkhand. Better Crops with Plant Food, 97:29-31.
Reference ID: 23106
Notes: #23106e > S serial #20270e
Abstract: Field experiments within the maize-wheat crop sequence grown on the relatively low fertility red and lateritic soils achieved a yield target of 5 t/ha of maize and 4 t/ha of wheat with site-specific nutrient management (SSNM). This research provides a path towards the possibility of doubling current crop production on such soils.

Duan Y., D. Tuo, P. Zhao, H. Li, and S. Li. 2013. Response of Potato to Fertilizer Application and Nutrient Use Efficiency in Inner Mongolia. Better Crops with Plant Food, 97:24-26.
Reference ID: 23107
Notes: #23107e > S serial #20269e
Abstract: Potato production in Inner Mongolia is limited by unbalanced nutrition and inadequate water supplies. Field trials find balanced fertilization can significantly increase tuber yield for both rainfed and irrigated potato. Crop uptake of N, P and K increased rapidly at 25 to 57 days after emergence (DAE) under both rainfed and irrigated conditions. The economic benefit from fertilizer application was higher in irrigated versus rainfed potato.

Stark J. C. and B. G. Hopkins. 2013. Potato Response to Phosphorus Fertilizer Using a Dicarboxylic Acid Polymer. Better Crops with Plant Food, 97:7-10.
Reference ID: 23108
Notes: #23108e > S serial #20269e
Abstract: Improving P use efficiency in some alkaline soils is difficult due to poor P solubility. A dicarboxylic acid polymer (DCAP) was added to P fertilizer to improve potato P uptake, efficiency, and yield. This five-year study consisting of nine field trials, evaluated potato response to seasonal applications of liquid or dry P fertilizer with or without DCAP on calcareous soils with low to moderate soil test P. Addition of DCAP increased total yields of premium quality "U.S. No. 1" potatoes for selected P rate/source/timing combinations in seven of the nine trials.

Johnson R. S., A. Olivos, Q. Xiaoqiong, C. Crisosto, and T. Michilaides. 2013. Proper Nectarine Nutrition Improves Fruit Quality. Better Crops with Plant Food, 97:11-13.
Reference ID: 23109
Notes: #23109e > S serial #20269e
Abstract: Successful stone fruit production requires attention to both fruit yield and fruit quality. Mineral nutrient shortages will result in a greater degree of fruit browning during storage. Excessive N fertilization stimulates vegetative growth, delays fruit ripening, and increases the severity of brown rot.

Fulton J., T. McDonald, C. W. Wood, O. Fasina, and S. Virk. 2013. Optimizing Nutrient Stewardship Using Broadcast Fertilizer Application Methods. Better Crops with Plant Food, 97:15-17.
Reference ID: 23110
Notes: #23110e > S seriel #20269e
Abstract: Research from Auburn University suggests continued advancement in the capacity of spinning disk broadcast spreaders in order to increase the efficiency of the field operation has likely enhanced the risk for well known issues related to obtaining good uniformity in product spread patterns for common granular fertilizer blends. Recommendations are provided in order to increase awareness of this risk and ensure optimal results can be obtained from this popular fertilizer application method.

Bobrenko I. A., N. V. Goman, and E. Y. Pavlova. 2013. Zinc Application Method Impacts Winter Triticale in Western Siberia. Better Crops with Plant Food, 97:21-22.
Reference ID: 23111
Notes: #23111e > S serial #20269e
Abstract: Field experiments revealed that winter triticale responds significantly to Zn fertilizer applied to soil low in available Zn. Both yield and quality of grain were

improved with Zn application. Soil application of Zn was generally more effective compared to seed treatment. The optimum Zn rates for soil application and seed treatment were found to be 8 kg Zn/ha and 100g ZnSO 4/100 kg seed, respectively.

Li S. and Y. Zhang. 2013. 4R Potassium Management in Processing Tomato Production in Xinjiang. Better Crops with Plant Food, 97:4-5.
Reference ID: 23112
Notes: #23112e > S serial #20268e
Abstract: Production of processing tomato in the northwestern province of Xinjiang, China is often restricted by inadequate K nutrition. This article provides examples of K application practices that follow 4R Nutrient Stewardship guidelines, and the associated yield and quality benefits that can be gained through their implementation.

Mikkelsen R. and R. Norton. 2013. Soil and Fertilizer Sulfur. Better Crops with Plant Food, 97:7-9.
Reference ID: 23113
Notes: #23113e > S serial #20268e
Abstract: A continual supply of sulfur (S) is essential for plant growth. Organic matter is the largest reservoir of S in soil, but it must be converted to soluble sulfate before plants can take it up. The major source of S fertilizer is obtained from scrubbing fossil fuels. There are many excellent soluble and slowly soluble sources of S fertilizer that can meet plant nutritional requirements when applied at the right rate, time and place.

Norton R., R. Mikkelsen, and T. Jensen. 2013. Sulfur for Plant Nutrition. Better Crops with Plant Food, 97:10-12.
Reference ID: 23114
Notes: #23114e > S serial #20268e
Abstract: Sulfur (S) is essential for plant nutrition, but its concentration in plants is the lowest of all the macronutrients. Plants are able to assimilate sulfate and reduce it to essential amino acids, where S is involved in a range of metabolic functions, including protein synthesis. Greater attention needs to be paid to the role of S in balanced crop nutrition in many global regions.

Singh S. and A. K. Sarkar. 2013. Sulfur Management for Optimizing Oilseed and Pulse Production in Rain-fed Jharkhand. Better Crops with Plant Food, 97:13-14.
Reference ID: 23115
Notes: #23115e > S serial #20268e
Abstract: Sulfur (S) deficiency in Indian soils is increasing due to extensive use of S-free fertilizers coupled with the increasing area under high S demanding crops such as oilseeds and pulses. On-farm experiments conducted on rain-fed upland soils of Jharkhand showed that S application could improve yield and quality of these crops. Significant direct and residual effects of S application on crop yields were found in mustard-black gram and groundnut-mustard cropping systems. Sulfur application was beneficial over existing recommendations that omit S for niger, mustard, groundnut, black gram, lentil, and soybean.

Francisco E. and H. Hoogerheide. 2013. Nutrient Management for High Yield Cotton in Brazil. Better Crops with Plant Food, 97:15-17.
Reference ID: 23116
Notes: #23116e > S serial #20268e

Abstract: Guidelines to interpreting analysis data and recommended fertilization practices are outlined for this unique cotton production center located within the Brazilian Cerrado.

Crozier C. R., R. J. Gehl, D. H. Hardy, and R. W. Heiniger. 2013. Nitrogen Management for High Population Corn Production in Wide and Narrow Rows. Better Crops with Plant Food, 97:18-21.
Reference ID: 23117
Notes: #23117e > S serial #20268e
Abstract: A 3-year study of corn planted in wide and narrow rows in North Carolina found grain yields were significantly higher with narrow rows and side-dress N application than with other row width and timing combinations. The 19% grain yield increase in response to applications of N fertilizer could be attributed to changes in ear yield components: kernels per row increased by 17%, mean kernel weight increased by 8%, and rows per ear increased by 3% due to N application.

Yakimenko V. N. and V. V. Nosov. 2013. The Efficiency of Potassium Fertilizer Use in Western Siberia. Better Crops with Plant Food, 97:22-24.
Reference ID: 23118
Notes: #23118e > S serial #20268e
Abstract: A brief review shows that application of K fertilizer to cereal crops grown on soils of Western Siberia can contribute to 20 to 30% yield increases. Field experiments conducted in 'cereals-fodder crop' systems suggest a trend towards higher yields due to K application in both first spring wheat or spring barley crops. A significant yield response to K was obtained for second spring wheat and forage crops of maize or oat-pea mixes. Significant increases in carrot and potato yields were observed within the 'vegetable-potato' cropping system even at the lowest K rates.

Oberthür T., C. R. Donough, J. Cock, Rahmadsyah., G. Abdurrohim, K. Indrasuara, A. Lubis, and T. Dolong. 2013. Opportunities for Research and Development in Oil Palm Fertilization to Support Sustainable Intensification. Better Crops with Plant Food, 97:25-28.
Reference ID: 23119
Notes: #23119e > S serial #20268e
Abstract: The Southeast Asia Program of IPNI (IPNI SEAP) has developed a process to reduce yield gaps in oil palm plantations using Best Management Practices (BMPs). This process appraises the yield that can be obtained with BMPs on a set of commercial production blocks, evaluates the benefits from packages of management improvements, and also assesses the most appropriate BMP for a particular site. Estates can then identify BMPs suitable for yield intensification that work on a small set of commercial plots and use this information to make investment decisions for larger areas with a higher level of confidence.

Arnall B. 2013. The Magruder Plots: 120 years of Continuous Winter Wheat Research. Better Crops with Plant Food, 97:29-31.
Reference ID: 23120
Notes: #23120e > S serial #20268e
Abstract: Over the decades several articles, journal publications, and many insights have been derived from this un-replicated fertility study consisting of six simple treatments.

Kyveryga P. M. and T. M. Blackmer. 2013. 4R Management: Differentiating Nitrogen Management Categories on Corn in Iowa. Better Crops with Plant Food, 97:4-6.
Reference ID: 23121
Notes: #23121e > S serial #20267e
Abstract: Results of two large-scale on-farm evaluation studies are summarized where farmers used later-season digital aerial imagery, corn stalk nitrate tests (CSNT) and yield monitoring technology to quantify differences between five major N management categories-formed by combining different application timings and N fertilizer sources.

Bender R. R., J. W. Haegele, M. L. Ruffo, and F. E. Below. 2013. Modern Corn Hybrids' Nutrient Uptake Patterns. Better Crops with Plant Food, 97:7-9.
Reference ID: 23122
Notes: #23122e > S serial #20267e
Abstract: Biotechnology, breeding, and agronomic advancements have propelled corn yields to new highs with little guidance as to how to fertilize these modern corn hybrids to achieve their maximum yield potential. Current fertilization practices, developed decades ago, may not match uptake capabilities of modern hybrids that contain transgenic insect protection now grown at population densities higher than ever before. A re-evaluation of nutrient uptake and partitioning can provide the foundation for fine-tuning our practices as we strive to achieve corn's maximum yield potential.

Kraus H. T. and S. L. Warren. 2013. Ratios and Concentrations of Nitrogen, Phosphorus, and Potassium Affect Production of Herbaceous Perennials. Better Crops with Plant Food, 97:11-12.
Reference ID: 23123
Notes: #23123e > S serial #20267e
Abstract: Both the concentration and ratio of N, P, and K affect flowering and growth of herbaceous perennials. Based on experiments to determine the effects of N, P, and K and their ratio, it appears that herbaceous perennials N requirements are similar to herbaceous annual plants, but require lower P and K concentrations, more similar to woody perennial plants.

Parent L. E. and T. Bruulsema. 2013. Networking Soil Fertility Studies at the Agro-ecosystem Level using Meta-analysis. Better Crops with Plant Food, 97:13-14.
Reference ID: 23124
Notes: #23124e > S serial #20267e
Abstract: Research supporting 4R plant nutrition must address the complexity of its four factors interacting with many more soil and climatic factors varying among agro-ecosystems. Increasing emphasis must be placed on analysis of networked datasets. Meta-analysis provides statistical rigor for such analysis.

Satyanarayana T., K. Majumdar, A. M. Johnston, M. L. Jat, P. Kuchanur, D. Sreelatha, J. C. Sekhar, Y. Kumar, R. Maheswaran, R. Karthikeyan, A. Velayutahm, G. Dheebakaran, N. Sakthivel, S. Vallalkannan, C. Bharathi, T. Sherene, S. Suganya, P. Janaki, R. Baskar, T. H. Ranjith, D. Shivamurthy, Y. R. Aladakatti, D. Chiplonkar, Gupta.R., D. P. Biradar, S. Jeyaraman, and S. G. Patil. 2013. Nutrient Expert(TM): A Tool to Optimize Nutrient Use and Improve Productivity of Maize. Better Crops with Plant Food, 97:21-24.
Reference ID: 23125
Notes: #23125e > S serial #20267e

Abstract: Nutrient Expert (NE)-based field-specific fertilizer recommendations offered solutions to the farmers of southern India for better nutrient use in maize under the current scenario of escalating fertilizer prices. Results from validation trials, comparing NE-based recommendations with farmer practice and the state recommendation in 82 farmer fields of southern India, demonstrated the utility of the decision support system tool in improving the yield and profitability of maize farmers in the region.

Wang W., J. Lu, Y. Li, J. Zou, and W. Su. 2013. Fertilizer Plays an Important Role in Current Crop Production: A Case Study from Hubei. Better Crops with Plant Food, 97:18-20.
Reference ID: 23126
Notes: #23126e > S serial #20267e
Abstract: Results from large-scale multipoint field experiments with rice, winter wheat, rapeseed, and cotton showed that site-specific combinations of N, P and K fertilizers significantly increased crop yields, and that fertilizers play a much more important role in crop production today than in the past.

Francisco E. A. B. 2013. How Important are Phosphorus and Potassium for Soybean Production in the Cerrado of Brazil? Better Crops with Plant Food, 97:25-26.
Reference ID: 23127
Notes: #23127e > S serial #20267e
Abstract: Brazil appears poised to overtake the U.S. at the world's largest soybean producer. The successful establishment of a sustained, high-yielding environment within Brazil's highly productive, but nutrient poor, cerrado soils is at the heart of this new claim to fame.

Bayer C., T. Zschornack, R. O. Sousa, L. S. da Silva, W. B. Scivittaro, P. R. F. da Silva, S. J. Giacomini, and F. C. Carmona. 2013. Strategies to Mitigate Methane Emissions in Lowland Rice Fields in South Brazil. Better Crops with Plant Food, 97:27-29.
Reference ID: 23128
Notes: #23128e > S serial #20267e
Abstract: Minimum tillage, reducing irrigation water application, and crop diversification are identified as efficient strategies to mitigate CH4 emissions in rice fields while also increasing yield. Even though land area under rice cultivation increased 30% from 1990 to 2005 and the IPCC predicted an associated 30% increases in CH4 emissions, introduction of minimum tillage resulted in a 4% decrease in total CH4 emissions and a 48% decrease in emissions per unit of grain production. This is an example of how evaluation and establishment of local indexes of GHG emissions enables consideration of the impact of adopting new technologies that generalized indexes miss.

Smilde K. W. and L. C. Chapas. 1963. The determination of Nutrient status by leaf sampling of oil palm. Walfor Journal, 8-30.
Reference ID: 23129
Notes: #23129e
Abstract: The importance of leaf analysis as guide to the maintenance of adequate plant nutrition has been widely accepted, as shown in a recent review (Smith, 1962). The application of this technique to oil palm cultivation and its advantages over soil analysis have also been discussed by Broeshart (1955) who concluded that foliar analysis gives a rapid diagnosis of the mineral status of the plam on which application

of fertilizers may be based.Developing deficiencies may depress yield before symptoms become visible, and these can be traced with leaf analysis.

Ward J. B. 1966. Sampling Oil Palms for Foliar diagnosis. Oleagineux, 277-279.
Reference ID: 23130
Notes: #23130e
Abstract: The use of foliar analysis as an aid to the fuller interpretation of the results of agronomic experiments, to detect mineral deficiencies, and to provide a basis for fertiliser policy, has become general, at least on the larger oil palm estates (1, 2). Methods of selecting fronds for analysis have been discussed (3, 4) but the number of samples per unit area - the <Sampling rate> and the number of palms per sample area -the <sampling intensity> do not appear to have been investigated for the foliar survey of plantations.

Kang C. S., K. D. Kanniah, Y. H. Kerr, and A. P. Cracknell. 2015. Analysis of in-situ soil moisture data and validation of SMOS soil moisture products at selected agricultural sites over a tropical region. International Journal of Remote Sensing, 37: 3636-3654.
Reference ID: 23131
Notes: #23131e
Abstract: Calibration and validation activities on Soil Moisture and Ocean Salinity (SMOS)-derived soil moisture products have been conducted worldwide since the data became available, but this has not been the case over tropical regions. This study focuses on the setting up of a soil moisture data collection network over an agricultural site in a tropical region in Peninsular Malaysia and on the validation of SMOS soil moisture products. The in-situ data over a one-and-a-half-year period was analysed and the validation of the SMOS soil moisture products with this in-situ data was conducted. Bias and root mean square error (RMSE) were computed between the SMOS soil moisture products and the in-situ surface soil moisture collected at the satellite passing times (6 am and 6 pm local time). Due to the known limitations of SMOS soil moisture retrieval over vegetated areas with a vegetation water content higher than 5 kg m-2, an overestimation of SMOS soil moisture products to in-situ data was noticed in this study. The bias ranged from 0.064 to 0.119 m3 m-3 and the RMSE was from 0.090 to 0.158 m3 m-3, when both ascending and descending mode data were measured. This RMSE was found to be similar to those of a number of studies conducted previously at different regions. However, a wet bias was found during the validation, while previous validation activities at other locations showed dry biases. The result of this study is useful to support the continuous development and improvement of the SMOS soil moisture retrieval model, aiming to produce soil moisture products with higher accuracy, especially in tropical regions.

Tan K. P., K. D. Kanniah, and A. P. Cracknell. 2014. On the upstream inputs into the MODIS primary productivity products using biometric data from oil palm plantations. International Journal of Remote Sensing, 35:2215-2246.
Reference ID: 23132
Notes: #23132e
Abstract: This study evaluated the influence of upstream inputs into the Moderate Resolution Imaging Spectroradiometer (MODIS) primary productivity products, termed the MOD17, at tropical oil palm plantations (Elaeis guineensis Jacq.). Evaluation of MOD17 using oil palm plantations as test sites is ideal because the plantations are cultivated on large areas which are comparable with the size of MODIS pixels. It is

difficult to find test sites covered by other single species in a whole pixel. The upstream inputs studied included (1) MODIS land cover, (2) the National Centers for Environmental Prediction-Department of Energy (NCEP-DOE) Reanalysis 2 meteorological data set, (3) MODIS leaf area index/fraction of photosynthetically active radiation (LAI/fPAR), and (4) MODIS maximum light-use efficiency (maximum LUE). Oil palm biometric and local meteorological data were utilized as ground data. Furthermore, scaling up oil palm LAI and fPAR from plot scale to regional scale (Peninsular Malaysia) was done empirically by correlating oil palm LAI derived from the hemispherical photography technique with radiance information from the Disaster Monitoring Constellation 2 satellite (UK-DMC 2). The upscaled LAI/fPAR developed in this study was used to evaluate the MODIS LAI/fPAR. The results showed that the MODIS landcover product has an overall accuracy of 78.8% when compared to the Peninsular Malaysia land-use map produced by the Department of Agriculture, Malaysia. Regarding the NCEP-DOE Reanalysis 2 data set, vapour pressure deficit (VPD) and photosynthetically active radiation (PAR) contain large uncertainties in our study area. However, MODIS LAI and fPAR were correlated relatively well with the upscaled LAI (R2 = 0.50) and the upscaled fPAR (R2 = 0.60), respectively. The constant values of maximum LUE for croplands and evergreen broadleaf forest ecosystems are lower than the maximum LUE of oil palm. The relative predictive error assessment showed that the MOD17 net primary productivity (NPP) overestimated oil palm NPP derived from biometric methods by 142-204%. We replaced the upstream inputs of MOD17 by the local inputs for estimating oil palm GPP and NPP in Peninsular Malaysia. This was done by (1) assigning maximum LUE for oil palm plantations as a constant at 1.68 g C m.2 day.1, (2) utilizing meteorological data from local meteorological stations, and (3) using the upscaled fPAR of oil palm plantations. The amount of oil palm GPP and NPP for Peninsular Malaysia in 2010 were estimated to be ~0.09 Pg C year.1 (or equivalent to ~0.33 Pg CO2 year.1) and ~0.03 Pg C year.1 (~0.11 Pg CO2 year.1), respectively, indicating that oil palm plantations in Peninsular Malaysia can play an important role in global carbon sequestration. In the future there is likely to be a demand for MODIS GPP and NPP products that are more accurate than those currently generated by MOD17. We recommend future developments of the MOD17 processing system to allow improvements in the upstream input parameters, in the manner described in this article, both for global processing and for the production of more accurate values for GPP and NPP at regional and local scales.

Halvorson A. D. and S. J. Del Grosso. 2012. Nitrogen Source and Placement Affect Soil Nitrous Oxide Emissions from Irrigated Corn in Colorado. Better Crops with Plant Food, 96:7-9.
Reference ID: 23133
Notes: #23133e > S serial #20266e
Abstract: Research shows that N fertilizer source affects growing season soil N2O emissions from irrigated corn systems in Colorado. Use of controlled-release and stabilized N sources reduced N2O emissions under NT and ST corn production systems up to 66% when compared to commonly used urea and up to 43% compared to UAN. Urease and nitrification inhibitor additions to urea and UAN resulted in significant reductions in N2O emissions, as did polymer-coated urea. Surface broadcast application of N sources resulted in lower N2O emissions than surface band applications. Choice of N source and placement can be valid management alternatives for reducing N2O emissions to the environment in semi-arid areas.

Shahi V. B., A. Kumar, N. Gupta, K. Majumdar, M. L. Jat, T. Satyanarayana, M. Pampolino, S. Dutta, H. S. Khurana, and A. M. Johnston. 2012. Economics of Fertilizing Irrigated Cereals in the Indo-Gangetic Plains. Better Crops with Plant Food, 96:13-18.
Reference ID: 23134
Notes: #23134e > S serial #20266e
Abstract: On-farm studies in the Indo-gangetic plains (IGP) clearly indicated the positive response of cereals (rice, wheat, and maize) to NPK fertilization. Economic assessment of data, based on current as well as future fertilizer price and crop value or minimum support price (MSP) scenarios, showed favorable return on investment in N, P, and K fertilizers in the IGP.

Li S., J. Jin, Y. Duan, T. Guo, Y. Zhang, and Y. Li. 2012. Maize Response to Balanced Fertilizer Application in Northwest China. Better Crops with Plant Food, 96:18-19.
Reference ID: 23135
Notes: #23135e > S serial #20266e
Abstract: On-farm trials determined the effect of K fertilization on maize production within a region that has typically relied on N and P alone. Balanced use of N, P, and K fertilizer generated an average yield increase of 1.2 t/ha and was shown to improve farm income by USD 300/ha when compared to common farmer practice. This case of long-term use of N and P in the absence of K illustrates the seriousness of nutrient imbalance in this and other regions of China.

Barbazan M., C. Bautes, L. Beux, J. M. Bordoli, A. Califra, J. D. Cano, A. del Pino, O. Ernst, A. Garcia, F. Garcia, S. Mazzilli, and A. Quincke. 2012. Soil Potassium in Uruguay: Current Situation and Future Prospects. Better Crops with Plant Food, 96:21-22.
Reference ID: 23136
Notes: #23136e > S serial #20266e
Abstract: Recent field research in Uruguay has revealed K deficiencies in the main field crops of the country. A preliminary survey indicates that almost 5 M ha would be deficient in K. A critical soil test K (STK) level of 0.34 meq/100g (133 ppm) has been estimated based on 50 field trials conducted on the six primary field crops.

Ladha J. K., C. K. Reddy, A. T. Padre, and C. van Kessel. 2012. Role of Nitrogen Fertilization in Sustaining Organic Matter in Cultivated Soils. Better Crops with Plant Food, 96:24-25.
Reference ID: 23137
Notes: #23137e > S serial #20266e
Abstract: This article summarizes work published by Ladha et al. (2011) using data from long-term studies around the world to evaluate the impact of commercial fertilizer N on SOM. The results show that commercial fertilizer N leads to a slower decrease in SOM content, or may cause a small increase, after a new soil equilibrium is reached following N application.

Kihara J. and S. Njoroge. 2012. The Effect of Reduced Tillage and Mineral Fertilizer Application on Maize and Soybean Productivity in Kenya. Better Crops with Plant Food, 96:26-28.
Reference ID: 23138
Notes: #23138e > S serial #20266e

Abstract: Conservation Agriculture (CA) has been promoted for adoption by smallholder farmers in maize-based cropping systems in sub-Saharan Africa with limited success, mainly due to a reduction in crop yields in the initial years of transition from conventional tillage (CT) to CA. Results from this study confirmed the initial yield reduction with CA and showed that at least six seasons were required for maize yields under CA to match those under CT. However, soybean yields were not affected by tillage practice and may offer opportunity to accelerate the agronomic benefits of CA in rotation and intercrop systems.

Bagrintseva V. N. and V. V. Nosov. 2012. Potassium Nutrition for Small Grains Grown on Chestnut Soils. Better Crops with Plant Food, 96:29-31.
Reference ID: 23139
Notes: #23139e > S serial #20266e
Abstract: Long-term trends in soil K forms and available K status for Russian chestnut soils reveal that available K declines more rapidly in chestnut soils than in chernozems. Potassium fertilization of chestnut soils resulted in improvement of small grain (winter wheat and winter barley) yield and quality in the dry zone of Stavropol Krai.

Roberts T. L. and R. Norton. 2012. Applying 4R Nutrient Stewardship to Wheat. Better Crops with Plant Food, 96:3.
Reference ID: 23140
Notes: #23140e > S serial #20265e
Abstract: Wheat is the most important grain of trade for human consumption. It is produced in a vast range of environments from central Russia to the great Indian and Chinese river valleys and across the Great Plains and Pampas of the Americas. Soils and climates vary and so do yield potentials, so that developing appropriate local nutrient management strategies is critical to ensure that yields are produced that give the most efficient use of fertilizers.

Phillips S. and R. Norton. 2012. Global Wheat Production and Fertilizer Use. Better Crops with Plant Food, 96:4-6.
Reference ID: 23141
Notes: #23141e > S serial #20265e
Abstract: Global wheat production has risen over two and a half times since 1960 as the result of better farming practices, improved cultivars, and balanced nutrition. At the same time, fertilizer use in all agriculture has risen 4.3 times to keep up with growing food demand. It is estimated that growers use around 15% of the fertilizer consumed to produce the current 647 M t of wheat grain.

Arnall B. and F. Garcia. 2012. Improving Soil Fertility and Wheat Crop Management through the Long-term Study of Cereal Crop Rotations. Better Crops with Plant Food, 96:7-9.
Reference ID: 23142
Notes: #23142e > S serial #20265e
Abstract: Long-term fertility trials are established and used across the globe. Unfortunately, for many reasons long-term trials are regularly discontinued. These trials are a wealth of data and information laden with golden nuggets of new and amazing insight. In this article, such nuggets gleaned from long-term wheat trials in Canada, United States, and Argentina are presented.

Hawkesford M. J. 2012. The Diversity of Nitrogen Use Efficiency for Wheat Varieties and the Potential for Crop Improvement. Better Crops with Plant Food, 96:10-12.
Reference ID: 23143
Notes: #23143e > S serial #20265e
Abstract: Nitrogen use efficiency (NUE) is a complex process and must be de-convoluted into tractable and measurable sub-traits, which may be targeted for specific improvement that can be included in new wheat varieties. Current research conducted at Rothamsted Research aims to define the key traits contributing to yield and NUE, and to quantify existing diversity. Evolving from these studies are genetic and molecular analyses aimed at identifying specific markers for breeding and the underlying genes involved.

Lam S. K., D. Chen, R. Armstrong, and R. Norton. 2012. How Will Climate Change Affect Wheat Nutrition in Australian Cropping Systems? Better Crops with Plant Food, 96:13-15.
Reference ID: 23144
Notes: #23144e > S serial #20265e
Abstract: Understanding N dynamics is crucial to crop sustainability under rising atmospheric CO2 concentration. Field and glasshouse trials were conducted to investigate the effect of elevated CO2 on N dynamics in Australian cropping systems, with specific focuses on fertilizer N recovery by wheat, symbiotic N2 fixation by legumes, and N2O emission. Our results indicate that grain N removal will be higher in a carbon-rich world, and that current N management practice will need to be revised. However, because of the positive relationship between CO2 elevation and N2O emissions, global warming may be higher than current estimates.

Norton R. 2012. Nutrient Management for Wheat in a Variable Climate. Better Crops with Plant Food, 96:16-17.
Reference ID: 23145
Notes: #23145e > S serial #20265e
Abstract: Profitable use of N and P to meet crop requirements in a variable climate such as the grain belt of southeastern Australia means adopting strategies that minimize risk. Using yield potentials, N and P demands can be estimated, but research shows there is no particular penalty if N is provided as the yield develops during the season. As yet there are no strategies for in-crop P application although research is pointing the way.

Bijay-Singh, R. K. Sharma, Jaspreet-Kaur., M. L. Jat, K. L. Martin, Yadvinder-Singh, Varinderpal-Singh, H. S. Thind, H. S. Khurana, M. Vashistha, W. R. Raun, and R. Gupta. 2012. Optical Sensor-based Nitrogen Management for Irrigated Wheat in the Indo-Gangetic Plains. Better Crops with Plant Food, 96:18-20.
Reference ID: 23146
Notes: #23146e > S serial #20265e
Abstract: Robust relationships were observed between in-season GreenSeeker™ optical sensorbased estimates of yield at Feekes 5-6 and 7-8 growth stages and actual wheat yields. Sensor-guided fertilizer N applications resulted in high yield levels and high N use efficiency. Application of 90 kg N/ha at planting, or in two equal doses at planting and crown root initiation stage, were appropriate prescriptive fertilizer N management options before applying a corrective GreenSeeker™ guided fertilizer N dose for the Indo-Gangetic Plains (IGP) in northwest India.

Sandukhadze B. I. and E. V. Zhuravleva. 2012. Topdressing Nitrogen in Modern Winter Wheat Varieties in Central Russia. Better Crops with Plant Food, 96:21-23.
Reference ID: 23147
Notes: #23147e > S serial #20265e
Abstract: This research found that split N topdressing is not always more efficient than single topdressing on winter wheat in Russia. Modern wheat varieties generally have both the highest yield potential and response to N fertilizers.

Jensen T. and R. Norton. 2012. Wheat Grain Nutrient Concentrations: Wide-scale Average Values May Not Be Adequate for Field Nutrient Budgets. Better Crops with Plant Food, 96:24-25.
Reference ID: 23148
Notes: #23148e > S serial #20265e
Abstract: Large variability is observed in grain nutrient concentrations, which results in a degree of uncertainty in developing detailed nutrient budgets on a sub-region or individual field basis. This paper examines the interaction between individual grain nutrient values and the geographic scale in which they are collected and discusses the appropriate use of grain nutrient concentrations in developing nutrient budgets.

He P., J.-Y. Jin, H. Wang, R. Cui, and C. Li. 2012. Yield Responses and Potassium Use Efficiency for Winter Wheat in Northcentral China. Better Crops with Plant Food, 96:26-27.
Reference ID: 23149
Notes: #23149e > S serial #20265e
Abstract: Field experiments were conducted to study yield responses and K use efficiency parameters for wheat in three provinces across three years in northcentral China. Potassium application increased grain yield and profit for wheat in most cases. Determination of K use efficiency parameters demonstrated that there is potential to optimize K use efficiency further with best nutrient management practices.

Snyder C. S. 2012. Are Midwest Corn Farmers Over-Applying Fertilizer N? Better Crops with Plant Food, 96:3-4.
Reference ID: 23150
Notes: #23150e > S serial #20264e
Abstract: U.S. corn yield (Zea mays L.) and fertilizer N consumption data are briefly reviewed, and selected Land Grant university research-based recommended N rates for corn in the U.S. are compared with public data on actual N rates used by farmers in leading corn-producing states to determine if farmers may currently be over-applying N. Contrary to popular belief, U.S. corn farmers in leading corn-producing states do not appear to be applying N at rates in excess of profitmaximizing university recommendations.

Khristenko A. and S. Ivanova. 2012. Improvement of Diagnosis Accuracy of Phosphate Status for Ukrainian Soils. Better Crops with Plant Food, 96:5-6.
Reference ID: 23151
Notes: #23151e > S serial #20264e
Abstract: Through an analysis of the effect of soil properties on the accuracy of the Olsen P soil test, a refined method and interpretive scale for available soil P supply was developed for use in alkaline soils.

Zhao S. and P. He. 2012. Evaluation of In-season Nitrogen Management for Summer Maize in the North China Plain. Better Crops with Plant Food, 96:8-9.
Reference ID: 23152
Notes: #23152e > S serial #20264e
Abstract: Field experiments tested N fertilizer at different rates and ratios of basal: topdress application. A total N rate of 120 to 180 kg/ha was shown to maximize grain yield and, with split application, reduce N inputs by 25 to 50% compared to typical farm practice within the North China Plain.

Tasistro A. 2012. Use of Boundary Lines in Field Diagnosis and Research for Mexican Farmers. Better Crops with Plant Food, 96:11-13.
Reference ID: 23153
Notes: #23153e > S serial #20264e
Abstract: Better diagnostic tools that avoid the bias of the diagnostician and are more quantitative in nature are badly needed, especially in developing countries. The application of boundary lines to the databases that are routinely collected by advisers could serve as a useful alternative. Furthermore, they can provide valuable research information in a shorter time and more representative conditions than traditional experiments.

Roberts T. L., A. M. Fulford, R. J. Norman, N. A. Slaton, T. W. Walker, C. E. Wilson, Jr., D. L. Harrell, and G. N. McCauley. 2012. Development and Implementation of N-STaR: the Nitrogen-Soil Test for Rice. Better Crops with Plant Food, 96:14-15.
Reference ID: 23154
Notes: #23154e > S serial #20264e
Abstract: Researchers across the Midsouth U.S. rice producing states of Arkansas, Louisiana, Mississippi and Texas set out to develop a soil-based N test in 2003, which could be used to determine site-specific N fertilizer rate recommendations for rice. The test has now been implemented.

Cakmak I. 2012. HarvestPlus Zinc Fertilizer Project: HarvestZinc. Better Crops with Plant Food, 96:17-19.
Reference ID: 23155
Notes: #23155e > S serial #20264e
Abstract: The first phase of the HarvestPlus Zinc Fertilizer Project has assessed the potential for crop response to Zn-containing fertilizer in a number of target countries where soils are unable to produce staple foods with adequate Zn. Foliar spray of Zn fertilizers is highly effective in increasing Zn concentrations of cereal grains. However, attention should be paid to the timing of Zn spray. Soil application of Zn-containing fertilizers is more important for improving crop yields.

Zingore S. and K. E. Giller. 2012. Optimizing Phosphorus and Manure Application in Maize-Soybean Rotations in Zimbabwe. Better Crops with Plant Food, 96:23-25.
Reference ID: 23156
Notes: #23156e > S serial #20264e
Abstract: Soybean production in Zimbabwe is limited because farmers give little attention to the crop and prefer to apply fertilizer to the previous crop in the rotation (maize). Our research showed that the combined application of P fertilizer and manure to maize, as is currently practiced by farmers, was more productive and economic under poor soil fertility conditions. However, there is potential to increase income with application of P and manure to soybean on more fertile soils.

Bruulsema T., P. Heffer, R. Welch, I. Cakmak, and K. Moran. 2012. Fertilizing Crops to Improve Human Health: A Scientific Review. Better Crops with Plant Food, 96:29-31.
Reference ID: 23157
Notes: #23157e > S serial #20264e
Abstract: A large proportion of humanity depends for its sustenance on the food production increases brought about through the application of fertilizers to crops. Fertilizer contributes to both the quantity and quality of the food produced. Used in the right way—applying the right source at the right rate, time and place—and on the right crops, it contributes immensely to the health and well-being of humanity.

Junior D. M., J. A. Quaggio, H. Cantarella, R. M. Boaretto, and F. C. B. Zambrosi. 2012. Nutrient Management for High Citrus Fruit Yield in Tropical Soils. Better Crops with Plant Food, 96:4-6.
Reference ID: 23158
Notes: #23158e > S serial #20263e
Abstract: Current recommendations for nutrient management of citrus in tropical conditions are summarized based on the use of soil and leaf analyses, fruit yield, and characteristics of tree varieties commercially grown in Brazil.

Mengel D., D. Ruiz-Diaz, R. Asebedo, and T. Mazwell. 2012. Nitrogen Fertilization of Nitrogen-Stressed Soybeans. Better Crops with Plant Food, 96:14-15.
Reference ID: 23159
Notes: #23159e > S serial #20263e
Abstract: Soybeans are not generally considered responsive to N fertilizer; however, there are some circumstances where this crop can benefit from addition of N. Kansas research performed several years ago and reported in this magazine showed the potential for soybean grain response to N fertilizer in high-yield irrigated conditions. This article looks at other conditions where N fertilizer can be beneficial in soybean production.

He H., W. Li, and S. Tu. 2012. Balanced Fertilization Promoted Yield and Quality of Waxy Maize in Chongqing. Better Crops with Plant Food, 96:18-19.
Reference ID: 23160
Notes: #23160e > S serial #20263e
Abstract: Optimal fertilizer treatment cannot only produce high yield and quality of waxy (fresh) maize, but also enhance the net income for growers. The contents of total sugar and amylopectin, which govern maize palatability, can be positively affected through optimal N and K application.

Li S. and J. Jin. 2012. 4R Nutrient Management Practices for Potato Production in China. Better Crops with Plant Food, 96:20-22.
Reference ID: 23161
Notes: #23161e > S serial #20263e
Abstract: In China, potato yields have been restricted by low and unbalanced nutrient input. A key measure to better tuber yield, quality, and improved nutrient use efficiency will be successful implementation of regionally-based, best nutrient management practices.

Yin X. H., C. O. Gwathmey, and C. L. Main. 2012. Sulfur Effects on Cotton Yield Components. Better Crops with Plant Food, 96:27-28.
Reference ID: 23162
Notes: #23162e > S serial #20263e
Abstract: Little is known about the effects of S deficiency on cotton yield components. In container-grown cotton, S deficiency reduced seedcotton weight and the number of bolls per plant, leaving a greater proportion of bolls at first-position fruiting sites.

Son T. T., L. X. Anh, Y. Ronen, and H. T. Holwerda. 2012. Foliar Potassium Nitrate Application for Paddy Rice. Better Crops with Plant Food, 96:29-30.
Reference ID: 23163
Notes: #23163e > S serial #20263e
Abstract: Trials conducted in Vietnam with spring and summer rice grown on soils low in soil exchangeable K showed positive yield and net income responses from one to three foliar treatments with potassium nitrate. Grain yields and net income were improved when a portion of the basal KCl was replaced with the three foliar KNO_3 sprayings.

Johnston J. 2011. Soil Organic Matter Changes towards an Equilibrium Level Appropriate to the Soil and Cropping System. Better Crops with Plant Food, 95:7-8.
Reference ID: 23164
Notes: #23164e > S serial #20262e
Abstract: While soil organic matter (SOM) is an important aspect of soil quality it will never be easy to identify a critical level at which to maintain a soil. Nevertheless, the contribution of SOM to soil fertility, sustainable agricultural systems, and crop productivity cannot be over emphasized and every effort should be made to maintain, and if possible increase, SOM.

Johnston J. 2011. The Essential Role of Soil Organic Matter in Crop Production and the Efficient use of Nitrogen and Phosphorus. Better Crops with Plant Food, 95:9-11.
Reference ID: 23165
Notes: #23165e > S Serial #20262e
Abstract: The role of soil organic matter (SOM) in supporting the nutrient requirements of high crop yields is fundamental, especially as crop yield potential continues to improve. Lessons on N and P interactions with SOM and its support of high crop yields are well illustrated here through examples gleaned from long-term research conducted at Rothamsted.

Norton R., G. Fitzgerald, and M. Tausz. 2011. Climate Change and Wheat Crop Responses- FACEing the Future. Better Crops with Plant Food, 95:12-13.
Reference ID: 23166
Notes: #23166e > S serial #20262e
Abstract: Climate change, with higher temperatures and lower rainfall is challenging us now and will continue to do so in the future. However, some of the adverse effects of changing weather patterns may be reduced through the beneficial effects of higher carbon dioxide (CO2), even in low yielding environments. There are traits in current varieties that could provide keys to develop varieties better adapted to a warm, hot, and carbon-rich future.

Wortmann C., C. Shapiro, A. Dobermann, R. Ferguson, G. Hergert, D. Walters, and D. Tarkalson. 2011. High Yield Corn Production Can Result in High Nitrogen Use Efficiency. Better Crops with Plant Food, 95:14-15.
Reference ID: 23167
Notes: #23167e > S serial #20262e
Abstract: Articles such as "Fixing the Global Nitrogen Problem" by Townsend and Howarth in Scientific American, Feb 2010, are common. Alarm is expressed about the environmental impact of the increasing amount of reactive N in the atmosphere and in terrestrial and marine ecosystems around the globe. Much of this increase is attributed to production and use of N fertilizer. Use of fertilizer N is essential to meet growing global demand for agricultural commodities. Management is key to increasing productivity while also increasing N use efficiency and reducing N losses.

Pettygrove S., T. O'Geen, and R. Southard. 2011. Potassium Fixation and Its Significance for California Crop Production. Better Crops with Plant Food, 95:16-18.
Reference ID: 23168
Notes: #23168e > S serial #20262e
Abstract: The fixation of potassium in the interlayers of soil minerals has been the subject of interest for fertilizer management. This review highlights the mechanism of K fixation and a case study from Central California where K-fixing soils are common.

Terrazas J., G. Guaygua, E. Juarez, M. Crespo, and F. Garcia. 2011. Crop Responses to Fertilization in the Eastern Plains of Bolivia. Better Crops with Plant Food, 95:19-20.
Reference ID: 23169
Notes: #23169e > S serial #20262e
Abstract: The eastern plains of Bolivia is an important area of grain crop production. A network of exploratory experiments conducted from 2005 to 2008 focused on crop nutrient deficiencies and responses to applied P, K, S, micronutrients, and N. Results of these experiments are presented in this article. A high probability of grain yield response to P was measured when Olsen P tested less than 6 mg/kg. Potassium, S, and micronutrients might be deficient under certain conditions.

Nelson P. N., T. Rhebergen, S. Berthelsen, M. J. Webb, M. Banabas, T. Oberthür, and C. R. Donough. 2011. Soil Acidification under Oil Palm: Rates and Effects on Yield. Better Crops with Plant Food, 95:22-24.
Reference ID: 23170
Notes: #23170e > S serial #20262e
Abstract: Field experiments in Papua New Guinea have shown strong effects of fertilizer type and placement on soil acidification in oil palm plantations—a potential degradation issue that may eventually have an adverse effect on yields. However, measurements at four sites in Indonesia show that relatively high yields are possible on soils with a low pH, and that best management practices can actually increase pH at low values. It is concluded that current pH levels in major growing areas of oil palm in Southeast Asia can be managed such that they do not prevent relatively high oil palm yields.

Zhou J., W. Li, H. Dai, G. Dong, and S. Tu. 2011. Nutrient Management for Alfalfa Grown on Acid, Hilly Regions of Chongqing. Better Crops with Plant Food, 95:26-27.
Reference ID: 23171
Notes: #23171e > S serial #20262e
Abstract: Researchers found that the optimal fertilizer treatment for alfalfa production in the hilly areas within Chongqing, China included not only N, P, and K, but also Mg - at a frequency of once every 2 or 3 years. While not impacting yield, inclusion of Mo in the balanced, optimal treatment may result in cases of higher crude protein and enhanced palatability of alfalfa forage.

Yin X. H., C. L. Main, and C. O. Gwathmey. 2011. Cotton Yield and Quality Responses to Sulfur Applications. Better Crops with Plant Food, **95:28**-29.
Reference ID: 23172
Notes: #23172e > S serial #20262e
Abstract: More attention needs to be paid to S requirements of no-till cotton in Tennessee and other cotton-producing states where S deficiencies may occur. Applying about 20 lb S per acre can increase lint yields and fiber micronaire of cotton on no-till fields with low S levels in Tennessee and similar environments.

Vanlauwe B. and S. Zingore. 2011. Integrated Soil Fertility Management: An Operational Definition and Consequences for Implementation and Dissemination. Better Crops with Plant Food, 95:4-6.
Reference ID: 23173
Notes: #23173e > S serial #20261e
Abstract: Traditional farming systems in sub-Saharan Africa (SSA) depend primarily on mining soil nutrients. The African Green Revolution aims at intensifying agriculture through dissemination of Integrated Soil Fertility Management (ISFM) strategies. This article presents a robust and operational definition of ISFM, based on detailed knowledge of African farming systems and their inherent variability and of optimal use of nutrients.

Balkcom K. S. and C. H. Burmester. 2011. Optimize Nitrogen for Alabama Wheat Yields with and without Fall Tillage. Better Crops with Plant Food, 95:8-11.
Reference ID: 23174
Notes: #23174e > S serial #20261e
Abstract: Increased no-till or reduced tillage within Alabama wheat fields has raised research questions on how the trend might impact optimal N fertilizer rates and timings. Monitoring tiller growth as a means to predict N requirements was another option assessed across major soil types within the region.

de Sousa D. M. G. and T. A. Rein. 2011. Soil Fertility Evaluation and Control for Annual Crops in the Cerrado. Better Crops with Plant Food, 95:12-15.
Reference ID: 23175
Notes: #23175e > S serial #20261e
Abstract: The authors review recommended practices for evaluating and managing liming and fertilizer use for high yielding annual crops growing under no-till (NT) cultivation within the Cerrado.

Liu X., P. He, and J. Jin. 2011. A Long-term Analysis of Factors to Improve Nutrient Management for Winter Wheat Production in China. Better Crops with Plant Food, 95:16-18.
Reference ID: 23176
Notes: #23176e > S serial #20261e
Abstract: Data from 895 field experiments conducted between 2000 and 2008 were analyzed to calculate yield gaps, indigenous nutrient supplies, and nutrient use efficiencies – with the goal of improving nutrient management for wheat. Results showed an average yield gap of 0.76 t/ha between attainable yields and yields with farmers' practice. Successive inputs of large amounts of nutrients have significantly increased soil nutrient supply, and therefore contribute to lower use efficiencies since recommendations for N, P, and K have not been adjusted downward.

Li S., Y. Duan, T. Guo, and Y. Zhang. 2011. Demonstrating a Link between Nutrient Use and Water Management to Improve Crop Yields and Nutrient Use Efficiency in Arid Northwest China. Better Crops with Plant Food, 95:20-22.
Reference ID: 23177
Notes: #23177e > S serial #20261e
Abstract: Northwest China is characterized by dry growing conditions that limit crop yields and nutrient use efficiency. Research trials evaluating the effect of different water and nutrient management scenarios on crop yield and nutrient use efficiency showed positive interactions between water supply and nutrients.

Stewart W. M. and W. F. Bennett. 2011. Nutrient Deficiencies and Toxicities - as Relevant as Ever for Crops. Better Crops with Plant Food, 95:4-5.
Reference ID: 23178
Notes: #23178e > S serial #20260e
Abstract: This article briefly highlights some tips and resources that can help in recognizing and understanding nutrition problems in plants.

Xu X., J. Xie, Y. Hou, P. He, M. F. Pampolino, S. Zhao, S. Qiu, A. M. Johnston, and W. Zhou. 2015. Estimating nutrient uptake requirements for rice in China. Field Crop Research, 180:37-45.
Reference ID: 23179
Notes: #23179e
Abstract: Accurate knowledge of the nitrogen (N), phosphorus (P), and potassium (K) requirements for rice (Oryzasativa L.) in China is essential to quantitatively estimate optimal fertilizer application regimes to maximizecrop yield and increase nutrient use efficiency. On-farm experiments were collected in China's major rice-producing regions from 2000 to 2013, to determine the relationship between grain yield and nutrientuptake in the above-ground plant dry matter using the quantitative evaluation of the fertility of tropicalsoils (QUEFTS) model. The large datasets obtained which covered broader rice growing areas and ecologytypes (both indica and japonica) in China. The dataset was divided into two groups: single-season riceand early/middle/late rice, according to QUEFTS analysis. The QUEFTS model predicted a linear increasein grain yield if nutrients were taken up in balanced amounts until yield reached about 60-70% of yieldpotential. To produce 1000 kg of single-season rice grain, 14.8 kg N, 3.8 kg P, and 15.0 kg K were requiredin the above-ground plant dry matter, and the corresponding internal efficiencies (IEs) were 67.6 kg grainper kg N, 263.2 kg grain per kg P, and 66.7 kg grain per kg K. For early/middle/late rice, the amount of17.1 kg N, 3.4 kg P, and 18.4 kg K were required in the above-ground plant

dry matter to produce 1000 kgof grain, and corresponding IEs were 58.5 kg grain per kg N, 294.1 kg grain per kg P, and 54.3 kg grain perkg K. The QUEFTS model provides a scientific foundation for filtering high-yielding and high-efficiencyvariety, optimizing fertilizer application rate and developing nutrient management strategies to increase yield and nutrient use efficiency. This is the first report on comparison of the nutrient uptake of differentecology types in rice production area of China using QUEFTS model and test their feasibility through field validation.

Jensen, T. and IPNI. Plant Nutrition Today - Fall 2017 no.6: Plants take up trace elements vital to livestock. 1-2. 2017. IPNI.
Reference ID: 23180
Notes: #23180e
Abstract: It is much simpler being a plant nutrition scientist compared to a livestock nutritionist. Plants only require 14 mineral nutrients compared to 23 for healthy livestock. Of course, the length of both these lists of essential nutrients might grow over time as research discovers the need for minute concentrations of additional mineral nutrients.

Stewart, M. and IPNI. Plant Nutrition Today - Fall 2017 no.4: Potassium still important in bermudagrass forage production. 1-2. 2017. IPNI.
Reference ID: 23181
Notes: #23181e
Abstract: Bermudagrass is an important warm-season perennial grass for livestock grazing and hay production in tropical and subtropical regions of the world. In the southern U.S., it has been estimated that there are more than 6 million acres of bermudagrass pasture or hay. Coastal was long the standard bermudagrass hybrid throughout much of the southern U.S.; however, other hybrids, especially Tifton 85, have made inroads over the past few years.

Rahmat S. R. 2013. Gross margin analysis for palm oil industry in Malaysia. Case study: Johor, Malaysia. International Journal of Innovations in Business, 2:778-791.
Reference ID: 23182
Notes: #23182e
Abstract: Palm oil is well-known as a "red gold" for Malaysia, since this industry lures tremendous positive externalities to the country. Palm oil has contributed to poverty reduction in Malaysia through a land settlement scheme by the Federal Land Development Authority (FELDA), helping peasant households to overcome poverty. As a perennial crop, oil palms offer high profits and greater cost efficiency than other oil crops. Gross margin analysis for growers, which dis-aggregated into 3 groups (smallholders, medium size and private estates), are also calculated within this study which add another factor of inverse relationship (IR) theory between size and income in our case (using gross margin methodology). Small holders were found to earn lower gross margins than large holders as a result of the long-term impact of this industry in the study area Johor, Peninsular Malaysia. The field research was conducted in Johor to highlight the long term impact of this industry since Johor is a pioneer in this industry.

IPNI. RESEARCH WITH IMPACT: Boosting Soybean Yields and Raising Farmer Income in Kenya with Nutrient Management. 2012. USA, IPNI.
Reference ID: 23183
Notes: #23183e
THE CHALLENGE:

Grain legumes are an important source of dietary protein and income for farmers in many parts of sub-Saharan Africa. Soybean production provides smallholder farmers in Kenya and Uganda with an alternative cash income, improves nutritional security and contributes to the soil N supply through biological N2 fixation. Smallholder farmers currently apply little or no fertilizer on soybean and prefer to use it on other crops instead, which has contributed to poor soybean yields (<0.5 t/ha). High population density in Kenya puts pressure on the limited agricultural land, with farm sizes averaging less than 1 ha and little land available for expansion.

IPNI. Research with Impact: Overcoming Low Maize Yields with Lime and Potassium in Chiapas, Mexico. 2015. USA, IPNI.
Reference ID: 23184
Notes: #23184e
THE CHALLENGE:
Soil acidity is a major constraint that limits maize productivity in the southern agricultural region of Chiapas, Mexico. The region's dominant sandy soils are derived from granite in a lowland tropical environment. These soils are naturally acidic, but conditions are made worse by burning plant residues, use of acidifying fertilizers, and tillage. In the 1980's, a standard recommendation was made to apply 2 t calcium hydroxide/ha (hydrated lime) to neutralize soil acidity, regardless of conditions and lime variability. Although many positive responses resulted from this practice, yield benefits were not consistent, including yield declines due to subsoil acidity and ignoring the interactions between liming and plant nutrients. As a result of this inconsistent crop response, liming has not become a routine farm practice, and soil acidity remains a serious barrier to achieving high maize yields.

IPNI. Research with Impact: Improving Yield and Profitability of Processing Tomatoes in Northwest China with Potassium. 2012. USA, IPNI.
Reference ID: 23185
Notes: #23185e
THE CHALLENGE:
The Xinjiang region of northwest China is the largest producer of processing tomatoes in the country…in fact it is one of the largest processing tomato-growing regions of the world. About seven million tonnes of tomato fruit is produced annually, and this contributes to 70% of the China's tomato paste bound for export markets. Tomatoes require a relatively large amount of potassium (K) for adequate growth. Recently, scientists have detected declining K concentrations for soils in the region, and this is thought to be related to the amount of K removed from the field during the continual harvest of processing tomatoes as well as other crops. Falling soil K fertility is leading to a reduction in tomato yield and quality.

C & CI and C&. C&CI: Coffee and Cocoa International January 2017. Coffee & Cocoa International 43[6], 1-50. 2017. C & CI.
Reference ID: 23186
Notes: S serial #23186e

Feintrenie L., W. K. Chong, and P. Levang. 2010. Why do farmers prefer oil palm? Lessons learnt from Bungo district, Indonesia. Center of International Forestry Research, 9:1-17.
Reference ID: 23187
Notes: #23187e

Abstract: Indonesia has been the world's largest producer and exporter of palm oil since 2008. This paper discussed the livelihood impacts of oil palm development in Indonesia, based on lessons learnt from Bungo district, in the province of Jambi. The various community company partnerships that structure the sector are reviewed and the difficulties raised by the joint ventures schemes are discussed. The merits and drawbacks of oil palm as a smallholder crop are then analysed, based on household socio-economic surveys conducted in 2007-10.
The main causes of conflicts between oil palm companies and communities are unclear land tenure, and a recurrent lack of leadership in smallholders' cooperatives. Under fair partnerships between smallholders and companies, oil palm could become a smallholder friendly crop. The land-use profitability analysis demonstrates the high returns that can be generated by oil palm independent smallholdings, making it highly competitive with rubber, and much more profitable than rice production.

Polthanee A. and K. Wongpichet. 2017. Effects of Planting Methods on Root Yield and Nutrient Removal of Five Cassava Cultivars Planted in Late Rainy Season in Northeastern Thailand. Agricultural Science, 8:33-45.
Reference ID: 23188
Notes: #23188e
Abstract: The objectives of this study were to evaluate growth, yield and nutrients removal of five cassava cultivars planted by different planting methods in late rainy season of northeastern Thailand. A split plot design was used in this study. The planting methods (vertical and horizontal) were assigned as mainplots. Cassava cultivars (Rayong-7, Rayong-11, Rayong-72, Huaybong-80 and E-dum) were assigned as sub-plots with four replications. Results showed that vertical planting gave significantly higher fresh storage root yield than those of horizontal planting, across five cassava cultivars. The cultivar Rayong-7 produced maximum fresh storage root yield across two planting methods, but not significantly different from Rayong 11, Huaybong 80 and Edum cultivars. Irrespective of nutrient removal, N, P and K removed ranges from 2.9 - 3.6, 0.8 - 1.3 and 5.3 - 7.9 kg per ton fresh root weight, respectively depending on cassava cultivar. The cultivar Rayong-7 removed the highest quantities of N, and the cultivar Rayong-11 removed maximum of P and K in the present study. Regardless of nutrient removal at different plant parts; N, P and K removed maximum quantities in leaf, stem and storage root, respectively. Planting method had no significant effect on N and P removal, but significant effect on K removal. The vertical planting removed K higher than those of horizontal planting.

Lestari S., J. I. Hamada, F. Syamsudin, Sunaryo, J. Matsumoto, and M. D. Yamanaka. 2016. ENSO Influences on Rainfall Extremes around Sulawesi and Maluku Islands in the Eastern Indonesian Maritime Continent. Science Online Letters on the Atmosphere (SOLA), 12:37-41.
Reference ID: 23189
Notes: #23189e
Abstract: El Nino Southern Oscillation (ENSO) influences on rainfall extremes around Sulawesi and the Maluku Islands in the eastern Indonesian Maritime Continent were investigated focusing on spatial and seasonal aspects using daily rainfall data at 23 stations during 1972.2012. The results show that interannual variations in rainfall extremes were strongly correlated with the ENSO phases. Wetter (drier) conditions were associated with La Niña (El Niño) events, in terms of total precipitation, rainy days, and consecutive dry days at more than 90% of the stations. Dry days tend to increase more than 2 months in the El Nino than La Nina years causing severe

droughts in the region. Frequency and number of stations of heavy rainfalls increased (decreased) during La Nina (El Nino) events, whereas ENSO influences were weak (strong) on severest (moderately intense) rainfall events. ENSO influences on rainfall amount and number of rainy days vary spatially and seasonally. They were predominant during July.November but less during December.February. Heavy rainfall frequency was significantly higher during La Nina than El Nino years in transitional seasons.

Corley R. H. V. 2016. Climate change - What does it mean for oil palm? The Planter, 92:631-654.
Reference ID: 23190
Notes: #23190e
Abstract: The climate has changed continuously for millions of years, and will certainly change in future, but the direction of change is far from clear: Greenhouse gases (GHGs) warm the atmosphere, and computer climate models predict droughts, floods and hurricanes as a results of rising temperatures. However; the models are unable to simulate past temperature and rainfall patterns, so little reliance can be placed on the projections. Based on solar activity, some authors have even indicated the posibility of lower temperatures in future.

Euler M., V. Krishna, S. Schwarze, H. Siregar, and M. Qaim. 2017. Oil Palm Adoption, Household Welfare, and Nutrition Among Smallholder Farmers in Indonesia. World Development, 1-17.
Reference ID: 23191
Notes: #23191e
Abstract: Oil palm is one of the most rapidly expanding crops throughout the humid tropics. In Indonesia, the expansion is largely driven by smallholder farmers. While recent research has studied effects for the environment and climate change, socioeconomic impacts in the small farm sector have hardly been analyzed. Here, we address this research gap by analyzing effects of oil palm adoption on farm household living standards and nutrition in Sumatra. Using survey data and econometric models, we estimate average impacts, impact pathways, and impact heterogeneity. Results show that oil palm adoption improves household living standards and nutrition. Mean impacts on food and non-food expenditures, as well as on calorie consumption and dietary quality, are all positive and significant. A sizeable part of the total effects is attributable to oil palm adopters expanding their farm size rather than realizing higher profits per hectare. Oil palm has lower labor requirements than alternative crops (especially rubber), so that adopting farmers are able to manage larger land areas. Labor saved through switching from rubber to oil palm is also used to increase off-farm incomes. Impact heterogeneity is analyzed with quantile regressions. We find positive effects of oil palm adoption across the entire expenditure distribution. However, the absolute gains in total expenditures and non-food expenditures are larger for the better-off, suggesting that oil palm may contribute to rising inequality.

Bebber D. P., A. D. Castillo, and S. J. Gurr. 2016. Modelling coffee leaf rust risk in Colombia with climate reanalysis data. Biological Sciences, 10:1-9.
Reference ID: 23192
Notes: #23192e
Abstract: Many fungal plant diseases are strongly controlled by weather, and global climate change is thus likely to have affected fungal pathogen distributions and impacts. Modelling the response of plant diseases to climate change is hampered by

the difficulty of estimating pathogen-relevant microclimatic variables from standard meteorological data. The availability of increasingly sophisticated high-resolution climate reanalyses may help overcome this challenge.We illustrate the use of climate reanalyses by testing the hypothesis that climate change increased the likelihood of the 2008-2011 outbreak of Coffee Leaf Rust (CLR, Hemileia vastatrix) in Colombia. We develop a model of germination and infection risk, and drive this model using estimates of leaf wetness duration and canopy temperature from the Japanese 55-Year Reanalysis (JRA-55).We model germination and infection asWeibull functions with different temperature optima, based upon existing experimental data.We find no evidence for an overall trend in disease risk in coffee-growing regions of Colombia from 1990 to 2015, therefore, we reject the climate change hypothesis. There was a significant elevation in predicted CLR infection risk from 2008 to 2011 compared with other years. JRA-55 data suggest a decrease in canopy surface water after 2008, which may have helped terminate the outbreak. The spatial resolution and accuracy of climate reanalyses are continually improving, increasing their utility for biological modelling. Confronting disease models with data requires not only accurate climate data, but also disease observations at high spatio-temporal resolution. Investment in monitoring, storage and accessibility of plant disease observation data are needed to match the quality of the climate data now available. This article is part of the themed issue 'Tackling emerging fungal threats to animal health, food security and ecosystem resilience'.

Tandon H. L. S. 2013. Micronutrient handbook - from research to application (2nd edition with colour plates), Fertiliser Development & Consultation Organisation.
Reference ID: 23193
Notes: S 2.8.3 #23193
Abstract: We present before you the 54th practical and reference book published by FDCO on various aspects of plant nutrients and fertilizers including all major and micronutrients. Our specific interest in plant micronutrient began in 1989 with the publication of a guidebook on secondary and micronutrients.

Bell R. W., G. Pracilio, S. Cook, R. Chhay, and S. Vang. 2006. Mapping Rice Yield and its Fertilizer Response at Provincial-Scale in Takeo, Cambodia. Combodia Journal of Agriculture, 7:36-44.
Reference ID: 23194
Notes: H 21.5 #23194e
Abstract: Our objective was to identify responsive areas for nitrogen (N), phosphorus (P) and potassium (K) fertiliser use on rice (Oryza sativa L.) within Takeo province from trial results obtained at 2336 sites. Regression tree analysis identified in order of decreasing importance the following factors which explained the variation in yield from on-farm experiments: season, location, fertiliser, soil type. Semi variograms of the same data set indicated that a maximum spread of 12 km in datum points was required to map yield across the province. Separating the results into N response classes decreased the maximum spread of datum for mapping to only 8 km. The maps generated indicated areas in which response to fertiliser is more or less likely. Whereas P responses were predicted to be relatively uniform across the province, N and K responses were more varied. Results suggest a very strong positive response to N, particularly on the central-west of the province. They also suggest negative effects of high N rates on the most fertile soils (Kbal Po, Krakor) in the east of Takeo, and in the Prateah Lang and Koktrap soils in the flooded areas of the south east of Takeo. At the provincial scale, the maps identified areas that can be used to target

extension effort to where it is likely to be most effective, and areas where further research is needed to clarify reasons for poor response. This should enhance the strategic planning capability for delivery of ectension services and fertiliser inputs.

de Barros Silva E., F. D. Nogueira, and P. T. G. Guimaraes. 2002. Potassium fertilization and the quality of processed coffee beans. Scientia Agricola, 59:173-179.
Reference ID: 23195
Notes: H 8.1.5.1 #23195
Abstract: Climate and soil strongly influence the quality of processed coffee (coffee arabica L.) beans. This work studied the influence of potassium fertilization on the quality of processed coffee beans grown on two Oxisols (Rhodic Acrudox and Xanthic Acrustox). Trials were set up in a completely randomized split plot block design, to test the influence of three sources and four potassium rates - potassium chloride (KCl), potassium sulphate (K2SO4) and potassium nitrate (KNO3) at 0; 100; 200 and 400 kg, applied to plants of cv. Catuai Vermelho (3.5 x 0.7 m; one plant per hole), on the enzyme activity of poliphenyloxidase, caloration index and total sugars of processed coffee beans. The quality of beans grown under K2 SO4 and KNO3 fertilization was better than that of beans grown under KCl fertilization; results of K2SO4 and KNO3 fertilizations were significantly better for the Rhodic Acrudox. Best grain quality was observed for the application of 200kg K ha as KCl and KSO and 100kg K ha as KNO.

de Barros Silva E., F. D. Nogueira, P. T. G. Guimarães, and A. E. F. Neto. 2001. Coffee tree response to potassium fertilization in low and high yields. Pesquisa Agropecuária Brasileira, 36:1331-1337.
Reference ID: 23196
Notes: H 8.1.5.1 #23196
Abstract: In order to evaluate the response of coffee trees to potassium fertilization for low and high yield, two experiments were carried out in two Oxisols of Epamig Experimental Farms, in the Minas Gerais state, Brazil. The experiments were implanted in a field crop of the cultivar Catuaí Vermelho, line MG-99, which was planted six years ago at the spacing 3.5 x 0.7 m. The experiment was carried out in a randomized block design, with four repetitions in the split plot scheme. In the plots, K sources were applied: potassium chloride, potassium sulphate and potassium nitrate; and in the subplots, K doses (0, 100, 200 and 400 kg ha-1) were applied. Yield of processed coffee grains, available soil K (Mehlich-1) and leaf contents were determined in four crops (1995 to 1998): two crops for low yields (1995 and 1997) and two crops for high yields (1996 and 1998) in both soils. Coffee tree response to K doses was different between high and low yield. The yield alternation of coffee trees shows that critic levels of K in the soil and in the leaf contents should be obtained in high crops.

Ocampo, A., Labios, R., Labios, J., Luar, L., and Pampolino, M. Closing yield gap of white corn in the Philippines through site specific nutrient management. 2015. IPNI.
Reference ID: 23197
Notes: #23197e
Abstract: It has been long envisioned that Philippines will attain food sufficiency. About 20 percent of the population in the country uses white corn as their food staple second to rice which is even more favorable for its health benefits. However, overall production using open-pollinated (OPV) and tradictional varieties (TV) is low and inefficient.

IPNI. Research with Impact: Fire Does Not Reduce the Nutrient Value of Phosphorus Fertilizers. 2014. IPNI.
Reference ID: 23198
Notes: #23198e
THE CHALLENGE:
Fire strikes many fields in the Cerrado region of Brazil every winter due to weather conditions of high temperatures and low humidity that may last for many months. Some fires happen accidentally or farmers intentionally burn cover crops, crop residues, and pastures. In certain cases where fields burned, farmers had broadcasted phosphorus (P) fertilizer for the next season and wondered if the fire had an effect on their fertilizer, or if reapplication was needed.