AICRP- SOIL TEST CROP RESPONSE

Objectives

1. To develop relationship between soil test values and crop response to fertilizers in order to provide a calibration for fertilizer recommendation based on soil testing.
2. To obtain a basis for making fertilizer recommendations for targeted yields.
3. To evaluate the joint use of chemical fertilizers and organic manure for enhanced nutrient use efficiency.
4. To derive the basis for making fertilizer recommendations for a whole cropping sequence based on initial soil test values.
5. To evaluate various soil test methods for their suitability under field conditions.

1. Significant Achievements:

- Developed soil test based fertilizer prescription equations for different yield targets of crops grown in Uttarakhand and Western Uttar Pradesh.These equations are useful for optimizing fertilizer recommendations and different crops which are based on soil test values and farmers own yield targets and resources in a particular agroclimatic and management conditions. Soil testing labs, extension workers, farmers and other stake holders may directly use for economic and efficient fertilizer recommendation.
- These equations were developed for **Cereals**, viz. Transplanted and direct seeded rice, Wheat, Maize, Mandua, Barley, Sorghum **Pulses**, viz. Lentil, Urd, Pea, Gram, Cowpea, Arhar **Oil Seeds** *viz*. Mustard, Rai, Soybean, **Vegetables** viz. Cabbage, Tomato, Potato, Chilli, Cauliflower **Forage crops** viz. Oats, Berseem, Sorghum, Maize **other crops** viz. Sugarcane, Marigold, Turmeric, Garlic, Onion. Photographic view of some experimental crops are shown below:
- Target yield equations were developed both under chemical and INM mode of nutrient use. These equations having provision to use organic sources which are useful for sustaining soil health and saving of fertilizers. some of these equations are as fallow:

Nursery of brinjal

Brinjal

Okra

Rice

Hybrid Maize

Mandua

Crop (variety)	Fertilizer adjustment equation for yield targets (kg/ha)
Okra (var.Parbhani Kranti)	Equation with FYMFN=2.4T- 1.20 SN-0.19FYM-N,FP= 2.40T-8.24 SP- 1.36FYM-P,FK= 1.50 T-0.61 SK-0.15 FYM-KEquation without FYMFN=2.7 T–1.34 SN,FP=1.10 T–3.78 SP,FK= 1.41 T – 0.57 SK
Chili (var. Pant Jwala)	Equation with FYMFN=10.3T- 0.76SN-0.33FYM-N,FP= 9.01T-1.93SP- 0.11FYM-P,FK=8.39 T-0.59 SK-0.08 FYM-KEquation without FYMFN=12.1T- 0.88SN,FP = 10.3T- 2.25SP,FK= 9.31 T-0.65SK
Sorghum(var.CSV15)	Equation with FYMFN=6.92 T- 0.47 SN-0.38 FYM-N,FP= 2.77T- 2.29 SP- 0.50 FYM-P,FK=2.43 T-0.17 SK-0.17 FYM-KEquation without FYMFN=7.71T-0.52 SN,FP=3.13T-2.63 SP,FK= 2.53 T-0.16 SK
Turmeric (var. Pant Peetabh)	Equation with FYMFN=0.63T-0.42SN-0.32FYM-N,FP= 0.59T-2.38SP-0.43FYM-P,FK=0.38T-0.31SK-0.34FYM-KEquation without FYMFN=0.76T-0.52SN,FP=0.71T-2.85SP,FK= 0.51T-0.41SK
Chickpea (var. PUSA 262)	Equation with FYMFN=2.23T- 0.19SN-0.35FYM-N ,FP= 9.12 T- 10.6 SP- 2.38 FYM-P,FK=3.19 T-0.44 SK-0.47 FYM-KEquation without FYMFN=2.76T- 0.23SN,FP=8.46T- 9.84SP,FK= 3.25 T-0.46SK
Tomato (var. Heemsohna)	Equation with FYMFN=0.80T-0.62 SN-0.31 FYM-N,FP= 0.32 T- 1.97 SP-0.92 FYM-P,FK=0.47T- 0.42 SK- 0.26 FYM –KEquation without FYMFN=0.86 T- 0.67 SN,FP=0.37 T-2.16 SP,FK= 0.49 T-0.43 SK
Pigeon pea (var. UPAS 120)	Equation with FYMFN=5.66 T-0.28 SN-0.21 FYM-N ,FP= 16.81 T-7.92 SP-2.26 FYM-P.FK=9.56 T- 0.47 SK- 0.31 FYM–KEquation without FYMFN=7.12 T- 0.36 SN,FP=18.7 T-8.81 SP,FK= 11.77 T-0.58 SK
French bean ((var. Pant Anupama)	Equation with FYMFN=19.71 T- 0.43 SN-0.93 FYM-N,FP= 13.37T-3.52 SP- 0.64 FYM-P,FK=9.09 T-0.25 SK-0.57FYM-KEquation without FYMFN=23.75 T- 0.52 SN,FP=14.82T -3.91 SP,FK= 11.96 T-0.34 SK
Maize (var. Amar)	Equation with FYMFN=7.20 T- 0.84 SN-0.66 FYM-N,FP= 4.33 T-4.42 SP- 1.12 FYM-P.FK=2.52 T-0.29SK-0.35FYM-KEquation without FYMFN=10.29 T -1.20 SN,FP=5.93 T-6.07 SP,FK= 3.25 T-0.37SK
Marigold (var. PUSA Basanti)	Equation with FYMFN=1.08 T- 0.27 SN-0.48 FYM-N,FP= 1.88 T-3.09 SP- 3.50 FYM-P,FK=0.94 T-0.30 SK-0.92 FYM-KEquation without FYMFN=1.27 T -0.32 SN ,FP=1.99 T-3.18 SP,FK= 0.94 T-0.30 SK
Urd (var. Pant Urd 31)	Equation with FYMFN=1.69 T- 0.20 SN-0.42 FYM-N,FP= 9.09 T-10.46 SP- 2.45 FYM-P,FK=3.17 T-0.46 SK-0.48 FYM-KEquation without FYMFN=1.87 T -0.23 SN,FP=8.39 T-9.67 SP,FK= 3.23 T-0.46 SK
Rice (var. HKR 47)	Equation with FYMFN=3.67T-0.63 SN-0.63 FYM-N,FP= 3.02 T- 5.9 SP- 1.06 FYM-P,FK=1.35 T- 0.25 SK- 0.19 FYM –KEquation without FYMFN=4.18 T-0.71 SN,FP=3.69 T-7.17 SP,FK= 1.49 T-0.28 SK

- Evaluated soil test methods for their suitability in different crops and soils. Organic carbon and alkaline $KMnO_4$ method for available nitrogen, Olsen's method for available phosphorus in neutral to calcareous soils, Bray's method for available phosphorus in acid soils and ammonium acetate method for available potassium was found superior over other methods.Multi nutrient extractants were also tested in different crops and soils, AB-DTPA method was found at par with above methods for the determination of available P and available K. This may be helpful for soil testing labs for selection of efficient methods of soil testing for different crops and soils.
- Developed post harvest soil test value equations for some crops which may be helpful for fertilizer prescription under cropping system which not only save time but also expenditure on soil testing.
- Verification of the developed technology under the project was evaluated by conducting the trials at research centres and farmer's field which clearly established that STCR based fertilizer recommendations were superior over farmer's practice.
- Published literature for researchers, extension workers, soil testing personnel, farmers and other stake holders in the form of research bulletins, popular articles and pamphlets.
- Trainings on soil testing for KVK scientists, extension workers, state soil testing lab personnel's and farmers etc. were imparted as and when required by Directorate of Extension Education of the University.
- We have also provided our technologies to farmers and other stake holders through Farmer's fair biannually, ATIC, Kisan Rath and field demonstrations at farmers' fields as well as at research centre.

Extension

1. Trainings on soil testing for state soil testing lab personnel's and field staff would be imparted as and when required by State Government.
2. Trainings would also be imparted to KVK scientists and other stake holders of the states on soil testing/soil health/INM as and when required by their organization/department.
3. Trainings and demonstration would be given to farmers of Uttarakhand /other States on the issues related to Soil health, balanced fertilizer and Integrated use of fertilizers through Directorate of Extension Education of the University.

2. Future Thrusts:

1. Soil test based target yield equations would be generated for uncovered areas, crops and new varieties under changing scenario of agriculture particularly climate change and management options. Already developed equations will also be verified for different crops.
2. More emphasis would be put on priority of crops, viz. foriculture, medicinal and aromatic crops, spices and vegetable crops under irrigated /dry land conditions and INM /organic mode of nutrition.
3. Fertilizer prescription equations under INM would be tested under poly house crops, drip irrigation system and conservation agriculture system.
4. Various sources of organic manures such as vermicompost, biofertilizers, straw (rice/wheat) and green manure will be tried to develop fertilizer prescription equations.
5. Evaluation of soil test methods under organic mode.
6. Evaluation of multinutrient extractants and determination of critical limits of N, P &K for soils/ crops.
7. Study on correlation of P & K fractions with yield, uptake and post harvest soil test values.
8. Fertilizers Prescription Equations are site specific, therefore, require their verifications before used by soil testing lab/KVK/ state farms of their jurisdiction due to change in soil, climate, management and other factors.