**Agroforestry**
*Newsletter*
**National Research Centre For Agroforestry, Jhansi-284 003**

**Vol. 23, No. (2)** **APRIL - JUNE, 2011**

# 23okW LFkkiuk fnol

**dsUnz }kjk 08 ebZ] 2011** dks **viuk 23okW LFkkiuk fnol g'kksZYykl ds lkFk euk;k x;kA dk;Zdze ds eq[; vfrfFk Mk- ,- ds- flag] mi egkfuns"kd ¼izkd`frd lalk/ku izcU/ku½] Hkkjrh; d`f'k vuqla/kku ifj'kn~] ubZ fnYyh rFkk dk;Zdze ds fof"k'B vfrfFk Mk- ds- ,- flag] funs"kd] xzklyS.M jgsaA bl ekSds ij x.kekU; vfrfFk;ksa }kjk nhi izToyu dj dk;Zdze dk "kqHkkjEHk fd;k x;kA vius eq[; vfrfFk mn~cks/ku esa Mk- flag us vkg~oku fd;k fd fdlku HkkbZ T;knk ls T;knk vius [ksrksa esa o`{k yxk;s ftlls mudh t:jrksa dh iwfrZ gks ldsA mUgksus dgk fd d`f'kokfudh }kjk fdlku dks mldh t:jr dh lHkh oLrq;sa tSls ydM+h] bZ/ku] pkjk rFkk Qy bR;kfn ,d gh LFkku ls izkIr gksrs gS tks fd fdlkuksa dks thfodksiktZu ,oa jkstxkj fnykus eas l{ke gSA mUgksus dsUnz ds 23os LFkkiuk fnol ij viuh gkfnZd c/kkbZ nh rFkk dgk fd d`f'kokfudh dsUnz esa tks dk;Z gks jgs gS og izla"kuh; gSA d`f'kokfudh }kjk gh ,d frgkbZ Hkwfe dks o`{kksa ls vkPNkfnr fd;k tk ldrk gSA**

**dk;Zdze ds fof"k'B vfrfFk Mk- ds- ,- flag] funs"kd] xzklyS.M us vius lEcks/ku esa dgk fd nksuks laLFkku ,d nqljs ls feytqy dj dk;Z djsa rHkh vuqla/kku esa xfr nh tk ldrh gSA mUgksus d`f'kokfudh dsUnz esa fd;s tk jgs dk;ksZ dh ljkguk djrs gq,] 23osa LFkkiuk fnol ij d`f'kokfudh ifjokj dks gkfnZd c/kkbZ nhZA**

**Mk- ,l- ds- /;kuh dsUnz funs"kd us vfrfFk;ksa dk Lokxr djrs gq, fiNys 23 o'kksZ esa dsUnz }kjk vftZr miyfC/k;ksa dks**

foLr`r :Ik esa izLrqr fd;kA Mk- /;kuh us tksj nsrs gq, dgk fd cqUnsy[k.M esa o'kkZ ty dk 11 izfr"kr ty gh tehu ds vUnj tkrk gS] ckdh cg tkrk gSA mUgksus o'kkZ ty dks psdMse ,oa tykxe }kjk nksgu djus ij tksj fn;kA mUgksus dgk fd fdlku vius [ksrksa ij Qynkj o cgqmn~ns"kh; o`{k iztkfr yxkdj foijhr ifjfLFk;ksa esa Hkh blls vk; izkIr dj ldrs gSaA mUgksus fdlkuksa ls vkg~oku djrs gq, dgk fd Qlyksa ds ubZ&ubZ iztkfr;ksa ds cht vkil esa vknu&iznku dj vius [ksrksa esa cqvkbZ djsa rkfd T;knk ykHk fey ldsA

dk;Zdze dsa nkSjku Mk- jes"k flag] ofj'B oSKkfud us bdzhlsV ds lg;ksx ls pyk;s tk jgs okVjlsV izksxkze ¼Mksekxksj okVjlsM½ ds ckjs esa yksxksa dks foLrkj ls crk;k x;kA mUgksus crk;k fd blds vUrxZr vusd psdMse rFkk xsfo;u dk fuekZ.k djk;k tk jgk gS ftlls fdlkuksa dks dkQh ykHk gksxkA blds mijkUr Mk- vkj- ds- frokjh] izksxzke yhMj ekuo lalk/ku fodkl us d`f'kokfudh dsUnz esa foxr 23 o'kksZ ls vuqla/kku dk;ksZ dh foospuk dh xbZ vkSj crk;k x;k fd bl dsUnz }kjk fdlkuksa dks vkWoyk cfMax] uhcw] ve:n] vke] djkSnk bR;kfn dk dye ckW/kus dk izf"k{k.k fn;k tk pqdk gS] ftlls fdlku vc Lo;a cfMax ,oa dye dk dk;Z Lo;a dj ldrs gSA mUgksus d`f'kokfudh dsUnz esa pyk;s tk jgs leLr ifj;kstuk dh Hkh laf{kIr esa tkudkjh nhA

dk;Zdze ds nkSjku eq[; vfrfFk egksn; }kjk izxfr"khy fdlku Jh frTtw] djkjh] Jh lyhe] Mkcj x<dq.Mkj] Jh /kuhjke rFkk Jh ts- ih- „kekZ dks lky ,oa Le`fr fpUg nsdj mUgsa lEekfur fd;k x;kA dk;Zdze ds nkSjku fofHkUu [ksydwn izfr;ksfxrkvksa dk Hkh vk;kstu fd;k x;k ftlesa fot;h izfrHkkfxvksa dks ekuuh; eq[; vfrfFk }kjk iqjLdkj iznku fd;k x;kA

dk;Zdze esa xzklyS.M ds foHkkxk/;{k] jkT; ljdkj ds vf/kdkjh] d`f'kokfudh dsUnz ds iz/kku oSKkfud] ofj'B oSKkfud] oSKkfud] rduhdh vf/kdkjh ,oa iz"kklfud vf/kdkjh] deZpkjhx.k] vuqla/kku v/;srk ] cqUnsy[k.M ds "kks/k Nk= ,oa Nk=k;sa rFkk dsUnz ds lsok fuo`Rr vf/kdkjh ,oa deZpkjh

# fo“ks’k :i ls mifLFkr jgsaA dk;Zdze dk lapkyu Mk- jes“k flag] ofj’B oSKkfud ,oa vkHkkj Mk- vkj- ih- f}osnh] ofj’B oSKkfud }kjk fd;k x;kA

## BLACKGRAM (*Vigna mungo* L.) ADAPTED TO CLIMBING IN SEARCH FOR LIGHT TO COPE WITH DEEP SHADE

A functional adaptation is that which helps an organism to survive. Plants which do not get sufficient light to sustain their normal functioning in comparison to their open grown members, a variety of phenotypic traits are expressed as manifestation of adaptation. The magnitude of such traits ultimately leads to determine the capability of the plants in question to survive. Shade-plants essentially follow strategies of optimum use of available energy and of conservation of energy. Knowledge of physiological adaptations and growth requirements is important in the successful cultivation and sustained utilization of crops for light-limiting environment. So, where light is very scarce, the understory crops tend to turn towards height. This is prominent as most dense forests or in agroforestry systems. Thus many plants that grow in thick tropical rainforests have adaptations that allow them to obtain more light for their maximum use. By this course of action, many plants have adaptations for climbing high. In this way they can climb up closer to the top of the canopy where there is more light**.** Such plants include vines and lianas (woody vines). The intensity and spectral quality of light exhibits large temporal and spatial variation. For example, the daily photon flux available for plants grown in the deep shade of the tropical forest is more than 100 times less than that available for plants exposed to direct sunlight. The spectral quality of light, available for plants in the shade environment, is often different from that of the full sun light due to filtering by the canopy. And finally, diurnal changes in light quality and quantity inevitably modulate physiological processes in plants on a day-to-day basis. A typical diurnal PPFD (photosynthetic photon flux density) curve as recorded in our experimental site is given indicating the incident solar radiation pattern in the locality (Fig.1).

We have observed that black gram, which is an up-right annual crop turned to be climber in the deep shades (received about 50% and 25% of incident solar light) in simulated shade-net house experiments consistently in two consecutive years. A view of its distinct adaptation towards climbing high by black gram (variety Pant U-235) is seen in the given pictures (Plates 1 & 2). It has also been observed that apical top climbing parts of the crop had profuse flowering than the plant parts near the ground. This nature of adaptation could be linked with its desperate attempt to search light for survival which reflected in its favoured flowering in the top climbing position. Climbers generally possess low strength in its shoot and it has been observed with the black gram in deep shades through its significantly very less biomass index than the open or moderate shade (Fig.2). There was about 75 to 80 % reduction in biomass index in deep shade than in the open grown plants. Therefore, black gram has phenotypically manifested its shade adaptation towards climbing habit in deep shade which mainly could be linked towards searching light for its survival.

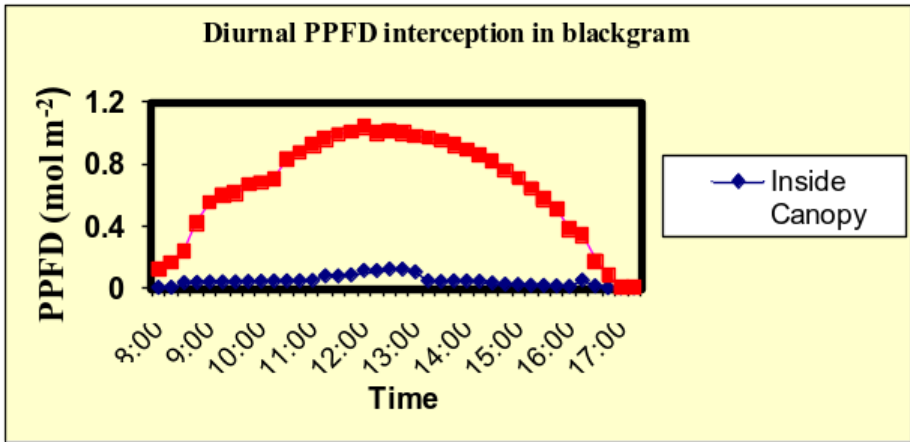



**Fig. 1: Diurnal PPFD (photosynthetic photon flux density) curve as recorded in the experimental site**

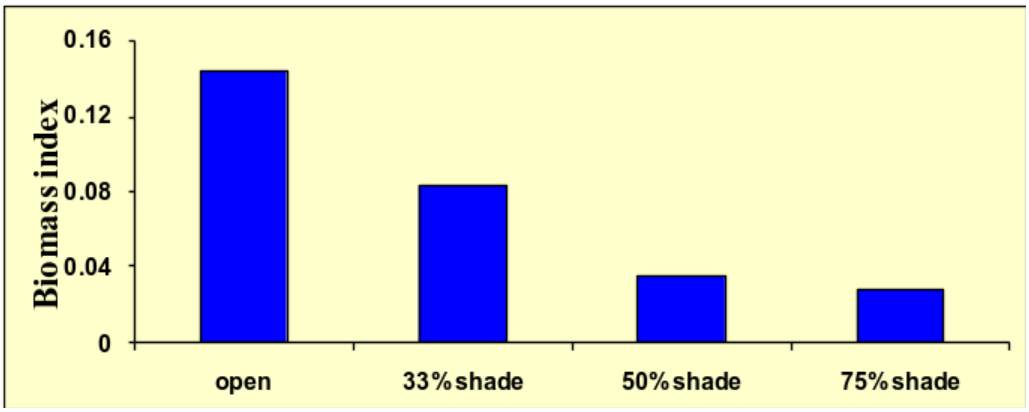



**Fig. 2: Comparative biomass index in black gram as affected by varying regimes of shade**



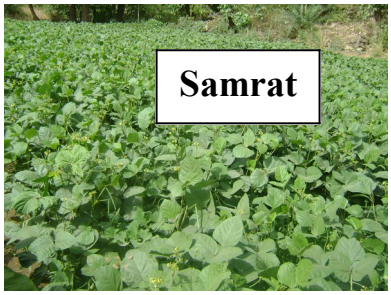
Plates 1 & 2 : Black gram turned to climbing high in deep shade.

**Badre Alam, Mayank Chaturvedi, Ram Newaj, Munna Ram and S.K.Dhyani.**
**National Research Centre for Agroforestry, Jhansi-284003**

**CROP DIVERSIFICATION AND INTENSIFICATION FOR HIGHER PROFITABILITY THROUGH SUMMER GREEN GRAM – A CASE FOR WATERSHEDS IN**

**BUNDELKHAND REGION**

The summers in Bundelkhand region of Central India are very harsh and characterized by acute water shortage even for drinking. In general, the crop fields remain fallow except small scale cultivation of vegetables and forages where some water is available. However, in areas, particularly watersheds, where enough water is available due to integrated soil and water conservation measures, land use diversification and intensification is the need of the hour for higher productivity and profitability. Under such scenario, summer green gram may be a viable option for inclusion in existing cropping systems of the region. Keeping above facts in mind, three summer green gram varieties namely Samrat, Satya and Meha were introduced in Garhkundar – Dabar and Domagor – Pahuj watersheds from Indian Institute for Pulse Research, Kanpur and evaluated with local variety on farmer's field.




The above three varieties were sown using seed rate 12 k $ha^{-1}$ during first week of April, 2010 in nearly half acre area each at both the watersheds. The recommended package of practices was followed in their cultivation. These varieties were supplied with nitrogen and phosphorus in 18 and 46 kg $ha^{-1}$ through DAP at the sowing time and five irrigations were provided as and when needed.

The mean data from both the location revealed that all the three varieties recorded higher growth and yield attributes and yield as compared local variety. The grain yield recorded in Samrat, Satya and Meha was 1350, 1265 and 1010 kg $ha^{-1}$, respectively which was higher by 46, 37 and 9 %, respectively over local variety (925 kg $ha^{-1}$). Further, Samrat and Satya matured about ten days earlier than the Meha, thus, making them more suitable for existing groundnut – wheat cropping systems. The B:C ratio for Samrat and Satya was as high as 2:1 and 1.8:1, respectively with corresponding net return of ` 36,000 and ` 32,600 $ha^{-1}$. The B:C ratio and net return in case of local variety was 1.1:1 and ` 19,000 $ha^{-1}$, respectively only. Further, the stover after final picking of pods was incorporated in to the soil as green manuring to improve soil physical, chemical and biological properties. Therefore, both the above summer green gram varieties can be included in the existing cropping systems for diversification, intensification and higher profitability.

**D. R. Palsaniya**
**National Research Centre for Agroforestry, Jhansi-284003**

**RESEARCH ADVISORY COMMITTEE**

Combined 18th RAC meeting of NRCAF & IGFRI was held on 26th to 27th April, 2011 under the chairmanship of Prof. R. M. Singh, Professor Emeritus, BHU; Dr. S. D. Rai, Ex. ADG, ICAR, New Delhi; Dr. A. K. Mishra, Ex. Addl. Commissioner (Horti.), DA&C, New Delhi; Sh. Sharma Puran, Sr. Journalist, Agra; Dr. K. A. Singh, Director, IGFRI, Jhansi and Dr. S. K. Dhyani, Director, NRCAF, Jhansi (Members of RAC) participated.

,Q-ih-,-vkj-ih- ¼Qst&2½ ds vUrxZr x<+dq.Mkj Mkcj tylesV esa Vªkihd YVj

izf'k{k.k ,oa iz{ks= fnol

,Q-ih-,-vkj-ih ¼Qst&2½ ds vUrxZr fnukad 10 **ebZ]** 2011 dks x<+dq.Mkj&Mkcj tylesV esa Vªkihd YVj ij ,d izf'k{k.k vk;ksftr fd;k x;kA ;g izf'k{k.k Jh lyhe [kkWa ds [ksr ij fd;k x;kA ftlesa 60 fdlkuksa us Hkkx fy;kA Vªkihd YVj cSy vFkok Vªk SDVj pkfyr ;a= gS] tks fujkbZ] xqM+kbZ] chtkbZ rFkk ukyh cukus ds fy, mi;qDr gSA bldh lhMfMªy ls ewWaxQyh] vjgj] puk] eDdk] mnZ] lks;kchu vkfn Qlyksa dh cqvkbZ dh tk ldrh gSA ;g ;a= bØhlSV] gSnjkckn }kjk fodflr fd;k x;k gS] tks mi;ksx esa vklku gSA mDr ;a= dk izkjfEHkd izf'k{k.k nsus ds fy, bØhlSV ds nks deZpkjh Hkh mifLFkr FksA ;a=ksa dk izn'kZu igys cSyksa ls] ckn esa Vªk sDVj ls fd;k x;kA p;fur fdlkuksa }kjk mi;ksx djus gsrq bls ,d o"kZ rd xkWao esa j[kk tk;sxkA ftl [ksr esa izf'k{k.k fn;k tk jgk Fkk] mlds cxy okys [ksr esa Jh lyhe ds }kjk yxk;h x;h Ñf"kokfudh dk Hkh izn'kZu fd;k x;kA Jh lyhe us 2008 ls ve:n vk/kkfjr Ñf"kokfudh viuk;h gSA bl le; Jh lyhe [ksr esa ve:n ds lkFk vjch dh [ksrh dj jgs gSaA bl volj ij ,Q-ih-,-vkj-ih- Vhe ds lnL;ksa us Ñf"kokfudh rFkk mUur ;a=ksa ds iz;ksx ij vius fopkj j[ksaA jk"Vªh; Ñf"kokfudh vuqla/kku dsUnz] >kalh ds funs'kd MkW0 ,l-ds-/;kuh us Ñ"kdksa dks Ñf"kokfudh ds Qk;ns crkrs gq, bl i)fr dks viukus dk vkxzg fd;kA iksLVj ds ek/;e ls Ñf"kokfudh ds fofo/k izdkjksa ij foLrkj ls ppkZ dh xbZA blls iwoZ iz{ks= fnol dk vk;kstu xzke&u;k[ksM+k ¼f<+dkSyh½] CykWd&cohuk] >kWalh ¼m-iz-½ esa 11 ekpZ] 2011 dks fd;k x;k FkkA MkW0 /;kuh us mEehn trk;h fd bl ifj;kstuk ds ek/;e ls Ñf"kokfudh ds vUrxZr {ks= foLrkj esa lgk;rk feysxhA Jh lyhe ds [ksr ij lQy Ñf"kokfudh Hkwfe mi;ksx ls lgHkkxh fdlku izHkkfor gq, vkSj mUgksusa viuh tksr ij bl i)fr dks viukus esa fo'ks"k :fp fn[kk;hA dk;Zdze 10%00 cts ls 2%30 cts rd pykA vUr esa fdlkuksa dks MkW0 iylkfu;k us /kU;okn Kkfir fd;kA fjiksVZ fjdkWMZ ds fy, rS;kj fd;kA

**ANNUAL WORKSHOP OF ALL INDIA COORDINATED RESEARCH PROJECT ON AGROFORESTRY**

Annual Workshop of All India Coordinated Research Project on Agroforestry (AICRPAF) was held during 21st to 23rd May, 2011 at College of Forestry, KAU, Thrisur. Dr. S. K. Dhyani, Director & Coordinator of the project organized this workshop. Dr. J. C. Dagar, ADG (Agron./ AF), ICAR, New Delhi and Dr. V. P. Singh, Regional Representative for South Asia, WAC, New Delhi also participated in the workshop. Twenty Four Coordinating centre from SAUs and two from ICAR Institutes (CRIDA & CAZRI) participated.

**INSTITUTE RESEARCH COUNCIL (IRC)**

Institute Research Council (IRC) meeting was held from 27th to 29th June, 2011and 1st July,2011 under the Chairmanship of Dr. S. K. Dhyani, Director of the Centre. All the Scientists of the Centre participated in the meeting and presented the progress and significant findings of their projects. New project was approved by the IRC.

# fgUnh dk;Z”kkyk

dsUnz ij fnuakd 1 tqykbZ] 2011 dks dsUnz funs”kd] Mk- ,l- ds- /;kuh dh v/;{krk esa fgUnh dk;Z”kkyk lEiUu gqbZA dk;Zdze dh v/;{krk djrs gq,  Mk- /;kuh us vius lEcks/ku esa dgk fd Hkkjr ljdkj ds xtV eas bl dsUnz dk LFkku ^^d** {ks= esa ”kkfey fd;k x;k gS] blfy, ge yksxksa dks viuk iz”kklfud dk;Z ”krizfr”kr fgUnh esa djuk gSA mUgkssus leLr oSKkfudksa] vf/kdkfj;ksa ,oa deZpkfj;ksa ls vkg~oku fd;k fd /kkjk 3¼3½ ds mij fo”ks’k /;ku fn;k tk,] D;ksafd /kkjk 3¼3½ dk mYya?ku djus okys vf/kdkjh dk uke laInh; jktHkk’kk lfefr }kjk ekaxk tkrk gSA blfy, bl ij fo”ks’k /;ku nsa vkSj /kkjk 3¼3½ ds vUrxZr vkus okys dkxtkr dks f}Hkk’kh ;k fgUnh esa tkjh fd;k tk,A dsUnz ^^d** {ks= esa gksus ds dkj.k 100 izfr”kr i=kpkj dk y{; fgUnh esa gSA  blfy, lHkh oSKkfudksa ,oa vf/kdkfj;ksa ls vihy fd;k tkrk gS fd fgUnh i=kpkj ij fo”ks’k cy nsa vkSj vf/kd ls vf/kd fgUnh esa i=kpkj djsa] ftlls dsUnz dks fn;k x;k y{; izkIr fd;k tk ldsA mUgksus lHkh vuqHkkxk/;{kksa dks funsZf”kr fd;k fd Qkbyksa ij vf/kd ls vf/kd fVIi.kh fgUnh esa fy[ksaA

dk;Z”kkyk ds eq[; oDrk Mk- lq/khj dqekj] ofj’B oSKkfud ¼m|kfudh½ us ^^cqUnsy[k.M esa vkWoyk vk/kkfjr izlaLdj.k bdkbZ dh lEHkkouk;sa** fo’k; ij viuk foLr`r O;k[;ku fn;kA dk;Z”kkyk ds nkSjku iz”uksRrjh dk;Zdze dk leUo;u Jh gwcyky] oS;fDrd lgk;d }kjk fd;k x;k ftlesa oSKkfudksa] vf/kdkfj;ksa ,oa deZpkfj;ksa }kjk jktHkk’kk lacaf/kr iwNs x;s iz”uksa ds mRrj ,oa tkudkjh nh xbZA dk;Zdze dk lapkyu Mk- vkj- ih- f}osnh ,oa vkHkkj Jh ch- flag] ofj’B iz{ks= izcU/kd us fd;kA

## jktHkk’kk dk;kZUo;u lfefr dhs cSBd

dsUn] esa fnukad 29-06-2011 dks jktHkk’kk dk;kZUo;u lfefr dhs cSBd lEiUu gqbZA cSBd dh v/;{krk dsUnz funs”kd Mk- ,l- ds- /;kuh }kjk dh xbZA cSBd esa jktHkk’kk dk;kZUo;u lfefr ds lHkh lnL; mifLFkr Fks ftlesa v/;{k egksn; }kjk fiNyh cSBd dh foUnqokj leh{kk dh xbZA rRipkr~ ljdkjh dkedkt esa jktHkk’kk dks c<kok nsus ds fy, vusd foUnqvksa ij fopkj&foe”kZ fd;k x;k vkSj ,d er ls fu.kZ; fy;s x;sA

## dsUnz dks jktHkk’kk ^^py cSt;Urh** iqjLdkj

uxj jktHkk’kk dk;kZUo;u lfefr dh 50oha cSBd eaMy jsy izcU/kd Jh v”kksd xqIrk dh v/;{krk esa Hkkjr gSoh bysfDVdy fyfeVsM] >Wklh ds dE;qfuVh lsUVj esa fnukad 18 ebZ] 2011 dks lEiUu gqbZA cSBd esa >Wklh tuin eas fLFkr yxHkx 60 dsUnzh; dk;kZy;ksa ds foHkkxk/;{kksa us Hkkx fy;kA cSBd esa fofHkUu dk;kZy;ksa ls izkIr jkTkHkk’kk ls lacaf/kr N%ekgh fjiksVZ dh leh{kk v/;{k egksn; }kjk dh xbZA blds mijkUr jktHkk’kk fgUnh esa Js’B dk;Z dj jgs dk;kZy;ksa ftlesa bl dsUnz dks jktHkk’kk fgUnh esa fd;s tk jgs dk;ksZ dh ljkguk djrs gq, v/;{k egksn; }kjk ^^py cSt;Urh** ”khYM nsdj lEekfur fd;k x;kA

**SEMINAR DELIVERED**

| S. No. | Seminar Topic | Name of the Speaker | Date |
|---|---|---|---|
| 1 | Genetics and Breeding of Neem, Shisham and Kardhai | Dr. V. K. Gupta, Pr. Scientist | 18.06.2011 |

**HUMAN RESOURCE DEVELOPMENT**

- Dr. V. K. Gupta, Dr. R. K. Tewari and Dr. A. K. Handa, Pr. Scientists and Dr. R. P. Dwivedi, Sr. Scientist of the Centre participated in the Annual Workshop of All India Coordinated Research Project on Agroforestry (AICRPAF) during 21st to 23rd May, 2011 held at College of Forestry, KAU, Thrisur (Kerala).

- Dr. R. K. Tewari, Pr. Scientist participated in Swadesh Prem Jagriti Sangoshthi from 28th to 31st May, 2011 organized by ASM Foundation at Dehradun. Dr. R.P. Dwivedi and Sh. Rajesh Srivastava displayed Agroforestry Technologies through exhibition stall.

- Dr. Anil Kumar and Dr. R. K. Tewari, Pr. Scientists of the Centre attended two days meeting cum workshop of Head of the Divisions and Regional Stations/ Centers at CIAE Bhopal during 14th to 15th June, 2011. The meeting was chaired by DG ICAR, New Delhi.

**TRAINING ABROAD**

With support from the NAIP, ICAR, Dr. Badre Alam, Sr. Scientist (Plant Physiology) has completed three months training (February 1 to April 30, 2011) from the Natural Resource Ecology Laboratory, Department of Soil and Crop Sciences, Colorado State University, Fort Collins, Colorado, U.S.A. with an objective to have advanced training on different models and techniques/software to perform analyses of soil C, carbon sequestration, greenhouse gas emissions and emission reductions associated with different land use and management scenarios in the context of climate change in the broad subject area of Carbon trading/ Carbon Sequestration/ Climate Change. The advanced training comprised a series of lectures and recitations on relevant topics to the subject areas, laboratory techniques on soil organic matter fractionation and field measurement of soil trace gas flux and soil carbon stocks, as well as hands-on training and application with the Century ecosystem carbon model, the DAYCENT model, IPCC AFLOU methodology, the Agricultural Land Use greenhouse gas inventory system (ALU) etc.

**NEW STAFF**

- Sh. D. D. Dhamani (AAO) from CSWCR&TI, Dehradun joined the Centre as Administrative Officer.
- Sh. Prabhu Dayal, Tech. Officer (T-5) from NRC for Groundnut, Junagarh joined the Centre.

**VISITOR**

- Hon'ble Dr. A. K. Singh, DDG (NRM), ICAR, New Delhi.
- Prof. R. M. Singh, Professor Emeritus, Department of Genetics & Pl. Breeding, BHU, Varanasi (U.P.).
- Dr. S. D. Rai, Ex. ADG, ICAR, New Delhi.
- Dr. A. K. Mishra, Ex. Addl. Commissioner (Horti.), DA&C, New Delhi.

# Press Meat Organized at NRCAF, Jhansi

NRCAF, Jhansi organized a press-meet in its premises on 21st June, 2011. This was facilitated by INCL group, PR agency of ICAR for dissemination of news and agricultural techniques masses. Electronic and print media personnel (20) participated in this meet. Following press note was released:

The scientists of ICAR are much hopeful that Agroforestry, if applied with proper scientific methods and crop pattern can increase the income of farmers' many fold in the drought affected and less productive land of Bundelkhand region. The technique is also helpful in soil conservation by checking erosion, increasing the fertility of the land, water harvesting, and refilling deleting underground water.

“Agroforestry is helpful to counteract degradation of resources and restoration of sustainable productivity with minimum risk, agroforestry appears to be only option,” said Dr S K Dhyani, Director, NRCAF, (ICAR), Jhansi. Agroforestry envisage growing of trees and shrubs along with crops together on the same piece of land. “Trees being deep rooted extract moisture and nutrients from deeper soil layers and add to the fertility through leaf litter fall. In addition, they conserve soil and water which is key resource for crop production,” added Dr Dhyani. The scientists at NRC Agroforestry have identified the trees which do not compete with crops and successfully demonstrated the selected crop pattern to the farmers in the region. Aonla, Ber, Guvava, Eucalyptus, Teak, Citrus Plants like orange, Kinnow and Lemon etc can be grown in the low fertile red soil of the region along with crops. The scientists are also working for improved varieties of Neem, Shisham, Babul, Jatropa and Karanj for higher yield and greater compatibility with crops. Among these varieties agroforestry system or Guava/ Citrus based agroforestry systems have been found more successful. Aonla based agroforestry system has proved its efficiency over other land uses in enhancing production on sustained basis. So far, 110 farmers in the region adopted Aonla based agroforestry system on 85 ha of land.

Elaborating the success story of agroforestry in Ubrao village of district Tikamgarh in Madhya Pradesh, Dr Dhyani informed that a farmer of the village Dani Ram Kushwaha alias Dhanua who adopted the technique in now earning `40,000 to 50,000 per year from his 4 acre land which was hardly earning `14,000 per year in 2006, by traditional farming. Earlier Dhanua grows only wheat on his field and look for the nearby town for work in off season to earn his livelihood but now he grows over 21 crops/ vegetables/ spices/ fruit trees in combination in the same field. His entire family has got employment in the field by selling, guava, citrus fruits, spices, vegetables and fodder in the nearby villages and towns.

The agricultural scientists of the Centre are claimed that Agroforestry is much better option in Bundelkhand region which constitutes 7 districts of Uttar Pradesh and 6 districts of Madhya Pradesh. The geographical condition of Bundelkhand region is not suitable for tradition farming. Low water availability and low water holding capacity of majority red soil, undulating topography renders cropping extremely difficult, low productive and highly uncertain,” added Dr Dhyani, who is also coordinator of All India Coordinated Committee for Research on Agroforestry of Indian Council of Agricultural Research (ICAR), New Delhi. The other option of animal husbandry is also not very profitable as fodder is not available throughout the year due extremes of summer. Further increase in human and animal population has exerted tremendous pressure on natural resources leading to continuously increasing erosion of soil.

There is only 850mm rain fall in the region, further the humus in the soil is very low of which 54 % soil in red and 46 % is black. Due to presence of rock the depth of soil varies from very low, to deep and invariably very deep, the groundwater level is also very deep. The underground water is the main source of water in the region that too is depleting very fast due to massive extraction for drinking, animals, and also for farming.

“The Centre has also imparted training to the youths on Ber top working which increases quality fruit production besides skill development to rural youths and providing alternate livelihood,” informed Dr Dhyani.

Another project of the Centre, Watershed Management through agroforestry interventions in Garh Kunder-Dabar of district Tikamgarh established that even with 40 % reduction in rainfall, water crisis can be averted in the region. Water harvesting through gabions, check dams, Khadins in nallah and depressions and field bunding are quite effective in natural resources conversation. The efforts of the centre has increased water level by 2-6 m in 60 % wells and ensured year round availability of surface water for drinking by stray cattle and wild animals.

The centre is also providing technical support to the Central Government’s Special Package Programme for Bundelkhand Region. Over 60 farmers of Datia district have been trained on Integrated Horticulture Development.

The Centre has so far organized 22 kisan Goshti, 8 Aonla Diwas, 3 Kisan Samman Diwas, 8 Van Mahotsav to educated and aware the farmers of the region about news technologies developed in agriculture and allied sectors. In addition to that several batches of state and central government official were also imparted trainings.