

No-till planting of black gram

for enhancing productivity in the NE Himalayas

Raghavendra Singh*, R K Avasthe and Subhash Babu

ICAR-National Organic Farming Research Institute, Tadong, Gangtok 737 102

*North-Eastern Himalayan Region (NER) of the country is hotspot of biodiversity. The region is favourable for pulses cultivation. The soil and agro-climatic conditions provide the strong foundation for pulses production in the region. However, in spite of all the favourable conditions, the region has a deficit of almost 82% of its pulses requirement. Although, the average productivity of pulses in NER (848 kg/ha) is higher than the National average (764 kg/ha), indicating the potential of pulses production in this region. The gap of requirement has to be reduced with the adoption of appropriate package of practices viz. short-duration varieties, conservation tillage, mulching, adjustment of sowing time, integrated nutrient and pest management etc. In the region, pulses are being grown in rice (*Oryza sativa* L.) and maize (*Zea mays* L.) fallow areas. Adoption of no-till and in-situ residue retention for moisture conservation are the main component for enhancing the productivity in the region.*

Keywords: Black gram, Himalayan region, No-till, Pulses

THE cropping intensity of the NEH region is very low and merely 118% due to non availability of the soil moisture for *rabi* season crops. In Sikkim, maize is grown as *pre-kharif* season crop during February to March. After harvesting of maize, most of the area are kept fallow due to excess rainfall during *kharif* season. Black gram is generally grown on rice bunds and in some parts after harvesting of maize. The yield of the crops is very low due to excess water in the field. Hence, no-till planting especially on side of the maize bunds may be the best alternative to get the higher yields of the black gram.

Pulses have good potential to diversify cropping systems in organic farms. Inclusion of pulses in organic production systems improves soil fertility by fixing nitrogen and freeing phosphorous. Therefore, in cereal-pulse rotations, subsequent cereal yield and crude protein concentration can be increased due to the residual nitrogen supplied by the previous

pulse crop. Pulses help increase organic matter and microbial biomass and activity in the soil and improve soil structure and water retention capacity while helping to reduce water erosion. The versatility of pulses allows them to be used in organic systems in different ways: rotations, intercropping, ley farming and as a cover crop.

Gap of pulses in NER

The pace of growth in pulses production in NER has not been encouraging. Although, the area and total production of pulses in NER increased over the years but the growth rate was less than population growth of the region. The requirement and deficit of pulses for NER, considering per capita consumption at 18.25 kg (per annum) have been worked out. The region as a whole is deficit if 78.8% pulses, ranging from 6.4% in deficit in Nagaland to 91.5% deficit in Tripura. To reduce the demand-supply gap, Government of India

launched various Programmes like integrated scheme of oilseed, pulses, oil palm and maize (ISOPOM), national food security mission (NFSM) and front-line demonstrations (FLD) programme in pulses. Still, prime attention is required in pulse production to meet the challenges of increasing population. Thus, there is a great challenge for policy makers, scientists and farming community to enhance pulse productivity and diversify their cropping systems to meet out the local pulse requirements. It is prime time to create the awareness about the improved crop management practices to scale-up pulses productivity and highlight future research priorities with the prime objective of sustaining pulse production in NER.

Reasons for low productivity of pulses in hilly region

- Declining factor productivity due to over exploitation of natural resources



- Deterioration in soil physical environment due to excessive tillage operations
- High energy requirements and reduced availability of protective foods
- Biotic interferences, declining biodiversity and pest resistance, requires strong and costly inputs
- Stagnating farm incomes due to monotonous cropping
- Degradation in land due to excessive exploitation of forest for fuel, timber and fodder caused deterioration in soil physical chemical and biological properties
- Climate vulnerability – frequent drought stress, cold, hail storm, flash floods and frosts
- Lack of awareness amongst the farmers' for adoption of new technologies

Reasons for adoption of conservation agriculture

- Rising costs of input and non-availability of labour during sowing time
- Decrease in organic carbon status in soil and loss of nutrient from top of

the soil in hilly region

- Heavy rainfall during rainy season provide less time and non-conducive land for preparation of sowing of the black gram

No-till planting of black gram in maize -fallow

In Sikkim, during rainy season (July–September) heavy rainfall occurs which accounts 70% of the total rainfall of the state. Hence, it may not be possible to grow pulses easily during rainy season. It is also presumed that inclusion of legumes in conservation agriculture for diversification of cereal-based cropping systems helps to overcome the problem of declining factor productivity. Similarly, adoption of no-till practice will also help in timely seeding of either of the crops in system mode, and hence, lead to increase in productivity of maize-based cropping system. In such situation, no-till planting of black gram immediately after harvesting of maize is successfully done at ICAR Research Farm, as well as farmers' field.

After harvesting of maize, field should be cleaned by removing all the derbies remaining on surface. FYM or mixed compost @ 5 t/ha should be applied as basal application prior to sowing followed by goat manure/ poultry manure @ 1-2 t/ha as basal dose to overcome micronutrient deficiencies. Before sowing, seed should be treated with *Rhizobium* and PSB @ 200 g/kg seed. Around 20-25 kg seed is required for a hectare of land. Sowing should be done by opening a narrow slit (5-8 cm depth) with the help of zero till furrow opener. Placing of seed should be done at 30-40 cm row-to-row and 15-20 cm plant-to-plant distance. Two hand weeding is required one at 15-20 DAS and second weeding at 35-40 DAS. For plant protection measures, two to three applications of neem based formulations (1500 ppm) is required. Pod picking should be done when most of the pods turn black, over maturity causes shattering of pods. Picking should be done preferably during morning or evening hours to prevent shattering losses while handling the pods. On



an average 12.6 q/ha grain yield of black gram obtained under no-till conditions. In economic terms net return obtained ₹ 34650/ha with a B:C ratio 1.44.

Benefits of conservation tillage (NT)

- Build-up of organic carbon and arrest decline in factor productivity
- Saving top fertilized soil from erosion
- Enhance NUE by creating favourable environment for microflora and fauna

- Help in sequestering GHG in the soil
- Improve biological activity and diversity
- Overall – reduce costs, efficient input use, stable yields, better natural resources

SUMMARY

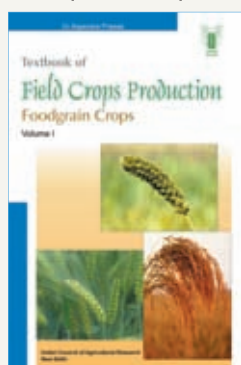
On long term basis, no-till (NT) planting of black gram in organic farming may sustain and maintain the natural resources and sustaining the livelihood security of resources poor

farmers of mountain region. NT may also reduce the cost of cultivation by saving in labour, time and farm power and also to reduces pollution for environment. Farm litter generally considered harmful, if left as such, but may be good sources of crop nutrition, if utilized properly by adopting suitable conservation practices under organic farming.

Corresponding author's email:
raghavenupc@gmail.com

Textbook of *Field Crops Production* – Foodgrain Crops

(Volume I)



The first edition of Textbook of Field Crops Production was published in 2002 and there has been a heavy demand for the book. This book is now being brought out in two volumes. The chapters cover emerging trends in crop production such as System of Rice Intensification (SRI), export quality assurance in the production technology of commodities like Basmati rice, organic farming, resource conservation technologies, herbicide management etc. Good agronomic practices must judiciously inter-mix the applications of soil and plant sciences to produce food, feed, fuel, fibre, and of late nutraceuticals while ensuring sustainability of the system in as much possible environment and eco-friendly manner. The advent of hydroponics, precision farming, bio-sensors, fertigation, landscaping, application of ICT, GPS and GIS tools, micro-irrigation etc. is in the horizon. The textbook covers both the fundamentals of the subject and at the same time inspire and prepare both teachers and students for the emerging frontiers.

TECHNICAL SPECIFICATIONS

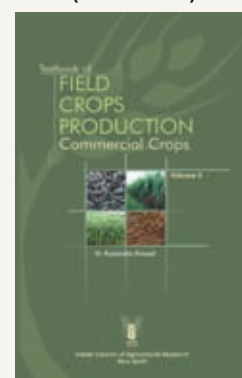
No. of pages : i-xii + 396 • Price : ₹ 700 • ISBN No. : 978-81-7164-116-1

Textbook of *Field Crops Production* – Commercial Crops

Availability of high-yielding varieties/hybrids and increased irrigated facilities have resulted in the development of production-intensive cropping systems in several parts of India, and this has catalyzed further agronomic research based on the cropping-system approach. Many changes have also taken place in the crop-production technologies. And this necessitated the revision of the earlier publication brought out in 2002. The revised textbook is in two volumes: First is covering Foodgrains and second is on Commercial Crops.

The discipline of Agronomy has no longer remained mere field trials without application of discoveries emanating from the related disciplines of Genetics, Soil Science and Agricultural Chemistry, Plant Biochemistry, etc. The future Agronomy Landscape will face challenges of climate change, transboundary issues, TRIPS and other trade-related barriers, biotic and abiotic stresses, consequences of biotechnology and genetic engineering and increased market demands in terms of quality assurance, customized food crops, global competition, ecosystem services on land and social equities etc. The Agronomy must measure up to these futuristic challenges with well-defined metrics and methodologies for performance. The advent of hydroponics, precision farming, bio-sensors, fertigation, landscaping, application of ICT, GPS and GIS tools and micro-irrigation is in the horizon. This revised edition in two volumes covers fundamentals of the subject and at the same time will inspire and prepare teachers and students for the emerging frontiers.

(Volume II)



TECHNICAL SPECIFICATIONS

Pages : i-xiv + 612 • Price : ₹ 800 • ISBN No. : 978-81-7164-146-8

For obtaining copies, please contact:

Business Manager

Directorate of Knowledge Management in Agriculture
Krishi Anusandhan Bhavan-I, Pusa, New Delhi 110 012
Tel : 011-25843657, Fax 91-11-25841282; e-mail : bmicar@gmail.com