5 ACHIEVING PRODUCTIVITY AND QUALITY REVOLUTION

MESSAGE OF HOPE

Productivity revolution has already begun…

- Improved nutrient and water management with the use of slow nutrient releasing urea briquetting technology has more than doubled the productivity of rice with farm of Shri. Chandrakant Kisan Kolte of Supeghar, in Pune district, who has obtained 126 q/ha.
- From the district of Satara alone, Rajma worth Rs. 8 crore is produced and exported to North Indian states, where the farmers are getting more than double the price of what they get in local market.
- Record yield of sugarcane has been obtained by Shri. Govind Dhondiba Bhagat of Mahalung dist. Solapur (355 t/ha.) by adopting improved crop management techniques.

a. General Observations :

5.1 The strategies to be resorted to enhance the state's agricultural production include giving priority to the watershed development program, use of microirrigation system, integrated nutrient management with emphasis on organic fertilizers, increased supply of quality seed and planting material, supply of micronutrients and slow-release fertilizers, integrated pest and disease management with emphasis on biological control, post harvest handling, storage and creation of infrastructure facilities and easy credit supply.

5.2 To achieve the productivity revolution, the proposed reorganised Land Use Board should be an autonomous functioning group to render proactive advice to the farmers and to undertake broad planning at district level and micro planning at village level taking into account the meteorological, marketing and management information collected from the respective sources. The necessary legal / administrative reforms will have to be made so as to bring this idea into reality.

5.3 To increase the efficiency of inputs like water, nutrients, pesticides etc. and to reduce the cost of cultivation, there is an urgent need to practice precision farming at the small farms scale. The present Agro Poly Clinics need to be strengthened to make them centers of planning and advice for the precision farming. The rural youth can be attached to such clinics through the community/activity groups. The poly clinics could also be linked to local agro business centers, credit societies and the banks. The trained rural youth could be provided with necessary credit, equipment and machinery to provide custom hire service to the farmers for the precision farming. Knowledge intensive demonstration centers should be established in each university area for this purpose.
5.4 Attention needs to be given to increase the production of underutilised and minor crops like Lathyrus (Khesari), Rajma, Ragi etc. Many of these crops have excellent nutritional qualities in terms of proteins, minerals and vitamins. Research and development activities should also be undertaken to achieve higher productivity of such highly neglected crops with great promise. While promoting the crop patterns for areas having nutritional underutilized crops, ecologically sound agricultural practices should be adopted.

5.5 The Khesari dal (*Lathyrus sativus*) cultivation has been banned since the consumption of this pulse crop was attributed to cause the paralytic disease “Lathyrism”. The disease is caused by the neurotoxic principal “BOAA” found in this pulse. Low neurotoxic variety has been developed by the IARI, New Delhi. If this variety is proved to be biologically safe, then its cultivation may be undertaken.

![Graph showing productivity vs irrigation percentage](image.png)

**Graph: Productivity Vis-a-Vis Irrigation percentage of major crops / crop groups in India & Maharashtra - 1996-97**

Low irrigation coverage gets reflected in low productivity compared to the national average.

5.6 For achieving the objective of productivity revolution, the existing weak linkages of Lab to Land as well as Land to Lab programmes need to be strengthened. Concept of pilot projects with large area demonstrations after a detailed study of gap analysis on the existing use of technology needs to be reintroduced for a quick dissemination of such poorly applied concepts. Such demonstrations could also be the starting point of promotion of Good Agricultural Practices (GAP) so much advocated in the global agriculture. As an extension to this approach, the concept of incubation centres for demonstration of various technologies useful for value addition needs to be promoted under each university area.
5.7 A state level grid of agricultural commodity markets and food banks should be established to provide remunerative market for the agricultural products and also to supply these products to consumers. The grid of markets, stores/warehouses/food banks should be operated by NGO’s, Cooperatives and Self Help Groups (SHGs). These measures are needed as sustainable market remedies to protect interests of farmers as well as consumers. Apart from this, linkages among producer-consumers, producer-processors, contract farmers-processors, producers-exporters should be strengthened. The help of APEDA and Small Farmer’s Agri Business Consortium (SFAC) of Govt. of India could be taken in this regard.

5.8 For achieving productivity and quality revolution, infrastructure which needs to be developed would include short term and medium term weather forecasting centers, advanced soil and water testing laboratories, pest and disease forecasting centers, biofertilizer and biocontrol laboratories for efficient culture supply and quality control, advanced fertilizer, pesticide and seed testing laboratories, leaf and tissue analysis laboratories. For post-harvest handling, major requirements of the state would include Food testing laboratories to check quality standards of improved as well as processed food material, Rice processing facilities in Konkan and Vidarbha, Food Parks for processing food and fruit crops, Bio technology parks to provide best planting material, bio fertilizer and bio control agents to farmers, fully developed Agri – export zones and rural godowns for storage of non-perishable farm produce.

5.9 To meet the productivity & quality challenges, the extension machinery should be retooled to shoulder the new responsibilities. At present the method of transfer of technology is through person to person contact, demonstration and HRD programs. Although these are very good tools, they need to be supplemented by mass media concept. It is proposed to make extensive use of information technology for transfer of technology to the farmers by way of establishing information KIOSK using electronic media and opening of separate satellite channels on T.V. and Community Radio.

5.10 For an effective research backup to the extension efforts, the state of Maharashtra should build up research capabilities in the field of genetic engineering, crop plants and microbes for the improvement of quality and productivity by a quantum jump, but at the same time maintaining sustainability. One such world class laboratory should be established at each of the four agriculture universities for the respective regional crops and at the V.S.I. for sugarcane.
b. Crop Specific recommendations:

5.11 Taking into account the agro-climatic situation under which kharif sorghum is grown, the target for productivity increase should be fixed at 2 t/ha. as against the present productivity of 1.5 t/ha. The area is expected to be reduced by about 2 lakh hectares and stabilized at 20 lakh ha. It is envisaged that the productivity increase is to be realised from the development of high yielding genotypes and the watershed development program ensuring resource conservation mainly soil & water. Mechanized sowing using the ferti-seedrill will also bring about enhanced productivity by proper seed and fertilizer placement in the soil. Alternate use of sorghum for starch and alcohol production should be explored.

5.12 Development of hybrids for rabi sorghum with higher yield potential, and resistance to biotic and abiotic stress should certainly increase productivity. The productivity of rabi sorghum has to be increased to about 2 t/ha. from the present level 0.6 t/ha. The area would get stablised at the present level of 30 lakh ha.

5.13 The present productivity of pearl millet is 0.9 to 1.0 t/ha. which is low since it is grown on lighter soils and under rainfed condition. The area will be stablised around 18 lakh ha. The productivity target of 2 t/ha can be attained through the development of hybrids and varieties with higher yield potential and resistance to drought and diseases.

5.14 The area under rice is expected to remain at the present level of 15 lakh ha since it is grown in the high rainfall area, where alternate crops are not available. However, there is substantial scope to increase rice productivity from 1.8 to 3.0 t/ha by the development of high yielding hybrids with disease and pest resistance. The productivity in the Konkan may even be raised to 5 t/ha with the spread of hybrids. Hybrid seed production programme should be strengthened in the upghat area. The biotechnology tools are expected to pay great dividends in rice breeding since the entire rice genome has been sequenced. Farmers earnings can be increased by growing species suitable for exports.

5.15 Maize, though grown on relatively small area in the state, has tremendous potential as an industrial crop for the production of starch, liquid fructose and other chemicals. The development of new single cross hybrids are expected to increase the productivity from 1.5 to 2.5 t/ha. Area under maize may increase from 3 to 6 lakh ha depending upon the growth of the industry. The cultivation of quality protein maize (QPM) should be emphasised for human food as well as poultry feed.

5.16 The area under wheat will remain stabilized at 7 to 8 lakh ha. The productivity per ha is expected to increase from 1.5 to 2.5 t/ha with the adoption of better management practices. There is good scope to grow quality wheat especially the durum and wheat for export purpose and value added products. Thermo-insensitive quality wheat varieties need to be developed and upcoming wheat hybrids need to be exploited.
5.17 Pigeonpea productivity of 0.8 to 0.9 t/ha can be increased to 2 t/ha by developing hybrids and varieties with higher yield potential and resistance to pests and diseases. Integrated pest management (IPM) needs to be emphasized in this crop. Incorporation of the Bt gene in the pigeonpea cultivars should be taken up to control the pod borer. This will lead to doubling of area in next ten years.

5.18 Gram productivity of 0.7 to 0.8 t/ha should be doubled by developing varieties which respond to irrigation and better management practices. The area is expected to increase up to 10 lakh ha from the present 7.5 lakh ha. Incorporation of Bt gene, disease (wilt and virus) resistance genes, will help in stabilizing the productivity. The improved management practices such as ‘P’ fertilization has doubled the yield in M.P.

5.19 The area under mung and urid bean crops will be stabilized around 12 lakh ha. However, the stagnated yield potential of these rainfed pulse crops needs a break through. The present productivity of 0.5 to 0.6 t/ha is expected to be doubled.

5.20 To increase the production of pulses, it is suggested to establish ‘Pulse villages’ with focus on production technology. Pulses Villages involve water harvesting and the use of the harvested water for growing high value but low water requiring pulse crops. Pulses are being imported into the country at a very high cost, and Maharashtra by leap frogging in pulses production, can make imports unnecessary. The work on protein quality improvement of pulses is under progress at N.C.L. Pune. Strategic partnership should be developed between the Agriculture Universities and international institutes like ICRISAT and AVRDC, Taiwan. The use of IPM technology will help in increasing the pulses productivity.

5.21 Genetic engineering tools should be resorted to improve the protein quality of pulses and to increase the ‘N’ fixing efficiency of the Rhizobium species. This research should be strengthened for all the pulse crops.

5.22 The present productivity of groundnut at 1.3 t/ha is expected to be increased upto 2 t/ha and the area could increase from 4 to 8 lakh ha. There is good scope to cultivate the table purpose bold seeded groundnut for exports. Incorporation of disease resistance through conventional methods as well as genetic engineering will improve yield substantially. Seed production program of groundnut should be improved keeping in view SRR of only 2% at present.

5.23 The present productivity of soyabean at 1.2 t/ha is expected to be increased upto 2 t/ha. by conventional breeding. The area under soybean is expected to increase upto 15 lakh ha from 10 lakh ha by introducing it as a rotation crop in the irrigated farming and substituting some kharif sorghum.

5.24 Research on the development of Sunflower hybrids with resistance to biotic and abiotic stresses and high oil content should be strengthened. Sunflower
productivity can be increased upto 1 t/ha from 0.7t/ha. under rainfed conditions and upto 3 t/ha under irrigated conditions. The strategy should be to encourage soybean in the kharif season and sunflower in the rabi and summer seasons under irrigation. Sunflower area may be stabilized around 3.0 to 3.5 lakh ha.

5.25 The present productivity of safflower at 0.6 - 0.7 t/ha can be increased to 1.5 t/ha by developing high yielding hybrids and varieties. Disease and pest resistance can be introduced by the biotechnology tools. Safflower area can be stabilized at 6 lakh ha by growing it as an intercrop with rabi sorghum and by giving one or two protective irrigation.

5.26 Sesamum is cultivated both as a kharif (1.5 lakh ha) and a rabi season (2.5 lakh ha) crop. The area may not increase, though productivity should be increased substantially by breeding.( Kharif from 0.4 t/ha to 1t/ha, Rabi from 0.3 to 0.6 t/ha.) Conscientious efforts will have to be made to increase the productivity of those oilseed crops which produce oils that are good for health.

5.27 High yielding hybrids of castor are developed which yield upto 1.5 t/ha under rainfed conditions and 3.5 t/ha under irrigated conditions. Castor oil has tremendous export potential. Area under castor seed cultivation can be increased upto 1 to 1.5 lakh ha (as a sole crop), especially on the lighter soils.

5.28 Cotton area will be stabilized around 25 lakh ha. The present productivity of 180 kg lint/ha will have to be increased to 300 kg/ha. Thus, the seed cotton yield will have to be increased to about 1 t/ha. Since 97% of the cotton area is rainfed, the productivity increase under rainfed conditions should be given priority.

- The increase in boll size, staple length and ginning outturn are the important attributes to be incorporated in deshi cotton. The introgression of characters from the American cottons into the deshi cottons for some of these attributes should be done. The work under progress at MAU Parbhani has produced very promising results in this direction.

- Improved deshi genotypes should be encouraged for cultivation and seed production program should be undertaken on the seed village model. The American hybrids/varieties are susceptible to pests and drought. Introgression of resistance traits from deshi cottons into American cottons should be done.

- Genetic engineering tools offer tremendous potential for cotton improvement for example Bt. Cotton. The combination of conventional and the genetic engineering techniques are expected to bring about a revolution in cotton productivity in the next 10 to 20 years. The industry should play complementary role for cotton development in this direction.

- I.P.M. should be instrumental in reducing cost of production of cotton. Since organically grown cotton has tremendous export potential, it should be encouraged
by giving incentives during initial years of transition from chemical to organic cultivation.

5.29 To increase sugarcane productivity, there is an urgent need to develop varieties with high yield potential and resistance to biotic and abiotic stresses. It is also essential to increase sucrose content genetically. Genetic Engineering tools are expected to help in the sugarcane improvement in the next decade or so. The target of sugarcane productivity can be fixed to 125 t/ha and of sugar recovery to 13%. The sugarcane cultivation should be stabilized around 8 lakh ha.

➢ To increase the productivity, it is essential to take care of soil health as well as crop health. For soil health, the use of subsoiler plough after 4-5 years, incorporation of organic manures, sugarcane trash, green manuring, use of bio-fertilizers, micronutrients etc. should be an essential component of sugarcane cultivation. Among bio-fertilizers, development and use of efficient strains of Azotobactor will play a significant role in reducing the cost incurred on chemical fertilizers.

➢ Use of tissue culture plantlets for seed production should become a regular practice so as to supply genetically pure and disease and pest free planting material for sugarcane.

➢ The water management in sugarcane has been widely neglected. However in future, micro-irrigation and fertigation should be practised on the major area under sugarcane, especially the area irrigated from wells and lift irrigation. This will save precious irrigation water and fertilizers and also maintain proper soil health.

➢ With the proper ratoon management and taking 2-3 ratoon crops, the cost of production is expected to be reduced substantially. In the ratoon crop, micronutrient deficiency is of widespread occurrence. Therefore, specific micronutrient application will also have to be a regular practice. Backward linkages, in this matter will have to be developed.

➢ Intercropping of annual crops in the widely spaced sugarcane should also become a regular practice so as to reduce the cost of production.

➢ Seed certification will have to be implemented to ensure quality seed supply and development of the quality seed production chain.

➢ Sugarbeet can be used as supplementary crop to sugarcane in Maharashtra so as to extend the crushing season by 2-3 months. Extensive research on sugarbeet should also to be undertaken.

5.30 Forage crop research and development has been almost neglected. The research on forage crops, especially seed production and supply needs to be strengthened. Forage development, both for annual and perennial crops, needs to be done also on the wastelands. The fodder development programme should be
transferred from Animal husbandry department to Agriculture department since the later has extension wing and the proper infrastructure to produce seed. State should take steps to arrest the diversion of pasture lands to non-pasture usage.

c. Genetically Modified Varieties

5.31 The Genetically Modified Varieties (GMV) of crop plants developed through genetic engineering should be released for commercial cultivation after thorough evaluation for their biosafety to the fauna and flora and only after careful risk-benefit analysis.

5.32 Genes for resistance to biotic and abiotic stresses may be isolated from wild relatives of crop plants and transferred to cultivated crop varieties through molecular breeding and genetic engineering.

5.33 There should be complete transparency in and credibility of, investigation related to the bio and health-safety aspects of GMV. The public should be constantly educated about the developments and safely considerations. However, once the tests on the GMV are carried out thoroughly and the GMV is found to be safe, it should be released for cultivation so that the benefits are not delayed.

5.34 An autonomous body on the lines of Atomic Energy Regulatory Commission could be thought of to instill confidence in the minds of the general public regarding the biosafety aspects of such organisms.