REPORT

OF THE COMMITTEE

ON STATISTICS OF AGRICULTURE AND ALLIED SECTORS

GOVERNMENT OF INDIA

NATIONAL STATISTICAL COMMISSION

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Acknowledgements

The National Statistical Commission asked me to chair the professional “Committee on Agriculture and Allied Sectors”, to review the issues relating to Agriculture Statistics and recommend improvements. I accepted the responsibility in view of the faster growth and increased openness of the economy in a global agriculture in which distortions were severe as the WTO negotiations show. The Agriculture Sector of the Indian Economy is important in terms of output, employment and surpluses for a faster growing economy. There was need if policies were to respond to faster growth openness and dualism, to take a larger overall view, highlighting the importance of linkages between various segments within the Agriculture sector, integrating the data sources with policy needs and using Information Technology and Communication(ICT) tools and offering a generally consistent approach to bring out timely, reliable and credible Agricultural Statistics for the next phase of growth.

I thank profusely all the Heads of the Sub-Groups and the respective Members for their valuable participation and contribution. Particularly, I thank the Heads of the Sub-Group who have taken a lot of initiative and spared their valuable time in preparing the subject specific reports assigned to them.

Shri Ashish Kumar, Additional Director General, NAD, CSO & Member Secretary and all other members of the Committee have taken keen interest in attending the meetings cheerfully and shared their experiences. Many members have also provided valuable inputs in their subject fields which were very helpful in making this report.

The Secretariat of the National Statistical Commission has also been of invaluable help to the working of this Committee, for hosting the meetings and providing logistical support.

My special thanks are due to Dr. S Durai Raju, DDG (NAD) CSO for his enthusiasm, involvement and active participation in the Committee and working hard to give the final shape to this Report. Also I thank all the officers and staff of Agriculture Unit of NAD, CSO for providing necessary logistical support.

We held two formal meetings and many informal discussions. I prepared the draft report based on the reports submitted by the Sub-Groups, the discussions and the comments thereof and then revised it suitably. I would like to express my sincere gratitude to all the Members, Special Invitees, CSO and the staff of the NSC.

Y K Alagh
List of Abbreviations

AoA  Agreement on Agriculture
API  Agricultural Prices in India
APMC Agricultural Produce Marketing Board
BoP  Balance of Payments
BOPSY Balance of Payments Statistics Yearbook
BPM6 The sixth edition of the Balance of Payments and International Investment
C/SPCB Central /State Pollution Control Board
CAAA Controller of Aid Accounts and Audit.
CEPA Comprehensive Economic Partnership Agreement
CGWB Central Ground Water Board
CSO  Central Statistics Office
DTRs  Daily Trade Returns
EBOPS Extended Balance of Payments Services
ECBs  External Commercial Borrowings
EDI  Electronic Data Interchange
EDMU External Debt Management Unit
EFTA European Free Trade Association
FAI  Fertilizer Association of India
FAOSTAT Food & Agricultural Organization Statistics
FTA  Free Trade Agreements
ICAR  Indian Council of Agricultural Research
IIP  International Investment Position
IMD  Indian Meteorological Department
IMF  International Monetary Fund
IMTS  International Merhandise Trade Statistics
ISRO  Indian Space Research Organization
MoA  Ministry of Agriculture
MOSPI  Ministry of Statistics and Programme Implementation
MOWR  Ministry of Water Resources
NAFTA  North American Free Trade Agreement
NBSS  National Bureau of Soil Survey & Land use Planning
NFH  National Family Heath Survey
NSSO  National Sample Survey Office
OECD  Organization of Economic Cooperation and Development
QR  Quota Restrictions
RPA  Rupee Payment Area
RTP  Reserve Tranche Position
SAFTA  South Asian Free Trade Agreement
SAU  State Agricultural Universities
SDRs  Special Drawing Rights
SDT  Special and Differential Treatment
SEZs  Special Economic Zones
SME  Small and Medium Enterprises
SNA  System of National Accounts
TTR  Total Trade Restrictions
WTO  World Trade Organization
Introduction

The Agricultural Statistics System in India is comprehensive and provides data on a wide range of topics such as crop area and production, land use, irrigation, land holdings, agricultural prices and market intelligence, livestock, fisheries, forestry, etc. It has been subjected to review several times to make it adaptive to contemporary changes in agricultural practices. India has a well-established and internationally known Agricultural Statistical System. It is a decentralized system with the State Governments, State Agricultural Statistics Authorities (SASAs) play a major role in the collection and compilation of Agricultural Statistics. Directorate of Economics and Statistics (DES), Ministry of Agriculture at the Centre is the nodal agency for Agricultural statistics at the national level.

This system, which has evolved over the course of time, provides various sets of statistics, data, indices and indicators. Agricultural statistics are also generated through various surveys and statistical operations conducted by different institutions and government departments. DES releases every year estimates of production and yield of food-grain crops, oilseed crops, sugarcane, fibre crops and important commercial and horticultural crops. Data on nine-fold land use classification, irrigation (crop-wise and source-wise) are also collected and compiled at the national and sub-national levels on an annual basis. Weekly data on wholesale/retail prices and farm harvest prices are collected from agriculture markets and used for the compilation of wholesale price index for agricultural commodities.

DES, MoA produces an annual publication entitled ‘Agricultural Statistics at a Glance’. This publication also covers data relating to agriculture in national income and social economic indicators, outlay and expenditure, capital formation, area, production and yield of principal crops, cost estimates, procurement by public agencies, per capita net availability, consumption and stocks, import/export, tariff, wholesale price index, land use statistics, census of agricultural inputs, wages of agricultural workers, livestock population and fish production in the country.

The Agricultural Statistical System has been subjected to review several times since independence so as to make it adaptive to contemporary changes in agricultural practices. Some of the important expert groups were: (a) the Technical Committee on Coordination of Agricultural Statistics (1949), (b) the National Commission on Agriculture (1976), (c) the High Level Evaluation Committee (1983) (d) the Workshop on Modernisation of the Statistical System (1998) (e) National Statistical Commission (2001) and (f) more recently the Experts Group on Agricultural Statistics under the Chairmanship of Prof A Vaidyanathan (2010).

The National Statistical Commission constituted an Expert Committee under the chairmanship of Prof Y K Alagh in 2010 with the following ToR:
Terms of Reference (ToR)

1. Identifying statistical products required at sub-state, state and national levels to depict the status of agricultural sector.
2. Agencies to collect, compile and disseminate agricultural statistics periodically.
3. Requirements of an agricultural decision making information system.
4. Use of modern technology such as handheld GPS guided mapping devices, remote sensing in measuring areas under different crops/uses.
5. Satellite accounting for agriculture sector.
6. Data flow from States to Centre.
7. Private participation in collection of agricultural statistics and development of information systems.
8. Reviewing methodology for estimating the production of horticultural crops.
9. Reviewing methodology for estimating the production of crops such as mushroom, herbs and floriculture.
10. Reconciliation of wide variation between the irrigated area generated by the Ministry of Agriculture and the Ministry of Water Resources.
11. Integration of Livestock and Agricultural Censuses to be taken together in a 20 per cent sample of villages with an element of household enquiry.
12. Developing appropriate methodologies for filling up data gaps relating to estimates of mutton, pork, poultry meat and meat by-products.
14. Reviewing the item basket and weighting diagram for the construction of Index Numbers of Area, Production and Yield.
15. Reviewing of rates used to apportion the areas of constituent crops of major crop mixtures/recognized mixtures.
16. Review of methodology for improving agricultural input statistics, particularly area under hybrids and Bt. seeds.
17. Statistics of product arrivals and prices in markets of different layers; prices used by aggregators.
18. Agricultural information systems used by agencies like USDA, FAO and relevance to India.

The first meeting of the Committee on Agriculture and Allied Sectors was held on 6th September, 2010 at Committee Room, Second Floor, Sardar Patel Bhavan, New Delhi under the Chairmanship of Prof. Y.K. Alagh. The Chairman stated that Indian economy has changed a lot after the policies followed in early nineties from a trade dominated system. There is the need to react quickly to global changes in an open economy with crops subjected to competitive pressures from a distorted trading economy where the WTO is grappling with the development of a more even system. Therefore, he stressed that there should be a data collection mechanism reacting in time to such changes to help policy formulation and decision making. He asked the members to refer the chapter relating to agriculture sector in the mid-term appraisal of Planning Commission.
After the detailed discussion, Chairman decided that sub groups should be formed for specific subject areas for detailed examination and submission of report for further discussion. Accordingly, the following six groups were constituted:

**SUB-GROUP- 1: Composition**

*Head of Sub-Group-1* : Dr. R. S. Deshpande, Director, ISEC, Bangalore

**Other Members :**
Dr. Shivanand Swamy, CEPT University, Navrangpura, Ahmedabad
Dr. Bhaskar Gaekwad, Head KVK, Mahabaleshwar, Maharashtra
Mrs Sudha Midha, Adviser DES, M/o Agriculture

**The TORs stated by the Statistical Commission were as follows:**
- Definitions /Standards/concepts
- Rural/Urban statistics
- Newer Crops/Newer activities
- Latest trend on agriculture/crop production
- Labour migration/Farm/Non-Farm labour
- Diversification: Emerging crops/medicinal/aromatic crops; Food Crops/Non-food crops
- FAO –I Stage processing

**SUB-GROUP- 2: Composition**

*Head of Sub-Group-2* : Dr. A. K. Bandyopadhyay, CMD, NABARD

**Other Members :**
Dr. Nilanjan Ghosh, Senior Vice President, TAER
Dr. Kinsuk Mitra, President, Winrock International India,
Smt. Tanushree Mazumdar, Senior Economist & Vice President, NCDEX
Shri Amarnath, Managing Director, Krishi Samruddhi Ltd (BASIX)
Shri P.S. Vijay Shankar, Co-founder & Director, Research, Samaj Pragati Sahayog

**Co-opted Members:**
Dr. P. Renganathan, CGM, TSD, NABARD
Dr. S.L. Kumbhare, CGM, MCID, NABARD
Shri Subrata Gupta, GM, Repositioning Cell, NABARD
Dr. Amar K.J. Nayak, XIMB and NABARD Chair Professor

**The TORs stated by the Statistical Commission were as follows:**
- Methodological Issues
- SHG, Private Sector participation, Producer Companies, Cooperatives
Market data collection; Spread/Futures, data with commodity exchanges; data on aggregators

Forest Data; Demand for timber, newsprint, non-timber forest products, JFM, Production, Timber, Non-Timber forest produce, Forest workers

**SUB-GROUP- 3: Composition**

**Head of Sub-Group-3 : Dr. N P S Sirohi, ADG, ICAR**

**Other Members :**
Dr. U.C. Sud, Head, Sample Survey Division, IASRI, New Delhi
Dr P Ramasundaram, Principal Scientist, NCAP, New Delhi
Dr KK Tyagi, Principal Scientist, IASRI, New Delhi
Shri T.K. Chanda, Additional Director (Statistics & IT), FAI, New Delhi
Dr. R.K. Tewatia, Chief (Agri. Sciences), FAI, New Delhi
Shri P.P. Mathur, Executive Director, Crop Care Federation of India

The TORs stated by the Statistical Commission were as follows;

- Input Data Collection; Investment and resource flows
- Irrigation, water use Statistics (LUS. MOWR data; reconciliation)
- Mechanisation, seed rates
- Fertilizer, recent trends on composites, new products, pesticides, environmentally benign pesticides; newer products
- Dissemination of input data for policy makers

**SUB-GROUP- 4: Composition**

**Head of Sub-Group-4 : Dr. M . Moni, DDG (NIC)**

**Other Members :**
Dr. Siddhartha Roy, Economic Adviser, Tata Services, Representative of Rallis India Limited
Dr. Hare Krishna Misra, Professor, IRMA

The TORs stated by the Statistical Commission were as follows;

- IT and ICT usage in Agricultural data
- Agro-climatic level
- Small Area farm Business.

**SUB-GROUP-5: Composition**

**Head of Sub-Group-5 : Prof. Maria Saleth, Director, MIDS**

**Other Members :**
Er.V.K.Chawla, Central Water Commission, New Delhi,
Mr. A. Marbaniang, Directorate of Economics and Statistics, Government of Meghalaya, Shillong,
Prof. A. Narayamoorthy, Alagappa University, Karaikudi.
The TORs stated by the Statistical Commission were as follows:
- Water and Land Use Statistics
- North-East Development
- Staff agencies

**SUB-GROUP-6: Composition**

*Head of Sub-Group-6:* Dr. V.K. Bhatia, Director, IASRI

*Other Members:*
- Prof. M. Surya Narayana, IGIDR
- Prof. Niti Mehta, SPIESR, Ahmedabad

The TORs stated by the Statistical Commission were as follows:
- Agro-Climatic level Statistics
- Small Area farm Business statistics
- Food Security statistics
- Trade and Tariff Policy statistics

The Second meeting of the Committee on Agriculture and Allied Sectors was held on 21\textsuperscript{st} April, 2011 at Conference Hall (basement), Sardar Patel Bhavan, New Delhi under the Chairmanship of Prof. Y.K. Alagh.

Sub-Group-3, 4 & 6 had submitted their reports. The Chairman appreciated the Sub-Group Heads who have submitted the reports, for putting commendable efforts in finalising the reports. He had gone through two sub-group reports (Sub-Group-3 & 6) which he could access. Most of the remaining work could be done through exchange of information electronically. Also he stressed the mandate of the Committee and submission of the final report by target date. Chairman asked all the heads of the Sub-Groups 1, 2 & 5 to submit their report as early as possible to enable the Committee to finalise the report. Subsequent to the above meeting, all Subgroups submitted their report except Sub-Group-1. Summary of the groups are as follows:

**Sub-Group-2:**

The Sub Group has reviewed and assessed in the meeting held on 18 March 2011 at NABARD, Mumbai, the data availability, methodology for data collection, stakeholders/ Agencies involved in data collection and identified data gaps for the Sectors (forestry, SHG, Producer Companies, Cooperatives, market, futures, commodity exchanges). The identified data gaps, if made available, would be useful at the macro level for policy formulation in a market economy.

**Sub-Group-3**

The member of the sub-group met on 1\textsuperscript{st} February, 2011 at IASRI, New Delhi under the chairmanship of Dr N P S Sirohi, ADG (Engg.), ICAR. In this meeting the approach of writing the report was discussed. It was agreed that the report will include background information on the four topics namely statistics on concerned
indicators along with sources of data availability, current status, gaps, suggestions for filling the gaps and future prospects.

**Sub-Group-4**

The Sub-Group deliberated the issues on 20\textsuperscript{th} April 2011, as given in the Terms of Reference, by the Committee on Statistics of Agriculture and allied sector, in respect of IT and IT usage in Agriculture data, Agro-Climatic level and small area farm business.


**Sub-Group-5**

The first meeting of the sub-group was held on 23\textsuperscript{rd} March, 2011 to discuss on water and land related statistical system as well as the data gaps and related statistical issues were discussed which lead to several important suggestions and recommendations for improving quality, clarity, and quantity of water and land-related statistics in the country.

**Sub-Group-6**

The member of the sub-group met on 1\textsuperscript{st} February, 2011 at IASRI, New Delhi under the chairmanship of Dr V K Bhatia, Director, IASRI. It was agreed that the report will include background information on the four topics namely statistics on concerned indicators along with sources of data availability, current status, gaps, suggestions for filling the gaps and future prospects.

All the Heads of the Groups were given freedom to choose the experts and submit their reports. This Report is based on the discussions held by the Committee and reports submitted by the Sub-Groups.
Plan of the Report

This Report is divided into six chapters.

Chapter-I deals with the terms of reference of the Committee along with various Sub-Groups constituted with their terms of reference.

Chapter-II deals with major strategic changes taking place in the agricultural sector, the fast growth of the economy, consequent demand changes for agriculture, demographic changes and need for infrastructure in relation to movements of workers and goods, their importance, their contribution to the GDP, consequential challenges and remedial measures in the areas of Crop Statistics, Plantation crops, Horticultural crops, Medicinal and Aromatic Plants, Livestock Statistics, Fishery Statistics and Forestry Statistics.

Chapter-III deals with market prices, Trade including exports/imports and storage for the Agricultural goods.

Chapter IV deals with agro climatic planning.

Chapter-V deals with major inputs as they are directly associated with improvement of Agricultural productivity.

Chapter-VI deals with Subsidy and Food Security.

Chapter-VII deals with applications of ICT tools in Agriculture and Agricultural Information System and newer dissemination systems like Portals, etc.

Chapter VIII gives the summary of the recommendations.
CHAPTER-2

Challenges in Agricultural Statistics

The Need

There are three kinds of motivations which lie behind the setting up of this Group. The first is that the structure of the Agricultural and Rural economy is changing. The emphasis on grains is giving way with the working of Engel’s Law and fast per capita income growth to non-grains and non-crop agriculture like horticulture and animal husbandry products. This needs a larger repertoire of crops and products, behavioral studies and newer sources of data for items thinly covered. Also in a faster moving economy timeliness both of data and emerging trends is important. It may be noted that agricultural impacts work both ways in the sense that acceleration and deceleration of growth matters for the agricultural sector. Issues of food security and poverty measurements remain.

The structure of the rural urban distribution of the economy, population and labour force is changing faster than anticipated. Indian statistics missed out on the changes in rural urban shares. Various studies had indicated these changes but were ignored and so most information is contaminated with incorrect population distribution statistics. This needs quick remedy. On the other hand the casualisation of the rural labor force has proceeded much faster. Again land use is changing fast as also the ownership and operational structure of land and agricultural holdings.

The structure of decision making is changing. The private sector, NGOs, producer groups, cooperatives are in the driving seat. But information on them and for them is lacking. We are in the strange situation in which in a single month the Planning Commission chaired by the PM has tabled an approach paper to the Twelfth Plan and simultaneously a Committee chaired by his Economic Advisory Council has recommended that the quantities like the Resources for the Plan, (given great significance in the Approach Paper, approved and circulated with numerical magnitudes) must be dropped from policy consideration. There is not much this Group can do to remedy the anarchic implications of such policy advising structures but the need for statistical machineries to be alert to the implications of policy changes and globalization are obvious. We now turn to details.

Structure of the Economy( Rural/Urban, Agriculture/Non Agriculture): Consequences for Land, Population Shares and Investment; Census Towns and Agricultural Markets

The distribution of the population between rural and urban areas has consequences for understanding, infrastructure planning and the supply potential of agriculture. The 2011 Census has established that a substantial part of additional urbanization is in what are called ‘Census Towns’. This phenomenon was there earlier but was not
recognized as urbanization as it is in the 2011 Census. In the literature it had been established as early as the middle part of the last decade that there were what was called ‘large villages’ which met the Census criteria of towns which were not classified as urban areas by the Government and at that time even in the Census (now called Census Towns). This led to a pessimistic perception of urbanization. It was argued then ‘that a part of this pessimistic perception may arise from settlements which are “urban” by Census definitions not being classified as “urban”. While the absolute differences on this account may be small, since population projections use first difference methods, “small” absolute differences can lead to “large” first differences and may affect the projections seriously. For Gujarat if a proper classification is made of the ‘villages’ that were not rural according to the census definition, but were not classified as towns, the first difference doubles. Thus the rate of change in urbanization would be twice that currently planned for, which is a serious matter. This issue was highlighted in a statistical study of Gujarat using village level data to illustrate the magnitudes and the propositions being made (Y.K.Alagh and P.H.Thaker,2006a as reported in Y.K.Alagh, 2007b, p.307-308).

This is an important issue of structure and policy consequences, so the original work for Gujarat is first reported. Then the ‘rediscovery’ of this in the 2011 Census is discussed. The magnitudes in Gujarat show that the 2006 projections have turned out to be accurate for 2011. Magnitudes in an agriculturally advanced State, namely Punjab, to contrast with industrially advanced Gujarat as done by Y K Alagh are also shown. These magnitudes are also discussed in a relatively backward State, namely Bihar. Policy makers have recognized this phenomenon for 2011 but are still resisting its implications for the future which has consequences and needs remedying.

According to the 2001 Census, Census Towns were non-statutory towns and were actually rural areas, but satisfied the following criteria.

(A) Minimum population of 5,000.

(B) Density of population of at least 400 persons per sq. km.

(C) 75 percent of the male working population engaged in non-agricultural activity.

These criteria of classifying Rural Areas as Urban Areas were in operation since
the 1961 Population Census. Applying the three criteria, before the 2011 Census the question arose if “big villages” prima facie having the defined characteristics of urban or semi-urban areas, should in reality be classified as urban? In a 2006 paper (Ibid., Alagh, et.al.,2006b) an attempt was made to answer this query.

**Estimates of Towns Classified As Villages**

The criteria of Population Density is easily explained since village populations stay in concentrated manner and consequently villages not satisfying the criteria of a minimum population of 5000 and the non-agricultural work force criteria satisfy the criteria of Population Density 0.75 per cent of the male working population engaged in non-agricultural activity is a variable of structural transformation and indicates the presence of the urban economy more precisely. Applying the three Census criteria of considering rural area as non-statutory towns, to village wise data of 2001 census, it was estimated that out of 18539 populated villages of the State, 122 villages (hence forth we call them as big villages) were classified as non-statutory towns. The population of big villages by sex was used at the District level as a correction factor and the revised District rural-urban population and degree of urbanization estimated. The total population of the 122 big villages was 11,21,083 (2.21 per cent of total population). If this was added up to the estimated State urban population then the revised degree of urbanization was 39.57 per cent (i.e. roughly 40 per cent). Detailed information of these 122 big villages in respect of village name, number of households, sex wise population, sex wise total workers and Non-Agriculture workers, proportion of Non-Agriculture male workers in total male working population, population density and its respective district is available in Appendix to the paper cited above (Alagh, et.al.,2006b).

The level of urbanization in Gujarat had therefore not increased by 2.87 % points, but 5.06% points, which is close to double the earlier estimated change and makes a big difference in policy and forecasting work. Since it is well known that urban projections are based on urban-rural growth differences and changes in first differences of the magnitudes considered can make big impacts on outcomes. Earlier land use studies found little effect of urbanization on land use. For example decadal release of land for urbanization was generally less than 5%. This has now changed. In Gujarat in the 2011 census, urban population was estimated at 42.6 percent of the total population, close to our 2006 estimate. This is 2.57 crores persons. But the projections of the urban population by the Technical Group on Population Projections(Government of India,2006) after the 2001 Census was 2.4 crores and so for almost a decade we have made policies ignoring around two million persons in urban Gujarat and their needs.
**Punjab**

Urbanization in Punjab is much less than in Gujarat. Urban population was more than 50% in four Districts, namely Ludhiana (59.14%), SAS Nagar(55.17%), Amritsar(53.64%) and Jalandhar(53.18%). Only Ludhiana(2.06 million), Amritsar(1.34 million) and Jalandhar(1.16 million) have an urban population of more than 7 lakh persons as compared to a very large number of such Districts in the more urbanized States. But it is an advanced agricultural State and the phenomenon of Census Towns was present there also. In 2011 Punjab counted the Punjabis who had shifted to urban areas correctly. The urban population was 104 lakhs as against the projected 107 lakhs. 37.5% of the population was urban in 2011. Urban population grew by 25.7%. But it was found out that for ten years the Punjabi’s were not migrating to what they called Towns but places he did business in. He converted large villages to small towns but was missed out. There were 143 statutory towns (Municipalities, Corporations, Cantonments and Notified Area Committees). These were on the radar, but the Census, 2011 discovered 74 Census Towns (Seema Jain, IAS, Census Commissioner, 2011). The people of Punjab were creating these towns but nobody knew of that and were not worrying about them. Out of the 20 lakh additional Punjabis who moved to urban areas, perhaps 8 lakhs went to these ‘towns’, they had created.

**Bihar**

Bihar is a poor State in terms of per capita income. It’s urbanization rate in 2001 was 10.46% of the total population. The Technical Group on Population Projections government of India, (2006) projected a near stagnant urbanization rate in 2011. Their projected figure was 10.5%. However in 2011, the actual rate of urbanization was higher. It was 11.3%. The population experts, policy makers and planners missed out the fact that Bihar’s urbanization was growing. In fact the growth rate of urban population at 35.1% in the period 2001-11 was higher than in the country. In a large State that meant a lot of people. The missing Bihari urban people were 1.5 million in number. They were in fact going to places where the infrastructure was poor. Including Census Towns urban growth more than 50% in the period 2001-11 took place in Rural Champaran, Begusarai, Bhagalpur, Munger and Bhojpur.

**Pan Indian Phenomenon**

Y.K.Alagh, 2012, shows that Census Towns is a pan Indian phenomenon. Statutory Towns increased from 2001 to 2011 by 242, but Census Towns increased by 2532. The chapter on rural transformation in the Approach begins by saying that “The Census of 2011 estimates that 833 million people continue to live in rural India(Government of India, 2011). But until very recently the Planning Commission, ignoring Census towns, was projecting that 870 million persons would live in Rural India in 2011(Government of India, 2008). The Planning Commission has finally
changed its earlier figures on urban population in 2011 of 357.95 million to the Census 2011 figure of 377.11 million (missing out 2 crore persons) and in the Approach Paper note the phenomenon of Census Towns but its projections for the future are sadly as earlier. They underestimated the rural population moving to small (Census, not official) towns by 37 million people. That is a lot of people and for an Approach titled ‘inclusive growth’, a critical slip up. As compared to an existing population of 377 million, the projection of 405 million in 2017 (Government of India, 2006) was grossly low. An earlier scheme for small towns was dropped in the Plan. The JNURM does not cover Census Towns. PPP models are not the answer for them as the CRISIL studies show that very small towns cannot service the charges for private investment in urban infrastructure in small towns. Actually problems arise when we get out of the metros. We have to get back to the drawing board for policy but timely statistics will be a precondition. Planning Commission’s projection is 400 mn urban population in 2011; 600 mn. in 2030 are underestimated (Y.K. Alagh, 2013).

These trends have important consequences. The area under crops has stopped growing and in fact there is evidence that it is declining. This has serious consequences for output and employment in the agricultural sector and what is called food inflation. Diversion of land from agriculture to non-agricultural purposes which was around two to five percent of land use for agriculture in a decade is according to scattered sources now almost five fold higher. Statistics giving a factual picture on an annual basis are critical in a fast growing land scarce economy. These trends will accentuate as the farming population follows demand growth and diversification arising out of a fast growing economy. Markets will have to be planned for and what is called storage and supply chain infrastructure, also for agro processing. These aspects are dealt with in the next chapter.

Recommendations for Statistics

Our main concern is with statistics for such estimates. The problem will be to generate data for Inter-censuses and Quinquennial NSS survey years. As it is well known area statistics at the village level are collected by two agencies on a sample basis. These are the Timely Reporting Scheme and NSS. Two schemes are in operation since early seventies namely, the Timely Reporting Scheme (TRS) and the scheme for Improvement of Crop Statistics (ICS). The schemes are discussed later.

For the present the recommendation is that:

These two agencies should be used to give an estimate at the village level of the area diverted from agricultural to nonagricultural purposes. These ‘villages’ being revenue entities would include ‘Census Towns’ by definition. The Committee recommends that the NSC set up an Expert Group to generate estimates from the TRS and NSS. ICS schemes to
generate village level sample estimates of land use between agricultural and non agricultural sectors. The Expert group may also examine if estimates can be generated of households moving out of agricultural sector as the main occupation. This scheme should be in operation by the agricultural year 2015.

**On Agricultural Demand**

Indian agriculture is already increasingly demand driven. This will accelerate in the future. Demand will depend largely on income growth and taste patterns, since population growth will play a moderate role as compared to earlier periods. It has been argued, by the present author and others that agricultural diversification in India is basically driven by domestic demand, (Y.K.Alagh, Shastri Memorial Lecture, reprinted in ICAR, Agricultural Transformation in India , 1989-1995). The major impact of faster income growth was on domestic demand leading a process of demand diversification in a big way. For example, the 1980s and 1990s record a much faster growth of agro-based consumption in the Indian demand basket. Per capita consumption of sugar went up from 6.2 kg/year in 1975-76 to 14.9 kg/year and that level was not only much higher than in comparable countries, but also than in countries which have much higher levels of per capita income. Also, there was a very rapid increase in consumption of non-crop based commodities like eggs and milk. Egg consumption per capita went up from 15 to 30 per year in the period of 1975-98. India became the largest producer of milk in the World.

Expansion and diversification of the consumption basket was basically driven by a higher growth performance since the 1980s. The agro-based items of consumption are important in the demand baskets of different income groups. These consumer items are not for elite consumption alone. As people are better off, they eat more eggs, drink more milk and eat vegetable, fruit and cheese. This has happened in the Nineties and by now this diversification of the food basket is well known. The process is not smooth and the period of the East Asian meltdowns and more recent cycles for example see a slow down.

The underlying long term trends, however are in terms of growth of agricultural demand and diversification of the demand basket with non-food grains growing faster than grains and non-crop based agriculture like animal husbandry growing even faster. Within crops demand of tree crops grows faster. These trends exhibited themselves again in the recovery of the agricultural economy in the period 2004-05 to 2007-08 and in the more uncertain period later, although numerical precision in short period growth rates is not advisable The underlying trends are driven by the growth of the economy, urbanization since demand patterns differ between rural and urban areas, income distribution since the rich consume differently than the poor and of course population growth.
The table below estimates for the urban rich and rural poor in the Seventies in India and some estimates of income (expenditure) elasticities from Complete Demand Systems for the Nineties.

**Income Elasticities in India for Agro Products: Structure and Changes**

<table>
<thead>
<tr>
<th>SNo</th>
<th>Commodity</th>
<th>Engel Curve Specification</th>
<th>Estimate for Seventies</th>
<th>Estimate for Nineties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Non Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>1</td>
<td>Paddy</td>
<td></td>
<td>0.18</td>
<td>0.18</td>
</tr>
<tr>
<td>2</td>
<td>Wheat</td>
<td>3b.Semi Log</td>
<td>0.15</td>
<td>1.82</td>
</tr>
<tr>
<td>3</td>
<td>Jowar</td>
<td></td>
<td>0.97</td>
<td>0.51</td>
</tr>
<tr>
<td>4</td>
<td>Bajra</td>
<td>3b. Semi Log</td>
<td>1.26</td>
<td>0.92</td>
</tr>
<tr>
<td>5</td>
<td>Other cereals</td>
<td></td>
<td>0.14</td>
<td>0.01</td>
</tr>
<tr>
<td>6</td>
<td>Pulses</td>
<td>3a. Semi Log 3b Linear</td>
<td>1.48</td>
<td>0.06</td>
</tr>
<tr>
<td>7</td>
<td>Vegetables</td>
<td>3b. Linear</td>
<td>0.79</td>
<td>0.05</td>
</tr>
<tr>
<td>8</td>
<td>Fruits</td>
<td></td>
<td>1.62</td>
<td>1.21</td>
</tr>
<tr>
<td>9</td>
<td>Spices</td>
<td></td>
<td>0.40</td>
<td>0.79</td>
</tr>
<tr>
<td>10</td>
<td>Milk and Products</td>
<td>3a. Linear</td>
<td>0.10</td>
<td>3.06</td>
</tr>
<tr>
<td>11</td>
<td>Meat and eggs</td>
<td>3a. Linear</td>
<td>0.02</td>
<td>1.55</td>
</tr>
<tr>
<td>12</td>
<td>Sugar</td>
<td></td>
<td>0.79</td>
<td>2.07</td>
</tr>
<tr>
<td>13</td>
<td>Gur</td>
<td>3a. Semi Log</td>
<td>0.17</td>
<td>1.80</td>
</tr>
<tr>
<td>14</td>
<td>Vanaspati</td>
<td></td>
<td>1.03</td>
<td>neg</td>
</tr>
<tr>
<td>15</td>
<td>Edible oil</td>
<td></td>
<td>0.70</td>
<td>1.33</td>
</tr>
<tr>
<td>16</td>
<td>Tea</td>
<td>3a. Linear</td>
<td>0.03</td>
<td>1.37</td>
</tr>
<tr>
<td>17</td>
<td>Coffee</td>
<td></td>
<td>1.55</td>
<td>1.74</td>
</tr>
</tbody>
</table>

**Note:** 1/ Unless otherwise specified the estimates are elasticities from double-log functions. In other cases the estimates are slope coefficients of the specified functions.

2/), The estimates are from Complete Demand Systems. The Rural Poor are the category “moderately poor” and the Urban Non-Poor, similarly so in the non-poor.

3/ refers to all cereals

4/ refers to fruits and vegetables
The income elasticity is high for cereals for the poor and low for the non-poor. They are negative for inferior cereals for the non-poor. Other cereals were an inferior product for the non-poor in the Seventies and have a low expenditure elasticity in the Nineties for the same group. The elasticity was low for the poor in the Seventies and is less than 0.5 for the same group in the Nineties. For paddy and so on we do not have comparable estimates for the two decades, but the estimates are plausible.

The table gives another feature. For commodities like milk and milk products, eggs and meat, edible oil and sugar, the estimates of expenditure elasticity were high for poor households, in some cases above 2, but were below 1 although not very low for the non-poor. There is a large literature on the declining consumption share of grains by poor households in India and its impact on poverty estimates (Y.K.Alagh, 2011)

These trends become important for the question of food and wage goods inflation, central to the sustainability of the growth process and data requirements of demand and supply of non-food grain items in detail become important. If per capita income increases by say six percent and the income elasticity of demand is 1.5, demand growth of the agricultural commodity will be around ten percent. This works both ways. For example it can be argued that the fall in food inflation in India in the third quarter of 2011-12 is on account of a decline in the growth rate. To all those gaining comfort on food deflation, it needs to be understood that the prices under pressure are non-cereals like pulses, oils, sugar, but more important vegetables, fruits, milk and meat and apart from vegetables. Here the income elasticity is more than one and a half to over two and a reduction in growth of two percent knocks off four to five percent in demand. Apart from seasonal factors the slowing in growth is softening inflation. Earlier Indian work (Y.K.Alagh and G.S.Guha, 1991.1993) had demonstrated with Indian econometrics a point the Economic Survey has made with global data that inflation growth tradeoffs begin at seven percent plus. The charts below from the Alagh-Guha paper and the Economic Survey illustrate.
Growth rate of GDP Vs. WPI

<table>
<thead>
<tr>
<th>Year</th>
<th>WPI</th>
<th>GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-08</td>
<td>116.6</td>
<td>389.66</td>
</tr>
<tr>
<td>2008-09</td>
<td>126</td>
<td>415.87</td>
</tr>
<tr>
<td>2009-10</td>
<td>132.8</td>
<td>450.76</td>
</tr>
<tr>
<td>2010-11</td>
<td>143.3</td>
<td>488.60</td>
</tr>
</tbody>
</table>

GDP in Rs 10,000 Cr at 2004-05 Price
Sources: Economic Surveys 2012-13
Recommendations of the Committee

The Committee recommends that Private Consumption estimates by the National Accounts Flow methods and by the NSS estimates should be generated annually. These should be generated separately for Rural and Urban Areas and By the Poor and Non Poor sections of the population. An expert group should clearly note the conceptual basis of the two estimates and differences between them.

The Committee recommends that quarterly estimates of GDP growth and price trends separately as estimated by the National income deflators, CPI and WPI be presented as also in charts.

Capital Formation, Investment and Flows of Resources to Agriculture

Ever since K.N.Raj’s pioneering work on savings in India and follow up by Y.K.Alagh, S.Mundle there has been an argument that flows to agriculture are different from investment in agriculture. This argument was more recently examined by a Committee set up by Ministry of Agriculture under the chair of Prof. B.B.Bhattacharya.

“The Bhattacharya Committee on Capital Formation in Agriculture has recommended a procedure for compilation of GFCF for agriculture which includes activities such as agro-chemicals production, construction of rural roads, rural electrification, rural godowns, agricultural cooperative banks, etc. The Committee has also recommended inclusion of expenditure on agricultural research and education as part of capital formation for agriculture.” (GOI, 2004, p.7).

There is a logical sequence in these arguments. From a narrow concept of Government, the movement is to include a more inclusive concept and then capital formation and effectiveness of the government sector. There is a long history to this debate. For example, the FAO had always argued that resource flows to agriculture should be in a gross sense, as compared to the earlier IMF concept of government expenditure which was very narrow, namely expenditure without a fee component (FAO, 1980, 1981). The High Level Evaluation Committee of the CSO in India took this more inclusive definition of resource flows as the more appropriate one (CSO, 1984). This was developed for that Committee by a group chaired by the Chair of this Committee and was a major chapter of the Report of the High Level Evaluation Committee. It argued: “The objectives for which estimates of resource flows to agriculture are required are the following: impact ( in terms of size and quantum ) of resource flows, particularly from the Government sector, on the growth and development of the agricultural sector and in relation to the requirements of that sector; in particular the separate impact of investment flows and current expenditure flows; the estimation of resource flows and government expenditures such that relationships with past flows and future requirements not only of fixed investment and working capital but also of technology diffusion and non-material inputs like development of institutions, skills and price support, can be examined. Such issues
have been generally emphasized in the Five Year Plan documents and discussion on policy matters. The details of resource flows in a consistent system with empirical counterparts were presented in Appendix VII.” (CSO, 1984, pp.25-26).

**Flows: A Consistent System**

To begin with, consider a simple economy (complications are introduced subsequently) with two production sectors: call them Agriculture and non-Agriculture. There is a government sector but it only produces services which are also produced by a private non-profit sector. Table below describes the current flows of this system.

In this Example the government sector does not produce commodities. Intermediate purchases by industries of domestically produced goods (at and in by the agricultural sector: a2 and n2 by the non-agricultural sector) are separate from imported purchases (m1 by the agricultural sector and m2 by the non-agricultural sector). Only current flows are shown and hence purchase of capital equipment by producing sectors is not indicated. Value added has only two components, compensation to employees and the rest called surplus. In Accrual accounts similar principles are implemented through the life of a project. In addition there will be the problem of the Union, the States and local bodies.

**Current Inter-Sectoral Flows of a Simple Two Sector Economy**

Concepts of agriculture's inter-sectoral flows can now be illustrated. A moment's reflection shows the relationship. The table below is a consolidation of the commodity and the production account of the key economic activity agricultural sector in the SNA. However, in addition to the SNA, the inter-sectoral aspects are disaggregated, e.g., a1, nl g1 p1 m1 a2, ag, ap and ae. (For framework of inter-sectoral flows, see O. Lange,1981, also P. Cornillase, 1972.). Refer SNA. p. 218. Also FAO, 1974), pp.7-8.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Sales</th>
<th>Sl. No.</th>
<th>Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(1)</td>
<td>(2)</td>
</tr>
</tbody>
</table>

(1) Intermediate consumption
(i) for agriculture (a1)
(ii) for non-agriculture (a2)
(iii) for government services (ag)
(iv) for private non-profit services (ap)
(p1)

(2) Net Exports (ae Equals exports of From Imports (m1))
Economy level agricultural flows are obtained by adding up either side of the Table. Inter-sectoral flows would be obtained by deleting self-input into agriculture (seed, feed and wastage-all) and adding up the remaining elements on either side. It may be noted that agricultural inter-sectoral flows include strict inter-industrial flows (nl and a2), flows from and to the government (gl and ag) and private non-profit (p1 and ap) service sectors and the rest of the world (m1 and ae). Policy interests, of the kind expressed for the Bhattacharya group or the FAO were on gross flows (the first item listed in each bracket in the last sentence) since the concern was with impacts on levels of development of resource flows from non-agriculture to agricultural sectors. The impact of a resource transfer of a programme in which Rs. 1000 are spent on subsidies in agriculture would surely be different from another programme in which Rs. 1,000,000 are spent on an irrigation-cum-fertilizer distribution scheme but Rs. 999,000 are collected back, although the net financial flows.

However, for examination of certain policy questions, e.g., marginal impact of relative price changes, and also certain welfare indicators, the derivation of net flows from the price flows may also be important (the bracketed items listed above). External flows in Table 2 can be measured gross as intermediate imports by the agricultural sector (m1) or on a net basis after subtracting from such imports, net exports of the agricultural sector (m1-ae). Since capital flows have not yet been considered, imports of fixed capital formation items, e.g., machinery and contra items for balancing are discussed subsequently.

The assumption that the Government sector produces only services in Table has, therefore, to be relaxed. In addition, the concept of the first (agriculture) sector's linkage with the rest of the economy has to be delineated somewhat carefully. Taking the second point first, it is useful to classify the second sector into three separate sub-sectors. The first is the second sector intensive first sector. In this sector will be included industries which produce inputs almost exclusively for the first sector. The second sector will be the second proper sector and the third will be universal intermediaries. Universal intermediaries will be industries like electricity, POL products, other energy, transport and construction and will be important for the Government sector. Current account flows will include only rental or maintenance and repair costs of items of a capital nature. Assume that the remaining definitions
of Tables are as before with the addition that indirect taxes and subsidies have been added. A moment’s reflection will show that as regards flows this disaggregation only sharpens the definition of flows developed earlier but does not add on any further conceptual dimensions. The importance of flows to and from the first sector stand out in sharper relief and government services to the first sector intensive second sector can be estimated.

The conceptual advantages of the expanded system for the present discussion of government budgeting are two-fold. It helps in introducing the government and public sector explicitly in inter-sectoral production flows. Further, it sharpens the issues involved in estimating capital flows to the sectors. A simplifying assumption may be made that there is no direct public sector production activity in the first say land sector. However, to the Government sector flows of service defined in Tables 1 and 2 will now have to be added flows on account of production or distribution activities in the public sector in the first sector intensive second sector and universal intermediaries related with the first sector. These activities can be fairly important. An issue for discussion is the separation of general government services from the activities of the public sector. This separation has been provided following the UN Classifications on the subject. However, two aspects may be noted: (a) for working out the impact of the public sector (including general government) on the first sector, the two sub-components would need to be aggregated; and (b) as regards the impact on the first sector, transactions within the government/public sector will have to be consolidated, e.g. expenditures of public sector industries supplying to the first sector and contra entries in the government accounts relating to subsidies on such inputs cannot be double counted or again loans to the first sector will have to be shown at the point of disbursement to the sector and transactions within government/financial institutions will have to be netted out. This is not always done in Cash Flow Accounting.

The IMF Accrual System of Accounts Now

The foregoing discussion is important because the IMF has now broadened its concepts of government expenditure to include expenditures that build production potential (R. Basanti, IMF, 2004). The issues discussed in the last section are important to appreciate the importance of what the IMF is doing now, namely integrating government expenditure with economic sectors and capital formation.

Recommendations of the Committee

The Committee recommends that Estimates of resource flows to Agriculture be prepared as recommended by the Bhattacharya Committee.

The Committee recommends that the estimates of Resource Flows to Agriculture be prepared in the conceptual apparatus as recommended by the High Level Evaluation Committee of the CSO in 1984, the details of
which are contained in a separate chapter of that report based on a Group chaired by Y.K.Alagh of which the report is separately available.

**The Committee recommends that the system of resource flows to agriculture be synchronized with the system of accrual accounting now adopted by India and in the frame of inter-sectoral flows as outlined in this report. The Committee recommends that these accounts should be in place in 2015.**

**Crop Statistics**

Agriculture is the mainstay of the Indian economy because of its high share in employment and livelihood creation. It supports more than half a billion people by providing employment to 52 per cent of the workforce. Its contribution to the nation's GDP was about 14 per cent in 2010-11. It is also an important source of raw material and demand for many industrial products, particularly fertilizers, pesticides, agricultural implements and a variety of consumer goods.

The rapid growth of agriculture is essential for meeting as we saw the wage goods requirements of faster growth. Slow growth in relation to demand leads to the wages prices barrier to non inflationary growth. It is also important for meeting the food and nutritional security of the people, to bring about equitable distribution of income and wealth in rural areas as well as to reduce poverty and improve the quality of life. Growth in agriculture has a maximum cascading impact on other sectors, leading to the spread of benefits over the entire economy and the largest segment of population. More recently this has been described as the Rural Urban Continuum (Y.K.Alagh, 2012, 2013)

Agricultural statistics system in India is decentralized, both horizontally and vertically. Primary statistics are collected by the State governments (provincial or sub-national) and consolidated for the country as a whole by the Directorate of Economics & Statistics (DES), under the Department of Agriculture & Cooperation, Union Ministry of Agriculture. This system, which has evolved over the course of time, provides various sets of statistics, data, indices and indicators. Agricultural statistics are also generated through various surveys and statistical operations conducted by different institutions and government departments. The DES is the nodal agency for compiling, documenting and disseminating the basic data and the key indicators at the national level.

Crop and land use statistics are basic elements of the Agricultural Statistics System. India has been a pioneer in terms of providing crop and land use statistics though, of late, there has been significant deterioration in the quality of these statistics. In India, most part of country has detailed cadastral survey maps, regularly updated land records and the institution of a permanent village reporting agency, and thus, has all the necessary means to produce consistent, unbiased and on time statistics. The production of area statistics is related with the quality of land records,
which is poor. Quality improvement maintaining credibility are still under control provided attempts are made immediately before these become out of control. The following sections deal with the current status and deficiencies of the system and what needs to be done to improve it.

**Crop Area Statistics**

From the point of view of crop area statistics, the States and Union Territories can be classified into three broad groups. Details of all these three groups are as under:

**Temporarily settled States:** Cadastral surveyed and area and land use statistics form a part of the land records maintained by the revenue agency. This system is followed in 18 States namely, Andhra Pradesh, Assam (excluding hill districts), Bihar, Chhattisgarh, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttaranchal and Uttar Pradesh, and the five Union Territories of Chandigarh, Dadra and Nagar Haveli, Daman and Diu, Delhi and Pondicherry.

- Statistics of crop area are compiled with the help of the village revenue agency (commonly known as *patwari* agency).
- A complete enumeration of all fields (survey numbers) called *girdawari* is made in every village during each crop season to compile land use, irrigation and crop area statistics.
- Due to complete enumeration, *girdawari* considered fairly reliable and also because of the *patwari*’s intimate knowledge of local agriculture and his ready availability in the village.
- An increasing range of functions assigned to the *patwari*, the *girdawari* tended to receive low priority

**Permanently settled States:** No land revenue agency at the village level exists, crop area and land use statistics are collected through a scheme of sample surveys. Permanently settled states are Kerala, Orissa and West Bengal. Statistics of crop area are compiled by specially appointed field staff under a scheme known as “Establishment of an Agency for Reporting Agricultural Statistics (EARAS)” *Girdawari* is limited to a random sample of 20 per cent villages of the State, which are selected in such a way that during a period of five years, the entire State is covered.

**States with Conventional Estimates:** Only “conventional” estimates are available and includes Part of Assam (hill districts), Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura, and the two Union Territories of Andaman and Nicobar Islands and Lakshadweep. Tripura and Sikkim (except some minor pockets) are cadastrally surveyed and remaining part is based on conventional crop estimates based on personal assessment of the village chowkidars

The three categories of States and Union Territories account for eighty-six, nine and five per cent, respectively of the total reporting area. Besides, there is non-reporting area of around seven per cent of the geographical area that mainly consists of the
hill tracts of North-Eastern States and the area under illegal occupation of Pakistan and China. No statistics are available for these areas.

It is well known that land ownership and tenancy statistics leave much to be desired. An overarching legislation is now introduced to build a land market. The structure is there. But the market is not. Not that buyers and sellers are not there. They are but who is a seller? Land records are in considerable difficulty as studies of the Lal Bahadur Shastri Academy bring out. In some (actually very few) States there is a modicum of a factual base. Computerization and use of information technology and in fact satellite imagery is more common. Google Earth or something like it can give you an authentic imagery of the patta, but it does not tell you whose name is there in the Sat Bara and the alterations in it.

Studies first brought to our attention in the seventies, that there is a pervasive structure of what is now called ‘reverse tenancy’. This is the phenomenon that small farmers lease their land to middle or large farmers and go to the town and work as landless labourers. By now this is very widespread and Census results and NSS surveys tirelessly tell us that casualization of the labor force is the dominant trend in the rural labor market. More recent surveys say more so. This is so since tenancy is illegal. The wo(man) who tills the land is more often than not, not the owner. But the records don’t say so for tenancy is against the law. In some parts of India the tenant is a small farmer and the person who owns it lives in the city. Again the farmer has some rights. Those parts of India are very populous so a lot of people are involved. The civil servants Yugandhar and B.K.Sinha, put it all on paper in a series of studies done by the Lal Bahadur Shastri Academy at Mussoorie and called a National Conferences to ‘solve’ the problem. But inspite of improvements, unrecorded tenancy still continues and in the better off States where land for non agricultural use is in greater demand, the problem is worse.

This is of course, a serious problem. In a way there is a market of sorts even now. In a typical village in Western India or in the Deccan Plateaux, a sixth to a fifth of the influential middle or large farmers will till two thirds plus of the agricultural land where anywhere upto half, is leased in. In Poorer India, a large part of marginal farmers would have leased in say a fifth to a third of the land. It is all illegal. The first thing is to legalize all this. We must create the base of a legal market. There is enough experience to show that it can be done. A good Collector can show how s(he) has done it. Then the farmer including the one who has lease status will have rights which can be bought and sold. Having said all this it is very clear that the land legislation is an important step in the right direction.

It will raise the land price. But what that will show is that the real cost of investment at the margin is high and the country has to get used to its real scarcities whether they are land, water or energy.

In order to improve the timeliness and quality of crop area statistics, A scheme “Improvement of Agricultural Statistics” is in operation since early seventies. The Scheme has three major components namely , Timely Reporting Scheme (TRS),
Establishment of an Agency for Reporting of Agricultural Statistics (EARAS), Improvement of Crop Statistics (ICS).

**Timely Reporting Scheme (TRS):** TRS is being implemented in 16 land record States namely, Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand, Jharkhand and Chhattisgarh and two Union Territories namely, Delhi and Puducherry. Principal objective of the Scheme is to reduce time lag in making available the area statistics of major crops in addition to providing the sampling frame for selection of crop-growing fields for crop cutting experiments. Under the TRS, the *patwari* is required to complete the *girdawari* on a priority basis in a 20 per cent random sample of villages and to submit the village crop statements to higher authorities by a stipulated date for the preparation of advance estimates of the area under major crops. These are used in the framing of crop forecasts. The TRS sample of villages is also selected in such a way that the entire temporarily settled parts of the country are covered over a period of five years.

**Establishment of an Agency for Reporting of Agricultural Statistics (EARAS):** EARAS is implemented in three non-land record States, namely, Kerala, Orissa and West Bengal and four North Eastern States, namely, Arunachal Pradesh, Nagaland, Sikkim and Tripura. In the absence of any Government Department for the regular updating of land records in these States, a full time agency for collection of statistics of area, production and yield rate has been established in each of the implementing States. The basic methodology under this component is the same as in TRS.

**Improvement of Crop Statistics (ICS):** Under the ICS scheme, an independent agency of supervisors carries out a physical verification of the *patwari’s girdawari* in a sub-sample of the TRS sample villages (in four clusters of five survey numbers each); and makes an assessment of the extent of discrepancies between the supervisor’s and *patwari’s* crop area entries in the sample clusters. The supervisor also scrutinises the village crop abstract prepared by the *patwari* and checks whether it is free from totaling errors and whether it has been dispatched to the higher authorities by the stipulated time. The ICS also covers the permanently settled States and the supervisory agency in this case too carries out the check in a sub-sample of EARAS sample villages using the same methodology which is followed in the temporarily settled States. In all, 10,000 sample villages are covered by the ICS, roughly 8,500 in the temporarily settled States and 1,500 in the permanently settled States. The National Sample Survey Organisation is responsible for the planning and operations of the ICS and employs full-time staff for field supervision. It shares the fieldwork with the designated State agencies, which carry out the field supervision in about half the number of sample villages.
Area data and corresponding pictorial representation for the year 2000-01 to 2009-10 have been given below and it can be inferred from them that the area under different crop group have remained more or less same.

<table>
<thead>
<tr>
<th>Year</th>
<th>Coarse Grain</th>
<th>Cotton</th>
<th>Oil Seed</th>
<th>Paddy</th>
<th>Pulses</th>
<th>Sugar</th>
<th>Wheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-01</td>
<td>30618.012</td>
<td>8594.3</td>
<td>24740.17</td>
<td>44816.432</td>
<td>21036.16</td>
<td>4396.005</td>
<td>25803.1</td>
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<tr>
<td>2001-02</td>
<td>29846.559</td>
<td>9120.04</td>
<td>24598.2</td>
<td>44917.891</td>
<td>22516.15</td>
<td>4502.269</td>
<td>26323.1</td>
</tr>
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<td>2002-03</td>
<td>27285.671</td>
<td>7708.689</td>
<td>23324.25</td>
<td>41349.847</td>
<td>21376.85</td>
<td>4569.477</td>
<td>25244.13</td>
</tr>
<tr>
<td>2003-04</td>
<td>30779.351</td>
<td>7597.989</td>
<td>25353.15</td>
<td>42612.382</td>
<td>23742.27</td>
<td>4077.788</td>
<td>26585.51</td>
</tr>
<tr>
<td>2004-05</td>
<td>28866.943</td>
<td>8800.849</td>
<td>29671.52</td>
<td>42097.263</td>
<td>22921.67</td>
<td>3659.48</td>
<td>26455.44</td>
</tr>
<tr>
<td>2005-06</td>
<td>29065.14</td>
<td>8677.189</td>
<td>29871.14</td>
<td>43659.932</td>
<td>22834.72</td>
<td>4221.39</td>
<td>26484.2</td>
</tr>
<tr>
<td>2006-07</td>
<td>28716.935</td>
<td>9144.589</td>
<td>28469.26</td>
<td>43805.432</td>
<td>23617.62</td>
<td>5150.8</td>
<td>27995.1</td>
</tr>
<tr>
<td>2007-08</td>
<td>28646.092</td>
<td>9408.784</td>
<td>28537.18</td>
<td>44043.771</td>
<td>24472.56</td>
<td>5152.77</td>
<td>28653.15</td>
</tr>
<tr>
<td>2008-09</td>
<td>27432.771</td>
<td>9402.855</td>
<td>29118.77</td>
<td>45714.995</td>
<td>22653.58</td>
<td>4610.661</td>
<td>28065.69</td>
</tr>
<tr>
<td>2009-10</td>
<td>27432.771</td>
<td>9402.855</td>
<td>29118.77</td>
<td>45714.995</td>
<td>22653.58</td>
<td>4610.661</td>
<td>28065.69</td>
</tr>
</tbody>
</table>

From the above table and Graph, it is clear that increasing the crop area is almost impossible and the land constraint is now binding. Now, the only choice left with India is to increase the productivity in order to meet the requirement.

**CROP PRODUCTION**

Production estimates are obtained by multiplying the area under crop with yield rate. The yield rate estimates are based on scientifically designed Crop Cutting Experiments (CCE) conducted under the General Crop Estimation Survey (GCES). The GCES covers around 68 crops (52 food and 16 non-food) in 22 States and 4 Union Territories. The estimates are based on 5,00,000 experiment and the survey design adopted is that of a stratified three stage random sampling with tehsil or
taluka as the stratum, a village as the first stage unit, a field growing the specified crop as the second stage unit and a plot, usually 5m x 5m, as the ultimate unit. The experiment consists of marking the plot and harvesting and weighing the produce from the plot. These weights form the basic data for yield estimation. The number of experiments and their distribution over the strata are made in a manner to be able to obtain the yield rate estimates with a fair degree of precision at the level of the State and each major crop-growing district. The field staff is periodically trained to conduct crop cutting experiments. The Improvement of Crop Statistics (ICS) scheme carries out a quality check on the field operations of GCES under which around 30,000 experiments are supervised by the ICS staff at the harvesting stage, out of which half of the experiments are supervised by the Assistant Superintendents of the Field Operations Division (FOD) of NSSO and the remaining half by the staff of the State Agricultural Statistics Authority (SASA).

Production data and corresponding pictorial representation for the year 2000-01 to 2009-10 have been given below and it can be inferred from them that the production for all the crops except for sugar has shown steady growth as indicated in the area table however for sugar frequent and unsystematic movement exists.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse Grain</td>
<td>31360.057</td>
<td>33792.222</td>
<td>26524.753</td>
<td>37521.603</td>
<td>32849.579</td>
<td>34069.439</td>
<td>33935.112</td>
<td>40537.842</td>
<td>39455.66</td>
<td>39455.66</td>
</tr>
<tr>
<td>Cotton</td>
<td>4927.5476</td>
<td>5114.8056</td>
<td>4509.1007</td>
<td>7027.692</td>
<td>8772.5071</td>
<td>9434.541</td>
<td>11542.218</td>
<td>13218.736</td>
<td>11341.223</td>
<td>11341.223</td>
</tr>
<tr>
<td>Oil Seed</td>
<td>31385.316</td>
<td>33482.925</td>
<td>27826.281</td>
<td>37989.275</td>
<td>38495.87</td>
<td>42836.257</td>
<td>40149.6</td>
<td>44748.787</td>
<td>41673.72</td>
<td>41673.72</td>
</tr>
<tr>
<td>Paddy</td>
<td>127996.34</td>
<td>139938.98</td>
<td>108310.06</td>
<td>131745.52</td>
<td>125146.91</td>
<td>137690.5</td>
<td>140033.35</td>
<td>144392.96</td>
<td>149476.11</td>
<td>149476.11</td>
</tr>
<tr>
<td>Pulses</td>
<td>14253.656</td>
<td>15715.01</td>
<td>13573.749</td>
<td>17173.66</td>
<td>15206.965</td>
<td>15881.124</td>
<td>16839.454</td>
<td>17629.921</td>
<td>17658.69</td>
<td>17658.69</td>
</tr>
<tr>
<td>Sugar</td>
<td>206226.41</td>
<td>216557.09</td>
<td>223292.3</td>
<td>160503.57</td>
<td>161992.05</td>
<td>216976.57</td>
<td>234670.64</td>
<td>297734.82</td>
<td>193881.18</td>
<td>193881.18</td>
</tr>
<tr>
<td>Wheat</td>
<td>69974.88</td>
<td>72755.581</td>
<td>66000.971</td>
<td>72139.793</td>
<td>68831.805</td>
<td>69357.25</td>
<td>75809.45</td>
<td>80797.792</td>
<td>82627.563</td>
<td>82627.563</td>
</tr>
</tbody>
</table>

**Crop Forecasts**

Final estimates are available much after the crop is harvested. However, the Government needs advance estimates of production for various decisions relating to pricing, distribution, export and import, etc. The Directorate of Economics & Statistics, Ministry of Agriculture (DESMOA) has been assigned to release estimate on principal food and non-food crops (food grains, oil seeds, sugarcane, fibres, etc.),
which account for nearly 87 per cent of agricultural output. Four forecasts are issued, the first in the middle of September, the second in January, the third towards the end of March and the fourth by the end of May.

The Way Ahead

Under the above circumstances, availability of reliable data on Agricultural statistics is critical for informed planning and decision making process. Further, owing to 73rd and 74th Amendments to the Constitution, micro level data for regional and panchayat level planning assumes greater importance. Timely and reliable statistics on crop production and crop area have been covered by the Vaidyanathan Committee of the NSC and this Committee would endorse that report.

The issue of unrecorded tenancies has already been described. It needs to be addressed in terms of information basis particularly after the proposed land legislation. Some sectors are becoming more important in terms of demand changes on account of high income elasticities of demand (see above) and the openness of the economy. These sectors like plantations, horticulture crops, livestock, Fishery and forestry sectors need to be addressed.

Plantation crops

Plantation crops in India are considered to be the main segment of the horticulture crops. They are the mainstay of agrarian economies in many States and Union Territories (UTs) of the country. They play an important role in the agricultural and industrial development of the country as a whole. They contribute a significant amount to the national exchequer and country’s exports by way of excise and export earnings. They also provide direct and indirect employment to large number of people in the country, and thus tries to supplement the poverty alleviation programmes, especially in rural sector.

Plantation crops constitute a large group of crops. The major plantation crops include coconut, arecanut, oil palm, cashew, tea, coffee and rubber; and the minor plantation crops include cocoa. India is the largest producer and consumer of cashew nuts. The total production of cashew is around 0.57 million tonnes from an area of 0.24 million hectares. India also holds number one position in arecanut production.

Tea and coffee are the main and oldest industries in the country, which provide ample employment opportunities to the people at large and holds immense potential for export. India is one of the largest tea producer in the world. Coffee is the second largest traded commodity in the world and is an extremely important foreign
exchange earner. The coffee industry of India is one of the largest producer of coffee in the world.

India is the third largest producer of coconut and leads 90 coconut-producing countries of the world. The area for coconut plantation in India has been majorly distributed over 18 States and 3 UTs, under different agro-climatic conditions. India is a premier coir manufacturing country in the world. Wide range of coconut products, edible and non-edible, are available for both domestic and export market. Tender coconut water concentrate is another product, apart from soft drinks, which is manufactured and marketed successfully.

But, in India, plantation crops have been continuously facing the problem of lack of investment and depressed yields, and are in great need of modernisation. Their total coverage is comparatively less and they are mostly confined to small holdings. Thus, the Government of India has identified some prominent crops as high-value crops of great economic importance. It is taking all possible steps and initiatives to commercialize the sector. Tea, coffee, rubber and coconut industries are providing greater business opportunities to the investors worldwide.

Production and area table of plantation crops have been shown below for the year 2006-07 to 2010-11. Area of plantation crops is more or less constant but production is decreasing.

<table>
<thead>
<tr>
<th>Crops</th>
<th>Area (In '000 Hectares)</th>
<th>Production (In '000 Tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2006-07</td>
<td>2007-08</td>
</tr>
<tr>
<td>Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arecanut</td>
<td>383</td>
<td>387</td>
</tr>
<tr>
<td>Cashewnut</td>
<td>854</td>
<td>868</td>
</tr>
<tr>
<td>Cocoa</td>
<td>30</td>
<td>32</td>
</tr>
<tr>
<td>Coconut</td>
<td>1940</td>
<td>1903</td>
</tr>
<tr>
<td>Total</td>
<td>3207</td>
<td>3190</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Crops</th>
<th>Area (In '000 Hectares)</th>
<th>Production (In '000 Tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2006-07</td>
<td>2007-08</td>
</tr>
<tr>
<td>Arecanut</td>
<td>483</td>
<td>490</td>
</tr>
<tr>
<td>Cashewnut</td>
<td>620</td>
<td>665</td>
</tr>
<tr>
<td>Cocoa</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Coconut</td>
<td>10894</td>
<td>10894</td>
</tr>
<tr>
<td>Total</td>
<td>12007</td>
<td>11300</td>
</tr>
</tbody>
</table>

Small Plantations are a significant part of our plantation economy and statistics for that sector leave much to be desired. For example in recent periods we know that crops like turmeric, vanilla and cocoa have faced global competition but data to meet such challenges in time is
unavailable, leading to considerable farm unrest and lack of information for adequate policy responses.

**Horticultural crops**

'Horticulture and allied' sector is an integral element for food and nutritional security in the country. Horticulture is the main segment, while its various sub-segments are fruits, vegetables, aromatic and herbal plants, flowers, spices and plantation crops. All these are regarded as the essential ingredients of economic security. The wide range of agro-climatic conditions of India is conducive for growing a large variety of horticultural crops, including, root and tuber crops, mushroom, ornamental crops, plantation crops like coconut, arecanut, cashew and cocoa. Contribution of horticulture crops to GDP(Agriculture) is about 30%.

<table>
<thead>
<tr>
<th>Year</th>
<th>GVO - Agriculture</th>
<th>GVO - Horticulture</th>
<th>Percentage Share of Horticulture</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004-05</td>
<td>461290</td>
<td>132576</td>
<td>28.70%</td>
</tr>
<tr>
<td>2005-06</td>
<td>488593</td>
<td>141001</td>
<td>28.90%</td>
</tr>
<tr>
<td>2006-07</td>
<td>507966</td>
<td>146603</td>
<td>28.90%</td>
</tr>
<tr>
<td>2007-08</td>
<td>535370</td>
<td>153722</td>
<td>28.70%</td>
</tr>
<tr>
<td>2008-09</td>
<td>532515</td>
<td>160066</td>
<td>30.10%</td>
</tr>
</tbody>
</table>

The Government of India has recognized horticulture crops as a means of diversification in agriculture in an eco-friendly manner through efficient use of land and optimum utilization of natural resources. Horticulture seeks to create ample opportunities for employment, particularly for unemployed youths and women folk. India has maintained leadership in the production of many commodities like mango, banana, acid lime, coconut, arecanut, cashew, ginger, turmeric and black pepper. Presently, it is the second largest producer of fruits and vegetables in the world.

India is next only to China in area and production of vegetables and occupies prime position in the production of cauliflower, second in onions and third in cabbage in the world. India has also made noticeable advancement in the production of flowers. Further, it is the largest producer, consumer and exporter of spices. India is home to a wide variety of spices like black pepper, cardamom (small and large), ginger, garlic, turmeric, chilli and a large variety of tree and seed spices. Almost all the States in the country grow one or more spices. The major spice producing States are Andhra Pradesh, Tamil Nadu, Odisha and Madhya Pradesh. North Eastern region and Andaman and Nicobar Islands also have potential areas cultivated for spices, particularly organically.
Further, coconut is a versatile crop and about 10 million people depend on its cultivation, processing and related activities. It is grown mainly along the coastal States of the country as well as in the North-Eastern region. It is grown over an area of 1.84 million ha. with a production of 8.67 million tonnes. India is a leading country in the world for coconut production.

Thus, over the years, much progress has been made for the advancement of horticulture and allied sector. Rising investments have resulted in increased production and availability of horticultural produce in the rural and urban areas. Many schemes and policies have been introduced, from time to time, for upliftment and commercialization of the sector. Large number of investors are taking advantage of the existing potentials in the sector, as well as trying to explore the untapped potential.

The two main sources of data for Horticulture crops are Crop Estimation Survey on Fruits and Vegetables by the Directorate of Economics and Statistics, Ministry of Agriculture (DESMOA) and National Horticultural Board (NHB). The survey, which is still in a “pilot” stage follows a stratified three-stage random sampling design in the case of fruit crops, with village, orchard and fruit bearing tree as the sampling units at the successive stages thus the production estimates DESMOA survey are technically sound but are complex, time consuming and rather difficult to implement in practice. Further, the survey is limited to 11 States due to lack of necessary staff resources. The estimates furnished by the NHB are subjective to the reports received from the ground-level staff. There is significant difference between the results of NHB & DESMOA estimates leading to confusion. Neither NHB nor DESMOA provide estimates of production of crops such as mushroom, herbs and floriculture that are of emerging commercial importance.

Production and area table of Horticulture Crop have been shown below for the year 2006-07 to 2010-11. Area of Horticulture Crop is more or less constant but production is increasing over the years.

<table>
<thead>
<tr>
<th>Area under different Horticulture Crop:</th>
<th>Area (In '000 Hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crops</td>
<td>2006-07</td>
</tr>
<tr>
<td>Total Fruits</td>
<td>5554</td>
</tr>
<tr>
<td>Total vegetable Total</td>
<td>7581</td>
</tr>
<tr>
<td>Aromatic</td>
<td>324</td>
</tr>
<tr>
<td>Flowers Cut*</td>
<td>144</td>
</tr>
<tr>
<td>Flowers Loose</td>
<td>3207</td>
</tr>
<tr>
<td>Spice Total</td>
<td>2448</td>
</tr>
<tr>
<td>Total</td>
<td>19389</td>
</tr>
</tbody>
</table>
Production of different Horticulture Crop: Production (In '000 Tonnes)

<table>
<thead>
<tr>
<th>Crops</th>
<th>2006-07</th>
<th>2007-08</th>
<th>2008-09</th>
<th>2009-10</th>
<th>2010-11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fruits</td>
<td>59563</td>
<td>10885</td>
<td>68465</td>
<td>71516</td>
<td>75826</td>
</tr>
<tr>
<td>Total Vegetable</td>
<td>90349</td>
<td>128449</td>
<td>129078</td>
<td>134102</td>
<td>137687</td>
</tr>
<tr>
<td>Total Aromatic</td>
<td>178</td>
<td>396</td>
<td>430</td>
<td>573</td>
<td>610</td>
</tr>
<tr>
<td>Flowers Cut*</td>
<td>37158</td>
<td>43644</td>
<td>47942</td>
<td>66671</td>
<td>69027</td>
</tr>
<tr>
<td>Flowers Loose</td>
<td>880</td>
<td>868</td>
<td>987</td>
<td>1021</td>
<td>1031</td>
</tr>
<tr>
<td>Plantation Crops</td>
<td>12007</td>
<td>11300</td>
<td>11336</td>
<td>11928</td>
<td>11968</td>
</tr>
<tr>
<td>Spice Total</td>
<td>3953</td>
<td>4357</td>
<td>4145</td>
<td>4016</td>
<td>4016</td>
</tr>
<tr>
<td>Total</td>
<td>191813</td>
<td>211235</td>
<td>214442</td>
<td>223155</td>
<td>231138</td>
</tr>
</tbody>
</table>

Source: Department of Agriculture and Cooperation (Horticulture Division).

There is intense need for reliable statistics for the Horticulture segments not well covered, where demand is rising fast and prices fluctuate widely

**Medicinal Plants and Aromatic Plants**

Globally, medicinal and aromatic plants (MAPs) constitute one of the integral parts of the biodiversity, ecosystem and biological heritage. Medicinal and aromatic plants are being used since ancient time for the treatment of many diseases in traditional and recognized systems of healthcare and for therapeutic, fragrance and flavoring products in pharmaceutical and cosmetic industries besides as sources of natural dye, fats and oil, essential oil, biopesticide, carbohydrate, resins, protein, vitamins, condiment, spices, timber, fiber and other useful substances. Plants are also considered to be the prime source of drug and aroma molecules and their precursors in modern medicine.

India is one of the twelve mega-diversity countries in the world and extremely rich in biological diversity with high level of endemism. Out of 34 biodiversity hotspots-earth's biologically richest place- India houses the major parts of three important biodiversity hotspots namely Himalayas, Western Ghat and Indo-Burma with about 45000-50000 plant species and 4,900 endemic species of flowering plants. Thus we have tremendous opportunities to convert them into the useful bio-resources by adopting sustainable collection, characterization, documentation, conservation and utilization for the food, environmental and health securities through strategic participatory research, developmental and promotional approaches to deliver the end products to the society for their utilization. Loss of biodiversity is a global phenomenon. More than one decade after the implementation of the Convention on Biological Diversity (CBD), the recognition of biodiversity loss has gained lot of attention at global, national and regional levels. The United Nations proclaimed '2010' as the International Year of Biodiversity and people all over the world are working to safeguard this irreplaceable natural wealth and reduce biodiversity loss.
Medicinal and aromatic plants (MAPs) are produced and offered in a wide variety of products, from crude materials to processed and packaged products like pharmaceuticals, herbal remedies, teas, spirits, cosmetics, sweets, dietary supplements, varnishes and insecticides (Ohmann 1991; Gorecki 2002; Lange 1996). The use of botanical raw material is in many cases much cheaper than using alternative. An estimated number of 70,000 plant species are used in folk medicine worldwide (Farnsworth and Soejarto 1991), a figure that has recently been confirmed by Schippmann et al. (see their chapter in this book). As a consequence, there is an enormous demand in botanicals – for domestic use and for commercial trade –resulting in a huge trade on local, regional, national and international level. As the production of botanicals still relies to a large degree on wild-collection (i.a. Bhattarai1997; He and Ning 1997; Lange 1998; 2002; Robbins 1999; Kupke et al. 2000; Katheet al. 2003), profound knowledge of trade, size, structure and streams as well as of commodities, traded quantities and their origin is essential for assessing its impact on the plant populations concerned.

India should focus on aspects associated with the international trade in medicinal and aromatic plant material, in particular on aspects of trade streams, trade structure, trade volumes and trade values.

**MEDICINAL AND AROMATIC PLANTS IN TRADE**

All commodities have to be declared on import into and export from a country in accordance with the prevailing tariff regulations providing product name, quantity, value, and country of origin or destination country, respectively. For this purpose, goods entering external merchandise trade are classified in trade according to different customs codes, which classify and codify merchandise into commodity groups.

<table>
<thead>
<tr>
<th>Year (in '000 T) and Area (in 000 H) for aromatic Plants</th>
<th>Production</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-07</td>
<td>324</td>
<td>178</td>
</tr>
<tr>
<td>2007-08</td>
<td>397</td>
<td>396</td>
</tr>
<tr>
<td>2008-09</td>
<td>430</td>
<td>430</td>
</tr>
<tr>
<td>2009-10</td>
<td>509</td>
<td>573</td>
</tr>
<tr>
<td>2010-11</td>
<td>516</td>
<td>610</td>
</tr>
</tbody>
</table>

Production and area of Aromatic crops shows that for the year 2006-07 to 2010-11, both are increasing fast. A Data base is needed for policies for this important area of activity to attract investment, meet rising domestic demand and earning through exports.
Livestock Statistics

Dairying has become an important secondary source of income and employment for millions of rural families. The Indian Dairy Industry achieved an annual output of 97.1 million tonnes of milk in 2005-06 and 112 million tonnes (provisional) in 2010/11. Most of the milk is produced by small, marginal farmers and landless labourers who are grouped into cooperatives at the village level. To provide them a steady market and a remunerative price for the milk produced, about 12 million farmers have been brought under the ambit of more than one lakh village level cooperative societies in the country.

Department of Animal Husbandry, Dairying & Fisheries, under the Ministry of Agriculture is responsible for matters relating to livestock production, preservation, protection and improvement of stocks, dairy development and also for matters relating to the Delhi Milk Scheme and the National Dairy Development Board. It also looks after all matters pertaining to fishing and fisheries, which includes inland and marine sectors and matters related to the National Fisheries Development Board.

The Department has been providing assistance to the State Governments for the control of animal diseases, scientific management and upgradation of genetic resources, increasing availability of nutritious feed and fodder, sustainable development of processing and marketing facilities and enhancement of production and profitability of livestock and fisheries enterprises. State Governments have set up separate departments which are responsible for development of animal husbandry and dairying in the State.

Central Statistics Office (CSO) has been using the production data only in respect of Milk, Meat, Egg and Wool received from Department of Animal Husbandry (ISS) and data for remaining items of livestock sector, the department is solely dependent on the state agencies. Authentication of data has been always a problem. GDP from this sector since 2004-05 is given in the table below:

<table>
<thead>
<tr>
<th>Year</th>
<th>04-05</th>
<th>05-06</th>
<th>06-07</th>
<th>07-08</th>
<th>08-09</th>
<th>09-10</th>
<th>10-11</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP-Livestock</td>
<td>119332</td>
<td>126765</td>
<td>133338</td>
<td>141398</td>
<td>153219</td>
<td>161424</td>
<td>164462</td>
</tr>
<tr>
<td>GR</td>
<td>6.2</td>
<td>5.2</td>
<td>6.0</td>
<td>8.4</td>
<td>5.4</td>
<td>1.9</td>
<td></td>
</tr>
</tbody>
</table>

In the preparation of Estimation of Value of Output for Livestock Sector statistics collected by Department of Animal Husbandry under Integrated Sample Survey (ISS) do not have sufficient coverage. ISS does not include Unregistered Sector for meat and animals slaughters, Meat Product (Heads and Legs, Fats from Slaughter and Fallen Animals) and Meat Byproduct (Hides and Skins), Camel and Sheep Milk, Duck
Egg for all the states, Goat Hair, Camel Hair and Pig Bristles, inputs of livestock sector i.e. Feed of Livestock, Market Charges and Operational Cost.

**It has to be noted that this is again a sector with high inflation potential with rising incomes. Also it has great income earning possibilities as the National Dairy Development Plan shows.**

**Fishery Statistics**

The *fisheries and aquaculture sector* is recognized as the sunshine sector in Indian agriculture. It stimulates growth of number of subsidiary industries and is the source of livelihood for a large section of economically backward population, especially fishermen, of the country. It helps in increasing food supply, generating adequate employment opportunities and raising nutritional level. It has a huge export potential and is a big source of foreign exchange earnings for the country.

The 'Department of Animal Husbandry, Dairying and Fisheries' is the main authority for development of fisheries' industry in India. It has been undertaking, directly and through the State Governments and the administrations of the Union Territories, various production, input supply and infrastructure development programmes and welfare-oriented schemes; besides formulating and initiating appropriate policies to increase production and productivity in the fishery sector. Further, the 'Ministry of Food Processing Industries' is another main agency responsible for sound growth of fish processing segment in India.

However, fishery is basically a State subject and the primary responsibility for its development rests with the State Governments. The major thrust in fisheries development has been optimising production and productivity; augmenting export; generating employment and improving welfare of fishermen and their socio-economic status.

Over the years, fisheries' industry is growing. This covers both capture and culture including inland and sea, aquaculture, gears, navigation, oceanography, aquarium management, breeding, processing, export and import of seafood, special products and by-products, research and related activities.

Accurate data on assessment of fishery resources, potential in terms of fish production; development of sustainable technologies for fin and shell fish culture; yield optimisation; harvest and post-harvest operations; landing and berthing facilities for fishing vessels and welfare of fishermen; etc. is not available.

As regards marine fisheries statistics, sample methodology in use is considered to be satisfactory. There is, however, a need for periodic review of sample size, stratification and intensity of data collection in view of the changes in the pattern of fish landings. There are also problems in the flow of data from States and
consequently delay in the compilation of all-India statistics. As far as the deep-sea sector is concerned, though only a small number of licensed vessels are in operation, the data on fish catch do not flow in a regular manner. There is a need to put in place a proper mechanism of reporting for this purpose.

The data on fish production from the inland sector are collected by the State Governments. The resources required for regular data collection are quite large and the cost incurred is not commensurate with the actual volume of fish production. Inland fisheries pose several problems due to the vast and diverse nature of water sources and it is necessary to develop a cost-effective methodology. IASRI is presently engaged in pilot studies in this regard but more concerted effort is urgently called for.

<table>
<thead>
<tr>
<th></th>
<th>at constant prices(2004-05)</th>
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<tbody>
<tr>
<td>value of output</td>
<td></td>
</tr>
<tr>
<td>inland fish *</td>
<td>31989</td>
</tr>
<tr>
<td>marine fish</td>
<td>15743</td>
</tr>
<tr>
<td>repairs, maintenance and other operational costs</td>
<td>16246</td>
</tr>
<tr>
<td>gross domestic product **</td>
<td>4836</td>
</tr>
<tr>
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<td>27152</td>
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</table>

The data on fish production from aquaculture, supplied by the States, similarly suffer from poor quality and become available with considerable time lag. The types of culturing methods are not reflected in the data. The data on fisherman population, fishing craft and gear are available from both the State Governments and the Livestock Census, while data on workers engaged in fishing are also available from the population census. However, the data from these sources are not comparable due to differences in concepts and definitions and their application across State. There is an apparent inconsistency between the value of the output and the export earnings, the latter being much higher. An exploratory study is required to reconcile the discrepancy.

Forestry Statistics

Forestry in India is a significant rural industry and a major environmental issue. Dense forests once covered India. As of 2010, the Food and Agriculture Organization of the United Nations estimates India's forest cover to be about 68 million hectares, or about 20 percent of the country's area. In qualitative terms, however, the dense
forest in almost all the major Indian states has been reduced. Forest degradation is a matter of serious concern.

In 2002, forestry industry contributed 1.7 percent to India's GDP. In 2006, the contribution to GDP dropped to 0.9 percent; largely because of rapid growth of Indian economy in other sectors and Indian government's decision to reform and reduce import tariffs to let imports satisfy the growing Indian demand for wood products.

India produces a range of processed forest (wood and non-wood) products ranging from sawnwood, panel products and wood pulp to bamboo, rattan ware and pine resin. India's paper industry produces over 3 million tonnes annually from more than 400 mills, which unlike their international counterparts, mostly uses the more sustainable non-wood fiber as the raw material. Furniture and craft industry is another consumer of wood.

India's wood-based processing industries consumed about 30 million cubic meters of industrial wood in 2002. An additional 270 million cubic meters of small timber and fuelwood was consumed in India. Some believe that the causes for suboptimal wood use include government subsidies on wood raw materials, poorly crafted regulations, and lack of competitive options for the rural and urban Indian consumer.

India is the world's largest consumer of fuelwood. India's consumption of fuelwood is about five times higher than what can be sustainably removed from forests. However, a large percentage of this fuelwood is grown as biomass remaining from agriculture, and is managed outside forests. Fuelwood meets about 40 percent of the energy needs of the country. Around 80 percent of rural people and 48 percent of urban people use fuelwood. Unless India makes major, rapid and sustained effort to expand electricity generation and power plants, the rural and urban poor in India will continue to meet their energy needs through unsustainable destruction of forests and fuelwood consumption.

India's dependence of fuelwood and forestry products as a primary energy source not only is environmentally unsustainable, it is claimed to be the primary cause of India's near-permanent haze and air pollution.

Forestry in India is more than just about wood and fuel. India has a thriving non-wood forest products industry, which produces latex, gums, resins, essential oils, flavours, fragrances and aroma chemicals, incense sticks, handicrafts, thatching materials and medicinal plants. About 60 percent of non-wood forest products production is consumed locally. About 50 percent of the total revenue from the forestry industry in India is in non-wood forest products category. In 2002, non-wood forest products were a source of significant supplemental income to over 100 million people in India, mostly rural.

Over the last 20 years, India has reversed the deforestation trend. Specialists of the United Nations report India's forest as well as woodland cover has increased. A 2010 study by the Food and Agriculture Organization ranks India amongst the 10
countries with the largest forest area coverage in the world (the other nine being Russian Federation, Brazil, Canada, United States of America, China, Democratic Republic of the Congo, Australia, Indonesia and Sudan). India is also one of the top 10 countries with the largest primary forest coverage in the world, according to this study.

From 1990 to 2000, FAO finds India was the fifth largest gainer in forest coverage in the world; while from 2000 to 2010, FAO considers India as the third largest gainer in forest coverage. Some 500,000 square kilometres, about 17 percent of India’s land area, were regarded as Forest Area in the early 1990s.

Significant forest products of India include paper, plywood, sawnwood, timber, poles, pulp and matchwood, fuelwood, sal seeds, tendu leaves, gums and resins, cane and rattan, bamboo, grass and fodder, drugs, spices and condiments, herbs, cosmetics, tannins and other non-wood forest products.

India is a significant importer of forest products. Logs account for 67 percent of all wood and wood products imported into India due to local preference for unprocessed wood. This preference is explained by the availability of inexpensive labor and the large number of productive sawmills. In trade year 2008-2009, India imported logs worth $1.14 billion, an increase of about 70% in just 4 years.

Indian market for unprocessed wood is mostly fulfilled with imports from Malaysia, Myanmar, Cote d'Ivoire, China and New Zealand.

India is growing market for partially finished and ready-to-assemble furniture. China and Malaysia account for 60 percent of this imported furniture market in India followed by Italy, Germany, Singapore, the United States, Hong Kong, Sri Lanka and Taiwan.

The Indian market is accustomed to teak and other hardwoods that are perceived to be more resistant to termites, decay and are able to withstand the tropical climate.

Teak wood is typically seen as a benchmark with respect to grade and prices of other wood species. Major imported wood species are tropical woods such as mahogany, garjan, marianti, and sapeli. Plantation timber includes teak, eucalyptus, and poplar, as well as spruce, pine, and fir. India imports small quantities of temperate hardwoods such as ash, maple, cherry, oak, walnut, beech, etc. as squared logs or as lumber. India is the world’s third largest hardwood log importer.

In 2009, India imported 332 million cubic meters of round wood mostly for fuel wood application, 17.3 million cubic meters of sawn wood and wood-based panels, 7.6 million metric tonnes of paper and paperboard and about 4.5 million metric tonnes of wood and fiber pulp. Value of output and overall GDP in Forestry Sector is given below:
The main drawback in the compilation of forestry statistics (as in the case of several other sectors) is the inordinate delay in the availability of data. Except the area under forest cover now being assessed by the biennial RS satellite survey, all the other published data have long time lags. The FSI faces the problem of delayed transmission of data by the States, which tend to accord low priority to the reporting work. Nearly half the States do not furnish the statistics in time, which delays the national compilation. The latest estimates of forest area based on Land Use Statistics pertain to 1996-97. There is a large discrepancy between the area under forest cover as published by FSI and by DESMOA mainly due to the differences in the concepts and definitions followed by two agencies.

**Employment in Forestry**

The data base of the population depending on forests in India is weak. Some estimates are on the very high side including populations living in districts with substantial forest populations, tribal populations and estimates of women collecting firewood for household consumption. There is, in these estimates, substantial double counting. At the other extreme unrevised India’s National Accounts Data estimates, that in 1980 only 0.25 million persons were working in the forestry and logging and hunting and trapping sectors. If marginal workers were added, this figure went up to 0.345 million. It also grows very slowly.

In a study done by Uma Lele, N.Kumar, Y.K.Alagh, N.C. Saxena published by the World Bank, employment in the forestry sector has been carefully estimated .The workforce dependent on forestry and logging is estimated at 5.32 million in 1993 as contrasted with the earlier estimate of 0.345 million in 1980. The rural workforce goes up from 0.3 million in 1980 to 4.92 million in 1993. 3 million workers in 1993 are dependent on collection of uncultivated materials in the forestry sector which would correspond to minor forest produce. 2.93 million of these were in the rural...
areas out of which 2.1 million were women. Another 3.85 million workers were engaged in the cultivation of medicinal plants, but not all of these would be in forest areas. The plantation sector employed 94 million workers. Estimates of a 100 million plus seem to be on the higher side. The CSO’s estimates of employment in the forestry sector need larger exposure and discussion.

The ban on logging is absolutely necessary, but the forests should be nurtured to produce everything else. This is not happening and India is becoming one of the largest importers of forest products, while many other countries are large exporters, say of medicinal plants, organic chemicals of forest origin and so on. These are all on OGL. Import duties in many cases are 10 to 15%. The first thing to do is to reform the tax system, so that forest produce, particularly what is called minor forest produce is not discriminated against. Apple trees get protection at 60%, some trees at 40%, but most at 10%. In the eighties, the Report of the Advisory Board of Energy as late as 1985 emphasised the need to save non-renewable resources in energy consumption. The industrial use of wood was to be restricted where alternatives were available. The Report says “the use of wood as a raw material should be prohibited” (GOI, 1984.) Energy efficiency was to be improved in rural sectors and renewable energy sources were to be encouraged. The Board recommended and the Government accepted, towards the latter half of the eighties, a policy of placing imports of wood, pulp and intermediates on Open General Licence (free import with low tariffs.) There was also pressure from the World Bank, which said in 1993 “The tariffs for forest products have been reduced considerably over the past few years. Many have been cut by 50 to 60 % during last year, but need to be further reduced. Liberalizing policies for trade can bring about environmental improvement through greater economic efficiency and less waste” (World Bank, 1993, p. 36.)

In the years when the average tariff rates was 60 %, this Report gives the prevailing tariffs for forest raw materials as:

<table>
<thead>
<tr>
<th>Raw Materials</th>
<th>Tariffs %</th>
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<tbody>
<tr>
<td>Logs</td>
<td>5</td>
</tr>
<tr>
<td>Sacwn wood</td>
<td>15</td>
</tr>
<tr>
<td>Wood chips</td>
<td>10</td>
</tr>
<tr>
<td>Pulp</td>
<td>10</td>
</tr>
<tr>
<td>Waste paper</td>
<td>20</td>
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</table>

Forest policy needs a structure of market reform and for example let producer and joint forestry management committees enter into contracts with those who can sell. The role of cooperatives is clear. Domestic producers of forest products in India will benefit if markets for such products develop faster. The State Forestry Corporations, which were to play a positive intermediation role, have failed and in most cases, have drawn down their working capital and are parking lots for defeated political functionaries. The Report of the Perspective Planning Committee for Agricultural Markets, (Shankarlal Guru Committee)
shows the extremely inadequate nature of marketing infrastructure in “backward areas”. Most forest districts fall in this category.

Third, most successful attempts at watershed development and community forestry, have high economic rates of return and meet energy and fodder deficits, but need initial support. This requirement arises from three reasons. First, input costs on degraded lands are initially high, due to soil amendments, high seed rates and low yields in the initial period. Second, in forest areas input costs are high. Third output prices are low. The last two reasons can be ameliorated with a much larger investment flow in the rural marketing infrastructure. The issue of strategic intervention and market development for developing a policy framework for much faster decentralized forestry development needs urgent attention.

Fourth, there is a very little loan money given through the banking system for forestry investment in recent years. The Agro-Climatic Project has been referred to. In its Annual Report for 1991, NABARD covered the whole area of lending for support to agro-climatic planning and policies. In particular, the decision was announced to accept community collateral for watershed development and social forestry schemes and also that lending operations would be through the watershed development cycle of three to five years. However, not much progress has been made in accelerated credit disbursement under these initiatives.

Fifth at present most of the investment in forests and services for forest development is done in the public sector, through the Five Year Plans. But by now, many states have forestry plans of a very small size and foreign aided projects are a larger part of the total expenditure in those cases which have larger forest Plans.

Sixth there is need to clean up the financing and technology procedures and support systems. Today a tribal who grows a tree on his own land, cant get financial accommodation for the sixth year, if he has seen the tree through five years with his own savings. Trees are not collateral. If policy supports nurturing our forests, the sector will lead the next agricultural revolution. Poultry and dairying grew at 5 to 7% annually. Forest produce demand is growing at that rate. But production growth is zero. This must be reversed. Some of the policy reform required for the replication on a required scale of such projects includes: lending through a weather or project cycle, NABARD had started a scheme of this kind in 1991 as a part of the agro-economic regionalisation strategy, gave it up in 1993 and is again starting it now (See Boston Consultants report on NABARD); Financial institutions have to design structures such that community collateral is possible for viable projects. The Reserve Bank is seized of this matter.

The Data requirements for a dynamic Forestry sector are tremendous.

The Recommended Approach

The strategy for statistics for major crops has already been worked out by the Vaidyanathan Committee so we do not repeat it. We need to concentrate on specified issues like land records, tenancy practices, crops
which are not paid attention like plantations, vegetables and fruit and the animal husbandry, forestry and fisheries sector. The incomplete information base of these sectors has been described. So has their importance to policy in supporting non inflationary growth and developing trade policies. India has an old tradition of small sample surveys at the IARS. In the opinion of this Committee, the statistical base of the emerging parts of the agricultural sector needs to be covered by small sample surveys. This is particularly so since methodological issues like quality and classification of production are important.

The broad sweep survey of data basis in land records, tenancies, plantations, medicinal and aromatic crops, vegetables and fruits, animal husbandry, forestry and fisheries, shows both data lacunae as also conceptual ambiguities leading to data deficiencies. Small sample surveys will generate the information base and the required base for progress in these areas.

**Small Area Estimation Techniques**

Small area typically refers to the part of a population for which reliable statistics of interest cannot be produced due to small sample sizes. The method is flexible in meeting the needs of a diversifying and dynamic economy undergoing fast change. The topic of small areas has gained importance in view of growing needs of policy and micro level policy and planning responses. Demand for reliable small area statistics (SAS) are increasing with growing concerns of governments relating to issues of fast change on account of globalization, distribution, equity and disparity. The traditional sampling theory fails to provide reliable and valid estimates for small areas, which may get under pressure and conversely have potential to meet policy objectives.

Many Small Area Estimation (SAE) techniques have been developed which make use of information from other sources. They also borrow strength from related or similar areas through explicit and implicit models that connect the small areas via supplementary data. The need for statistics at lower levels has been felt for a long time and efforts have been made to meet the requirements through some traditional approaches. The initial SAE methods were invariably based on certain assumptions in the form of implicit models. There are several other traditional SAE methods available in literature. Purcell and Kish (1979) reviewed various methods available till that time. For an early review of other traditional methods, reference may be made to Platek et al. (1987). These models were, however, subsequently explicitly modelled and a number of model based SAE techniques are now available.

**Small Area Estimation**

In this section some of the widely used small area estimation methods are discussed. There are several traditional SAE methods available in literature. Purcell and Kish (1979) reviewed various methods available till that time. For an early review of other traditional methods, reference may be made to Platek et al. (1987). In what follows, we discuss, briefly, synthetic method of estimation which is by far
one of the most widely used SAE methods. This technique is a simple common sense approach for small area estimation.

Among the implicitly model based methods, the synthetic method of estimation has been used in variety of situations. The name synthetic estimation is credited to National Center for Health Statistics (NCHS, 1968). A commonly acceptable description of synthetic estimator due to Gonzalez (1973) is as follows: An unbiased estimate is obtained from a sample survey for a larger area. When this estimate is used to derive estimates for sub-areas having the same characteristics as the larger area, these estimates are identified as synthetic estimates. The approach is also called “scaling down” approach. Use of auxiliary information at the basic level is crucial for scaling down the larger area estimates to smaller area. The synthetic approach of estimation is based on the assumption that the small area behaves similarly as the large area. When this does not hold the synthetic estimate may turn out to be heavily biased and thus may not give a satisfactory estimate.

Alternative approaches which do not require strong assumptions have been developed in small area estimation problems. These approaches are based on explicit models. Explicit model based technique of small area estimation is commonly used in many developed and some developing countries. The explicit models make special allowance for between area variation and thus are not based on very strong assumption as is the case with synthetic approach of estimation. An example of explicit model approach is mixed models that take into account the area specific variation. The mixed model approach of micro level estimation through use of area level model can be very useful. In what follows, we give in brief the methodology of small area estimation using an area level model. Details are available in Rao (2003). An area level model has two components:

(i) the direct survey estimate of the parameter based on the sampling design, expressed as

\[ Y_d = y_d + e_d, \quad d = 1, \ldots, D, \tag{1} \]

where \( D \) is total number of small areas that constitute the finite population, \( y_d \) are unobserved small area means (i.e., our parameter of interest), \( Y_d \) are observed direct survey estimators (the sample mean in our case) and the \( e_d \)'s are independent sampling errors of survey estimate with \( \mathbb{E}(e_d | y_d) = 0 \) and \( \mathbb{V}(e_d | y_d) = \nu_d \). The model (1) is a sampling model and \( \nu_d \) is a design-based sampling variance.

(ii) A linking model

\[ y_d = z_d^T \beta + u_d, \quad d = 1, \ldots, D, \tag{2} \]

where \( z_d \) denotes \( p \)-vector of area (or District) level covariates, \( \beta \) is a \( p \)-vector of unknown fixed-effect coefficients and \( u_d \) is random effects (also called the model errors), assumed to be independent and identically distributed with \( \mathbb{E}(u_d) = 0 \) and \( \mathbb{V}(u_d) = \sigma_u^2 \).
Combining (1) and (2), we obtain the model

\[ Y_d = z_d^T \beta + u_d + e_d, \quad d = 1, \ldots, D. \tag{3} \]

Clearly, the model (3) integrates a model dependent random effect \( u_d \) and a sampling error \( e_d \) with the two errors being independent. The model (3) is a special case of the linear mixed model. For known variance \( \sigma_u^2 \), assuming model (3) holds, the Best Linear Unbiased Predictor (BLUP) for \( y_d \) (Henderson, 1963) is given by

\[ \hat{y}_d = z_d^T \hat{\beta} + \gamma_d (Y_d - z_d^T \hat{\beta}) = \gamma_d Y_d + (1 - \gamma_d) z_d^T \hat{\beta} \tag{4} \]

where \( \gamma_d = \sigma_u^2 / (v_d + \sigma_u^2) \) and \( \hat{\beta} = \left( \sum_d (v_d + \sigma_u^2)^{-1} z_d z_d^T \right)^{-1} \left( \sum_d (v_d + \sigma_u^2)^{-1} z_d Y_d \right) \) is the generalised least square estimate of \( \beta \). In practice, the variance \( \sigma_u^2 \) is usually unknown and they are replaced by sample estimates, \( \hat{\sigma}_u^2 \) (in equation (4) and \( \hat{\beta}_{GLS} \)) yielding the corresponding empirical BLUP (EBLUP) denoted by \( \hat{y}_d \). We note that the EBLUP \( \hat{y}_d \) is a linear combination of a direct estimate \( Y_d \) and the model dependent regression synthetic estimate \( z_d^T \hat{\beta}_{GLS} \), with weights given by \( \gamma_d \). Here \( \gamma_d \) is called 'shrinkage factor' since it 'shrinks' the direct estimator towards the synthetic estimator \( z_d^T \hat{\beta}_{GLS} \) (Rao, 2003, chapter 5).

Turning to mean squared error (MSE) estimation, if \( \beta \) and \( \sigma_u^2 \) are also known, the variance of the BLUP (4) is given as

\[ \text{Var}[\hat{y}_d(\sigma_u^2, \beta)] = \gamma_d v_d = g_{1d} \]

In practice, \( \beta \) and \( \sigma_u^2 \) are estimated from the sample data and substituted for the true values, giving rise to the EBLUP. A naïve variance estimator is obtained by replacing \( \sigma_u^2 \) by \( \hat{\sigma}_u^2 \) in \( g_{1d} \). This estimator ignores the variability of \( \hat{\sigma}_u^2 \) and hence underestimates the true variance. Prasad and Rao (1990), extending the work of Kackar and Harville (1984) approximate the true prediction MSE of the EBLUP under normality of the two error terms and for the case where \( \sigma_u^2 \) is estimated by the ANOVA (fitting of constants) method as,

\[ \text{MSE}[\hat{y}_d(\hat{\sigma}_u^2, \hat{\beta}_{GLS})] = g_{1d} + g_{2d} + g_{3d} \tag{5} \]

where \( g_{2d} = (1 - \gamma_d)^2 z_d^T \text{Var}(\hat{\beta}_{GLS}) z_d \) with \( \text{Var}(\hat{\beta}_{GLS}) = \left( \sum_d (v_d + \sigma_u^2)^{-1} z_d z_d^T \right)^{-1} \) is the excess in MSE due to estimation of \( \beta \) and \( g_{3d} = \sigma_u^2 \left( \sigma_u^{-4} + \sigma_u^{-2} \right)^3 \times \text{Var}(\hat{\sigma}_u^2) \) is the excess in MSE due to estimation of \( \sigma_u^2 \). The neglected terms in the approximation are of order \( o(1/D) \). Building on the approximation, Prasad and Rao (1990), (details can be found in Rao, 2004) derive a MSE estimator of (5) with bias of order \( o(1/D) \) as,
\[mse\{\hat{y}_d (\delta^2_u, \hat{\beta}_{gal})\} = g_{1d}(\delta^2_u) + g_{2d}(\delta^2_u) + 2g_{yd}(\delta^2_u). \]  \hspace{1cm} (6)

where \(g_{kd}\) is obtained from \(g_{kd}\) by substituting \(\hat{\delta}^2_u\) for \(\delta^2_u\), \(k\) = 1, 2, 3. The MSE estimator (6) is robust with respect to departures from normality of the random area effects \(u_d\) (but not the sampling errors \(e_d\)) (Lahiri and Rao, 1995- details can be found in Rao, 2004 ). Here, standard error of the EBLUP is calculated as square root of MSE. Note that the leading term in (6) is \(g_{1d} = \gamma_d v_d\) so for the small values of \(\gamma_d\) (i.e., the model variance \(\sigma^2_u\) is small relative to the sampling variance \(v_d\)), \(MSE\{\hat{y}_d (\delta^2_u, \hat{\beta}_{gal})\} \ll v_d = V_d(Y_d)\) illustrating the possible gains from using the model dependent estimator. Further, the availability of good auxiliary data is key to successful application of the small area estimation technique since this provides a basis for good model fit. An area level model has been extensively used in India for reliable estimation of important parameters at the lower level. Notable in this context are papers by Srivastava et al. (2006), Chandra et al. (2010) and Singh et al. (2005), Tikkiwal and Ghiya (2004).

Another important model in the context of small area estimation is the unit level model. As the name suggests, a unit level model requires detailed unit level covariate data for the entire population. Some of the sources through which unit level information on the covariates can be obtained are the census conducted in India i.e. population census, agriculture census, livestock census, economic census etc. A unit level model can be effectively used if a mechanism is in place whereby matching units in the large scale survey and census data is possible.

More precise micro level estimation is possible through the use of Bayesian models i.e. Empirical and Hierarchical Bayes (HB) models. The inferences in HB methods are obtained through posterior distributions. In India there have been sporadic attempts towards application of various small area estimation techniques. But either they have been based on traditional biased approaches like synthetic method of estimation or the model based applications have been only demonstrative in nature. Data availability, from different survey is guaranteed. A number of large scale surveys are conducted in our country for generation of macro level estimates. There is enough data which could be used as covariates in different situations. But access to such data is a problem. Many a times the data becomes available after a considerable time lag. However, due to computerization taking place, improvements are taking place. With computerization of data from various censuses, access to several covariates at district level and sometimes at even lower levels has become simpler. Although SAE methods are available, the situations for application of the techniques are also identified, but the application of SAE techniques needs very serious preparatory work. Choice of suitable covariates, ensuring their availability, developing and testing the models, validating the small area estimates are the steps, which need very careful considerations. Both internal and external evaluations are extremely important for validation purpose. There are also some cautions needed in application of SAE methods. In this context, a remark by Kalton (1987) seems to be
I consider that a cautious approach should be adopted to the use of small area estimates and specially to their population by Government Statistical Agencies. When Government Statistical Agencies do produce model dependent small area estimates, they need to distinguish them clearly from conventional sample based estimates. Some small area estimates may be seriously in error and errors in small area may be more apparent to users than errors in national estimates. Before small area estimates can be considered fully credible, carefully conducted evaluation studies are needed to check on the adequacy of the model being used. Sometimes model dependent small area estimators turn out to be of superior quality to sample based estimators and this may make them seem attractive. However, the proper criterion for assessing their quality is whether they are sufficiently accurate for the purpose for which they are to be used.

**Recommended Approach of the Committee**

In the policy and structure areas listed above, the Committee recommends that a Task Force may be setup to prepare SAE estimates for each characteristic and behavioural variable for which information is listed and is required for the sectors of plantations, medicinal and aromatic plants, horticulture and vegetables, fish and forestry. The 12th Plan should have a detailed programme for producing data outputs with this method.
Agricultural Markets

To benefit the farming community from the new global market access opportunities, the internal agricultural marketing system in the country needs to be integrated and strengthened. Agriculture and agricultural marketing need to be re-oriented to respond to the market needs and consumer preferences. As we saw earlier, the farming population follows demand growth and diversification arising out of a fast growing economy. The phenomenon of census towns emerging as a major entity of urbanization in the Census 2011 is important to show that the farming population follows demand changes but it does not suggest that markets have been developed there. Markets will have to be planned for and what is called storage and supply chain infrastructure.

Y.K. Alagh, in his Rural Urban Continuum (Yoginder.K.Alagh, 2011) quoting FAO argues that “If we measure how isolated the rural population is in terms of market access, using a definition of more than five hours of travel time to reach a market town of more than 5,000 people, only five percent of South Asians live in “remote areas” whereas more than 30 percent of Africans are in this situation. Similar characteristics hold true for the percent of the population living in higher potential agricultural areas, as shown below.” (Ibid., Alagh, 2011, p. quoting FAO, 2008, p.4)

This Alagh, shows can also be confirmed by an earth satellite analysis, as follows:

![Diagram](image)

*Source: Center for International Earth Science Informa (2004)*.

( Ibid., Alagh, 2011, quoting FAO, p.6)
Government, however, is promoting organized marketing of agricultural through regulated markets, not necessarily where the farmer sells in large numbers. Most of the State Governments and Union Territories have enacted legislations to provide for development of agricultural produce market.

Regulated markets have helped in mitigating the market handicaps of producers/sellers at the wholesale assembling level. But, rural and semi urban markets in general, and tribal markets in particular, remain out of their ambit. These policies require that physical markets with facilities and services attract farmers and buyers, not that markets should be created where transactions take place.

An efficient agricultural marketing and supply chain infrastructure is essential for the development of the agricultural sector. In as much as it provides outlets and incentives for increased production, the marketing system contributes greatly to the commercialization of subsistence farmers. World-wide, Governments have recognized the importance of liberalizing agricultural markets. Government policy has to effectively address issues of marketing liberalization and help to overcome the constraints faced by various organizations including private sector involved in agri-marketing. The ever increasing production, spread of latest technologies, changing socio – economic environment, increasing demand for downsizing the distribution chain and reducing the margin between farmers and ultimate consumers, challenges emerging out of liberalization and globalization in the post WTO period require a vibrant, dynamic and assimilative marketing structure and system. In India there is obvious dissonance between places where trade takes place and official plans for infrastructure.

Market infrastructure is important not only for the performance of marketing functions and expansion of the size of the market but also for transfer of appropriate price signals leading to improved marketing efficiency. High investment with entrepreneurial skills is required for creation and managing these infrastructures. Private investment in the market infrastructure development may be encouraged by modifying various procedure backed up by a package of incentives. For providing infrastructure in remote and difficult areas, public sector would need to continue to play an important role.

Projections of production and marketed surplus of various farm products show that even at the existing marketed surplus-output ratios, the quantities which the marketing system will be required to handle in future, are quite large. The marketing system backed by strong, adequate infrastructure is the core content of agri-marketing. Development of infrastructure with spot markets and others in place, is a huge task.
Commodity Trading

Commodity trading in India has a long history. In fact, commodity trading in India started much before it started in many other countries. However, years of foreign rule, droughts and periods of scarcity and Government policies caused commodity trading in India to diminish. Commodity trading was, however, restarted in India recently. Today, apart from numerous regional exchanges, India has four national commodity exchanges namely, Multi Commodity Exchange (MCX), National Commodity and Derivatives Exchange (NCDEX), National Multi-Commodity Exchange (NMCE) and Indian Commodity Exchange (ICEX). The regulatory body is Forward Markets Commission (FMC) which was set up in 1953.

Indian markets have recently thrown open a new avenue for retail investors and traders to participate: commodity derivatives. For those who want to diversify their portfolios beyond shares, bonds and real estate, commodities is an option. Earlier this wouldn't have made sense. For retail investors could have done very little to actually invest in commodities such as gold and silver or oilseeds in the futures market. This was nearly impossible in commodities except for gold and silver as there was practically no retail avenue for punting in commodities.

However, with the setting up of three multi-commodity exchanges in the country, retail investors can now trade in commodity futures without having physical stocks! Commodities actually offer potential to become a separate asset class for market-savvy investors, arbitrageurs and speculators. Retail investors, who claim to understand the equity markets may find commodities an unfathomable market. But commodities are easy to understand as far as fundamentals of demand and supply are concerned. Retail investors should understand the risks and advantages of trading in commodities futures before taking a leap. Historically, pricing in commodities futures has been less volatile compared with equity and bonds, thus providing a portfolio diversification option.

The size of the commodities markets in India is also quite significant. Of the country's GDP of Rs 13,20,730 crore (Rs 13,207.3 billion), commodities related (and dependent) industries constitute about 58 percent. Currently, the various commodities across the country clock an annual turnover of Rs 1,40,000 crore (Rs 1,400 billion).

Like any other market, the one for commodity futures plays a valuable role in information pooling and risk sharing. The market mediates between buyers and sellers of commodities, and facilitates decisions related to storage and consumption of commodities. In the process, they make the underlying market more liquid. Though the government has essentially made almost all commodities eligible for futures trading, the nationwide exchanges have earmarked only a select few for starters. While the NMCE has most major agricultural commodities and metals under its fold, the NCDEX, has a large number of agriculture, metal and energy commodities. MCX also offers many commodities for futures trading.
A farmer in remote India accesses international rates for pepper on his personal digital assistant (PDA) before getting into a contract on the local exchange. He takes his decision based on information available to him, which was simply not possible a few years ago. Welcome to the world of national commodities exchanges. Farmers, speculators, traders and hedgers in India can finally agree on the same platform at market dictated prices. The need for national commodity exchanges was felt to relieve the farmers from the clutches of middlemen and provide for an efficient platform for price discovery. Though there is still a degree of ignorance about commodity exchanges and their functioning, most brokerages are confident that the advent of national commodity exchanges will make investors learn the technicalities of commodities trading.

The NCDEX and MCX have a network of over 600 members and 1,000 members, respectively. Currently, 120 commodities are available for futures trading under the guidance and framework laid down by the Forward Markets Commission (FMC). Out of the 120 commodities 24 are highly liquid. There are 3 national and 22 regional exchanges in India.

There should be a national level link and complete statistics should be collected and disseminated for various planning and decision making process.

**Storage of Agricultural Products**

In recent times, the rotting of food grains in storage facilities of the Food Corporation of India (FCI) and other public agencies such as the Central and State Warehousing Corporations (C&SWCs) has received much attention. “Between 1997 and 2007, 1.83 lakh tonnes of wheat, 6.33 lakh tonnes of rice, 2.20 lakh tonnes of paddy and 111 lakh tonnes of maize were damaged in different FCI godowns,” revealed a right to information petition. The Supreme Court of India in an order also pointed out that: “…In a country where admittedly people are starving, it is crime to waste even a single grain”. It further suggested the Government to take different steps including among others, distributing the food to those who deserve it. This in a sense also reflects Rae's right to food, but more importantly, it also points out the states duties to make that right feasible.

The Ministry of Consumer Affairs, Food & Public Distribution in a recent press release indicates that as of 1 June 2011 the capacity with FCI and other public agencies to store grains is 623.65 lakh tonnes of which 28.5 per cent (or 177.69 lakh tonnes) is under cover and plinth in the open. What is worrying is that this combined capacity is only 95.3 per cent of the stocks at 654.73 lakh tonnes. A letter to the Supreme Court of India further highlights poor foodgrains management on two additional aspects. First, there are instances of storage of foodgrains under cover and plinth in the open for more than a year exposing them to two or three monsoons and thereby rendering a substantial amount of it unfit for consumption. Second, the FCI let go of hired space because of adverse remarks from the Comptroller and Auditor General (CAG) and then could not hire back the same when the situation warranted.
A parliamentary committee report on similar concerns begins by invoking the Universal Declaration of Human Rights and the International Covenant on Economic, Social and Cultural Rights while reiterating the State’s obligation “to ensure for everyone under its jurisdiction access to the minimum essential food which is sufficient, nutritionally adequate and safe to ensure their freedom from hunger”. The report goes on to suggest the need to construct additional storage spaces in a decentralized and time bound manner without compromising on modern scientific technology, have more frequent physical verification of the stored foodgrains stocks, introduce the national food security bill (NFSB) at an early date, and finalize the poverty estimates so as to help reduce exclusion and inclusion error among others. The NFSB is likely to be introduced in the monsoon session of the parliament in 2011 and the Planning Commission has now accepted the new poverty estimates for 2004-05 suggested by an expert group that it had constituted. Both these issues need some further discussion.

In India, about 70% of farm produce is stored by farmers for their own consumption. Farmers store grain in bulk, using different types of storage structures made from locally available materials. The pre-treatment necessary for better storage life is cleaning, drying of the grain and storage structure design & its construction also play a vital role in reducing or increasing the losses during storage.

**Storage Structures at Farmer Level:** The major construction materials for storage structures in rural areas are mud, bamboo, stones, and plant materials. They are neither rodent-proof, nor secure from fungal and insect attack. On average, out of a total 6% loss of food grain in such storage structures, about half is due to rodents, and half to insects and fungi.

**On-farm food grain storage:** Farmers need storages of 1-4 t capacity to store grain. If the storage time is short (2-3 weeks) a flexible PVC sheet covering (30-50 micron size) known as a crop umbrella is used. Sometimes tarpaulins or large canvass sheets are also used to protect the grain, especially at night to avoid the surface layer of the grain becoming moist with dew. However, for 2-3 months storage periods, the bin developed at the Indian Agricultural Research Institute (IARI) is the most suitable. It is a LDPE (low density polyethylene) sandwiched bin, popularly known as Pusa bin.

**Bulk storage of food grains in India:** The grain is stoma in bull: mainly by traders, big farmers, cooperatives and government agencies such as the Food Corporation of India (FCI). The available storage capacity of these sectors is of the order of 18.55 million tonnes which is about 12% of total production and 41% of surplus (i.e. 30% of total production) production which comes to market for sale. The main agencies storing surplus grain, and the amounts involved, are as follows:

- FCI-7.7 million tonnes (Mt)
- Central Warehousing Corporation 2 Mt
- State Warehousing Corporation-24 Mt
- grain marketing cooperatives-4.5 Mt
- some state governments 1.9 Mt.
There are many kinds of storage systems followed depending on the length of storage and the product to be stored.

**Community Storage Structures:** Bulk storage structures of higher capacity, ranging from 25-100 t are termed community storage structures. They are made from reinforced bricks, corrugated galvanized sheets and aluminum sheets in capacities ranging from 25 to 57 t.

India produces about 150 million tonnes of food grains per year. Production has been steadily increasing due to advancement in production technology, but losses have remained static at 10%. This means that the loss of food grains is also increasing with the increase in food production. The main reason for this is improper storage, and an average of 6% out of a total 10% loss takes place during storage of food grains. For scientific storage, drying of food grains to a safe moisture level is a top priority. In India there are about 35 000 dryers in the rice and pulse milling industry, but all of them are used to process the grain. The use of dryers to dry surplus grain kept for storage is not common. The main reasons for this are a lack of awareness among the rural populations, high capital cost, and no incentive given for farmers to produce properly dried grain. An immediate answer to this problem would therefore be to develop and select a proper size of dryer which is simple in construction and operation, and lower in cost. Storage of grain in India is done at many levels. The major production is stored at farmer level and the root cause of massive storage loss lies here. Suitable low-cost structures are to be developed and made available to the farmers. Different grains need different type of storage facility. Suitable study should be conducted.

**Private Sector in Storage**

As India’s agricultural sector diversifies storage needs are also rapidly changing. Private sector Corporations in some cases financed by term lending agencies are coming of age. For example IDFC has given large loans to Private Corporations engaged in constructing storage for agricultural commodities. In some cases these companies use the receipts for commodities stored by them as collateral for financing farmers. These are very interesting ways of financing what is called the value chain in Indian agriculture. It is important to collect information on these nascent trends to develop policy frameworks for them. The Committee suggests that the NSC in consultation with IDFC and NABARD may develop a system of collecting statistical information on Private Sector storages and financing mechanisms based thereon.

**The Committee recommends that the Directorate of Market Intelligence conducts a quinquennial census to enumerate agricultural markets including those outside the regulated markets. These would include all markets where more than fifty sellers appear at least three times a week for transactions. Such a Census may also include a very brief list of questions, not more than five on the nature of facilities available.**
The Committee recommends that Marketable and Marketed Surplus Ratios are available with considerable time lag and for distant years in the past. Such studies should be done more regularly and with wider coverage to enable farmers to get the benefit of recent behavioral patterns and policy makers to base decisions on recent information.

The Committee suggests that The NSC in consultation with IDFC and NABARD develops a system of collecting statistical information on Private Sector storages and financing mechanisms based thereon.

The Committee also recommends that agricultural commodities futures data which is fairly extensive should be inventorised by an expert group and its use made available to farming and trading communities in small towns and large villages through a user friendly primer especially prepared for such audiences including in regional languages.

**Prices**

Directorate of Marketing Intelligence(DMI) under Ministry of Agriculture is primarily responsible to collect price data on Agricultural products. Wholesale prices data are received in DES, MOA mostly through postal mail, which entails delay. Data on retail prices of the essential commodities are received with a time lag of about five to six weeks and the response rate is only of the order of 60 per cent. Supply of data through post is stated to be the reason for delay. The State Governments generally use part time reporters who are not fully conversant with the connotations of the different terms used in price data collection and they do not pay adequate attention to the reporting work. The main deficiency in the collection of price data arises due to large non-response. There is no coordination among the State agencies concerned nor an adequate supervisory check over price collection.

Wholesale prices are primarily used to monitor weekly price movements. Lack of documentation on collection of prices and quality data on prices lead to un-representative prices. Price collection mechanism does not provide timely data. The State agencies at the district level and below are not capable in following up cases of chronic non-response.

The Committee recommends that the price collection system should ensure simultaneous data flow from lower levels to the State as well as to the Centre.

The Committee recommends that the Centres of price collection should, as far as possible, be the same for essential commodities as for those of wholesale prices.

The Committee recommends that markets should be connected with wide area network to record, process and disseminate price data.
Exports and Imports of Agricultural products

Agricultural commodities which are exported are Pulses Rice(Basmati), Rice (Other than Basmati), Wheat, Other Cereals, Tea, Coffee, Tobacco Unmanufactured, Tobacco Manufactured, Poultry & Dairy Products, Floriculture Products, Spices, Cashewnut Shell Liquid, Cashew, Sesamum Seed, Niger seed, Groundnut, Guar gum Meal, Oil Meals, Castor Oil, Shellac, Sugar, Molasses, Fruits/Vegetable Seeds, Fresh Fruits, Fresh Vegetables, Processed Vegetables, Processed Fruit Juices, Miscellaneous Processed Items, Meat & Preparations, Marine Products, Cotton Raw including Waste, Jute Hessian, Poultry Products, Paper/Wood products. Significant export commodities have shown very high volatility in value over time.

Imported agricultural products are Pulses Wheat, Rice, Other Cereals, Cereal Preparation, Milk & Cream, Cashew Nuts, Fruits & Nuts Excluding Cashew Nuts, Spices, Sugar, Oil Seeds, Vegetable Oils Fixed (Edible), Vegetable & Animal fats, Cotton (Raw & Waste), Jute (Raw), Tea, Wood & Wood Products.
The agricultural sector has been playing a key role in the composition of Indian exports. Indian agricultural exports has been slowly declining in recent years and the share has declined from 14.2% in 2001-02 to 10.5% in 2010-11.

Timely dissemination of data on import/export is must for proper monitoring of trading of agri products globally.

Trade and Tariff Policy Statistics

Tariff Policy

India was a founding member of the General Agreement on Tariffs and Trade (GATT) in 1947 and of the World Trade Organization (WTO) in 1995, and so has actively participated in the different rounds of negotiations.

India’s reforms as it adapts to global trade competition

Tariffs are the main instrument of trade policy. The average MFN tariff applied in agriculture is more than 40%, while the average bound tariff is 117.2%. In addition to import tariffs; India uses import restrictions on 7.7% of tariff lines. On top of this, import tariffs are adjusted to ensure domestic supply on key products. Finally, even while prohibitions, licensing, and other restrictions on exports have been removed, some essential and sensitive items can be subjected to ad hoc restrictions as the need arises, in order to maintain stability in domestic supplies and prices.

Trade Indicators

Trade indicators are organized around five thematic categories namely, Trade Policy, External environment, Institutional environment and Trade outcome. Each category is further divided into sub-categories. Country performance may be examined individually as well as in relation to other countries or country grouping, (by region, income group, trade agreement or other user-defined group).

Trade Policy

- Tariffs to Gain Strategic Advantage.
- Infant Industry and Restructuring Protection.
- Revenue Considerations.
- Balance of Payments Considerations.
- Tariffs as a Negotiating Tool and WTO Accession,

External Environment

- India’s Market Access according to Tariff Trade Rules (TTRI10) for 2007 (including preferences) stands at 3.5 percent for all goods, improving its ranking to 55th (of 125 countries) from 59th the year before. India’s agricultural and non-agricultural exports face similar barriers.
- They are lower than for the typical South Asian country (MA-TTRI of 7.6 percent) but higher than for an income group comparator (2.4 percent).
• The simple average of the rest of the world tariff faced by Indian exports is 9.8 percent. When taking into account the volume of exports, it is 3.8 percent, with the rate faced by agricultural goods and non-agricultural goods significantly different at 12.6 and 3.1 percent, respectively.
• India is currently involved in negotiating a number of free trade agreements (FTAs). An FTA with ASEAN was signed in 2009, and a comprehensive economic partnership agreement (CEPA) with Korea was substantially concluded in September 2008.
• India has an FTA with Sri Lanka, has signed to the South Asian Free Trade Agreement (SAFTA), and has implemented a CEPA with Singapore.
• India is negotiating a trilateral FTA with Brazil and South Africa, as well as deals with Malaysia, Mauritius, Thailand, the Southern Africa Customs Union, the EU, and the European Free Trade Association (EFTA)

New Trade Architectures and Information Requirements

• A part of the global reaction to the world’s problems is to suggest that the fulcrum should (will?) shift to Asia. That’s where the growth is and that’s where the reserves are. Also that’s where the sound policies are. India is a major player in the G20 and a permanent invitee to the G 8. Her contributions must be knowledge based. Agricultural Policies are at the forefront of the global debates.

• The American and the German economies are still much too big and powerful for these fashionable statements to matter in a big way. However the big giants like Japan, China and India are much too diversified to get knocked substantially in global volatility. But does more trade and investment in Asia and within Asia have no future? While the big rebalancing is a no brainer, it is incorrect to throw the baby out with the bath water. It is important to begin at the beginning.

• As the Cornell professor Iwan Azis who like our own Kaushik Basu spent some time away from his academic roost, heading the ADBs regional integration office, been emphasizing markets factored in the US economy before the ratings and cycles in growth will be moderated in Asia. The ADB, given its Japanese and Korean origin on strategic thinking has organized work on Asia at a turning point. The idea was to work on ‘assistance to Asian countries in building a regional macro-financial-trade policy framework to coordinate efforts to address development issues with more comprehensive policies rebalancing.’ In one such meeting, the chair of this group in his inaugural keynote in Seoul argued that financial trade policy literature and news generally argue in an implicit comparative static framework and this was true of the rebalancing reporting concentrating on exchange rate developments and implications and issues emerging there from. Volatility in these trends introduced greater uncertainty(Y.K.Alagh, 2012).

• Development issues tend to be conceptually underplayed in this context even if they gain urgency in crisis situations and these have substantial investment, human development, and related trade and financial policy interrelations and
this is particularly true of rebalancing which to be meaningful needs a medium term framework. Paul Krugman got the Nobel for his international trade work but his work on urbanization for example as a regional scientist was equally important in the contemporary Asian development context. We use two examples for arguing that a focus on development with an emphasis on sectors which have large employment and output consequences can trigger innovative thinking on trading potential. The requirements of a medium term tariff policy, as also financial innovation are critical here. Cross country FAO studies in Asia have shown the negative impacts on diversification, spread of agricultural growth, employment and poverty outcomes of static trade policy prescriptions in meltdown periods (See FAO, Son, Que, Dieu and Trang and D Beresford, 2006; also Y.K.Alagh, FAO, 2006). Agriculture trade has relevance in regional trade arrangements in Asia with countries having very different agro climatic endowments and therefore possibilities for specialization and consequently trade. A counterfactual which builds a medium term framework for agricultural tariff policies was advocated by me. Similarly SME policies required in a stimulus phase I argued can trigger trade and development and the Koreans were good at that.

- A stable medium term trade policy rule based regime and currency arrangements could lay the foundations for rebalancing and development. The need for newer financial products to buttress such kinds of development is obvious and giving some examples we spelt out in terms of modalities, also involving regional arrangements. As the ADB, IFPRI models had shown in the Asia 2020 volumes if this kind of reform was not there acceptable poverty hunger outcomes would not be possible in Asia. Policies requiring a medium term framework will need a macro policy and exchange rate regime of the kind discussed in Seoul last year. Therefore, an attempt has to be made to link the discussion with the contemporary policy dialogues after the Seoul G8/G20 meetings last year. Iwan Azis himself had an interesting computable general equilibrium model of regional rebalancing which started with employment and safety net objectives in a meltdown rather than general admonitions on reform.

- Large Asian countries have detailed agro climatic inventories (For Indonesia see L.Nasution 1993 and I Aziz, 2000, for India see Y.K.Alagh, et al., 1988, for China, Kunmin, Z. and He Xueyang, 2000, for summary of China, Indonesia, and India, UNU, 2002). It is a fascinating scientific story but suffice it to say that the large Asian land masses, the Indonesian Archipelago, the countries of what was called Indo-China, Thailand and Myanmar and South Asia are rich in agro-climatic diversity and are what I have called in UNCEDs Sustainable Development: From Concept to Action Project, ‘World’s within the World’ (Y.K.Alagh and I Sachs in UNCED, 1991). This in fact becomes a very powerful argument for trade. What it says is that for each region we should look for what it can do best. Agriculture and rural development would then concentrate on specialization and food and fibre deficits and surpluses would be cleared with trade. It has been shown that agricultural growth based on
agro climatic resource endowments is sustainable in the sense that it is water, energy and land conserving (See in this context the next chapter).

- The policy issues are an assessment of diversification processes as a part of rebalancing in terms of consumption and demand trends and possible change in the structure of the labor force in fast growing Asian economies; The marketing, communication, first stage processing infrastructure and knowledge and skill basis of accelerating the process and avoiding angularities and dislocation of unanticipated sharp shifts, as seen in political conflicts in countries like India and China for example in land acquisition and lack of facilities for migrants in rural urban continuums. These would have trade and/or exchange policies, including tariffs and incentives for smooth functioning of markets in a medium term framework, rather than the impacts of volatile markets in fledgling developments needing medium term stability. This in turn would need development of financial products and markets to support the market processes at play, in diverse capital markets. There would be the need of safety nets including employment guarantees and food security networks. Asian economies have reached a stage where advances are possible and security can provide powerful incentives for technological change, as in earlier periods of economic history;

- Development of inter-regional profiles would give a larger context in which such policies can be followed. It is true that most of the rebalancing literature, particularly of the CGEM or GTAP variety gets dominated by US and Germany outcomes. Recognizing the importance of large global economies, it is possible that exploration of comparative static Asian inter-regional flows will throw up interesting alternative possibilities. The macro frameworks accepted at the Seoul meetings of the G20 could provide quantitative coordinating framework in which such possibilities could be explored. Counterfactuals where structural change of the kind discussed takes place in a benign framework as also BAU projections exist, to highlight the importance policies can make.

The Committee recommends that the NSC sets up a Group with DEA, MOC and CSO to prepare a statistical base for India’s global negotiations on agricultural issues. Its TORs should be based on the extensive discussion in this section.

Institutional Environment

Households

The status of residence is said to have been acquired by staying or intending to do so for one year or more in a territory.

Enterprises

- As a general principle, an enterprise is resident in an economic territory where the enterprise is engaged in a significant amount of production of goods and/or services.
• An enterprise is defined as an “institutional unit” engaged in production, which may be a corporation or quasi-corporation, a non-profit institution, or an unincorporated enterprise (part of the household sector).
• Corporations and non-profit institutions are normally expected to have a centre of economic interest in the economy in which they are legally constituted and registered.
• Corporations may be resident in economies which are different from those to which their shareholders belong.

**Nature of Transactions**

- Transactions affecting international flows can be recorded in the “BoP” accounts, while changes in external financial assets and liabilities are recorded in the account of International Investment Position (IIP).
- A transaction is an interaction between two persons (residing in different economies) or institutional units (located in different economies) that occurs by mutual agreement or through the operation of the law and involves an exchange of value or a transfer.

**Accounting System: Double entry book-keeping**

The basic principle involved in compilation of the BoP is the use of the internationally accepted convention of double-entry recording system. The accounting system followed for recording international transactions is guided by three broad book-keeping principles:

1. Vertical double-entry book-keeping, also simply known as double-entry book-keeping involving corresponding entries (credit/debit);
2. Horizontal double-entry book-keeping ensuring the consistency of recording for each transaction category by counterparties; and
3. Quadruple-entry book-keeping involving the simultaneous application of both vertical and horizontal book-keeping, which is the accounting system underlying the recording of transactions in the national and international accounts.

**Basis of Recording**

- In deriving BoP aggregates, the current and capital account transactions are recorded on a gross basis (*i.e.*, showing full values) as credit and debit entries.
- In general, gross transactions recorded in the current account often indicate the relative importance of particular item within an economy.
- Recording the transactions on a gross basis also helps in measuring their global share. On the other hand, the components of the financial account are recorded on a net basis (*i.e.*, as net changes, which are increases less reductions in the same type of transactions) separately for each category/instrument of assets and liabilities on the same side of the balance sheet, partly because gross data for transactions often are not available.

**Valuation**

- The revised Balance of Payment guidelines strengthens the basic principles in establishing a clear linkage between flows (transactions) and the stock of external financial assets and liabilities,
• This help in making a clear distinction between transactions and other changes in the accounts arising out of valuation and other adjustments.

**Timing**

• Generally, there are four broad principles to determine the time of recording transactions, namely: the accrual basis, the due-for-payment basis, the commitment basis, and the cash basis.
• Since BoP is compiled on an accrual basis, the accrual accounting principle governs the time of recording for all transactions. Under accrual accounting, flows are recorded at the time when economic value is created, transformed, exchanged, transferred, or extinguished.
• Accordingly, a change of economic ownership is recorded when ownership changes, and services are recorded when they are provided.
• The change of economic ownership is central in determining the time of recording for transactions in goods, non-produced, non-financial assets, and financial assets on an accrual basis.

**Timing Adjustments**

• Timing adjustments may be necessary particularly in the case of merchandise trade as the latter may not always reflect changes in economic ownership due to a time lag in the physical movement of goods.
• Sometimes, the practices followed in customs statistics also may lead to distortions requiring timing adjustments.
• When the process of importing or exporting involves a lengthy voyage, a change in the economic ownership of goods can vary widely from the time when the goods are recorded in trade statistics. In such cases timing adjustments should, in principle, be applied to correct the trade statistics.

**System of National Accounts (SNA)**

• BoP transactions and the corresponding data in the IIP are closely linked to the System of National Accounts that provides a broader framework for collection and presentation of the economic statistics of the economy.
• The SNA is the international standard framework for the accounting of national income, which encompasses transactions, other flows, stocks, and other changes affecting the level of assets and liabilities from one accounting period to another.
• The SNA covers the transactions between “residents and residents“ as well as those between “residents and non-residents”. As such, BoP statistics and IIP data feed into national accounts.

**Harmonisation between the SNA and External Accounts**

• The IMF’s latest manual on Balance of Payments (BPM6) is in agreement with the SNA (2008).
• As the BoP and the IIP are integral parts of the SNA, there is virtually complete concordance—between the Manual and the SNA—on issues such as the defining resident units (producers or consumers), valuation of transactions, the stock of external assets and liabilities, time of recording transactions and stocks, conversion procedures, coverage of international
transactions in goods, services, income, capital transfers, and foreign financial assets and liabilities.

- As far as this report is concerned the harmonization issue has been conceptually discussed in some detail in Chapter 2 in the section on intersectoral flows.

**Trade Facilitation**

- As the first generation of trade reforms, consisting mainly of easing of border restrictions to merchandise trade and liberalization of foreign exchange markets, have been or are being implemented by the majority of developing countries, it is becoming obvious that their successful integration into the world economy increasingly depends on the realization of a series of complex, behind-border measures that fall under the heading of trade facilitation.

- Broadly defined, these measures include anything from institutional and regulatory reform to customs and port efficiency and are inherently far more intricate and costly to implement.

- The World Bank attaches great importance to trade facilitation and more rapidly increasing trade-related work is in the area of trade facilitation and competitiveness.

**Status of Trade Statistics in India**

The Directorate General of Commercial Intelligence & Statistics (DGCI&S) is the premier organization of Govt. of India for collection, compilation and dissemination of India’s Trade Statistics and Commercial Information. It is entrusted with the work of collecting, compiling and publishing/disseminating trade statistics and various types of commercial information required by the policy makers, researchers, importers, exporters, traders as well as overseas buyers. DGCI&S collects the basic data from different customs formations in the form of DTR (Daily Trade Return) and then processes and compiles it using state-of-the-art technology. The foreign trade data generated by the Directorate are disseminated through (i) Monthly Press Release brought out every month by the Ministry of Commerce and Industry, (ii) Monthly Foreign Trade Statistics of India by Principal Commodities & Countries, (iii) Monthly Statistics of Foreign Trade of India (Import & Export), and (iv) Quarterly Statistics of Foreign Trade of India by Countries. It also brings out an Assessment Report on India’s Foreign Trade by Air every year. The Reserve Bank of India (RBI) has been compiling and publishing Balance of Payments (BoP) data for India since 1948. India’s Balance of Payments Compilation Manual was brought out for the first time by the RBI in 1987 in line with the Fourth Edition of the Balance of Payments Manual of the IMF (BPM4, 1977). The Manual provided a conceptual framework and procedures for compilation of India’s balance of payments.
Statistical gaps

Goods

- The trade which takes place through e-commerce is mostly in the digital mode. The data on such transactions is not captured in the existing traditional system of DGCI&S.
- The data on Repairs on goods not shown under the head goods.
- The data on "goods for processing" is not available.
- The data on imports not given as Free on Board (FOB) basis.
- The data on Re-exports is not available.

Services

- The data on Transportation services is not available by route (sea, air and others) and by component (passenger, freight and others).
- Regarding disaggregated information on health and education related services are not available.

Income and Transfers

- Income and transfers are not classified under the heads of primary income and secondary income.
- Disaggregated details on remittances made by those staying abroad for less than one year and those staying for more than a year, are not captured through the existing periodic survey on "Remittances from Overseas Indians" conducted by RBI.

Capital Account

- The capital account in India's current BoP is not shown separately as "capital account" and "financial account".
- The acquisition of gold by the RBI, if any, from the residents including the Government, not shown in the statement that reconciles flow (BoP) and stock (IIP).

The Committee recommends that an Advisory Group be created of representatives of farmers groups, government officials, FIs, trade economists and senior economic journalists to recommend user friendly presentation of tariff, trade and BoP data for the agricultural sector.
Agro-Climatic Level Statistics
Agro-Climatic Planning in Context of Macro-Economy

In India farm level investments and decisions are largely left to private initiative. Government however takes supporting and regulatory functions through myriad of institutions and instruments aimed at product-price support, farm input subsidies, creation of market/infrastructure and farm research organizations, investments in irrigation systems, and provision of rural roads and electricity. Policy initiatives for the farm sector have so far appeared to be uncoordinated and ad hoc and measures have come under fire for their deleterious effect on the farm economy. As Indian farm sector integrates with global threats and opportunities, the role of prices as an engine of agricultural growth and the relevance of non-price factors is being debated.

‘Getting prices right’ has basically implied removal of subsidies on farm inputs, improving terms of trade for farm output vis-à-vis rest of the economy and influencing cropping patterns to capture India’s comparative advantage in land-based commodities for production and exports. Since subsidies are criticized to be poorly targeted it makes sense to improve terms of trade for agriculture and complement this by stepping up investments in agriculture. Increased investment in agriculture appears to be a better bargain than short-sighted measures such as subsidies. This is mainly because of the fact that cultivable land in India is in short supply and raising productivity per unit of cultivable land will require heavy investment in irrigation, rural infrastructure, research and extension. It has been empirically established (See Chapter 2 above) that in the process of economic reforms favourable terms of trade seem to have raised overall aggregate production and also in creating conditions under which private gross fixed capital formation in Indian agriculture increases. This in turn induces a shift in production function provided suitable technologies are available or evolved. Non-price factor like technology than becomes equally, if not, more important than relative prices. Global opportunities in the wake of the new world trade order also provide considerable optimism. In that context, existing cropping pattern cannot be viewed sacrosanct. Crop diversification can lead to significant gains in income, employment and export earnings.

The role of non-price factors for agriculture output growth cannot be overemphasized. Product price support is a necessary but not sufficient condition that can be aimed at after broad based technical change occurs. The latter is induced by non-price policies (government investment in agriculture including that on R&D, marketing infrastructures, land reforms and institutional credit), that are both necessary and sufficient conditions. Availability of land, water, farm inputs, devising cost effective and sustainable techniques for soil and moisture management
and evolving suitable cropping systems for the diverse agro-climatic situation should hold the centre-stage for steering the farm sector on desired path. Agro-climatic planning approach focuses on strategies to promote sustainable agriculture systems and raises capability of peasants for maximizing returns per unit of land and labour through optimum use of inputs, be it water, energy, fertilizers, seeds or farm credit. The green revolution technology increased yield levels of major cereals in selected, naturally endowed regions, but accentuated regional differences in agriculture development because of varying levels of investments in rural infrastructure and technological innovations. This resulted in creating and accentuating regional imbalances in agricultural growth. It is now realized that disproportionately high efforts are required for obtaining additional output from regions of high resource concentration. There is a need to spread out technology to newer regions. Agro-climatic planning marks a departure from intensive, highly localized farming in developed regions. It is broad-based, technology-cum-resource centered and sustainable farming. Over-riding concern is resource-use efficiency and inter-generational equity as mapped over varying agro-climatic conditions. Land and water resource development through approaches suitable to varying agro-climatic conditions can result in higher productivity and efficiency. Agro-climatic planning can no doubt yield regionally differentiated strategies based on integrated area based solutions rather than generalized approaches.

Scope of Agro-Climatic Planning

In view of wide variations in agro-climatic and economic conditions across the country, the plan documents (Ninth and Tenth) acknowledged that a generalized strategy for agriculture cannot be entirely fruitful. ‘Regionally differentiated strategy’ for achieving agricultural growth and equity, which accounted for agro-economic, climatic, environmental conditions, was recognized as need of the hour. Emphasis was laid on integrating the food production systems with employment and poverty alleviation objectives along with attention on marginalized, rain-fed regions, and north-eastern regions.

The 73rd Constitutional Amendment also widened the scope of agro-climatic planning as a tool for decentralized development. The 73rd Constitutional Amendment gives constitutional status to the panchayats at the district and sub-district levels. The panchayats are entrusted with the task of preparation of plans for economic development and social justice and implementation of schemes for the same. For decentralized planning to be truly reflective of the felt needs of the people, it is essential that plan formulation is initiated at the local levels. Local self governing bodies require scientific inputs, including data base, technical expertise, studies etc. for effecting holistic regional development of agricultural hinterlands. There is need for an information support system that would aid the village panchayats in formulating the integrated development plans to ensure judicious use of land and water resources. For revitalization of the farm sector only bottom-up and resource based planning can effect prioritization of development initiatives and investment decisions

Further, small and marginal farmers dominate the land holdings in India. Introduction of high value added agriculture on small and marginal holdings and
production oriented towards exportable commodities can be beneficial for raising living standards of majority of cultivators. Thus supportive systems including those for price support, infrastructure and irrigation, credit, marketing, etc, have to gear to address needs of small landholders. Occupational diversification arising from interdependence between farm and non-farm activities is crucial for employment generation and income enhancement. Non farm activities, such as first hand agro-processing, maximize value addition of farm produce and profitability of cultivators. Thus agro-climatic planning would be well advised to identify areas having potential for farm-non farm linkages that particularly benefit small and resource poor farmers. The liberalised global economic environment for agriculture offers enhanced possibilities for specialization in production of commodities. Access to demand centres, reduction in capital and input prices consequent to globalization accelerates process of diversified development and improves profitability. However to take advantage, land use patterns need to be redefined based on regional comparative advantages. Thus, identification of long-term specialization of the defined agro-climatic locales would encourage cost competitiveness.

Meanwhile these concepts have gained policy applications again. They were popular in the Eighties of the last century being supported by Prime Minister Rajiv Gandhi but fell in some disuse. However, recent five year plans give them focus. There has been a revival of these ideas in India’s Eleventh Plan. Many of the Eleventh Plan’s blue ribbon schemes are in the agro climatic mould. An important innovation during the 11th Plan was the new Rashtriya Krishi Vikas Yojana (RKVY), which was designed to give more flexibility to States and provide incentives for them to spend more on agriculture and to do so, on the basis of properly designed district and state plans. The state agricultural plan, it said, should be based on (these initial) district plans, subject to reasonable resources from its own plan and adding those available from the centre, aimed at achieving the state’s agricultural growth objective, keeping in view the sustainable management of natural resources and technological possibilities in each agro-climatic region (emphasis added). This plan should then determine each district’s final resource envelope, their production plan and the associated input plan (Y.K. Alagh, 2013).

**Methodology and Information Requirements**

To satisfy above requirements, and to address compulsions behind operationalizing agriculture development strategies on spatial basis, regionalization is imperative. For agricultural regionalization the determinants are agro-climatic features, particularly soil and climate type, temperature, water demand and supply characteristics including rainfall regimes, captive water resources, quality of water and aquifer conditions. Regionalization approaches can take various forms. They could be based on a chosen primary feature with other agro-climatic features playing secondary roles. Another approach could be to use cropping patterns, intensities and productivities, since they reflect natural conditions and effect of inputs. Regionalization of the rural economy, based on agro-climatic resources has been considered essential pre-requisite for research and planning in agriculture across the world. Classical approaches have been by Thornwaite (1948), Trewartha (1968), Food and Agriculture Organisation, ICRISAT, National Agricultural Research Project.

Agro-climatic planning exercises can follow after creation of information base mapped over different spatial units for agro-meteorological, economic and technical parameters backed by quantitative information from diverse national organizations: Ministry of Agriculture, Ministry of Water Resources, Indian Council of Agricultural Research and its organisations, Central Statistics Office, National Sample Survey Office, Registrar General of India, Indian Meteorological Department, NABARD to name a few. Implicit in the success of agro-climatic planning is the presence of dynamic information system to assess and monitor changes both in the development instruments and their impact indicators. Such an information system will provide the data base as also decision making tools towards evolving a dynamic planning approach. This information system has to provide area-specific information on crop and allied sectors, land use, water resources, details about human resources, agricultural inputs and should be constantly widened and updated to make the planning process comprehensive. The planning task would have to entail taking stock of resource potentials as well as criticalities to determine ecological boundaries. Efficiencies of resource use, as a result of alternative technologies, need to be measured against spatial and temporal equity. The methodology for agro-climatic planning would thus follow inter-connecting stages incorporating:

- Area profiles,
- Analysis to arrive at issues,
- Design of strategies for intervention,
- Programme formulation based on prioritized strategies. Such plans subsume convergence of lateral activities, finance and existing institutional structures.

**Data:** Agro-climatic approach to agriculture development includes the entire range of land and water resource based activities, subsumed under the broader definition of farming systems. The information requirement for preparing a regional agro-climatic plan is wide-ranging. The inherent assumption is that resource-based planning is meaningful only for homogeneous regions with respect to natural resource endowments (specifically, agro-climatic factors) in planning for agriculture and allied sectors. The basic data elements required, their sources and availability are highlighted in Table 1.

**Indicators:** The multi-stage output would use exiting data elements to derive crucial socio-economic indicators such as land and labour productivities, per capita availability of land, pressure of man and animal on cultivable land, typologies of land uses, cropping pattern groups, crop specialization and diversification indices, per capita food availability to spell out food security, female literacy etc. It is necessary to supplement the available information from agencies highlighted above with periodic studies on subjects like market intelligence, innovative practices, employment, land use, horticulture, agro-processing, fishery etc. This would be an aid in the evolution of policy, and also to substantiate state level priorities.
In an increasingly land constrained economy, productivity assessment is required for different crops ‘what is possible and what is being achieved’ or yield –gap analysis. Crop yield potential demonstrated on agricultural research stations can provide the upper bound with which available yields could be compared. However, this has to be carried out under certain constraints of data; mainly non availability of yield levels separately for irrigated and rain fed conditions for a majority of crops, limited data on trials for crops, years, and fertilizer use by crops. However, there remains tremendous chasm between the yields achieved at the demonstration farms and that in the farmers’ fields. The lacunae lies in improper dissemination of scientific knowledge and technology transfer from the lab to the farms. Resource poor small and marginal farmers, and those residing in the remote reaches of the country are particularly slow to adopt new technologies and scientific practices. A concerted effort is required to address the needs of these categories of farmers. The yield gaps can be bridged through an integrated package of technology, services and public policies.

**Table 1: Statistics Relevant for Agro-climatic Planning, Sources and Availability**

<table>
<thead>
<tr>
<th>Data Class</th>
<th>Topic</th>
<th>Source</th>
<th>Availability Status</th>
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</thead>
<tbody>
<tr>
<td><strong>AGRICULTURE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Land use</td>
<td>i) Nine-fold Landuse Classification</td>
<td>MOA</td>
<td>2008-09</td>
</tr>
<tr>
<td></td>
<td>ii) Wasteland Satellite Mapping</td>
<td>ISRO (NRSA), CSO</td>
<td>2008-09</td>
</tr>
<tr>
<td>b) Crop use</td>
<td>i) Area, Production, Yield</td>
<td>MOA</td>
<td>2008-09</td>
</tr>
<tr>
<td></td>
<td>ii) Cropwise area irrigated</td>
<td>MOA</td>
<td>2008-09</td>
</tr>
<tr>
<td></td>
<td>iii) Area under Fruits and Vegetables</td>
<td>MOA</td>
<td>2008-09</td>
</tr>
<tr>
<td>c) Irrigation</td>
<td>i) Irrigated area by sources</td>
<td>MOA</td>
<td>2008-09</td>
</tr>
<tr>
<td></td>
<td>ii) Minor irrigation</td>
<td>MOWR</td>
<td>2000-01</td>
</tr>
<tr>
<td></td>
<td>iii) Groundwater Potential and use</td>
<td>CGWB</td>
<td>2008-09</td>
</tr>
<tr>
<td>d) Prices</td>
<td>i) Farm Harvest prices, Wholesale Prices</td>
<td>API (MOA)</td>
<td>2007-08</td>
</tr>
<tr>
<td>e) Livestock</td>
<td>i) Category-wise No. of farm animals and poultry</td>
<td>MOA</td>
<td>2007</td>
</tr>
<tr>
<td><strong>INPUTS &amp; CONSUMPTION</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>a) Fertilizer</td>
<td>i) Fertilizer consumption</td>
<td>FAI</td>
<td>2009-10</td>
</tr>
<tr>
<td>b) Other Inputs</td>
<td>i) Tractors, Tubewells, Bank Credit, Rural energy</td>
<td>MOA</td>
<td>2006-07</td>
</tr>
<tr>
<td>c) Crops</td>
<td>i) Per capita Annual</td>
<td>NSSO</td>
<td>2008-09</td>
</tr>
<tr>
<td>Consumption of major crop sector commodities.</td>
<td>ICAR</td>
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<td>------------------------------------------------</td>
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<tr>
<td>ii) Crop Varieties for drought prone areas.</td>
<td>ICAR</td>
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<tr>
<td>iii) Varieties of pest-resistant crops.</td>
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<tr>
<td>d) Crop Health</td>
<td></td>
<td></td>
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<tr>
<td>i) Crop insect, pest and disease monitoring.</td>
<td>SAUs, State Departments of Agriculture, ICAR</td>
<td></td>
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<tr>
<td>ii) Innovative agronomic practices &amp; crop production technologies</td>
<td></td>
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</table>

**LAND AND WATER RESOURCES**

<table>
<thead>
<tr>
<th>a) Rainfall</th>
<th>i) Station-wise Monthly Rainfall</th>
<th>IMD</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Soils</td>
<td>i) Texture, depth, stored soil moisture, water availability period. ii) Soil Nutrient (NPK)</td>
<td>NBSS &amp; LUP State Agriculture Departments</td>
<td></td>
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<tr>
<td>c) Climate</td>
<td>i) Type ii) Potential Evaporation</td>
<td>ICAR</td>
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**DEMOGRAPHY**

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<tr>
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<tbody>
<tr>
<td>b) Workers</td>
<td>i) Main/Marginal ii) Rural/Urban iii) Industrial Classification</td>
<td>Census</td>
<td>2001</td>
</tr>
<tr>
<td>c) Literacy</td>
<td>i) Male/Female ii) Rural/Urban</td>
<td>Census</td>
<td>2001</td>
</tr>
<tr>
<td>d) SC/ST</td>
<td>i) Sex-wise Population</td>
<td>Census</td>
<td>2001</td>
</tr>
<tr>
<td>e) Poverty</td>
<td>ii) Poverty Ratio Urban &amp; Rural</td>
<td>NSSO</td>
<td>2007-08</td>
</tr>
<tr>
<td>f) Projections</td>
<td>i) State level Total Population</td>
<td>Census</td>
<td>2026</td>
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</tbody>
</table>

**EMPLOYMENT STRUCTURE**

|---------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------|

**LAND SYSTEM**

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<tr>
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<tbody>
<tr>
<td>Holdings</td>
<td>TRADE</td>
<td>MARKET</td>
<td>ENVIRONMENT RELATED</td>
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<tr>
<td>b) Tenure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Tenure System</td>
<td>Agri. Census, MOA</td>
<td>2005-06</td>
<td></td>
</tr>
<tr>
<td>a) Tariffs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Tariffs on important Tradable commodities</td>
<td>MOA, WTO</td>
<td>2009-10</td>
<td></td>
</tr>
<tr>
<td>b) Exports &amp; Imports</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Imports and Exports of Important Commodities</td>
<td>MOA, FAOSTAT, WTO</td>
<td>2009-10</td>
<td></td>
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<tr>
<td>ii) Share of exports &amp; imports in Agricultural GDP</td>
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<tr>
<td>c) Competitive Advantage</td>
<td></td>
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<tr>
<td>i) Nominal Protection Coefficients for Important Tradable commodities</td>
<td>Empirical Researches</td>
<td></td>
<td></td>
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<tr>
<td>Markets</td>
<td>a) Arrivals</td>
<td></td>
<td></td>
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<tr>
<td>i) Market arrivals of important Commodities</td>
<td>APMCs</td>
<td>2009-10</td>
<td></td>
</tr>
<tr>
<td>b) Prices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) National and World Prices of important commodities</td>
<td>WTO, FAOSTAT</td>
<td>2010</td>
<td></td>
</tr>
<tr>
<td>i) River basin wise Pollution</td>
<td>CPCB, SPCBs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Problem Soils</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Salinity, Alkalinity, Water logging</td>
<td>CSO, Departments of Agri, Water Resources</td>
<td>2008-09</td>
<td></td>
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<tr>
<td>c) Disaster</td>
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<td></td>
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<tr>
<td>i) Disaster related Information</td>
<td>State Revenue Departments (Relief cells), CSO</td>
<td>2008-09</td>
<td></td>
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<tr>
<td>ii) Waste Management, Mining</td>
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</table>

Note: Most of the data is for time series and at a disaggregate level, which can be aggregated by agro-climatic regions, districts and states.

**Models:** Apart from easy access to comprehensive data and information base, a workable and scientific agro-climatic plan would gain by some local analytical expertise. This can lead to deductive reasoning which is essential for proper identification of strategy. Secondly, possible ways of integrating agro-climatic regional plans with national concerns need to be worked out. For instance, macro implications can be spelled or national concerns can be mapped over micro spaces with due appreciation of local resource availability. For instance, using computable models regional objective function can maximize returns on land, subject to consumption norms, land use constraints, trade policy or commodity balances at national level. Such exercises can evaluate investment and production activities from the viewpoint of society and environmental considerations. Models can also quantify through shadow prices the effects of removing some binding constraints for the farmers or of imposing ecological/environmental restrictions. Such exercises will
suggest the required policy changes which will eliminate the divergence between economic profitability and financial viability. Information base is also needed to explicitly incorporate comparative advantages of different regions in the production of various commodities and for those regions that suffer due to globalization process. The very essence of agro-climatic approach therefore requires vigorous involvement in information generation and dissemination. Ways would have to be devised to transfer appropriate technologies for crop and allied sectors to the farmers and other agents of change.

**Information Dissemination**

Provision of overall infrastructure like roads, communications, development of market centres, large irrigation systems, electricity and fertilizer and other facilities in the context of location specific strategy are very much in the public domain. But a large part of the strategy is such in which effective action can be taken by an individual farmer or a group of farmers. Most important of these pertain to crop sequencing, crop combination, diversification of agricultural activities into allied sectors. For taking informed decisions, the farmers need not only a plan detailing out possibilities and potentials but also technical and market information.

Agricultural producers and small farmers require location specific information on technologies, best practices, market and price information on agricultural inputs and outputs. Specific information on soils, pests, crops, weather forecasts and expert systems for sustainable management of production system is also required. Besides productivity enhancement, sustainability, resource management, there are several issues that have a bearing on rural livelihoods such as poverty alleviation, food and nutritional security, globalization, liberalization of world trade, etc. The final decision in agriculture rests with the farmer-cultivator. Given the local agro-climate and land endowments, the farmers’ decisions, no doubt are largely influenced by factors like availability of water, inputs, credit and overall infrastructure situation including access to the market. Yet within the broad contours defined by these external factors, farmer has a variety of options, and exercises choice to the best of his knowledge and ability. The farmer could gain options, given external constraints, by advice on technology, market and optimal sequence of activities. He, in fact, needs access to the comprehensive agro-climatic plan for the region that has already taken into account the location specific attributes. Additionally, apart from farmers, there are cooperatives and corporations engaged in cropping, horticulture, milk production, fisheries and other agro-based activities. These organizations also need access to the total plan backed with technical information and advice. Agro-industries, banks and specialized financial institutions are other users of agro-climatic plans.

At present information regarding new agricultural technology as well as beneficiary schemes of the government are dispersed over line departments, input agencies, agricultural universities, research organizations and so on. There is a need for a specialized window which gives access to comprehensive agricultural plans and assessment of regional potentials to all interested parties. A “single window bank” for dissemination and monitoring purpose is thus required. A framework for such a
The bank was conceived and tried on a pilot basis under the aegis of the Agro-Climatic Regional Planning Project (ACRP). The bank became dysfunctional as the Project concluded. However we would like to stress upon its importance and revival. The Agro-climatic Planning and Information Bank (APIB) was conceived to provide the clients an integrated vision of the regional plan aiding their decision making. It was to be an effective interface with the farmers in the field. The main premises were as follows:

- For effective decision making access to knowledge base, including technical and economic data, tools and studies, is essential.
- To provide wider access to user groups it would be necessary to create single window to reach out to all the actors on the ground.
- Substantial information has been generated under the Indian Council of Agricultural Research (ICAR) system, Indian Space Research Organization (ISRO), Agricultural Universities, State Line departments etc pertaining to agriculture and allied activities. It would be useful to consolidate the efforts and refine them to suit local needs.

The bank was tested on a pilot basis to be a model for country wide application. Its areas of operation were envisaged to be homogenous resource regions. Two regions, representing primarily dryland area and the other diversified region, were selected. The information required for crop planning such as, land and water assessment and utilization, was stored and processed at the lowest level of disaggregation, which varied depending upon the source of information. Thus crop data was at village level; resources at cluster of villages; information on prices, credit availability was at level of sub-region or block. Given the concept of the bank, the following were considered to be the major tasks of the pilot bank:

1. Compilation of information, area specific development strategies
2. Computerized storage and retrieval of information and tools
3. Dissemination of information in appropriate formats
4. Providing specific planning services and integration with macro level planning exercises.

It may be added that the Agricultural Extension Division of the ICAR has also taken initiative of technology dissemination through Agricultural Technology Information Centres (ATIC) which are in the process of development under the National Agricultural Technology Project (NATP). ATIC is a ‘single window’ support system linking various units of research institutions with intermediary users and end users (farmers) in decision-making and problem solving exercise. The center provides diagnostic services for soil and water testing, plant and livestock health; supply research products such as seeds, planting material, poultry strains, livestock breeds, fish seed, processed products etc. for testing and adaptation; provide information through published literature and communication material as well as audio-visual aids (Sharma et.al., 2004). There are thus tried and tested initiatives which have served as specialized windows providing access to information in a comprehensive fashion to the farming communities in addition to other interested parties. Such efforts deserve to be pushed further as integral part of agro-climatic planning approach.
Concluding Remarks

Space specific analysis of land and water resources and strategy intervention for their efficient use can have high pay-off and also enhance long term sustainability of the farm sector. Prescriptions for supply-side interventions under different agro-climatic conditions, are not however sufficient for achieving the desired outcomes. Many of the deficiencies related to water and land resources are an outcome of divergence between private and social interests. Price mechanism (including subsidies and price support) seems to be functioning in a manner that optimality in water and soil resources is not achieved. Under the changing economic environment, earlier systems for an inward looking economy together with hierarchical imposition of programmes are inadequate, even irrelevant.

Inroads into an increasingly competitive world are possible only if highest possible efficiency in resource use is achieved. This would call for strengthening and evolving markets for land and water resources that set prices close to resource criticalities. More importantly research initiatives would be required to evolve organizational forms under varying agro-climatic endowments to empower local institutions, encourage cooperation, and encourage role of agencies, may be voluntary, particularly those having experience and expertise in dealing with land and water resources. State would have to play an important role as an efficiency creator and as a guardian of larger societal interests, particularly for the bypassed people and areas. Emphasis has to shift from purely welfare oriented spread of economic and social infrastructure to locating and overcoming crucial bottlenecks that deter linking of different spaces for global opportunities. Agro-climatic planning is crucial due to its focus on non-price imperatives that are so essential for growth in a regionally differentiated manner.

The Committee recommends that the National Statistical Commission may set up an Agro Climatic Information System Bank as designed in this report
CHAPTER-5
MAJOR AGRICULTURE INPUTS

Seeds

The seed scenario in the country is changing fast and with significant increase in Seed Replacement Ratio (SRR) of major field crops during the last one decade and availability of plenty of certified/quality seeds in the country, the competition is hotting up with entry of several multi-national companies in the production of quality seeds and farmers’ preferences are changing from varieties to hybrids. Therefore, all the seed producing companies have to give more stress in improving its product basket both in terms of better varieties/hybrids as well as improved services to the farming community. India need dependable supplier of quality seeds at affordable prices.

With the launching of the National Seed Project (NSP) in 1974, National Seeds Corporation (NSC) was assigned the lead role to develop the seed industry in the country on sound lines. NSC has also contributed in the establishment of various State Seed Corporation under the NSP during seventies.

There are 10 Regional Offices and 77 Area Offices/Sub-Unites of the Corporation spread all over the country. In the seed production, emphasis is given for production of oil seeds, pulses and hybrids, including vegetables. NSC has established strict Quality Control procedure to ensure supply of quality seed to farmers. NSC has established five Quality Control Laboratories, one each at New Delhi, Secunderabad, Bhopal, Kolkata and Pune to undertake seed testing to check the quality of seeds. Besides, production and distribution of quality seeds, NSC is also involved in the production of Tissue Culture Plants like Banana. It also undertakes supply of seedlings/saplings of fruits crops through procurement from the MOU Partners. Seed marketing is carried out through three channels namely sale through dealers, sale of seeds and mini kits supply to the State Governments & Govt. of India and sale through its own sale counters. There are about 2800 dealers of the Corporation who account for more than 65% of the sale turn over.

National Seeds Corporation plays a key role in the implementation of various schemes of the Govt. of India like integrated scheme for “Oil seeds, Pulses, Oil and Palm & Maize” (ISOPOM), “National Food Security Mission (NFSM)” and “National Horticulture Mission” (NHM). It also provides technical support to the seed producing agencies including State Seed Corporations by imparting training of personnel engaged in the production of seeds in that organization. NSC is the nodal agency for the implementation of the Central Sector Scheme to create infrastructure facilities for establishment of processing plants and storage godowns in different states in the
private sectors. The seed bank maintained by the Corporation with the grant in aid of the Govt. of India holds larger quantity of seeds of different crops/varieties that are meant to meet the demand that arises during natural calamities like flood, drought etc. NSC also takes care to meet the demand for quality seed of the farmers in the interior parts of the country like North Eastern States & other hilly regions.

Timely availability of seeds should be made public and should reach ever village so that farmers do not face any problem in procurement.

Fertilizers

After independence the use of fertilizers in India in the last 50 years has grown nearly 170 times. In 1950 use of fertilizer per hectare in India was 0.55 Kg but by 2001-02 this figure has increased to around 90.12 Kg per hectare. Green revolution during 1960s and subsequent increased intensification of agriculture were major causes behind this growth. Fertilizers and pesticides have become major cost of production in India along with the cost of other input like seeds, and labor cost.

Fertilizer is a kingpin in enhancing crop production. It is also a key to securing the food need of a country. No country has been able to increase agricultural productivity without expanding the use of chemical industry. Balanced fertilization means application of essential plant nutrients, particularly the major nutrients, N, P and K in optimum quantity through correct method and time of application in right proportion. It is essential to encourage the use of nitrogenous, phosphatic and potassic fertilizers, so as to achieve the desirable consumption ratio of 4:2:1 to maintain the soil health and to sustain the crop productivity. With the use of unbalanced ratio of these fertilizers the coefficient of fertilizer use has considerably gone down, thus, adversely affecting the acreage yields of economical crops.

The loss of soil fertility poses an immediate threat to food production. Agricultural soils lose their fertility by plant nutrient exhaustion a real and immediate threat to food security and to the lives and livelihood of millions of people. The loss of fertility reduces yields and affects water holding capacity leading to greater vulnerability to drought, a fertile and productive resource for the farmer and the entire ecosystem.

The farmer's main objective is to maintain the productivity of his soil. An excessive use of fertilizer which is not utilized for crop production can pollute the environment. For this purpose, it is very important to consider as to what is the crop requirement for various nutrients and what is their actual use. An IFA world fertilizer manual has revealed that for producing 5 tons of rice grain/ha, 304 kg nutrients (111 kg N, 35.5 kg P2O5 and 148 kg K2O/ha) are required. For producing 5 t/ha of wheat grain, 367.7kg nutrients (139.6kg N,41.2kg P2O5 and 188 kg K2O) are needed. For
producing 8.8 ton of grain yield per hectare of wheat and rice in rice-wheat system 663 kg nutrients (235 kg N, 92kg P205 and 336kg K202) are required. Of all farm inputs fertilizer has been one of the most profitable. Fertilizer responsive plants, the rapid development of weedicides and pesticides, narrow rows, sophisticated fertilizer placement implements, the low cost of fertilizer and efficient soil testing service have all contributed to the economic response and the continuous popularity of fertilizers all over the world. Without commercial fertilizers, world populations would probably that of soon exceed food supply. With fertilizers and other modern necessities such as improved seed, better insecticides and more effective fungicides, the critical population pressures can be delayed perhaps indefinitely. The relatively low cost of fertilizers as compared with the cost of other farm inputs, such as land, wages and farm machinery have also contributed towards increasing fertilizer consumption.

The proper use of fertilizers on soils of low natural fertility makes it possible to grow a wider variety of crops. Widening the selection of crops, can result in the use of more vigorous, efficient and valuable cropping systems. The net result of the liberal use of fertilizers is greater efficiency in the utilization of land, labour and water. It has been a traditional practice to supply fertilizer to sow crops just prior to or at the time of planting. Nitrogen is readily lost in the water that percolates through the soil. The nitrogen lost in percolating waters is almost entirely in the nitrate form loss in the ammonium form is negligible, because clay and humus particles absorb the ammonium ion. There is some possibility of losses of nitrogen by leaching immediately after urea fertilizer is applied to the soils.

The most important constraints to crop growth are those caused by inefficient and imbalance use of plant nutrients in form of fertilizers. The fertilizers constitute the most important scientific breakthrough in feeding the growing populations of India.

Food and Agriculture Organization (FAO) of the United Nations has estimated that contribution of fertilizer in increasing crop productivity is about 50 per cent. Studies show that contribution of fertilizers through crop production ranges between 30 to 50 per cent under a given soil climatic conditions. Fertilizer production and consumption in India showed an outstanding growth over a period of time. The production of all fertilizer products during 2009-10 was 16221 thousand tons as compared to 14289 thousand tons during 1999-00.

The following table shows the production, imports and consumption of fertilizers during the period 1999-00 to 2009-10.
The demand for fertilizers from 2007-08 to 2011-12 and the comparison of consumption of fertilizers in selected countries are given below:

<table>
<thead>
<tr>
<th>Demand for fertilizer (in LMT)</th>
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<tbody>
<tr>
<td>2007-08</td>
</tr>
<tr>
<td>2008-09</td>
</tr>
<tr>
<td>2009-10</td>
</tr>
<tr>
<td>2010-11</td>
</tr>
<tr>
<td>2011-12</td>
</tr>
<tr>
<td>includes Urea, DAP, Complex Fertilizer, SSP, MOP.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Consumption of fertilizers in selected countries (in kg per hect)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt</td>
</tr>
<tr>
<td>Canada</td>
</tr>
<tr>
<td>USA</td>
</tr>
<tr>
<td>China</td>
</tr>
<tr>
<td>India</td>
</tr>
<tr>
<td>Pakistan</td>
</tr>
<tr>
<td>France</td>
</tr>
<tr>
<td>Austria</td>
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</tbody>
</table>

Production Import and Consumption of (NKP) fertilizers (in 000' Tones)

<table>
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<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>14289</td>
<td>14752</td>
<td>14632</td>
<td>14468</td>
<td>14265</td>
<td>15405</td>
<td>15575</td>
<td>16095</td>
<td>14706</td>
<td>14334</td>
</tr>
<tr>
<td>Imports</td>
<td>4075</td>
<td>2090</td>
<td>2399</td>
<td>1757</td>
<td>2018</td>
<td>2752</td>
<td>5254</td>
<td>6080</td>
<td>7750</td>
<td>10221</td>
</tr>
<tr>
<td>Consumption</td>
<td>18069</td>
<td>19702</td>
<td>17360</td>
<td>16094</td>
<td>16798</td>
<td>18398</td>
<td>20340</td>
<td>21651</td>
<td>22570</td>
<td>12470</td>
</tr>
</tbody>
</table>

The use of various inorganic fertilizers, agriculture contributes about 13 per cent to Gross Domestic Product and is one of the the largest source of foreign exchange earnings. Crops, mainly sugarcane, cotton, horticultural crops, medicinal plants, plantation crops, rice and wheat, make a vital contribution to the overall growth and earnings.

**Irrigation**

The models used for discussion in India, including the National Commission on Perspectives for water Development don’t take this factor into account and therefore are outdated for discussion. It would be imprudent to brush aside the decline in cropped area as a consequence of the drought of 2002-03. It is true that in the South West Monsoon, 2002, 21 meteorological sub-divisions out of 36 had deficient/scanty rainfall. In the earlier drought in the late Eighties, NAS also fell and the severity of the drought in 1986-87 and 1987-88 was comparable. But in the Eighties even in the second year of drought NAS was 134 million hectares and it was 139.58 million hectares in 1986-87. More basic factors seem to be now at play. We need to disentangle the ‘drought’ effect from these more basic factors leading to
diversion of land from agriculture and this needs analysis with statistical and GIS
data and field level verification, but at a more general level soil degradation,
urbanization and slow down of irrigation have been suggested as reasons. Soil
degradation (See Ratna Reddy’s work reported in Chaddha, 2005) has been
extensively studied. Water is related with urbanization, both for non agricultural
demand and for land use reasons: It is not accurate to say that urbanization in India
has proceeded slowly in the last decade. As per the latest Land Use data, net area
sown during the last few years is around 141 Million Hectares.

<table>
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<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Area sown</td>
<td>141.17</td>
<td>141.46</td>
<td>140.00</td>
<td>140.90</td>
<td>141.36</td>
</tr>
</tbody>
</table>

Source: Agricultural Statistics at a Glance (2011)(Area in Million Hectares)

**Water**

There is an intimate relationship between cropping intensity, land use and water
development. Irrigation permits the possibility of multiple cropping by bringing
additional land under cultivation and the same land to be used more than once.
Application of new technologies in the past was related to assured water supply. The
new technology obviously raises productivity. But on account of photo insensitivity
properties, newer technologies permit shorter duration crops, which also is
associated with increase in cropping intensity. The use of these kinds of relationships
has been common in Indian agricultural policy and plan models, since the mid-
Seventies, when the first agricultural sub-model of Indian planning was formulated
for grain self reliance and is used in the current generation of water forecasting
models also. (Chopra, 2005)

In the Nineties arable area had stopped growing and so the land constraint was far
more severe. Growth was seen as now to be sourced from double cropping and
yields. This fundamental relationship was used to project the intensive resource base
of the economy. It was projected that by the end of the decade India would have
used up most of its balance water reserves, with the irrigated area reaching around
114 million hectares by 2010. Projections for 2020 were a requirement of irrigation
of 122 million hectares. The projections assume a vastly improved performance on
the land and water management frontiers. It needs to be remembered that the
balance ground water reserves are now more limited. A very dramatic effort will be
needed to harvest and carefully use the available water.

Meanwhile in actual fact in this decade irrigated area stopped growing.

**Table Irrigated Area in India 1998-99 to 2002-03(mn.hec.)**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Year</th>
<th>Net Irrigated Area</th>
<th>Gross Irrigated Area</th>
<th>Irrigation Intensity</th>
</tr>
</thead>
</table>

77
People like the Chairman of this Committee were wrong in forecasting that cropped area would remain constant, but were right in the warning they gave. The decline in canal irrigated area is equally recent and shocking, having been discovered by Tushar Shah of the International Water Management Institute in this neat little picture copied from the IWMI website.

We really do not have a detailed analysis of the debacle in irrigation. The first issue is the failure of the Advanced Irrigation Benefit Programme. This programme for completing on-going irrigation projects was started when I was Planning Minister. It was started because we have a long history of successes with such programmes. The first such programme was started in 1975-76, when we had formulated a plan for food self reliance. Table 5 shows that it worked and irrigated area went up by 5 million hectares and irrigation intensity from 108.77 to 110.25. We then reinvented it in 1987-88 when the late Rajiv Gandhi wanted a Plan for stepping up stagnating agricultural production. As member in the Planning Commission, I saw it again worked and over a brief period irrigated area went up by around 5 million hectares and irrigation intensity from 113.15 to 115.15. There has been very little progress since. These earlier programmes and the critical role they played have been described elsewhere but the real issue is why did the AIBP fail? We need a serious
professional evaluation, but being involved with planning and monitoring such programmes for over three decades. It maybe that not including a Canal component to cover the last mile of water deliveries is one reason and the other is bringing in a loan component and not keeping it a Central Plan scheme.

There are, however, more basic factors at play. As compared to relief against rainfall failure, the farmer now wants yield enhancing water supplies for water stress periods of diverse crops grown with modern technology. Access to ground water gives them this facility, badly planned and inefficiently managed canals don’t. farmers and their communities now want control on water deliveries. We have just started canal systems which employ for example hydraulic controls upto distributory levels and the successful examples are few and far between. In a recent critique of the Ken Betwa project put on web by the Interlinking of Rivers Project we have described how the soil scientists have shown that the area is unsuitable for paddy and irrigation would enhance yields from oilseeds, pulses and fodder crops, but the system is designed largely for flood irrigated paddy. We have also described the alternatives now possible, like the computer controlled delivery systems being constructed in the Sardar Sarovar Command.( See Alagh, 2006, below)

Are Small projects and Groundwater the Answer?

Tushar Shah has shown that this is not so. Infact groundwater use in a hundred Districts is according to him the problem and needs a special programme of replenishment.

According to Shah, “There are 100 districts which account for over 60% of India’s ‘critical’ and over-exploited blocks. These also happen to have the highest concentration of dug-wells in the country; here is where falling water tables have the most disastrous impact on drying up wells and forcing farmers to revert to rainfed farming. Outside the Punjab, most recent farmer suicides are reported from these districts; and groundwater stress is an important source of agrarian distress in these regions.

**Groundwater-stressed Hard-rock States of India**

<table>
<thead>
<tr>
<th>Annual Groundwater draft (billion m$^3$)</th>
<th>Total number of irrigation dug wells in use and % of India’s critical and over-exploited blocks$^3$</th>
<th>Area irrigated by groundwater (m ha)$^4$</th>
<th>% of wells and tubewells with electric pumps$^5$</th>
<th>Potential for increased recharge through well modification (b m$^3$)$^6$.</th>
</tr>
</thead>
</table>

<p>| 79 |</p>
<table>
<thead>
<tr>
<th>State</th>
<th>Percentage of GDP</th>
<th>Share of Groundwater</th>
<th>Diversion (‘000)</th>
<th>Recovery (‘000)</th>
<th>Groundwater</th>
<th>FDI</th>
<th>IRR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>14.90</td>
<td>1185</td>
<td>296</td>
<td>1.68</td>
<td>93.5</td>
<td>5.9</td>
<td></td>
</tr>
<tr>
<td>Gujarat</td>
<td>11.50</td>
<td>936</td>
<td>43</td>
<td>2.39</td>
<td>54.5</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td>Karnataka</td>
<td>10.71</td>
<td>328</td>
<td>68</td>
<td>0.86</td>
<td>96.1</td>
<td>1.64</td>
<td></td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>17.12</td>
<td>1277</td>
<td>30</td>
<td>3.50</td>
<td>85.5</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>Maharashtra</td>
<td>15.09</td>
<td>1659</td>
<td>8</td>
<td>1.57</td>
<td>96.1</td>
<td>8.3</td>
<td></td>
</tr>
<tr>
<td>Rajasthan</td>
<td>12.99</td>
<td>1172</td>
<td>190</td>
<td>3.66</td>
<td>47.4</td>
<td>5.86</td>
<td></td>
</tr>
<tr>
<td>Tamilnadu</td>
<td>17.65</td>
<td>1656</td>
<td>175</td>
<td>1.41</td>
<td>82.5</td>
<td>8.28</td>
<td></td>
</tr>
<tr>
<td>Total for 7 states</td>
<td>99.96</td>
<td>8213</td>
<td>810</td>
<td>15.07</td>
<td>82.6</td>
<td>41.1</td>
<td></td>
</tr>
<tr>
<td>7 states as % of India total</td>
<td>43.3</td>
<td>85.4</td>
<td>70.9</td>
<td>48.9</td>
<td>65.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Source: Tushar Shah**

Much of this distress can be alleviated—and at a relatively low cost to the society—by mounting a well-designed program of groundwater recharge. It is sometimes suggested that small watershed development programs are an effective answer to groundwater depletion; however, according to Tushar Shah, this is only partly so. In arid and semi-arid areas of India, tanks, small water harvesting structures with poor surface-area-to-depth ratio act as evaporation pans; they lose much more water to non-beneficial evaporation than is available for recharging the aquifers. In the old times, when groundwater withdrawal was a small fraction of today, irrigation tanks made sense; but today, they need to be reinvented. This is evident in the fact that on their own, farmer communities in many of these districts are converting their centuries-old irrigation tanks into percolation tanks to increase recharge to their wells.” While Tushaar Shah does not mention this, this will require development in the framework of watershed development, in the sense that the aquifer characteristics will have to be the bedrock of the regeneration process and it will involve the interaction of the efforts of multiple stakeholders. Tushar Shah’s point, however is that individual effort will be required and this then becomes a case of the point made early in the watershed project experience of aligning individual rights with limited and focused cooperation. Also there are synergies in combining this programme with canal modernization.

By their very nature, hard-rock areas have a profusion of dug-wells and tanks while sandy-alluvial aquifer areas are dominated by tube-wells and have few tanks for irrigation. The groundwater recharge strategy in hard-rock areas should therefore focus on modifying dugwells and tanks for maximizing groundwater recharge.
The implications of these trends are not being realized with the urgency they deserve, since at a basic level resource constraints of a more severe kind faced by certain East Asian economies are now being approached in India. Organizations, communities, households and individuals will have to grasp this fact and live with it. The severity of the blow will take time to sink in. But India does not have time. A few years ago I had warned that we are getting close to the kind of land and water shortage East Asian societies like China, Japan and Korea have grappled with, but have built up institutions through the centuries to cope. I had argued that we need to hasten. We would have roped in rain harvest water and improved irrigation deliveries.

The Twelfth Plan Approach Paper gives the example of the Andhra Pradesh Farmers Managed Irrigation Project. The Approach paper says: “Based on the aquifer mapping exercise, we need to develop sustainable groundwater management plans for each aquifer. This requires action on the ground involving partnerships of stakeholders at the village-level with hydro-geologists and social mobilizers, who would guide collective sharing and sequential use of groundwater based on a careful understanding of the storage and transmission characteristics of different aquifers in each of the hydrogeological settings outlined in the MTA of the XIth Plan. Promising work on a reasonable scale has started in this direction in Andhra Pradesh. The Andhra Pradesh Farmer Managed Groundwater Systems (APFAMGS) project is supported by the Food and Agriculture Organization and implemented by NGOs in seven drought-prone districts of Andhra Pradesh. The project employs participatory hydrogeological monitoring, by engaging farmers in data collection and analysis, and building their understanding of the dynamics and status of groundwater in local aquifers. This is complemented with crop water budgeting, whereby the quantity of water required for crops is assessed at the aquifer level and compared with the amount of groundwater actually available to arrive at a suitable cropping pattern that would permit sustainable groundwater use. The total outreach of the program is estimated at 1 million farmers. Such initiatives need to be undertaken at many more locations in the Twelfth Plan.”

The report which highlights the APFAMGS (Yoginder.K.Alagh, 2009. Evaluation Report of FAO Cooperation with India: 2010) makes the point of data based decision systems for the water sector. The point is that the difficulty of a bureaucratic approach to water management in dry areas is being questioned. Data systems have to be up to date, open, transparent and in the public domain.
To begin with, let us discuss the main agencies that are involved in the collection, collation, publication, and dissemination of water and land use related statistics at the national and state levels. The main agencies involved in water-related statistics, the Central Water Commission (CWC) and the Central Groundwater Board (CGWB), both under the Ministry of Water Resources, deal respectively with the surface and groundwater data. These two agencies provide a variety of water related statistics at the basin, state, and regional scales. The other major agency that provides information, especially on irrigated areas, land use, and cropping pattern, is the Directorate of Economics and Statistics (DES) operating under the Ministry of Agriculture of both in the central and state governments. The DES at the central government obviously collects the relevant information from the DES of individual states and union territories. The DES of the states and union territories, in turn, collects all the relevant information from the village, block, and district levels.

The Ministry of Environment Forests provides data on water quality and pollution for most of the major rivers and their tributaries. The data on drinking water supply in the rural, urban, and industrial purposes were provided respectively by the Ministries of Rural Development, Urban Development, and Industry. The Planning Commission is a major source for information on the investment and financial aspects of water development and management. Such financial data are available both across individual states and union territories and over plan periods. The National Sample Survey Office (NSSO) is another major agency providing water-related data, especially on some special aspects of groundwater development and management at the All India level. The two NSSO surveys conducted respectively during 1984-85 and during 2003-04 provide very valuable information on the ownership and distribution of irrigation wells and pumpsets both at the macro and micro levels.

The Minor Irrigation Division of the Ministry of Water Resources provides very valuable information on minor irrigation through the Minor Irrigation Census that it conducts periodically. So far three minor irrigation censuses have been conducted. The first Minor Irrigation Census was conducted in 1993 by having 1986-87 as the reference period, the second Minor Irrigation Census was conducted in 2001 by having 1993-94 as the reference period the third, and the latest Minor Irrigation Census was conducted in 2005 by having 2000-01 as the reference period. Since these minor irrigation censuses are conducted in all 33 states and union territories of India and cover a total of 6.38 lakh villages in 586 districts, they provide very valuable information on the statistics of minor irrigation both at the micro and macro levels, especially adding the much needed temporal dimension. Notably, the minor irrigation census data are digitized and are widely available through the National Informatics Centre of the Ministry of Communication and Information Technology.

The Public Works Departments and the Groundwater Departments or their corresponding agencies in the state and union territories have with them a variety of statistics on small water bodies, groundwater levels, reservoir storages, and irrigation potential created through the construction of dams of varying sizes. Some of this information is also periodically reported to the national level agencies such as
the CWC and CGWB. Besides the government departments and agencies, there are also private agencies such as the Centre for Monitoring Indian Economy and Indicus, which provide water and land related data on a payment basis. Besides the websites of the CWC and CGWB, there are also other websites such as the www.waterinfo.gov.in and www.indiawaterportal.org from which one can download some of the water and land use related data.

**Published and Other Sources of Water and Land Use Statistics**

As to the published sources of information on water and land use, there are a variety of publications produced and distributed by some of the agencies discussed above with different levels of periodicity. The CWC, as the apex body dealing with the water development and management in the country, is producing and distributing the following publications.

(a) Water Related Statistics  
(b) Integrated Hydrological Data Book  
(c) National Register on Large Dams  
(d) Pricing of Water in Public System in India  
(e) Handbook on Water Resource Statistics  
(f) Financial Aspects of Medium and Major Projects

Most of these publications can also be downloaded from the CWC website: http://www.cwc.nic.in/main/webpages/publications.html. Among these publications, the one titled: Water Related Statistics is the most comprehensive as it brings together a number of important water-related statistics such as rainfall, water resources potential and utilization, pricing and financial aspects, land use and cropping pattern, sediment and pollution, and floods and water forecasting. While the rainfall related information are collected from the meteorological department, the information on land use, irrigation, and cropping pattern, food production and yield of selected crops, and agricultural domestic product are all obtained from the Ministry of Agriculture. The information on pollution and water quality parameters for major rivers and their tributaries are obtained from the Ministry of Environment and Forest.

The publication titled: Integrated Hydrological Data Book, which provides a variety of hydrological and land use information for all the non-classified river basins (all river basins except the international river basins such as the Indo-Gangetic and Brahmaputra systems) in the country, is based on the data collected from 855 gauge and discharged stations located along all the major rivers and their tributaries. The data provided in this publication is going to be further refined and made more comprehensive as the number of gauge and discharged stations are planned to be increased from 855 to 2000 in the near future. By classifying all the non-classified river basins into 12 river basin systems, this Hand Book provides for each river basin system the information on the basic physical and hydrological features such as the seasonal maximum, minimum, and mean river flows and the storage capacity of completed, ongoing, and planned projects, sediment load, water quality parameters,
and basin and state-wise land use, including the extent of gross and net sown area as well as the gross and net irrigated area.

While the *Handbook of Water Resources Statistics* provide some basic information on water resources potential, utilization, and development for ready reference, the two publications entitled: *Pricing of Water in Public System in India* and *Financial Aspects of Medium and Major Projects* provide key information on the financial, pricing, and cost recovery aspects of irrigation sector. As noted already, some of this financial information is also available in the publication entitled: *Water Related Statistics*. Notably, the time series information on pricing and cost recovery aspects of irrigation projects found in the two publications noted above are also available in the report of the Vaidyanathan Committee entitled: *Report of the Committee on Pricing Irrigation Water*, published in 1992. Although, the data in this report is a bit outdated, it is important to note that it has estimated the levels of water productivity based on a comparison of the values of rainfed and irrigated outputs on a per hectare basis. Considering the importance of calculating water productivity at present, there is an urgent need to update the exercise made by the Vaidyanathan Committee to produce the much needed statistics on water productivity for various crops, periods, and regions. The information on water productivity can shed more light on the realistic levels of cost recovery as well as the potential for water use efficiency.

The *National Register of Large Dams* provide up-to-date information on the total storage capacity and available storages on a continuing basis and such information are based on the constant monitoring of 81 large dams in the country. The Ministry of Agriculture often uses this information to make projection of area under cultivation and yield levels of major crops. The Minor Irrigation Census for the three period, noted above is also available in published form, but that is only in a consolidated form. However, the micro level information on Minor Irrigation Census is available in digitized form for download from the National Informatics Centre. Similarly, the Agricultural Census, conducted every five years by the Ministry of Agriculture also provides water and land use related statistics at the state and district levels. While the consolidated information on Agricultural Census is available in published form, actual survey data in digitized form can be obtained from the Ministry of Agriculture.

The CGWB compiles the information on groundwater tables based on the observations from 15640 observation or control wells spread across the country. Observations are taken four times a year covering the groundwater tables both before and after the two monsoon periods. Besides the observation or control wells managed by CGWB, there are also other wells maintained by surface water projects monitored by CWC, where the control wells help the project authorities to avoid waterlogging and to plan for additional groundwater development within surface water projects. Based on the water level data and other hydro-geological information and using the norm suggested by the Groundwater Estimation Committee constituted in 1984, the CGWB and State Ground Water Departments have estimated the groundwater resources of the country. It was further estimated
that 67 percent of the groundwater resources are due to recharge from rainfall and the rest are due to seepage from canal and other surface water bodies. The CGWB also has block level information on the level of groundwater development. Based on the level of groundwater development, CGWB has categorized all the blocks in the country as critical, Semi-critical, and others. This information is valuable for planning credit provision and devising groundwater development programs in different parts of the country. Most of the information on groundwater resource potential, exploitation, and utilization at the block level are available in the form of consolidated tables and maps at the CGWB website: http://cgwb.gov.in/download.htm.

Data Gaps and Related Statistical Issues

While India has a relatively strong data base on both water and land resources, still there is a lot of room for development and improvement. The following are some of the areas where such improvements are possible and needed.

First, there are conceptual problems with some technical underpinnings in the calculation of the total supply and demand. The total quantum of precipitation in the country is estimated to be 4000 cubic kilometre (cum). The total ‘available’ water resources for development is estimated to be 2385 (1953 cum from surface water and 432 cum from groundwater) cum and the total ‘usable’ water resources is reckoned at 1086 cum (690 cum from surface water and 396 from groundwater). There are issues involved in the use of the concepts of ‘available’ and ‘usable’ water resources. For instance, the ‘availability’ figures are being questioned not only on grounds of double-counting due to the overlap between surface and sub-surface sources of water but also due to the discounting of the role of evapotranspiration. Besides the concept of ‘water stress’ is also related to water availability, as the former is calculated as annual water resource available per capita. Similarly, the aggregate total national demand for water is also conceptually linked with the underlying water level of water use efficiency. As use efficiency is enhanced, the aggregate water demand is expected to decline. While the total water demand projected for 2050 ranges between 973 and 1180 cum, water demand management policies promoting water use efficiency and water recycling will place the demand to be closed to the lower bound of the projection.

Second, we have temporal data on irrigated area by individual sources, but we do not have the same on storage structures (reservoirs and tanks) with their planned and actual irrigated areas. Similarly, we also do not have temporal data on the number of tanks (small water bodies) and their current status in terms of storage and irrigable area. Such a temporal data on the number of tanks with their command areas will help us to make right decision on water investment. Similarly, there is also a need to develop temporal data on the number of diesel and electric pumpsets, their energy consumption levels, and the extent of their irrigated area.

Third, although conjunctive use of water (tank + well or well + canal) is practiced in many parts of India, the data on the extent of area covered by this practice is not available at present, especially on a temporal basis. More important from the
conjunctive use perspective is the hydrological linkage between surface and groundwater, especially in and around canal irrigation projects. This implies that seepage losses in canal and other surface irrigation systems in the upper reaches are actually not losses as they contribute to groundwater resource potential within the canal and other surface irrigation projects. In this sense, the area being reported under groundwater irrigation in many canal command project is possible due to aquifer recharge from surface irrigation. This ultimately results in reduced area being reported under canal irrigation. Most of the states do not charge for groundwater even though the wells are recharged from seepage from canals and applied canal irrigation.

Fourth, besides the statistical issues related to the underreporting of the area under canal irrigation and masking the extent of conjunctive use of groundwater and surface water, there is also the problem of variations in the actual area being irrigated by various irrigation projects. This problem occurs partly because of the discrepancy between the planned and actual area of irrigation and partly because of the changed sectoral allocation of water over time. The planned or designed command of projects is based on an optimum crop pattern, soil features, and land irrigability classifications. But, the actual area irrigated is based on the observed crop pattern after project construction as determined by consumption needs, investment requirement, and price levels of farm inputs and outputs. The actual area being irrigated is also affected by the fact that a large amount of canal water, which is originally developed for irrigation purpose, is now increasingly transferred to domestic and industrial purposes. But, there is no information on how much water is actually used for domestic purpose from each system and what are the implications of this water diversion for area being irrigated by each system. If this data is available, it would help us both in fixing water price for irrigation and other purposes more appropriately as well as in calculating the gross receipts from irrigation and non-irrigation uses more realistically.

Fifth, while the CGWB website vast amount of data in map and summary form, to facilitate analytical research and quantitative analysis by scholars working on groundwater management, it is important to give access to them the original data set on groundwater potential and utilization, and water table fluctuations. Such original data set when available in temporal form and cross-section of development blocks can help the researchers to relate them with economic and development variables such as employment, income, land and labour productivity, yield levels of major crops, and infrastructural aspects such as road and market developments. It is only the research and analysis of this kind that will help us to understand and evaluate the economic impact of groundwater development in the country.

Sixth, micro-irrigation systems such as drips and sprinklers have been in use in India over the last two decades. But, the separate information on the area covered by drips and sprinklers is not available. State-wise and crop-wise area under different micro-irrigation systems on temporal basis is required for making policy decision. Similarly, it is also useful to have information on the area under the System of Rice Intensification, especially given its implications for water use efficiency and water savings in canal irrigation projects under rice cultivation.
Seventh, watershed development programme being implemented in different parts of the country has made significant impact on water availability in many rainfed regions. Micro level studies have reported that the area under irrigation has increased in watershed regions after treatment. However, no agency is providing any data on the area getting additional irrigation from watershed projects and the extent of yield and employment impact. But, these sets of information are essential for quantifying the extent and sustainability of the actual impacts of the watershed development projects.

Eighth, while India has one of the largest irrigation sectors in the world, data on resource use efficiency are seldom published by any agency. We do not have any data on how efficiently the released water is used in the command area for different crops. This is mainly because of the absence of water accounting and auditing exercise. It is important to note in this respect that Maharashtra has introduced water auditing for each project that has helped to enhance water use efficiency in canal command areas. Notably, 'Water Auditing Report' is regularly published in Maharashtra over the last few years. It is time that similar attempts are being made in other states and 'Water Auditing Report' is published for the whole country. With the information on water auditing and yield levels, it is possible to calculate land and water productivity for different crops, seasons, and areas.

Ninth, the area coverage of irrigation has increased substantially since independence. But, the actual economic impact and contributions of irrigation have not been estimated and published on a temporal basis. In fact, we do not have any reliable estimate from the government sources on the contribution of irrigation in value terms. Therefore, the following types of data can be compiled and published regularly:

(a) Yield by source of irrigation,
(b) Adoption of yield increasing inputs by source of irrigation,
(c) Cropping pattern by source of irrigation,
(d) Gross and net cropped area by source of irrigation, and
(e) Gross value of output by irrigated and un-irrigated area.

Tenth, the indirect economic benefits or the multiplier effects of irrigation are considered to be as large as its direct benefits. This was also clearly underlined by late Prof. D. R. Gadgil in his seminal work on benefit-cost analysis of irrigation projects. Irrigation induced multiplier effects of irrigation are vast and they take the form of the second round employment and income of the direct benefits both in the farm and non-farm sectors. Empirical studies calculate the irrigation multiplier effects to be as much as 1:3. However, we have no data on the magnitude of the indirect benefits of irrigation development. Since information on indirect benefits of irrigation would help us to estimate more reliable benefit-cost ratio for irrigation projects, concerted efforts are needed to collect and publish data on the indirect benefits of irrigation on the following parameters:

(a) Irrigation impact on agricultural wage rate,
(b) Irrigation impact on agricultural and rural employment,
(c) Irrigation impact on consumer price index,
(d) Irrigation impact on literacy rate,
(e) Irrigation impact on consumer expenditures,
(f) Irrigation impact on rural poverty,
(g) Irrigation impact on migration, and
(h) Irrigation impact on the health aspects of population.

Eleventh, currently multiple government departments and agencies are publishing similar types of data on water and land utilisation. But, there are conceptual and statistical discrepancies in the data quality published by these agencies. Researchers and policy makers are also often confused in choosing the correct data from these sources. One of the most glaring cases of such data discrepancies relate to the difference in the data on irrigated area provided by the CWC and the one provided by the DES under the Ministry of Agriculture. The differences are due to the fact that while CWC data relate to the created irrigation potential as reported by the project authorities, the DES data relates to actual area irrigated as reported by the land use statistics coming from the village level. In any case, these and other discrepancies in data quality published by various government departments and agencies need to be avoided. This requires a greater coordination among the agencies involved in the collection, collation, and dissemination of water and land use related statistics.

And, finally, land use data is relatively more accurate and formal than water related data partly due to the long history and partly due to formal land records and tax systems. Temporal data on land use is also available for any scale. But, there is a serious issue of data gap in the sense that the land use data is not able to reflect the increasing movement of land away from agricultural to non-agricultural uses, which is observed, especially during the last few years marked by rapid urbanization and industrial and commercial developments. As a result, the official figure of net sown area continues to be stated as 142 million hectares, despite the vast chunks of area under cultivation are going out of agricultural production every year. This problem suggests the need for more careful accounting of not only land under different uses. Equally important are the serious food and water use implications of the ongoing land transfers out of agriculture.

**Recommendations**

The water and land related statistical system as well as the data gaps and related statistical issues discussed in the previous sections lead to several important suggestions and recommendations for improving quality, clarity and quantity of water and land-related statistics in the country. The most important among these recommendations are given below.

First, as has been shown, a number of public and private agencies are involved in the collection, collation, publication, and dissemination of water and land related data. The multiplicity of agencies also creates conditions for the emergence of some conceptual confusions and statistical discrepancies. To avoid these problems and promote certain
amount of standardization in data, it is useful that a single agency act as a repository for all water and land related data. Such an agency can also reduce the transaction cost of obtaining the data for the researchers and other users. Such an agency indeed exists already within the CWC. The Information System Organization (ISO) operating within the Water Planning and Project Wing of CWC qualifies to play the role of a single agency repository for collecting, standardizing and disseminating the water and land related data in the country. The ISO has to link up and coordinate with other agencies having different information on water and land resources in the country.

Second, there is an urgent need for the rationalization of the water and land related data in the country. Such a rationalization requires a rearrangement of the water and land related data within a conceptual and methodological framework. One framework that would be vastly helpful in understanding the economic and welfare impacts of water and land resources related to the ‘inputs-outputs/outcomes-impact’ framework. The water related data that are available with CWC or CGWB related mainly to inputs. On the other hand, the yield, irrigation and water use data that are with the Ministry of Agriculture or Rural Development relate to outputs/outcomes. But, the information on income, employment, consumption that the researchers collects from primary surveys or other secondary sources relate to the impact dimension. For it to valuable as a development tool, the statistical system in the country should promote the development information on this ‘input-output/outcome-impact’ framework. While this framework is very valuable and is not easy to develop within a short span of time. Concerted efforts and systematic investments are needed to make a statistical system of such quality a reality.

Third, immediately connected with the above point is the need to prioritize data in the sense that a core set of data on some of the key variables are assembled first on a priority basis, while the development of data on other variables is sequenced within a well defined future path. In this respect, the core set of data identified should be such as to help the development of certain indicators that can show the overall physical, financial, economic, ecological and institutional health of the water sector. For instance, the data on water resources developed and water resources utilized can be used to develop the indicator for utilization gap. Similarly, the data on water pricing and cost recovery and the economic value of water in different context can be used to develop the indicator for the financial gap and incentive gap. These indicators, though simple, are very valuable for influencing policy decisions.

The Ministry of Water Resources has recently released a Report on a Draft for a National Framework Law for the Water Sector, Which worked under the Chairmanship of the Chair of this Committee, Y.K.Alagh. This Draft provides for the development of A WRIS (A Water Resources Information
The Committee recommends that the NSC coordinate with the MOWR for the development of this system.

13.4 : State-wise Percent Coverage of Irrigated Area under Principal Crops during 2008-09*

<table>
<thead>
<tr>
<th>State/Union Territory</th>
<th>Total area</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANDHRA PRADESH</td>
<td>48.7</td>
</tr>
<tr>
<td>ARUNACHAL</td>
<td></td>
</tr>
<tr>
<td>PRADESH</td>
<td>20.2</td>
</tr>
<tr>
<td>ASSAM</td>
<td>3.8</td>
</tr>
<tr>
<td>BIHAR**</td>
<td>61.0</td>
</tr>
<tr>
<td>CHHATTISGARH</td>
<td>27.0</td>
</tr>
<tr>
<td>GOA</td>
<td>22.0</td>
</tr>
<tr>
<td>GUJARAT**</td>
<td>45.6</td>
</tr>
<tr>
<td>HARYANA</td>
<td>85.3</td>
</tr>
<tr>
<td>HIMACHAL</td>
<td></td>
</tr>
<tr>
<td>PRADESH**</td>
<td>19.7</td>
</tr>
<tr>
<td>JAMMU &amp; KASHMIR</td>
<td>41.4</td>
</tr>
<tr>
<td>JHARKHAND</td>
<td>9.7</td>
</tr>
<tr>
<td>KARNATAKA</td>
<td>31.9</td>
</tr>
<tr>
<td>KERALA</td>
<td>17.0</td>
</tr>
<tr>
<td>MADHYA PRADESH</td>
<td>32.5</td>
</tr>
<tr>
<td>MAHARASHTRA**</td>
<td>19.0</td>
</tr>
<tr>
<td>MANIPUR**</td>
<td>21.9</td>
</tr>
<tr>
<td>MEGHALAYA</td>
<td>21.5</td>
</tr>
<tr>
<td>MIZORAM</td>
<td>11.8</td>
</tr>
<tr>
<td>NAGALAND</td>
<td>20.5</td>
</tr>
<tr>
<td>ORISSA</td>
<td>35.0</td>
</tr>
<tr>
<td>PUNJAB</td>
<td>97.6</td>
</tr>
<tr>
<td>RAJASTHAN</td>
<td>34.7</td>
</tr>
<tr>
<td>SIKKIM**</td>
<td>9.1</td>
</tr>
<tr>
<td>TAMIL NADU</td>
<td>58.3</td>
</tr>
<tr>
<td>TRIPURA**</td>
<td>35.4</td>
</tr>
<tr>
<td>UTTARAKHAND</td>
<td>47.9</td>
</tr>
<tr>
<td>UTTAR PRADESH**</td>
<td>76.4</td>
</tr>
<tr>
<td>WEST BENGAL**</td>
<td>56.2</td>
</tr>
<tr>
<td>ALL INDIA</td>
<td>45.3</td>
</tr>
</tbody>
</table>

* Provisional
** The figures related to irrigated area (Part-II) are either estimated based on the data for the the latest available year received from the State/UT or are estimated/taken from Agriculture Census.
Net irrigated area as per the annual reports of Central Water Commission for the year 2004-05 is 62.3 M Ha.

<table>
<thead>
<tr>
<th>Year</th>
<th>ALL INDIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-06</td>
<td>41.6</td>
</tr>
<tr>
<td>2006-07</td>
<td>42.9</td>
</tr>
<tr>
<td>2007-08</td>
<td>44.6</td>
</tr>
<tr>
<td>2008-09</td>
<td>44.6</td>
</tr>
<tr>
<td>2009-10</td>
<td>45.3</td>
</tr>
</tbody>
</table>

Percentage of area under irrigation has been given in the adjacent table which shows there is slight increase in the percentage irrigated land in the country.

Power and Electricity

Modern agriculture needs modern energy - the two are closely linked. For many developing countries, agriculture is the dominant sector in developing the economy. Increasing productivity and the modernisation of agricultural production systems are the primary drivers of global poverty reduction and energy plays a key role in achieving this. Energy input to modern and sustainable agricultural production and processing systems is a key factor in moving beyond subsistence farming towards food security, added value in rural areas and expansion into new agricultural markets. There are two main energy requirements for greater agricultural productivity in a market-oriented agriculture, provided either by renewable or conventional energy sources or a combination of both:
1. Energy for transport (fossil fuels or biofuels) is needed for many services within the supply chain, from the production process to transport to markets. Market-oriented agriculture is heavily dependent on vehicles for transport and on favorable infrastructure such as linkages to roads. Access to markets is a major incentive for farmers to increase production in order to increase income.

2. Energy for production, processing and commercialization is provided in different forms. In many rural areas, supplying electricity by connecting to the national grid is economically or logistically unfeasible. Decentralized power production with renewable energy systems and hybrid systems (combination renewable/fossil) proves more reliable, more environmentally friendly and more cost-effective than fossil fuel systems alone.

The important role played by modern energy services and related technologies in modern smallholder agriculture throughout the supply chain, from agricultural production, post-harvest and storage to the processing and commercialization of crops, needs to be accepted. The dual role of agriculture as energy user and producer needs recognition and suggests information management models of a book keeping kind.

Tractor manufacturing in India started in 1961 with an aggregate capacity to manufacture 11000 tractors. Joint efforts made by the government and private sector have led to steady increase in the level of mechanization over the years. Pump sets have been increasing rapidly. Earlier, the average capacity of pump sets was 3.68 kW and a pump set on an average consumed 6004 kWh of electricity in that year (Central Electricity Authority, 2005). However, owing to insufficient electricity supplies, some farmers have also procured diesel pump sets as a standby. In the recent past, concerted efforts of the government has led to an introduction of biomass and solar photovoltaic based pumping systems.

As a result of increased mechanization in agriculture, crop production and rural agro processing emerged as one of the major consumers of commercial energy. The share of mechanical and electrical power in agriculture increased from 40% in 1971-72 to 84% in 2003-04. The availability of farm power per unit area (kW/ha) has been considered as one of the parameters of expressing the level of mechanization. Power availability for carrying out various agricultural operations has increased from 0.3 kW/ha in 1971-72 to the tune of 1.4 kW/ha in 2003-04. Connected load in the agriculture sector in 2004 was estimated to be 51.84 GW, the number of consumers being 12.8 million. Electricity consumption in agriculture sector has been increasing mainly because of greater irrigation demand for new crop varieties and subsidized electricity to this sector. Studies document that proper selection, installation, operation, and maintenance of pumping sets is neglected, as a result of which they do not operate at the desired level of efficiency, leading to huge waste of energy.

Agriculture (plantation/food) consumed 7123 thousand tonnes of HSD (high-speed diesel) in 2003-04, accounting for 19.2% of the total HSD consumption during the year. Consumption of LDO (light diesel oil) and furnace oil for plantation in 2003-04
was 44000 and 243000 tonnes, respectively, accounting for 2.7% of the total LDO and 2.9% of the total furnace oil consumed in the country. Consumption of furnace oil for transport (agriculture retail trade) in the agriculture sector was 94 thousand tonnes (Ministry of Power and Natural Gas; 2004). However, it is difficult to assess the total diesel consumption for agriculture from the available data. Distribution of diesel for Agricultural Transport and Pump Sets should be collected and disseminated periodically.

**Sample Surveys to supplement the Agricultural Census quinquennial data may be planned. They should also attempt to collect information on newer kinds of machines being used for agriculture as real wages rise on account of schemes like MNREGA. Energy balances should be prepared in different agro climatic zones through the rainfall cycle.**

**Transport**

An efficient transport system is critically important to efficient agricultural marketing. If transport services are infrequent, of poor quality or expensive then farmers will be at a disadvantage when they attempt to sell their crops. An expensive service will naturally lead to low farm gate prices (the net price the farmer receives from selling his produce). Seasonally impassable roads or slow and infrequent transport services, coupled with poor storage, can lead to losses as certain crops (e.g. Fruits, fresh vegetables, tea) deteriorate quickly over time. If the journey to market is made over rough roads then other crops (e.g. bananas, mangoes) may also suffer losses from bruising; this will also result in lower prices to the farmer. If the margin between what the farmer receives from the sale of his produce and what the urban consumer pays for his produce is high then the effective demand transferred to the farmer will be correspondingly be reduced.

**TRANSPORT COSTS**

It is generally recognized that transport operating costs are higher on rough roads than on good quality bitumen roads and generally this will be reflected in passenger fares and freight tariffs. However a wide range of transport costs (measured per passenger/km or tonne/km) have also been found in different countries for similar types of transport operation on similar roads. This indicates that there is substantial scope for improving efficiency of transport operations in many countries. A comparative study of rural transport carried out in Ghana, Zimbabwe, Thailand, Pakistan and Sri Lanka in 1994-5 has shown that Ghana and Zimbabwe have transport charges that are two to two and half times more expensive than for Asian countries for comparable journeys of up to 30km. In this case data was collected from a variety of different types of vehicles including tractors, power tillers pickups and trucks (Ellis and Hine 1998).

In surveys held in Tanzania designed to measure the impact of poor road condition, it was found that over a 50km distance that an increase in roughness of 50% would increase truck charges by 16% and increase pickup charges by just under double. It
was also found that there were large changes in wet and dry season charges on poor quality roads. For example, on one road passenger fares increased by 60% in the wet season and freight charges increased by 65%. Similar figures were also found in Madagascar where on poor quality roads wet season passenger fares on “Taxis-brousses” were 70% higher than dry season fares (Ninnin, 1997).

More recently, it was found that long distance freight rates in Tanzania were on average three times higher than for Indonesia. However transport charges and costs (per tonne km) by conventional vehicles are not uniform. Not only are there large differences in costs between different countries for the same type of transport (particularly between Africa and Asia), there are large differences between rural short haul transport (usually carried out by pickups or small rigid trucks) and long distance interurban transport that is more often carried out by heavy tractor and semi-trailer. Research carried out in Cameroon, Mali and CÔted’Ivoire has shown that costs of short distance local transport (i.e. up to 10km) are on average six times those of long distance transport (i.e. 50km) (LET, ENSTP and INRETS, 1989).

THE IMPACT OF TRANSPORT COSTS ON AGRICULTURAL PRODUCTION

The proportion of transport charges to final market price will vary with a range off actors such as commodity type, the efficiency of the transport and marketing sectors and travel distance. Studies carried out in Ghana demonstrated this variation. As a proportion of final market price wholesale transport to Kumasi were found to be between 3.5 and 5% for maize, yam and plantain with mean distances of the different crops of between 120km to 200km (Hine, Riverson and Kwakye, 1983). In another study an average of 7 to 8% were found for Koforidua. A more recent study carried out by the Ministry of Transport found that for Accra the proportion was 11% for maize (420 km) and 25% for tomatoes (360 km).

Our own Marketed surplus studies show that the impact of total transport costs on agriculture will be higher than these figures indicate because the critical factor is the relationship between transport costs and what the farmer receives for his produce at the farm gate. Both market margins and transport costs (including the high cost of farm to market operations need to be subtracted from the final market price.

The effect of reduced transport marketing costs on agricultural productivity can be estimated using agricultural supply price elasticities. These have been shown to lie in the range 0 to 1.5. If it is assumed that transport costs of moving goods to a major urban market are equivalent to say 30% of farm gate prices and that agricultural prices are set at the urban market then, a reduction of total transport costs by 20%, which is totally passed onto the farmer, will induce a rise in farm gate prices by six per cent. If it is also assumed that the total agricultural supply elasticity is +1 then one may estimate that total agricultural output would rise by about 6%. Road investment has an important part to play in reducing transport costs, however improving short lengths of feeder roads may have little impact if no change in transport mode occurs. It has been calculated that upgrading 5km of feeder road from earth to gravel standard might only increase farm gate prices by about one
tenth of one per cent. In comparison bringing new motor vehicle access 5km closer to a village (or farm) when the alternative was head loading by hired labour could increase farm gate prices by over a hundred times as much.

Besides transport costs, other factors that can account for a wide range of prices, these include small volumes, poor price information, commodity perishability, differences in storage and retailing costs and a monopolistic marketing system. For example at the village level travelling wholesalers will travel together to a village may collude and set prices to the farmer before they arrive. Individual farmers will often have little choice as to whom they will trade with. More often than not, it will be with one travelling wholesaler with whom the farmer has a long standing relationship, this is often strengthened by a credit agreement. For many farmers, indebtedness will force them to sell at peak harvest time when prices are low. The price of transport is not the only disincentive to increased agricultural production.

**Indian Marketed Surplus studies** show the importance of such factors in farm/market differentials. But such studies are done at infrequent intervals. The Expert Group has learnt that the MOA has conducted such studies in 2011-12. It is recommended that such studies should at least be conducted quinquennially. There should be a mechanism to collect data on this sector periodically.
CHAPTER-6
Subsidy and Food Security

Credit and Subsidy

In India a multi-agency approach comprising co-operative banks, scheduled commercial banks and RRBs has been followed for purveying credit to agricultural sector. The policy of agricultural credit is guided mainly by the considerations of ensuring adequate and timely availability of credit at reasonable rates through the expansion of institutional framework, its outreach and scale as also by way of direct lending. Over time, spectacular progress has been achieved in terms of the scale and outreach of institutional framework for agricultural credit. Some of the major discernible trends are as follows:

Over time the public sector banks have made commendable progress in terms of putting in place a wide banking network, particularly in the aftermath of nationalization of banks. Table and plot pertaining to the performance of the various credit providers is given below.

<table>
<thead>
<tr>
<th>Year</th>
<th>Co-op Bank%</th>
<th>RRBs%</th>
<th>RRBs</th>
<th>Commercial Banks</th>
<th>Commercial Banks%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999-00</td>
<td>40</td>
<td>3172</td>
<td>7</td>
<td>24733</td>
<td>53</td>
<td>46268</td>
</tr>
<tr>
<td>2000-01</td>
<td>39</td>
<td>4219</td>
<td>8</td>
<td>27807</td>
<td>53</td>
<td>52827</td>
</tr>
<tr>
<td>2001-02</td>
<td>38</td>
<td>4854</td>
<td>8</td>
<td>33587</td>
<td>54</td>
<td>62045</td>
</tr>
<tr>
<td>2002-03</td>
<td>34</td>
<td>6070</td>
<td>9</td>
<td>39774</td>
<td>57</td>
<td>69560</td>
</tr>
<tr>
<td>2003-04</td>
<td>31</td>
<td>7581</td>
<td>9</td>
<td>52441</td>
<td>60</td>
<td>86981</td>
</tr>
<tr>
<td>2004-05</td>
<td>25</td>
<td>12404</td>
<td>10</td>
<td>81481</td>
<td>65</td>
<td>125309</td>
</tr>
<tr>
<td>2005-06</td>
<td>22</td>
<td>15223</td>
<td>8</td>
<td>125859</td>
<td>70</td>
<td>180486</td>
</tr>
<tr>
<td>2006-07</td>
<td>22</td>
<td>15170</td>
<td>10</td>
<td>100999</td>
<td>68</td>
<td>149349</td>
</tr>
</tbody>
</table>
• Widening the spread of institutional machinery for credit and decline in the role of non-institutional sources.
• The share of institutional credit, increased reflecting concomitantly a remarkable decline in the share of non-institutional credit.
• Notwithstanding their wide network, co-operative banks, particularly since the 1990s have lost their dominant position to commercial banks.
• The efforts to increase the flow of credit to agriculture seems to have yielded better results in the recent period as the total institutional credit to agriculture recorded a higher growth as compared to what it was earlier. However, the growth of direct finance to agriculture and allied activities witnessed a decline.

Subsidy regime of Govt. of India may be divided into Indigenous (Urea) Fertilizer, Imported (Urea) Fertilizer, Sale of decontrolled fertilizer with concession to Farmers, Petroleum Subsidy, Grants to NAFED for MIS/PPS, Other Subsidy (Import/Export of Sugar, Interest Subsidies, Other Subsidies, Subsidy on Import of Pulses/edible oils). India subsidizes agricultural inputs in an attempt to keep farm's cost low and production high. GOI’s intended results are for farmers to benefit from lower costs, but also for them to pass some of the saving to consumers in form of lower food prices. GOI pays directly to fertilizer companies in exchange for selling fertilizer at lower price to the farmers. Irrigation and electricity subsidies are provided directly to the farmers by supplying the electricity at the price lower than the cost of production. The effective price to the farmers for fertilizer is around 25 to 60% and for electricity it is around 10 to 30 percent. Details of subsidies of GOI is given below:

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td>24176</td>
<td>25181</td>
<td>25796</td>
<td>23077</td>
<td>24014</td>
<td>31328</td>
<td>43751</td>
<td>58443</td>
<td>63844</td>
<td>72823</td>
</tr>
<tr>
<td>Total Fertilizer Subsidy</td>
<td>11015</td>
<td>11847</td>
<td>15879</td>
<td>18460</td>
<td>26222</td>
<td>32490</td>
<td>76603</td>
<td>61264</td>
<td>62301</td>
<td>67159</td>
</tr>
<tr>
<td>Petroleum Subsidy</td>
<td>5222</td>
<td>6353</td>
<td>2956</td>
<td>2681</td>
<td>2699</td>
<td>2820</td>
<td>2852</td>
<td>14951</td>
<td>18137</td>
<td>68483</td>
</tr>
<tr>
<td>Grants to NAFED for MIS/PPS</td>
<td>305</td>
<td>159</td>
<td>128</td>
<td>266</td>
<td>566</td>
<td>864</td>
<td>378</td>
<td>851</td>
<td>254</td>
<td>200</td>
</tr>
<tr>
<td>Other Subsidies</td>
<td>2611</td>
<td>964</td>
<td>1234</td>
<td>3320</td>
<td>4155</td>
<td>4568</td>
<td>6902</td>
<td>7057</td>
<td>9862</td>
<td>8512</td>
</tr>
<tr>
<td>Total Subsidies</td>
<td>43534</td>
<td>44476</td>
<td>46071</td>
<td>47783</td>
<td>57685</td>
<td>71786</td>
<td>130043</td>
<td>142567</td>
<td>174634</td>
<td>217115</td>
</tr>
</tbody>
</table>

Total Subsidy data should be collected on a periodical basis. A Committee on aligning Agricultural Pricing to a WTO trade dominated regime has made detailed recommendations on measuring Aggregate Subsidies to the Agricultural Sector as also the Aggregate Measure of Support. These techniques have been discussed earlier in this report. Such estimates need to be made on an annual basis.
Food Security

Food security is of importance for a country like ours where still 33% of population are BPL and more than 50% of population do not have access to nutritional food as per requirement of various traits of the human body.

As per Food and Agriculture Organization (FAO), food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Food security has three components, viz., availability, access, and absorption (nutrition). The three are interconnected. Improvement in nutrition is important, even for increase in productivity of workers. Thus, food security has intrinsic (for its own sake) as well as instrumental (for increasing productivity) value.

Poverty Removal and Food Security:

A reduction of the population below the poverty line also leads to the diversification of the food basket and not just an increase in cereal demand. In fact, the ADB has modeled that a strategy of diversified agricultural growth reduces poverty and malnutrition faster (See Table below)

Poverty removal and malnutrition amelioration based on water development Asia 2020

<table>
<thead>
<tr>
<th>REGION</th>
<th>Per capita food availability (kcal/day)</th>
<th>Rural poverty (millions)</th>
<th>Eliminating malnutrition (malnourished children, 0 - 5 years, millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>2 083</td>
<td>2 397</td>
<td>2 559</td>
</tr>
<tr>
<td>South Asia</td>
<td>2 184</td>
<td>2 370</td>
<td>2 510</td>
</tr>
<tr>
<td>China</td>
<td>2 019</td>
<td>2 680</td>
<td>2 913</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>1 945</td>
<td>2 525</td>
<td>2 626</td>
</tr>
<tr>
<td>Developing Asia</td>
<td>2 045</td>
<td>2 525</td>
<td>2 646</td>
</tr>
</tbody>
</table>

Source: ADB, 2000 based on work by IFPRI
Note: ! neg is negligible

The Different Scenarios on which the estimates are prepared are as follows:

- A= Low Investment : Weak Reform
- B= High Investment : Strong Reform
- C= Eliminating Malnutrition
- D= Baseline for Malnutrition
- E= Eliminating Malnutrition
Rural poverty is very high in the region, consisting of 669 million persons in the Nineties, out of which 266 million are in the PRC and 250 million in India, according to IFPRI studies used by ADB. IFPRI’s global IMPACT model, projects a Business as Usual Scenario of “Low Investment Weak Reform”, and preferred Scenario of “High Investment Strong Reforms”, Diversification policies are a central component of differences in the two scenarios:

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Name</th>
<th>0</th>
<th>-10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Low Investment Weak Reform</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>High Investment Strong Reform</td>
<td>5%</td>
<td>10%</td>
</tr>
</tbody>
</table>

These kind of results emerge because reform leads to faster agricultural and rural growth which is based on widespread and diversified agricultural growth and also diversified agricultural growth generates rural incomes and employment which reduces malnutrition. These impacts can be empirically measured when behavioural demand studies are available since then price response of both poor and rich households separately in rural and urban areas can be measured. Income supplementation and public distribution policies working through pricing and dual markets (an open market and a rationing system) can be integrated quantitatively into commodity market and parastatal policies specifically aimed at households below the poverty line. If a food security policy is not politically determined it is central to the policy discussion. Statistics has to play a new role in all this, remodeling past studies as it were.

The kind of estimates ADB and IFPRI have modeled (Table above) has its origin in the Indian work on poverty removal and in fact the first model of this type was worked out by R. Radhakrishna in the early Nineties for the ADB which showed that if these economy level interactions were ignored a cheap food policy (in those days Rs. 2/kg. rice in Andhra could actually make the poor worse off: (R. Radhakrishna and S. Indrakant, 1988)). However, recently the food security has been given an immediate focus in policy by the welcome inclusion of abolition of hunger as an objective by the UPA Government in its policy agenda. This has led to two kinds of pressures on food demand exercises. The first is to raise the bar on poverty levels by the State Governments and some agencies of the Government of India from the Planning Commission’s poverty estimates as discussed above. The other is to follow recent global work which tends to argue that almost the entire Indian population is poor. (These issues are discussed extensively in Yoginder K. Alagh, The Poverty Debate in Perspective, Indian Journal of Human Development, January 2010, pp.33-43)

The debate on poverty is central to food security. Some swear by global estimates. The fact that poverty estimates are affected very highly by price adjustments at the State level and not so much by consumption differences has been documented by the data mining exercise of S. Gangopadhyaya and Amaresh Dube. In fact, when the price indices are Purchasing Power Parity prices for defining poverty lines instead of price indices for each class in rural and urban areas you get the result that almost
the entire Indian population is below the Poverty Line. For example Shaohua Chen and Martin Ravallion estimate that, while the $1 a day was consistent with the Indian poverty line, the population below the poverty line in India as now estimated is as in Table below (See Y.K.Alagh, p.39).

<table>
<thead>
<tr>
<th>S.No</th>
<th>Year</th>
<th>Poverty Norm $2 a day</th>
<th>Poverty Norm US$2.5 a day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1990</td>
<td>701.6</td>
<td>766.5</td>
</tr>
<tr>
<td>2.</td>
<td>1993</td>
<td>735.0</td>
<td>808.9</td>
</tr>
<tr>
<td>3.</td>
<td>1996</td>
<td>757.1</td>
<td>841.1</td>
</tr>
<tr>
<td>4.</td>
<td>1999</td>
<td>782.8</td>
<td>875.2</td>
</tr>
<tr>
<td>5.</td>
<td>2002</td>
<td>813.1</td>
<td>911.4</td>
</tr>
<tr>
<td>6.</td>
<td>2005</td>
<td>827.7</td>
<td>938.0</td>
</tr>
</tbody>
</table>

Source: Shaohua Chen and Martin Ravallion, 2008 pp.34-5.

An issue which refuses to fade away the discrepancy between PFCE as per National Account Statistics (NAS) and the estimates of per capita consumption expenditure by National Sample Survey (NSS), apart from relying only on the latter. This is a serious matter and goes back to ideological differences on statistics and economy level accounting. The issue which has origins in controversies on the plan models and strategies of the Fifth plan, has been raised recently by Surjit Bhalla’s work on poverty using NAS and NSS estimates for poverty numbers (S.Bhalla, 2003, 2004). One of the most careful analyses of such differences by M.Mukherjee in 1972 concluded that “without an intensive study of the discrepancy between the two sources of consumption data, it is not possible to conclude in favour of either”. The arguments of that classic study (Y.K.Alagh, Survey of Research Methodology, ICSSR, Vol.1, 1974)are still valid but were not discussed at by the Expert Group. This is particularly so when the Expert Group recognized that “NAS based estimates are higher by a very large factor for commodity groups like sugar, edible oils, clothing and footwear, durable consumer goods and rent, fuel and power” and that “NSS based estimates of cereals are higher than NAS based estimates”. In the
1980’s, cereal consumption was not rising but sugar, etc. consumption was rising very fast along with aggregate calorie consumption per capita. K.L. Datta (Annexure D, pp.96-1010) has gone back to M.Mukherji’s scientific position and pointed out that recent work on the NSS estimates has tried to quantify errors, but similar work has not been done on NAS estimates and the jury is still out.

Events have however, overtaken economic statistics controversies on poverty in India. Policy makers found it impossible to work with odd results like urban poverty is more than in rural areas or that poverty in advanced regions is more than in poor regions. Planning Commission and other studies have shown that poverty estimates are very sensitive to price data variation and this feature, led to unusable results at the State levels. The Department of Rural Development undertook independent studies of Below Poverty Line populations. Also scholars like R. Radhakrishna came out with devastating findings on deprivation levels in specific age groups and sections of the population like women (R.Radhakrishna and Shovan Ray, ed., 2006). A number of interesting efforts have been made at the State level to develop online identification of poor households in States like Gujarat, Kerala and others. These approaches are now in the driving wheel.

These controversies have been placed in context by the Tendulkar Committee (Planning Commission, 2009). The Tendulkar Committee report is available for discussion (Y.K.Alagh, pp.40-42). The work done by R.Radhakrishna and S.Sengupta under the care of Prof. Suresh Tendulkar, presents technical backup for a larger consultation and policy focused process. The Tendulkar Group moved over from a calorie determined poverty line to a food expenditure determined line. They are happy with the existing urban poverty ratio or head count ratio of 25.7% derived from the 1977 Task Force as adapted for price adjustment from time to time. They now suggest this should be the National Poverty Line and the expenditure required to meet this goal should be the poverty line for both rural and of course urban areas. The exercise is fascinating, both for policy and in theory. We are all critical of the Official Poverty Line, but they 'found it desirable in the interest of continuity to situate it in some generally acceptable aspect of the present exercise.' (GOI,2009,p.5). Like Banquo’s ghost the earlier Official Line (which was based on the 1977 Alagh Task Force), casts its shadow, possibly since Prof. Tendulkar was its member. The poverty ratio for urban areas derived from that method now drives the Tendulkar system. That ratio was derived from calorie norms. Now the argument is turned on its head and the same ratio in turn determines the required food expenditure determined poverty line basket. That basket is also suggested for rural areas. Viewed in a causal sense, the urban poverty ratio in 1979 came from calorie requirements and the Poverty Line basket. Now the ratio determines the basket for both rural and urban areas.

As a detour in logic the parallels are there in the Mahalonobis system where a given rate of investment in capital goods drove the system or Nobel laureate Oliver Williamson where firms drive the market and not the other way around. These kind of systems are also associated with causal chain analysis as pioneered by Herman
Wold (H.Wold, 1953). The two crucial features of a recursive system are a triangular B matrix. As an illustration consider the model:

\begin{align*}
y_{1t} &= d_{11}x_t \\
y_{2t} &= b_{21}y_{1t} + d_{21}x_t \quad \text{and so} \\
y_{1t} &= d_{11}x_t, \quad y_{2t} = (b_{21}d_{11} - d_{21})x_t
\end{align*}

In the Official Poverty Line, calorie requirements determine Household Expenditure requirements, which in the second equation determine the poverty line. In the Tendulkar Poverty Line the urban expenditure requirements determine the Poverty Line and so the arrows go back. Public policy is not an exercise in logic or causal chain systems and the Tendulkar report has many advantages. For one thing it shifts the emphasis from calories to food demand. The 1979 Task Force was in its logical structure permitting this in its complete demand systems but the focus then was on grains. That structure of reasoning with price elasticities separately for the rich and poor led to dual pricing. The Tendulkar Committee framework provides the food purchasing power and framework lets the poor substitute, between food items.

It works in a framework that the State will now not have the full responsibility for education and health needs or for that matter drinking water for the poor. Here The Tendulkar Committee is one sided in stating that ‘the earlier poverty lines assumed that basic social services of health and education would be supplied by the State.’ It does not clarify that the 1979 Task Force stated that the State must have a Basic Needs Plan and give it the highest priority, in terms of pro poor priorities in expenditure.

The Tendulkar Report has a concept of inclusive growth where the State does not take on itself such pro poor responsibilities but provides for a concept of income supplements for private expenditures for them. It shows that with these supplements, the new poverty line would correspond to standards which would lead to physical nutrition norms, like nutrition for basic metabolic needs and others being met on an average, in fact exceeded. Statistically, this part of the report, overlaying averages of nutrition norms with food expenditure is tentative, but its early hours yet, the approach is creative and more can and I am sure will be done. A more serious issue is that if expenditures on education and health are included in the poverty line calculations how do we account for the public expenditures on them/ or are we happy with double counting. These issues will need debate and resolution, since they keep on coming up.

The Tendulkar Report, we have reported earlier, has two merits and one shortcoming. It gives up the old official poverty line. But not wholly so and the new line is the urban line in the old poverty line sometimes called the Alagh Poverty Line since in the late seventies it was laid down by a Task Force of the Planning Commission and this is mandated as the new poverty line for both rural and urban areas. There were many debatable issues. We will only note two. In the excellent technical note to the BPL report K.L.Datta has explained at length of the complexity
of the relationship between calorie consumption and poverty and Sainath the issue that some facilities have to be universally provided. Saxena takes on the issue of entitlements head on and Tendulkar side steps it.

Living as we were in 1976 in the memory of ship to mouth food supplies, the concerns of emerging India in this century could not be visualized and it is futile to paste them on a tattered 1979 Poverty Line. Experience since 1991 is that the reform by stealth fails in substantial measure. The Tendulkar Committeee has made us cross that rubicon. Recognising it by now requires that we articulate the space of different sections of our people in a definable and contestable manner in the design of reform. This generation is doubly blessed for it has to again reinvent the desirable future. It is futile to dodge this issue and the statistical machinery will have to come to grips with it. The Rangarajan Committee is required to do this. Meanwhile, the Food Security apparatus has been approved as policy and so has to be reinforced with an Information System.

**Food Security Statistics**

Policy formulation and evaluation would not be effective without a sound institutional capacity for comprehensive information base, its appreciation and interpretation. A pre-requisite for verification of the information base on any topic is a well-articulated concept and definition with reference to major parameters. This is precisely an area where the policymaking on food security in India has a weak footing. This is because much of the discussion on food security has proceeded without a well-defined concept, contemporary norm and framework.

The discussion is organized as follows: To begin with provide a generally well-accepted definition of food security. Then deal with issues related to estimation, followed by description of information requirements, listing of sources of information for India and evaluate India’s capacity.

From a very narrow perspective, food security exists when enough food is available. The focus could be at the global, national, community, or even household level. This would lead us to define how much is enough? If the norm is with reference to market demand, then the question would be how much and at what price. If the norm is with reference to energy and nutrient requirements, then what are these requirements? If one goes through the reports of the Expert Groups of the Government of India (GoI) or even the Eleventh Five Year Plan, one does not find a clear official stand on the concept and the relevant norms (GoI, 2002 & 2008; Suryanarayana, 2011, Suryanarayana and Silva, 2007).

Policy focus and emphasis on food security has involved three different types of shifts in approach to the problem: (i) From the global and the national to the household and the individual (ii) From the food-first perspective to a livelihood perspective; and (iii) from objective indicators to subjective perceptions (Maxwell, 1996). It is important to begin with a decision on the policy orientation since the
information requirements and policy imperatives would differ depending upon its specification.

The concept as it originated referred to enough food to meet dietary energy requirements. The term ‘national food security’ was used to refer to self-sufficiency, i.e. the country has enough to meet its needs or demands of its population. Generally, the term at the national and global level is used to refer to supply side of the problem. The concept at the household level, as a measure of welfare, refers to access, that is, access by all people to enough food to live a healthy and productive life subject to its nutritional value and their consumption preferences. The World Food Summit in 1996 defined food security as a scenario when ‘all people, at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life’.

A food secure household would not necessarily imply security for its members due to reasons like (i) preferences leading to changes in priorities in consumption of food vis a vis other goods and services as observed in India in recent years; and (ii) unjust intra-household allocation as found in several poor developing countries.

Finally, good health outcomes depend on non-food factors such as sanitary conditions, water quality, infectious diseases and access to primary health care. In other words, food security per se does not assure nutritional security. Further, health outcomes/impacts are due to both short-term, medium-term and even long-term causes and hence, contemporary correlations between input and impact measures would make little sense.

**Estimation**

Food security at the global/national/regional level can be examined in terms of macro variables measuring both physical and economic access. Some such variables could be production, changes in stocks, trade to measure physical access and per capita income, inequality in income distribution and incidence of poverty to provide a perspective on economic access. Such information is readily available in official documents like the National Accounts Statistics and annual reports from the Department of Statistics and different Ministries concerned.

Studies assess household status on food security in terms of information collected through household consumer expenditure surveys. Several studies including the one by the Expert Group on Long Term Grain Policy (GoI, 2003) are based on the findings from the National Sample Surveys on household consumer expenditures. However, what is missed out in these studies is that they do not generally make allowances for age-gender-activity profile of the households while assessing the nutritional status relative to requirement. Nor do they provide for differences in household acquisition and allocation behavior, which are very important inputs in any policy formulation for food security.
Information Requirement

For a comprehensive perspective on food security scenario of a country, one may examine with reference to the framework outlined for the Food Insecurity and Vulnerability Information Mapping System by the Food and Agricultural Organization. It has specified diverse set of indicators as follows:

(i) **Indicators in the national and sub-national context:** Demographic conditions, economic conditions, environmental conditions and natural resources, political conditions, social and cultural conditions, risks, hazards and shocks

(ii) **National Food economy indicators:** Food availability, stability of food supplies and access, food access

(iii) **Household indicators:** Care and feeding practices, household practices, health and sanitation

(iv) **Individual outcome indicators:** Food consumption status, health status and nutritional status.

The Food and Agricultural Organization (FAO) Committee on Food Security has specified indicators to assess the performance of the food economy in terms of availability, stability and access. They are as follows:

**Food Security and Nutritional Status (Core) Indicators:**

(i) **Food Consumption:**
   (1) Dietary energy supply per person (DES)
   (2) Cereals, roots and tubers as percent of DES
   (3) Percentage of population undernourished

(ii) **Health status:**
   (1) Life expectancy at birth
   (2) Under-5 mortality rate

(iii) **Nutritional Status**
   (1) Proportion of children under-5 that are underweight, stunted or wasted.
   (2) Percentage of adults with body mass index < 18.5

**National Food Economy Indicators:**

(i) **Economic conditions**
   (1) GNP per capita
   (2) Growth in GNP per capita
   (3) GNP per capita at purchasing power parity

(ii) **Food availability**
   (1) Estimates of food production and net availability with due adjustment for changes in stocks, wastage and seed requirement.

(iii) **Food access:**
   (1) Estimates of inequality in income/consumption distribution
   (2) Estimates of poverty measures.

(iv) **Stability of Food Supplies and Access:**
   (1) Index of variability of food production
   (2) Changes in cropping pattern
   (3) International prices
(v) **Risks, hazards and shocks:**

1. No of regions facing food emergencies.
2. Institutional Capacity for Information: India

Most of the data sources and their information have been evaluated for their statistical properties like reliability and unbiasedness in the literature some of which are listed in the ‘References’. In this context, it is important to cite some of the inadequacies of at least sources like the NSSO, which have provide information for much of the analysis of welfare consequences of alternative policy options. For instance, the NSS data on household consumer expenditure distribution is generally perceived to be reasonably representative and reliable. However, the data on household consumer expenditure distribution throws up profiles, which raise uncomfortable questions for which the NSSO provides unconvincing explanations. To illustrate with an example, the data from the 61st round (2004-05) shows incidence of benefits of welfare programmes like the Antyodaya cards under the public distribution system (PDS) even among the richest decile groups in rural and urban India. However, the NSSO explains this anomaly on the ground that this could be due to household expenditure on durables incurred by the genuinely poor households during the 30 days preceding the date of interview. However, the data does not corroborate this explanation at all (Suryanarayana, 2011) and the explanation is casual. However, this has serious implications for policy analysis. If the explanation were valid, it would imply that the data is not representative at all; otherwise, it would imply inappropriateness of the database for analyzing welfare consequences of policy options.

The Most important limitation seems to be a limited capacity for appreciating even the elementary statistical tools. For instance, the Eleventh Plan documents caries out trend analysis of the levels of living, food and nutritional status of the poor consumption with reference to per capita measures of corresponding variables little realizing that mean based estimators of averages are inappropriate for skewed distributions like that of income or consumption. As a result, the Plan ends up making factually wrong inferences and empirically irrelevant policy recommendations (Suryanarayana, 2011).

Another major limitation of even expert groups is, the lack of careful appreciation of elementary concepts and measures. For instance, Expert Group on the Methodology for the BPL Census 2009 does not even distinguish between a household and person (GoI, 2009). It keeps citing 28.3 as the percentage number of poor persons as well as households. It cannot be both since generally the poorer households are larger.

Another limitation of studies on welfare consequences of policies to promote food security like the public distribution system is due to inadequate appreciation of contemporary policy interventions in an integrated perspective. For instance, government documents as well as non-government research reports estimate welfare gains in terms of differentials between market and PDS prices. However, this would not make much sense since market prices themselves are determined by, *inter alia*, public interventions like restrictions on inter-state movement of food.
grains to facilitate food grain procurement for the PDS in the states having food grain surplus. Due to such interventions, food grain prices are suppressed in food grain surplus regions and escalated in food deficit areas generating an exaggerated profile of income transfers in the latter. In fact, such calculations overlook an important fact that the PDS supplies meet only a fraction of the food grain requirement of a household and hence, ignore welfare loss due to escalation in food grain prices in the open market, which meets the bulk of the food requirement of the average household.

Several studies have attempted to examine welfare consequences of public interventions to promote food security in terms of a consumer demand model specified and estimated based on aggregate sample data for the country as a whole. One is not sure how valid such a specification would be. This is because the all-India sample is obtained by a simple pool of sample observations across states. While statistically it would make sense as an average household, conceptually one would doubt the existence of a representative consumer with a utility function implied by the statistical average. Even otherwise, the procedure would be valid if only the economic constraint binding the households across states is the same and the preferences are linear and additive, which are highly unrealistic.

Institutional capacity for information is a necessary condition for sound policy formulation. However, a sufficient condition is capacity for appreciation of data inadequacies, concepts, measures and their interpretations. When it comes to a topic like ‘food security’, Indian information base is reasonably complete though not comprehensive because of inadequacies due to lack of an official policy framework and norm, and changes associated with the development process. However, much remains to be done regarding understanding these issues and careful application of statistical measures and their interpretations.

**Food security and Vulnerability**

India ranks 66 among 88 countries in the Global Hunger Index (GHI) of 2010 (8). GHI is a multidimensional measure using three equally weighted indicators, viz., proportion of undernourished population for 2004-06, proportion of underweight children below the age of five for 2003-08, and mortality rate of under-five children for 2008. With a GHI value of 23.7, the situation is considered alarming for India. What is more, a similar calculation for 17 major states indicates that the situation is serious in four, alarming in 12 and extremely alarming in one. This suggests greater importance of the Right to Food. There are two points of concern in the calculation of the undernourished population being based on 1800 kilocalorie as an adequate requirement. First, this seems to have emerged from the thinking that such people will receive state support under some social security arrangement, as in some Western societies, to meet their minimum food requirement and that they do not have to put in hard labour. But, this norm will be inadequate for those individuals whose occupation and other contingencies will require greater energy intake, as is often the case with the poor in many parts of the world.
Second, even when one agrees with the norm, a more appropriate term that it represents is the proportion of underfed population because besides deficiencies in energy, under-nourishment also includes deficiencies in protein, vitamin and minerals among others. Such an interpretation also fits with the final index being a measure of hunger, not under-nourishment. Even for the poor, a first priority will be to meet some minimum energy requirement to avoid starvation. But, once this is met, there are other priorities of life such as educational requirement of children or immediate health needs of some family members that could take precedence over food and nutritional adequacy. But, shortfalls in adequate food and nutrition will also have adverse long term implications on health that can also have intergenerational impacts - poor health of mother being translated to a poor health in the child.

Between 1972-73 and 2004-05, energy consumption of the richest decile and the poorest decile is converging, but a substantial gap still remains with the energy consumption of the latter as a proportion of the former being 53 per cent in rural areas and 56 per cent in urban areas in 2004-05. While the positive relationship between energy intake and expenditure deciles is understandable from an income perspective, there is an ethical imperative because the energy requirement is likely to have an inverse relationship with income. Also average food consumption misses out on capturing the uncertainty that the poor face in terms of access to food and that could mean some days of starvation. Such a struggle for food on a daily basis is likely to exclude other things essential for the development of a healthy body and mind.

Growth of per capita expenditure for the bottom five decile groups compared to the all India average is higher when 2004-05 as compared with 1972-73, but lower than 1993-94. Poorer groups had relatively lower increments in recent years, which is also identified as a post-reforms period where the economy has witnessed a higher growth path. Some of the other vulnerable populations are lactating and pregnant mothers, children – particularly the girl child and school dropouts, the elderly, single and destitute women, those with ailments and physical disabilities, dalits and tribals, and the unemployed among others. Similarly, some sectors have not benefitted as much as others have. One such sector is agriculture.

**National Food Security Bill**

The EGOM on the NFSB began by stating that the bill will "... provide for food and nutritional security, in human lifecycle approach, by ensuring access to adequate quantity of quality food at affordable prices". The EGOM refers to cash transfers in lieu of entitlement and leveraging it with unique identification. Both these points have been in discussion in policy circles for quite some time and have a common origin. They are likely to do away with leakages and bring about effective targeting. Cash transfer is a money-centric approach that ignores the need to make food available where people need it. If food is made available and there exists an effective foodgrains distribution mechanism then cash transfers (perhaps one that is pegged to the real amount of food, note that this is different from being conditional to food purchases only) could make it accessible. Unique identification is a
techno-centric approach to a real world problem of identifying individuals with food and nutrition insecurity. Independent of the issue of privacy under unique identification, which is equally important in a democratic polity, any technology for identifying people should be leveraged only after it is in place. This is not to belittle either the relevance of money or technology. They are very important, but as means and not as ends. One has to be cautious in the approach, otherwise exclusion and inclusion errors can take different forms and dimensions.

**Counting the poor**

Exclusion error is considered more serious than inclusion error. This is particularly so in a welfare state and that too when the excluded person would be much below the poverty line whereas the included person is largely just above that line. Then again, the norm used as a poverty line could refer to one aspect of vulnerability whereas the intervention measure through public policy could be intended for something else. In India, food and nutrition interventions have different forms. Some of these are the Integrated Child Development Scheme (ICDS) through Anganwadi for children below six years and pregnant and lactating mothers, the Mid-day Meal (MDM) scheme for children going to government and government-assisted primary schools, and the Targeted Public Distribution System (TPDS) under which below poverty line households receive food ration at a subsidised price through the fair price shops. Under TPDS it is essential to know the list of people below the poverty line. The Planning Commission has now accepted the recommendation of the expert group where incidence of poverty is 41.8 per cent for rural areas and 25.7 per cent for urban areas in 2004-05.

While calculating this, the expert group did away with benchmarking the incidence of poverty with a calorie norm and the limitations of that have been discussed earlier in this report. The report of the expert group does mention that around the poverty line, people in urban India can afford the existing norm. But, their observed intake of 1776 kilocalories is closer to a norm of 1770 kilocalories indicated by Food and Agriculture Organization (FAO). If the latter is being used as a justification in support of the observed intake then it misses the point that once basic hunger is satisfied then people will have other priorities that could compromise with food and nutrition security. The FAO norm is for light and sedentary activities and not for medium to heavy activities that the poor may be associated with, in the Indian context. Thus, the claim that the new poverty line goes beyond calorie needs and incorporates the health care and education requirement has to be read in this context.

There are a few other concerns with this new estimate. It uses median expenditure of health and education as a norm, which could be an underestimate because expenditure distribution is positively skewed. It is not easy to replicate or to come up with comparable poverty lines for earlier years. Thus, time series analysis, beyond what is given in the report, is difficult. And, the acceptance of the poverty ratio for urban India from the old method as a starting point and then using it to compute a poverty line basket, as we saw has no other basis other than a pragmatic consideration of starting from somewhere. More importantly, it changes the share of
poor across states, and if the absolute numbers are not taken into consideration for increasing the budget, then poorer states will get lower amounts under some centrally sponsored poverty reduction schemes. As the estimates of the expert group are based on a sample survey of consumption expenditure from households, it cannot be used to identify poor households in the population. It is for this that an independent census of below poverty line households in rural areas was undertaken in 2011.

This should be an independent exercise. The incidence calculated using the national sample survey data cannot be imposed on the census data to limit the number of households who are poor even if one allows a margin to address for some exigencies. This top-down approach may reduce the inclusion error, but is likely to increase the exclusion error. What is required is a bottom-up approach grounded in reality to complement the top-down administrative structure and implementing mechanism. There is a strong case to involve the community at various levels, strengthen transparency to evaluate processes at each and every stage after policy formulation till achievement of the policy objectives, and improve accountability.

Any analysis of hunger has to take into consideration availability, accessibility and adequacy of food among others. It must satisfies Mahatma Gandhiji’s talisman and Rawlsian fairness. The Rangarajan Committee is now mandated to do all this. Our main concern is the Information System for achieving these lofty goals. A preliminary listing of a Decision Support System for Food Security Statistics is as follows;

**National Level Decision-Making**

We have not been able to work on the problem of decision making tools for human security, since this is a new area, needing work. But food security is more manageable and we had worked out systems earlier. In the present phase these need modifications, some of which we suggest here. The nation decision-making level will be pivotal for food security. Major critical decisions will have to be made at this level. Illustrative kinds of decisions will be as follows:

(i) Purchase of food items in international markets, or establishing access, for example through ‘future’ markets, or recourse to bilateral or multilateral agencies, for example ‘food aid’ or ‘cereal facilities’;
(ii) Decisions on adjustment of domestic stocks through national policies. These may include purchase or sale of public stocks and attempts to influence private inventories, as also the related questions of desired levels of domestic prices of food items;
(iii) Use of support prices, tariff mechanisms and domestic taxes, restrictions and subsidies;
(iv) Optimal internal stock movements and the related question of domestic availabilities and price spreads in regional markets;
(v) Access and vulnerability question of classes of consumers, for example in mofussil areas, or categories like women, children, the unemployed and the destitute or disabled;
(vi) Short-run decisions relating to financing, credit and foreign exchange requirements of operational food policies;

(vii) Decisions with a medium-term horizon like assessment of food demand, incentives and support policies for domestic producers, development of improved processing and marketing infrastructure, standardisation, nutritional and quality aspects, and employment and income supplements for marginal populations and areas.

It is quite obvious that national-decision systems support will be required at core economic policy-making centres relating to food security, for example, the Cabinet, Finance Ministry, Planning Ministry and in this case the Civil Supplies, Rural Development and Agriculture Ministries. Second, the same will be required for sectoral levels, for example, Health Ministry and Local Government Ministry. Finally, national level parastatals and institutes may require such information, such as the Central Bank, Agricultural Bank and nutrition and agricultural technology related institutions. It needs to be noted that while the decisions and agencies taking them have been listed separately, the information system itself will play a co-ordinating and integrating role. A decision to import, for example, has to be based on simultaneous consideration of expected international and domestic prices and availabilities, both with government and likely behaviour of private trade. While the output for the decision makers of the decision support system will be a select list of indicators required by him, in these will have to be integrated processes of reasoning and analysis. These will be in the nature, to the extent possible, of a comprehensive set of models, but will most certainly consist of a set of sub-models operationalised at the level of international markets, the national market, regional markets and different segments of the population. Core scarcities will have to be incorporated; for example, in the short run domestic and foreign exchange resources, transport and marketing infrastructure, and in the medium term sustainable land water resources availabilities, estimated demands and policy generated parameters emerging from the structural adjustment programme and, in particular the nation’s projected agricultural strategy for the 1990s.

State Level Decision-Making

At the state level the requirements of information for decisions will be more direct and pressing. These will include data of a continuous kind on prices and quantities marketed in agricultural markets and retain prices by location. If base level models show, as is likely, a relationship between local food production and local prices, then estimates for area, production and yield and forecasts for the current agricultural season will be required. Data on government stocks and improvements will be needed. If possible, effort should be made to develope indicators of private stocks. Direct data from trade channels is a possibility. Alternately, stock movements or market arrival or turnover data may be used. If none of these are available, estimates may have to be inferred from price data and movements in it, for which a back up relational model may be required. At the market level, it will be important to standardise in terms of quality, weight and related considerations. Quality noise can distort price data in a significant manner.
On the demand side, population and work force data will be required by location, sex and age-distribution. Forecasts for post-census years will be necessary. Benchmark analysis of household budgetary surveys of the kind conducted by statistical survey agencies or the nutrition survey of the kind undertaken by the National Nutrition Institute will be used to prepare indications of ‘vulnerable’ or ‘at risk’ segments of the population. Their magnitude and location will have to be constantly updated.

Again modelling effort will be required. Three kinds of efforts can be anticipated. The first will be attempts at updating data bases with historical information being continuously updated in a reasonably accurate manner, ensuring consistencies with currently available information of a limited kind. The second will be behavioural modelling, for example of demand-supply markets and price impacts. The third requirement will be aggregating of market information to regional and national aggregates. This is a complex problem since the regions are open economies.

Information requirements for medium term decisions at the state level will be of very high priority, as they would relate to higher levels of efficiency and capabilities of the system to meet food security needs through time. Three kinds of broad requirements can be indicated to outline the nature of work requirements for the information system for decision support. Each would need considerable operational detailing. The first would relate to expansion of supply potentials, the second to marketing, trading, distribution and information infrastructure and the third to improvements in access to food by different segments of the population.

For food security, the important question will be the medium term economic price incentives, access to improved and cheaper inputs, and credit policies such that the economic environment is to encourage expansion of agricultural potential or improved use of existing resources for food crops. Such policies would vary depending on the agro-climatic regime, for example, in the different soil and water regimes; they would also vary between the old lands and those recently reclaimed – as also those areas, which primarily depend on canal irrigation and those on ground water use or both.

As the reform process strengthens itself, the effort will have to be to work out operationally the concepts detailed in economics for agricultural strategy in the 1990s, namely, the long range marginal cost of agricultural supply potential in each region, and to encourage policies towards output prices and input availabilities and price in approximate this supply price objective. This would encourage peasant households to meet the desired output objectives, expand food supply possibilities as part of this effort and more important, generate additional income and employment, which can come on the medium term only through widespread agricultural development.

Marketing information and distribution infrastructures relate with food security by ensuring access to available supplies in an efficient manner. Regional spreads in food prices emerge from market imperfections. Generally regions of food
deprivation or access difficulties, i.e. upper hills and rural areas outside the valleys and deltas, are also areas of poor communications and agriculture marketing infrastructure. Improved information on food prices is the first step, but wider and more efficient markets are very important. Modern communication and data networking facilities should be used not only to collate, analyse and transmit data from rural markets, but for interactive communication.

As the rural economy diversifies, there is every reason for the peasant in upper hills or other backward areas, for example, to have available to him data on prices of crops to be considered by him for sowing, in other regions and in other countries, with which his output will compete at harvest time. Thus extra superior long cotton prices in the Philippines or Pakistan may also be important for his decision.

Information systems will of course have to be built up on storage facilities, stock and movements of public stocks of food items. Efficient deployment of such stock through regions and time is important from the cost saving angle of public interventions. Inventory management under uncertainty and optimal transportation models become important here – as also improved storage processes. Seasonal aspects of the crop season and post-harvest assessments of stocks and prices are generally necessary for sound policy decisions.

Problems like iron deficiency in women, female rural illiteracy, low nutritional levels in some areas, and emerging trends of decline in protein/energy intake in some population segments hit by adjustment, may need to be isolated and reversed targeting of deliveries and social adjustment programmes of short run employment and income generation may need to be developed. Data bases which will provide labour market trends, information on successful community intervention strategies and filtering data mechanisms for isolating the truly needy populations at the household level will also be required. Information will also have to be planned for taste patterns, food storage, cooking and consumption habits and local technologies, either traditional or new, with application possibilities for resolving food gaps in an efficient manner. Delivery systems, which work, particularly market channels integrated with community efforts or public objectives, will need to be actively searched for.

The focus in the Indian discussion on poverty and vulnerability has to change from somewhat sterile discussions of greater precision in estimates, which will not lead to any results, if the history of past debates is an indicator. Work must be oriented to assessments of the geography and correlates of hunger and the larger question of human insecurity, which is becoming a major issue. Data and information systems to address these problems need to be worked on. Regarding disasters, it needs to be recognized that while natural causes are there for some crises, social and governance institutions to cope with them are important, since in many cases it is the nature of development itself which has created the crisis.

The data systems for a Decision Support System at the National and State Level Food Security Systems as detailed in this report must be set in place by 2014, in an introductory manner and completed by 2015.
CHAPTER-7
Applications of ICT tools and AIS

Agriculture Information System (AIS)

AIS should be responsible for providing support system to the farmers. AIS should assigned for Information Development, Information Management, and Information Dissemination. AIS disseminates information on newly developed technologies and efficient farm management practices through mass media such as internet, radio, television, newspapers, and magazines. Various other means for transfer of technologies and information are technical books, periodicals, pamphlets, leaflets, and posters. Informative CD, DVD, VCR tapes, and other audio-visual aids may also be circulated through easily 24*7 accessible counters.

The key areas on which information support is required are Analysis of domestic and international agricultural trends, Development of management technology for farmers, Profitability analysis of agricultural and livestock production and economic analysis of agricultural technologies, Information support for agricultural research and extension and Enhancement of agricultural library service.

AIS must integrate national institutes related to agriculture through high-speed networks. Good practices of service industry sector such as, e-mail consultation, Short Message Service (SMS), and crop-wise virtual meeting rooms need to be applied to the AIS. The system needs collaboration between farmers and researchers.

A query based data base is facilitated wherein problems raised by farmers are rapidly resolved by researchers. Internet-based training courses for farm managers are offered to help farmers as well as extension workers. Subject matter specialists serve as lecturers in these video courses delivered through the internet and on CD-ROMs.

AIS need to maintain a knowledge portal for agricultural sciences and technology where individual researchers and experts interact with each other and are also able to share implicit knowledge, know-how, experience, case study and research output. Such informal interactions result in free flow of creative ideas, improved quality of research and collaborative projects, which benefits all, including the farmers. AIS should assist the farmers in developing their homepages for e-shopping malls.
Use of ICT tools

The new Information and Communication Technologies (ICT) must empower the resource-poor farmers with up-to-date knowledge and information about agricultural technologies, best practices, markets, price trends, consumer preferences, sources of finance, weather, soil-moisture conditions and the environment.

Some of the ICT Initiatives in India:

All India Radio Farm School Program: This program began in the 1960s, had considerable success and reached many thousands of small holders. The programs were broadcast in 144 districts and special farm units were established in 46 radio stations to provide a farm broadcasting service daily.

Tamil Nadu Agricultural University (TNAU): The TNAU Directorate of Extension Education is distance education to help farmers rural youth in India learn new production technologies and adopt new technologies. The Directorate conducts Farm Schools on All India Radio, which lessons over 3 month. It also offers correspondence courses, Video lessons in agriculture and allied fields are also broadcast or distributed on cassettes to farmers, extension workers, government and non-government organizations, etc.

Yashwantrao Chavan Maharashtra Open University (YCMOU): The YCMOU (www.ycmou.ac.in), established as a state open university in 1989, collaborates with local government and NGOs to provide non-formal education on agriculture and crop production and other programs, using distance education, audio-visual materials, study groups and practical demonstrations.

National Institute of Agricultural Extension Management (MANAGE): MANA Innovations in Technology Dissemination (ITD) component of the National Agricultural Technology Project (NATP) being implemented with World Bank assistance by the Ministry of Agriculture, Government of India. ITD will provide computers and Internet connection for all participating agencies, researchers, extension managers and farmer clients in 28 districts in 7 States, video conferencing between the participating organizations, training and information for farmers on, e.g., crop technology and market intelligence, and funding for the communication expenses. It has set up a network of information kiosks to provide training in and access to ICT for disadvantaged rural communities. These kiosks offer information on, e.g., farmers’ rights, loans and grants. The basic aim is to re-orientate extension to be more demand-driven, integrated with research and directed towards self-sustainability and farmer-centered decision-making.

NAARM Virtual Learning Centre (VLC): VLC is an initiative of National Academy of Agricultural Research Management in Hyderabad, Andhra Pradesh and designed
to build the capacity of India’s NARS in Research Management by providing online, non-formal, free and interactive learning in agricultural research management, information management and human resources management that can be emulated by the various institutions of NARS. All courses are designed by the faculty of NAARM to facilitate easy learning and interaction.

**M.S. Swaminathan Research Foundation (MSSRF):** MSSRF (www.mssrf.org) has interesting experiments which have replication possibilities. **Gyandoot:** Gyandoot (www.gyandoot.net) is an award-winning intranet in Dhar district in Madhya Pradesh that connects rural cyber cafes to the Internet and serves the everyday needs of the local people. The cyber cafes are located on the roadsides of the central villages. They serve over half a million rural people, who can access prices and volumes of local and national agricultural produce markets on a daily basis, print out land records for crop loans from banks, apply for caste, income and domicile certificates and other government services, gain public grievance redressal, and access rural Hindi e-mail, employment news, a rural newspaper, and various e-learning and e-advisory services.

There are other experiments in the private sector and in cooperatives such as the Pravara Cooperative at Loni in Ahmednagar.

**Indian Society of Agribusiness Professionals (ISAP) e-group:** ISAP (www.isapindia.org) is a network of professionals in India and the SAARC countries that serves farmers and small rural entrepreneurs and the many agricultural graduates who fail to find gainful employment or work in isolation. It uses a mix of face-to-face meetings, seminars and workshops, e-mail, discussion lists, SMS, telephony, a Website and Agri-clinics to share information nationwide. It is run by professionals in irrigation, food processing, international trade, research, and agricultural extension. It is probably the largest agriculture and rural development professional network in the world. It has registered over 9,000 members, 75 chapters, 400 NGO partners, and 110,000 farmers and has answered well over 3,000 farming community. ISAP was selected by Digital Partners, USA, as one of the most Promising Social Enterprises for their 2002 Award.

**ITC’s e-Choupal:** The Indian Tobacco Company (ITC) began e-Choupal as a cost-effective means of dealing directly with farmers to buy agricultural products for export. Farmers can strike orders with ITC online, and thus reduces the intermediary cost. The kiosks can also be used for companies to sell products and services directly to the farmers and train the farmers on how to use them.

**Indiagriline by EID Parry:** The AgriPortal of EID Parry (www.indiagriline.com) is designed to address the specific needs of the rural farming community and catalyze e-commerce in agricultural and non-farm products by offering a network of partnerships. The content is developed in Tamil by EID Parry in collaboration with the Tamil Nadu Agriculture University and its Research Stations, Tamil Nadu University for Veterinary and Animal Sciences, National Horticulture Board, AMM
Foundation, Murugappa Chettiar Research Centre, and other players in agricultural media and publishing.

The Tatas have started a pulses portal for the Ishakti pulses project at Pudokuttoi in Tamil Nadu which is now being replicated. (See GOI, Expert Group Report on Pulses, 2012, MOA).

**Recommendations**

The Committee recommends that in view of the preliminary and experimental nature of ICT experiments in the agricultural sector in India, an expert Standing Committee be set up to monitor such experiments and the NSC gives biennial report on such developments and the action points for building a National Agricultural Information System.
CHAPTER-8

Recommendations

Recommendations are summarized below:

Motivation

1. There are three kinds of motivations which lie behind the setting up of this Group. The first is that the structure of the Agricultural and Rural economy is changing. The emphasis on grains is giving way with the working of Engels Law and fast per capita income growth to non-grains and non-crop agriculture like horticulture and animal husbandry products. This needs a larger repertoire of crops and products, behavioral studies and newer sources of data for items thinly covered. Also, in a faster moving economy, timeliness of both data and emerging trends, is important. It may be noted that the agricultural impacts work both ways in the sense that acceleration and deceleration of growth matters for the agricultural sector. Issues of food security and poverty measurements remain. The structure of the rural urban distribution of the economy, population and labour force is changing faster than anticipated. Indian statistics missed out on the changes in rural urban shares. Various studies had indicated these changes but were ignored and so most information is contaminated with incorrect population distribution statistics. This needs quick remedy. On the other hand the casualisation of the rural labor force has proceeded much faster. Again land use is changing fast, as also, the ownership and operational structure of land and agricultural holdings. Finally, the structure of decision making is changing.

2. Regarding structural changes the problem will be to generate data for Inter-Censal and Quinquennial NSS survey years. As is well known, area statistics at the village level are collected by two agencies on a sample basis. These are the Timely Reporting Scheme and NSS. Two schemes are in operation since early seventies namely, the Timely Reporting Scheme (TRS) and the scheme for Improvement of Crop Statistics (ICS). These two agencies should be used to give an estimate at the village level of the area diverted from agricultural to non-agricultural purposes. These ‘villages’, being revenue entities, would include ‘Census Towns’ by definition. The Committee recommends that the NSC set up an Expert Group to generate estimates from the TRS and NSS ICS schemes to generate village level sample estimates of land use between agricultural and non agricultural sectors. The Expert group may also examine if estimates can be generated of households moving out of agricultural sector as the main occupation. This scheme should be in operation by the agricultural year 2015.

3. The Committee recommends that Private Consumption estimates by the National Accounts Flow methods and by the NSS estimates should be generated annually. These should be generated separately for Rural and Urban Areas and by the Poor and Non-Poor sections of the population. An expert group should clearly note the conceptual basis of the two estimates and differences between them.
4. The Committee recommends that quarterly estimates of GDP growth and price trends separately, as estimated by the National Income deflators, CPI and WPI be presented as also in the charts.

5. The Committee recommends that Estimates of Resource flows to Agriculture be prepared as recommended by the Bhattacharya Committee. The Committee recommends that the estimates of Resource Flows to Agriculture be prepared in the conceptual apparatus as recommended by the High Level Evaluation Committee of the CSO in 1984, the details of which are contained in a separate chapter of that report based on a Group chaired by prof. Y.K.Alagh of which the report is separately available.

6. The Committee recommends that the system of resource flows to agriculture be synchronized with the system of accrual accounting now adopted by India and in the frame of inter sectoral flows as outlined in this report. The Committee recommends that these accounts should be in place by 2015.

7. Availability of reliable data on Agricultural statistics is critical for informed planning and decision making process. Further, owing to 73rd and 74th Amendments of the Constitution, micro level data for regional and panchayat level planning assumes greater importance. Timely and reliable statistics on crop production and crop area have been covered by the Vaidyanathan Committee of the NSC and this Committee endorses that report.

8. The issue of unrecorded tenancies has already been described. It needs to be addressed in terms of information basis particularly after the proposed land legislation. Some sectors are becoming more important in terms of demand changes on account of high income elasticities of demand and the openness of the economy. These sectors like plantations, dairying, horticulture crops, livestock, fishery and forestry sectors need to be addressed.

9. Small Plantations are a significant part of our plantation economy and statistics for that sector leave much to be desired. For example, in recent periods, we do know that crops like turmeric, vanilla and cocoa have suffered with global competition but data to meet such challenges in time is unavailable, leading to considerable farm unrest and lack of information for adequate policy responses.

10. There is intense need for reliable statistics for the Horticulture segments, not well covered, where demand is rising fast and prices fluctuate widely.

11. Production and area of Aromatic crops show that for the year 2006-07 to 2010-11, both are increasing fast. A Data base is needed for policies for this important area of activity to attract investment, meet rising domestic demand and earnings through exports.
12. It has to be noted that Daitying is again a sector with high inflation potential and rising incomes. Also it has great income earning possibilities as the National Dairy Development Plan shows.

13. The data on fish production from aqua culture, supplied by the States, similarly suffer from poor quality and become available with considerable time lag. The types of culturing methods are not reflected in the data. The data on fisherman population, fishing craft and gear are available from both the State Governments and the Livestock Census, while data on workers engaged in fishing are also available from the population census. However, the data from these sources are not comparable due to differences in concepts and definitions and their application across State. There is an apparent inconsistency between the value of the output and the export earnings, the latter being much higher. An exploratory study is required to reconcile the discrepancy.

14. In the policy and structure areas listed above the Committee recommends that a Task Force be setup to prepare SAE(Small Area Estimates) for each characteristic and behavioural variable for which information as listed as required for the sectors of plantations, medicinal and aromatic plants, horticulture and vegetables, dairying, fish and forestry. The 12th Plan should have a detailed programme for producing data outputs with this method.

15. The Committee recommends that the Directorate of Market Intelligence conducts a quinquennial census to enumerate agricultural markets including those outside the regulated markets. These would include all markets where more than fifty sellers appear at least three times a week for transactions. Such a Census may also include a very brief list of questions, not more than five on the nature of facilities available.

16. The Committee recommends that Marketable and Marketed Surplus Ratios are available with considerable time lag and for distant years in the past. Such studies should be done more regularly and with wider coverage to enable farmers to get the benefit of recent behavioural patterns and policy makers to base decisions on recent information.

17. The Committee suggests that the NSC in consultation with IDFC and NABARD develops a system of collecting statistical information on Private Sector storages and financing mechanisms based thereon.

18. The Committee also recommends that agricultural commodities futures data which is fairly extensive should be inventorised by an expert group and its use made available to farming and trading communities in small towns and large villages through a user friendly primer, especially prepared for such audiences including in regional languages.

19. The Committee recommends that the price collection system should ensure simultaneous data flow from lower levels to the State as well as to the Centre.
20. The Committee recommends that the Centres of price collection should, as far as possible, be the same for essential commodities as for those of wholesale prices.

21. The Committee recommends that markets should be connected with wide area network to record, process and disseminate price data.

22. Timely dissemination of data on import/export is must for proper monitoring of trading of agri products globally.

23. The Committee recommends that an Advisory Group be created of representatives of farmers groups, government officials, FIs, trade economists and senior economic journalists to recommend user friendly presentation of tariff, trade and BoP data for the agricultural sector.

24. The Committee recommends that the National Statistical Commission set up an Agro Climatic Information System Bank as designed in this report.

25. The water and land related statistical system as well as the data gaps and related statistical issues discussed in the previous sections lead to several important suggestions and recommendations for improving quality, clarity, and quantity of water and land-related statistics in the country. The most important among these recommendations are given below:

a. First, as has been shown, a number of public and private agencies are involved in the collection, collation, publication, and dissemination of water and land related data. The multiplicity of agencies also creates conditions for the emergence of some conceptual confusions and statistical discrepancies. To avoid these problems and promote certain amount of standardization in data, it is useful that a single agency act as a repository for all water and land related data. Such an agency can also reduce the transaction cost of obtaining the data for the researchers and other users. Such an agency indeed exists already within the CWC. The Information System Organization (ISO) operating within the Water Planning and Project Wing of CWC qualifies to play the role of a single agency repository for collecting, standardizing, and disseminating the water and land related data in the country. The ISO has to link up and coordinate with other agencies having different information on water and land resources in the country.

b. Second, there is an urgent need for the rationalization of the water and land related data in the country. Such a rationalization requires a rearrangement of the water and land related data within a conceptual and methodological framework. One framework that would be vastly helpful in understanding the economic and welfare impacts of water and land resources related to the ‘inputs-outputs/outcomes-impact’ framework. The water related data that are available with CWC or CGWB related mainly to inputs. On the other hand, the yield, irrigation, and water use data that are with the
Ministry of Agriculture or Rural Development relate to outputs/outcomes. But, the information on income, employment, consumption that the researchers collects from primary surveys or other secondary sources relate to the impact dimension. For it to valuable as a development tool, the statistical system in the country should promote the development information on this ‘input-output/outcome-impact’ framework. While this framework is very valuable but is not easy to develop within a short span of time. Concerted efforts and systematic investments are needed to make a statistical system of such quality a reality.

c. Third, immediately connected with the above point, is the need to prioritize data in the sense that a core set of data on some of the key variables are assembled first on a priority basis, while the development of data on other variables is sequenced within a well defined future path. In this respect, the core set of data identified should be such as to help the development of certain indicators that can show the overall physical, financial, economic, ecological and institutional health of the water sector. For instance, the data on water resources developed and water resources utilized can be used to develop the indicator for utilization gap. Similarly, the data on water pricing and cost recovery and the economic value of water in different context can be used to develop the indicator for the financial gap and incentive gap. These indicators, though simple, are very valuable for influencing policy decisions.

26. The Ministry of Water Resources has recently released a Report on A Draft for A National Framework Law for the Water Sector, Which worked under the Chairmanship of the Chair of this Committee, Y.K.Alagh. This Draft provides for the development of A WRIS (A Water Resources Information System). The Committee recommends that the NSC coordinate with the MOWR for the development of this system.

27. Sample Surveys to supplement the Agricultural Census quinquennial data may be planned. They should also attempt to collect information on newer kinds of machines being used for agriculture as real wages rise on account of schemes like MNREGA. Energy balances should be prepared in different agro climatic zones through the rainfall cycle.

28. Indian Marketed Surplus studies show the importance of such factors in farm/market differentials. But such studies are done at infrequent intervals. The Expert Group has learnt that the MOA has conducted such studies in 2011-12. It is recommended that such studies should at least be conducted quinquennially. There should be a mechanism to collect data on this sector periodically.
29. Total Subsidy data should be collected on a periodical basis. A Committee on aligning Agricultural Pricing to a WTO trade dominated regime has made detailed recommendations on measuring Aggregatte Subsidies to the Agricultural Sector as also the Aggregatte Measure of Support. These techniques have been discussed separately in this report. Such estimates need to be made on an annual basis.

30. The Committee recommends that in view of the preliminary and experimental nature of ICT experiments in the agricultural sector in India, an expert Standing Committee be set up to monitor such experiments and the NSC gives a biennial report on such developments and the action points for building a National Agricultural Information System.
Government order on the Constitution & Terms of Reference

F.NO. 8(64)/2010-NSC
Government of India
Ministry of Statistics and Programme Implementation
National Statistical Commission Secretariat

II floor, Sardar Patel Bhavan,
Sansad Marg, New Delhi-110 001
30th July, 2010

ORDER

Sub: Constitution of professional Committees by the NSC.

The issue of constituting professional committees to assist it on various technical issues was under the consideration of the National Statistical Commission (NSC) for quite some time. It has now been decided by the NSC to constitute eight professional committees. The details of composition and terms of reference of each committee are given in the Annexure. The Committee on Statistics of Agriculture & Allied Sectors will have tenure of twelve months. All the remaining Committees will have tenure of six months. The Committee shall accordingly submit their reports to the NSC.

2. With the approval of the Chairman of the NSC, each of the Committees may also enlist the assistance of subject matter experts within and / or outside the Government and may co-opt them as members according to necessity.

3. The expenditure on TA/DA of the official members will be borne by their respective Ministries/Departments/Organisations. Each of the non-official Members would be entitled for a sitting fee of Rs. 1,000/- per day for attending meetings. They will be eligible to travel by air in executive class or by rail in air-conditioned first class while undertaking tours in connection with the meetings of the respective Committees. They will also be entitled to TA/DA on tours as admissible to a Joint Secretary to the Government. Besides, they will also be entitled to transport or transport charges for local travel for attending the meetings of the respective Committees.

4. Secretariat support to the Committees would be provided by the Central Statistical Organisation. The expenditure on conducting the meetings of the Committees and on payments/reimbursements made to the non-official Members
will, under the relevant heads, be debitable to the budget allocated to the NSC under the non-plan grant of the Ministry of Statistics & Programme Implementation (MOSPI).

5. This issues with the concurrence of IFD vide Dy. No. 514/B&F, dated 29th July, 2010.

6. This Order comes into effect from 1st August, 2010.

Sd./
(M.V.S. Ranganadham)
Dy. Director General
Telefax: 011-23367128
Mob. 919818878155
E-mail: nsc-secretariat@nic.in
Committee on Statistics of Agriculture & Allied Sectors

Composition:

<table>
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<tr>
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<th>Name</th>
<th>Position</th>
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<tr>
<td>1</td>
<td>Prof. Y.K. Alagh</td>
<td>Chairman</td>
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<tr>
<td>2</td>
<td>Dr. R.S. Deshpande, Director, Institute for Social and Economic Change, Bangalore</td>
<td>Member</td>
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<td>3</td>
<td>Prof. R. Maria Saleth, Director, Madras Institute of Development Studies, Chennai</td>
<td>Member</td>
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<tr>
<td>4</td>
<td>Director of Indian Agricultural Statistics Research Institute, New Delhi or his nominee</td>
<td>Member</td>
</tr>
<tr>
<td>5</td>
<td>Director of Remote Sensing Institute or his nominee</td>
<td>Member</td>
</tr>
<tr>
<td>6</td>
<td>Directors of Directorates of Economics &amp; Statistics, West Bengal, Andhra Pradesh, Bihar and Mizoram</td>
<td>Members</td>
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<tr>
<td>7</td>
<td>Dy. Director General, National Sample Survey Office (Field Operations Division), Agricultural Statistics Wing, Faridabad</td>
<td>Member</td>
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<tr>
<td>8</td>
<td>Chairman, Commission for Agricultural Costs &amp; Prices, New Delhi or his nominee</td>
<td>Member</td>
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<tr>
<td>9</td>
<td>Director General, Indian Council of Agricultural Research or his nominee</td>
<td>Member</td>
</tr>
<tr>
<td>10</td>
<td>CMD, National Bank for Agricultural and Rural Development (NABARD), Mumbai or his nominee</td>
<td>Member</td>
</tr>
<tr>
<td>11</td>
<td>CMD, Agricultural and Processed Food Products Export Development Authority (APEDA), New Delhi or his nominee</td>
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<td>15</td>
<td>Additional Director General, Central Statistical Office (National Accounts Division)</td>
<td>Member</td>
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Terms of Reference:

1. Identifying statistical products required at sub-state, state and national levels to depict the status of agricultural sector
2. Agencies to collect, compile and disseminate agricultural statistics periodically
3. Requirements of an agricultural decision making information system
4. Use of modern technology such as handheld GPS guided mapping devices, remote sensing in measuring areas under different crops/uses
5. Satellite accounting for agriculture sector
6. Data flow from States to Centre
7. Private participation in collection of agricultural statistics and development of information systems
8. Reviewing methodology for estimating the production of horticultural crops
9. Reviewing methodology for estimating the production of crops such as mushroom, herbs and floriculture.
10. Reconciliation of wide variation between the irrigated area generated by the Ministry of Agriculture and the Ministry of Water Resources.
11. Integration of Livestock and Agricultural Censuses to be taken together in a 20 per cent sample of villages with an element of household enquiry.
12. Developing appropriate methodologies for filling up data gaps relating to estimates of mutton, pork, poultry meat and meat by-products.
14. Reviewing the item basket and weighting diagram for the construction of index Numbers of Area, Production and Yield.
15. Reviewing of rates used to apportion the areas of constituent crops of major crop mixtures/recognized mixtures.
16. Review of methodology for improving agricultural input statistics, particularly area under Hybrids and Bt seeds.
17. Statistics of product arrivals and prices in markets of different layers; prices used by aggregators.
18. Agricultural information systems used by agencies like USDA, FAO and relevance to India.

**Tenure: One year**
Minutes of the meetings of the Committee on Statistics of Agriculture and allied sectors.

(i) Minutes of the first meeting of the Committee

The first meeting of the Committee on Agriculture and Allied Sectors was held on 6th September, 2010 at Committee Room, Second Floor, Sardar Patel Bhavan, New Delhi under the Chairmanship of Prof. Y.K. Alagh. The list of participants is given in the annexure.

The Chairman welcomed all the members of the Committee and then initiated the discussions after brief introduction of each Member. The economy was growing fast and there was structural change in agriculture responding to demand changes. Demand was rising and on account of the Engels Law was also diversifying. The emerging rural urban continuum was both an advantage and a policy challenge. Resource scarcities of a non renewable nature were compelling and technology was a boon, but information, both of a widespread nature and of recent changes was essential. He informed the need of having full-fledged Agricultural Information System (AIS) for our country. The USDA and the EEC had similar systems already in place.

Also he informed the members that a Committee constituted under the Chairmanship of Prof. Y.B. Vaithianathan by the Ministry of Agriculture on the subject matter and its role and functions. He stated that the Committee under Prof. Vaithianathan has submitted its interim report. He clarified that TOR of the Prof. Vaithianathan Committee is mostly dealing with area and crop production details and the improvement thereof and given Prof Vaidyanathan’s expertise and lightly review the Reports and endorse them.

Chairman stated that Indian economy has changed a lot after the liberalisation and globalisation in early nineties and a lot of changes have taken place in various sectors of the economy. Therefore, he stressed that there should be a data collection mechanism to capture such changes for proper decision making. He asked the members to refer the chapter relating to agriculture sector in the mid-term appraisal of Planning Commission.

He informed that cereals are not growing during the last few years whereas commercial crops and the non-cereal crops are growing faster. Classical ratios of yield and acreage keep changing. It is expected that growth rate of agriculture will not exceed 3 percent. We (Hanumantha Rao and Alagh) have investigated on what would be the quantum of investment in agriculture sector so as to achieve higher growth rate. After thorough examination and detailed study, it was concluded that investment in agriculture sector should be around 12 percent. However investment at present is about 22% and the growth rate in agriculture sector is far less and is
not commensurate with the high investment. National Statistical Commission has done excellent work and created useful documents in the subject matter.

Chairman told the Members that Urbanisation is taking much faster than what it was predicted. For South-Asian countries, Food and Agricultural Organisation (FAO) has summarized the urbanisation scenario in South-Asian countries in its Report in 2007. Registrar General of India in its latest report stated that urbanisation growth in Gujarat for example in the nineties is about 2.5 percent whereas in reality it is about 5 percent. Around 2 percent area used to go to urbanisation during inter-Census period, but now it is more than 5%. There is qualitatively lot of difference during the period 1991-2001 and 2001-2010. These changes should not be missed out. Despite the fact of fast urbanisation, the classical problem of poverty and hunger has not been reduced enough.

If changes are very fast and rapid then prediction and forecast would be more difficult. Relationship between poverty, hunger and growth should be examined for appropriate policy intervention. Chairman asked the members to refer Prof. Tendulkar’s Report on poverty and the controversies between Dandekar and Sukhatme for modified poverty line and the issues thereof.

On supply side the situation on land and water availability is serious and agro-climatic level should be taken into account for irrigation and crop intensity estimates. Generally government policy is emphasising only on 6 to 7 principle crops and income generation is increasingly from elsewhere. For example, Vanilla, Muesli etc. grow natural in Nagaland and other parts of the country which are money spinners. There should be suitable measures for capturing of these fast growing sectors for the information of planners and policy makers.

Indian agriculture is highly diversified and there should be mechanism to cross check outputs through market intelligence survey data. Milk cooperatives can yield good information and we need to focus on alternative set of information. In this regard research centres for development of agriculture, agency for pricing, etc., have gone into great details of collecting information on technology, seed rate, water etc. Also, National Commodity & Derivatives Exchange Limited (NCDEX) has done excellent work on standardisation, segregation of products and warehouse issues. We can get relevant information from NCDEX. Collecting timely information on trade of agricultural products is very difficult.

Data relating to spices and land use, we should get more information. Biotechnology is spreading fast and data is not collected. There are experiments on the management by the villages themselves for collecting and us on IT and computer based systemising data. Such initiative will help in building Decision Support System (DSS) for effective and timely decision making. Also we should explore the possibility of involving larger private sectors.
The manual on DSS developed by Arab Republic of Egypt, for policy making data support systems at the highest levels could be referred.

After his introductory address, invited the members to give their views on the subject matter. Director, ISEC, Bangalore stated that how the data comes in and he stated that he is sceptical of using raw data without validation. He has informed the kind of improvement we should look for, as stated below:

1. Full attention on emerging sectors
2. Focus on strong and growing sector viz horticulture, animal husbandry and fishery then focus on agro-climatic zone. In this regard he informed the members that GIS application shown no plantation and the ground check resulted otherwise.
3. Data on Crop Cutting Experiment (CCE) are manipulated because of crop insurance.
4. There is a lot of difference in irrigation data between different agencies like irrigation department and DES.
5. No data on pre-urban area
6. No data on medicinal and ornamental plants.
7. Also data on non-timber forest products are weak.
8. No connectivity in pravara area
9. There is improved availability with zero time lag with details in the quantum of rains and duration of rains, dealing with flood situation etc. These data are collected through wide spreads telemetric station across Karnataka.

The Vice President, NABARD has informed the Committee that data on Corporate investment in agriculture sector is not there. Initiative should be taken to collect through institution mechanism. Also areas cultivated by various groups such as SHG, SAG. Producer companies have been set up for encouraging certain agriculture crops. Similarly area under production of medicinal and aromatic plants are highly volatile. In this regard specific study needed for cross checking market behaviour of these products.

Chairman has asked the Members to refer two important reports by Mr. Nitin Desai on producer companies, Data base by the NGO Pradan and ii)Report by Prof. Bhattacharya Committee on new concepts of agricultural investment and resource floes and of groups like BASIX and IFMR on newer financial products.

The Additional Director General, ICAR has stated that data on farm mechanisation and investment on capital goods are not available. He also stressed that value addition of farms – adoption of technologies and entrepreneur ship in farming - data is very necessary and useful.
The Director, IASRI has informed that the estimation on parameters in small areas of would be very helpful in reducing the vast differences in area and yield estimation. No mechanism to get data on agricultural sector from single sources. Availability of data differs from state to state. In this regard Chairman has informed that TN Srinivasan Committee report would be helpful.

The Adviser(Horticulture) informed that there are lot of time tested centrally sponsored schemes like Timely Reporting Scheme (TRS) General Crop Cutting Experiment (GCCE), Improvement of Crop Statistics (ICS) etc. What are the practices followed by different states are not monitored properly and often field functionaries are not available. Our basic thrust should be on collection of reliable, timely and credible data. Statewise limitation should be worked out and should be resolved. She has stressed upon item no. 8 &9 TOR.

The Adviser(Animal Husbandry Deptt.) has stressed up on TOR no. 11 and 12. He has stressed upon outsourcing of Animal Husbandry Data. Chairman has informed that the data on milk, egg and wool could be cross checked with cooperative data like NDDB, Venkatashware Hatchery, NECC. Also he has informed that data from Ministry of Corporate Affairs could be collected for organised sector for cross checking and validation. For livestock census the Adviser has stressed for single agency for data collection work.

Representative of Mizoram State has expressed that data on agricultural, Horticulture and the irrigation are inflated. Also no man-power to collect village level data in agricultural sector. Villages in North East states are different than that of other part of the country and specific methodology has to be developed for North-Eastern states for collection of Agricultural statistics. No data is available on current fallow land.

The Adviser (Land Use Statistics) has informed that web based system is in place for LUS with the time lag of 1 to 2 years. She informed the committee that area on social forestry and marshal land are not available. There should be the policy decision for agricultural information system at a Ministry level for collection of data at village level. Chairman intervened that irrigation statistics for states differ for potential irrigation created and actually utilised. She also informed that CCS data is best for mechanisation of farming activities at all-Indian level and there is no other agency undertakes this data collection work.

Representative of NCDEX has informed that no data is available on crop-side for different level of aggregation. Design should be developed for different levels of aggregation of prices of agricultural commodities and availability of data for forecasts. Chairman has informed that there is no mandate for government for developing forecasting models as it is for the NCDEX and other Agencies to go into such areas.
The DDG, FOD, NSSO, Faridabad has informed that to examine the quality of aggregated statistics, inputs given by FOD were used by Vaithianathan Committee. Supervision by states has not produced any positive results whereas supervision by NSSO has resulted in improving the quality of data.

The Secretary, Agricultural & Processed Food Production Export Development Authority (APEDA), has informed that export oriented data on agricultural products are not available. They are not in position to put together agricultural statistics of APEDA and official statistics.

The Director, Madras Institute of Development Studies, Chennai has informed that data on irrigation is not available. Also he has informed the role of private sectors in generating statistical products.

The Director, DES, Andhra Pradesh has informed the committee that Agriculture Statistics is a State subject and the consolidation of Agriculture Statistics at State level is missing. Prof. Y.K. Alagh, has informed that Vaithianathan committee report could be examined and it could be extended for state level consolidation as well.

Director, ISEC, Bangalore has informed that crop-wise estimates at sub-state level is very important and hence he has reiterated that regional level estimate could be more useful for planner and policy makers.

After the detailed discussion, Chairman has informed that various groups should be formed for specific subject areas for detailed examination and submission of report for further discussion. Accordingly, the following groups were to be formed:

- **Group 1**:
  - Definitions /Standards/concepts
  - Rural/Urban statistics
  - Emerging crops/medicinal/aromatic crops
  - Food Crops/Non-food crops
- **Group 2**:
  - Newer Crops/Newer activities
  - Latest trend on agriculture /crop production
  - Projection of labour
  - Diversification
  - FAO –I Stage processing
- **Group 3**:
  - Methodological Issues
  - SHG, Private Sector participation
  - Market Data collection
  - Forest Data
- **Group 4**: 
Input Data Collection
- Irrigation, water use Statistics
- Mechanisation, seed rates
- Fertilizer, pest control,
- Dissemination of input data for policy makers

- Group 5:
  - IT and ICT usage in Agricultural data
  - Agro-climatic level
  - Small Area farm Business.

- Group 6:
  - Decision Support System
  - Staff agencies
  - Water and Land Use Statistics
  - North-East Development

- Group 7:
  - DSS for Poor and Marginal Farmers
  - Food Security

Chairman informed that the Group Heads and its composition would be informed soon and each Group would submit its report within three months of its constitution. The meeting ended with vote of thanks to the Chair.

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### Annexure

#### List of Participants

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<td>Dr. U. C. Sud, Head, Dir. of Sample Survey, IASRI, New Delhi</td>
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<td>7.</td>
<td>N. P. S. Sirohi, ADG (Engg.), ICAR, 405, KAB-II, ICAR, New Delhi</td>
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<td>8.</td>
<td>Dr. A. K. Bandyopadhyay, Chief General Manager, NABARD, Mumbai</td>
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<td>9.</td>
<td>Sh. Sunil Kumar, Secretary, APEDA, Hauz Khas, New Delhi</td>
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<td>11.</td>
<td>Sh. M. V. S. Ranganadham, DDG, NSC Secretariat</td>
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<td>12.</td>
<td>Sh. P. Prakasam, Director, D. E. S., Andhra Pradesh, Hyderabad</td>
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<td>13.</td>
<td>Sh. A. Lakshmikantha Reddy, Exe. Vice President, NCDEX</td>
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<td>Dr. Shailja Sharma, Adviser, M/O Agriculture</td>
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<td>Sh. Rajeev Lochan, Adviser, M/O Agriculture</td>
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<td>16.</td>
<td>Sh. Biakthaneangi Hradral, Research Officer, DES, Mizoram</td>
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<td>17.</td>
<td>Sh. A. K. Mathur, Adviser, D/O Animal Husbandry, M/O Agriculture</td>
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<td>18.</td>
<td>Sudha Midha, Adviser (Hort.), Hort. Division, Deptt. of Agri. &amp; Coop., 103, Shastri Bhavan, New Delhi</td>
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<td>19.</td>
<td>Dr. S. D. Raju, DDG, NAD, CSO</td>
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<td>Sh. M. A. Khan, A.D., CSO</td>
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(ii) Minutes of the second meeting of the Committee

The Second meeting of the Committee on Agriculture and Allied Sectors was held on 21st April, 2011 at Conference Hall (basement), Sardar Patel Bhavan, New Delhi under the Chairmanship of Prof. Y.K. Alagh. The list of participants is given in the annexure.

The Chairman welcomed all the members of the Committee and then initiated the discussions. He appreciated the Sub-Group Heads who have submitted the reports, for putting commendable efforts in finalising the reports. He has informed that he has gone through two sub-group reports which he could access and the third one he could not access it. He informed the members that henceforth most of the remaining works could be done through exchange of information electronically. Also he stressed the mandate of the Committee and submission of the final report by target date. He then invited the Sub-Group Heads to present their works.

Dr V K Bhatia, Director, IASRI and the Head of Sub-Group-6 presented his works in brief. He informed that the mandate of the Sub-Group is on the four components namely (a) Agro-Climatic level Statistics (b) Small Area farm Business statistics (c) Food Security statistics and (d) Trade and Tariff Policy statistics. He explained that the report includes background information on the above four topics, statistics on concerned indicators along with sources of data availability, current status, gaps, suggestions for filling the gaps and future prospects.

Chairman while giving his observations informed the members that the topic namely Agro-Climatic level was explained well in the report. However the link between the resources(Land-Water-Climate) is to be elaborated, alternate possibilities, link between resources and production should also be explained. Similarly link on resources-trade and climatic level should be illustrated taking a clue from Rio Summit and research works on building sustainability. A model plan should be brought out from the study of two to three regions. He further said that the 11th Five year plan document would be helpful in preparing the report with great details. Also he said that the possibility of integrating the model on with India Statistical strengthening Project (ISSP). Discussing a suitable methodology for going from resources to Production and to trade would be helpful.

With regard to irrigation statistics, Chairman informed that the reservoir statistics should be rearranged region and sub-region-wise. District level plan should be integrated with this. Besides, priority could be indicated in the report which would be useful.

Regarding small Area farm business statistics, Chairman stressed that even crop level statistics should be made available. He illustrated with Vanilla crop, being grown in small area but very important for commercial point of view in addition it is very important for some area or region and for the farmers growing that crop.

Area and production statistics produced through the conventional method is not giving credible satisfactory estimates. Land records are in poor condition and identifying useful characters of crops is difficult under present scenario due to bad land records. In respect of food security, the chairman informed that a research paper by Mr Surya could be flagged for giving sense of priority to the subject.
A implementable policy is missing. Relevant information required to be addressed and vulnerability should be addressed. Based on relevant paper on DSS, UNICEF Publication on food security, short term & long term information requirement should be suitably addressed and incorporated.

Trade statistics for decision making, paper by Abhijit Sen (WTO publication), objectives of price policy, summary of Alagh Committee and Monthly updates by Kapila could be discussed. Up-to-date data on tariff is not available. Rastriya Krishi Vikas Yojana could be a referral point for relevant information.

Food Security requirement, supply-production equilibrium, storage facility, perishable through distribution channel, corporatisation of seed and grains, post harvest wastages are important. Relevant material could be collected from Mr. Bhasha and could be discussed in the report. Resources required to get lower level of disaggregation and for suitable methodology required, few district level studies are required.

Then, the Chairman requested Shri M Moni, Head of Sub-Group-4 to give the presentation on the report he has submitted. He explained the IT usage in Agriculture data, Agro-Climatical level and small area farm business. He stated that he had collected inputs from the Stakeholders viz., State Agricultural Universities, ICAR Institutes, State level Agricultural Statistical Agencies (SASAs) to understand the IT and IT usage in agricultural data, at agro-climatic level and Small Area Farm Business besides Video Conferencing between the Members of the Sub-Group and the Stakeholders.


He informed the members that the report was finalised after thorough deliberations. Then he explained the contents of 20 sections and 21 recommendations in brief.

After the presentation, the Chairman appreciated the commendable works carried out by the Sub-Group-4 under the stewardship of Shri M Moni. He has made some observations such as (a) Involvement of private sector to be checked (b) Clear policy on data standard, data integration and data sharing (c) demand driven system and concept should be brought out (d) Involving private sector in a transparent way would be useful and (e) Animal husbandry is labour intensive which has to be given due consideration.

Then the Chairman invited the Sub-group -3 to present its report. Dr U C Sud had presented the content and coverage of the report as Shri N.P.S. Sirohi, head of this Sub-Group could not turn up to the meeting. He presented the contents of the six chapters in the report in brief and concluded that sustainability of high crop production could be ensured through site
specific nutrient management. Further, fertilisers will play a key role in addressing the problem of low and stagnating yield in agricultural and horticultural crops.

Shri Sud explained that the existing data collection agencies may be revamped by reorganization and wherever manpower crunch is felt, the job could be outsourced on contract basis but under the supervision of trained permanent staff. Data flow should come from private dealers, manufacturers of agricultural inputs, seed companies, agri clinics, private extension, corporate, biotech companies, Cost of cultivation scheme, etc. with regular periodicity.

After the presentation, the Chairman said that regular real time online data updation and uploading by input companies and dealers and government agencies/ministries/departments will be a boon for researchers. Then the chairman deliberated on various issues like how to collect fertiliser data? From where data comes? Pesticide manufacturing data, involvement of private agencies, change in irrigation statistics, village level information, shift of land, Irrigation utilisation should be made known, etc.

Prof. Maria informed that he has identified the agencies and data availability. Further he said that there are conceptual differences among different agencies, problems in satellite images to be collected, cloud cover problems in remote sensing, etc. Then he said that his report would be sent soon. Since there was no representative from North-East despite several attempts, the report got delayed.

Representatives from NABARD said that the current availability of data on Forest, Markets, etc. are delayed and not upto date resulting huge time-lag. They said that they have identified data gaps and data producing agencies. Bank linkages is available at State level only, data on district level required. Data on how many moved above poverty line, activity-wise details and SHG, etc. are required. Issue of transparency and governance in private sectors exists. Data on Fuel wood used and Minor forest sector are required. Finally they said that they will try to submit their report as early as possible.

Then Chairman enquired about submission report by Prof. Deshpandey. He said that he has already done some works and will try to submit the report within two months.

Finally, the Chairman asked all the heads of the Sub-Group to submit their report as early as possible. He said that receipt of reports from the Sub-Groups would enable the Committee to finalise the report by cut off date. The meeting ended with a vote of thanks to the Chair.
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<td>Ms. Nisha Rani, SI, NAD, CSO</td>
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