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Prior to the present job since August 2005, Dr. Iyengar was Director of the Centre for Social Studies, Surat (2004-05) and Director of Gujarat Institute of Development Research (1999-2004). His areas of research interest are Gandhian thought and praxis, natural resource development and management, people's institutions and role of non-government organisations in initiatives in societal development. His recent involvement has been with DANDI project and Collected Works of Mahatma Gandhi. He has actively co-ordinated NGO initiatives in the rescue and relief operations of the Gujarat earthquake, January 2001.

Dr. Iyengar was a member of the Environmental Economics Research Committee (EERC) of the World Bank supported national project on capacity building in environmental economics. He also chaired a sub-committee on Monitoring and Evaluation of the Watershed Development Programme of the Government of Gujarat. On Human development front, he was a member of the Technical Advisory Committee on Abortion Assessment Project, India and Convenor of the on Population Policy, Government of Gujarat. He was also a member of the Task Force on "Land and Forest Regeneration" under the Capacity 21 Project of the World Bank at Indira Gandhi Institute of Development Research, Mumbai. He is a Trustee in many voluntary organisations in Gujarat and in other states. He is also a visiting faculty in different universities and research and training institutions in Gujarat. He has authored seven books and published more than 60 research articles.

He has been travelling extensively in the country as well as abroad to spread Gandhian vision and thoughts of non-violent human society.

AERC Foundation Day Lecture 2013
(On July 1, 2013)

Agro Economic Research Centres
Need to Introduce Fresh Agenda

by

Dr. Sudarshan Iyengar
Vice-Chancellor,
Gujarat Vidyapith,
Ahmedabad, Gujarat

AGRO-ECONOMIC RESEARCH CENTRE
For the states of Gujarat and Rajasthan
(*Sponsored by Ministry of Agriculture, Govt. of India)*
SARDAR PATEL UNIVERSITY,
Vallabh Vidyanagar, Dist. Anand, Gujarat, India

AERC Foundation Day Lecture 2013.

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About the Centre:

The Agro-Economic Research Centre (AERC) for the states of Gujarat and Rajasthan was established in July 1961 at the Sardar Patel University, Vallabh Vidyanagar by the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi. AERC has been working as an associate institution of S. P. University and enjoying autonomy status in its working. The Centre has completed 52 glorious years (1961-2012) of its journey marked by both achievements and challenges. During these years, the Centre has emerged as a strong policy feedback centre of the Ministry of Agriculture, Government of India due to hard work and strong commitment of the staff in the Centre. The focus of research effort in the initial stage was on comprehensive village surveys and resurveys in order to understand the process and direction of change at the village level. Subsequently, the emphasis of research has shifted to problem oriented studies.

The Centre has by now completed 152 problem-oriented studies, 21 village surveys and 4 village resurveys. During its long journey, the Centre has brought remarkable improvement in every aspects of research including methodological base of the studies. The studies have come out with useful findings and policy implications for agricultural and rural development of the states of Gujarat and Rajasthan.

As suggested and approved by the Governing Body of the AERC, *Foundation Day Lecture Series is started from this year.* This is the first lecture in *Foundation Day Lecture Series*.

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Agro Economic Research Centres:
Need to Introduce Fresh Agenda

Sudarshan Iyengar[1]

Dr. Kalamkar, Director AERC, Prof. Trivedi, Amritaben Patel, AERC team members, colleagues in Economics Department, faculty members, distinguished guests, ladies and gentlemen,

I am privileged to be here amongst you on the occasion of 52nd Foundation Day of the AERC, V.V. Nagar. At the outset I should submit that I was somewhat surprised when Prof. Mahesh Pathak asked me to deliver the Foundation Day lecture. I am not an agricultural economist of any repute, nor have I worked on the subject with any continuity. It is true that I have been looking at rural development issues and use and management of land and water as natural resources and commons. Hence, it was difficult for me to choose a topic in the area of agro economic research for today's lecture and do justice. I therefore propose to make some general comments on agriculture scene today and make a few suggestions about fresh agenda for research in Agro Economic Centres in the country in the capacity of a person having some rudimentary knowledge about the subject.

After Independence India did decide to modernise agriculture. We did not listen to Gandhiji on his economic model. Gandhiji had suggested building rural economy around local resources. His vision of human settlement and society was rural. In a letter to Nehru in 1945 he narrated his vision clearly. He wrote,

[1]Vice Chancellor, Gujarat Vidyapith, Ahmedabad. This is a lecture (revised) delivered on the 52nd Foundation Day of AERC at Vallabh Vidyanagar.

"I am convinced that if India is to attain true freedom and through India the world also, then sooner or later the fact must be recognised that people will have to live in villages, not in towns, in huts, not in palaces. Crores of people will never be able to live at peace with each other in towns and palaces. They will then have no recourse but to resort to both violence and untruth. I hold that without truth and non-violence there can be nothing but destruction for humanity." (Parel Anthony 1997, p150)

Gandhiji's idea of *swadeshi* in Independent India had meant self-sustaining and self-reliant decentralised village economies with exchange among themselves. In his model trade was limited and international trade further so. Agriculture, animal husbandry, fishery, household and cottage industry was to cater to the basic minimum needs of all population. All would be gainfully employed and earn decent and adequate livelihood with dignity. Nehru did not agree with Gandhiji and chartered a different course of state controlled and regulated industrialisation and modernisation. This approach necessitated producing more and more surplus in agriculture to support the growing urban population. Agriculture had to be modernised.

Gandhiji also understood that agricultural production had to be increased to meet the demand for growing population. But he did not fully support the increase in demand by those who already had adequate food to eat. To give a simple illustration, Gandhiji's thought on vegetarianism can be extended to argue that demand for food grain to feed animals to fatten them for consumption cannot be approved. If one is talking about growth in food grain production for this purpose, it is not acceptable in Gandhian scheme. Gandhiji did appreciate that it was necessary to grow more food grains to be consumed directly.

An initial effort was 'grow more food campaign' by bringing more and more area under cultivation (area effect). By late 1960s growth in area expansion had slowed significantly. 1967 witnessed nationwide drought and famine like condition, food imports shot up and instead of

'farm to mouth' Indian food situation reflected 'ship to mouth' scenario. A major breakthrough did come in late sixties. This came to be known as the Green Revolution. It was seed revolution. Hybrid seeds replaced the local seeds. Along with seeds, irrigation, agro-mechanical and bio-chemical technologies completed the revolution. The new millennium started manifesting limitations and negative externalities of the seed and chemical technologies. Questions started arising about mono-cropping, use and abuse of chemicals in agriculture, soil health, human and livestock health etc. Plethora of literature has come into existence by now on these issues. An ecological concern such as loss of agro-biodiversity has also been surfaced. Policy makers in developing economies and particularly in India have paid scant attention to environmental and ecological issues. Since rapid economic growth is the objective of the country, non-economic concerns are not being addressed seriously. The policy makers and researchers have not paid adequate attention to study the food chains to establish real need for growth in food grains production.

Going back on the agriculture development in India, organised, state sponsored research in agricultural economics was indeed thoughtfully initiated by the Government of India. In 1961, Agro Economic Research Centres were set up all over India. The objective of the state with respect to agriculture was to make the sector grow faster by substantially improving the productivity and production. Hence, the economic issues involved were to be studied. As known to this audience the objective of Agro Economic Research Centres are the following.

- To carry out continuous study of changes in the rural economy by means of surveys of a number of selected villages at each year.

- To conduct adhoc investigations into the problems in which the Ministry of Agriculture is especially interested.

- To carry out research work on problems relating to Agricultural Economics of the country.

The main activities of the AERCs initially included conducting village surveys, studies, investigations of the problems being experienced by farmers in agriculture and animal husbandry as also to provide technical advice to the central as well as state governments on the issues referred to by them. However, in the early 1970s the focus shifted to problem-oriented studies of immediate policy implications to the Government of India and the State Governments.

AERC, VV Nagar has conducted impressive number of studies since its inception in 1961 in Gujarat and in Rajasthan. The Centre has had a number of researchers who later became very well-known scholars and policy makers in the country and abroad. The website information suggests that 137 studies have been completed and about ten studies are ongoing. I am sure last update would improve the tally. The research has covered wide range of topics including specific crop types, cost of production, credit, cooperative, yield production, irrigation, use of inputs etc.

An important task was added to the agenda of the AERC. The Comprehensive Scheme for Studying the Cost of Cultivation of Principal Crops in India became an integral part of AERC. In 1970-71 on the recommendations of the Standing Technical Committee on Indices of Inputs Costs the scheme was launched with a view to fulfil the requirements of data for formulating the agricultural price and other agro economic policies. This scheme is fully funded by Ministry of Agriculture, Government of India. Under the scheme, the data on cost of cultivation/production is collected with prescribed methodology and procedure. The Scheme envisages collection of representative data on inputs and outputs in physical and monetary terms, compilation and supplying the estimates of cost of cultivation per hectare and cost of production per quintal of the selected crops to

Commission for Agricultural Costs and Prices (CACP) every year on a continuing basis. The data is checked, corrected, validated, given appropriate rates and weights and computed into field-wise, crop-wise and state-wise cost estimates by Directorate of Economics and Statistics before these are supplied to CACP to recommend the Minimum Support Prices (MSP) to the Government of India.

Describing the importance of the Cost of Cultivation Surveys (CoCS) Prof A Vaidyanathan (2005) has noted the following.

"These surveys are being conducted regularly since 1970-71 in all the major states of the country; farms are selected on the basis of rigorous sampling procedures; information is collected by investigators residing in the selected villages; concepts and formats of data collection are uniform across states; and are comparable across space and time. They seek to get comprehensive, quantitative information of the characteristics of sample farm households in terms of land and livestock holdings, access to different sources of irrigation, cropping patterns, use of material inputs and use of human, animal and mechanical labour, production and marketing disposition of produce as well as the extent and sources of credit for various purposes. What makes these surveys unique is the fact that they collect plot-wise data on the crops grown in different seasons, the specific varieties used, irrigation source, sowing and harvesting dates, details of cultivation operations (including their timing and work inputs), and yields. Properly used, they can provide us an extraordinarily rich source of material for better understanding of the nature and extent of diversity of agricultural economy, and their dynamics, across regions and across different types of farms and the factors underlying them. Unfortunately this potential has remained largely unutilized" (p 1).

However, it was felt by the agricultural economists and other researchers that the huge data base which the system generates was being severely unused. The Indian Society of Agricultural Economics took up this issue sometime in mid 1990s and tried to gain access to data base and analyse the data collected and compiled under the CoCS. Prof. A. Vaidyanathan headed a Committee constituted by the Society and he has penned a report. Describing the situation with respect to data base and access he writes,

"CoCS data have been used more or less exclusively by the Agricultural Prices Commission, and later by the Commission for Agricultural Costs and Prices (CACP), to assess the costs of production of different crops in different regions as one of the factors for deciding the recommendations regarding minimum support and procurement prices. The Directorate of Economics and Statistics (DES), which sponsors and funds the surveys, did not use the data for any analytical studies of growth and technical change and other aspects of agricultural performance"[2].

He has noted that the institutions that were collecting the data were allowed to keep the survey schedules and a copy of the collated data sent to the Directorate did very little to use the survey material for teaching, for post-graduate theses research or for faculty research. He further writes,

"Undoubtedly this reflects, in good part, a lack of appreciation of the potential value of the survey data and a lack of interest in utilising this potential. The few who had an interest was impeded by the fact that the Government considered the data to be very sensitive because they were used in price fixation. Until recently the data were deemed classified. In some cases, in which the institutions conducting depended on their state governments for their funding, the free use of the survey data was impeded when they were considered to weaken the bargaining position of the state in the discussions on price fixation with the CACP"[3].

Since the Indian Society of Agricultural Economics took keen interest, pressure was built on the government machinery. Prof. Vaidyanathan says,

"Eventually a special committee headed by Dr. S. R. Sen was appointed to review the matter. They were strongly in favour of removing the restrictions on data access and recommended that, except for the three most recent years, all the data be made freely available to interested researchers. While the Government accepted the recommendation, implementation of the policy has been tardy"[4].

[2]Vaidyanathan A. 2005, p 1-2
[3]Ibid – 1-2
[4]Ibid p 1-2

The entire report is worth reading because it not only describes how the data was accessed, it is also reporting the analytical work done with the data of a few states. It has not been smooth. Only four Centres namely, Tamil Nadu Agricultural University, Coimbatore; Kerala University, Thiruvananthapuram; Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar; and Rajasthan Agricultural University, Udaipur, had preserved the data from the 1970s and showed active interest in working on the project.

I am not getting into those details right now, but I would like to note that Prof Vaidyanathan with his assistants has been able to clean and analyse the data and present some very insightful results. The study helps in setting up of new agenda for the AERC, VV Nagar too. I am not aware whether the AERC, VV Nagar has already picked up the lead and accessed the data. But if this has not happened there is scope to expand the agenda. I am also certain that with the electronic devices such as computers, the scope for data storing has improved in AERC and it would help in taking up the analysis work more meaningfully.

The CoCS data are also important for another reason. I am flagging this issue as very vital. In the post liberalisation and globalisation era a distinctive feature of Indian Agriculture has been farmers' suicide. Perhaps never in the history of agriculture in India there is any record about farmers' suicide. Severe famines, death due to starvation and malnutrition etc, have been known issues in Indian agriculture. Chronic and intergenerational debt liabilities are also well-known. But farmers' suicide is not only new but it is also alarming because of its spread and persistence. I am of the opinion that CoCS would be a very important instrument in understanding the reasons for farmers' suicide. I should also remind ourselves that the issue of food security at household and village level has surfaced once again.

The draft Food Security Bill in the Lok Sabha has generated a lot of heat[5]. We may have to confront the issue seriously as we all know that PDS has not yielded desirable outcomes irrespective of the quality of management.

Farmers' suicides have happened all over the country, but Maharashtra, Andhra Pradesh and Punjab have been in the forefront. Various reasons have been advanced for farmers' suicide. Behere and Behere (2008) have studied farmers' suicide in Vidarbha region in Maharashtra and have listed following set of reasons.

- absence of adequate social support infrastructure at the level of the village and district,
- uncertainty of agricultural enterprise in the region,
- indebtedness of farmers,
- rising costs of cultivation,
- plummeting prices of farm commodities,
- lack of credit availability for small farmers,
- relative absence of irrigation facilities,
- repeated crop failures,
- dependence on rainfall for farming,
- rural living and easy access to poisons, and
- Lack of political will and insight in the region.

There are many other studies that would also list similar reasons. S.S. Gill's study for Rural Punjab notes multidimensional crisis of the rural economy in the post green revolution phase, pauperised peasant households, crop failure, unemployment and indebtedness as major economic reasons. Vandana Shiva and Kunwar Jalees (2004)

[5]When this lecture is being finally revised, the Lok Sabha has passed the Food Security Bill. It is a financial solution offered and hardly talks about production strategies for small and marginal farmers to become food secure first by growing food on farms as priority. Offering financial security and right, there is promise of paper money that does not guarantee food! Gandhi's idea of *swadeshi and svavalamban* is still the best food security model.

criticising the Karnataka Government's official report on farmers suicides says that "the report while claiming to be "scientific," makes unscientific reductionist claims that the farm suicides have only psychological causes, not economic ones, and identifies alcoholism as the root cause of suicides" (p 2), and holds unfair trade rules of WTO responsible. The Report has analysed the farmers' suicides in Karnataka, Andhra Pradesh, Punjab, West Bengal and other states. The main reasons that have been brought out are failure of institutional credit delivery system, farmers' indebtedness and inefficient and low coverage of crop insurance. Interestingly, the report has identified that there is a shift from food crops to commercial crops that are input intensive. The report says,

"A trend is seen towards food crops making way for commercial crops in most of the areas where suicides have occurred. This involves purchase of wider range of inputs with ready cash. Most of the suicides are by small and marginal farmers who fall into the trap of private moneylenders. If the crop is good, the price of the produce goes down, and they do not reap the benefit. If it fails, they become indebted. If the crop fails continuously, they become more indebted forcing the farmers to commit suicide." (p 48)

A good literature review is done by Sanchita Mukherjee from Centre for Development Studies, Thiruvananthapuram in 2009. She has reviewed the literature that has appeared covering the major affected states Maharashtra, Andhra Pradesh, Karnataka, Kerala, and Chhattisgarh. Summarising the factors in the abstract, the reviewer notes,

"The reasons cited by the literatures highlights rural indebtedness as one of the major factor. Policies associated with the process of liberalisation increased stress on the country's peasantry, with the withdrawal of formal support towards this sector, which in turn made farmers dependent on non-institutional sources such as private moneylenders and private agents. Seed sector liberalisation has not only brought private players in agriculture but also encouraged monoculture of hybrid cash crops requiring costly inputs, which eventually gets transformed into debt. This situation coupled with crop failure due to pest attack, climatic change and lack of irrigation led to mismatched expectation of farmers and

indebtedness. Agonised farmers found solution to all these woes in the forbidden path of committing suicide." (p 1)

Three to four items draw special attention. They are: crop choices in favour of cash crops, rising cost of cultivation, plummeting prices of farm commodities and lack of credit availability to small farmers. Rest all other reasons have been there since long and those reasons have not led to farmers' suicides in past.

Cost of cultivation, prices of farm commodities and lack of credit are important and linked. It is important to examine how speedily these components have monetised. There has been a paradigm shift in Indian agriculture since the post reform era. Indian agriculture had a component of commerce in it but marketised agriculture has indeed been a new phenomenon with which Indian farmers and especially small and marginal farmers were not very familiar. Marketised agriculture implies buying inputs and selling output. The extent of monetisation of agriculture has increased. The proportion of paid out cost to total cost appears to have risen sharply. It may be noticed that the nomenclature has changed. In CSO's publication, 'Manual on Cost of Cultivation Surveys, in section 2.2 the changed nomenclature is given. It says,

"Costs incurred on a farm can be classified as cash cost or non-cash cost. Cash Costs are the costs for which farmer spends money for acquisition of material inputs like seeds, fertilizer, chemicals or labour inputs like hired labour etc. On the other hand, non-cash costs are attributable to items of cost, which do not require spending money. These may be items of cost like family labour, payments made in kind, home grown seeds, manure etc., exchange labour, depreciation, interest on operating capital etc." (p 14)

Shah, Shah and Iyengar (1991) had pointed out that with assured irrigation the agriculture production system tends to change subsistence and commercial agriculture to marketised agriculture. In the first two types of agriculture the proportion of paid out cost or cash cost is very low or non-existent. When farmers, of all size of holdings,

turn to market increasingly for purchase of inputs with cash, the agriculture becomes marketised. The trend for marketised agriculture had begun in late 1970s with Green Revolution technologies, and with economic liberalisation, the pace, coverage and intensity have increased. If the component of cash cost or paid out cost rises, the cultivator farmer has to raise cash resources. Institutional credit was brought in as the instrument for providing crop loans. Since the transactions were being monetised increasingly, the formal lending sectors i.e. banks and or the Government financed cooperation department had to ensure safe return of loans. Crop insurance was introduced to cover the risk. All efforts were made to improve the production efficiency, productivity and returns. Crops failures due to monsoon failures, inadequate irrigation facility and pest and insect attacks make the agriculture very vulnerable.

I will first try to show that the paid out costs form substantial part of the total cost incurred by the farmers. The IARI's annual publication Agriculture Research Data Book 2012 has given cost of cultivation data for selected crops. Let us review the cost components in it and find out what are items for which the farmers have to get into monetised transaction for inputs. Table 5.17 contains data for cost of production for important crops by states. The cost is given as rupees per quintal for years between 1997-98 and 2008-09. The table has been abridged and compiled and presented as Table 1.

In Table 1 the cost is indicated per quintal of output. It is clear from the table that there are inter-spatial and inter-temporal variations in output per unit of land. Hence, cost per unit of output in quintal varies across states and over time. But when one looks at the data for 2003-04 to 2008-09, which are in continuous series, an increasing trend in cost per quintal is observed. It appears that costs are generally increasing in case of most crops and in most states.

I have selected important cereal, pulse and cash crops as most of these crops are now being produced for market. Let us begin with

Paddy. Data for six major paddy producing states are also given in the original table. It may be seen that there are interstate variations in all the years. In 1997-98 the variation was relatively small, but it has widened in later years. Between 2003-04 and 2008-09 cost per quintal of paddy has risen for all the states. It means that input prices have been increasing. Same is the case with Wheat. In case of Jowar, Karnataka appears to have very low yields in 2003-04 and in 2008-09, but for the remaining years, the trend shows increasing cost of cultivation. Bajra and Maize also show rising cost trends. In case of pulses too Gram, Urad and Arhar show rising cost trends with Madhya Pradesh as exception in Urad. Output of Urad in Madhya Pradesh appears to be highly fluctuating and hence cost figures are high and fluctuating. Irrigation is one of most important output stabilising factor. Since, data for irrigated and un-irrigated crop are not available, this output related disturbance would remain. Looking at cash crops one finds that there is secular rise in cost of cultivation with rare exceptions. In case of Groundnut it can be seen that all the three important Groundnut growing states have experienced rise in cost of cultivation per quintal between 2003-04 and 2008-09. Gujarat appears to enjoy cost advantage over other two states, but the cost of cultivation has been rising in Gujarat too. Similar is the case with Sugarcane. In case of Cotton, Gujarat has been in the forefront in adopting Bt. Cotton, yet it may be seen that between 2003-04 and 2008-09, the cost of cultivation of a quintal of cotton has been rising secularly. Thus, with the data as available and given in Table 1, it can be said that even after allowing for output fluctuations over time and between states, the cost of cultivation appears to be increasing over time in almost each state, and for every crop.

The IARI's annual publication Agriculture Research Data Book 2012 has also given cost of cultivation data by crop for a single year 2007-08 by type of cost per unit of land i.e. per hectare. This data although for a year would substantiate the argument that cost of cultivation are high indeed for many crops. I have once again compiled the data for

selected crops that are marketed. Table 2 (i) and onward contain the details.

Food grain crops are retained for home consumption and also sold. Paddy, Wheat, Jowar, Bajra, and Maize are main cereals and Tur or Arhar is the main pulse crop in the country. With the data given in the tables 2 (i) to 2 (iv), one can comment on the cash or paid out component in the total cost. The data has one limitation. In case of each cost cash and non-cash components should have been made available. But by examining the source and the type of cost it should be possible to estimate the cash component.

The tables suggest that in the cost of cultivation surveys data for following components are collected.

Operational Costs

Set I
Seeds
Manure
Fertilisers (chemicals)
Insecticides and pesticides

Set II
Human Labour
Bullock Labour
Machine effort

Set III
Irrigation Charges
Set IV
Interest on Working Capital (should mean crop loans)
Miscellaneous

Fixed Costs

Set V

Rent on own land
Rent on leased land
Land Revenue and Tax
Interest on fixed Capital
Depreciation on buildings, machines and equipment

In low monetised agriculture, most of the operational cost items were non cash. Seeds and Manure came from own farm and animals. Bullock and human power were also supplied by farm and family. Irrigation from dug well did not have any money capital investment and operating costs. Insecticides were hardly used. Hence, the paid out cost component was very small. With the introduction of the Green Revolution technology, seed, fertiliser, insecticide, irrigation charges, machine labour, and human labour involve cash payments. Based on the data contained in the tables at the end on cost of cultivation per hectare of land, I present below the proportion of cash or paid cost component in the total operational cost.

The data show very interesting information. If we assume that all human and bullock labour was either family or home based and there was no cash paid for it, Wheat has average highest proportion of paid out or cash costs considering major wheat producing states. Paddy too has relatively higher proportion in most major paddy producing states (Table 3). Jowar and Tur (Arhar) have low proportions of paid out costs. However, as is known, some operations in Paddy, Wheat, Groundnut, Cotton and most operations in Sugarcane involve labour intensive work and labour has to be hired and paid. So if drop the assumption of non-cash labour, then the proportion of paid out or cash cost to total cost will increase. If a simple arithmetic average of all the proportions for the selected crops the average proportion of

paid out or cash component works out to 46 percent. If we add the cash cost portion of human labour by assuming that about 60 per cent of human labour has to be incurred by paying cash, the cash or paid out cost to total operational cost would be in the range of 70 to 80 per cent.

Undoubtedly, it is established that agriculture has become market dependent both for inputs and output. Inputs have to be purchased and since costs have to be paid in cash, unless the output is sold for cash, accounts are not settled. Here is where difficulties start for farmers. Marketised agriculture is an economic enterprise that requires special aptitude. Secondly, viability of the enterprise varies across size of holding, initial economic position of the entrepreneur, his/her ability to manage all inputs including labour, and mobilise credit. In order to incur the operational costs, farmers have to borrow either from formal lending institutions or from private money lenders. In all cases the interest is nearly 1-2 per cent per month. The output has to be sold in order to make the cost payments. Hardly any single farm enterprise has any control over market for output. Climate, rainfall and pests and insects are most unpredictable and uncertain variables over which the entrepreneur has very little control. Most farmers and especially small, marginal and middle size farmers do not possess the complete knowledge. Information asymmetry is very high. All these factors make the agriculture enterprise highly risky. Crop insurance schemes are weak, often not fool proof, and inadequate. If the irrigation fails or monsoon fails and the output is lost even by 10 to 20 percent, the value of output would turn out to be less than the cost incurred. This is the first debt trap.

The data in the tables 2 (i) to 2 (vi) show the debt traps. Let us review this by crops. In case of Paddy, the value of output in at least two states was either same or less than the total operational and fixed costs put together (see table 2 (i)). Tamil Nadu farmers could just realise Rs 37,320 per hectare in the Paddy production and incurred total cost of Rs. 37,183 per hectare. In Madhya Pradesh and West

Bengal farmers realised less revenue than the costs. Wheat is the only crop (see table 2(ii)) where the selected states data show that the revenue realised for crop output was more than the costs incurred. For two major Jowar producing states total cost is 70 per cent more than the revenue realised in case of Andhra Pradesh and 21 per cent more in case of Maharashtra. In case of Bajra, Gujarat farmers could just meet the cost and in case of Maharashtra, farmers realised 24 per cent less revenue over costs. In case of Maize crop, Andhra Pradesh could barely meet the cost with the revenue, Bihar farmers could earn about 20 per cent more, and Rajasthan farmers lost (see table 2 (iii)). In Tur (Arhar), all the three major states show good revenue earning over cost, with Gujarat showing substantial revenue surplus over costs. In case of Groundnut, Andhra Pradesh could just about meet the cost whereas Gujarat farmers appeared to have gained well. In two important crops Cotton and Sugarcane (see tables 2 (v) and 2 (vi)), cotton has been profitable in all three states Haryana, Andhra Pradesh and Gujarat, but in case of Sugarcane Andhra Pradesh and Maharashtra have not been able to recover cost but Uttar Pradesh and Tamil Nadu have gained.

The extension work by the state and the input sellers motivate and encourage farmers with partial truths, they hide information and sell inputs. Small and marginal farmers have in many cases and in many states shifted to cash crops completely. Further, with the introduction of Bt and Hybrid seeds small and marginal farmers tend to adopt mono cropping practice and grow non-food crops with the hope that they would get higher cash return with which they will be able to buy food. In case of partial or total crop failure the debt trap becomes imminent. They no longer ensure their own food security by sowing food crops necessary for their family survival. The Public Distribution System (PDS) has raised false hope of getting food grains at subsidised rates. But it involves cash payment. In case of crops failure, the farmers are not able to buy food grains even at PDS outlets, let alone repayment of crops loans or credit bill payments to the input sellers.

I am not stating anything new. All this is known to the farmers, policy makers, agricultural economists and of course AERC staffers. The point I wish to make is how serious are we in collecting data? There are state specific characteristics, there are farm size specific problems, and then are sociological variables of caste and ethnicity. How detailed are the survey instruments? I would suggest a serious revisit and review of it. How well the CoCS staff trained to capture the specific details if the survey instruments have it? And finally and more importantly as Vaidyanathan has pointed out, how detailed are the data analysis carried out? Let us remind ourselves that the CoCS data are not required only for fixing procurement prices, but also for examining the enterprise viability. I think that the Ministry of Agriculture, GoI has not attended this aspect adequately.

There is one more aspect which the CoCS is not paying attention to. With monetisation of the economy and exposure to market, farm families have been demanding consumer items in a big way. The city life style has entered the village households. For the goods and services the payment has to be in cash. In anticipation of increased income, the families tend to spend more than what they could afford. Market based cash expenditure appears to have increased. Hence, the farm families are in double debt trap. No wonder the farmer in the event of crop failure would be encumbered with heavy debt burden and would be in a non-retractable debt trap. Death is the only solution farmer sees and commits suicide. Behere and Behere have estimated the rate of suicidal death among farmers in Vidarbha region in Maharashtra to be anywhere between 8 and 43 persons per 100,000 population. We have shown in the cost of cultivation data tables for 2007-08 that Maharashtra is major producer of Jowar, Bajra and Sugarcane and in the all three cases the total cost per hectare has been more than the revenue realised by way of value of output. I feel that AERCs have special responsibility to collect more important consumption data for farm families. The NSSO rounds may be of some help, but while examining the farm costs, the consumption expenditure data should also be collected. In this context let us just

examine the wage rates that are implicit in the cost of cultivation data. Amount spent on human labour per hectare is given and also the total human hours spent per hectare data is collected and estimated. This gives a range of wage rate per hour. For all the states put together the wage rates per hour by crops were: Rs 12 per hour for Paddy, Wheat, Rs 10 for Jowar and Maize, Rs 9 for Bajra, Rs 8 for Tur, Rs 11 for Groundnut, and Rs 13 for Cotton and Sugarcane. If we collapse all the crops then the average rate for labour per hour will be Rs 11 at 2007-08 prices. Assuming an eight hour industry-service norm for a working day, the daily wage rate would be Rs 88! This is far below the minimum wage that is prescribed for agricultural labour. Incidentally, this will also be imputed cost for family and exchange labour. Even if there are two to three members in the family who have worked on farm for growing a crop, they don't get paid and if it is non-food cash crop, it does not help store the grain for consumption. Crop failure in such an instance becomes more risky and grave.

Market is not an angel. It is not always a level playing field. We should also be aware of new avatars in which it appears and tantalises us. Contract farming is one such feature of marketised agriculture. Somebody else is asking us to produce for market about which primary producers knows nothing. The buyer is a monopsonist. He or she determines what quality is. The terms offered appear very attractive but the fine print is never read. These aspects are not covered in the CoCS. If the State still assumes that it is concerned about the welfare of poor and disadvantaged sections, then collection of quantitative data alone with the survey method is not sufficient. The AERCs should be supported with a par of anthropologists, who should stay in villages for extended periods and find out the minute details about household production and consumption behaviour and investigate the factors for enterprise failures leading to suicides. I am not sure whether the AERC have become sensitised towards this issue. I suggest that studies should be mounted as part of the CoCS. This to my mind is a fresh agenda for the AERCs in the country.

I wish to make few more points with respect to research agenda of CoCS and other studies at the AERCs in the country. First, it appears that environmental and ecological problems are still not on the research agenda of the GoI's agriculture and hence the AERC in VV Nagar does not seem to have taken up studies relating to environment and ecology. It is not clear in the objectives whether the AERCs have some autonomy with respect to choice of research subjects and is there a feedback mechanism from centres to the apex level. Even if such autonomy is not available, it is desirable that ecology and environmental issues in agriculture are studied. Green Revolution Technology's backlash has begun. Use of chemical fertilisers, excessive irrigation, use of pesticides, weedicides, and tractor operated deep ploughing etc. may have yielded production and productivity gains in the short run, but it has caused the soil health to deteriorate. The CoCS should include green accounting to find out the environmental and ecological costs. Some more serious ecosystem studies should also be mounted.

Secondly, two more new approaches in agriculture are trying to find place. One is pushed by market and the other by concerned farmers. The market forces are trying hard with great influence to introduce genetically modified (GM) crops. The claims are tall. But in a country like India where the scientific community is not very rigorous and assertive, the long implications are not monitored and studied. With inadequate and company sponsored studies, the varieties are permitted to be grown. In such cases, the ARECs in the country should undertake longitudinal studies for observing the impact of GM crops cultivation on flora, fauna and human beings. This should be brought up on the AERC research agenda.

Concerned and nature friendly farmers are reverting back to organic farming. The seeds, manure and even pest and insect control and management is essentially nature based. What is the scope for improving the productivity in organic farming? Can it produce enough to meet the growing demand for food? Would it be economically

viable to do organic farming? These questions need to be addressed and hence they should be on the AERC research agenda. I think that special cost of cultivation and ecological studies should be mounted around organic farming.

Indian agriculture is facing serious challenges. Policy interventions are necessary, but they should be based on good information system and data base. AERCs have the potential to collect and analyse data and create an efficient environment for sound policy formulation. I thank the AERC to have given me this opportunity to share my views.

Table 1: Cost of Production for Important Crops by States 1997-98 to 2008-09

(Cost Rupees per quintal)

Crops/States	1997-98	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
Paddy							
Andhra Pradesh	437	489	504	541	557	638	790
Bihar	N.A.	468	551	497	519	435	581
Haryana	477	693	705	618	609	677	1,021
Madhya Pradesh	444	533	784	690	695	783	745
Punjab	356	443	449	487	477	506	670
Uttar Pradesh	338	440	571	559	615	601	733
Wheat							
Haryana	392	507	523	577	589	673	717
Himachal Pradesh	N.A.	818	679	720	779	867	1,217
Madhya Pradesh	475	568	584	721	730	779	810
Punjab	412	504	494	556	617	648	804
Rajasthan	393	499	480	528	568	650	683
Uttar Pradesh	N.A.	483	598	654	636	651	770
Jowar							
Andhra Pradesh	744	997	713	747	898	1,166	1,102
Madhya Pradesh	556	729	674	757	724	672	1,123
Karnataka	N.A.	1,212	684	770	706	956	1,007
Bajra							
Haryana	399	570	675	782	N.A.	679	770
Uttar Pradesh	288	454	457	593	N.A.	538	976
Maize							
Himachal Pradesh	468	488	511	736	561	670	796
Madhya Pradesh	470	642	727	744	1,170	885	976
Gram							
Haryana	740	1,598	1,285	N.A.	1,597	3,479	1,968
Madhya Pradesh	881	991	1,005	1,401	1,591	1,613	1,552
Rajasthan	728	1,338	1,094	1,488	1,248	1,818	1,692
Urad							
Andhra Pradesh	1,370	1,268	1,277	1,386	1,426	1,554	1,915
Madhya Pradesh	1,068	2,242	1,603	3,106	2,139	1,940	1,834
Arhar							
Madhya Pradesh	1,221	1,384	1,203	1,392	1,588	1,569	1,874
Groundnut							
Andhra Pradesh	1,384	1,680	1,563	1,989	2,089	2,063	2,555
Gujarat	933	946	1,533	1,286	1,689	1,566	1,919
Karnataka	N.A.	2,579	1,899	1,714	2,413	1,673	3,484
Cotton							
Gujarat	1,377	1,567	1,501	1,595	1,709	1,717	2,179
Haryana	2,130	2,008	1,479	2,166	1,924	1,876	2,127
Madhya Pradesh	1,621	2,581	2,546	1,959	2,302	2,025	1,708
Karnataka	N.A.	1,911	1,519	2,071	1,867	1,575	2,233
Maharashtra	N.A.	2,152	2,113	2,137	2,052	2,010	2,539
Punjab	2,845	2,140	1,601	1,606	1,630	1,826	2,004
Sugarcane							
Andhra Pradesh	N.A.	65	79	96	89	106	120
Haryana	56	73	70	90	92	97	92
Karnataka	N.A.	66	65	74	64	48	86
Maharashtra	44	78	75	95	80	76	106
Tamil Nadu	N.A.	64	69	77	78	73	86
Uttar Pradesh	43	56	65	69	68	73	94

Notes: Rounded to nearest Rupee. N.A. Not Available

Source: Compiled from Table 5.17 as in Agricultural Research Data Book, 2012, Director, Indian Agricultural Research Institute, Pusa, New Delhi. http://www.iasri.res.in/agridata/12data/

Table 2 (i): Cost of Cultivation of Paddy

(Cost in Rupees per Hectare)

Item	Paddy					
	2007-08					
	A.P.	T. Nadu	U.P	Punjab	M.P.	W.B.
I. Operational Cost	**23,032**	**25,965**	**15,087**	**16,014**	**9,491**	**19,460**
Human Labour	12,476	12,015	6,889	5,472	4,298	11,692
Bullock Labour	775	498	1,459	90	1,635	2,140
Machine Labour	3,036	4,801	1,467	3,631	805	800
Seed	775	2,516	1,496	726	911	751
Manure	531	758	306	180	586	629
Fertiliser (Chem)	2,977	3,083	1693	2,338	685	1,667
Insecticides	1,055	437	85	1,486	98	302
Irrigation Charges	565	1,182	1,357	1,636	271	1,068
Interest on Working Capital	596	672	332	424	202	410
Miscellaneous	59	3	1	48	-	41
Proportion of operational cost less human and bullock Labour	**43 %**	**52 %**	**45 %**	**65 %**	**38 %**	**29 %**
II. Fixed Cost	**14,412**	**11,218**	**7,214**	**18,767**	**4,159**	**8,682**
Rent own land	13,347	8,164	5,553	13,681	3,036	7,031
Rent Leased land	41	507	20	2,737	-	160
Land Revenue &Tax	2	103	5	-	4	34
Depreciation on Implements and buildings etc.	210	556	353	200	386	390
Interest on Fixed Capital	811	1,871	1,284	2,149	733	1,067
Total I + II	**37,444**	**37,183**	**22,301**	**34,781**	**13,651**	**28,142**
III (A) Yield and Value						
Yield in quintals	55.11	49.36	35.00	68.01	15.36	36.70
Value main product Rs/Ha.	**41,995 (762)**	**37,320 (756)**	**26,110 (746)**	**56,037 (824)**	**10,576 (688)**	**24,978 (680)**
Value By Product Rs/Ha.	2,637	2,951	1,577	616	1,388	3,677
III (B) Material and Labour Input per Ha.						
Seed (kg)	76	-	-	-	85	70
Fertilizers (Kg of Nutrients)	231	238	130	189	54	113
Manure (Q.)	19	30	12	25	11	20
Human Labour (Hours)	864	841	827	403	549	1,227
Animal Effort (Pair Hours)	24	19	28	2	78	112

Notes: Rounded to nearest Rupee. N.A. Not Available. Figures in bracket in section III (A) indicate price in Rs per quintal.
Source: Compiled from Table 5.18 as in Agricultural Research Data Book, 2012, Director, Indian Agricultural Research Institute, Pusa, New Delhi. http://www.iasri.res.in/agridata/12data/

Table 2 (ii): Cost of Cultivation of Wheat

(Cost in Rupees per Hectare)

Item	Wheat				
	2008-09				
	Punjab	Rajasthan	M.P.	U.P.	Bihar
I. Operational Cost	**15,564**	**18,018**	**11,720**	**16,660**	**13,709**
Human Labour	4,035	6,312	3,241	4,893	4,231
Bullock Labour	78	351	738	504	714
Machine Labour	5,272	3,305	2,290	3,855	2,920
Seed	1,371	2,061	1,577	1,829	1,635
Manure	30	437	3	8	4
Fertiliser (Chem)	2,894	1,670	1428	2,128	1,927
Insecticides	1,038	110	4	28	-
Irrigation Charges	297	3,382	2,143	2,945	1,926
Interest on Working Capital	425	391	297	410	354
Miscellaneous	124	-	-	-	-
Proportion of operational cost less human and bullock Labour	**74 %**	**63 %**	**66 %**	**68 %**	**64 %**
II. Fixed Cost	**19,859**	**11,858**	**9,730**	**8,929**	**6,080**
Rent own land	13,961	7,680	7,868	6,712	4,968
Rent Leased land	2,022	768	-	274	-
Land Revenue &Tax	-	10	5	5	38
Depreciation on Implements and buildings, etc.	359	323	432	449	223
Interest on Fixed Capital	3,517	3,078	1,424	1,488	851
Total I + II	**35,423**	**29,876**	**21,450**	**25,529**	**19,789**
III (A) Yield and Value					
Yield in quintals	39.83	37.19	23.86	33.29	25.59
Value main product Rs/Ha.	**43,649 (1,096)**	**40,949 (1,101)**	**27,344 (1,146)**	**33,278 (999)**	**23,693 (926)**
Value By Product Rs/Ha.	4,478	7,155	4,127	5,919	3,399
III (B) Material and Labour Input per Ha.					
Seed (kg)	105	156	116	144	115
Fertilizers (Kg of Nutrients)	234	124	108	159	128
Manure (Q.)	3	12	0.04	0.28	0.14
Human Labour (Hours)	185	475	342	511	437
Animal Effort (Pair Hours)	1.31	12.36	28.57	14.70	32.22

Notes: Rounded to nearest Rupee. N.A. Not Available. Figures in bracket in section III (A) indicate price in Rs per quintal.
Source: Compiled from Table 5.18 as in Agricultural Research Data Book, 2012, Director, Indian Agricultural Research Institute, Pusa, New Delhi. http://www.iasri.res.in/agridata/12data/

Table 2 (iii): Cost of Cultivation of Jowar, Bajra, Maize

(Cost in Rupees per Hectare)

Item	Jowar		Bajra		Maize		
	2007-08		2007-08		2007-08		
	A.P.	Maharashtra	Gujarat	Maharashtra	A.P.	Bihar	Rajasthan
I. Operational Cost	**10,390**	**13,129**	**12,001**	**12,390**	**17,508**	**12,486**	**12,966**
Human Labour	5,650	4,979	5,224	4,630	8,176	4,524	6,409
Bullock Labour	1,823	4,586	647	2,877	1,978	435	1,908
Machine Labour	518	1,110	2,432	2,339	1,746	1,582	1,276
Seed	365	449	715	662	1,677	1,318	717
Manure	20	353	502	286	838	2,149	1,243
Fertiliser (Chem)	1,491	996	1,239	907	2,379	233	897
Insecticides	195	3	11	-	138	1,916	2
Irrigation Charges	55	320	949	386	137	2,159	297
Interest on Working Capital	253	332	280	302	433	318	217
Miscellaneous	21	-	-	-	6	-	-
Proportion of operational cost less human and bullock Labour	**28 %**	**28 %**	**51 %**	**39 %**	**42 %**	**60 %**	**36 %**
II.Fixed Cost	**4,418**	**5,139**	**3,593**	**4,647**	**9,220**	**6,101**	**4,763**
Rent own land Rent Leased land Land Revenue &Tax	3,065	3,482	2,686	2,748	8,237	4,844	2,898
Depreciation on Implements and buildings etc.	333	363	65	343	256	364	315
Interest on Fixed Capital	1,016	1,258	335	1,544	720	863	1,493
Total I + II	**14,808**	**18,268**	**15,593**	**17,036**	**26,728**	**18,567**	**17,729**
III (A) Yield and Value							
Yield in quintals	10.55	17.32	19.47	19.14	41.50	37.92	21.07
Value main product Rs/Ha.	**8,500 (806)**	**14,837 (857)**	**15,164 (779)**	**13,736 (718)**	**26,095 (629)**	**22,225 (586)**	**14,396 (683)**
Value By Product Rs/Ha.	1,718	6,085	4,417	2,746	1,371	3,208	3,318
III (B) Material and Labour Input per Ha.							
Seed (kg)	10.16	10.23	6.87	4.34	23.26	20.54	30.86
Fertilizers (Kg of Nutrients)	90.48	71.90	94.49	73.38	191.51	132.35	66.67
Manure (Q.)	0.65	4.82	17.54	4.17	22.49	10.26	25.74
Human Labour (Hours)	461	576	655	485	638	686	675
Animal Effort (Pair Hours)	61	86	22	44	73	21	76

Notes: Rounded to nearest Rupee. N.A. Not Available. Figures in bracket in section III (A) indicate price in Rs per quintal.
Source: Compiled from Table 5.18 as in Agricultural Research Data Book, 2012, Director, Indian Agricultural Research Institute, Pusa, New Delhi. http://www.iasri.res.in/agridata/12data/.

Table 2 (iv): Cost of Cultivation of Tur (Arhar) and Groundnut

(Cost in Rupees per Hectare)

Item	Tur (Arhar)			Groundnut	
	2007-08			2007-08	
	U.P	Karnataka	Gujarat	A.P.	Gujarat
I. Operational Cost	**7,887**	**8,612**	**9,193**	**17,764**	**16,873**
Human Labour	4,432	3,352	3,974	8,610	4,900
Bullock Labour	1,136	3,975	2,225	1,563	2,354
Machine Labour	1,371	1,568	869	926	1,864
Seed	550	316	351	4,045	4,926
Manure	9	533	251	575	642
Fertiliser (Chem)	30	781	917	971	1,074
Insecticides	-	1,190	270	286	480
Irrigation Charges	213	-	111	351	197
Interest on Working Capital	145	220	224	436	436
Miscellaneous	-	-	-	-	-
Proportion of operational cost less human and bullock Labour	**29 %**	**15 %**	**33 %**	**43 %**	**57 %**
II.Fixed Cost	**10,280**	**4,395**	**6,123**	**10,763**	**6,691**
Rent own land	6,783	3,522	5,191	8,907	6,060
Rent Leased land	-	-	23	88	48
Land Revenue &Tax	31	9	38	3	11
Depreciation on Implements and buildings, etc.	649	295	186	415	98
Interest on Fixed Capital	2,817	569	684	1,350	474
Total I + II	**18,167**	**13,006**	**15,315**	**28,527**	**23,564**
III (A) Yield and Value					
Yield in quintals	8.95	7.26	12.61	13.12	13.05
Value main product Rs/Ha.	**23,339 (2,607)**	**15,761 (2,171)**	**29,162 (2,312)**	**28,644 (2,183)**	**32,020 (2,453)**
Value By Product Rs/Ha.	2,531	891	2,065	1,504	4,922
III (B) Material and Labour Input per Ha.					
Seed (kg)	16.60	11.83	11.34	104.04	114.62
Fertilizers (Kg of Nutrients)	2.36	50.86	65.22	63.13	73.60
Manure (Q.)	0.31	12.02	11.03	21.37	26.02
Human Labour (Hours)	581	442	717	689	504
Animal Effort (Pair Hours)	28	66	72	58	58

Notes: Rounded to nearest Rupee. N.A. Not Available. Figures in bracket in section III (A) indicate price in Rs per quintal.
Source: Compiled from Table 5.18 as in Agricultural Research Data Book, 2012, Director, Indian Agricultural Research Institute, Pusa, New Delhi. http://www.iasri.res.in/agridata/12data/

Table 2 (v): Cost of Cultivation of Cotton

(Cost in Rupees per Hectare)

Item	Cotton		
	2007-08		
	Haryana	A.P.	Gujarat
I. Operational Cost	**22,228**	**24,265**	**20,352**
Human Labour	11,911	10,414	8,615
Bullock Labour	1,288	2,374	1,447
Machine Labour	1,902	1,736	1,965
Seed	1,935	2,314	1,883
Manure	-	1,785	1,038
Fertiliser (Chem)	1,365	2,658	2,025
Insecticides	1,445	2,294	1,505
Irrigation Charges	1,958	15	1,369
Interest on Working Capital	425	672	504
Miscellaneous	-	2	-
Proportion of operational cost less human and bullock Labour	**41 %**	**47 %**	**52 %**
II.Fixed Cost	**12,649**	**15,755**	**8,756**
Rent own land	10,799	12,298	7,066
Rent Leased land	105	2,329	135
Land Revenue &Tax	-	6	19
Depreciation on Implements and buildings, etc.	259	257	203
Interest on Fixed Capital	1,485	865	1,332
Total I + II	**34,877**	**40,019**	**29,107**
III (A) Yield and Value			
Yield in quintals	18.09	23.55	16.68
Value main product Rs/Ha.	**40,987 (2,265)**	**51,902 (2,203)**	**42,764 (2,564)**
Value By Product Rs/Ha.	1.138	86	682
III (B) Material and Labour Input per Ha.			
Seed (kg)	3.91	1.76	3.02
Fertilizers (Kg of Nutrients)	108	191	150
Manure (Q.)	-	35	37
Human Labour (Hours)	802	656	991
Animal Effort (Pair Hours)	38	63	43

Notes: Rounded to nearest Rupee. N.A. Not Available. Figures in bracket in section III (A) indicate price in Rs per quintal.
Source: Compiled from Table 5.18 as in Agricultural Research Data Book, 2012, Director, Indian Agricultural Research Institute, Pusa, New Delhi. http://www.iasri.res.in/agridata/12data/.

Table 2 (vi): Cost of Cultivation of Sugarcane

(Cost in Rupees per Hectare)

Item	Sugarcane			
	2007-08			
	A.P.	Uttar Pradesh	Maharashtra	Tamil Nadu
I. Operational Cost	**56,120**	**22,729**	**54,729**	**61,527**
Human Labour	42,131	12,128	19,995	41,761
Bullock Labour	657	638	3,571	162
Machine Labour	537	868	7,712	1,496
Seed	2,337	3,135	4,637	4,087
Manure	440	400	947	949
Fertiliser (Chem)	3,560	2265	7,323	6,063
Insecticides	957	218	102	212
Irrigation Charges	2,730	2,109	7,580	3,610
Interest on Working Capital	2,732	967	2,861	3,176
Miscellaneous	37	-	-	12
Proportion of operational cost less human and bullock Labour	**24 %**	**44 %**	**56 %**	**32 %**
II. Fixed Cost	**27,085**	**18,115**	**18,328**	**21,555**
Rent own land	23,456	15,250	11,934	16,078
Rent Leased land	854	-	-	-
Land Revenue &Tax	4	24	207	216
Depreciation on Implements and buildings, etc.	401	524	792	512
Interest on Fixed Capital	2,370	2,318	5,394	4,728
Total I + II	**83,205**	**40,844**	**73,057**	**83,082**
III (A) Yield and Value				
Yield in quintals	782.5	523.37	875.36	1,109.07
Value main product Rs/Ha.	**79,782 (102)**	**55,404 (106)**	**65,513 (75)**	**117,886 (106)**
Value By Product Rs/Ha.	226	3,463	6,078	2,295
III (B) Material and Labour Input per Ha.				
Seed (kg)	20.59	25.87	35.28	33.33
Fertilizers (Kg of Nutrients)	290	182	546	486
Manure (Q.)	19	19	15	52
Human Labour (Hours)	2,588	1,363	2,011	2,632
Animal Effort (Pair Hours)	29	24	76	8

Notes: Rounded to nearest Rupee. N.A. Not Available. Figures in bracket in section III (A) indicate price in Rs per quintal.
Source: Compiled from Table 5.18 as in Agricultural Research Data Book, 2012, Director, Indian Agricultural Research Institute, Pusa, New Delhi. http://www.iasri.res.in/agridata/12data/

Table 3
Proportion of Operational Cost less Human and Bullock Labour

(in per cent)

States	Proportion of operational cost less human and bullock Labour: Major Crops								
	Paddy	Wheat	Jowar	Bajra	Maize	Tur	Groundnut	Cotton	Sugarcane
Andhra Pradesh	43	-	28	-	42	-	43	47	24
Tamil Nadu	52	-	-	-	-	-	-	-	32
Uttar Pradesh	45	68	-	-	-	29	-	-	44
Punjab	65	74	-	-	-	-	-	-	-
Madhya Pradesh	38	66	-	-	-	-	-	-	-
West Bengal	29	-	-	-	-	-	-	-	-
Rajasthan	-	63	-	-	36	-	-	-	-
Bihar	-	64	-	-	60	-	-	-	-
Maharashtra	-	-	28	39	-	-	-	-	56
Gujarat	-	-	-	51	-	33	57	52	-
Karnataka	-	-	-	-	-	15	-	-	-
Haryana	-	-	-	-	-	-	-	41	-

Source: Compiled from Tables 2 (i) to 2 (vi)

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