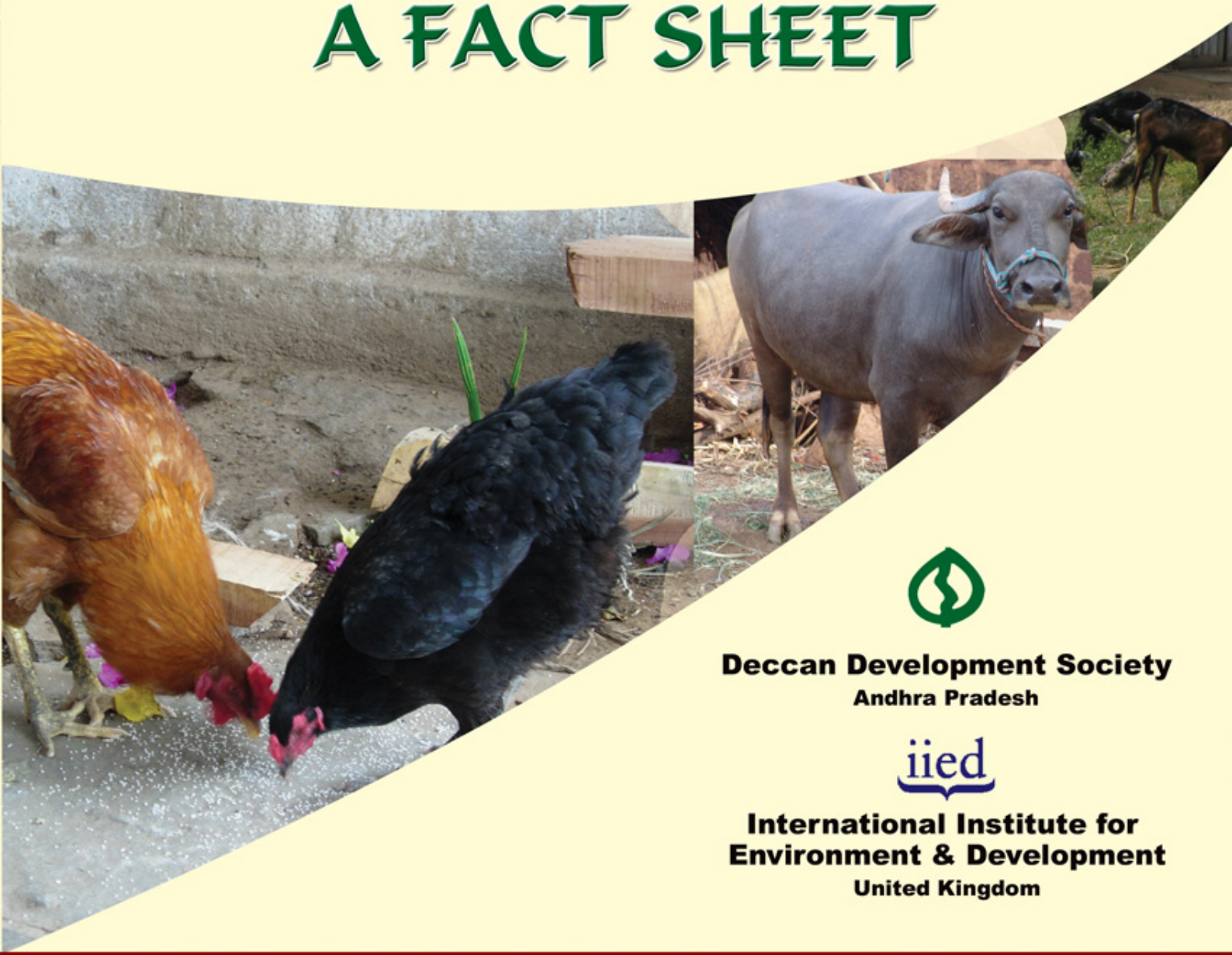
DDS - IIED
Democratising Agriculture Series: 1

# TAKING "LIVE" STOCK
# The Current Thrust of Livestock Related Research in India

## A FACT SHEET

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**June 2009**

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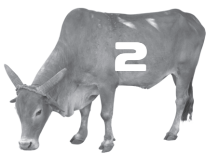

# LIST OF ACRONYMS

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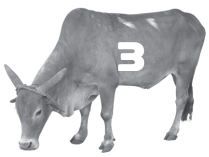
| **APEDA** | AGRICULTURAL AND PROCESSED FOOD PRODUCTS EXPORT DEVELOPMENT AUTHORITY (APEDA) |
| **BARC** | BHABHA ATOMIC RESEARCH CENTRE |
| **CCRH** | CENTRAL COUNCIL FOR RESEARCH IN HOMEOPATHY |
| **DAC** | DEPARTMENT OF AGRICULTURE AND COOPERATION |
| **DBT** | DEPARTMENT OF BIOTECHNOLOGY |
| **DRDE** | DEFENCE RESEARCH DEVELOPMENT ESTABLISHMENT |
| **DST** | DEPARTMENT OF SCIENCE AND TECHNOLOGY |
| **FAO** | FOOD AND AGRICULTURE ORGANISATION |
| **GOI** | GOVERNMENT OF INDIA |
| **ICAR** | INDIAN COUNCIL OF AGRICULTURAL RESEARCH |
| **IAEA** | INTERNATIONAL ATOMIC ENERGY AGENCY |
| **KAU** | KERALA AGRICULTURAL UNIVERSITY |
| **MoEF** | MINISTRY OF ENVIRONMENT AND FORESTS |
| **NAIP** | NATIONAL AGRICULTURE INNOVATION PROJECT |
| **NATP** | NATIONAL AGRICULTURAL TECHNOLOGY PROJECT |
| **NGO** | NON GOVERNMENTAL ORGANIZATION |
| **NPRE** | NATIONAL PROJECT FOR RINDERPEST ERADICATION |
| **NBAGR** | NATIONAL BUREAU OF ANIMAL GENETIC RESOURCES |
| **NDRI** | NATIONAL DAIRY RESEARCH INSTITUTE |
| **PAU** | PUNJAB AGRICULTURAL UNIVERSITY |
| **RTI** | RIGHT TO INFORMATION |



# About this Fact Sheet

In its millennial history, Indian agriculture has made livestock an indivisible part of its farming systems. In recognition of the critical and central role that livestock play in the farms and homes of the Indian farmer, they have been given the status of Mother and God in the Indian cultural milieu.

It is during the post green revolution that the status and importance of cattle in farming households started diminishing. As the lifeless machines usurped the life-giving cattle, Indian farming was enslaved by chemical agriculture. All the indigenous breeds which had shown an amazing capacity to adapt themselves to a wide variety of ecosystems and harsh climatic conditions were slowly marginalized by the "modern" agricultural research extension systems.

***Everybody Loves a Good Drought*** by the celebrated writer-journalist Mr. P Sainath is an iconic book on Development. It takes an extraordinarily fresh look at the theory and practice of development in India. Its opening chapter is a scathing indictment of the livestock policy adapted by a leading NGO in Orissa which literally enervates the indigenous, hardy, eco-suited Oriya breed by forcing artificial insemination, an act meant to benefit an industrial house dealing with artificial insemination. The NGO, incidentally, was set up by the very same industrial house. This diabolical interconnection between industry, NGOs and the governmental development departments makes a fascinating, albeit tragic reading in ***Everybody Loves a Good Drought***.

While Mr Sainath uses a farcical development experience to highlight his vision of a people-led, people-centred development, the live "stock" taking by Kanchi Kohli is a pointer to the current research agenda pursued by a large number of livestock related institutions of the Indian Council of Agicultural Research [ICAR] as well as several Indian agricultural universities. As we grapple with this livestock agenda of the Indian research institutions, we cannot but see how the Animal Science division of the Indian Council for Agricultural Research (ICAR) has clearly and totally embraced the mandate, mission and thrust of the agricultural-related research encapsulated in the statement of ICAR— that it is working towards the "Development of technologies to support production enhancement, profitability, competitiveness and sustainability of livestock and poultry sector, food and nutritional security."

The key words emphasised above are a mirror image of the crop-related research. The jury is still out on the impact of this chemical fertiliser-pesticide based farming research which stands incriminated for soil fatigue, environmental damage and climate change related problems that have driven Indian agriculture to an unprecedented crisis. It is a matter of concern that the livestock research has also worn this straitjacket, even though it is dealing with living animals and not with "lifeless" crops.

To achieve this aim several collaborations have been set up at the national and international level with premier institutions in areas of biotechnology, molecular biology and so on (See: http://www.icar.org.in/ansci.htm). Thus animals are not seen as life forms by this research but as "productive assets" and therefore one could engage in transgenic technology without bothering about moral or ethical concerns (See details in subsequent chapters).

It is quite informative that many of these research partnerships are funded by the USAID and the World Bank who have a clear agenda of "encouraging" a high resource input based livestock development. This is completely in tune with their general policy of spreading a Gene Revolution [formerly Green Revolution] model of agriculture that promotes input industry-centred development rather than a farmer-centred development. Already we are privy to the tragic results of such a development model. Any analysis of the extraordinary agrarian crisis and lakhs of farmer suicides this country is witnessing points its finger to the Green Revolution model. Interestingly, those farmers who have retained some control over their livestock and are able to earn a living through

them have been able to buck this suicide trend. Will the new research partnerships and the agendas on the design boards of such partnerships push even these independent farmers into new debt traps by subjecting them to another model of livestock development?

This is the question that concerns ADARSA which is engaged with the issue of democratization of agricultural research. Therefore it is critical for us to analyse whether the new paradigm of livestock research will disempower pastoralists, small farmers, adivasis, women and dalits who have kept alive the grand tradition of livestock keeping as a part of their small-scale agricultural practices.

Apart from the issue of the small scale and marginal farmers, pastoralists form one of the largest populations in this country, especially in some of the most ecologically harsh parts of the country. Their livestock options have been grounded on the capacity of their animals to adapt to these difficult ecosystems. Will the worldview of the pastoralists which is based on their cosmology, their ecological relationship with their environments, and their commitment to promote multi level diversities endure in the context of corporate greed?

If this disquiet is not addressed by the agricultural policy makers, research designers and research scientists, this will surely lead to Sainath's nightmarish prediction of a people-proofed development model. We hope that this small fact sheet is used by all development actors in this country to take a passionate look at these issues and raise their collective voice against this unabashed erosion off people's control over their livestock in this Gomatha country. A failure to do this now will lead to a civilisational tragedy.

Ms Kanchi Kohli, who has put together this Fact Sheet, through a painstaking RTI process, deserves my grateful thanks. Dr Sagari Ramdas of ANTHRA, a rare people-centered organization working on livestock issues has written a brilliant note, analyzing the research trends. We are extremely grateful to her for bringing these insights.

p v satheesh
Coordinator
Alliance for Democratising Agricultural Research
November 2009

# An Overview Note

**Dr. Sagari R Ramdas**
**Anthra**

## I. The ICAR and Livestock Related Research

Research on Animal Science and Veterinary Science, exists as a component of the larger Agriculture Research carried out in India. Much of the public sector livestock related research in India is through the coordination of the Animal Science Division of Indian Council of Agricultural Research (ICAR). ICAR articulates the vision for animal science research as being the "*Development of technologies to support production enhancement, profitability, competitiveness and sustainability of livestock and poultry sector food and nutritional security.*"To achieve this collaborations at national and international level with premier institutions are in order in areas of biotechnology, molecular biology and so on (See: http://www.icar.org.in/ansci.htm).

The ICAR oversees and coordinates and monitors research activities in its 19 Research Institutes and their Regional Centers. The Division has under it 3 national research institutes out of which 2 are deemed universities, 4 Central Research Institutes, 1 National Bureau, 4 Project Directorates and 6 National Research Centers and a National Centre for Agricultural Economics and Policy Research . These centres undertake overall research on animal genetics or specialise on kind of animal like Buffallo, Camel, Mithun, Goat, Pig, Equine and so on. (See: http://www.icar.org.in/ansci.htm). More details of the kind of research that is being carried out is broadly available on the websites of each of these centres or institutions.

## II. The World Bank Link and its Determinants

Public Sector Agriculture/ Animal Science Research post economic reforms in India, has clearly altered course, and the direction it should and will be financed is unambiguously articulated in Government documents[1] as also in World Bank Country and Sector reports[2] that have provided critical financing to the public sector, providing the necessary start up ammunition to push the public sector research on agriculture in a new direction that we detail below. It is crucial to understand this as it forms the basis and provides the blueprint of all research that has emerged from and will continue to be carried out within Public Sector Agricultral Research Institutions in India during this past decade of neo-liberal reforms. Research has flown from and has been dictated by this framework,

The World Bank Agriculture Sector report[3] describes how from independence till the end of the Seventh Plan (1985-89), agriculture related R&D was largely driven by what is defined as "resource and input based growth", firmly linked to the support received both nationally and internationally for furthering the objectives of the "green revolution".

Post reforms the World Bank[4] argues that the challenges for the National Agricultural research system, led by the ICAR are three fold: coming to grips with the growing importance of the market and agri-business; addressing the problems of the poor farm families living in disadvantaged areas'; and strengthening its position at the frontiers of agriculture science

The challenge is presented to be the need to strengthen the role of agriculture research for rural poverty alleviation, income growth and enhanced quality of life in a market context, with changes required in the approach to research and technology transfer. Therefore the priority area for financing is to enhance agricultural productivity, competitiveness, and rural growth.

- ***National Agricultural Technology Project (NATP): T***o further the reforms in the agricultural sector, in 1998 the World Bank extended a loan of Rs 992 crores to the Government of India[5] which was executed by the National Agricultural Research System (NARS), through which 852 projects were financed. The project ended in 2005. The National Agricultural Technology Project (NATP)pursued technology led poor-growth, and facilitated public sector reform for accelerating the flow of agricultural technologies. [6] The ICAR website states that the recently concluded that the NATP was aimed to implement the **shared understanding** of the Government of India and the World Bank on technology-led-pro-poor growth, and it facilitated the public sector reform process for accelerating the flow of agricultural technologies. A key lesson from the NATP was that deliberate investments in partnership building and shared governance are required to speed up technology adaptation and dissemination. [ For More on NATP, see also Farmer Proofing Agricultural Research, DDS-IIED Fact Sheet I]

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1 http://www.icar.org.in

2 World Bank, 2005. India: Re-energizing the Agricultural Sector to Sustain Growth and Reduce Poverty, OUP. New Delhi

3 ibid 1

4 World Bank, 2006.Project Appraisal Document, National Agricultural Innovation Project, March 9th 2006. Republic of India.

5 NATP website. /www.icar.org.in/natp/Intro.htm. NATP was the world's biggest World Bank assisted agriculture project worth Rs. 992 crores developed and executed by NARS.

6 Also See Deccan Development Society. 2008. Farmer Proofing Agricultural Research: A Fact Sheet. DDS-IIED Democratising Agriculture Series-1. Deccan Development Society, Hyderabad for more details on the NATP project implementation on crop related research.

- ***National Agricultural Innovation Project (NAIP):*** The NATP paved the way for a second loan from the World Bank to the ICAR to finance the National Agricultural Innovation Project (NAIP), in July 2006, to the tune of USD USD 200million with a country contribution of USD 50 million, for a period of six years till 2012.[7] The NAIP project clearly articulates that the purpose of this large support to the Indian Public Agriculture Sector is " To contribute to the sustainable transformation of Indian Agricultural Sector from primarily a food self-sufficiency to more a market orientation in support of poverty alleviation and income generation . The specific objective is to accelerate the collaborative development and application of agricultural innovations between public reerach organizations, farmers, private sector and other stake-holders." (http://www.naip.icar.org.in/) ,[8]

This new research paradigm argues that innovations are required in agriculture which will emerge out of a creative collaboration between the public sector research institutions, the private sector, farmers and civil society, in response to new challenges and "opportunities" created by the transformation of Indian Agriculture. The paradigm is anchored firmly in the neo-liberal market-mode of research, where public- sector research has to become "demand driven" and will market "knowledge products" or "commodities of research", which end-users can benefit from, again from the aegis of the market- through purchase.

Of significance to the Animal Science sector are the following priority areas of research as officially articulated:

**i) Livestock and Fisheries Production:** Focused attention to genetic upgradation, nutrition, management, disease surveillance and control, production of feeds, diagnostic kits and vaccines, post-harvest handling and processing and marketing of livestock and aquaculture produce, by-produce and wastes will be certainly rewarding. Work on monitoring and control of trans-boundary livestock diseases has important implications for human health, international trade and compliance with importing country requirements.

**ii) Genetic Resources and Bio-prospecting:** Sustained growth in agricultural productivity with a dependence on continued improvements in germplasm (plants, animals including fish and microbes) and improved nutritional value of staple foods, besides crop and livestock disease and pest control. For this the traits will require improved yield potential, increasing yield stability through resistance to biotic and abiotic stresses, and enhancing adaptation to high stress conditions like drought, water logging and salinity. Identification of resistance genes in wild relatives, molecular marker mapping and marker-assisted transfer to the elite germplasm to be pursued. Bio-prospecting will have to lay the foundation for effective mining and targeted the transfer of genes for specific traits. The vast microbial gene pool to be explored and utilized for crop and animal improvement. These efforts which are capital-and knowledge-intensive, will warrant strong public-public and public-private partnerships. Interactions between research institutes and the industry will need to be strengthened for realizing the full potential of frontier science***s***.

The indicators of success of the research reflect the above paradigm shift. Success of the transformation of the public agriculture research system will be measured by the increased numbers of public-private partnerships, agricultural innovations, existence of functioning business development units, joint development of technologies and patent applications.

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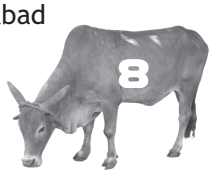
7 Also See Deccan Development Society. 2008. Farmer Proofing Agricultural Research: A Fact Sheet. DDS-IIED Democratising Agriculture Series-1. Deccan Development Society, Hyderabad for more details on the NAIP project implementation on crop related research.

4 NAIP website



**NAIP takes the market orientation agenda of public research further by allowing for "better" integration of income and poverty alleviation in a market context! While NATP was located in the public sector, the NAIP emphasizes and harness energies between the public and private sectors, farmers and farmers organizations and civil society. . It focuses on combining technology generation and uptake pathways.** The NAIP project funds four broad components:

a) The first one is an overarching one to make ***ICAR a catalyzing agent for managing the change in the Indian NARS*** for which there is a funding for USD 46 million. Funding herein is to create an enabling policy and institutional environment in business development, technological advancement and so on.

b) Second is the one related to ***Research on production and consumption systems*** with a USD 75 million funding from the World Bank.

The specific objective of this component is to establish market-oriented collaborative research alliances for sustainable improvement of selected agricultural production to consumption systems. About 15 consortiums will be supported which will be key to capturing "integration and economies of scale". Key words here are " potential for growth, value addition, competitive advantage, export potential, backward and forward linkages". These chains are supposed to sustain food security, augment incomes and generate new employment. Suggested chains for funding within this are also described. Here we mention those relevant to the Animal / Veterinary Science sector and include:

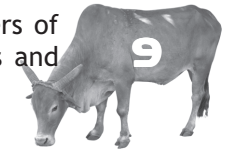
- ★ *Agro-processing:* Dairy products
- ★ *Income augmentation and employment generations:* Milk and Milk products in rainfed areas, Peri urban dairy, poultry in southern and eastern India, Small ruminant in Arid and SAT
- ★ *Export Promotion:* Aromatic and Medicinal Plants
- ★ *Resource Use Efficiency (Innovative Environmentally friendly PCS's):*Organic Farming, Bio-pesticides, Bio-fuel

Critical expected outcomes for this component include, "Increased interaction between public and private sector for agricultural innovation purposes" as well as "Increased interaction between public and private sectors for agricultural innovation" . These will be measured by indicators in number of processing technologies released and adopted; new rural industries established and finally the number of private sector organizations participating in research consortia

c) The third component focuses on ***Research on sustainable Rural Livelihood Security*** also funded at USD 75 million has the core objective of this component is the sustained improvement of incomes and well being of farm families in mainly rain-fed, hill and mountain, dryland, tribal dominated and coastal areas, which have thus far been left out of development. This again is to be achieved by private and public sector collaborations through research consortias- focused on enhancing productivity, profitability and sustainability. Key words here again are bringing together farmers with agricultural service providers in research and extension, private sector companies involved in input provision, processing and marketing. About 20 consortia's will be funded through this. Some 150 districts were selected by the Planning Commission to qualify for this funding and were priortiised based on an index called Livelihood index.

The problem with this is that the index itself, pushes the research in a direction of "increasing productivity which is narrowly defined" . To illustrate, they have for instance used something called a agriculture status index which measures the productivity of various mainstream crops per hectare as also the productivity of meat, milk and eggs per animal. The aim is to thus put into place technologies that will have "productivity indexes in animals that are higher than what is the base-line index. Thus the success will be a measure of "increase in productivity of meat, milk and eggs, in animals in that area. This narrow definition of "productivity" utterly marginalizes and obscures the diverse production goals and needs of local communities with respect to their animals.

The indicators of success as listed out in the project document once again rely on numbers of technologies made available, adopted along with number of farmers using the technolgies and finally increase in agricultural services and processing enterprises in an area.



**Typically using the above yardstick of success the following scenario emerges:**

Backyard poultry with indigenous poultry breeds are a very critical part of Adivasi life, culture, livelihoods, economy, food, food sovereignty etc. The birds are reared with the purpose of maximizing the number of live birds that they can produce out of a clutch of eggs. The birds have been bred over the years for this purpose and not as "high egg yielding " birds. The total number of eggs produced per hen per year ranges from 60-80 eggs per year. The returns from the birds are multiple , but even if viewed on mere economic terms – the returns from one hen per year ranges from Rs 4000-Rs 5000, with minimal investment, as the birds largely feed off the crop-residue of food crops grown and cultivated in the fields, as also forage in the backyards.

With the productivity yardsticks of "eggs per animal', the eggs are woefully lower than the average egg-laying hybrid chicken which yields approximately 300 eggs/ year. So then the research and action which starts working is to research and develop a bird that can survive in the backyard and produce 280-300 eggs/ year. This new technology is "developed" and supplied to Adivasi farmers. The birds have to constantly be supplied by the "producer breeding company" ,and the farmers are expected to rear them and sell the eggs. The experience of such "new high –yielding / so-called improved breeds" in the past have proven to be disasterous under field adivasi conditions. The birds cannot survive under the tough conditions, require a constant supply of high-quality feed, need a lot of care- and most cirtically cannot dodge the predators of the jungle (such as snakes, cats, fox, etc) as do the indigenous bird breeds.

The technology (read new breed') works fantastically under farm conditions, as also data will show that it is far more superior than the local breeds. But the reality is quite different . Most crucially being "put together birds", communities do not have sovereign control over the germplasm, and there is a constant "supply dependency" involved. They loose their knowledge and skill and important role of selecting and shaping the future generations of birds, according to their needs. This task of breeding, which was once the domain of the community , now becomes the exclusive domain of the "company".

d) The fourth component 4 is **Basic and Strategic research in the frontier areas of agriculture science** funded at approximately USD 56 million.

Herein support goes to research in identified and well-defined areas of frontier science which will have a bearing on Indian agriculture. The areas of research have apparently been identified by an intensive process of consultations amongst scientists from India and abroad who are best in their fields of science and are "relevant" stakholders. Collaborations with foreign scientific institutions or individual scientists with global leadership in the relevant areas will be encouraged and 15 consortia will be funded.

Critical subject matter fields that have been identified through "consultation" will be funded herein. The "cutting edge science" is unequivocally in the realm of biotechnology- genes, gene manipulations, "allele mining" , identifying "novel genes", vaccine production, and research linked into climate change such as applying research to improve the digestibility of low-value fodders, keeping in mind that recent research has shown that "domestic animals-particularly ruminants" release methane into the environment, and an important green house gas (according to FAO). The other concern areas are around agriculture trade and disease surveillance.

Thus the research subjects listed are:

- ★ *Genetic enhancement of animal including* Gene discovery, genetic enhancement and allele mining in farm animals and fishes; Proteomics/transcriptomics for response to biotic and abiotic stresses; QTL idenitifcation, cloning and /or use in Market assisted selection; Bio-prospecting the marine biota for novel genes, bioactive molecules and products; Stem cell research in fishes and animals; Molecular diagnostics and vaccines for farm animals.
- ★ *Natural Resource Management and Integrated Pest Management including* Enhancing nutrient efficiency in buffaloes and cattle by manipulating rumen microbes and enhancing nutrient qualities of low value fodders; Strategic research into overcoming long standing non-tariff barriers against major Indian agri exports, plants, animals and fish products;
- ★ *Other topics including n*ovel value addition processing and storage methods for agri products and by products and development of state of the art animal disease surveillance and control systems.

It clearly says that this component will have a less explicit development dimension, with a major emphasis being on obtaining "intellectual property (IPR) , or patents, which will be the central indicator for this component. Maximum emphasis is on training in advanced labs and on procurement of equipment for frontier research.

Very pertinently, the World Bank document on NAIP states that the partnership agreement between GOI and USA on collaboration between Indian agricultural universities and American land-grant universities signed in 2006, will be dovetailed in the project, especially in the capacity building elements of component 2,3, an 4. It acknowledges that IFAD is considering establishing a facility to support the participation of International Agriculture Research centres in NAIP.

## III. Research Plan for the Eleventh Five year Plan

The Report of the Working Group of Agriculture research and education for the eleventh five year plan (2007-2012) only reconfirms the thrust areas for Animal Science as previously articulated. They write that "Technologies supported and demand driven Livestock sector will be the future engine for growth to ensure nutritional security and livelihood of landless rural poor below the poverty line. This demands a paradigm change in agricultural production and research concepts."

To achieve this, the working groups details the thrust areas and nature of change envisioned which we reproduce. It is extremely evident that the plan recommendations too are merely following the recommendations and path already committed to by ICAR through NAIP, and detailed above: emphasis on genetic manipulation, interest in indigenous breeds for their genes to develop superior breeds through bio-technology, improving nutrition through biotechnology, and finally the overwhelming urgency to package, process, market.

***Extract from the XI Five Year Plan Working Group Document: Animal Science Status Review***

To achieve the productivity targets, there is an urgent need for reorientation of research programs. Emphases need to shift on assessing the genetic potential of indigenous breeds, which of late have been found to be highly productive once given suitable management and environment. The classification of animals as dairy breeds will therefore have to be revised. Intensive research work needs to be undertaken for genetic identification of traits of excellence in Indian breeds, like Jaffarabadi buffalo, Black Bengal goat, Garole sheep etc. and identify the functional genomic associated with their trait of excellence. The biodiversity existing in the domestic livestock needs to be investigated using molecular tools which should involve the transfer of major genes associated with production excellence, tropical adaptability to diseases and stress resistance.

With large quantities of animal products now being produced, the research on process technologies, value addition, packaging, storage, transportation and marketing should receive high priority for intensive research. Quality assurance of animal products for domestic markets and for export, particularly in the changed international scenario, needs added emphasis. In the absence of any proper slaughter regime, there is considerable wastage in meat production and the losses up to 30% could be saved through organized rural slaughter house system for which necessary research back up in terms of slaughter- house design, hygienic meat production, quality control and marketing needs to receive added attention. Male buffalo and cattle calves suffer acute neglect and this results in great wastage. Effective package of practices for management to slaughter age need to be evolved. Prevention of animal losses due to disease should be the major area of focus with emphasis on development of diagnostic kits and vaccine. The health of the human population is intimately connected to the health of the animal with several fatal and debilitating diseases being common to man and animal. A serious attention to animal health care, disease diagnostic and prophylactic will go a long way in ensuring human health also.

With endemic shortage of animal feeds to the extent of about 40% annually in the livestock sector, research efforts should be to utilize greater amount of agricultural by- products and straws for animal feeding. Technologies to augment feed resources including the genetic modification of microorganism to utilize high lignin forage grasses are required to be developed. There should be research efforts to support intensive animal production.

Since the biotechnological research and its application in animal production and health has remained segmented, there is urgent need to have a comprehensive program on buffalo genome, genomic for high fecundity, transgenic for modification of milk, growth, fiber and hair, and manufacture of pharmaceuticals, vaccines and diagnostics.

Market opportunities for livestock sector following the policy of economic liberalization of the government of India, the value of livestock output has grown by over 5.5% per year since early 90s and there are expectations of even faster growth as the demand for livestock products is increased. The sector's ability to capitalize on new market opportunity is constrained by the availability of infrastructure and research support for quality genetic material production and animal health system.

In the concepts of development and sustainability, it is, therefore, essential that livestock be considered the real estate around which the future agricultural development should be based.

Thus the thrust areas of the XI V Year Plan for Animal Sciences include:

- Productivity enhancement and improvement of indigenous livestock and poultry breeds for high yielding strains for milk, meat and fiber through crossing and selection. This is to be done through crossing and selection, fertility using newer embryo biotechnological tools, marker assisted selection to improve disease resistance (small ruminants – parasitic diseases) & fertility and buffalo genomics.

- Manipulation of rumen ecosystems; isolation of cellulose gene; rumen fungi and fungi from wild animals, bio-availability of nutrients and micronutrients, improvement and utilization of local feed and fodder resources, cereal straws and other agro-by products. Also, identification of newer feed resources and development of complete rations for different categories of livestock and poultry, , use of additives, supplements and probiotics for efficient utilization of straws etc.

- Animal disease modeling and forecasting to develop strategies for their control, development of diagnostics and immuno prophylactics[9] using molecular techniques and strengthening prophylactic measures for livestock diseases, including emerging, exotic and zoonotic diseases, intervention of newer generation drugs and indigenous drug formulations for various diseases, environment pollutants, industrial toxicants, mycotoxins and mycotoxicosis, characterization and use of animal microbes for development of diagnostics& vaccines and improving quality and efficacy of products and repository of animal microbes.

- Development and improvement of processing technologies for value addition; quality assurance; shelf life and reducing cost of packaging and prevention of losses, livestock production for sustainable livelihood; social impact of livestock production and technologies on productivity and economic empowerment of livestock farmers, pricing, marketing, processing and trade strategies/policies; institutional credit and policy support for accelerated livestock development.

- Human Resource development through estimation of manpower need for livestock research, education, research education and training, research and training priorities for animal husbandry extension and economics and clinical education as PG Research

The new initiatives proposed in the 11th Five Year Plan is towards maintaning the the growth rate and global situation and also to meet sanitary and phyto sanitary requirements.[10] For this it is proposed to establish some the of National reference laboratories along with BSL-III level containment facilities.[11] The plan further states, that certain research areas like genomic, vaccines, diagnostics & drugs, environmental pollutants, contaminants and toxicants zoonotic diseases,

ethno-veterinary medicine, repository of micro-organisms, methane production etc. in network mode need to be undertaken. . In addition, it is important to consider programmes related to the diversification of nutrient sources in animal feeding for intensive production, market intelligence, economic pricing and marketing of Livestock Products, dry land productivity and production augmentation in livestock, feed processing and feed Quality improvement and rural & backyard poultry production.

As per Planning Commission documents the total espenditure on Agriculture and Allied Sectors was in the X Plan period was Rs.159082.7 crores (at current price). For the XI plan, the plan documents indicate that the Eleventh Plan Base Year 2006–07 Budget Estimates for Department of Agriculture and Co-operation (DAC); Department of Agricultural Research and Education; Department of Animal Husbandry, Dairying, and Fisheries is a total of Rs.6927 crores. In addition, Rs 25000 crore is to be provided as Central Assistance to States through RKVY, to be administered by DAC.

### Verdict: Government of India's Public Agriculture Research Goals is being successfully met! Reforms underway and indicators of success are being successfully met!

The Public Agriculture Research System is successfully being transformed to serve the interests of private sector and agri-business, which is in anycase the expressed mandate of the government.

Information on the kind of research conducted by the different ICAR institutions as also State Universities over the past 5-6 years reveals that the following

i) Prominent presence of private sector in public sector agriculture / animal science research.

ii) Overwhelming number of research programs are anchored around bio-technology

iii) Interest in indigenous genetic resources and research therein are driven by the fact that "novel genes" with significant characteristics can potentially be identified and then "used" to create new varieties, which can then be commericalised and sold to farmers.

iv) Research directed towards creation of new breeds.

v) Research on ethanol, pharmaceuticals and genetic enhancement and so on.

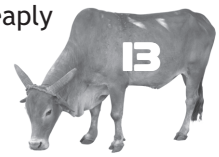
### What is problematic with this Path?

What is completely appalling is the manner in which the poorest farmers in whose name the agriculture public research system is being reformed and transformed and sold out to the private sector, have been completely excluded from the decision making process. All research in a nutshell has been reduced to the realm of bio-technology – be it discussions around conserving indigenous breeds, improving and meeting nutritional needs of animals, improving health care, or alternately is all about improved packaging, processing, and exporting and ofcourse the yard stick of success is measured by obtaining patents on technology , products, and how rapidly and effectively these can be commercialised.

The interests to conserve and work on farmers indigenous knowledge is driven putely by the profit possibilities and patent possibilities therein. "Bio-prospecting" is the official language used, and it ofcourse receives legal sanction by India's Biological Diversity Act, 2002- which explicitly supports this kind of prospecting and conservation.

It is crystal clear that the public research sector which is financed by citizens tax-payer money is being expected to perform scientific research "cheaply" to profit the agri-business and private sector.

One has to pose hard questions as to why it is that the entire research has been reduced to molecular manipulations- possibly because this is where the "big money is", and is the pot of gold of the future, where the large agri-businesses hope to strike while the iron is hot- and do it cheaply by having governments invest in the research, and then they profit from it.



Scientific research has never been more reductionist as it exists today- its all about manipulating and trying to tweak a gene, or add some micro nutrient supplements, without bothering to engage and confront the larger and more complex questions of interactions of humans, livestock, crops, land, water- , problems which can never be addressed and solved by taking genes out of one organism and inserting it into another.

The challenges that poor farmers/ livestock rearers face today is about how they can continue to rear their indigenous breeds in a context where they have been deprived of land to graze their stock on, been forced to plant and cultivate crops that do not provide crop-residues as fodder, have to battle with the absence of a public health care system , are confronted by emerging diseases that have entered the region because they came with the import of exotic high-producng animals, and whose products are being priced out of the market, because of the larger dumping of products by developed countries, under liberalised trade regimes. Their research needs are very basic- once the larger structural questions are addressed.

The problem with this research is that it is sub-servient to the larger "neo-liberal growth paradigms, where people loose complete sovereignty over not only the process of food production but also the research process.

***It is upto the citizens, particularly farmers of this country to demand for a more accountable systems of public research which shall serve the farmers interest and be led by their needs, rather than the need to "meet the market" and partner with the private sector.***

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9 Profolatic is an an agent that tends to ward off disease.

10 The Agreement on the Application of Sanitary and Phytosanitary Measures (the "SPS Agreement") entered into force with the establishment of the World Trade Organization on 1 January 1995. It concerns the application of food safety and animal and plant health regulations (http://www.wto.org/english/tratop_e/sps_e/spsund_e.htm.)

11 This is linked with the biosafety levels in biotechnology and genetic modification realted applications. A biosafety level is the level of the biocontainment precautions required to isolate dangerous biological agents in an enclosed facility. The levels of containment range from the lowest biosafety level 1 to the highest at level 4. In the United States, the Centers for Disease Control and Prevention (CDC) have specified these levels. BSL III is applicable to clinical, diagnostic, teaching, research, or production facilities in which work is done with indigenous or exotic agents which may cause serious or potentially lethal disease after inhalation (http://en.wikipedia.org/wiki/Biosafety_level#Biosafety_level_3)

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# Cases in Question

Kanchi Kohli

In the overview note and introduction to this fact sheet, Dr. Sagari Ramdas and P.V Satheesh have clearly spelt out the policy agenda for livestock research what is has in store for us. In this section as well as the tabular representation that follows in the next chapter, I have attempted to highlight the specific instances where intent of livestock related research in India is playing itself out.

Suo moto disclosure does not often take us to facts thats reveal the kind of partnerships and collaborations that many of these research institutes and centres have been working with for the last 5-6 years. A closer look at the funding and technical assistance to these centres highlights that a large part of the support has come from Government of India (GoI) departments which have an express mandate of applying biotechnology based applications to work towards genetic enhancements and other related experimentation. Partnerships (both funded and assistance) have also come from national and international private sector companies or research institutions.

As revealed from examples in this note and also more details in the table that follows, the research partnerships are towards development of ethanol, pharmaceuticals or breed enhancement with the use of biotechnology applications. International financial institutions like the World Bank have also provided direct funding to research centres or through ICAR as part of the National Agriculture Technnology Project (NATP) and National Agricultural Innovation Project (NAIP). These instances very often than not indicate that livestock related research is often done ex situ rather and on farm, wherein is the farmer's science is not a part of the research agenda. The research partnerships are towards development of ethanol, pharmaceuticals or breed enhancement with the use of biotechnology applications. Infact there are hardly any programmes/initiatives from these public sector insitutions that look at the promotions and revival of traditional livestock breeds. Infact most instances point to collection of germplasm for further laboratory tests, and feeding into the research requirements of the donors be it small and big corporations or even government bodies like the Department of Biotechnology.

The examples highlighted here will reveal some significant collaborations which are in tune with the vision of the ICAR Animal Science Division. There isn't much in the present research that has the potential to provide livelihood security of pastoralists or farmers and little that looks at the conservation of indigenous breed of livestock: cattle or avifauna. Infact, there are virtually no research programs on livelihood security, or the problems and challenges of weakening access to land, and how the consequent fodder shortage can be addressed or how breeds can be conserved by communities in -situ. Instead virtually every single research falls into one of the categories described earlier by the NAIP, indicating that in the eyes of the Government all is well with the Agri Research System and its on the right path to transform and reform to achieve "growth".

### 1. NDRI and Eli Lilly Asia Inc.India, Bangalore

The National Dairy Research Institute (NDRI) has a project with Eli Lilly Asia Inc.India, Bangalore to research on the effect of rumenisin of methaanagenes and nutrient utilization in lactating cattle and buffaloes. Rs.4 lakhs were provided by the company for a period of 2006-08. Eli Lilly and Company (India) Pvt. Ltd is a subsidiary of the US pharmaceutical major, Eli Lilly and Company. The company was set up in 1993 primarily to manufacture and market a select range of drugs ( http://www.lillyindia.co.in/). Neither the NDRI website nor the information received through Right to Information reveal further details of this research. No public information is also available through the internet with reference to this research.

However, it is important to note that Eily Lilly has been criticised worldwide for its production and promotion of the drug Prozac which is known to cause akathisia, defined as an extreme subjective feeling of inner restlessness. This condition has long been known to be caused by antipsychotic drugs and recognized as leading to suicidal and homicidal-suicidal feelings.[12] More recently, Elanco, a division of Eli Lilly and Company (NYSE: LLY), today announced that Lilly has signed an agreement to acquire the worldwide rights to the dairy cow supplement, Posilac(R) (sometribove), as well as the product's supporting operations, from Monsanto Company. [13] *Posilac*(*R*) is a protein supplement to improve milk productivity in *dairy* cows.

### 2. Project Directorate on Poultry, Hyderabad and M/s ABT Corporation, Bangalore

The Project Directorate on Poultry, Hyderabad has been working since the 1970s to enhance productivity of chicken for household nutritional security, income and employment generation. The Directorate has the mission to "develop and propagate improved varieties of chicken for sustainable production under intensive and extensive systems" (http://www.pdonpoultry.org/). The Directorate has a ongoing consultancy project on poultry nutrition with M/s ABT Corporation, Bangalore. This company has several products in the market on poultry and cattle feeds and is used by veterinarians. In particular, the company is engaged in manufacturing and exporting of Poultry Feed Chemicals, sanidol, soilpro br, polymorph, promax sms, destrox, provaxin, biopase and herbal birds Feed supplement. It has paid the Project Directorate Rs. 85000 through this consultancy.

### 3. Indian Veterinary Research Institute (IVRI) and Australian Centre for International Agricultural Research (ACIAR)

IVRI and ACIAR have been collaborating on an Indo Australia project entitled, "Antigenic competition and vaccine failure in small ruminant[14] vaccine in India, a preliminary investigation". Small ruminants are animals like sheep, goat etc. ACIAR is an Australian Government statutory authority that operates as part of Australia's Aid Program within the portfolio of Foreign Affairs and Trade (http://www.aciar.gov.au/). The research is being carried out through the University of Sydney, Australia with Dr. John Egerton of the Department of Veterinary Clinical Studies as the project leader.

This project aims to investigate the occurrence of antigenic competition in vaccinated small ruminants in India and to identify differences and similarities in responses of sheep and goats. It will also define the steps in the immune response that cause the phenomenon of antigenic competition and will look for ways to overcome it. The project background states that multi-component vaccines that enable several vaccines to be incorporated into a single injection help maximise production. However, some of the most advanced livestock vaccines in Australia have been found to be limited by competition for immune response between components (antigens) in the vaccines. Outcomes for this project are currently being prepared.[15]

### 4. National Bureau of Animal Genetic Resources (NBAGR) and Department of Biotechnology

The NBAGR with a Rs.29.99 lakh funding from Department of Biotechnology is presently carrying out an analysis of candidate genes involved in the immune response regulation in indigenous cattle. The study shall proposes to yield information on the different genetic variants of these genes present in the indigenous population and also the differences in the gene sequence with respect to the Bos Taurus breeds.

As part of this project blood was collected from 160 cows of Sahiwal breed of bos indicus cattle and from 30 Holstein Friesian animals. DNA isolation was carried out by the phenol: chloform procedure. Milk samples were also collected from these animals and somatic cell counts in the milk samples were determined. Quality of milk was also determined by the change in pH. mcp-1 and TLR-4 gene sequences have been submitted to Gene Bank at the *National Center for Biotechnology Information (*NCBI).[16] The NCBI was established in 1988, as a national resource for molecular biology information.

It is then clear that much of the research findings of this collaboration will be used for biotechnology related applications, where the basis is the DNA of indigenous Sahiwal cows. Unfortunately, there is however no public information available on the possible directions of such data analysis.

### 5. National Dairy Research Institute (NDRI), Karnal's Collaborations with World Bank and Seed Companies

National Dairy Research Institute (NDRI), Karnal has had several private sector collaborations other than funding from agencies like the World Bank. NDRI project collaborators include Summit Seeds Ltd which acting as a subsiary for Agriculture Environmental Renewal Canada Inc. (AERC) which is a Canadian Hybrid Seed Company. The Memorandum of Understanding (MoU) signed between NDRI and Summit Seeds is to study the technical, commercial and environmental feasibility of growing hybrid seeds of forage sorghum, winter sorghum, grain and forage pearl millet in India. For this Summit Seeds will conduct trials with NDRI, Karnal and Haryana and Punjab governments' agriculture departments in farmer's fields to study agronomic superiority, proximate analysis, palatability and breeding trials. According to a newsreport in Financial Express dated April 26th 2002, "AERC will have exclusive property rights over genetic materials it would provide to Summit Seeds which will be accompanied by DNA fingerprinting and shall contain a declaration that material is bred by AERC. Under the agreement, Summit Seeds will pay 10 per cent of the net sale of seeds to AERC as royalty."[17]

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12 Dowloaded from http://www.petitiononline.com/lilpro/ on 13th July 2009.

13 Source: http://newsroom.lilly.com/releaseDetail.cfm?releaseid=329001

14 *Ruminant* is a mammal of the order Artiodactyla that digests plant-based food by initially softening it within the animal's first stomach

15 Downloaded on 26.1.09 from http://www.aciar.gov.au/project/AS1/1994/113

16 Source: http://www.nbagr.ernet.in/externallyfunded.html downloaded on 14.7.2009

17 Source: http://www.financialexpress.com/news/four-canadian-agro-firms-foray-into-indian-market/44429/

Two other projects have been with M/s Metahelix Life Science (P) Ltd, Bangalore which an agricultural biotechnology company. These projects refer to feeding studies on Bt Cotton. Funding has also been received for studying effect of supplementing bypass fat on lactating crossbred cows. This is funded by Tinna Oils & Chemicals Ltd is a a joint venture of Tinna Group and M/s. Archer Daniels Midland Co., USA.

### 6. Project Directorate on Cattle, Meerut Programme with State Agricultural Universities

The Project Directorate on Cattle, Meerut has a programme with state agricultural universities for Field Progeny Testing Project. In this project, the frozen semen of crossbred Frieswal bulls is being used to genetically improve farmer's cow under field conditions. Frieswal is a cattle strain developed by Project Directorate on Cattle (ICAR) in collaboration with Directorate of Military Farm by crossing pure Holstein-Friesian with Sahiwal and stabilizing the exotic inheritance at 5/8 level.[18] The primary methodology is the use of artificial insemination to increase the milk yield in the cattle. The project has the objective to undertake progeny testing of crossbred bulls on a large scale. It was initiated during the 8th Five Year Plan and is currently underway in three units BAIF, Uruli-Kanchan; Punjab Agricultural University (PAU), Ludhiana and Kerala Agricultural University (KAU), Mannuthy. More details of the number of animals from which semen was procured and in how many instances artificial insemination was done is available on http://www.pdcattle.ernet.in/fpt.htm The Project Directorate has also highlighted figures on the amount of increase in milk yield in lactating cattle.

Other than these instances, the Indian Veterinary Research Institute (IVRI), Izzatnagar has amongst other projects carried out a project on vaccine failure in small ruminant vaccine in India with the Australian Centre for International Agricultural Research (AICAR). AICAR is the Australian Government's statutory authority and operates as part of Australia's Aid Program within the portfolio of Foreign Affairs and Trade. The Insitiute also has a project funded by the Department of Biotechnology (DBT) to study the bioconversion of lignocellulosic feeds by rumen anaerobic fungi. Anaerobic fungi is being experimented upon for the being an important component in the production of ethanol which is an important component of biodiesel production. The DBT has also funded the Central Institute of Research on Buffaloes with a Rs.52.69 lakh to carry out a project for "Isolation, Culture and Characterisation of Adult Stem Cells in Buffaloes" in the year 2007-08.

There are biotech developments and interventions in the fisheries sector as well. According to the latest Economic Survey of 2008-09 completed before the 2009 budget of the Indian Government, a National Fisheries Development Board (NFDB) has been set up to *"realize the untapped potential of the fishery sector with the application of modern tools of research and development including biotechnology."* The board was registered in July 2006 under the Andhra Pradesh Societies Registration Act, 2001, and has become operational.

These details only highlight some specific areas of livestock related research which point to the trends and kinds of private sector and biotech based partnerships that are being developed. A closer look at the tabular representation will also give more information. It would be critical to delve further into the findings of these research projects had where exactly they have been used. This informaiton is not avaiable in the public domain and definitely not on the internet. Farmer and Pastoralists needs or promotion of indigenous breeds barely figure in the reseach priorities in the 15 ICAR institutions for which data analysis has been don From 14-17 February 2009, the ICAR organised a World Conference on Animal Nutrition. A press release related to this conference dated 11th February 2009 states the purpose *"to search for science led solution to some of the challenges like optimising bio-availability of nutrients through chemical and biological means, feed-livestock balancing approach, preparation of designer livestock products through animal feed, development of greenhouse gas mitigation technology through rumen micro manipulation, probable role of microbes in delignification, exchange of ideas, information and technology amongst the countries and possibility of launching national/regional feed security mission etc."* (http://www.icar.org.in/news/con-world-nutri.htm)

[18] Source: http://www.cababstractsplus.org/abstracts/Abstract.aspx?AcNo=20043079220

The Ministry of Agriculture's 2009-10 budget allocations amount to a total of Rs.10060 crores. Out of this Rs. 7200 crores is for the Department of Agricultural Research and Cooperation; Rs. 1760 crores for Department of Agricultural Research and Education; and Rs.1100 crores for Department of Animal Husbandry, Dairying and Fisheries. This does fall short of the demands that each of these departments had sought from the centre. But nevertheless, the GoI's financial allocations and several private collaborations in the offing, the Ministry of Agriculture has yet again set out to determine the future India's agriculture: both crop and livestock.

## Special Economic Zone for Agricultural Research

The fact that agricultural research in the crop and livestock sector is bending over its back to suit only an economic and business agenda is seeing the most creative representations. Even though the setting up of Special Economic Zones (SEZs) in India are marred with deep controversy due to the issues of land acquisition, loss of livelihoods and ecological damage, an Indira Gandhi Centre for Advanced Research on Livestock (IGCARL) is being established as a "world class" univeristy at Pulivendula in Kadapa District of Andhra Pradesh, India. It is proposed to be an autonomous institution under Public Private Partnership (PPP) with a Special Economic Zone (SEZ). This university has been incorporated as a private limited company under Companies Act, 1956.

The objectives include *"application of frontier and cutting-edge technologies like biotechnology, information technology and nanotechnology, establishment of state of tstate of the art analytical laboratory for testing of livestock products and making use of GIS for disease monitoring."* Further, *"the proposed programme of work involves 6 research groups on molecular and cytogenetics, reproduction and cryobiology, biotechnology and nanobiology, microbiology and immunology, animal nutrition, and quality control."*

This SEZ University has a proposed budget of Rs 386 crores for 2007-2008 to 2009-2010 for its Research Center. Governmenft of India has since accorded approval for Biotech SEZ in 77 acres of IGCARL land which the IGCARL hopes will attract foriegn investors.

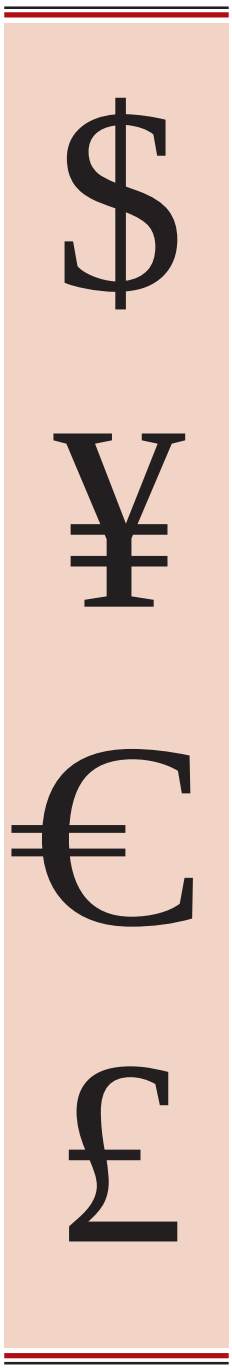
Amongst its programmes, the IGCARL proposes the freezing and export of the Ongole cattle and embryos and other germplasm. There is also studies on introduction of genes for better production, reproduction, disease resistance and adaptation planned where patenting of genes is also to be explored.

Needless to say that small and mariginal farmers as well as the interest of traditional biodiverse farming are clearly and obviously out of an epitome of commercialisation of agricultural sector where business of research is an upfront agenda.Source: http://ahfd.ap.nic.in/igcarl/

# Summary and Analysis of Livestock Research being carried out in ICAR Institutes

## Responses received via Right to Information

Kanchi Kohli



In September 2008, Right to Information applications were filed before the CPIO, Indian Council for Scientific Research (ICAR) seeking the following information related to livestock related research.

1. Please provide information (including but not limited to letters, MoU's, contracts etc) from on the amount of funding/ sponsorships received by ICAR towards research related to livestock
2. Please provide names of private companies (national and foreign) from whom such funding/sponsorships has been received and for what purpose/project this has been received.
3. Please provide names of foreign research institutes, foreign agencies, foreign government departments from whom funding/sponsorship has been received and for what purpose/project this has been received.
4. Please indicate whether the above funding/sponsorship is towards primary research, collection of raw material or technical assistance and collaboration in the field of livestock and fish related research
5. Please also provide the amount per agency per project that has been received by ICAR

Similarly information related to collaborative research projects of ICAR related to livestock was also sought in September 2008.

Presented in this section is the summary and analysis of the responses received along with additional information on funding agencies and/ or projects in footnotes:

# ICAR Institutions

| S.No. | Research Institute | Details of Agricultural Research |
|---|---|---|
| 1. | National Research Centre on Pig, Guwahati | "Nil" to all the above questions. Technical collaboration etc has been incoroporated with State Veterinary Department and Assam Agricultural University |
| 2. | Project Directorate on Cattle, Meerut | a) Production of superior males through embryo transfer technology funded under **NATP** in 2001-02 (Rs.21.20 lakhs)<br>b) Characterisation and differentiation of embryonic and spermatogonial stem cells in cattle and buffalo under **NAIP** during 2008-09 (Rs.80.50 lakhs)<br>c) Studies on genetic aspects of Holstien-SAhiwal crossbreds- **Frieswal Project'**[1]**- collaboration with Military farm, Ministry of Defence**<br>d) Genetic studies on performance of important indigenous breeds and their improvement through selection- **Indigenous Breeds project"-with State Agricultural Universities**<br>e) Field recording of performance data for undertaking large scale progency testing- **Field Progeny Testing Project**[2]**- with State Agricultural Universities** |
| 3. | Central Institute of Research on Buffalo Research (CIRB), Hisar[3] | a) Isolation, Culture and Characterisation of Adult Stem Cells in Buffaloes (Rs.52.69 lakhs, 2007-08)- ***Department of Biotechnology, Ministry of Science and Technology***<br>b) Analysis for various naturally produced, low molecular volatile compounds of stores feed and use of synthetic volatile compounds as fumigant (Rs. 1.28 crores for three years 2005-08)- ***Department of Biotechnology, Ministry of Science and Technology***<br>c) Role of TLR 9 for CPG immunomodulation in Buffalo calves (Rs.38 lakhs 2006-07)- ***Department of Biotechnology, Ministry of Science and Technology***<br>d) **NATP** CGP-211 related to Identification of Molecular Markers applicable to Progeny Testing Programme in Buffalo)<br>e) **NATP**-PSR 29 on Manipulation of Ruman Microbial ecosystem for improving the utilization of straws and stovers AED (irrigated) New Delhi (Rs. 13,25,77,200, 2000-08)<br>f) **NATP**- ROS-15 on Measures to counteract/detoxify aflotoxins in oilseeds and nutrition coarse cereals based poultry and livestock feeds (Rs.27,44,554, 2000-2008)<br>g) NATP-SDMS-AH on Animal Health information system through monitoring and surveliance. **PD-ADMAS-**Bangalore (Rs.12,40,286, 2000-08)<br>h) Isolation and molecular characterization of superior fibre degrading anarobic fungus and development of protocol for their preservation and utilization for increasing digestability of fibrous feed in buffaloes- **DBT** |

[1] The Frieswal project envisages to evolve a National Milch Breed "Frieswal", a Holstein-Sahiwal cross, yielding 4000 kg of milk with 4% butter fat in a mature lactation of 300 days (http://www.pdcattle.ernet.in/researchproject-frieswal.html) .

[2] **Frozen semen of crossbred bulls is being used to genetically improve farmer's cow under field conditions. The project has the objective to undertake progeny testing of crossbred bulls on a large scale in the field. Being carried out along with BAIF, Kerala Agricultural University and Guru Angad Dev Veterinary University, Ludhiana, Punjab** http://www.pdcattle.ernet.in/fpt.htm

[3] The institute has completed projects in collaboration with USAID, ACIAR Australia and IDRC on areas of priority and mutual interest. The Institute has established collaboration with various national and international institutions. Department of Bio-Technology Government of India supported research project on Embryo Transfer Technology (http://cirb.nic.in/collaborative.htm)

| S.No. | Research Institute | Details of Agricultural Research |
|---|---|---|
| 4. | Project Directorate Poultry, Hyderabad | **M/s ABT Corporation, Bangalore** for the Advisory Consultancy Project on Poultry Nutrition (Rs. 85000)[4] |
| 5. | NBAGR, Karnal | a) Genome studies for characterization of indigenous poultry (2004-07, Rs.33.327 lakhs)-**DBT**<br>b) Comparative Genomics and identification of SNPs in Quantitative Trait Loci for diversity analysis of Buffaloes (2006, Rs.27 lakhs)- **DBT**<br>c) Identification of Qualitative Trait loci for milk yield, fat and protein percent in buffaloes (2008, Rs.8.29 crores)- **NAIP, World Bank**<br>d) Animal Genetic Resources Biodiversity (1999-2004, Rs.434.8 lakhs)- **NATP, World Bank**<br>e) Immunological and molecular investigations of bovines interleukins in Indian indigenous cattle (1999-2003, Rs.22,94,449)- **DBT**<br>f) Integrated National Agricultural Resources Information System (INARIS) (2001-2004, Rs.26.18844 lakhs)- **NATP, World Bank**<br>g) Generation and Evaluation of expressed sequence tags (ESTs) from Buffalo Mammary Gland for Milk Protein and Milk Associated Genes (2002-06, Rs.39.60 lakhs)- **DBT**<br>h) Molecular marker based genetic structuring of native cattle (Bos indicus) breeds from different agro climatic regions of India (2007-2011, Rs.55.35 lakhs)- **DBT**<br>i) A digitized inventory of animal resources (2002-2004, Rs.7.10431 lakh)- **DBT**<br>j) Analysis of candidate genes involved in the immune response regulation in indigenous cattle (2007-2010, Rs.29.99 lakhs)- **DBT**<br>k) Genetic profiling of important meat and wool type indigenous sheep breeds using neutral functional markers (2007-2010. Rs.55.35 lakhs)- **DBT**<br>l) BOYCAST fellowship for 3 months (2008, $2400 per month+Rs.15,000 contingency)- **DST**<br>m) Travel expenses and stay for attending the FAO/IAEA International Symposium on Gene based technologies for improving animal production and health in developing countries (2003, $1500)- **IAEA**<br>n) Travel expenses and stay in Paris from European Commission for attending the International Symposium on Animal Genomics for animal Health (2007. rs.66,000)- **European Commission**m) For Preparation of country report of AnGR (Rs.8,31,215)- **FAO** |
| 6. | National Institute of Animal Nutrition and Physiology (*NIANP*), Bangalore | a) Projects from DBT, National Funds (NFBRRA), NATP, NAIP. No foreign or corporate funds received- Details of programme not disclosed in RTI response<br>b) Project with **Australian Centre for International Agricultural Research (ACIAR )** on Increasing the productivity of cattle in India and Australia with rumen fungal treatments (2003 onwards, Rs. 32.59 lakhs)[5] |

[4] ABT Corporation is well known and well accepted by veterinarians and end users as an organization. It has several products in poultry/cattle feeds. This includes in manufacturing and exporting of Poultry Feed Chemicals, sanidol, soilpro br, polymorph, promax sms, destrox, provaxin, biopase and herbal birds Feed supplement. http://www.aciar.gov.au/project/AH/1997/058

[5] The project is focusing on cattle, particularly dairy cattle, where inputs (feed) and outputs (milk) are monitored closely. Project scientists are working to identify superior fungi that persist in the rumen of cattle fed diets with appropriate fibre content, and develop a prototype method to produce large volumes of inoculum of these fungi.They are testing and confirming that the fungus-specific feed additives are effective in cattle, and determining how to supply cost-effective inoculum and the food additive to the dairy cattle/buffalo industry in India. The project was favourably reviewed in 2007 and the external reviewer recommended that an extension be granted so that Australian scientists could further train the Indian scientists in molecular microbial techniques. Funding was therefore provided by ACIAR for the project to undertake a study involving the molecular fingerprinting of rumen microbial populations in cows supplemented with MPS For details: http://www.aciar.gov.au/project/AH/1997/058

| S.No. | Research Institute | Details of Agricultural Research |
|---|---|---|
| 7. | Central Institute for Research on Goats (CIRG), Mathura | a) Development of inactivated vaccine using native isolates of mycobacterium avian (**DSIR**, Rs.6 lakhs)<br>b) Molecular diagnosis of johne's disease of goats by PCR and DNA probes (**Council of Science & Technology , Uttar Pradesh- UPCST**, Rs.3.06 lakhs)<br>c) Development of novel herbal products (**DST**, Rs,34.44 lakhs)<br>d) Genetic variants of polymorphic traits and gene marker studies in Indian goat breeds (**DBT**, Rs.14.52 lakhs)<br>e) A digitized inventory of animal resources (**DBT**, Rs. 1.24 lakhs)f) Development of characterization of indigenous vaccine and diagnostics for Johne's disease (**CSIR**, Rs.64.16 lakhs) |
| 8. | National Research on Equines, Hisar | a) MM Research project on "veterinary diagnostics for prevalent and emerging diseases" (199-2004, Rs.28.33 lakhs)- **NATP (through ICAR)**<br>b) MM research project on "Animal health information system through diseases monitoring and surveillance." (2001-03, Rs.11.70 lakhs)- **NATP (through ICAR)**<br>c) For strengthening OBM system/ISD/ARIS (1998-99, Rs.3.25 lakhs)- **NATP (through ICAR)**<br>d) For strengthening library system (2003-06, Rs.3.25 lakhs)- **NATP (through ICAR)**<br>e) For disease testing (2003-04, Rs.5 lakhs)- **Dairying and Fisheries** (**DAHD &F) Ministry of Agriculture**f) Collaborative research project with **DRDE, Ministry of Defence** (2006-9, Rs.4.60 lakhs) |
| 9. | National Research Centre on Yak, Arunachal Pradesh | Rs. 1760.31 received from ICAR between 2000-08. No details of programmes provided. |
| 10. | National Research Centre on Meat, Hyderabad | Plan funds from ICAR, Rs.1297.7 lakhs between 2000-08). **No details of programmes provided.** |
| 11. | Central Avian Research Institute, Izatnagar, Bariely | Technical Assistance and IACR collaborationa)Goat husbandry based integrated approach for livelihood security in disadvantaged district of Bundelkhand- **NAIP**<br>b) Enhancement of post hatch inmmunocompetence and growth of broiler chickens through *in ovo* approaches- **DST**<br>c) Studies on cloacal gland and development of semen dilutor for Japanese quail- **DST**<br>d) Molecular evaluation of forest moulting procedures and development of effective alternatives in while leghorn hens- **DBT**<br>e) Identification of differential gene sequences for disease resistance and tropical adaptability in two indigenous chicken- **DBT**<br>**OTHERS:**<br>a) NATP and Agro Ecosystems Directorate (2000, Rs.139.08 lakhs No. NATP/AED (Arid/PAL-032/99)<br>b) ICAR, Agro Ecosystem Directorate (Rainfed Farming) NATP, Central Research Institute on Dryland Agriculture, Hyderabad (2000, Rs.131.204 lakhs, No. NATP/AED (RF)/RNPS-16/2000)<br>c) ICAR, NATP, Project Implementation Unit. Lal Bahadur Shastri Centre, IARI, Pusa campus (2001, Rs.4,12,45,175, No. 27 (47)/99/NATP, MM-III-38) |

| S.No. | Research Institute | Details of Agricultural Research |
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| | | d) Department of Biotechnology, Min of Science and Technology (2002, Rs.44.81 lakhs, No. BT/PR-2646/AAQ//01107/20011)<br>e) ICAR (2004, Rs.14,43,600) (F.No.7-32/2003-ASRII/30304180031)<br>f) DBT, Min of Science and Technology (2004, Rs.42.48 lakhs, No.BT/PR387/AAQ/01/146/2003)<br>g) DST, Min of Science and Technology (2006, Rs.12,39,000, No.SR/SO/AS-12/2005)<br>h) DBT, Min of Science and Technology (2006, Rs. 29.97 lakhs, No. BT/PR5027/AAQ/01/193/2004)<br>i) DBT, Min of Science and Technology (2006, Rs. 50.33 lakhs, No. BT/PR7023/AAQ/01/266/2005)[MORE INFORMATION CAN BE ASKED FOR AS PER RESPONSE] |
| 12. | National Dairy Research Institute, Karnal | a) Effects of feeding cottonseed produced from Bt Cotton for four weeks on feed intake, milk production and composition of lactating cows in India Rs.4 lakhs, 2000-2001)- **MAHYCO[6], Mumbai**<br>b) Studies on the performance of the Canadian forage pearl millet and sorghum hybrids under different dates of showing and nitrogen levels their Palatability and Nutritive value in dairy animals (Rs.9,96,400, 2002-05)- **M/s Summit Seeds India Ltd, Chandigarh[7]**<br>c) Feeding studies of Bt Cotton development by Metahelix Life Science (2003-2004, Rs.6,47,475)- **M/s Metahelix Life Science (P) Ltd, Bangalore[8]** Evaluation of heat treated (roaste<br>d) soybean in lactating cows (2003-04, Rs.82,000)- **American Soyabean Association, New Delhi**<br>e) Effect of supplementing Bypass fat on lactating crossbred cows (2004-06, Rs. 1 lakh)- **Tinna Oils and Chemicals (P) Ltd[9]**<br>f) Evaluating of feed of herbal based supplement for dairy cow (2004-06, Rs.1,10,000) **Daglia Agro Vet Ltd, Indore**<br>g) Effect of Virginiamycin on Rumen fermentation in crossbred cattle (2006-08, Rs.3,26, 593)- **Pfie Centre, Patel State, Mumbai**<br>h) Effect of rumenisin of methaanagenes and nutrient utilization in lactating cattle and buffaloes (2006-08, Rs. 4 lakhs)- **Eli Lilly Asia Inc.India, Bangalore[10]**<br>i) Study on assessment of success/failure of milk processing plants in Assam (2006-07, Rs.61,500)- **International Crops Research Institute, New Delhi**<br>j) Conservation Aril. Livestock and Livestock strategies in the Indo- gangetic plains of South Asia: Synergies and Trade offs (2006 onwards, Rs.4,50,000)- **CIMMYT (International Maize and Wheat Improvement Centre), New Delhi**<br>k) Efficacy of feeding whey based as replacers on performance of neonatal dairy cattle and milch buffalo calves ( 2006-07, Rs.3,07,790)- **M/s A.C. International, New Delhi**<br>l) Feeding of Vovates to lactating crossbred cows for enhancing milk production (2007-08, Rs. 4,63,035)- **Alphamma Placement Ltd, Faridabad**<br>m) Feeding studies of Bt Cotton Development by Metahelix Life Science (2002-05, Rs.6,47,475)- **M/s Metahelix Life Science (P) Ltd, Bangalore**<br>n) Dairy Value Chain Analysis in Dynamic regions in India (2008 onwards, Rs. 6 lakhs)- **World Bank, New Delhi** |

[6] MAHYCO is a company that strives to provide farmers with hybrid seeds. It is the first private enterprise in India to produce and market hybrids of Cotton, Sorghum, Pearl Millet, Sunflower and Wheat. It is also the first Indian company to commercially grow and market transgenic Bollgard cotton- India's first transgenic crop in 2002 (www.mahyco.com)

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| 13. | National Research Centre on Mithun, Nagaland | Conservation and propagation of quality mithun germplasm in Nagaland. Includes aspects such as ex situ preservation of germplasm, artificial insemination and specialized training for the same as well as developing a protocol for superovulation in Mithun (2008, Rs.32 lakhs)- **DBT**<br><br>Collaborations with ICAR Insitutes, Assam Agricultural University (AAU), West Bengal University of Animal Sciences (WBUAS) and Fisheries. Animal Samples and technical assistance have been given to Nagaland University, AAU, WBUAS. The ICAR institutes include ICAR Research Complex, Barapani, NCR Pig, Guwahati and NDRI, Karnal |
| 14. | National Research Centre on Camel, Bikaner | **Collaborative Inter Institutional Projects:**<br><br>a) RFLP based genotyping of major histocompatibility complex class II genes in Marwari horses. A total of 22 blood samples of marwari horses (16 from field and 6 from EPC) were collected.<br><br>b) Molecular and biochemical studies of acute intermittent porphyria in Indian patients and their families. All the available 18 sequences were analysed using Gene Tool. Probable mutations were observed. About 2-3 sequences will be deposited in the GenBank. (with SP Medical college, Bikaner)<br><br>c) Development of a new camelid anti snake venom (with SP Medical College, Bikaner)<br><br>d) Development of single domain antibodies for diagnosis/therapy (with BARC, Mumbai)<br><br>e) Development of a cell culture adapted live attenuated camel pox vaccine (with Indian Veterinary Research Institute, Mukteshwar)<br><br>**Linkages and collaborations (2006-07)**<br><br>i) Research work of MV Sc. and PhD students with Rajasthan Agricultural University<br><br>ii) Camel Milk Analysis especially on protective proteins with NDRI, Karnal<br><br>iii) Camel hair and its utilization in the form of blends with Centre for Sheep and Wool Research Institute, Avikanagar<br><br>iv) Camel drawn implements and their performance with Central Institute of Agricultural Engineering, Bhopal<br><br>v) Camel milk as nutritional adjuvant in treatment of type-I diabetes and analysis of PBGD gene with AIIMs, New Delhi<br><br>vi) Extension of camel husbandry practices with Lokhit Pashupalan Sansthan, NGO at Sadri, Pali |
| 15. | Indian Veterinary Research Institute (IVRI), | a) Establishment of User Centre at IVRI under Biotech Information System (BTIS)- **DBT** |

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| | Izzatnagar Some projects since 2000: | b) Financial assistance for research work on "Foot and Mouth Disease"- **Dept. of Science and Technology**<br><br>c) National research project on renderpest eradication- Ministry of Agriculture<br><br>d) Investigation of fern flora of northwest humid Himalayas for urinary carginogen- **MoEF**<br><br>e) Indo Australia project entitled, "Antigenic competition and vaccine failure in small ruminant vaccine in India, a preliminary investigation"- **Australian Centre for International Agricultural Research**[11]<br><br>f) Impact of domestic animals and food derived from animals on the epidemiology of enterohaemorrhagic Escherichia coli (EHEC)shigtoxin producing E.coli (STEC)- **Indian Council for Medical Research**<br><br>g) Development of transgenic cabbage expressing glycoporation of rabies virus- **DBT**<br><br>h) Bioconversion of lignocellulosic feeds by rumen anaerobic fungi and manipulation of rumen ecosystem by intre-ruminal transinoculation of superior strains1[2]- **DBT**<br><br>i) Expression of Immunodominant antigen and development of DNA vaccine construct against bovine brucellosis- **DBT**<br><br>j) Consulting and providing Tuberculin PPD & Syringes Medical Screening of 200 Monkey for Tuberculin testing and X-Ray examination- **MoEF**<br><br>**k)** Studies on interactions of fibre degrading microbes and methanogenic bacteria of run for reducing methanogenesis -**FAO/ IAEA project** *(2002-2008, $60,000)*<br><br>l) Integrated Consortium on Tick and tick borne diseases- **European commission 6th Framework Programme for Research, UK** *(2004 for three years. Euro 15840)*<br><br>m) Diagnosis and seroepidemiology of contagious bovine pleuropneumonia- **NPRE**[13] *(2002 for three years, Rs.40 lakhs)*<br><br>n) Monitoring of extraneous chemical substances and their residues in animal products- **APEDA** *(2002 for three years, Rs.27.78 lakhs)*<br><br>o) Studies on Vibro parahaemolyticus in and around Kolkatta with emphasis on the emerging pandemic clone- **Indian Council for Medical Research** *(2005 for three years, Rs.7.78 lakhs)*<br><br>p) Modern approaches to control infertility in buffaloes- **UPCAR** *(June 2006 for three years, Rs.968.220 lakhs)*<br><br>q) Genetic manipulation by gene transfer of peanut and Sannhemp fro FMDV immunogen expression: a strategy for developing edible vaccine- **DST** *(September 2006 for three years, Rs.18.28 lakhs)* |

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| | | r) Measurement of methane emission due to enteric fermentation using open circuit respiration chamber in cattle and buffaloes- **NATCOM, MOEF** *(2008 for two years, Rs.14.89 lakhs)*<br><br>s) Development of enzyme linked immunosorbent essay (ELISA) for diagnosis of cystic echinococcosis (CE)- **Indian Council for Medical Research** *(January 2008 for three years, Rs.8.62 lakhs as first installment)*t) To study the vivo efficacy of a panel of Homeopathic treatment drugs against highly pathogenic Avian Influenza Virus (H5N1) in chickens- **CCRH** *(From February 2008, Rs. 29.72 lakhs)*<br><br>u) Non invasive monitoring of buffalo reproduction: Application of fecal steriod hormones and metabolic assay- **BARC.** DAE/BRNS *( March 2008 for three years, Rs. 30 lakhs)* |

7 In this project Summit Seeds is acting as a subsiary for Agriculture Environmental Renewal Canada Inc. (AERC) which is a Canadian Hybrid Seed Company **(**http://www.aerc.ca/collaborators.html). It has been reported that as part of this project Summit Seeds will conduct trials with NDRI, Karnal and Haryana and Punjab governments' agriculture departments as well as farmers. Moreover, "AERC will have exclusive property rights over genetic materials it would provide to Summit Seeds which will be accompanied by DNA fingerprinting and shall contain a declaration that material is bred by AERC. Under the agreement, Summit Seeds will pay 10 per cent of the net sale of seeds to AERC as royalty." THE FINANCIAL EXPRESS, APRIL 26, 2002 (http://www.financialexpress.com/news/four-canadian-agro-firms-foray-into-indian-market/44429/)

8 Metahelix is an agricultural biotechnology company focusing on developing traits and technologies for crop protection & improved productivity. Hybrid Seeds and traits are commercialized by its wholly owned subsidiary seeds business Dhaanya Seeds (http://www.meta-helix.com/)

9 Tinna Oils & Chemicals Ltd is a a joint venture of Tinna Group and M/s. Archer Daniels Midland Co., USA. It comprises of Oil seed processing division at Latur, Maharashtra; Animal Health & Nutrition division at Latur, Maharasthra; Biodiesel production plant at Latur, Maharasthra; The Cargo Handling, Stevedoring and Warehousing division at Vizag seaport, Andhra Pradesh and The Specialty Ingredients Division operated out of Mumbai (http://www.tinnagroup.com/companies.html)

10 Eli Lilly and Company (India) Pvt. Ltd is a subsidiary of the US pharmaceutical major, Eli Lilly and Company. The company was set up in 1993 primarily to manufacture and market a select range of drugs ( http://www.lillyindia.co.in/)

11 This small project aims to investigate the occurrence of antigenic competition in vaccinated small ruminants in India and to identify differences and similarities in responses of sheep and goats. It will also define the steps in the immune response that cause the phenomenon of antigenic competition and will look for ways to overcome it. Outcomes for this project are currently being prepared. (Downloaded on 26.1.09 from http://www.aciar.gov.au/project/AS1/1994/113). ACIAR is an Australian Government statutory authority that operates as part of Australia's Aid Program within the portfolio of Foreign Affairs and Trade (http://www.aciar.gov.au/).

12 Anaerobic fungi is being experimented upon for the being an important component in the production of ethanol (see: http://www.springerlink.com/content/g76x01m32x672288/)

13 NPRE is National Programme on Rinderpest Eradication under the Department of Animal Husbandry and Dairying. Rinderpest is a highly infectious viral disease (Morbilli virus infection) of cloven hoofed animals inflicting heavy mortality in bovine population as well as in small ruminants. he present National Project for Rinderpest Eradication (NPRE) was launched with effect from May, 1992 as a part of Project ALA/89/04: "Strengthening of Veterinary Services for Livestock Disease Control with special emphasis on Rinderpest Eradication". The main objective of the project is to eradicate Rinderpest and Contagious Bovine Pleuro Pneumonia (CBPP) by strengthening the veterinary services across the Country and to obtain freedom from rinderpest & CBPP infection following the pathway prescribed by Office International des Epizooties (OIE), Paris (See: http://dahd.nic.in/npre.htm).

The OIE is the intergovernmental organisation responsible for improving animal health worldwide. It is recognised as a reference organisation by the World Trade Organization (WTO) and as of March 2009, had a total of 173 Member Countries and Territories (See: http://www.oie.int/eng/OIE/en_about.htm?e1d1)