



Intellectual assets management and transfer in animal science sector at the Indian Council of Agricultural Research (ICAR)

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ABSTRACT

Intellectual assets in animal science at the Indian Council of Agricultural Research (ICAR) such as vaccines, diagnostic kits, food products and processes, know-how, designs, parameters are managed by protecting with the different Intellectual Property (IP) tools such as patents, trademarks, and designs. A three tier IP management system of ICAR is given a range of proven results, including 245 patent applications filed by 15 animal science research institutes, out of which 130 were filed during 2007 to 2012 and 39 in 2013–14 in 12 subject specific areas of animal science. A total of 22 patent applications were granted to five research institutes, which falls under six classes (A, B, C, D, F, G and H) of the IPC classification, as specified in its 24 sub-classes. Eighteen trademarks were filed by four ICAR institutes in different groups of trademark classes for their goods and services. IVRI, Izatnagar had also filed 13 designs for their engineering items and product development. To transfer such intellectual assets, 166 partnerships were developed by 12 ICAR institutes for 102 technologies. These assets belong to 12 different subject specific areas of animal science. These assets were transferred through different modes of commercialization to 110 public and private organizations. IP protected asset transfer was on its higher side with 21.56 per cent, which is a successful indicator for ICAR as a research organization. The outcome of these efforts has opened the path for research and its incubation in the mode of business for well being of its major clients including farmer and livestock industry.

Key words: Intellectual assets, IPR, IPC, Partnerships, Patents, Technology transfer, Trademarks,

Intellectual assets are the key resources for research based organizations, involving man, money and material. Asset generation is a process which starts from its need assessment from field level to testing or execution in research labs and transfer in the business chain for its multiplication and social development. Managing intellectual assets is an emerging trend where, different IPR tools such as patent, trademarks, copyrights, designs, trade secrets etc. are available to protect and promote for generation of employment, business and secondary resources for the development of agrarian society (Ravishankar and Archak 2000). Moreover, transfer of these resources is ultimately important to reach its end-users.

Animal science is an important subsector of agriculture research at ICAR, as animal husbandry provides livelihood to 87.7 % of the farmers operating small holdings of farm size and livestock. The vast resource of livestock and poultry in India plays a key role in improving the socio-economic conditions of rural masses. India continues to be the largest producer of milk in the world with 132.43 million tonne

milk in 2012–13 with an annual growth rate of 3.54% (DADF 2014).

Animal Science Division of ICAR coordinates and monitors research activities in its 19 research institutes and their regional centers, with a vision for development of technologies to enhance productivity, profitability, competitiveness and sustainability of livestock and poultry sector for providing food and nutritional security to Indian masses (www.icar.org.in).

ICAR established a three-tier intellectual property (IP) management system in 2006 to manage the intellectual assets, whereby each institute is equipped with knowledge, manpower and freedom of decision, which is governed by its “Guidelines for Intellectual Property Management and Technology Transfer/ Commercialization” (ICAR 2006). To institutionalize this system, ICAR had also launched a scheme in its XI plan budget, which completed 5 years in 2012. Under this system, Institute Technology Management Units (ITMUs) headed by scientific personnel, were formed at all ICAR institutes. To facilitate these ITMUs, five Zonal Technology Management Centers (ZTMCs) were opened in different zones for technology protection, promotion and commercialization. At central level, Intellectual Property and Technology Management (IP&TM) Unit is leading this system by providing budget, technical support in case to case basis and assistance for IP related legal issues. This

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scheme is being given more focus in XII plan budget (2012–17) and rechristened as National Agriculture Innovation Fund (NAIF) with major emphasis on innovation and incubation components.

MATERIALS AND METHODS

This paper is the outcome of assessments of reports, schedules and data of XI plan scheme for IP management at ICAR, and comparison and collection of IP related data from websites of Indian Patent Office (IPO), World Intellectual Property Organization (WIPO), European Patent Office (EPO), United States Patent Office (USPTO) and other paid software. This scheme was executed in XI Plan and later extended for 2013–14. The objectives of this study were (i) to know the intellectual assets of animal science and their IP management status, and (ii) transfer mechanism and status of these assets to entrepreneurs and different public and private organizations.

To collect the information for this study, IP&TM Unit had developed three proforma with all relevant aspects (Management of IP portfolio, commercialization of technologies, outreach activities, capacity building in IP management etc.), viz. *Self-Review, IP Data-Update and Result Framework Document (RFD)*. These proformas were finalized and implemented after vetting from experts in IPR field and time to time revision of them with suggestions from ZTMCs and ITMUs. These were also included in divisional documents of IP&TM Unit for ISO 9001:2008 Certificate, which was authorized and audited by Bureau of Indian Standards (BIS). Self-review and IP data-updating proformas were circulated to all animal science research institutes once in a year from 2008–09 to 2013–14. RFD is a continuous phenomenon, where unit is receiving monthly update on all these aspects.

The collected information was analyzed and compared with different available database and IP parameters; and presented in the form of patents, trademarks and designs with animal science institutes, their processing status at IPO; classification of these assets (subject specific and International Patent Classification (IPC) by WIPO; transferred intellectual assets and their subject specific classification; partnership development; and its impact on organization as well as end-users.

RESULTS AND DISCUSSION

Management of intellectual assets: Intellectual assets tend to achieve the greatest benefits when combined with other assets (Basu *et al.* 2003). To manage and protect these resources, ICAR institutes are using different IP tools, which were analyzed and presented below:

Patents: It is an important IP tool which governs through Indian Patent Act 1970, where law recognizes the exclusive right of a patentee to gain commercial advantage out of his invention. The first patent application was filed by National Dairy Research Institute (NDRI), Karnal, for “*Continuous Ghee Making Machine*” (IN704016) in 1960, followed by “*A Process for Manufacture of Buffalo Evaporated Milk*”

(IN132165) in 1972; and “*Processing of Whey for the preparation of Acidophilus whey drink ‘Acido whey’*” (IN160280) in 1985. From 1960 till 1995, only ten patent applications were filed by individual scientists of NDRI, Karnal and Central Avian Research Institute (CARI), Izatnagar with their own interest.

After that, the effect of TRIPS agreement and general awareness about IP had been increased and the institutes started filing of patents in different research areas of animal science. Sixty-six patent applications were filed by 7 ICAR’s animal science institutes, whereas NDRI, Karnal (7); Indian Veterinary Research Institute (IVRI), Izatnagar (14); CARI, Izatnagar (6); National Research Centre on Equines (NRCE), Hisar (4); Central Sheep and Wool Research Institute (CSWRI), Avikanagar (3); Central Institute for Research on Goat (CIRG), Makhdoom (2); and one by National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI), Bangalore from 1996 to 2006.

Meanwhile, ICAR had implemented its IPR guidelines and launched an IP based scheme which reflected its impact in XI plan period, where 130 patent applications were filed by 14 ICAR institutes, viz. IVRI, Izatnagar (42); NDRI, Karnal (26); CIRG, Makhdoom (23); National Institute of Animal Nutrition and Physiology (NIANP), Bengaluru (7); National Research Centre on Mithun (NRCM), Nagaland (7); CSWRI, Avikanagar (6); National Bureau of Animal Genetic Resources (NBAGR), Karnal; National Research Centre on Equines (NRCE), Hisar and National Research Centre on Pig (NRCP), Guwahati (4 applications each); National Research Centre on Meat (NRCMt), Hyderabad; and Project Directorate on Poultry (PDP), Hyderabad (2 applications each); CARI, Izatnagar; Central Institute for Research on Buffalo (CIRB), Hisar and NIVEDI, Bengaluru (1 application each).

In the last 2 years (2013 to 2014) 39 more applications were filed by 8 ICAR institutes. The cumulative total of patent applications rose to 245 by 15 animal science institute of ICAR. Most of the applications were filed by NDRI, Karnal (75); followed by IVRI, Izatnagar (66); CIRG, Makhdoom (28); NBAGR, Karnal (15); and others. This increasing trend of filing patent applications by animal science institutes at ICAR was the results of continuous efforts of IPR scheme at IP&TM Unit and BPD component of National Agricultural Innovation Project (NAIP). It encouraged the researchers by providing IPR guidelines,

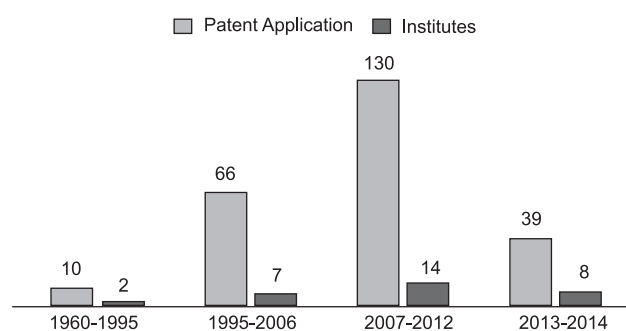


Fig. 1. Trends of patent applications filing.

as well as monetary support to protect their research on time. Figure-1 is showing this trend; where XIth plan period provides a boost by filing 130 applications, which was continued in its extended period also. These results reveal that ICAR is not a leading organisation in patent filing as Council of Scientific and Industrial Research (CSIR) but, it is growing in animal science research, where different animal vaccines and milk adulteration testing kits were protected and available in market chain.

Patent classifications: Patent applications were classified according to their subject area and utility in animal science. There were 17 research areas, whose inventions were filed for patenting, viz. Milk Products and Processes (22%); Animal Health Management (10%); Animal Biotechnology (10%); Animal Health Diagnostic Kits and Animal Nutrition 8% each; Animal Products and Processes (7%); Animal Vaccines (6%); Milk Adulteration Detection Technologies (5%); Meat Products and Processes, Animal Breeding, and Animal Parentage Verification Kits 4% each; Poultry Food Products and Animal Biochemistry 3% each; Animal Husbandry Tools, Poultry Health Diagnostic Kits, and Dairy Machines 2% each; and Poultry Health Diagnostic Kits (1%).

As per IPC of WIPO, which is having 8 sections (A to H) out of that ICAR institutes filed their applications in 7 section, viz. Section A-Human Necessities (54%); Section B-Performing Operations and Transporting (5%); Section C-Chemistry and Metallurgy (30%); Section D-Textiles and Paper (1%); Section F-Mechanical Engineering, Lighting Heating, Weapons and Blasting (1%); Section G-Physics (7%); and Section H-Electricity (3%) (www.wipo.in).

In a next step analysis of this classification through web searching, it was found that in Section- A: 48 applications were filed under its sub-sections A01, A21, A23 and A61; whereas in Section-B: six applications were filed under its sub-sections B01, B08, B23, B60, and B65. In Section-C 33 applications were filed under its sub-sections viz. C02, C06, C07, C08, C10, C12, C13, C14, and C22. One application was filed in each of Section-D (D04) and Section-F (F28); whereas two applications in each were filed in Section-G (G01 and G02) and Section-H (H02 and H04). Animal science research was protected at IPO, in which most of the applications were filed under section A023 (23), A61 (17), C12 (13), C07 (11), A01 (7), G01 (7) and H04 (3); others were also had one or two applications.

The spread of patents in IPC as well as in subject specific classification indicates that, ICAR institutes had a holistic approach of research and cover all the relevant areas. It is also supporting to the research in institutes to compete at international platforms, because IP protection is an important symbol for progressive research in animal science research.

Present status: As per IPO database (www.ipindia.nic.in) the present status of above applications was as follows: 22 (9%) applications were granted to 5 ICAR institutes, viz. NDRI, Karnal (9); CARI, Izatnagar (6); IVRI, Izatnagar (4); NRCE, Hisar (2) and NIVEDI, Bengaluru (1). The remaining applications are in different steps of grant at Indian Patent office, viz. Applications awaiting examination

(32%), Applications not yet published (22%) (Newly filed applications), Applications under examination (18%), Abandoned under Section 9(1), (where Applications were not filed completely) (8%), Applications abandoned U/S 21(1) (5%) (Requirement(s) not met by applicant), Refused for grant (section 15 of the Act) (3%), and Deemed to be withdrawn U/S 11B (4) (2%).

An analysis revealed that most of the applications which were abandoned under Section 9(1), 21(1) and 15 were filed before 2008–09, and were those where inventors had no expertise and support to write or explain their claims. After implementing the IP management scheme at IP&TM Unit, this problem was addressed through ZTMCs and ITMUs. This status also revealed that 18% applications are under publication, where possibility for grant of patent is higher. It is also important that IPO has equipped its website with more functions and improved the speed processing of applications.

Granted patents: Twenty-two patents were granted to 5 animal science institutes, out of which some important patents are as follows: kit for diagnosis of brucellosis; lab scale process for preparation of low cholesterol ghee; method for preparation of diagnostic kit useful for forecasting equine herpes virus-1 disease; method of preparing cooked chicken roll, chicken stock, and mustard oil based chicken gizzard pickle; novel immunosensor apparatus for rapid diagnosis of FMD in livestock; process for commercial manufacture of *kradi*; synergistic mineral mixture for increasing milk yield in cattle; process for the preparation of a new and simple diluents for chicken semen; synergistic mineral mixture for increasing milk yield in cattle. These patents are providing research avenues for frontier areas as well as path for opening the labs to industry.

Trademarks and design: Trademarks are any sign or combination of signs capable of distinguishing the goods or services of one undertaking from those of the other. TRIPS Agreement provides initial registration and each renewal for a term not less than 7 years and shall be renewable indefinitely. By using the importance of this IP tool four animal science institutes had registered their names of birds' species, institute logos, devices and animal based food products. Four ICAR institutes (CARI, Izatnagar (4), NRCMt, Hyderabad (2), NRCM, Nagaland (7) and PDP, Hyderabad (4)) have filed 17 trademarks, which were registered in 4 different classes separately, viz. Class-5 (Pharmaceutical, veterinary and sanitary preparations); Class-18 (Leather and imitations of leather, and goods made of these materials), Class-29 (Meat, fish, poultry and game; meat extracts) and Class-31 (Agricultural, horticultural and forestry products and grains). IVRI, Izatnagar had filed 13 design applications at Indian Patent office, out of that 10 applications were already accepted and published by Indian Patent office.

The above IP protection details reveals that, ICAR institutes well manage their IP resources and their maintenance, which generates different collaborations, consultancies, contract research and service. Efforts in this direction reached to one step ahead of it by transferring

these assets to their end-users. IP protection is a source of repute in scientific community for the researchers as well as organizations. These IP assets help animal science institutes to get different international funds, projects and consultancies.

Transfer of intellectual assets

Intellectual asset transfer through technology commercialization is a parallel process of radical and incremental innovation, the determination of technical and business feasibility, the creation of intellectual assets, and the development of a plan to enter the market (Chakraborty 2013).

Before implementing XI plan scheme of IP management at ICAR, its intellectual assets were generally used to transfer through institute extension system, where gap between demand and supply was unfilled. To bridge this gap, ICAR as well as its World Bank funded NAIP introduced a system, where business aspect was introduced through Zonal Technology Management and Business Planning and Development Units (ZTM&BPDUs). This new system in collaboration with ITMUs developed a business environment for animal science technologies in the leadership of IVRI, Izatnagar as well as CIFT, Cochin. The objectives of this initiative was to promote relationships, communication and collaboration, strengthening of interaction, encouraging month support and development of research with commercial potential, conversion of research results into new products and processes, and to secure reasonable compensation (Melvin 2010).

Intellectual assets: Intellectual assets are the technologies produced by ICAR institutes which may be an input, device, process, practice, implement, know-how, tool or group of multidisciplinary approach which developed through continuous selection, improvement, upgradation, and association of existing and traditional practices, by using new methods of diagnosis/treatments from biological, physical and chemical sciences. These assets were classified in 12 subject specific areas according to their work domain, which were transferred to public and private organization are as follows: Milk Adulteration Detection Technologies, and Animal Health Management and Vaccines share 13% each; Poultry Farming and Poultry Breeds; Animal Health Diagnostic Kits, and Dairy Food Processing shares 10% each; Poultry Health Management (9%); Animal Food Products (8%); Meat Technology and Products, Poultry Food Products, and Dairy Farming Technologies shares 6% each; Animal Nutrition (5%); and Cattle Germplasm Management (4%).

All these assets generated by 12 ICAR institutes, which belongs to different research mandates of animal science research, includes NDRI, Karnal (31); IVRI, Izatnagar (25); CARI, Izatnagar (16); PDP, Hyderabad (10); NRCM, Hyderabad (6); Central Institute for Research on Cattle (CIRC), Meerut (4); CIRG (2); and NBAGR, Karnal; NIANP, Bengaluru; NRCP, Guwahati; NRCE, Hisar; and NIVEDI, Bengaluru share one asset each.

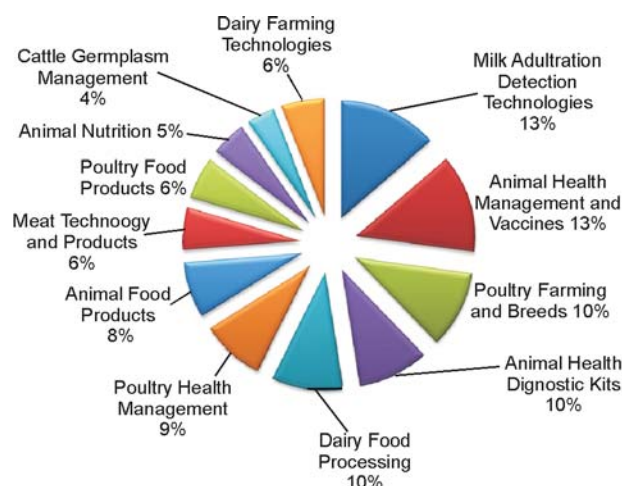


Fig. 2. Subject specific classifications of intellectual assets.

Some important intellectual assets which were transferred by respective institutes to different business houses and presently available in market are as follows:

Vaccine technologies: Peste des Petites Ruminants (PPR) or goat plague; Vero cell based sheep pox vaccine; Goat pox vaccine. **Diagnostics:** Recombinant antigen (VP7 protein) based indirect ELISA blue tongue antibody detection kit; Non-structural protein 3ABC based diagnostics assay (ELISA) for foot and mouth disease to Differentiate Infected from Vaccinated Animals (DIVA); A rapid test for detection of non-structural protein 3ABC antibodies from foot-and-mouth disease virus infected animals. **Milk adulteration testing kits:** A qualitative and quantitative test for anionic detergent in milk, detection of *Listeria monocytogenes* in milk, detection of *Enterococci* in milk, and kit for parentage verification in buffaloes; Zebu cattle (*Bos indicus*); camels (single and double humped); and ruminant livestock.

Protected assets transfer: ICAR institutes are using different IP tools to protect their intellectual assets viz. patents, trademarks, copyrights and designs. Till date 245 patent applications, 18 trademarks and 13 designs were filed by 15 animal science institutes of ICAR. Out of these protected assets, 22 patent (4 applications already granted to CARI, Izatnagar) applications and most of the trademarks were transferred to different organisations and stake holder through commercialization process. This was an important achievement, where 9 % of transferred assets were protected by IP law against the world average, which is less than one % (DeGeeter 2010). Thus 21.56 % transferred assets were IP protected within a short time span (2006 to 2014), which was also a successful indicator for ICAR as a research organization.

Partnership development: To transfer these assets, 12 ICAR institutes viz. IVRI, Izatnagar (50); NDRI, Karnal (43); CARI, Izatnagar (31); NRCM, Hyderabad (12); PDP, Hyderabad (8); CIRC, Meerut (6); 4 each NBAGR, Karnal and NIANP, Bengaluru; 3 each CIRG, Makhdoom and NRCE, Hisar; and one each NIVEDI, Bengaluru and NRCP, Guwahati were developed 166 partnerships with 110

national and international organisations, during the period 1991 to 2005 (5) and 2006 to 2014 (161). These organizations were classified according to their domain area, regions, administration and control and found that 30% organizations were operating in local areas (at district or block levels), followed by 16% Entrepreneurs, 15% National Level Companies, 14% State Level Companies, 9% State Agricultural Universities, 6% State Government Departments, 5% Multinational Companies and International Organizations, and 5% National Institutes and Non-Governmental Organisations.

Time span: As per information received from different ITMUs, it was found that CIRC, Meerut signed first 2 agreements for Germplasm and Data Recording Unit (1991) and Field Progeny Testing (1995); followed by NDRI, Karnal to Khoa Making Machine (1997) and Long Shelf life Paneer (2005); meanwhile NRCM, Hyderabad had also signed an agreement for its Process for Production of Emulsion Based Products (2001). These were the individual efforts, later on the effect of implementation ICAR's guidelines for IP management (2006); IPR Scheme in 2007 and NAIP funded BPD units enhanced these partnerships from 5 to 166 till 2014.

Mode of transfer: To transfer these assets, ICAR institutes used different mode of transfer which fixed the responsibility of the partner as well as respective institutes for security, sensitivity and technical feasibility. All these technologies were assigned to the partners through signing of Memorandum of Understandings (65%), Licensing Agreements (23%), Consultancy Agreement (5%), Contract Research Agreements (4%) and know-how and direct supply to different entrepreneurs and stakeholders (3%). The score of MoUs was high; because most of the assets were in the form of know-how, which were transferred through technical assistance; advice, suggestions, onsite guidance etc.

Impact of IP management system: The major objective of ZTM & BPD Unit was to foster and promote Public Private Partnership (PPP) concept so that benefits of research and development of animal science institutions could find a better reach-out to the stakeholders, entrepreneurs, field veterinarians, start-up companies and farming community for their profitable exploitation. These units set in the areas of technology commercialization, entrepreneurship development, and management of intellectual property rights. Harmonization of IP regimes, access to technologies required for biotechnological research and development through easy licensing and/or patent exemptions especially for public goods oriented research would pave way for making private investment or private public participation attractive in animal science sector (Ramesha *et al.* 2010). As mentioned, 102 technologies in 12 different streams of animal science, which includes animal breeding methods; animal health management and vaccines; diagnostic kits for animal health, milk adulteration and poultry health management; animal and milk based food products and their processing to 110 partners. The partnerships were spread over the country

which include local entrepreneurs, state and national level companies, government organisations as well as national and international institutes. In the area of business resource development, 29 entrepreneurs were registered and 23 incubatees were graduated. Other than this, 76 consultancy assignments were undertaken and 1,354 farmers were directly benefitted with the value addition (NAIP 2014).

The outcome of this study emphasizes that intellectual assets management of animal science research is the key source for developing its research and business prospects. Among 19 ICAR institutes of animal science research, 15 are using different tools of IPRs for protecting their research and maintaining them as per requirement of law. Patent is the leading IP tool followed by trademark and design. Protection of intellectual assets in the animal sciences also encourages the business incubation dimensions and facilitates the growing partnerships with different type of stake holders including public and private organizations. The study reveals that the recent trend in the animal science sector supports and encourages the entrepreneurship development culture and encourages scientific fraternity interaction with incubatees is opening the new path for IP progress. The institutionalization of IPR through XI plan scheme in NARS had given a path for opening research labs as incubation centers. With these remarkable results in protection and transfer of intellectual assets, the new initiatives have been evolved and extended in the country's future dynamic areas like grass-root innovators as well.

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