CHAPTER II : MINISTRY OF AGRICULTURE AND FARMERS' WELFARE

Coastal Aquaculture Authority, Chennai

2.1 Establishment of regulatory and administrative mechanism for coastal aquaculture by the Coastal Aquaculture Authority

Survey of coastal areas to delineate land suitable/unsuitable for aquaculture was not carried out. Adequate regulations for construction, operation, inspection and monitoring of aquaculture farms were not framed. Standards for inputs used in aquaculture, Standard Operating Procedure for testing of waste water samples and guidelines for periodicity of DLC/SLC meetings were not prescribed. Environment Protection Fund for compensating the affected persons was not created and Grievance Redressal Mechanism was inadequate.

2.1.1 Introduction

The Ministry of Environment and Forests (MoEF), New Delhi constituted (February 1997) an Authority called 'Aquaculture Authority' (AA) on the directions (December 1996) of Supreme Court in response to a public interest petition[1]. The AA was vested with all the powers necessary to protect the ecologically fragile coastal areas, sea shore, water front and other coastal areas and was specially expected to deal with the situation created by the shrimp culture industry in the Coastal States/Union Territories (UTs). Subsequently, the Parliament enacted (June 2005) the 'Coastal Aquaculture Authority (CAA) Act, 2005' (Act) under which the Coastal Aquaculture Authority (Authority) was established. The main objective of the Authority is to promote sustainable development of coastal aquaculture in coastal areas[2] without causing damage to the coastal environment and to ensure that the concept of responsible coastal aquaculture is followed.

Section 3 of the Act empowers the Central Government to take all such measures to ensure that the coastal aquaculture does not cause any detriment to the coastal environment and the concept of responsible coastal aquaculture contained in the guidelines so framed, is to be followed to protect the livelihood of various sections of the people living in the coastal areas.

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1 WP (Civil) No. 561 of 1994 in the Supreme Court highlighting the serious threats posed to the environment by the uncontrolled intensified shrimp farming.

2 The area of land within two kilometres from the High Tide Line (HTL) of seas, rivers, creeks, and backwaters in the country.

The powers and functions of the Authority include making regulations for the construction and operation of aquaculture farms within coastal areas, inspecting coastal aquaculture farms to ascertain their environmental impact, registering coastal aquaculture farms and ordering the removal or demolition of any coastal aquaculture farm causing pollution after giving hearing the occupier of the farm. CAA Rules, 2005 were notified (December 2005) by the Government of India (GoI), Ministry of Agriculture which contained the administrative powers and procedures of the Authority and guidelines for regulation of coastal aquaculture, hereinafter referred to as 'Guidelines'. Subsequently, the GoI notified (March 2008) the Coastal Aquaculture Regulations, 2008 which mainly included norms for conduct of Authority meetings, method of recruitment of employees of the Authority, etc. For processing the applications for registration/renewal of registration of coastal aquaculture farms, State Level Committees (SLCs)[3] and District Level Committees (DLCs)[4] were set up. A total number of 35,670 aquaculture farms and 302 hatcheries had been registered by the Authority as of March 2018 in the 12 Coastal States/UTs of the country.

2.1.2 Objective and Scope

An audit was undertaken with the objective of verifying whether an effective regulatory and administrative mechanism had been put in place by the Authority, as envisaged in the directions from the Supreme Court and the CAA Act, 2005, to regulate the coastal aquaculture farming. Records covering the period 2013-14 to 2017-18 were examined at the Coastal Aquaculture Authority, Chennai, Tamil Nadu SLC, Chennai, and four[5] DLCs of Tamil Nadu.

2.1.3 Audit Findings

Even though the Coastal Aquaculture Authority had been formed under the Act as early as in 2005, Audit noted that till date (July 2019), the regulatory and administrative mechanism was deficient. Additional regulations to govern Coastal Aquaculture are yet to be framed, standards have not been set, and

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[3] 12 SLCs in Coastal States/Union Territories (UT) with Secretary in-charge of Fisheries Department of the State/UT Government as Chairperson and Secretaries of Revenue, Environment Departments of the State/UT Government and a representative of Marine Products Export Development Authority (MPEDA) as members and the Commissioner/ Director in-charge of Fisheries Department of the State/UT Government as Member-Convener.

[4] At the District Level, there are 68 DLCs consisting of the District Collector as Chairperson and representatives of Revenue, Agriculture, Environment Departments and Zilla Parishad as members and the District Level Fisheries Officer of the State/UT Fisheries Department as Member-Convener.

[5] DLCs at Cuddalore, Nagapattinam, Thanjavur, and Thiruvarur were selected based on district-wise highest number of farms registered in Tamil Nadu.

environment protection fund had not been created till date (July 2019). The details are as discussed below:

2.1.3.1 Regulations for construction and operation of aquaculture farms

Section 11(1)(a) of the Act states that it is the responsibility of the Authority to make regulations for the construction and operation of aquaculture farms within the coastal area. The existing regulations/guidelines were not adequate as they did not stipulate that coastal aquaculture has to be carried out only with the prior approval of the Authority. It also did not prescribe the procedure to ascertain compliance with the norms before according registration nor did they set out regulations about how existing aquaculture farms could register with the Authority.

Though created in 2005, the Authority set up an Expert Group[6] to frame the regulations for construction and operation of facilities connected with coastal aquaculture activities only in May 2014. This was in response to the Andhra Pradesh High Court (HC) admitting three Writ Petitions[7] on complaints regarding location of shrimp farms adjoining the agricultural lands causing seepage of saline water and pollution due to effluents from shrimp farms. The Terms of Reference (ToR) of the Expert Group included making of regulations for construction activity associated with coastal aquaculture facilities and suggesting required norms for site selection, excavation/construction/ installation of such of the facilities required for coastal aquaculture without causing detriment to the coastal environment so that the concept of responsible coastal aquaculture is complied with. The Expert Group which was to submit its Report to the Authority within 90 days, met twice (August 2014 and December 2014) and is yet to submit the Report (July 2019).

The Authority stated (May 2019) that the framing of the Expert Group Report was delayed as the post of Chairperson of the Authority had been lying vacant since 2015 and that the Expert Group did not meet subsequently due to administrative reasons.

Thus, even after 14 years of enactment of the Act, the Authority had not yet framed adequate regulations for the construction and operation of aquaculture

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[6] Expert Group consists of Member Secretary, CAA as chairperson; Scientist 'F', National Institute of Ocean Technology, Chennai & Member CAA as Member; A representative from Central Institute of Brackish-water Aquaculture (CIBA), Chennai with background of aquaculture engineering as Member; A representative from the Union Ministry of Environment and Forests as Member; and Assistant Director (Tech.), CAA as Member Convenor.

[7] No. 33146 of 2012, No. 8164 of 2013 and No. 21174 of 2013.

farms within the coastal areas. The Authority did not hold the Expert Group accountable despite its inability to deliver according to the mandate of its ToR.

2.1.3.2 Environment Protection Fund

The Supreme Court had directed (December 1996) that an "Environment Protection Fund" should be created with the proceeds from compensation received from the aquaculture polluters. The fund was to be utilised for compensating the affected persons as identified by the Authority and also for restoring the damaged environment. However, no provision for creation of such a fund was provided in the Act/Rules/Regulations and no 'Environment Protection Fund' was created by the Authority, as such.

In similar cases where environment is affected, the GoI had established Compensatory Afforestation Fund, as per order of Supreme Court in 2002, to be utilised for afforestation, regeneration of forest ecosystem, wildlife protection and infrastructure development. Similarly, District Mineral Foundations (DMFs) were set up in all districts in the country affected by mining related operations as per mandate of the Mines and Minerals (Development & Regulation) Amendment Act, (MMDRA) 2015. The DMFs were to work for the interest and benefit of persons and areas affected by mining related operations and is funded through the contribution from miners which is fixed by the Central Government.

The Authority stated (March 2019) that the creation of Environment Protection Fund would be proposed in the next meeting and would be placed before the Ministry for approval and added that so far, no compensation had been given to affected parties.

2.1.3.3 Norms for Water Spread Area (WSA)

Para 4.9 of the Guidelines *inter alia* stipulate that the WSA of a farm should not exceed 60 *per cent* of the total area of the farm land. The Authority had, however, decided (February 2007) not to insist on the above mandatory condition in respect of farms with less than two hectares (ha), but in case of larger farms, the stipulated percentage was to be strictly complied with. Audit noticed that, out of 35,670 farms registered by the Authority, the WSA of 24,417 farms was more than 60 *per cent* of the total farm area as detailed in **Table No. 1**. It is pertinent to mention here that the Authority failed to maintain the ratio even in case of larger farms (more than two ha).

Table No. 1: Details of Water Spread Area

Category	No. of Farms registered	No. of Farms in which WSA is more than 60% of Total Farm Area	No. of Farms in which WSA is more than 90% of Total Farm Area
Farm area of up to 2.00 ha	29,579	20,339 (69%)	983
Farm area between 2.00 and 5.00 ha	5,312	3,621 (68%)	162
Farm area more than 5.00 ha	779	457 (59%)	12
Total	**35,670 (100%)**	**24,417 (68%)**	**1,157 (3%)**

The relaxation in Guidelines was not notified by the Authority in the Official Gazette as laid down under Section 25 of the Act which states that the Authority may make Rules and Regulations by notification in the Official Gazette.

The Authority stated (March 2019) that it had carried out analysis of Total Farm Area (TFA) *vis-à-vis* WSA and found that 24 *per cent* of farms still retain 60:40 (WSA: TFA) ratio in most of the states. Since most of the applications pertain to small farms of less than two ha, a flexibility was given with respect to area between TFA and WSA since the provision of land area is not related to any environmental issue. Efforts are, however, made to amend the ratio of WSA: TFA under the present aquaculture scenario.

The reply is at variance with our understanding that 68 *per cent* of the farms, as indicated in the table above, have WSA of more than 60 *per cent* of the TFA, which include 174 farms which are above the relaxed norms of two ha which in any case have not been notified as yet. The Authority also failed to maintain the ratio even in case of larger farms (more than two ha). Further, the minutes of the meeting (28 February 2007), in which the Authority had taken the decision, do not mention of any study/analysis being carried out to assess the impact of relaxation of the cap on WSA. The relaxation of this mandatory provision was not in the interest of safeguarding the coastal areas from social and environmental impacts since the smaller farms (up to five ha) were already exempted, under Para 13.4 of the Guidelines, from the provision of mandatory Effluent Treatment Systems unlike large farms resulting in waste water from these shrimp farms which is high in nitrogen, phosphorous, carbon compounds, organic matter etc. getting dissolved in soil and polluting the ground water/irrigation canals and also the soil quality.

2.1.3.4 Procedure for conduct of Environmental Impact Assessment of large farms

As per Para 15.1 of the Guidelines, an Environment Impact Assessment (EIA) should be made even at the planning stage by all the aquaculture units of more than 40 ha of WSA. The DLCs/SLCs set up by the Authority should ensure that

EIA has been carried out by the aquaculture units before they forward their recommendations to the Authority for registration. Similarly, as per Para 16.1 of the Guidelines, the shrimp culture units with a net water area of 40 ha or more shall incorporate an Environment Monitoring Plan and Environment Management Plan (EMMP) covering the impact on watercourses in the vicinity, on ground water quality, on drinking water sources, on agricultural activity, on soil and soil salinisation, waste water treatment and Green Belt development (as per specifications of the Local Authorities).

As per the guidelines issued (September 2006 & May 2012) by the MoEF on EIA, the EIA shall be prepared on the basis of the existing background pollution levels *vis-à-vis* contributions of pollutants from the proposed plant and shall address some of the basic factors like – meteorology and air quality; hydrology and water quality; site and its surroundings; occupational safety and health; details of the treatment and disposal of effluents (liquid, air and solid) and the methods of alternative uses; control equipment and measures proposed to be adopted. Preparation of EMP is required for formulation, implementation and monitoring of environmental protection measures during and after commissioning of projects. Further, MoEF had constituted State Level Environmental Impact Assessment Authorities to examine the EIA applications and accord permission for taking up specified activities. However, though the Guidelines of CAA mandate for preparation of an EIA and EMMP, the Guidelines are silent about the procedure for preparing an EIA and EMMP and about the competent environmental authority to make such an assessment.

The Authority had registered 16 farms each with a WSA of 40 ha or above as of March 2018. Audit scrutiny of the records pertaining to 13 farms made available revealed that:

(a) Eight out of the 13 farms[8] had merely furnished a self-certificate to the effect that they made EIA but no reports incorporating the details of EIA were furnished. Three farms had submitted the EIA report prepared by private firms and one farm had not furnished any statement in this regard.

(b) 11 farms had merely furnished a self-certificate of EMMP without any supporting documents.

[8] Registered between August 2008 and January 2018.

Farm in Nagapattinam District of Tamil Nadu where effluents are let out on the road

Farm in Cuddalore District of Tamil Nadu where the effluents are let out in open

The Authority replied (September 2018) that the EIA/EMMP should be made by the concerned aquaculture units and it will be verified by the DLC/SLC before their recommendations of the farms to the Authority.

Audit is unable to conclude how the SLCs had ensured that the EIA had been carried out and EMMP had been prepared by the aquaculture units of more than 40 ha, while forwarding their recommendations to the Authority for registration, based merely on the self-certifications of the applicants.

We recommend that Remote sensing and satellite data be utilised to map aquaculture farms and ensure that farms of size greater than 40 ha have indeed carried out EIA as mandated, and lay down guidelines for such EIA and ensure that it is validated by the SLC/DLC before forwarding it to the authority

2.1.3.5 Survey of coastal areas to delineate land suitable/unsuitable for aquaculture

Rule 5(iii) of the CAA Rules, 2005 requires the Authority to survey the entire coastal area of the country and advise the Central and the State/UT Governments to formulate suitable strategies for achieving eco-friendly coastal aquaculture development. The Guidelines also envisage that detailed master plans for development of aquaculture through macro and micro-level surveys of the potential areas and zonation of coastal area delineating the land suitable and unsuitable for aquaculture using the remote sensing data, ground truth verification, Geographical Information System (GIS) and socio-economic aspects should be considered. In areas where pond density or WSA of shrimp ponds are in excess of Carrying Capacity (CC) of the eco-system, a reduction in pond density and thus, a reduction in the overall WSA should be effected. The Authority had not conducted any such survey even after 14 years of its establishment. The Authority replied (March 2019) that the land survey of costal states for suitability or non-suitability for aquaculture being a herculean task requires huge manpower and investment.

Most of the States and MPEDA have completed geo-tagging of various aquaculture farms. The Authority contemplates acquiring the data from these Authorities and will come out with the study of delineating suitable/unsuitable aquaculture areas.

As the data on geo-tagging of the farms stated to be done by the States Authorities/MPEDA was not made available to Audit, Audit is unable to comment on the relevance and correctness as to how the data would serve the purpose of the Authority and by what time, the Authority would complete the work of delineation of coastal areas for aquaculture activities. The excuses put forth by the Authority are hardly acceptable, as the Authority has been formed for regulating aquaculture

2.1.3.6 Standards for Coastal Aquaculture Inputs

The functions of the Authority, include fixation of standards for all coastal aquaculture inputs[9] for the maintenance of the water bodies and the organisms reared therein and other aquatic life. Inputs used in coastal aquaculture play a vital role in sustainable aquaculture. Food Safety Standards Authority of India issued Food Safety and Standards (Contaminants, Toxins and Residues) Regulations, 2011 which mention the permissible items and their tolerance limits in respect of antibiotics/drugs used in the process of shrimp production. A sub-committee, formed (May 2008) by CAA for fixing standards for probiotics with a timeline of three months to submit a report, had not furnished any report. No further action was taken by the Authority for fixing standards of probiotics and other inputs.

The Authority stated (July 2018) that no standards were fixed for inputs as they did not have required skilled manpower, infrastructure facility and financial support. The reply is not tenable as the Authority should have taken up the case of insufficient resources with the Ministry and made an attempt to recruit personnel from the academic and institutions dealing with the subject, since it is not an unknown commercial activity for the entity. The Authority further stated (March 2019) that the sub-committee could not submit report since no plausible decision could be arrived by the committee members. A new Committee has been set up especially in the wake of export rejections due to antibiotic usage and final committee meeting would be shortly convened for developing guidelines for inputs. No timeline was mentioned by the Authority to complete this job which had a significant impact on the commercial and safety aspects of the aquaculture farm.

[9] Feed, feed additives, disinfectants, immune-stimulants, probiotics, drugs and other growth supplements.

2.1.3.7 Standard Operating Procedure (SOP) for testing waste water samples

The waste water from shrimp farms contains suspended solids comprising unconsumed feed, faecal matter and plankton[10] and dissolved nutrients such as ammonia, nitrite, phosphorus, carbon-di-oxide, hydrogen sulphide. The nutrients and organic matter in the waste waters have potential to cause reduction in dissolved oxygen in receiving waters due to breakdown of dissolved and particulate organic matter and other waste materials.

Para 13.4 read with 13.5 of the Guidelines stipulate that before discharging the waste water into environment by any hatchery/farm/feed mills/processing units, the waste water has to be properly treated in an Effluent Treatment System (ETS) and the intensity of the Residual Suspended Solids/Biological Oxygen Demand (BOD)/Chemical Oxygen Demand (COD) dissolved nutrients has to be ensured within the permissible levels[11]. However, the Authority had not notified any SOP for testing the samples in the laboratory/conducting such tests. Quality of water that is to be let out had not been defined with regard to Suspended Solids/BOD/COD and dissolved nutrients.

The Authority established its own laboratory in 2011 at a cost of ₹ 82.12 lakh for testing of waste water samples collected from farms. The laboratory was not accredited by any Accreditation Authority *viz.*, NABL, ISO, etc. The Authority had not drawn any Annual Action Plan for the number of waste water samples to be collected and tested. During the period from March 2011 to April 2016, only 275 waste water samples were collected and tested in the laboratory. In 85 of the 275 samples, the test results indicated that suspended particulate matter were beyond the permissible limits. The Authority warned the farm owners wherein samples revealed irregularity and directed them to take rectificatory action. However, no samples were collected thereafter by the Authority, even in the above cases where irregularity was noticed.

Thus, one of the main functions of the Authority, i.e., to ensure that waste waters from coastal aquaculture units does not cause any damage to environment, had not been carried out by the Authority effectively. Also, the laboratory established at a cost of ₹ 82.12 lakh to test waste water samples had been kept idle since May 2016.

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[10] The small and microscopic organisms drifting or floating in the sea or fresh water, consisting chiefly of diatoms, protozoans, small crustaceans, and the eggs and larval stages of larger animals.

[11] Suspended solids (Max milligrams per litre (mg/l)) – 100 (Coastal Marine Waters) & 100 (Creek or estuarine courses when the same inland water courses are used as water source & disposal point); BOD (Max mg/l) – 50 & 20 respectively; COD (Max mg/l) – 100 & 75 respectively.

The Authority stated (March 2019) that the laboratory was used as and when randomly the water samples were collected. Due to various administrative reasons, manpower and fund deficiency, the lab was not utilised at full strength in later three years. The Authority contemplates to establish a functional lab and fully utilise the equipment and seek requisite accreditation.

While there is no separate Sanctioned Strength for the laboratory, the Sanctioned Strength of the Authority includes two Senior Technical Assistants, one Assistant Director (Tech.) and one Director. The post of the Assistant Director (Tech.) is vacant since June 2016 and no efforts of the Authority to recruit staff and make the laboratory functional were noted.

2.1.3.8 Regulations for periodicity of conduct of meetings of DLC/SLC

The CAA Regulations, 2008 stipulate a timeframe of four and two weeks for the disposal of application by the DLCs and SLCs respectively from the date of receipt of applications, but the Authority had not framed any regulations regarding the periodicity and places of the meetings of the DLCs/SLCs, and the rules including quorum to be observed at its meetings during the transaction of business. Since the conduct of meetings was irregular, 319 applications for registration/renewal were pending with the four Committees[12] as on 31 March 2018 for periods ranging from May 2007 to August 2017. In case of SLC, Tamil Nadu, no meeting was conducted after November 2012.

The Authority replied (March 2019) that the delay in processing was due to the non-availability or pre-occupation of the Chairperson of DLC/SLC and that it was beyond the purview of the Authority to frame regulations. The reply is not acceptable as Section 25 of the Act enables the Authority to frame regulations for better monitoring of coastal aquaculture and a primary objective should be quick and timely disposal of applications.

2.1.3.9 Verification of small farms before registration

As per provisions of Rule 10 (1)(b) of the CAA Rules, 2005 read with Section 13 (7) of the Act, in the case of application of shrimp farms above 2.0 ha WSA, the DLC shall have to inspect the farm concerned to ensure that the farm meets the norms specified in the Guidelines with specific reference to the citing of coastal aquaculture farms prior to making recommendation, through the SLC, to the Authority.

However, the above inquiries and inspections are not a pre-requisite for shrimp farms up to 2.0 ha of WSA, since the provisions of Rule 10 (1)(a) of the CAA

[12] SLC at Tamil Nadu and DLCs at Nagapattinam, Thanjavur and Thiruvarur.

Rules, 2005 empowers the DLCs to recommend the applications directly to the Authority, upon satisfaction of the information furnished in the application.

Audit noticed in a test check of complaints regarding the failure to maintain requisite distance from the nearest agricultural farms were received against some of these smaller farms with a WSA of less than or equal to 2.0 ha (each) registered by the Authority on the recommendations of DLCs (4 farms in Cuddalore district of Tamil Nadu and 5 farms in Guntur District of Andhra Pradesh). Audit further noticed that 83 *per cent* of the farms registered by the Authority (i.e., 29,579 out of 35,670 registered farms) were smaller farms each having WSA of 2.0 or less. As such, prior inspection of the farm, irrespective of the size of the farm, should have been stipulated to safeguard environmental issues due to violations that would impact agricultural fields and drinking water resources.

	
Farm in Cuddalore District of Tamil Nadu where the farm is adjacent to water body	**Farm in Cuddalore District where ground water is tapped for farm**

Authority stated (March 2019) that due to manpower shortage, the applications could not be processed after onsite verification. However, the states were approached in case of clarification or queries raised by stakeholders.

Reply is not tenable, since it was not clear as to how this would help, when the farms had already been established and no details were provided as to which stakeholders were heard and what was considered.

2.1.3.10 Single Window System of registration

The coastal aquaculture farms, hatcheries and inputs used in coastal aquaculture are registered by the Authority. Processing Centers and Export Agencies are registered by MPEDA, which is an autonomous organisation under Ministry of Commerce dealing with export of all marine products from India. The shrimp quality check labs and ELISA screening centers for Pre-Harvest Test are also operated by MPEDA. However, the feed mills, input manufacturers and

Polymerase Chain Reaction (PCR)[13] laboratories are not being registered and monitored by any Authority. Thus, there is no single-window system of registration of all stakeholders in the shrimp production. Lack of single window registration system in the country for shrimp culture was also commented (November 2017) by European Union (EU) teams (shrimp importers from India) during their visit of farms in the country.

The Authority stated (March 2019) that to bring the registration process under "Single Window" system, it has requested MPEDA to transfer details of farms enrolled with them. The Authority contemplated to bring PCR equipment registration under its purview and also bring notification for input registration. This provision needs to the initiated early and with a specified timeline for compliance.

2.1.3.11 Renewal of registration

Section 13 (3) (a) of the Act stipulates that the registration shall be valid for a period of five years. Further, Section 13(10) of the Act stipulates that any application for the renewal of such registration shall be filed along with the prescribed fees within two months before expiry of such registration of a farm.

Audit observed that out of 35,670 farms registered by the Authority up to the end of March 2018, the validity of the registration of 22,216 farms (62.28 *per cent*) had expired during the period between 2012 and 2017 and not renewed yet. Non-renewal of registration resulted in non-realisation of registration fee to the extent of ₹ 1.27 crore. Test check in audit showed that 725 farms in Nagapattinam District have been continuing the aquaculture activities even after expiry of their registration.

The Authority replied (March 2019) that renewal of registration has been an impending factor as the Authority had to depend on DLCs/SLCs recommendations. Through persuasion during the last year (2018), the Authority could gather from many states, renewal applications for registration, but there were no specific numbers cited for such renewal requests received as against the required number considering expired registrations.

Even though the Authority was aware of the expiry of the registrations from time to time, it had no mechanism in place, such as alerts through the digital database/system, to remind the DLCs/SLCs to ensure renewal of registration in

[13] Polymerase Chain Reaction (PCR) PCR is a laboratory method used for making a very large number of copies of short sections of DNA from a very small sample of genetic material. This process is called "amplifying" the DNA and it enables specific genes of interest to be detected or measured.

time and discontinuance of operations by farms that had not renewed the registration.

2.1.3.12 Inspection and Monitoring of Aquaculture Units

Section 11(b) of the Act stipulates that the Authority shall inspect coastal aquaculture farms to ascertain their environmental impact caused by coastal aquaculture. An adequate inspection and monitoring of coastal aquaculture units is essential for effective discharge of the basic functions of the Authority i.e., to ascertain the environment impact caused by coastal aquaculture and to order for removal or demolition of farms causing pollution.

The Central Pollution Control Board (CPCB) carries out random surprise inspection of the 17 categories of highly polluting industry sectors to verify their compliance and on receipt of public complaints. Since, aquaculture farms/hatcheries do not fall under these 17 categories of industries, their periodic monitoring is not being carried out by CPCB. It has not mandated any such periodic monitoring by State Pollution Control Boards (SPCBs) also and the respective SPCBs decide upon the frequency of such monitoring based on the pollution potential and categorisation of such individual units.

In spite of the absence of monitoring by CPCB/SPCB, the Authority being the regulator for aquaculture farms in the country, through the CAA Rules, 2005 did not provide any periodicity of inspection of the aquaculture farms. Authority has no inspection plan based on the size of the farm or target for number of farms/hatcheries to be inspected in a year. For inspection of thousands of farms spread out in entire coastal line of the country and in the adjacent areas of various rivers and creeks, there are four technical posts sanctioned in the Authority and it has no Regional/Branch Office even in the places such as Andhra Pradesh where the farms density was as high as 54 *per cent* of the total registered farms. During April 2013 to March 2018, the Authority inspected only 246 farms and 213 hatcheries.

The Authority stated (March 2019) that due to manpower deficiency, limited inspection was conducted.

2.1.3.13 Grievance Redressal Mechanism

No Guidelines were framed by the Authority with regard to the procedure and timelines on how to attend a complaint *viz.*, (i) after receiving the complaint within what time the complainant has to be given first response, (ii) if forwarded to DLC for verification, within what time they have to reply, (iii) if reply is not received from DLC, whether and when the matter has to be

escalated to higher authority (SLC), (iv) if no reply is received from SLC, within what time it has to be placed in Authority meeting and get their further directions, etc. No Citizen's Charter was prepared by the Authority to clear the grievances as seen from their portal. The complaints were in most cases simply forwarded to the DLCs.

From a scrutiny of the available files, Audit observed that there were complaints of serious nature like huge area of coastal land with vegetation taken for construction of illegal shrimp farming, construction of ponds neighbouring paddy fields, close to habitats, polluting groundwater, etc., In many cases, the complaints received by the Authority were forwarded to the DLC of the respective district and the Authority asked them to enquire the facts of the complaint and called for their response but not followed up thereafter, even in cases where pollution of groundwater in the vicinity were reported.

The Authority stated (March 2019) that complaints are recorded in a register and complaints are sent to DLCs/SLCs for verification, confirmation and reporting but no action is seen forth from DLCs/SLCs.

Since 2018, the Authority is said to have conducted site inspection with a team and responded to the complaints. However, no details of site inspection carried out in response to complaints were provided and no complaint registers were furnished to Audit.

2.1.4 Conclusion

The main objective of the Authority is to promote sustainable development of coastal aquaculture in coastal areas without causing damage to the coastal environment and to ensure that the concept of responsible coastal aquaculture is followed. The Authority did not frame adequate regulations for construction and operation of aquaculture farms and conduct of periodical meetings by SLCs/DLCs. "Environment Protection Fund" envisaged by the Supreme Court order to compensate the affected persons as identified by the Authority and also for restoring the damaged environment was not created.

The Authority relaxed the TFA:WSA norms without any analysis on record and without following due procedure of notifying the amendments in the official gazette. Guidelines did not prescribe the procedure for making an EIA and EMMP and about the competent environmental authority to make such an assessment. Authority had not carried out survey of coastal areas to delineate land suitable/unsuitable for aquaculture. Authority has not fixed standards for aquaculture inputs like feeds, feed-supplements, drugs, etc.

SOP has not been prescribed for testing of wastewater samples by Authority. No samples had been collected and tested since last three years due to non-functioning of laboratory. Provisions for verification of small farms before registration were not adequate. There was no single window system of registration for all the parties in the coastal aquaculture activity.

Authority did not ensure renewal of registration of farms after validity period of five years and the farms continued to operate without valid registration. Authority had not framed a proper plan for inspection and monitoring of aquaculture units. Proper grievance redressal mechanism to attend to complaints relating to environmental issues of coastal aquaculture farms had not been established by the Authority. The Authority does not have any mechanism to monitor quantum of damage to the environment. There is an urgent need to step up reliance on advanced technologies such as geo-spatial information systems for identification of the farms during registration process, inspection and monitoring.

Recommendations

The Authority needs to prepare a Plan of Action to fulfill the objectives of its creation very early.

It should also adopt digital technology and remote sensing to map aquaculture farms and their composition, registration and spread

Regarding manpower, it needs to accelerate recruitment through regular or contractual process preferably directly from campuses where related subjects are taught

The observations were issued to the Ministry of Agriculture and Farmers' Welfare in November 2018 and their reply is awaited (December 2019).

2.2 Working of Central Arid Zone Research Institute, Jodhpur

Out of 21 commercialisable technologies developed by CAZRI since its inception, 13 technologies were yet to be commercialised as of March 2019 and eight technologies though commercialised, could not reach the end users. Out of 14 Intellectual Property Rights enabled technologies, patents for only six technologies could be obtained by CAZRI till March 2019. Institute was not successful in releasing new foodgrain crop variety since 2005. Evaluation Committee, for carrying out objective evaluation of all research projects was not formed. In 35 test checked cases audit noticed that CAZRI was primarily dependent on Scientists to choose the research project and no record was available to show involvement of stakeholders and farmers in research topic selection. Average shortage of 35 *per cent* existed in scientific staff. The average publication of research papers in

Indian and foreign Journals by scientists of CAZRI was only 68 per year during 2012-18. Out of total 405 research papers published by Scientists only 149 papers were published in journals having six and above rating by National Academy of Agricultural Sciences. Citation index of research papers revealed that 252 out of 405 research papers were never cited. CAZRI was not aware until 2015 that Institute was in short possession of 16.43 acres of land. Shortfalls were noticed in coverage of blocks under Frontline Demonstrations, On-farm Trials and achievements of various kinds of training programmes by *Krishi Vigyan Kendras*.

2.2.1 Introduction

The arid zone of India covers about 12 *per cent* of the country's geographical area occupying 38.7[14] million ha. The Central Arid Zone Research Institute (CAZRI), Jodhpur was established (1952) as Desert Afforestation Station, later expanded (1957) into Desert Afforestation and Soil Conservation Station and subsequently upgraded (1959) to a multidisciplinary research institute of Indian Council of Agricultural Research (ICAR), New Delhi, which is an autonomous organisation under the Department of Agricultural Research and Education (DARE) of Ministry of Agriculture and Farmers' Welfare, Government of India.

CAZRI carries out research projects through six divisions[15] located at the Headquarters in Jodhpur and five Regional Research Stations (RRS) located in different agro-climatic zones which work on location specific issues. CAZRI hosts three Krishi Vigyan Kendras (KVKs) at Jodhpur, Pali and Kukma-Bhuj for carrying out agricultural extension activities[16] viz. 'On Farm Trials'[17] (OFT) and 'Frontline Demonstrations'[18]. Director, head of the CAZRI, oversees

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14 31.7 million hectares of hot desert and about 7 m ha is under cold desert.

15 Six Divisions of CAZRI are Division of (i) Natural Resources, (ii) Integrated Farming Systems, (iii) Plant Improvement and Pest Management, (iv) Livestock Production and Range Management, (v) Agricultural Engineering and Renewable Energy and (vi) Transfer of Technology and Training.

16 Agricultural extension activities are carried out for dissemination of technologies in agricultural and allied fields.

17 On Farm Trials (OFT) are aimed at testing the proven technologies evolved at Research Stations on farmers' field with their farming system perspective in view under their management and their active participation so as to convince them the relevance and viability of the new technology.

18 Front Line Demonstrations (FLD) are conducted with an objective to demonstrate newly released crop production and protection technologies and its management practices in the farmers' fields under different agro-climatic regions and farming situations, by the Scientists before being fed into the main extension system of the State Line agricultural departments. While demonstrating the technologies in the farmers' fields, the scientists are required to study the factors contributing higher crop production, field constraints of production and there by generate production data and feedback information.

research projects and administrative matters and is also the Chairman of Institute Research Committee[19] (IRC).

The mandate of CAZRI as approved by DARE, is:

- to undertake basic and applied research on sustainable farming systems in the arid ecosystem,
- to act as repository of information on the state of natural resources and desertification processes,
- to develop livestock-based farming systems and range management practices for the chronically drought-affected areas and
- to generate and transfer location-specific technologies.

CAZRI identified ten themes for undertaking research projects during 2012-18 for fulfilment of its mandate (**Annexe-2.1**).

2.2.2 Audit Scope and Methodology

Audit was undertaken to assess (i) research projects with output/outcomes, (ii) implementation of extension activities and (iii) utilisation of resources covering the period 2012-18 for examination of institutional records at CAZRI Headquarters as well as its Divisions, three Regional Research Stations (RRSs-Jaisalmer, Kukma-Bhuj and Leh-Ladakh)[20] and three KVKs located at Jodhpur, Pali and Kukma-Bhuj alongwith collection of information from the related agencies/institutions/departments[21]. Of the 137 research projects concluded by CAZRI during 2012-18, records relating to 35 research projects (25 *per cent*) were selected on a random basis for detailed scrutiny apart from other activities of CAZRI. Audit commenced with an Entry Conference with CAZRI on 22 February 2018, wherein the audit objectives, scope and methodology were explained to the Institute. Exit Conference was held on 18 June 2019 wherein important audit findings were discussed. The replies furnished by the CAZRI/ICAR during audit and Exit Conference have suitably been incorporated.

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[19] Institute Research Committee (IRC, previously Staff Research Council) is the highest body where research projects are presented and approved.

[20] Out of five RRSs located at Bikaner, Pali, Jaisalmer (Rajasthan), Kukma-Bhuj (Gujarat) and Leh-Ladakh (Jammu & Kashmir) audit selected one RRS from each State.

[21] ICAR, Department of Agriculture/Horticulture/Animal Husbandry, Rajasthan, Gujarat and Jammu &Kashmir.

2.2.3 Audit findings

2.2.3.1 Budget allocation for Research activities

CAZRI proposed a budget of ₹ 20.90 crore (₹ 18.65 crore vide SFC Memo for 2012-17 + ₹ 2.25 crore for 2017-18 vide Budget Estimates) for research and operational activities (including equipment) against which ICAR allocated ₹ 10.29 crore for the said period.

Audit noted that during 2012-18 ICAR released ₹ 460.54 crore to CAZRI for Plan (₹ 15.61 crore) and Non-Plan (₹ 444.93 crore) expenditure. Against total allocation of ₹ 460.54 crore actual expenditure of CAZRI during the period 2012-18 was ₹ 458.77 crore **(Annexe-2.2)**. Of the total allocation of ₹ 460.54 crore, major portion of grants of ₹ 408.82 crore (88.77 *per cent*) was allocated to meet establishment (₹ 225.60 crore i.e. 48.99 *per cent*) and pension expenses (₹ 183.22 crore i.e. 39.78 *per cent*)[22], ₹ 41.43 crore (nine *per cent*) for other expenses and only ₹ 10.29 crore (2.23 *per cent*) was allocated for conducting research and operational activities (including equipment) against ₹ 20.90 crore projected by CAZRI for research and operational activities.

CAZRI had an average strength of 92 scientists during 2012-18. The allocation of ₹ 10.29 crore on research and operational activities when seen against budget proposal of ₹ 20.90 crore for a six year period appeared to be insufficient for a premier research institute of national importance which is mandated to carry out these activities in entire arid zone of India. Further, the allocation was also meagre considering the number of scientists and the substantial expenditure of ₹ 225.60 crore on establishment expenses of scientists and supporting staff during 2012-18.

CAZRI accepted and verified the figures (June 2019). As regards substantial reduced allotment by ICAR, ICAR stated (November 2019) that it was due to limited availability of the budget in the SMD (NRM-Subject Matter Division) of ICAR and in view of the fund crunch, the allocation for other institutes/schemes of NRM Division was also reduced proportionately.

The reply substantiates the audit contention that resources allocated for the research activities, that are a major component of CAZRI's mandate were meagre.

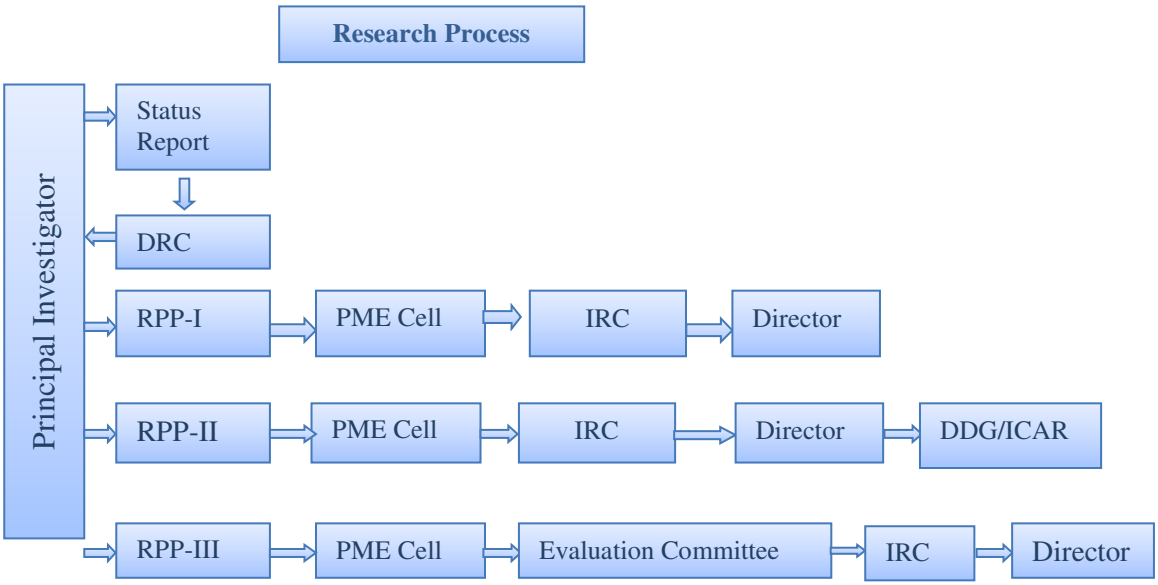
[22] Pension expenses of ₹ 183.22 crore during 2012-18 were allocated in the name of CAZRI to meet pension expenses relating to retired employees of ICAR institutes situated in Rajasthan and Gujarat.

2.2.4 Research activities and dissemination of Technologies

2.2.4.1 Research Process

ICAR's Proformae and Guidelines for Research Project Proposal, Monitoring and Evaluation (Guidelines) vide para 10 prescribes the chronology of activities for research project proposal submission, approval, implementation and completion. The research process covers steps as given in following flow chart:

Flow Chart of Research Process



DRC: Divisional Research Committee[23]
PME Cell : Priority Setting, Monitoring and Evaluation Cell[24]
DDG: Deputy Director General
RPP : Research Project Performae
IRC: Institute Research Committee[25]
ICAR: Indian Council of Agricultural Research

Activities of the Institute including research are reviewed and guided by the Quinquennial Review Team[26] (QRT) constituted by ICAR which reviews all the research projects at the interval of five years.

[23] Divisional Research Committee (DRC) comprises the HoD of the division of concerned PI and other scientists of the Division.

[24] PME Cell is a cell constituted in CAZRI to vet and monitor the research projects.

[25] Institute Research Committee (erstwhile Staff Research Council) as defined in Rules and By-laws of ICAR consists of Director of the Institute as Chairman, and members viz. Joint Director Research, Heads of Divisions, PIs of all projects, Deputy Director General/Additional Director General of ICAR concerned with the CAZRI and Scientists-in-charge of Research Management Unit (Member Secretary).

[26] Quinquennial Review Team (QRT) comprising of five/six eminent scientists is constituted by ICAR to examine institute and its activities to assess whether research and development programmes are inconformity with the priorities of the ICAR and the nation. The recommendations of QRT approved by ICAR are implemented by the Institute and Action Taken Report on such recommendations is submitted as and when required.

(A) Status of Research Projects

CAZRI completed 137[27] Research Projects (Institutional: 92 and externally funded: 45) under 10 themes during 2012-18 as per details given in **Table 2**. Theme-wise research projects completed during 2012-18 are detailed in **Annexe-2.1**.

Table No. 2: Year-wise details of Research Projects completed

(Units in numbers)

	Institutional projects				Externally funded projects			
Year	**On-going at the beginning of the year**	**Newly taken up**	**Projects concluded**	**On-going at the end of the year**	**On-going at the beginning of the year**	**Newly taken up**	**Projects concluded**	**On-going at the end of the year**
2012-13	70	14	26	58	31	04	15	20
2013-14	58	13	06	65	20	05	05	20
2014-15	65	19	14	70	20	07	04	23
2015-16	70	17	16	71	23	05	07	21
2016-17	71	15	20*	66	21	06	08	19
2017-18	66	06	14**	58	19	03	06	16
Total		**84**	**96#**			**30**	**45**	

*****Including two projects merged with externally funded projects and one project terminated.*

*** Including one project terminated.*

96 – 4 projects terminated/merged = 92 projects

Out of above, audit selected 35 research projects (Institutional: 24 and externally funded: 11) which constituted 25 *percent* of total concluded projects during 2012-18. Findings in implementation of projects are as discussed below:

(B) Non-involvement of Stakeholders in selection of research topics

Para 6.1 of Guidelines prescribes that the farmers and the landless livestock owners be mandatorily involved in the initial project formulation and in areas directly addressing the farmers. Also, recommendation 14(4) of guidelines states that identification/involvement of stakeholders should be a pre-requisite for each research project formulation.

In 35 test checked research projects, Audit noted that CAZRI was primarily dependent on Scientists to select the research project topic and involvement of stakeholders and farmers in topic selection was not available on record.

CAZRI stated (May 2019) that it is not mandatory to select topics of research projects only by involving the stakeholders and farmers. However, issues brought out by stakeholder/farmers during *kisan goshthis*/interactions with the Scientists, found important to farming community, are proposed for undertaking the research.

[27] Excluding two projects terminated and two projects merged with externally funded projects.

Reply is not acceptable as it is in contravention of the Guidelines (para 6.1) which clearly states that '*in consideration of the fact that research under ICAR has to address agriculture community, the farmers and the landless livestock owners, it has invariably been made mandatory to involve the stakeholders in the initial project formulation and in areas directly addressing the farmers involving the clients in the project itself*'. The proceedings of kisan goshthis *etc.* were not documented so it was not possible to relate them to actual activities of the Institute. It was also noted that the list of research projects furnished by CAZRI which were claimed to be initiated based on inputs from the farmers/stakeholders included only ongoing projects as on March 2018 which were different from the research projects test checked in audit.

(C) Evaluation of Research projects by Evaluation Committee

Paragraph 9.2.2 (ii) of the Guidelines prescribed (January 2012) that a Committee[28] will carry out objective evaluation of all projects before submission to the Chairman, IRC. Audit noticed that Evaluation Committee was not formed in CAZRI as of March 2019.

ICAR stated (January 2019) that the suggestion has been noted and mentioned that experiments had been monitored during *Kharif* and *Rabi* seasons by the Director and Heads of Divisions and research projects had also been evaluated by the DRCs.

Reply of ICAR regarding evaluation by DRCs is not tenable as the evaluations conducted at division level are done by the concerned division where the project is listed, whereas evaluation conducted by the Evaluation Committee includes ratings by two more HoDs of related disciplines, hence evaluation by DRC cannot substitute for the evaluation to be conducted by Evaluation committee at Institute level, which was a mandatory requirement of the ICAR guidelines.

(D) Delay in completion of Project Reports

After completion of a research project and its presentation in IRC, the Principal Investigator of Research prepares final Project report (RPP III) after incorporating IRC's recommendations on project report and submits to the Director CAZRI for final approval.

Of the 35 test checked cases, it was noted that though in 12 research projects, the research was completed in time but the research completion reports were not presented in the IRC meeting[29] held subsequent to the date of completion, and

[28] Comprising (i) Chairman, PME Cell, (ii) Head of Department (HOD) where the project is listed and two other HODs of related disciplines and (iii) Member Secretary, PME Cell.

[29] IRC meetings are held twice a year during the period April –July and October- November normally before onset of the cropping season.

were presented in the next IRC with a delay of two to 23 months. In five out of these 12 cases, final reports (RPP-III) were submitted with delay of 8-12 months to the Director CAZRI for approval from the date of their presentation in IRC. Delay in submission of completion reports of research projects (RPP-III) resulted in delayed extension of outcomes of the research projects.

CAZRI stated (June 2019) that time taken to complete the formalities of Research project report was as per approved procedure, hence extra time needed was not delay, but was part of procedure with reference to approval of results by IRC.

Reply is not acceptable as (i) in 12 cases where research had been concluded, there was no further procedural formalities required for presentation of actual results/reports in the IRC and (ii) only those five cases have been pointed out in which the results were not submitted to Director even after lapse of six months from the presentation in IRC with due consideration of six months for procedural formalities. In any case it is assumed that the timelines have been prescribed keeping in mind procedural formalities and the Institute needs to observe their own schedules for timely review.

(E) Development, Patenting and transfer of technologies

CAZRI is mandated to generate and transfer location-specific technologies for the arid zone. As a result of various Research Projects conducted under different themes, CAZRI had developed 58[30] technologies (including 21 commercialisable/marketable technologies[31] - **Annexe-2.3**) since its inception. Out of 21 commercialisable/marketable technologies developed, only eight technologies were commercialised and 13 technologies were yet to be commercialised (March 2019).

Further, of the 21 commercialisable/marketable technologies developed by CAZRI, 14 were Intellectual Property Rights (IP) enabled technologies[32]. However, of these 14 technologies, CAZRI could obtain patents for six technologies while three patent applications were rejected and five patent applications were under process with Indian Patent Office as of March 2019.

Further, though CAZRI had signed nine Memorandum of Understandings (MoUs) with four agencies between September 2014 and December 2016 for

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30 Including commercialisable/non-commercialisable technologies, varieties and Package of Practices

31 Out of these 21 technologies, five technologies were developed and completed during 2012-14.

32 IP enabled and seven Non-IP enabled (IP protected technologies are those that fall under the category of "Inventions" and can be patented under Indian Patent Act. All other are non-IP protected technologies).

transfer of commercial rights of eight technologies, it was noted that only one agency had commenced production using CAZRI technologies from which CAZRI received nominal amount of ₹ 274 as royalty (March 2018). Hence, dissemination of these technologies to the end-users also is yet to be achieved.

ICAR stated (January 2019) that the Indian Patent Law came into existence since 1970 but ICAR started focusing on commercialisation and management of Intellectual Property through establishment of Institute Technology Management Units in different institutes since 2006. Regarding commencement of commercial production of IP enabled technologies, ICAR stated that it is expected that in near future that would be further up-scaled by the agencies including those that have earlier taken CAZRI's technology.

The reply of ICAR may be viewed in the light of the fact that the commercialisable/marketable technologies developed by CAZRI lacked appeal/utility for mass production which was evident from the negligible amount of royalty of ₹ 274 received since inception till date. This indicates that despite expenditure of approx. ₹ 18.36 lakh[33] on development of commercialisable/marketable technologies the outcomes of these technologies remained out of the reach of the end users. The Institute whose core objectives included to ensure commercialisation of technologies for their effective transmission up to the end users, has not achieved this objective in the last 13 years despite establishment of Institute Technology Management Unit in 2006 with the aim to overcome barriers in commercialisation. It is to be noted that the Institute had a budget ranging from ₹ 28.13 crore to ₹ 112.17 crore in the last 10 years and the cumulative expenditure amounts to ₹ 597.25 crore since 2008-09.

(F) Releasing of crop variety of food grain

CAZRI had released the last foodgrain crop variety (Moth-3) in 2005. Despite concluding maximum number of research projects (32) under the theme 'Biodiversity conservation and improvement of annuals and perennials' including five research projects related to foodgrain crop varieties during 2012-18, CAZRI could not succeed in releasing any new crop variety of foodgrain since 2005.

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[33] As per the records made available by CAZRI, out of 21 commercialisable technologies Institute incurred expenses of ₹ 18.36 lakh on development of 15 technologies. Amount of ₹ 18.36 lakh included cost of raw material excluding salary of scientists, technical staff and institutional expenses, except two technologies wherein salary of innovator, technical and supporting staff was included in development cost. In respect of remaining six technologies (21-15) no development expenditure was available with the Institute.

ICAR stated (January 2019) that breeding for improved variety is a continuous process. As a result of such efforts three varieties of grasses[34] developed by CAZRI were released in the country by the Central Varietal Release Committee in 2018. Similarly, watermelon variety[35] developed by the Institute has been released for north western parts of the country. One variety each of Lasora (CAZRI G 2025 Maru Samridhi) and Karonda (CZK-2011 Maru Gaurav) have been identified for release in the States of Rajasthan, Gujarat and Haryana where their formal release is still awaited for want of finalisation of minimum standards. CAZRI during Exit Conference (June 2019) stated that new hybrids of pearl millet (26) and varieties of cluster bean (14) were contributed to All India Coordinated Research Projects (AICRP) trials[36]. From among these cultivars, many were promoted to Advance Varietal Trials[37] AVT-I and AVT-II. The release proposals were also submitted to AICRP workshops and more efforts would be made to release the varieties in field crops.

The fact, however, remains that only after a long gap of 12 years from 2005, the varieties of grasses and watermelon were released in 2017-18 but no new foodgrain crop variety could be released by CAZRI. Though CAZRI has participated in varietal trials but final release of any food grain variety is awaited since last 13 years.

2.2.4.2 Dissemination of results of Research Projects

(A) Research publication

ICAR guidelines for 'Internal Evaluation and Forwarding Research Papers to Scientific Journals and Data Management in ICAR Institutes'(2014) prescribe (para 1.2.1) that to maximise the benefits from research, publications resulting from research activities must be disseminated in the most effective manner and at the earliest opportunity and that the best mode for publications arising from the research should be considered by the author(s) based on the status and reputation of the journal or publisher (para 1.2.3).

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34 Two varieties of *Cenchrusciliaris* (CAZRI 358 and CAZRI 2178) and one variety of *Lasiurussindicus* (CAZRISewan-1).

35 CAZIK-13-2.

36 All India Coordinated Research Project (AICRP) is a programme in which the central research institutes as well as agricultural universities and State Departments of Agriculture work together as a team to resolve research problems of the crop at national level.

37 Under Advance Varietal Trials a variety is evaluated for three years, one year in the Initial Varietal Trials (IVT) and for two years under Advanced Varietal Trials – AVT-I and AVT-II.

Further, Vision 2025 (effective from 2007) of CAZRI prescribes on an average 180 to 200 publications (including research papers) per year for the Institute. The reputation of a journal relating to agriculture is judged by its National Academy of Agricultural Sciences (NAAS) rating and NAAS rating of six and above is also required (as per RFD 2017-18). It was noted that despite emphasis by ICAR for publishing research papers in reputed journals by their Scientists, publication of research papers by CAZRI's scientists was not significant as discussed below:

- The total publications including research papers published by Scientists of CAZRI were 110 (2012-13), 100 (2013-14), 135 (2014-15), 194 (2015-16), as against 180-200 publications contemplated in Vision 2025. Although total publications subsequently increased to 278 and 272 during 2016-17 and 2017-18 respectively which was more than publications contemplated in Vision 2025, yet total publications during 2012-15 were less than those contemplated in Vision 2025.

- As regards publication of research papers, during 2012-18, scientists of CAZRI, had published 405 research papers in Indian and foreign Journals with an average of 68 research paper publications per year.

- RFD 2017-18 of CAZRI has a success indicator namely 'Research articles published' which requires publication of research articles in the journals having the NAAS rating of six and above. 149 of the 405 research papers, (37 *per cent*) have been published in journals having NAAS rating six and above while 174 papers (43 *per cent*) were published in the journals having NAAS rating between 1 and 5.90 and 82 papers were published in journals having no NAAS rating. This was reflective of the quality of research and efforts to document the same.

- Review of Citation index[38] of 405 research papers published by Scientists of CAZRI during 2012-18 revealed that 252 research papers (62 *per cent*) were never cited in other published researches. Out of remaining 153 research papers (38 *per cent*) cited during this period, only four research papers were highly cited ranging between 39 and 135 times, 39 research papers were cited between 6 and 38 times and 110 research papers were cited between one and five times.

ICAR stated (January 2019) that (i) the publication parameter was added in the RFD 2014 and this is only one, and not the sole parameter to judge the

[38] A kind of bibliographic index, an index of citations between publications, allowing the user to easily establish which later documents cite which earlier documents.

productivity of scientists, and (ii) the Institute is now encouraging the scientists to publish more research papers in high impact journals. As a result, the number of research papers being published is showing an increasing trend which has increased from 42 in 2012-13 to 105 during 2016-17. Also, citation of research papers takes time, and is likely to increase over a period of time.

In our observation, however, the publication did not meet the prescribed levels as per Vision 2025 and RFD 2017-18. Further, higher frequency of citation of the publications depends upon the topicality/importance of the research papers this criticality was seen in case of four research papers[39] which were published in 2013, 2015 and 2017 but cited 39 to 135 times.

(B) Co-ordination of CAZRI with State Line Departments

The functions of CAZRI *inter alia* include collaboration with different national and international institutions in similar field for knowledge sharing and improvement of skill and hence, CAZRI is expected to develop better co-ordination with the State Government Departments (Agriculture and Animal Husbandry) of Rajasthan, Gujarat and Jammu & Kashmir who were engaged in implementing various developmental activities in arid areas. Research outcomes including improved practices developed by CAZRI which could be directly implemented by farmers are presented by the Scientists of CAZRI in a committee namely Zonal Research and Extension Advisory Committee (ZREAC) consisting of Scientists of research Institutes as well as officers of State Department of Agriculture responsible for extension activities.

It was noted that though CAZRI conducted various basic and applied researches and documented the results of research systematically, yet the impact of CAZRI's work at State level was lower due to poor linkage with State line departments as detailed below:

- Audit enquiry (April 2018) with Animal Husbandry Department of Rajasthan and then Jammu & Kashmir revealed that their co-ordination with CAZRI was 'nil' with reference to various aspects viz. utilisation of research of CAZRI, technical support to line departments, CAZRI's participation in workshops/seminars and formation of coordination committee etc., except delivering some lectures by its Scientists at a training institute, Jodhpur.

[39] Research papers on (i) 'Effect of zinc oxide nanoparticles on growth and antioxidant system of chickpea seedlings (2013), (ii) ZnO Nanoparticle Biosynthesis and Its Effect on Phosphorous-Mobilising Enzyme Secretion and Gum Contents in Cluster bean (2013), (iii) Performance of indirect through pass natural convective solar crop dryer with phase change thermal energy storage (2015) and (iv) Pearl millet genome sequence provides a resource to improve agronomic traits in arid environments (2017).

- Agriculture Department of Government of Rajasthan publishes zone-wise booklets viz. Package of Practices (POP) every year incorporating varieties/technologies recommended by the ZREAC for distribution among field level agricultural officials and farmers. Agriculture Department, Rajasthan stated (July 2018) that CAZRI's involvement was limited to participation in ZREAC meetings held at Jodhpur and Bikaner. Audit found that CAZRI presented only 19 research/technologies in ZREAC meetings during 2012-18 and of this seven were included in POP. It was found that no follow up of these accepted research/technologies was carried out by CAZRI to assess field level implementation.

- QRT 2010-16 had also recommended CAZRI to improve linkage with State Government/line departments. This indicates there were scopes for developing more co-ordination with State Line departments as officials of these departments were not much acquainted with the activities of CAZRI.

- Audit could not locate any records to verify the co-ordination of CAZRI with Agriculture Department of Government of Gujarat except that the Director of Horticulture is one of the committee members of Management Committee of CAZRI, Jodhpur.

Thus, extension of CAZRI's research/technologies at State level suffered due to inadequate co-ordination with State line departments and a lack of participatory approach.

ICAR stated (January 2019) that once the technologies are accepted in ZREAC and included in POP of the State Government, follow up is usually taken up by the State line departments. However, ICAR agreed that there was a scope for more coordination with the State line departments and the Institute would make efforts in that direction.

Reply of ICAR may be seen in the light of main functions of CAZRI as prescribed in RFD 2017-18 which includes technology dissemination, socio-economic assessment and capacity-building of the stakeholders.

2.2.4.3 Agricultural Technology Information Centre

The Agricultural Technology Information Centre (ATIC) at CAZRI, Jodhpur was established(January 2000) to provide a single window delivery system for the products and services of the institute to the farmers and other interested groups as a process of innovativeness in technology dissemination, to facilitate

direct access of the farmers to the institutional resources available in terms of technology, advice, technology products like seed, plant saplings, small implements, value added products etc. for reducing technology dissemination losses and to provide mechanism for feedback from the users to the Institute.

Audit noted that ATIC had established a Kisan Helpline facility and 1,768 telephone calls were received during 2012-18, averaging 295 calls per year. However, there was no dedicated toll free number for this purpose, but a general telephone number of ATIC is being used without any extension facility to connect to the concerned scientist or specialist with whom the tele caller farmer could discuss his agriculture related problem. Further, there was a progressive decline in number of visitors to ATIC during this period from 12,456 persons in 2012-13 to 11,699, 5,825, 8,398 and 8,964 and 8,194 during 2013-14, 2014-15, 2015-16, 2016-17 and 2017-18 respectively. This number only increased to 15,295 during 2018-19.

ICAR stated (January 2019) that all the visitors visit ATIC as per their own programme, budget and convenience. However, the observation of Audit had been noted for further action.

ATIC should make proactive efforts to provide toll free helpline facility for giving free and easy connectivity to farmers and other stakeholders to solve their issues. After the issue was raised by audit (June 2018), ATIC organised two *Kisan Melas* which were attended by more than 8000 farmers (including ATIC visitors in 2018-19).

Picture 1 : Quality plant seedlings being demonstrated by staff of CAZRI to stakeholders during Kisan Mela 2018 organised by CAZRI

Picture 2: Transfer of technology to farmers through Krishi Vigyan Kendra gateway of CAZRI during Kisan Mela 2018 organised by CAZRI

2.2.4.4 Digitisation of maps/information prepared by CAZRI as repository of information

CAZRI's performance as repository of information on the state of natural resources and desertification processes was commented positively by Quinquennial Review Team (QRT) 2010-16 stating that Division of Natural Resources and Environment of Institute has generated valuable data and maps and recommended that all digital data bases and maps produced from 1960 are to be preserved. QRT also recommended that a website may be created and access provided to the users with a password. ICAR stated (January 2019) that all maps had been digitised and uploaded on CAZRI's website. Audit noted that maps prepared since 1974 were uploaded on the website (February 2019), which is a positive development.

2.2.5 Krishi Vigyan Kendras (Extension activity)

KVKs, an arm of CAZRI for extension activity of CAZRI, conducts Frontline Demonstrations (FLDs) to demonstrate the potentials of newly released varieties/technologies on the farmers' fields and introduces the advantages of the new variety/technology over traditional practices. KVKs also conduct On Farm Trials (OFTs) for identifying technologies in terms of location specific sustainable land use systems. Audit covered all the three KVKs of CAZRI located at Jodhpur, Pali and Kukma-Bhuj. Findings noted in implementation of various activities by these KVKs, are discussed below:

2.2.5.1 All blocks not covered in Frontline Demonstrations

ICAR through Agricultural Technology Application Research Institute-ATARI (erstwhile Zonal Project Directorate) monitors, reviews and co-ordinates the

KVK system through different Zonal Offices. KVKs at Jodhpur and Pali (Rajasthan) of CAZRI are monitored by ATARI Zone II, Jodhpur. KVK at Kukma-Bhuj was also monitored by ATARI Jodhpur before being transferred to ATARI Zone VIII, Pune with effect from 2017-18.

The Zonal Project Directorate, Zone VI, Jodhpur (now ATARI Jodhpur), while allotting of FLDs to be conducted by KVKs during 2014-15, instructed (June 2014) all Programme Co-ordinators of KVKs (Zone VI Rajasthan and Gujarat) that '*respective KVKs must cover the whole district/blocks and suggested that priority should be given to those blocks/villages which are still not covered under FLDs, training and other activities."*

Audit noted that coverage of blocks during 2012-17 under FLDs by KVKs Jodhpur, Pali and Kukma-Bhuj were only 3, 5-6 and 3-5 blocks as against 7, 10 and 5 blocks respectively under their jurisdiction, which resulted in depriving the farmers of the blocks not covered from the adoption/benefits of new varieties/technologies developed by the Scientists. However, during 2017-18 the KVKs covered all the blocks under their jurisdiction for FLDs.

ICAR stated (January 2019) that covering all the blocks in FLDs every year was not possible because of the limitation of manpower and mobility. However, the point raised by Audit would be suitably addressed.

The fact remains that during the years 2012-17, some blocks (nine) were repeatedly skipped by all three KVKs for conducting FLDs despite clear instructions from Zonal Project Director to give priorities to such blocks which were not covered under FLDs.

2.2.5.2 Shortfall in achievements of targets of OFTs

Achievements against targets for OFTs fixed by the KVKs (Jodhpur, Pali and Kukma-Bhuj) for the period 2012-18 were as detailed in **Table No. 3**:

Table No. 3: Achievements against targets for OFTs fixed during 2012-18

(Units in numbers)

Year	Targets of OFTs fixed in Annual Action Plan (in numbers)			OFTs conducted as per Annual Progress Report (in numbers)			Shortfall in OFTs (*in nos.& percentage*)		
	KVK Jodhpur	KVK Pali	KVK Kukma-Bhuj	KVK Jodhpur	KVK Pali	KVK Kukma-Bhuj	KVK Jodhpur	KVK Pali	KVK Kukma-Bhuj
2012-13	5	7	4	3	5	3	2 (40)	2 (29)	1 (25)
2013-14	5	7	3	4	5	3	1 (20)	2 (29)	0 (0)
2014-15	5	10	10	5	8	4	0 (0)	2 (20)	6 (60)
2015-16	7	10	7	7	7	4	0 (0)	3 (30)	3 (43)
2016-17	8	10	9	9	10	6	0 (0)	0 (0)	3 (33)
2017-18	11	8	8	9	8	6	2 (18)	0 (0)	2 (25)

The table indicates that shortfall in conducting OFTs by KVK Jodhpur, Pali and Kukma-Bhuj ranged between 18 to 40 *per cent*, 20 to 30 *per cent*, and 25 to 60 *per cent* respectively during 2012-18.

ICAR stated (January 2019) that shortfall in targets were due to leave of staff, limitation of funds and vacant positions and that in future, necessary steps would be taken to achieve the set targets.

The issues regarding shortage of staff due to leave/vacancy and funds arrangement at KVKs should have been visualised and managed by Head of KVK/respective ATARI Zone through alternate arrangements to avoid the shortages in meeting the OFT targets.

2.2.5.3 Training programmes by KVKs

As per ICAR guidelines, KVKs were required to organise on-campus and off-campus, short and long term vocational training courses in agricultural and allied areas for the farmers, farm women, rural youth for higher productivity and generation of self-employment. They were also required to conduct training courses for extension personnel for updating their knowledge with emerging advances in agricultural research. Further, the RFD of CAZRI has shown high percentage of achievement regarding trainings organised.

Audit noticed following shortcomings in organising trainings by KVK, Kukma-Bhuj and KVK Jodhpur of CAZRI during scrutiny of their Annual Action Plans and Annual Progress Reports:

- **Non-fixation of training targets:** KVK Kukma-Bhuj did not fix any targets for 'on campus' and 'off campus' training programmes during 2012-13, 2016-17 and 2017-18 and 2012-13, 2014-15, 2016-17 and 2017-18 respectively in respect of Rural youth **(Annexe–2.4)**. Similarly, in KVK, Jodhpur targets for training to Extension personnel were not fixed for the years 2013-14 to 2016-17 and hence no such trainings were conducted during this period.
- **On campus training:** In KVK Kukma-Bhuj there was shortfall of 40 *per cent* and 100 *per cent* in respect of training courses for Extension Functionaries and Rural Youths respectively during 2013-14 to 2015-16 when targets were fixed **(Annexe-2.4)**.
- **Off campus training:** In KVK Kukma-Bhuj there was a shortfall of 60.86 *per cent* in training courses to Rural Youths during 2013-14 and 2015-16 when targets were fixed **(Annexe-2.4)**.

- **Vocational training:** In KVK Kukma-Bhuj no vocational training courses for farmers, farm women and rural youths were conducted during 2012-18.
- **Ex-trainee Sammelans:** KVKs were required to evaluate and take follow-up action on training courses to make further improvements and enhance their usefulness. This was to be done through questionnaires, interviews and interaction with the participants and ex-trainees meets. Audit noticed that KVK, Jodhpur organised one ex-trainees sammelan during 2014-15 and no ex-trainees sammelans were organised during 2012-13, 2013-14 and 2015-16 to 2017-18. In KVK, Kukma-Bhuj also no ex-trainees sammelans were organised during 2012-18.

ICAR accepted the facts and stated (January 2019) that the shortfall in trainings by KVKs was due to vacant posts of Subject Matter Specialist (SMS)/Head, lack of hostel building and demonstration unit at KVK, Kukma-Bhuj. ICAR further stated that the point raised by Audit has been noted and will be taken care of in future. In respect of KVK Jodhpur ICAR admitted the facts and stated that training for extension functionaries would be undertaken by KVK, Jodhpur. In respect of ex-trainees Sammelans also, ICAR noted the audit observation for action in future.

2.2.5.4 Non-availability of infrastructure facilities with KVKs

As per ICAR guidelines[40], each KVK was required to establish infrastructure facilities as mentioned in table below. The shortcomings noticed in audit with respect to infrastructure facilities in KVKs Jodhpur, Pali and Kukma-Bhuj are mentioned in **Table No. 4**:

Table No. 4: Details of shortcomings in infrastructure facilities

Norms for infrastructure facilities prescribed for KVK	Status of availability of infrastructure facilities in KVK		
	KVK Jodhpur	KVK Pali	KVK Kukma-Bhuj
Administrative cum laboratory building with a plinth area of 550 sqm.	Available	Available	Not available
A trainees' hostel with a plinth area of 305 sqm.	Available	Available	Not available
Residential apartments for six staff with a total plinth area of 400 sqm.	Not Available	Not available	Not available
Two demonstration units of 160 sqm each with brick wall, tubular structure and GI/asbestos sheet.	Available	Available	Not available

[40] A Guide for KVK Managers.

Permanent source of water supply atleast for drinking and part of area to be irrigated in KVK	Available	Not available	Not available

As such some of the infrastructure facilities as prescribed in Guidelines were not available with KVKs Jodhpur, Pali and Kukma-Bhuj as shown above, which affected the activities of KVKs. The infrastructure facilities were not developed due to non-providing of funds by ICAR to KVKs upto March 2018.

ICAR while accepting the facts stated (January 2019) that infrastructure facilities would be developed as and when funds are made available.

2.2.5.5 Monitoring of KVK activities

Each KVK has a Scientific Advisory Committee (SAC) which is chaired by the head of the host Institution (CAZRI) and includes members from different agricultural Institutions/Line Departments including Training organisers of KVKs as Member Secretary. SAC provides necessary guidance to KVKs on various issues, considers annual plans, reviews the progress of their activities and achievements and suggests to improve the functioning of KVKs.

SAC of KVK Jodhpur recommended (February 2014) that KVK, Jodhpur may organise interface workshop involving KVKs of arid region to redefine the thrust areas and also to popularise the solar appliances. However, Interface workshop as recommended by SAC was not organised by KVK, Jodhpur.

KVK Jodhpur replied (April 2018) that the interface workshop could not be conducted due to insufficient funds. ICAR accepted (January 2019) the facts and stated that efforts should have been made by KVK for allotment of funds for organising Interface workshop.

2.2.6 Utilisation of Resources

2.2.6.1 Vacancy position of Scientific Staff

During 2012-18, the average sanctioned posts of scientific staff in CAZRI were 141. Audit noted that average filled up posts of scientific staff was 92 resulting in average shortage of 49 posts during this period which was 35 *per cent* of sanctioned posts. Average shortage of Scientists in RRS, Jaisalmer was 65 *per cent*, RRS, Kukma-Bhuj 56 *per cent*, and in RRS Leh-Ladakh it was 74 *per cent* which was higher than the average shortage for the Institute as a whole. Post-wise shortage of Scientific Staff is shown in **Annexe-2.5**.

There was shortage of 22 personnel in the cadre of Scientists, 16 in the cadre of Senior Scientists and seven in Principal Scientist's cadre as of 31 March 2018. Further, it was noted that the posts of Principal Scientist in Agricultural

Entomology, Senior Scientists in the disciplines of Agricultural Economics, Agricultural Statistics, Agricultural Meteorology and Physics and Scientists in the disciplines of Agricultural Statistics and Animal Nutrition remained vacant during the entire period of 2012-18 which adversely affected the researches in these disciplines.

Audit also noted that despite QRT recommendation (2010-2016) to ICAR for filling up all vacant posts on priority basis, many posts in CAZRI remained vacant.

ICAR while accepting the facts stated (January 2019) that the vacant posts were in the process of recruitment and some RRS posts would also be filled up by transferring scientists from the CAZRI Headquarter. ICAR further stated (May 2019) that non-appointment on important posts were owing to ongoing restructuring process in Agricultural Scientists Recruitment Board. CAZRI further replied during Exit Conference (June 2019) that five scientists have been transferred from Headquarters to RRSs.

2.2.6.2 Asset Management

Findings on the management of assets by CAZRI are described in the succeeding paragraph:

➢ Shortage in area of land under possession of CAZRI

Jodhpur Development Authority[41] (JDA), allotted 695.55 acres land[42] between May 1957 and October 1960 to CAZRI. However, lease deed was not obtained by CAZRI at the time of allotment. Subsequently, in compliance to the decision of ICAR, 100 acres land was handed over (2006) by CAZRI to All India Institute of Medical Sciences (AIIMS), Jodhpur without measuring the balance land available with CAZRI.

In 2015, as a condition for issuance of lease deed (JDA patta), land survey was got conducted through an agency which revealed that total land in possession of CAZRI was 579.12 acres instead of 595.55 acres (695.55-100). In compliance with the directions of concerned Ministries/Departments of GoI and Government of Rajasthan, 67 acres land was again handed over (2016) by CAZRI to AIIMS, Jodhpur.

Audit noticed that issuance of lease deed (JDA patta), was pending with JDA (March 2019) due to discrepancies in possession of the land as given **Table No. 5:**

[41] Erstwhile known as 'City Improvement Committee'

[42] 162.95 acres on 6 May 1957, 95.80 acres on 6 March 1960 and 436.80 acres on 6 October 1960

Table No. 5: Discrepancies in possession of the land

Sl. No.	Description	Area of land in acres
1.	Land allotted by JDA to CAZRI during 1957 to 1960	695.55
2.	Total land transferred by CAZRI to AIIMS, Jodhpur in 2006 and 2016 (100 acres + 67 acres)	167.00
3.	Total area of land which should be in possession of CAZRI	528.55
4.	Actual area of land in possession of CAZRI (ascertained during land survey in 2015)	512.12
5.	Area of land found short possessed	16.43

Hence, CAZRI is now in possession of 512.12 acres land instead of 528.55 acres resulting in shortage of 16.43 acres. CAZRI wrote to JDA (November 2016) for providing *khasra*-wise details of allotted land and to locate the exact *khasra* which would correspond to the short possessed land. JDA informed (December 2016) that the revenue maps of this land, available with them, were in tattered condition and *khasra* number of disputed land could not be traced. Subsequently, based on report (November 2019) of *Tehsildar* (Land Records) Jodhpur, JDA replied (December 2019) that at the time of allotment of land (1957 to 1960) to CAZRI there were *kachcha* roads towards north and east side of CAZRI and present roads have been widened as per master plan which were part of land of Haddi Mill colony adjacent to CAZRI land. Hence, due to Haddi Mill colony and widening of kachcha roads, CAZRI's land is short by 16.43 acres.

CAZRI had not measured land during initial possession and even during construction of boundary wall in various phases. Also, no measurement of remaining land with CAZRI was done at the time of handing over of land to AIIMS Jodhpur. The institute is not in possession of 16.43 acres of land, which is very valuable.[43]

ICAR accepted the audit observation and stated (January 2019) that the Institute would further pursue the matter with the District Administration.

2.2.7 Conclusion

Institute developed 21 commercialisable/marketable technologies since inception, but these were not effectively disseminated through mass production. CAZRI has not released any new foodgrain crop variety seed since 2005. In 35 test checked cases it was observed that CAZRI was primarily dependent on

[43] Land measuring 16.43 acres was valued at ₹ 71.56 crore. Calculation made on the basis of District Level Committee (DLC) rate of ₹ 1000 per sq. feet of nearby Udyog Nagar Colony. Since khasra wise map is not available so the DLC rate of land having common khasra number of CAZRI and the Udyog Nagar colony has been considered.

Scientists to choose the research project and no record was available to show involvement of stakeholders and farmers in research topic selection. Average research papers published by CAZRI was 68 per year during 2012-18; research papers were published in journals having low ratings by NAAS and citation index of research papers was low for maximum research papers. For carrying out research and operational activities CAZRI received meagre grant of ₹ 10.29 crore against the projected grant of ₹ 20.90 crore which was 2.23 *per cent* of total allocation to CAZRI from ICAR during 2012-18. Therefore, more than 97 *per cent* of the grant of CAZRI was utilised for salaries and related expenditure.

Shortfalls were noticed in extension activities viz. coverage of blocks under FLDs, in achieving targets of OFTs and conduct of training programmes etc., by KVKs. Infrastructure facilities as prescribed in guidelines were not available at KVKs at Jodhpur, Pali and Kukma-Bhuj. There was average shortage of 35 *per cent* in respect of scientific staff. CAZRI was not aware until 2015 that Institute was in short possession of 16.43 acres of land worth ₹ 71.56 crore.

These points were referred to the Ministry in October 2018 and June 2019, reply awaited as of December 2019.