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STANDING COMMITTEE ON AGRICULTURE
(2018-2019)

SIXTEENTH LOK SABHA

MINISTRY OF AGRICULTURE AND FARMERS WELFARE
(DEPARTMENT OF AGRICULTURAL RESEARCH AND EDUCATION)

"ICAR-CENTRAL TUBER CROPS RESEARCH INSTITUTE- A PERFORMANCE REVIEW"

{Action Taken by the Government on the Observations/ Recommendations contained in the Fifty-Eighth Report (Sixteenth Lok Sabha) of the Standing Committee on Agriculture (2017-2018)}

SIXTY FIFTH REPORT

LOK SABHA SECRETARIAT
NEW DELHI

January, 2019/Pausha,1940 (Saka)

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Presented to Lok Sabha on	07.01.2019
Laid on the Table of Rajya Sabha on	07.01.2019

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INTRODUCTION

I, the Chairperson, Standing Committee on Agriculture (2018-19), having been authorized by the Committee to submit the Report on their behalf, present this Sixty-Fifth Report on action taken by the Government on the Observations/Recommendations contained in the Fifty-Eighth Report (Sixteenth Lok Sabha) of the Standing Committee on Agriculture (2017-18) on the Subject "ICAR-Central Tuber Crops Research Institute- A Performance Review" pertaining to the Ministry of Agriculture and Farmers Welfare (Department of Agricultural Research and Education).

2. The Fifty-Eighth Report (Sixteenth Lok Sabha) of the Standing Committee on Agriculture (2017-18) on the Subject "ICAR-Central Tuber Crops Research Institute- A Performance Review" pertaining to Ministry of Agriculture and Farmers Welfare (Department of Agricultural Research and Education) was presented to Lok Sabha and laid on the Table of Rajya Sabha on 03.08.2018. The Action Taken Notes on the Report were received on 14.11.2018.

3. The Report was considered and adopted by the Committee at their Sitting held on 04.01.2019.

4. An analysis of the action taken by the Government on the Observations/Recommendations contained in the Fifty-Eighth Report (Sixteenth Lok Sabha) of the Committee is given in **Appendix.**

NEW DELHI;
04 January, 2019
14 Pausha, 1940(Saka)

HUKMDEV NARAYAN YADAV
Chairperson,
Standing Committee on Agriculture

CHAPTER-I

R E P O R T

This Report of the Standing Committee on Agriculture deals with the action taken by the Government on the Observations/Recommendations contained in the Fifty-Eighth Report (Sixteenth Lok Sabha) of the Standing Committee on Agriculture (2017-2018) on 'ICAR-Central Tuber Crops Research Institute- A Performance Review' pertaining to Ministry of Agriculture and Farmers Welfare (Department of Agricultural Research and Education) which was presented to Lok Sabha and laid on the Table of Rajya Sabha on 03.08.2018.

1.2 The Ministry of Agriculture and Farmers Welfare (Department of Agricultural Research & Education) have furnished Action Taken Replies in respect of all the 17 Observations/Recommendations contained in the Report. These replies have been categorized as under:

(i) Observations/Recommendations that have been accepted by the Government:

Recommendation Nos. 1, 2, 4, 5, 6, 7, 8, 10, 11, 14, 15, 16 and 17

Total 13
Chapter - II

(ii) Observations/Recommendations in respect of which the Committee do not desire to pursue in view of the Government's reply:

Recommendation No. NIL

Total 00
Chapter - III

(iii) Observations/Recommendations in respect of which action taken replies of the Government have not been accepted by the Committee:

Recommendation Nos. 12 and 13

Total 02
Chapter - IV

(iv) Observations/Recommendations in respect of which final replies of the Government are still awaited :

Recommendation Nos. 3 and 9

Total 02
Chapter - V

1.3 The Committee trust that utmost importance would be given to implementation of the Observations/Recommendations accepted by the Government. In cases, where it is not possible for the Department to implement the Recommendations in letter and spirit, the matter should be reported to the Committee with reasons for non-implementation. The Committee desire that further Action Taken Notes on the Observations / Recommendations contained in Chapter-I and final Action Taken Replies to the Recommendations contained in Chapter-V of this Report be furnished to them at an early date.

1.4 The Committee will now deal with the action taken by the Government on some of the Recommendations in the succeeding paragraphs.

FINANCIAL PERFORMANCE

(Recommendation No. 3)

1.5 The Committee had observed/ recommended as under:-

"The Committee note that the institute has been provided Rs. 97.01 Crore at RE stage as against Rs. 105.78 crore provisioned at Budget estimates during XII plan. The Committee also note that there was decline in allocations under plan head to the Institute over the years as allocations under this head progressively decreased from a high of Rs. 7.0 Crore during 2012-13 to Rs. 5.26 crore during 2016-17. Allocations under Plan head to the institute during XII plan period were further reduced from Rs. 29.36 crore at BE stage to Rs. 22.82 crore at RE stage. Further, the Institute was provided Rs.22.45 crore during the 2017-18.

The Committee also note that despite success of Institute to overachieve target for internal revenue generation (Rs.3.36 crore against the target of Rs.2.34 crore) during XII plan, these were not more than 1.75 to 4.11% of

total Expenditure that clearly indicate that target were set too low. The Committee are of view that ICAR-CTCRI being only institute in the world dedicated for research on Tuber crops in the world, has tremendous responsibility to provide leadership in cutting age research in their field of expertise. The Committee are also of the considered view that Root and tuber crops has potential to provide solution for shortfall in food production due to climatic changes associated with the global warming. These crops have potential to emerge as an alternative to staple food in future. Therefore, the Institute will require investment in capital head such as establishment of laboratories, procurement of latest scientific equipments etc. to achieve excellence in their endeavor. The Committee, therefore, recommend the Government to enhance allocations under capital head to the Institute in upcoming fiscals. The Committee also desire the ICAR to analyze revenue generation potential of Institute and enhance the target so that investment on R & D could be monetized for the benefit of the Country.

1.6 The Department of Agricultural Research and Education in the Action Taken Reply has stated as under:-

"The Institute is putting concerted efforts to enhance revenue generation through sale of farm produce, technology commercialization, consultancies, training fees (national and international), collaborative projects, students programme and other services. New R&D initiative has been taken up with reference to 'Wealth from Waste' like biogas from cassava leaf waste etc. Provision for infrastructure and latest equipments will be made in the new plan budget after the current plan period (2017-2020) is over.

1.7 While observing low revenue target being set by the CTCRI, the Committee desired the ICAR to analyze revenue generation potential of Institute and enhance the target so that investment on R & D could be monetized for the benefit of the Country. The Department in their Action Taken Reply has stated that the Institute is putting concerted efforts to enhance revenue generation through sale of farm produce, technology

commercialization, consultancies, training fees (national and international), collaborative projects, students programme and other services. New R&D initiative has been taken up with reference to 'Wealth from Waste' like biogas from cassava leaf waste etc. The Committee feel that the reply of the Department is evasive as no concrete plan for enhancing the revenue has been elaborated. The Committee are of view that huge market opportunity exist for the research outcome and products being brought out by the Institute like CTCRI which is the only specialized Institute in the world for niche research on Root and Tuber crop and there is need to adopt a professional approach to enhance the revenue potential on investment being made in Research Institute in the Country. The Committee, therefore, desire the Department to sponsor a study to assess the revenue generation potential of agriculture research institutes in general and of CTCRI in particular.

INDUSTRIES BASED ON ROOT AND TUBER CROPS

(Recommendation No. 9)

1.8 The Committee had observed/ recommended as under:-

"The Committee note that Root & Tuber crop apart from direct human consumption, can be used as raw material for food processing Industries such as Savory snacks, Baked products, Pasta and noodles and Functional foods. Root & Tuber crops are also main raw material for Starch based industries. The Committee further note that about 40% of the total production of Cassava, sweet potato, elephant foot yam, taro and arrowroot is processed before its use in different parts of the country. However, the Committee note that level of processing of Root & Tuber crops in the Country varies from 90% in Tamil Nadu to 40% in States like Bihar.

The Committee were informed that ICAR-CTCRI proactively cooperate with Industries based on Root & Tuber Crops and had developed many products such as Tuber crops based fried snack foods, Improved technology for fried

cassava chips, Extruded snack foods from cassava and rice flour, Cassava papad, Gluten free bread, Cold water miscible starch from cassava and bio-pesticides. The Committee were informed that the Institute has also developed many technologies and machineries such as hand operated, pedal operated and motorized Cassava chipping machines, Mobile starch extraction plant, Mobile starch extraction plant, Industrial rasper for extraction of starch, Centrifugal granulator for cassava-based feed, Cassava harvester, Cassava peeling knife and Pilot plant for liquid adhesive which are very helpful for the Industries based on Root & Tuber Crops. The Committee also note that ICAR-CTCRI has developed good manufacturing practices for Savory snacks, Baked products, Industrial products, Pasta and noodles, functional foods and Starch graft co-polymers which may be very useful to standardizing manufacturing practices and maintaining hygiene in food processing Industries based on Root and tuber crops in the country.

The Committee are of view that there is huge potential for Food products and snacks based on Root and Tuber Crops as these are healthy and rich in nutrition. However, there is need to make consumer aware of health benefits of Root & Tuber crops. Further, there is need to develop snacks and other products based upon dietary and taste preferences of consumers in various parts of the Country. The Committee, therefore, recommend the Institute to take a survey for analyzing dietary and taste preferences of consumers in various parts of Country. This survey may become the basis of further research on preparation of region specific snacks and other products based on Root & Tuber crops. Further, the Institute should also explore the possibility of a joint campaign involving industry and Central and State Government for enhancing awareness about health benefits of Root & Tuber crops in the Country. The Committee would like to be apprized about steps taken in this regard within three months of presentation of this Report."

1.9 The Department of Agricultural Research and Education in the Action Taken Reply has stated as under:-:-

> "It is planned to outsource the survey for analyzing dietary and taste preferences of consumers in various parts of the country. Research programme to develop region specific products based on Root & Tuber Crops will also be taken up. Joint campaigns involving Central and State Government for enhancing awareness about health benefits of Root & Tuber Crops are being initiated and to be intensified in a systematic way."

1.10 While recognizing the need to develop snacks and other products based upon dietary and taste preferences of consumers in various parts of the Country, the Committee had recommended the Institute to take a survey for analyzing dietary and taste preferences of consumers in various parts of Country and conduct further research on preparation of region specific snacks and other products based on Root & Tuber crops based on the result of survey. Further, the Committee had also recommended the Department to explore the possibility of a joint campaign involving industry and Central and State Government for enhancing awareness about health benefits of Root & Tuber crops in the Country. The Department in their Action Taken Reply has stated about plan for outsourcing the survey for analyzing dietary and taste preferences of consumers in various parts of the country. The Committee were also informed that Joint campaigns involving Central and State Government for enhancing awareness about health benefits of Root & Tuber Crops are being initiated and to be intensified in a systematic way. However, the Department failed to furnish any concrete plan either for conducting survey for analyzing dietary and taste preferences of consumers in various parts of Country or for organizing joint campaign involving industry and Central and State Government for enhancing awareness about health benefits of Root & Tuber crops. The Department also failed to furnish any budgetary allocation for these purpose during the current financial years. The Committee, therefore, desire the Department to furnish details of proposed

survey and campaign being planned to enhance awareness about health benefits of Root & Tuber crops to them within one month of presentation of this Report. The Committee also desire the Department to make adequate financial allocation t for these purpose in the next financial year.

RESEARCH COOPERATION AND COLLABORATION

(Recommendation No. 12)

1.11 The Committee had observed/ recommended as under:-

"Research Cooperation and Collaboration is becoming one of the most significant features of scientific and technological activities in the 21st century. This era is being characterized as Big Science, in which the scale and comprehensiveness of research projects have increased, thereby, increasing the resource dependencies between scientists. Collaboration among scientists of various research institutes help in minimizing fund requirement, avoiding duplication of research efforts and enhancing research output. The Committee note that the ICAR-CTCRI collaborates with various State Agricultural Universities (SAUs), State Departments of Agriculture, Horticulture, Tribal Development etc. and related Industries in developing, validating and scaling up the technologies developed. At International level, the Institute has collaboration with CGIAR institutes such as CIAT, California, CIP, Lima and IITA besides organizations such as CIRAD, France, USDA, NRI, UK, ETH, Switzerland etc. The Committee were informed that the Institute has collaborated with ICAR-CPRI, Shimla and IIRS, Dept. of Space, Govt. of India, Dehradun for Fertilizer best management practices by Site specific nutrient management, Climate smart agriculture practices for tropical tuber crops and Cassava area estimation using remote sensing.

The Committee appreciate the steps being taken by the Institute for promoting collaborative research with other Institutes of national and international prominence. However, the Committee observe that Institute has

not taken any steps for collaborative research with other research agency for up scaling of technology for bio-degradable plastic and bio-ethanol Cassava. Keeping in view of paucity of funding for advanced research work and need of specialized knowledge, the Committee are of view that there is need enhance collaborative research work for optimization of resources and research outcome. The Committee find that ICAR-CTCRI has not taken steps to enhance collaboration with other National institute such as CFTRI which has expertise in the field of food processing technologies or with Central Institute of Plastics Engineering & Technology (CIPET) which has expertise in plastic engineering or with Indian Institute of Petroleum which has expertise in Petroleum products. The Committee, therefore recommend the ICAR-CTCRI to explore possibilities for collaborative research work with these institutes in order to take projects of bio-degradable plastic, Bio-ethanol Cassava and food processing technologies and make them industry worthy. The Committee also desire the Department of Agricultural Research and education to prepare clear guidelines for collaborative research work with other National and International Research Institutes before approving research proposal in order to avoid duplication of efforts and optimizing fund utilization.

1.12 The Department of Agricultural Research and Education in the Action Taken Reply has stated as under:-

"The Institute has already developed PLA-modified starch based bioplastics in collaboration with CIPET, Kochi. The Institute is exploring the possibilities for further collaborative research with CFTRI, CIPET, IIP etc. to take research projects on biodegradable plastics, bioethanol from cassava and food processing technologies to assess commercial feasibility".

1.13 The Committee note that the Department in their Action Taken Reply has submitted about steps already taken by them to develop PLA-modified starch based bioplastics in collaboration with CIPET, Kochi and their intention

about exploring the possibilities for further collaborative research with CFTRI, CIPET, IIP etc. to take research projects on biodegradable plastics, bioethanol from cassava and food processing technologies to assess commercial feasibility. However, the Department has failed to furnish any response on recommendation of the Committee on preparation of clear guidelines for collaborative research work with other National and International Research Institutes before approving research proposal in order to avoid duplication of efforts and optimizing fund utilization. The Committee are of the view that there is need of comprehensive planning in order to promote the culture of collaborative research with other agriculture research institutes and other research Institutes which has expertise in aspects related to research on agriculture and a clear guidelines to promote such cooperation and collaboration will not only save resources but will also enhance the quantum and quality of research outcome. The Committee, therefore, once again reiterate their earlier recommendation for preparation of clear guidelines for collaborative research work with other National and International Research Institutes in the Country and abroad.

RESEARCH STUDENTS AT ICAR-CTCRI

(Recommendation No. 13)

1.14 The Committee had observed/ recommended as under:-

"The Committee note that ICAR-Central Tuber Crops Research Institute is a recognized centre by the University of Kerala, Kannur University, MG University, MS University and Utkal University for undertaking Doctoral programme. Several of the Scientists of ICAR-CTCRI have been recognized as Research Guides by these universities. ICAR-CTCRI also imparts 1-2 months hands-on training especially in the fields of bio-technology and microbiology to Undergraduate and Postgraduate students leading to submission of dissertation as a part of course curriculum. The Committee were informed that 96 students of M.Sc. were enrolled in institute during 2012-2017, whereas, 25 students and 5 students were enrolled for Ph.D programme and Post- Doctoral studies respectively during the same period.

The Committee observe that despite being only Institute in the world conducting research exclusively on Tropical Tuber Crops, the institute has failed to attract adequate students from foreign countries as only one student from Kenya underwent three months research programme at the Institute during 2014-15. The Committee also observe that none of doctoral or post doctoral students enrolled at institute were able to develop crop hybrid or receive patent for significant research outcome during the last five years. The Committee are of considered view that apart from research, an Institute should also aim to train adequate numbers of students and impart them research orientation in order to make available qualified and trained manpower for Industries. Further, availability of a talented and diversified pool of students are pre-requisite for enhancing the quality of research outcome. The Committee, therefore, desire the Institute to make effort for enhancing the numbers of research students at ICAR-CTCRI and its research station at Bhuvneshwar. The Committee recommend the Department of Agricultural research and Education to explore the possibility for research fellowship at ICAR-CTCRI to students in order to attract talents students from the Country and abroad."

1.15 The Department of Agricultural Research and Education in the Action Taken Reply has stated as under:-:-

"The Institute is taking all efforts to attract students from reputed Indian and foreign universities and we have received more applications for different fellowships by foreign students such as CV Raman Fellowship for African Students. Scientists are encouraged to invite more students from India also. The Institute is providing trainings to school, graduate and post-graduate students regularly in order to make available qualified and trained manpower for Industries."

1.16 While observing the need of attracting talented students from the country and other parts of the world, the Committee had recommended the

Department to make effort for enhancing the numbers of research students at ICAR-CTCRI and its research station at Bhuvneshwar and explore the possibility for research fellowship at ICAR-CTCRI to students in order to attract talents students from the Country and abroad. The Department in their action taken Reply has stated about steps being taken by the Institutes to attract students from reputed Indian and foreign universities. However, the Committee note that Department has not furnished any response on exploring the possibility for research fellowship at ICAR-CTCRI to students in order to attract talented students from the Country and abroad, as recommended by the Committee. The Committee deplore the callous attitude of the Department in submitting response on observations/ recommendations of the Committee and hope that such lapse will not be repeated in future. The Committee further desire the Department to initiate action to explore possibility for research fellowship at ICAR-CTCRI to students in order to attract talents students from the Country and abroad. The Committee would like to be apprised about action taken in this regard within one month of presentation of this Report.

CHAPTER - II

OBSERVATIONS/RECOMMENDATIONS THAT HAVE BEEN ACCEPTED BY THE GOVERNMENT

(Recommendation No. 1)

Human community during their course of evolution and spread across the world had shown ingenuity while choosing sources of nutritional food. Traditionally, root and tuber crops had been one of the most important sources for food and nutritional security for communities across the world. These crops with the capacity to survive in adverse climatic conditions and minimum resource input requirement are rich source of dietary energy such as carbohydrates. These crops also use to add to agricultural diversity to farming system making enhancing resilience in case of adverse climatic conditions. However, with advent of modern agriculture system which promote high input intensive cultivation of limited number of high yielding crop species, a decline was observed in crop diversity in agricultural systems across the world, relegating Root and Tuber crops as marginalized crops. The Committee are of view that Root and Tuber Crops with their inherent potential to withstand adverse climatic change, may emerge as important plank to ensure food and nutritional capacity in the country in coming decades when challenges of climatic changes associated with global warming will become more severe. The Committee in successive paragraphs have analyzed the performance and preparedness of ICAR-Central Tuber Crops Research Institute (ICAR-CTCRI) which is the only research organization in the World dedicated solely to the research on tropical tuber crops.

Reply of the Government

The ICAR-CTCRI is grateful to honorable Chairman and Members for their invaluable recommendations towards overall development of root and tuber crops.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

(Recommendation No. 2)

The Committee note that ICAR-Central Tuber Crops Research Institute (ICAR-CTCRI) was established in 1963 at Thiruvanathapuram with a vision for study on Root and tuber crops for ensuring better health, wealth generation and inclusive growth. The Institute is working with a mission to integrate root and tuber crops as a sustainable farming system component to ensure food and nutritional security of the Nation and livelihood improvement of rural population. The Committee have been informed that Institute has mandate for basic, strategic and applied research on genetic resource management, crop improvement, sustainable production and utilization of tropical tuber crops. It is also responsible for coordinating research and validation of technologies through AICRP on tuber crops. The Committee also note that ICAR-CTCRI has a regional station at Bhubaneswar and coordinating AICRP-on Root and Tuber crops. The Committee were informed that Institute is able to test the efficacy of new crop varieties of Root and Tuber Crops and technologies in other parts of the Country through 12 All Indian Coordinated Research Projects in various parts of the Country.

Reply of the Government

The institute is carrying out R&D programme as per the mandate, satisfying the mission of integrating root and tuber crops as a sustainable farming system component to ensure food, nutrition and livelihood security as well as to foster its vision towards tuber crops based inclusive growth.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

DEVELOPMENT AND RELEASE OF NEW VARIETIES OF ROOT AND TUBER CROPS

(Recommendation No. 4)

The Committee note that ICAR-CTCRI has developed sixty high yielding varieties of different R&T crops including 16 of cassava, 18 of sweet- potato, 14 of yams, 9 of taro, 2 of elephant foot- yam and 1 of Chinese potato during the last five years. It has also developed three triploid varieties— Sree Harsa, Sree Athulya, and Sree Apoorva with high dry matter and extractable starch content were for starch industry. The Committee also note the Institute was also able to develop first cassava mosaic disease (CMD) resistant variety Sree Padmanabha and short duration cassava varieties viz. Sree Jaya and Sree Vijaya ideal for cultivation in rice fallows of Kerala. The Committee were also informed that high yielding and high starch containing cassava varieties viz. H165 and H226 contributed in a big way in the establishment of starch and sago industries in and around Salem district of Tamil Nadu. The Committee also note that the Institute has been able to earn a revenue of Rs. 48.00 lakhs from commercialization of11 varieties of Root and Tuber crops/hybrids released by the ICAR-CTCRI during XII plan.

The Committee also note that ICAR-CTCRI has a system in place at ICAR-CTCRI to monitor performance and productivity of new Root and Tuber crops/hybrids released by the institutes. All new hybrids developed are tested for their performance in Initial Evaluation Trial (IET), Multi Location Trial (MLT) and Uniform Regional Trial (URT) in various selected locations under AICRP (Tuber Crops). All released varieties are also tested in Institute farm as well as through progressive farmers for their performance. The Committee were also informed that ICAR-CTCRI and its Regional Centre at Bhubaneswar collaborate with different State Governments and take up projects to popularize the newly released varieties of root and tuber crops. The Institute has taken up programmes under Tribal Sub-Plan to popularize these varieties in north eastern states of India.

The Committee further note that the Institute has standardized production technology for quality planting material of Cassava, Sweet Potato, Elephant Foot Yam and other tuber crops. Mini-sett technology for tuber crops was developed at the Institute is very popular among farming community. Management practices for intercropping cassava with coconut, arrowroot with coconut, yams with maize, and yams and edible aroids with coconut, banana and rubber have been standardized. Precision nutrient management technologies such as drip fertigation for cassava and elephant foot -yam and drip irrigation for elephant foot- yam have been developed. Soil fertility management practices for all these crops were substantially improved with the development of soil- test based fertilizer recommendations as well as site specific nutrient management (SSNM) practices developed using calibrated QUEFTS model. The model-based approach resulted in development of nutrient recommendation zonation maps as well as customized fertilizers for cassava, elephant foot- yam, sweet- potato and yams. The Committee also note that the Institute has developed a methodology for climate change impact assessment of cassava, sweet- potato, elephant foot -yam and yams using ECOCROP model and the model was calibrated for these crops for Indian conditions using geoinformatics tools.

The Committee appreciate the work being done by the ICAR-CTCRI for the development of high yielding varieties of Root & Tuber Crops. However, the Committee are of view that there is large scope for expansion of farming of R & T Crops in other parts of Country especially in eastern States. The Committee, therefore, desire the Institute to proactively work with State Government to identify potential areas which are suitable for farming of Root & Tuber Crops and take steps to educate farmers about high yielding varieties and improved production techniques for farming of Root & Tuber Crops. The Committee also desire the Institute to take a project for identification of varieties of fruits and tuber crops being grown in various parts of the Country and document their properties and traditional uses by the local communities.

Reply of the Government

The Institute already got approved two RKVY projects to popularize improved varieties in tribal dominated districts. The required documentation on traditional uses will be taken care of under these projects and other Institute programme in addition to our regular activities. The importance of improved varieties are being exposed through regular conduct of exhibitions, frontline demonstrations, on-farm programme, MGMG as well as farmer-researcher interface programme across the country. Those ongoing activities will be intensified further as suggested.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

RESEARCH ON MEDICINAL AND NUTRITIONAL ASPECT OF ROOT & TUBER CROPS

(Recommendation No. 5)

The Committee observe that Root and Tuber Crops, apart from being used as a staple food, were traditionally being used for treatment of various diseases/ailments in various parts of the Country. However, the Committee feel that ICAR-CTCRI is yet to take any project for research on nutritional and medicinal aspects of Root and Tuber Crops. The Committee, therefore, recommend the Institute to take steps for promotion of research on nutritional and medicinal aspects of Root and Tuber Crops being grown in various parts of the Country. The Committee also desire that the Institute to take a project for compilation of traditional uses of Root and Tuber Crops in the Country. The Committee would like to be apprised of the steps taken in this regard within three months of the presentation of the Report.

Reply of the Government

The Institute has extensively worked on nutritional profile of tropical tuber crops, however, the medicinal properties were not given extensive thrust. Since our sister institute namely Directorate of Medicinal and Aromatic Plants (DMAP), Anand has been mandated to study the medicinal aspects of all the agricultural crops. However nutritional and medicinal aspects of Root & Tuber Crops has been studied partially under externally aided and institute programme. As per the recommendation, the Institute can take up a programme with special emphasis on medicinal and nutritional values in collaboration with appropriate Institutions. A documentation entitled, 'Traditional Tuber Crops Food of North East India' has already been made. Further updation of documentation will be taken up.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

ENHANCEMENT IN PRODUCTION OF ROOT AND TUBER CROPS

(Recommendation No. 6)

The Committee note that there was annual production of 4095000 tons Cassava and 1638000 tons sweet potato were produced in the Country during 2016-17. The Committee were informed that Tamil Nadu, Kerala and Andhra Pradesh were major producer of Cassava whereas Odisha, West Bengal, Chhattisgarh and Uttar Pradesh were major producer of the sweet potato in the Country. The Committee are of view that in order to exploit the opportunity for market for Starch and other produce based on Root and Tuber Crops in the International Market, the Country needs to enhance production of Root and Tuber Crops in the other parts of the Country. The Committee are view that there is significant scope for enhancement in the area of production in Root and Tuber Crops in non-traditional States, however, there will be need for handholding of farmers in order to encourage them for cultivation of Root and Tuber Crops. The Committee, therefore, desire that the Institute take steps for identification of areas suitable for cultivation of Root and Tuber Crops in non-traditional States in the Country and make an assessment of

support, which will be required by the farmers for the shift to cultivation of Root and Tuber Crops. The Committee would like to be apprised of the steps taken in this regard within three months of the presentation of the Report.

Reply of the Government

Expansion of area under tropical root & tuber crops in non-traditional states/ areas [(Karnataka (Bengaluru rural, Dharwad, Belgaum)], Tamil Nadu (Thanjavur, Tiruvarur, Nagapattinam), Maharashtra (Beed, Pune), Punjab (Jalandhar), Gujarat (Valsad, Dang, Tapi), Uttar Pradesh (Bundelkhand region) and Goa are being initiated involving SAUs, Krishi Vigyan Kendras, Department of Agriculture, progressive farmers and other stakeholders. Projected area increase per year will be 2-5 % under root and tuber crops in these non-traditional areas.

Frontline extension programmes *viz.,* Frontline demonstrations of improved varieties of root and tuber crops, farming/cropping systems, Integrated nutrient, pest and disease management, post harvest processing and value addition; training programmes, entrepreneurship development programmes, seminars, farm advisory visits, exhibition, extension publications etc. are being organized and to be intensified in collaboration with stakeholders of identified areas.

The NEH programme of ICAR-CTCRI also aims at increasing the area under root and tuber crops in north-eastern states of India to enhance the food, nutritional security and livelihood of people in North-Eastern Regions *viz.,* Manipur, Meghalaya, Nagaland and Tripura. Production of quality planting materials by farmers' participatory approach meets the demands of farmers for cultivating root and tuber crops for maximizing the productivity and profitability. Besides, innovative market-led extension model 'Village Incubation Centre' which was created for post harvest processing and value addition of tuber crops in Riha village, Ukhrul district of Manipur in 2016 is being upsclaed in 2018 in other parts of NE region.

Feasibility studies with respect to introduction of root and tuber crops in non-traditional states will be done using field surveys, focus group discussions, PRA

exercises and by multidisciplinary team for assessing the requirement of farmers for the shift to cultivation of root and tuber crops and their commercial ventures.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

(Recommendation No. 7)

The Committee note that ICAR-CTCRI is focusing on research for development of organic farming methods for Root & Tuber Crops. The Committee were informed that research work conducted for the past 12 years helped develop organic farming technology for cassava, yams, elephant foot-yam and taro. The Institute were able to develop a learning system using artificial neural networks (ANN) to predict performance of elephant foot- yam organic production system under various agroclimates. The institute has observed increase in yield by 10-20% with organic management. The tuber quality improved with higher dry matter, starch, crude protein, K, Ca and Mg contents. The anti-nutritional factors, oxalate content in elephant foot -yam and cyanogenic glucoside content in cassava lowered by 21 and 12.4%, respectively. Due to organic farming in elephant foot- yam, cost-benefit analysis indicated net profit 28% higher with additional income of Rs 47,716/ ha. The Committee also note that the Institute has developed organic farming technology for cassava, yams, elephant foot- yam and taro. The Institute was also successful in developing nutrient rich organic manure through composting of cassava starch factory solid waste (thippi) and synthesis of Zeolite materials from fly ash with high cation exchange capacity for enhanced soil nutrient retention.

The Committee appreciate the work of Institute on research on organic methods for cultivation of Root & Tuber Crops. However, the committee would like the Institute to disseminate the organic farming methods and technology among farmers in order to safeguard natural resources from harmful effects of chemical fertilizers and pesticides. The Committee would like to be apprized about steps taken in this direction within three months of presentation of this Report.

Reply of the Government

The Institute is regularly conducting farmers fair both, on and off campus, and participating in all agro-fest across the country with special emphasis on promotion of organic farming and root and tuber crops technologies. Regular FLDs, on-farm demonstration and entrepreneurship development programme will be intensified. In this context, Institute has collaborated with Coconut Development Board (CDB) and ICAR-Indian Institute of Farming Systems Research (ICAR-IIFSR) for large scale dissemination of organic farming and integrated farming system (IFS) technologies.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

DISEASE AFFECTING PRODUCTION AND ROOT AND TUBER CROPS

(Recommendation No. 8)

The Committee note that Root & Tuber Crops being vegetatively propagated are highly susceptible to disease proliferation due to easy transmission of biotic causal agents and this leads to serious problems. The important disease among Root & Tuber crops are mosaic disease, tuber-rot, mite, whitefly and mealy bug in cassava, weevil in sweet potato, anthracnose and mosaic in yam, leaf blight in taro, collar rot and mosaic in elephant foot yam and storage pests. The Committee were further informed that Cassava mosaic disease (CMD) caused by the Indian cassava mosaic virus (ICMV) or the Sri Lankan cassava mosaic virus (SLCMV) is a very serious disease that limits its yield. It occurs in more severe form in Tamil Nadu and also in Kerala, and causes yield losses ranging from 20to 50% or even up to 80%. The main reason for the spread of the disease is due to the indiscriminate and repeated use of the infected planting material and by the rapid spread through whiteflies.

The Committee also note that ICAR-CTCRI has been able to develop Sree Padmanabha, Muktakeshi Bhu Kripa and Sree Swathy varieties which are resistant against Cassava mosaic disease, Taro leaf blight disease and Anthracnose disease in yam respectively. The Committee were informed that the Institute has plan for development of Eco-friendly strategy for management of insect- pests in tuber crops

and development and refinement of integrated disease management and forecasting system for improved tuber crops production. Various bio-control agents were also developed to control many of the pests and diseases of Root and Tuber crops.

The Committee also note that the Institute has standardized a Diagnostic techniques for important viral and fungal diseases — cassava mosaic disease, cassava tuber-rot, sweet- potato feathery mottle, sweet- potato leaf curl, dasheen mosaic in elephant foot- yam and taro, yam mild mottle virus, yam badna virus, anthracnose in yam, taro leaf -blight and collar -rot in elephant foot- yam. Dipsticks were developed manually based on DsMV specific IgG-gold conjugate. The Committee were informed that test was found highly sensitive and was capable of detecting virus with very low titre. Further, the Committee also note that the Institute were able to sequence full genome of cassava mosaic viruses (ICMV , SLCMV), sweet- potato leaf -curl virus and dasheen mosaic virus and Transgenic plants resistant to cassava mosaic virus have been developed using Rep gene of Indian cassava mosaic virus.

The Committee appreciate the success of the Institute in developing pest resistant varieties of Root & Tuber crops, development of diagnostic kits and development of Transgenic plants resistant to cassava mosaic virus. The Committee are of view that susceptibility of Root & Tuber crop farming towards disease is major stumbling block in achieving the aim to enhance production and productivity of Root & Tuber crops in the Country. Further, climatic changes associated with global warming may led to proliferation of new kinds of pest affecting Root & Tuber crops. The Committee, therefore, desire the Institute to focus their attention for development of disease resistant varieties of Root &Tuber crops which can withstand climatic changes associated with global warming.

The Committee are also of view that there is need to replace existing varieties of Root & Tuber Crops which are susceptible to disease and make available saplings of disease free varieties among farmers. The Committee, therefore, desire the Institute to make plan for this and collaborate with State Governments concerned and Central Government for availability of funds for distribution of sapling among farmers and other necessary extension services.

Reply of the Government

Highest priority is given for identifying resistant genotypes of cassava, yam, taro and elephant foot yam for cassava mosaic disease, yam anthracnose, taro leaf blight and collar rot respectively. Disease free planting materials of cassava and elephant foot yam are being given top priority for multiplication and distribution to the needy ones. Efforts are being taken to monitor the emergence of new pathogens as well as dynamics of pathogen in relation to climate change. The following five research programmes are taken up to address the problems of pests and diseases in root and tuber crops.

- Development and refinement of integrated disease management and forecasting system for improved tuber crop production
- Flagship Project: Cassava mosaic disease- variability, diagnostic, vector relation and management
- Integrated crop, water and nutrient management for improving productivity of tropical tuber crops. Activity1: Production of disease free planting materials in tropical tuber crops
- Conservation and utilization of germplasm of tuber crops for sustaining production
- Genetic improvement of tuber crops through conventional breeding and molecular approaches

In order to produce and distribute quality planting materials, the Institute has taken up two RKVY projects and another project 'Tuber Crops Development Scheme' and it is envisaged to supply quality planting materials to non-traditional and new areas.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

USE OF ROOT AND TUBER CROPS AS ANIMAL FEED

(Recommendation No.10)

The Committee note that Root and Tuber Crops are being used Animal Feed especially for Piggery in other Countries. However, the Committee surprised to note that the ICAR-CTCRI has not taken steps for research on development of animal feed from Root and Tuber Crops. The Committee, therefore, desire the Institute to start a research project for exploring the possibilities for development of animal feed based on Root and Tuber Crops being grown in the Country.

Reply of the Government

The Institute has already done studies on cassava-based silage and cattle/poultry feed. Piggery is an important enterprise in north-eastern region of our country. Research projects on Root & Tuber Crops for animal feeds will be taken up in collaboration with ICAR-NEH.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

GREEN TECHNOLOGIES FROM CASSAVA STARCH

(Recommendation No. 11)

The Committee note that the institute has developed and patented a technology for manufacturing starch -based biodegradable plastic from Cassava. The starch incorporated plastic films (up to 25-40%) possess adequate mechanical strength and flexibility and can be processed just like normal plastics, i.e., heat-sealed, printed, coloured etc. The granules and finished products can be stored almost like synthetic plastics and biodegradable under soil burial conditions. The Committee were informed that this technology can be easily adopted by the existing plastic manufactures using conventional machines. The Institute has prepared Poly (lactic acid)-cassava starch composite based moulded articles by injection moulding and blow films methods. These can be used as disposable articles for various purposes. Further, a semi-synthetic cassava (tapioca) starch based superabsorbent polymer has been developed which is effective in soil moisture retention and can be

used as a soil additive, especially under controlled conditions such as in green houses for plant nurseries, ornamental and medicinal plants for saving irrigation water.

The Committee also note that the the CTCRI has developed an improved technology for bioethanol production from cassava starch using novel enzymes, derived from genetically engineered microorganisms. The process is time saving and less energy consuming, and can yield 680 litre ethanol from 1 tonne of dry chips / flour of Cassava. However, the Committee are distressed to note that the Institute is yet to commercialize these technologies. The Committee were informed that lack of sufficient budget is preventing the Institute to scale up the project and make it viable for commercial production. The Committee are of view that there is huge market for eco-friendly products which can be alternative for non-biodegradable plastic and Institute should have proactively scouted for partners in Private sector which could have invested in project for scaling up this important technology. Further, there must be enough Government support for scaling up of technologies in the important area of eco-friendly products. The Committee, therefore, recommend the institute to take steps for search of partners in private sector for projects of scaling up of technologies for bio-degradable plastic and bio-ethanol from cassava. The Committee also recommend the Government to make available sufficient funds for these important projects, if Institute fails to find Private investment. The Committee would like to be apprized about steps taken in this direction within three months of presentation of this Report.

Reply of the Government

Efforts are underway for licensing of bench scale production of 'bioethanol from cassava' and for further development of commercial scale production. Conclave and Entrepreneurship development programme were organized for joint collaboration in those areas with government and private entrepreneurs.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

PERFORMANCE ANALYSIS OF ICAR- CENTRAL TUBER CROP RESEARCH INSTITUTE

(Recommendation No. 14)

The Committee note that ICAR has a policy for evaluation of performance of scientist at various research Institutes under ICAR and scientists are required to submit their Annual Performance Appraisal Report on 15 March every year which gives scope for evaluation of all research work done by the scientist. Scientists are also required to submit their research performance online in Half Yearly Progress Monitoring (HYPM) website at 6 months intervals which is evaluated by the concerned HOD as well as Director. The Committee have been informed that ICAR-CTCRI were able to develop 42 technologies and got 2 patents and 3 copyrights during Twelfth Plan (2012-17). The Committee also note that 52 scientists of the Institute have published 265 publication during Twelfth Plan. The Committee note that ICAR and ASRB has fixed norms for each category of scientist to be eligible for promotion and specific number of publications in International / National journals is made mandatory. The Committee were informed that there were 51 publications by the Scientists of Institute in International / National Journals of which 17 were in journals with NAAS rating above 6.0 during 2015-16. The Committee also note that 13 scientists has supervised 13 students for PhD and 4 Scientists supervised 4 students for Post Doctoral research at ICAR-CTCRI.

The Committee note that none of scientists of ICAR-CTCRI have contributed for public policy formulation in agriculture sector in general and Root and tuber crop in particular. The Committee also observe that individual performance of scientists varies widely. The Committee note that only 4 scientists of the institute were able to file/ Obtain 8 patents, whereas, 9 scientists of the institute were able to bring 18 contract research and 32 scientists of the institute were able to develop 217 technologies. Considering the performance of scientists of ICAR-CTCRI, the Committee are of view that there is need to enhance capacity of scientists who are not able to perform according to the norms set by the ICAR. The Committee, therefore, recommend the Department to analyze the reasons for varying

performance of scientists and take steps for corrective action including training in order to enhance research outcome of the Institute. Further, the Committee also desire the Department to recognize the better performers and provide them suitable incentives in order to enhance their morale. The Committee would like the Department to complete the performance analysis of scientist at ICAR-CTCRI within three months of presentation of Report and take corrective action under intimation to the Committee.

Reply of the Government

Performance analysis of all the scientists are being done on a regular basis to improve the individual and overall performance of the Institute as per different yardsticks in APAR and HYPM reports. Very clear instructions have been given to all the scientists to increase their performance.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
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INFRASTRUCTURE AT ICAR-CTCRI

(Recommendation No. 15)

The Committee note that the Institute has state-of-the-art laboratories for DNA Sequencing, Molecular Marker Study, Tissue Culture, Bioinformatics, Soil Fertility and Plant Nutrition, Soil Physics, Geoinformatics, Transgenics, Virus Diagnostics, Biopesticides, Food Processing and Starch Biochemistry. The laboratories are equipped with genetic analyser, gel documentation system, real time quantitative PCR, ELISA reader, thermal cycler (PCR), cryostat, graphite furnace AAS, leaf area meter, chlorophyll fluorescence meter, automated soil CO_2 flux system, automatic N digestion and distillation system, electroantennogram, HPLC, HPTLC, GLC, Fibre Analyser, Image Analyser, Tintometer, Refractometer, Food Extruder, Food Texture Analyser, DSC, Rheometer, FTIR, Rapid Viscoanalyser, Diode Array Spectrophotometer, FT-NIR Spectrometer and automatic weather station. The Committee were also informed that the Institute has established a full-fledged Local

Area Network and a VPN connectivity is established for Global Access to the servers. Agricultural Knowledge Management Unit (AKMU) was established with 17 workstations with centralized facilities for printing, scanning etc. The Unit became one of the nodal points of National Knowledge Network of India (NKN) for effective sharing of scientific resources. The Institute has a modern library with more than 18,000 volumes, and current subscription of 42 journals besides re-prints and e-prints on tuber crops.

The Committee also observe that the Institute has requirement for advanced research equipments such as Agrobotics and Computer Simulation Laboratory, Ploidy Analyser , Oxygen Diffusion Rate Meter and accessories, Profile moisture meter, TDR based with accessories and Erdas Imagine & Arc GIS licenses which is essential for research works. The Committee are of view that necessary infrastructure and research equipments forms the basis of a robust research system. However, efforts should be made to explore possibilities to share research equipments with Institute located in nearby Districts. The Committee desire the Institute to explore possibilities for sharing of research equipments with other Institutes. Further, the Committee recommend the Department to make necessary financial allocation to the ICAR-CTCRI for provision of above mentioned research equipments if Institute is not able to access these equipments in other Research Institutes.

Reply of the Government

The Institute has got many sophisticated equipments in various fields of research. In order to share the research equipments with other Institutes, we have prepared a list of all available equipments. Those were posted in the DKMA web portal and also the information has been uploaded in Institute website.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

USE OF CHEMICAL FERTILIZERS AND PESTICIDES FOR CULTIVATION OF ROOT AND TUBER CROPS

(Recommendation No.16)

Integrated Pest and Nutrient Management is cardinal principle for safe and judicious use of pesticides and fertilizer in agriculture. The Committee note that ICAR-CTCRI has developed site specific nutrient management (SSNM) technology using computer programmes to calculate the exact quantity of fertilizers required for getting a particular yield for all major growing regions of the country. Fertilizer calculation charts, decision support system and mobile app were developed to help the farmers to calculate the quantity of different fertilizers. The Committee also note that ICAR-CTCRI collect soil samples from Root and Tuber Crops farmers and analyze samples and prepares Soil Health Card. Further, Institute has also developed Integrated Pest and Disease Management strategy for all important pests and diseases such as cassava mosaic disease, tuber rot of cassava, sweet potato weevil, collar rot of elephant foot yam etc. The Committee note that the Institute has trained 2653 farmers from 2012-2018 about Integrated pest and disease management of tropical tuber crops.

The Committee also note that the Institute has developed bio-pesticide and biofumigant from cassava leaf and tuber rind.viz. Menma, Nanma and Shreya. The formulation Menma is very effective against borer pests like pseudostems weevil and rhizome weevil in banana, red palm weevil in coconut etc. Sucking pests such as mealy bug, thrips, scale insects, mites etc. Nanma is very useful in horticultural crops. Waxy coating around mealy- bug gives protection from insecticide application but Shreya can dissolve mealy substance and kill it. Biofumigants isolated from cassava leaves are effective against stored product pests. Large scale field trial covering over one lakh banana plants in different districts of Kerala under the RKVY project has established the efficacy of the bioformulation against pseudostem and rhizome weevils in banana.

The Committee appreciate the ICAR-CTCRI for success achieved in the field of Integrated Pest and Nutrient Management. However, the Committee desire the Institute to disseminate methods of site specific nutrient management (SSNM) technology and bio-pesticide and biofumigant from cassava among the farmers cultivating Root & Tuber crops in other parts of Country so that use of chemical fertilizer and pesticides can be further minimized. The Committee also desire the Institute to explore the market opportunities in other States so that return on investment on research could be optimized.

Reply of the Government

The Institute has developed customized fertilizers for different tuber crops based on SSNM technology and frontline demonstrations (FLD) have been planned in farmers' fields across the country with the support of KVKs and State Agricultural Universities. The Institute also developed five crop-based micronutrient formulations and were sold to a private company, M/S Linga Chemicals, Madurai and they have brought out all these five products to market. Biopesticide formulations also were sold to eight KVKs across Kerala state. Trainings, demonstrations and exhibitions are also arranged to popularize the SSNM technology and biopesticide and biofumigant. The Institute also has taken up a RKVY project to popularize the biopesticide and biofumigant.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

PLANNING FOR THE FUTURE

(Recommendation No. 17)

The Committee note that Cassava mosaic disease – variability, diagnostics, vector relation and management and Development of cassava starch based novel products and functional foods from other tuber crops are flagship project of ICAR-CTCRI which it intend to focus in future. Apart from these, the Institute has identified other priority areas of research such as Conservation and utilization of germplasm of

tuber crops for sustaining production, Genetic improvement of tuber crops through conventional breeding and molecular approaches; Integrated crop, water and nutrient management for improving productivity of tropical tuber crops; Studies on the impact of climate change and devising mitigation strategies for sustaining productivity of tuber crops; Development and refinement of integrated disease management and forecasting system for improved tuber crops production; Improving knowledge and skill of stakeholders for sustainable production of tuber crops etc. as thrust areas in future.

The Committee is also note that ICAR-CTCRI has made projection for fund to the tune of Rs.8.09 crore for the period of 2017-20 to achieve the target set for the future. The Committee, therefore, recommend the Department to make available requisite funds in coming fiscal to the Institute to achieve its aims.

Reply of the Government

The Institute has taken up research projects on all the above mentioned thrust areas in Institute / Externally funded projects.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

CHAPTER - III

OBSERVATIONS/RECOMMENDATIONS WHICH THE COMMITTEE DO NOT DESIRE TO PURSUE IN VIEW OF THE GOVERNMENT'S REPLIES

NIL

CHAPTER - IV

OBSERVATIONS/ RECOMMENDATIONS IN RESPECT OF WHICH REPLIES OF THE GOVERNMENT HAVE NOT BEEN ACCEPTED BY THE COMMITTEE

RESEARCH COOPERATION AND COLLABORATION

(Recommendation No. 12)

Research Cooperation and Collaboration is becoming one of the most significant features of scientific and technological activities in the 21st century. This era is being characterized as Big Science, in which the scale and comprehensiveness of research projects have increased, thereby, increasing the resource dependencies between scientists. Collaboration among scientists of various research institutes help in minimizing fund requirement, avoiding duplication of research efforts and enhancing research output. The Commmittee note that the ICAR-CTCRI collaborates with various State Agricultural Universities (SAUs), State Departments of Agriculture, Horticulture, Tribal Development etc. and related Industries in developing, validating and scaling up the technologies developed. At International level, the Institute has collaboration with CGIAR institutes such as CIAT, California, CIP, Lima and IITA besides organizations such as CIRAD, France, USDA, NRI, UK, ETH, Switzerland etc. The Committee were informed that the Institute has collaborated with ICAR-CPRI, Shimla and IIRS, Dept. of Space, Govt. of India, Dehradun for Fertilizer best management practices by Site specific nutrient management, Climate smart agriculture practices for tropical tuber crops and Cassava area estimation using remote sensing.

The Committee appreciate the steps being taken by the Institute for promoting collaborative research with other Institutes of national and international prominence. However, the Committee observe that Institute has not taken any steps for collaborative research with other research agency for up scaling of technology for bio-degradable plastic and bio-ethanol Cassava. Keeping in view of paucity of

funding for advanced research work and need of specialized knowledge, the Committee are of view that there is need enhance collaborative research work for optimization of resources and research outcome. The Committee find that ICAR-CTCRI has not taken steps to enhance collaboration with other National institute such as CFTRI which has expertise in the field of food processing technologies or with Central Institute of Plastics Engineering & Technology (CIPET) which has expertise in plastic engineering or with Indian Institute of Petroleum which has expertise in Petroleum products. The Committee, therefore recommend the ICAR-CTCRI to explore possibilities for collaborative research work with these institutes in order to take projects of bio-degradable plastic, Bio-ethanol Cassava and food processing technologies and make them industry worthy. The Committee also desire the Department of Agricultural Research and education to prepare clear guidelines for collaborative research work with other National and International Research Institutes before approving research proposal in order to avoid duplication of efforts and optimizing fund utilization.

Reply of the Government

The Institute has already developed PLA-modified starch based bioplastics in collaboration with CIPET, Kochi. The Institute is exploring the possibilities for further collaborative research with CFTRI, CIPET, IIP etc. to take research projects on biodegradable plastics, bioethanol from cassava and food processing technologies to assess commercial feasibility.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

Comments of the Committee

For comments of the Committee please refer to Para No. 1.13 of Chapter I of this Report.

RESEARCH STUDENTS AT ICAR-CTCRI

(Recommendation No. 13)

The Committee note that ICAR-Central Tuber Crops Research Institute is a recognized centre by the University of Kerala, Kannur University, MG University, MS University and Utkal University for undertaking Doctoral programme. Several of the Scientists of ICAR-CTCRI have been recognized as Research Guides by these universities. ICAR-CTCRI also imparts 1-2 months hands-on training especially in the fields of bio-technology and microbiology to Undergraduate and Postgraduate students leading to submission of dissertation as a part of course curriculum. The Committee were informed that 96 students of M.Sc. were enrolled in institute during 2012-2017, whereas, 25 students and 5 students were enrolled for Ph.D programme and Post- Doctoral studies respectively during the same period.

The Committee observe that despite being only Institute in the world conducting research exclusively on Tropical Tuber Crops, the institute has failed to attract adequate students from foreign countries as only one student from Kenya underwent three months research programme at the Institute during 2014-15. The Committee also observe that none of doctoral or post doctoral students enrolled at institute were able to develop crop hybrid or receive patent for significant research outcome during the last five years. The Committee are of considered view that apart from research, an Institute should also aim to train adequate numbers of students and impart them research orientation in order to make available qualified and trained manpower for Industries. Further, availability of a talented and diversified pool of students are pre-requisite for enhancing the quality of research outcome. The Committee, therefore, desire the Institute to make effort for enhancing the numbers of research students at ICAR-CTCRI and its research station at Bhuvneshwar. The Committee recommend the Department of Agricultural research and Education to explore the possibility for research fellowship at ICAR-CTCRI to students in order to attract talents students from the Country and abroad.

Reply of the Government

The Institute is taking all efforts to attract students from reputed Indian and foreign universities and we have received more applications for different fellowships by foreign students such as CV Raman Fellowship for African Students. Scientists are encouraged to invite more students from India also. The Institute is providing trainings to school, graduate and post-graduate students regularly in order to make available qualified and trained manpower for Industries.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

Comments of the Committee

For comments of the Committee please refer to Para No. 1.16 of Chapter I of this Report.

CHAPTER - V

OBSERVATIONS/ RECOMMENDATIONS IN RESPECT OF WHICH FINAL REPLIES OF GOVERNMENT ARE STILL AWAITED

FINANCIAL PERFORMANCE

(Recommendation No. 3)

The Committee note that the institute has been provided Rs. 97.01 Crore at RE stage as against Rs. 105.78 crore provisioned at Budget estimates during XII plan. The Committee also note that there was decline in allocations under plan head to the Institute over the years as allocations under this head progressively decreased from a high of Rs. 7.0 Crore during 2012-13 to Rs. 5.26 crore during 2016-17. Allocations under Plan head to the institute during XII plan period were further reduced from Rs. 29.36 crore at BE stage to Rs. 22.82 crore at RE stage. Further, the Institute was provided Rs.22.45 crore during the 2017-18.

The Committee also note that despite success of Institute to overachieve target for internal revenue generation (Rs.3.36 crore against the target of Rs.2.34 crore) during XII plan, these were not more than 1.75 to 4.11% of total Expenditure that clearly indicate that target were set too low. The Committee are of view that ICAR-CTCRI being only institute in the world dedicated for research on Tuber crops in the world, has tremendous responsibility to provide leadership in cutting age research in their field of expertise. The Committee are also of the considered view that Root and tuber crops has potential to provide solution for shortfall in food production due to climatic changes associated with the global warming. These crops have potential to emerge as an alternative to staple food in future. Therefore, the Institute will require investment in capital head such as establishment of laboratories, procurement of latest scientific equipments etc. to achieve excellence in their endeavor. The Committee, therefore, recommend the Government to enhance allocations under capital head to the Institute in upcoming fiscals. The Committee also desire the ICAR to analyze revenue generation potential of Institute and enhance the target so that investment on R & D could be monetized for the benefit of the Country.

Reply of the Government

The Institute is putting concerted efforts to enhance revenue generation through sale of farm produce, technology commercialization, consultancies, training fees (national and international), collaborative projects, students programme and other services. New R&D initiative has been taken up with reference to 'Wealth from Waste' like biogas from cassava leaf waste etc. Provision for infrastructure and latest equipments will be made in the new plan budget after the current plan period (2017-2020) is over.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

Comments of the Committee

For comments of the Committee please refer to Para No. 1.7 of Chapter I of this Report.

INDUSTRIES BASED ON ROOT AND TUBER CROPS

(Recommendation No. 9)

The Committee note that Root & Tuber crop apart from direct human consumption, can be used as raw material for food processing Industries such as Savory snacks, Baked products, Pasta and noodles and Functional foods. Root & Tuber crops are also main raw material for Starch based industries. The Committee further note that about 40% of the total production of Cassava, sweet potato, elephant foot yam, taro and arrowroot is processed before its use in different parts of the country. However, the Committee note that level of processing of Root & Tuber crops in the Country varies from 90% in Tamil Nadu to 40% in States like Bihar.

The Committee were informed that ICAR-CTCRI proactively cooperate with Industries based on Root & Tuber Crops and had developed many products such as Tuber crops based fried snack foods, Improved technology for fried cassava chips, Extruded snack foods from cassava and rice flour, Cassava papad, Gluten free

bread, Cold water miscible starch from cassava and bio-pesticides. The Committee were informed that the Institute has also developed many technologies and machineries such as hand operated, pedal operated and motorized Cassava chipping machines, Mobile starch extraction plant, Mobile starch extraction plant, Industrial rasper for extraction of starch, Centrifugal granulator for cassava-based feed, Cassava harvester, Cassava peeling knife and Pilot plant for liquid adhesive which are very helpful for the Industries based on Root & Tuber Crops. The Committee also note that ICAR-CTCRI has developed good manufacturing practices for Savory snacks, Baked products, Industrial products, Pasta and noodles, functional foods and Starch graft co-polymers which may be very useful to standardizing manufacturing practices and maintaining hygiene in food processing Industries based on Root and tuber crops in the country.

The Committee are of view that there is huge potential for Food products and snacks based on Root and Tuber Crops as these are healthy and rich in nutrition. However, there is need to make consumer aware of health benefits of Root & Tuber crops. Further, there is need to develop snacks and other products based upon dietary and taste preferences of consumers in various parts of the Country. The Committee, therefore, recommend the Institute to take a survey for analyzing dietary and taste preferences of consumers in various parts of Country. This survey may become the basis of further research on preparation of region specific snacks and other products based on Root & Tuber crops. Further, the Institute should also explore the possibility of a joint campaign involving industry and Central and State Government for enhancing awareness about health benefits of Root & Tuber crops in the Country. The Committee would like to be apprized about steps taken in this regard within three months of presentation of this Report.

Reply of the Government

It is planned to outsource the survey for analyzing dietary and taste preferences of consumers in various parts of the country. Research programme to develop region specific products based on Root & Tuber Crops will also be taken up. Joint campaigns involving Central and State Government for enhancing awareness

about health benefits of Root & Tuber Crops are being initiated and to be intensified in a systematic way.

(Ministry of Agriculture and Farmers Welfare)
[Department of Agricultural Research and Education]
(O.M No. 12(27)/2016-HS-II dated 08.11.2018)

Comments of the Committee

For comments of the Committee please refer to Para No. 1.10 of Chapter I of this Report.

NEW DELHI;
04 January, 2019
14 Pausha, 1940 (Saka)

HUKMDEV NARAYAN YADAV
Chairperson,
Standing Committee on Agriculture

Appendix

STANDING COMMITTEE ON AGRICULTURE

(2018-19)

MINUTES OF THE TENTH SITTING OF THE COMMITTEE

*****

The Committee sat on Friday, the 04th January, 2019 from 1000 hrs. to 1050 hrs. in the Chamber of the Hon'ble Chairperson, Standing Committee on Agriculture, Room No. 138 (Third Floor), Parliament House, New Delhi.

PRESENT

Shri Hukmdev Narayan Yadav – Chairperson

MEMBERS

LOK SABHA

2. Shri Sanjay Dhotre
3. Shri Sanganna Karadi
4. Shri Nalin Kumar Kateel
5. Smt Raksha Khadse
6. Dr. Tapas Mandal
7. Shri Janardan Mishra
8. Shri Mukesh Rajput
9. Shri C.L.Ruala

RAJYA SABHA

10. Shri Rajmani Patel
11. Shri Kailash Soni
12. Shri Mohd. Ali Khan
13. Shri Ram Nath Thakur
14. Dr. Chandrapal Singh Yadav

SECRETARIAT

1.	Shri Arun K. Kaushik	–	Director
2.	Shri Sumesh Kumar	–	Deputy Secretary

2. At the outset, Chairperson welcomed the Members to the Sitting of the Committee. Thereafter, the Committee took up for consideration the followinsg draft Reports:

*(i) XXXX XXXX XXXX XXXX XXXX

(ii) Draft Report on the Action Taken by the Government on the Observations/Recommendations contained in the 58th Report (16th Lok Sabha) of the Standing Committee on Agriculture (2017-18) on the Subject "ICAR-Central Tuber Crops Research Institute - A Performance Review" of the Ministry of Agriculture and Farmers Welfare (Department of Agricultural Research and Education).

3. After some deliberations, the Committee adopted the draft Reports without any modifications and authorized the Chairperson to finalize and present these Reports to Parliament.

The Committee then adjourned.

***Matter not related to this Report.**

Appendix

ANALYSIS OF ACTION TAKEN BY GOVERNMENT ON THE FIFTY-EIGHTH REPORT (16th LOK SABHA) OF STANDING COMMITTEE ON AGRICULTURE (2017-18)
(Vide Para 4 of Introduction of the Report)

(i)	Total number of Recommendations	17
(ii)	Recommendations/Observations which have been Accepted by the Government	
	Rec. Nos. 1, 2, 4, 5, 6, 7, 8, 10, 11, 14, 15, 16 and 17	
	Total	13
	Percentage	76.47%
(iii)	Recommendations/Observations which the Committee Do not desire to pursue in view of the Government's replies	
	Rec. No. NIL	
	Total	00
	Percentage	0.00%
(iv)	Recommendations/Observations in respect of which replies of the Government have not been accepted by the Committee	
	Rec. Nos. 12 and 13	
	Total	02
	Percentage	11.76%
(v)	Recommendations/Observations in respect of which Final replies of the Government are still awaited	
	Rec. Nos. 3 and 9	
	Total	02
	Percentage	11.76%