

**PROJECT “STRENGTHENING OF CROP QUALITY ANALYSIS
AND FOOD PRODUCT TESTING LABORATORY
UNDER RKVY 2017-18**



**Atal Bihari Vajpayee Institute of
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Foreword

Agriculture is the basis of Madhya Pradesh’s economy, little less than half of the land is cultivable. Madhya Pradesh is predominantly an agrarian economy with agriculture, animal husbandry and fisheries playing a significant role for promoting growth in the State economy. Agriculture is the livelihood for more than 50% of the population in Madhya Pradesh and is the single largest private sector providing job opportunities for rural people besides being the source of supply of food grains and other dietary staples and serving as the prime source of raw materials for industries. The farmer’s community belongs to socio-economical weaker section, and they are not capable to get their crops tested for quality and improvement purposes.

Therefore, in the year 2017-18 *Department of Farmers welfare and Agriculture development department, Government of Madhya Pradesh under RKVY* decided to grant funds for strengthening of crop quality analysis and food testing laboratory at JNKVV Jabalpur for helping local farmers in increasing their economic condition and boosting export policy of the state.

I congratulate Mr. Aamir Manan Deva and his team for collecting data, analysis and its Visualization. Agriculture plays a vital role in strengthening the rural economy of the Madhya Pradesh. There is no doubt that farmer community are very much interested to enhance crop production and economic status but the necessary supporting arrangement like crop quality testing infrastructure, knowledge and conviction towards increase in the crop production and quality seems to be real challenge for taking the scheme forward.

The study has brought out various limitations regarding project implementation and benefit to farmers due to irregularities by the implementing agency. However, the scheme has made a good impact by procuring of sophisticated machinery for testing of farmers for crops which may be a good beginning to resolve all the issues related to quality of the crops and food products. I hope this study gives a direction for the future –*the way to go enhance Agricultural export production and economic status of farmers.*

Date: - 04/12/2020

(Mangesh Tyagi)
Principal Advisor

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Aamir Manan Deva
(Advisor)

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Chapter 1

Introduction

1.1 Rashtriya Krishi Vikas Yojana – An overview

National development council (NDC) launched RKVY (Rashtriya Krishi Vikas yojana) scheme in 2007 as an umbrella scheme for ensuring holistic development of agriculture and allied sectors. The scheme has come an extended way since its inception and has been implemented across two plan periods (11th and 12th). The scheme incentivizes States to extend public investment in Agriculture & allied sectors. the cupboard has approved (as on 1st November 2017) for continuation of the continued Centrally Sponsored Scheme (State Plans) as Rashtriya Krishi Vikas Yojana- Remunerative Approaches for Agriculture and Allied Sector Rejuvenation (RKVY-RAFTAAR) for 3 years i.e. 2017-18 to 2019-20 with a financial allocation of Rs. 15,722 Crores with broad objectives of creating farming a remunerative economic activity through strengthening the farmer’s effort, risk mitigation and promoting agri-business entrepreneurship. The NDC reaffirmed its commitment to realize 4 per cent annual growth within the agricultural sector during the 11th plan. The most objective of RKVY is to resolve agricultural development strategies and to satisfy need of farmers. The scheme was introduced and concerned by the slow growth in agriculture and allied sectors and its main motive being that agricultural development strategies must be reoriented to satisfy the requirements of farmers and called upon the central and government to evolve a technique to rejuvenate agriculture. The main objectives of the scheme were:

- To incentivize the States to increase public investment in agriculture and allied sectors.
- To provide flexibility and autonomy to the States in planning and executing agriculture and allied sectors schemes.
- To ensure the preparation of plants for the districts and the States based on agro-climatic conditions, availability of technology and natural resources.
- To ensure that the local needs/crops/priorities are better reflected.

- To achieve the goal of reducing the yield gaps in important crops, through focused interventions.
- To maximize returns to the farmers. Price Stabilization Fund Scheme (PSFS)
- To check whether the agricultural plans in the states are focused on local needs, crops and priorities
- To reduce the yield gaps in important crops in the state.
- To maximize returns to the state farmers in Agricultural and allied sectors.

To make quantifiable changes in the production in Agricultural and allied sectors.

1.2 Madhya Pradesh-Agricultural Profile

Located in the central part of the country, Madhya Pradesh is bordered by the states of Rajasthan, to the northwest, Uttar Pradesh to the north, Chhattisgarh to the east, Maharashtra to the south, and Gujarat to the west. Madhya Pradesh being the largest state of the country has a mixed topography of hills and plains. Madhya Pradesh is the second largest State in India with a geographical area of 308,252 sq.km, constituting 9.38 per cent of the country's total area. The capital of Madhya Pradesh is Bhopal and the largest city and the commercial capital of the state is Indore. Agriculture is the basis of Madhya Pradesh's economy, little less than half of the land is cultivable. Madhya Pradesh is predominantly an agrarian economy with agriculture, animal husbandry and fisheries playing a significant role for promoting growth in the State economy. The State has greater dependence on agriculture from an economic as well as employment perspective. The most important crops are rice, wheat, sorghum (jowar), corn (maize), pulses (legumes such as peas, beans, or lentils), and peanuts (groundnuts). Rice is grown mainly in the east, where there is more rainfall, while in western Madhya Pradesh wheat and sorghum are more important. Agriculture is the livelihood for more than 50% of the population in Madhya Pradesh and is the single largest private sector providing job opportunities for rural people besides being the source of supply of food grains and other dietary staples and serving as the prime source of raw materials for industries. Realizing the urgency of problems in many of the states in India, National Development Council (NDC) resolved that a special Additional Central Assistance Scheme, named National Agriculture Development Programme (NADP / RKVY) be launched. The

NDC also felt that agriculture development strategies must be reoriented to meet the needs of farmers and called upon the Central and State governments to evolve a strategy to rejuvenate agriculture with a commitment to achieve at least four per cent growth in the agricultural sector during the 11th Five Year plan period. To achieve this, formulation of action plans by means of developing Comprehensive District Agriculture Plans (DAP) is recommended. As per the expenditure norms, 306 projects were implemented in Madhya Pradesh even though number of projects proposed for implementation was 367 during the 11th Plan. Under RKVY, State Government is given freedom to make interventions, in the identified priority sectors, for achieving high growth rate in agriculture. About Rs. 1791.9 crore has been spent on these 306 projects.

1.3 History of the current project

The Department of Food science and technology college of Agriculture, Jabalpur, Jawaharlal Nehru Krishi Vishwa Vidyalaya, in 2017 were given funds for the renovation of laboratory and purchase of essential equipment's and machines for strengthening the lab in order to set a crop quality facility to meet the present and future demand. The project stated that the Jabalpur district of Madhya Pradesh is producing variety of spices, durum, wheat, potato, onion, garlic, fruits and vegetables etc. and the major challenge being the lack of facilities for testing, poor facilities for Quality Management and lack of in-house testing facilities for incoming raw material and finished products and awareness related to the product safety and quality. The objectives and aims of the project were (Source DPR, JNKVV);

a. **Analysis of samples of various crops covered under Export Zone for export purpose:**

The Laboratory is proposed to help the Farmers to get their produce analyzed prior to export in various countries and get high remunerative prize of produce. The samples will be analyzed as per export requirement of different country.

b. **To analyze breeding material at different stages, prior to their release for biochemical quality attributes:**

The material evolved by breeders will be analyzed for various qualitative, physiochemical and biochemical parameters depending on the type of materials. On the basis of this data breeder will know the status of their material and then decide the further course of his work and develop the variety for export requirement. It is proposed

that variety of any crop will be released only after the qualitative and biochemical evaluation of the material under question. The methodology for various types of estimations will also to be standardized for their application in this program. Also, the facilities generated under the scheme will be used for providing training to other scientist's students and farmers.

c. **To identify product specific new crop varieties of economic and nutritional significance:**

Since last decades, the quality evaluation perceptions of seed and raw material of industries have been changed from mere chemical analysis to product-based breeding Programme. Therefore, to cope up with sensitivity and rapidness demanded in the changed scenario of all- round progress in all quality perception. The technology of product preparation will be standardized and product quality will be evaluated. Based on the above data, crop cultivars for product specific purpose will be developed for export and recommended for release.

d. **Analysis of samples of raw material and processed food product developed by food processing industries for human safety and export promotion purpose:**

The Laboratory is proposed to help the entrepreneur, food processing industry to get their processed product analyzed prior to export in various countries and get high prize for their product. The samples will be analyzed as per export requirement of different country.

e. **To provide consultancy services and impart training to entrepreneurs and farmers in quality analysis:**

The project will provide benefit to a very large segment of population of farmers of Madhya Pradesh. The farm produce and product will be analyzed in the Quality lab. By knowing the quality status, the farmers and entrepreneurs will be able to send their produce for export through APEDA. The following produce and food products will be analyzed in the laboratory for various parameters by standard analytical methods which have been validated by national and international agencies such as AOAC, AACC, APHA, USDA, FDA, ISO, CODEX, BIS, PFA, AGMARK and FSSAI etc.

1.4 Expected Outcomes

✓ **Increase in export potential of potato, onion and garlic from Madhya Pradesh.**

Madhya Pradesh being one of the largest producers of potato, onion and garlic and the fact that the proposed area of is extremely suitable for these crops, a decision was taken by the Steering Committee to set up Agri-Export Zone for these products to tap the potential international market. The Zone cover districts of Malva, Ujjain, Indore, Dhar and shajapur. The project involves an investment of around Rs. 50 crores out of which Rs. 20 crores will flow from Central Government agencies and the remainder will be provided by private sector agencies. This project is likely to benefit 3000 farmers and would entail an incremental export of around Rs. 5 crores in the first year itself which will increase to around Rs. 50 crores in the next 5 years.

✓ **Increase in export potential of durum wheat from Madhya Pradesh.**

Madhya Pradesh is a major producer of Durum Wheat in the country. Durum Wheat commands a higher price as compared to non-durum wheat. Few multinational traders had shown substantial interest in procurement of wheat from the state and that one of them had also set up an office at the Ashok Nagar Mandi in Guna. State government, before proposing, had already worked out a plan for encouraging production of organic wheat which had a substantial demand. Govt has set up the export zone which covers the districts of Ujjain, Ratlam, Mandsaur, Neemuch, Indore, Dhar, Shajapur, Dewas, Bhopal, Sehore, Vidisha, Raisen, Hoshangabad, Harda and Narsinghpur. The Export zone Project would entail an investment of around Rs. 86.43 crores out of which Rs. 9.03 crores will flow from the Central Government Agencies, Rs. 27.55 crores from State Government Agencies and private sector will put around Rs. 49.84 crores. In the next 5 years it is expected that there would be an export of Rs. 1155 crores from this zone. More than 10000 farmers are also likely to benefit from the setting up of this zone.

✓ **Increase in export potential of oranges from Madhya Pradesh.**

The Agricultural Export Zone for oranges entails an investment of around Rs. 10.00 Crores out of which Rs. 1.69 Crores will flow from various Central Government Agencies and Rs. 2.70 Crores from State Government Agencies. Private sector is likely to invest around

Rs.5.66 Crores. It is expected that during the first 5 years there would be an export of around Rs. 29.91 Crores of Oranges from this zone. More than 2000 farmers are likely to get benefited as a consequence of setting up of this zone.

✓ **Increase in export potential of Lentil and Gram from Madhya Pradesh**

This Agricultural Export Zone entails an investment of around Rs. 18.65 Crores out of which Rs. 2.11 Crores will flow from various Central Government Agencies and Rs. 5.27 Crores from State Government Agencies. Private sector is likely to invest around Rs.11.26 Crores. It is expected that during the first 5 years there would be an export of around Rs. 235.75 Crores of Lentil and Grams from this zone. More than 3000 farmers are likely to get benefited as a consequence of setting up of this zone.

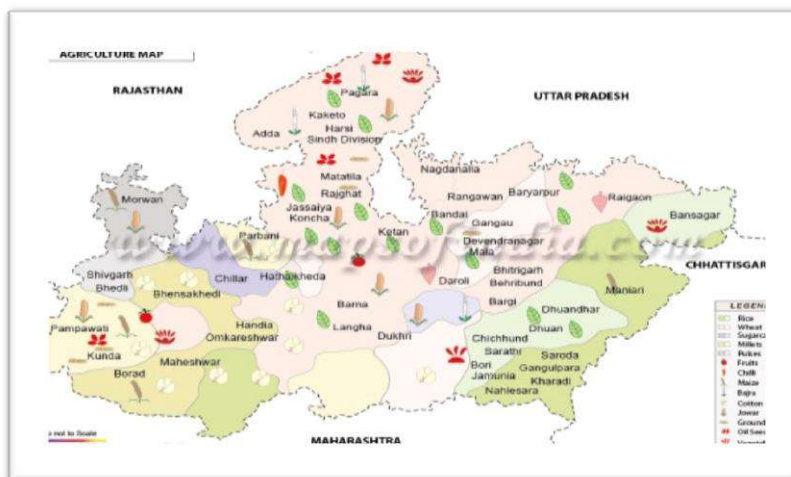
✓ **Availability of wholesome best quality of products to the consumers.**

✓ **Overall improvement in environment, life safety and socioeconomic status of the farmers in the state.**

1.5 Agricultural potential and scope of export

Madhya Pradesh is located in Central India and surrounded by Uttar Pradesh in the North, Chhattisgarh in the East, Maharashtra in the South and Gujarat and Rajasthan in the West.

The most commonly spoken language of the state is Hindi, English and Marathi are the other languages used by the people of the state. Bhopal (The capital) Indore, Gwalior, Jabalpur and Ujjain are some of the key cities of the state. Madhya Pradesh got an honor of the best agriculture state of



the India in the year 2013 for highest agriculture growth of 18 per cent per annum and also stood in top most position in India for producing pulses and oilseeds in the year 2013 for record production and procurement of wheat at Minimum Support Price (MSP) in the year 2011–12. The state also got “Krishi Karmath Award” of 2012 for development and extension of newer

modern technology of agriculture in the country. The state is a leading producer of soybean, gram, garlic and coriander.

Demographic Representation of Madhya Pradesh		
	Particulars	Figures
	Area (in sq. kms.)	308 thousand sq. K.M.
	Latitude	21° 53` to 22° 59`N
	Longitude	76° 47` to 78° 44` E
	Population (Census 2011) (thousand)	72598
	Male	37673 (51.81)
	Female	34985 (48.19)
	Rural	52538 (72.37)
	Urban	20060 (27.63)
	Scheduled Tribes (%)	20.27 (Census 2001)
	Scheduled Castes (%)	15.17 (Census 2001)
	No of districts	50
	Number of Tehsils	272
	Development Blocks	313
	Villages	55393
	Literacy (%)	70.6
	Male	80.53
	Female	60.02
	Density of Population (Person/sq.km.)	236
	Child Sex Ratio (Over 1000)	912

Table 1: Source: Government of Madhya Pradesh
Provisional Data – Census 2011, Figures in parenthesis show percentage to total population.

The majority of the population of Madhya Pradesh lives in rural areas as 72.37 percent of total population of M. P. lives in the villages of rural areas.

1.6 Agricultural Economy in Madhya Pradesh

Agriculture is the basis of Madhya Pradesh's economy. Little less than half of the land area is cultivable; however, its distribution is quite uneven because of variations in topography, rainfall, and soils. The main cultivated areas are found in the Malwa Plateau, the Rewa Plateau, and the Chhattisgarh Plain. The Narmada valley, covered with river-borne alluvium, is another fertile area. The most important crops are rice, wheat, sorghum (jowar), corn (maize), pulses (legumes such as peas, beans, or lentils), and peanuts (groundnuts). Rice is grown mainly in the east,

where there is more rainfall, while in western Madhya Pradesh wheat and sorghum are more important. The state is the largest soybean producer in India. Other crops include linseed, sesame, sugarcane, and cotton, as well as minor millets, which are grown in hilly areas. Madhya Pradesh has the basic mainstay of the common people that is agriculture; and it is through agriculture that the state is growing with leaps and bounds. In Madhya Pradesh, about 74.73 % of people come from villages that are far from the influence of industrialization. Supply of food grains and other dietary staples and serving as the prime source of raw materials for industries.

Village Area under Agriculture (in lakh hectares)		
	Particulars	Figures (Lakh in Hect.)
	Area under forest	87.08
	Cultivable Waste Land	9.67
	Net Area Sown	151.91
	Gross Cropped Area	251.14
	Double Cropped Area	99.23

Table 2: Agricultural Profile of MP Agricultural Statistics Kharif & Rabi crops FW&AG GoMP

Agricultural Production for the year 2018-19		
	Particulars	Figures (in Metric Tonns.)
	Food Grains Production	436.35
	Soya been	53.21
	Total Oil Seeds (Including Soya been)	69.47
	Sugar Cane (In Term of Gur)	5.43

Table 3: Agricultural Profile of MP Agricultural Statistics Kharif & Rabi crops FW&AG GoMP

Average Yield of Principal Crops (2018-19)		
	Particulars	Figures (KG/Hectare.)
	Rice (Paddy)	3507
	Wheat	3537
	Jawar	1933
	Gram	1525
	Soya Bean	1072
	Sugarcane	61545

Table 4: Agricultural Profile of MP Agricultural Statistics Kharif & Rabi crops FW&AG GoMP

Agricultural development is essential not only to achieve self-reliance in food grains at the state level, but also for ensuring household food security and to bring equity in distribution of income and wealth resulting in ultimate reduction of the poverty level. In fact, high economic growth will have no meaning for the masses living in rural areas unless agriculture is revitalized.

Realizing the urgency of problems in many of the states in India, National Development Council (NDC) resolved that a special Additional Central Assistance Scheme, named National Agriculture Development Programme (NADP / RKVY) be launched. The NDC also felt that agriculture development strategies must be reoriented to meet the needs of farmers and called upon the Central and State governments to evolve a strategy to rejuvenate agriculture with a commitment to achieve at least four per cent growth in the agricultural sector during the 11th Five Year plan period.

1.7 Agricultural Extension (RKVY) in Madhya Pradesh

There are 47 Krishi Vigyan Kendra's are in operations to carry out extension activities in Datia, Ashoknagar, Burhanpur, Neemuch, Mandla, Badwani, Umaria, Sheopur, Dewas, Katni, Chhatarpur, Shivpuri, Hoshangabad, Morena, Sagar, Khargone, Betul, Shajapur, Ujjain, Mandsaur, Harda, Damoh, Narsinghpur, Raisen, Dindori, Gwalior, Rewa, Betul, Panna, Dhar, Sehore, Bhind, Indore, Khandwa, Tikamgarh, Seoni, Rajgarh, Guna, Ratlam, Sidhi, Shahdol, Balaghat, Vidisha, Satna, Jhabua, Chhindwara and Bhopal districts under the jurisdiction of JNKVV and RVSKVV. One Central Farm Machinery Training & Testing Institute also working in Budhni M.P. and two Agriculture Technology Information Centre (ATIC) Centers Jabalpur and Bhopal also working in Madhya Pradesh. Kisan Call Centre (KCC) in which all agricultural information provides to farmers by agriculture specialist on farmers mobile without any payment. This KCC is currently working in Jabalpur at Madhya Pradesh. The State Government of Madhya Pradesh has also a vast network for providing crops and farm technologies to the farmers at village level. There are Joint Director and Deputy Director Agriculture posted in all the divisions and at all the districts of Madhya Pradesh. The extension activities are carried out by Assistant Director Agriculture, Senior Agriculture Development Officer, Agriculture Development Officer and Rural Agriculture Extension Officer at Block and villages levels in Madhya Pradesh.

The Madhya Pradesh has tradition of production of a number of varieties suitable for processing of agricultural commodities including grains, oil seeds, spices, fruits and vegetables and export potato, soybean etc. Many crops has been identified as key crops as thrust areas for value addition in Madhya Pradesh i.e. Banana, Mango, Orange and Papaya in fruits, Potato, Onion, Peas, Tomato and Brinjal in vegetables, Wheat, Rice, Maize and Jowar in cereals, gram, tur and

lentil in pulses, Soybean, Groundnut, Mustard in oil seeds, Garlic, Coriander, Chilies, Ginger and Fenugreek in spices and Jrianis, Bel, Aloevera and Anola in medicinal plants. There is huge potential for diversifying agriculture and developing the Agri-Business sector including food processing industry in the state, which will give a strong boost to rural incomes and have major multiplier effect on employment and equitable income growth throughout the economy. A strong and dynamic food processing industry can play a vital role in diversification and commercialization of agriculture and ensure value addition to the agriculture produce, generate employment, enhance income of farmers and create surplus for export of processed products.

1.8 Strengthening of Crop Quality and Food Testing Laboratories

The Food Safety and Standards Authority of India (FSSAI) has been established under Food Safety and Standards Act, 2006 which consolidates various acts & orders and other food related issues that have been handled in various Ministries and Departments. FSSAI has been created for laying down science-based standards for articles of food and to regulate their manufacture, storage, distribution, sale and import to ensure availability of safe and wholesome food for human consumption. Food testing laboratories are an integral part of food safety regulatory system. FSSAI has inherited 72 State food testing laboratories notified under Prevention of Food Adulteration Act (under the transition provision under Section 98 of FSS Act, 2006), for primary testing and surveillance. Section 43 (1) of FSS Act, 2006, provides that the Food Authority may notify food laboratories and research institutions accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL) or any other accreditation agency for the purposes of carrying out analysis of samples by the Food Analysts under this Act. Section 43 (2) of FSS Act, 2006, also provides that the Food Authority may establish or recognize by notification, one or more referral food laboratory or laboratories to carry out the functions entrusted to the referral food laboratory by this Act or any rules and regulations made there under. The objective here is to equip at least one of the Food testing Laboratories in each State/UT and two labs in larger States. A total of 45 State labs are proposed to be strengthened under the scheme. Equipping these labs with latest state-of-the art analytical instruments would enable them to:

- Analyze the regulatory and surveillance samples drawn by the FSO within the shortest possible time frame.

- Analyze the safety parameters in food samples such as Heavy metals, Pesticide residues, Antibiotic and drug residues and naturally occurring toxic substances along with Microbiological tests.
- Reduce the time taken from sample collection to sample analysis.
- Ensure compliance of FSSAI standards on food.
- Enable the laboratory to achieve NABL accreditation within 2 years from the date of release of final installment.
- Become a resource point for training and facility up-gradation for other existing Government /Public Food testing laboratories in the State.
- Introduce online laboratory data management system through Laboratory Information Management System (LIMS).

1.9 Structure of the report

First chapter focuses on the background information about the RKVY program, followed by the details of Project background and its original objectives on the basis of which funds were allocated to JNKVV for up gradation of the already existing laboratory in Department of Food science and technology. Second chapter presents the impact evaluation methodology for the strengthening of Crop quality and food testing laboratory. Third chapter discuss the review of RKVY projects and implementation. Chapter 4 discusses Implementation of current project done, Budget Allocation and Activity of Work by Department. Chapter 5 focuses on project scope and export policy, with a prime focus on Agricultural export crops of Madhya Pradesh, which would have boosted the Agricultural economy in the state, if the current project is implemented as presented in detailed project report and discussed by the implementing agency. Chapter 6 will focus on key finding by the study team to laboratory including renovation of existing infrastructure in Department of Food Science and Technology. In this chapter, details about the machinery for Crop and food Testing will be discussed with a major focus on its cost and usage of the intervention/benefit and its impacts on farming communities specifically productivity and income is elaborately discussed. Chapter 7 presents the possible recommendations about how the Laboratory will prove fruitful to the farmer’s community and other associated stakeholders viz Research scholars, students of various agricultural and allied sectors for taking up innovative projects for development of new variety of food products and crops during their curriculum. If the project will prove successful, it will ensure awareness and

capacity building of local farmers in knowing the quality of their crop so that they will get suitable prices for their product, Employment generation for Technical persons, marketing details.

Chapter 2

Impact Evaluation Methodology

2.1 Objectives and Scope of the Evaluation Study

Evaluation Objectives

- ❖ Assess the impact of Laboratory on beneficiaries, post project implementation.
- ❖ Ascertain the impact on the Export Agricultural Produce of the beneficiaries compared to the rest of the cohort in the similar geographies.
- ❖ Evaluate the level of efficiency in the project implementation along with identification of the operational challenges.
- ❖ Assess the impact made on the crop quality testing work in the State.
- ❖ Identify the problems encountered by the laboratory after completion of the project.
- ❖ Suggestive future recommendations for effective Implementation thereof.

Scope of work

The Department of Farmers Welfare and Agricultural Development has shown interest in an evaluation of the project strengthening of crop quality analysis and food product testing laboratory, by AIGGPA. The same shall be done in the following manner:

- ❖ The basic objective of the impact study is to review different components viz Infrastructural Renovation and modern equipment procurement’s for laboratory testing.
- ❖ To assess the impact of this project under RKVY for improvisation of various crop varieties so that it will help state in boosting economy under export policy.
- ❖ To suggest recommendations for improvement of overall sustainability and state specific measures for improving the effectiveness of the RKVY scheme.

2.2 Impact Evaluation study and result framework

The aim of the Study is to assess the Infrastructural Setup and Procurement of Equipment’s in Strengthening the crop quality and food testing laboratory in terms of;

1. Relevance
2. Project Design
3. Delivery and to evaluate the results in terms of

- a. Fulfillment of Objectives
- b. Operational Efficiency
- c. Impact and Sustainability.

2.3 Impact Evaluation Study Approach

The study is carried out in the following manner;

2.3.1 Research Design

The current study has adopted post facto qualitative analysis research design as Jawaharlal Nehru Krishi Vishwa Vidyalaya /RKVY Jabalpur has already made interventions in the field that were also the implementing agency of the project. The study used qualitative data for assessing the impact. Qualitative data has been collected by using structured observations, field visit and interviews. Data visualization of post execution of the projects were analyzed and recorded.

2.3.3 The Stakeholders of the project

Stakeholders covered under the study are listed below:

The beneficiaries of the project were Local Farmers involved in agricultural produce, Food Business Operators involved in manufacturing and packaging of Agricultural produce for export purposes, Scholars enrolled in various departments of the Agricultural university for development of new crop varieties, as well as department officials, various Agricultural federation officials and district officials from respective locations.

The following aspects were covered at the level of each stakeholder: -

- ❖ Beneficiary profile
- ❖ Awareness about the project
- ❖ Availied benefits as of now
- ❖ Impact of project on development and purposes mentioned in objectives.
- ❖ Impact on crop testing parameters
- ❖ Satisfaction level of the beneficiaries with the project and overall implementation.

2.4 Validation of Field Data

The study team has validated the data by visiting the department of Food science and Technology, JNKVV Jabalpur. The team has thoroughly analyzed components of the project for validation of field data. Further, interacted with Director of Research Services for data validation and simultaneously interacted with department officials for the qualitative assessment of the project in respective location. Open interviews were conducted with the officials of the concerned department to get a picture of the implementation of the scheme across the state. The primary data was collected through interview schedules with the relevant stakeholders.

Chapter 3

Review of different components of RKVY scheme

3.1 Objectives of the RKVY scheme

The main objectives of the scheme are-

- I. To incentivize the states so as to increase public investment in agriculture and allied sectors.
- II. To provide flexibility and autonomy to states in the process of planning and agriculture and allied sector schemes.
- III. To ensure the preparation of agriculture plan for the districts and the states based on agro climate conditions, availability of technology and natural resources.
- IV. To maximize return to the farmers in agriculture and allied sectors.
- V. To bring about quantifiable changes in the production and productivity of various components of agriculture and allied sectors by addressing them in a holistic manner.

3.2 Components and pattern of assistance

RKVY scheme was initiated in 2007 as an umbrella scheme for ensuring holistic development of agriculture and allied sectors by allowing states to choose their own agriculture and allied sector development activities as per the district/state agriculture plan. The scheme has come a long way since its inception and has been implemented across two plan periods (11th and 12th). Till 2013-14, the scheme was implemented as an Additional Central Assistance (ACA) to State Plan Scheme with 100% central assistance. It was converted into a Centrally Sponsored Scheme in 2014-15 also with 100% central assistance. Since 2015-16, the funding pattern of the scheme has been altered in the ratio of 60:40 between Centre and States (90:10 for North Eastern States and Himalayan States). For Union Territories the funding pattern is 100 % central grant.

3.3 Implementation arrangements

A state becomes eligible to receive RKVY allocation if and only if:

The base line share of agriculture and allied sector in its total state plan (excluding RKVY fund) expenditure is at least maintained; and District agriculture plans (DAP) and State Agriculture plan (SAP) have been formulated. RKVY funds will be made available to the states in two installments of 50% each. Eligibility and interstate allocation criteria will not be applied for providing funds under the sub scheme of RKVY or RKVY special schemes.

Chapter 4

Project Implementation

4.1 Implementation

Proposal for the project was submitted for the year 2017-18 for assistance of Rs 241.59 lakhs for providing funds for renovation of different laboratories and purchase of essential equipment's and necessary Instruments for strengthening of lab. This could have helped farmers in increasing their Export Potential.

4.2 Budget Allocation of Project

S.N	Components	Department	Relevant Scheme	Cost Rs in lakhs	Year 2016-17
0					
1	Laboratories renovation (Roof treatment/repairing of floor / Lab work station Partitioning and furnishing including electrification work)	Department of Food Science and Technology, College of Agriculture, JNKVV, Jabalpur	Agricultural Sector, JNKVV, Jabalpur MP	29.02	2017-18
2	Purchase of Necessary Equipment's for Laboratory			212.57	

4.3 Activity and Plan of the work

1. Establishment of Crop Quality Control lab in the College of Agriculture Jabalpur campus of JNKVV Jabalpur.
2. Procurement of instruments, purchase of chemicals and glassware's, with installation of equipment and instruments.
3. Qualitative and biochemical evaluation of the samples of raw material and processed food products provided by various farmers and Industries.

4. Analyses of the samples (on payment basis) sent by outside agencies along with submission of reports and proper recordkeeping.
5. Compilation of data, analysis and preparation of annual report.
6. Evaluation of various samples of food crops improved by breeders for baking quality, milling quality, chapatti making quality of cereals and pulses.
7. Analysis and interpretation of data to generate the recommendation.
8. Preparation of project completion report and submission to funding agency.

Chapter 5

Export Potential of cash crops and their Quality Testing Profiles

5.1 Project Focus

Impact Assessment means measuring the effectiveness of organizational activities and judging the significance of changes brought about by those activities. Impact assessment is intimately linked to Outcomes, and, in that sense, ripples through the organization. Impact is seen as the positive and negative, intended or unintended long-term results either directly or indirectly. Impact should be seen as the contribution of the intervention to the overall goal.

5.2 Export Policy

The Agricultural and Processed Food Products Export Development Authority (APEDA) has already notified various parameters for export of agricultural produce to foreign countries based on their quality and wholesomeness. There is a huge demand for cereals in the global market are creating an excellent environment for the export of Indian cereal products. In 2008, India had imposed ban on export of rice and wheat etc to meet domestic needs. Now, seeing the huge demand in the global market and country's surplus production, Country has lifted the ban, but only limited amount of export of the commodity are allowed. The allowed marginal quantity of exports cereals could not make any significant impact either on domestic prices or the storage conditions. The important cereals are wheat, paddy, sorghum, millet (Bajra), barley and maize etc. According to the final estimate for the year 2015-16 by ministry of agriculture of India, the production of major cereals like rice, maize and Bajra stood at 104.32 million tons, 21.8 million tons and 8.08 million tons respectively. India is not only the largest producer of cereal as well as largest exporter of cereal products in the world. India's export of cereals stood at Rs. 47,287.12 crore / 6,611.09 USD Millions during the year 2019-20. Rice (including Basmati and Non-Basmati) occupy the major share in India's total cereals export with 95.7% during the same period. Whereas, other cereals including wheat represent only 4.3 % share in total cereals exported from India during this period. Major Export Destinations for the year (2019-20) are Bangladesh, Nepal, Pakistan Iran, Saudi Arabia and United Arab Emirates.

5.3 Cash Crops of the state and potential for export

Cash crop is also known as profit crop which is grown to sell for profits in agriculture. And usually, it is purchased from parties who do not belong to the farm. Prices for major cash crops are set in commodity markets with a global scope and with variation to settle the demand and supply of the same. The cash crops of Madhya Pradesh include Wheat, Potato, Onion, Garlic, Rice, Pulses, Pearl Millet, Kodo and Kutki. Crops of Madhya Pradesh are basically divided into three categories namely Cash crops, Oilseeds and Food Grains and wheat, maize, paddy are grown in abundance. Major crops include Paddy, Wheat, Maize, and Jowar among cereals, Gram, Tur, Urad, and Moong and among Pulses, Soyabean and Groundnut and Mustard among Oilseeds. Major crops in Madhya Pradesh state of central India also include commercial crops like Cotton and Sugarcane. These two significant cash crops are grown in a considerable area in few districts of Madhya Pradesh. Horticulture crops like Potato, Onion, Garlic, along with fruits like Papaya, Banana, Oranges, Mango and Grapes are also grown in the state of Madhya Pradesh.

5.3.1 Wheat is considered as the major crop of the state in terms of area and production. Wheat occupies the highest area under Rabi crops. Madhya Pradesh Ranks 2nd in India in Wheat Production (2015-16). Madhya Pradesh is known for its distinguishing “Sharbati” variety of Wheat. The wheat producing areas of Madhya Pradesh comes under Wheat belt of the country where about 75cm to 127cm rainfall occurs. Major Varieties-HI 8381, HI 8498, MPO 1106, HD 4502, PDW 233, Raj 1555. New durum varieties Malav Ratna, Malavshree, Malav Shakti, Sudha, and among aestivums HI 1418, HI 1479, HI 1500, JWS 17 and NP 4010 are the new hopes. The products that can be manufactured by the processing of wheat are Flour, Semolina, Daliya, Cerel food, pasta, bread & Bakery, etc. The main wheat growing districts are Sehore district, Vidisha district, Raisen district, Shivpuri district, Gwalior, Ujjain, Hoshangabad district, Sagar district, Tikamgarh district, Satna district, and Indore district. Madhya Pradesh Ranks 2nd in maize production, and the products of maize include fodder for animals, food grain, sweet corn, baby corn, green cobs, and popcorn.

5.3.2 Paddy stands second after wheat in terms of area coverage and production. It is grown in the eastern parts of Madhya Pradesh and needs about 100cm to 125cm rainfall. Another

significant crop grown is **Rice**, about 2.50 hectares of land of the state is irrigated for the cultivation of these major crops. The irrigated area under rice is available in Balaghat district, Jabalpur district, Gwalior district, and Bhind district. In the eastern zone, Satna district, Rewa district, Sidhi district, Shahdol district, Dindori district and Mandla district in southern zone Balaghat district, Seoni district, in the central zone Jabalpur, Damoh district, and in Northern zone Bhind district, Morena district, Gwalior district and Shivpuri district are the major rice producing areas. **Jowar** is important crop of Madhya Pradesh and is grown in dry regions in both Rabi and Kharif seasons in the western parts of the state. The main Jowar growing districts are Mandsaur district, Ratlam district, Ujjain, Rajgarh district, Shajapur district, Dewas district, Indore district, Khargone Khandwa district, Shivpuri, Morena, Gwalior, Guna district, Bhind district, etc.

5.3.3 Gram is a Rabi crop grown in Madhya Pradesh. MP Ranks 1st in Gram Production in India, Major Varieties-JG-322, JG-221, , JG-63, Ujjain 21,24, and the processed products are Snacks, Daal, Besan, etc. It is grown in Hoshangabad, Narsinghpur, Chhindwara district, Guna, Vidisha district, Ujjain, Mandsaur, Dhar district, Bhind, Morena, Shivpuri and Rewa district. Groundnut is Kharif crop, which is used as oilseed. The production of groundnut in the state takes place in the Malwa plateau and low land of Narmada valley. The state ranks sixth in production of groundnut in India. The main groundnut growing districts are Mandsaur, Dhar, Ratlam, Khargone, Jhabua, Betul, Chhindwara, Ujjain, Rajgarh and Shajapur.

5.3.4 Soya Bean Madhya Pradesh stands 1st in the production of Soya bean. Major Varieties- 9305, JS-335, 5560 and the processed products include cattle feed, ingredient in health drinks, chunk, milk, cheese, bread as well as oil, etc. The chief soya bean producing districts are Chhindwara, Seoni, Narsinghpur, Indore, Dhar, Ujjain, Ratlam, Shajapur, Guna, Bhopal, Hoshangabad, Jhabua, Vidisha, Mandsaur, Balaghat, Satna, Neemuch, Betul and Sheopur.

5.3.5 Cotton is the second largest cash crop after soya bean in Madhya Pradesh. The main cultivation areas of cotton are Khargone, Dhar, Indore, Ujjain, Dewas, Mandsaur, Shajapur, Ratlam, Sehore and Jhabua districts. Both indigenous and American varieties are grown in the state because of the favorable black soil for the production of cotton.

5.3.6 Oranges Madhya Pradesh is the leading producer of Orange having second largest area under cultivation. Varieties Grown are Nagpur Mandarin, Kinnow, Coorg Mandarin, Mosambi, Processed products of oranges includes Juices, Jams, Squash, Syrups, Cosmetics, perfumes, essential oils, etc. Madhya Pradesh is among the top ten mango producing states in India. Varieties-Alphonso, Bombay Green, Langra, Chausa, Sunderja, Dashehari, Fazli, Amrapalli, Mallika. Processed products includes Squash, Pulp, Marmalade, Juice, Raw slices in Brine, Amchur, Pickle, Murabba, Chutney, Panna, starch, etc. There is growing demand for export of mango pulp. Varieties such as Kesar and Alphonso, have been marked by APEDA as high value varieties. Madhya Pradesh Ranks No. 2 followed by Bihar in terms of production volume of Guava in India. Major Varieties are Sardar(L-49) , Allahabad Safeda, Gwalior-27, Seedless, Lalit, Shweta and the processed products are Drinks (Juices), Paste, Nectar, RTS, Jam, Jelly, Concentrates, Confectionary (Candies). Madhya Pradesh can lead the country in terms of banana exports as the fruit is available round the year, Main transit points for bananas are Khandwa, Burhanpur, Dhar and Barwani. Major varieties-Grand Naine, Robusta, Dwarf Cavendish (Basrai), Red banana and Nendran and the processed products are Banana Puree, Banana Powder, Banana Flour, Banana based foods & beverages. Cultivation of pomegranate as a commercial crop was started in 2013, In terms of productivity, MP is placed 5th in the country with a productivity of 9,75 MT per Ha. Pomegranate growing districts of Madhya Pradesh are Shajapur, Khargone, Agar Malwa, Dhar, Ujjain, Khandwa, Dewas, Vidisha, Barwani and Burhanpur. Major varieties grown –Bhagwa, Jyoti, Ruby, Mridulla and the processed products include Juice, Seed Oil, peel extracts for its uses in dietary supplements and food preservatives.

5.3.7 Onion MP is the leading Onion producing state along with Maharashtra and Karnataka, accounting approx. 60% onion production of the country, together, The major varieties-AFDR, AFLR, Bhima light red, Bhima dark red, Bhima super, Bhima Shakti, Early grano, Pusa white round, Arka Kirtiman, N-53. Processed products of onion Powder, Flakes, Paste, Sauce, Rings, Pickles, Onion vinegar. Madhya Pradesh is the largest tomato producing state of the country, Varieties-Variou s including both improved natural varieties and hybrid F1 varieties, processed products include Puree, Dehydration, Ketchup (Powder and cut piece). MP is 5th largest potato producing State accounting for 6.73% of total production in India, Varieties-Kufri-Chipsona, Kufri-Chipsona-2, Kufri-Chipsona-3, Kufri Chandramukhi, Kufri Jyoti, Kufri Jawahar, Kufri Sultej, processed products are Potato flour, Potato chips, Frozen Potato products, Potato starch

and tapioca of potato. MP has a commanding share in the country’s pea production-over 20.42% of the total. The major pea varieties grown –Shubra, KMPR-400, KMPR-552, Pusamukta Prakesh, Arkel, Kasha Nandin, Pusapragati, Bonneville, PSM-3, GS-10, etc, processing of peas yields Frozen Peas, Dehydration of Peas, processing it in to powders, etc.

5.3.8 Garlic Madhya Pradesh is the largest producer of garlic in India. Garlic is the third largest spice in MP in terms of the area under cultivation. Major varieties grown in Madhya Pradesh are Yamuna Safed-3, Yamuna Safed-4 (G-323), Yamuna Safed-5 (G-189) and AgrifoundParvati-2 (G-408), G-282. Processing of Garlic-Dehydrated flakes, dehydrated powder, and paste. MP is the 3rd largest producer of Dry chillies contributing over 7.24% of the national Chilli harvest, Major Chilli variants grown in MP –Pusa Jwala, Sona-21, Jawahar, Sadabahar, Agni. MP has the second highest productivity for green chillies in India (17.08) for 2016-17. Processing of Chilli- Red Chilli , powder, green chilli cut dried, Fresh chilli, red chilli powder, Dried green chilli. Madhya Pradesh is 3rd in terms of the volume of production of Coriander. The major varieties of coriander grown in these regions are Swati, Sadhana, Rcr-41, Rajendra Swati, Moroccan, Gwalior No.5365, CO1, CO2 and CO3.

Crops	Total area Hectares	Total production	Productivity	MP share in india	Postharvest loss	Surplus
Wheat	5911482	17690000	2.99 MT/Ha	18.92 %	1054324MT	8844329 MT
Maize	1098300	3139946MT	2.97 MT/Ha	11.83 %	128738 MT	2554383 MT
Soya bean	5906390	4448112MT	0.771 MT/Ha	57 %	278452 MT	3550364 MT
Gram	3016839	3364309MT	1.12 MT/Ha	45 %	143992 MT	3017763 MT
Orange	116252	1437970MT	12.36MT/ Ha	30.24%	90592MT	1279459MT
Mango	42797	556099 MT	13.0 MT/Ha	2.3 %	50939 MT	380817 MT
Guava	30310	523749 MT	17.27 MT/Ha	14.36%	94170 MT	372954 MT
Banana	24310	1646891MT	67.74MT/H a	5.65 %	127799 MT	1082619 MT
Pomegran	9230	88660 MT	9.75MT/Ha	-	10663 MT	77106 MT

ate						
Onion	120140	3254524MT	27.08 MT/Ha	15.09%	193644MT	2312973 MT
Tomato	94249	3102000MT	32.91 MT/Ha	15.75%	470263 MT	1960322 MT
Potato	156725	3134462MT	21.1 MT/Ha	6.73%	217532 MT	1772715 MT
Peas	104917	1113468MT	10.61 MT/Ha	20.42%	112015 MT	959533 MT
Garlic	159371	405000 MT	2.54 MT/Ha	31.85%	24138 MT	317247 MT
Chilli	85000	135500 MT	1.59 MT/Ha	7.24 %	8821.05 MT	84646 MT
Coriander	200000	102500 MT	1.51 MT/Ha	19.2 %	7483 MT	73943 MT

Table 5: Agriculture Data: Agriculture statistics at a glance 2018-19

The figures in the table given above reveal postharvest losses due to quality degradation of crops which decreases the export capacity and pricing in Agri-export process. Despite having huge production area farmers are not able to produce due to lack of Modern laboratory infrastructural setup. The project will prove fruitful for all the stakeholders in boosting the export economy.

The table indicates that state has a capacity to grow majority of the crops with abundant production compared with other states, but due to lack of Quality control, losses were maximum. Now with the strengthening of lab, losses can be prevented.

5.4 QUALITY TESTS FOR IMPROVISATION OF CROP QUALITY AND FOOD PRODUCTS

5.4.1 Wheat Quality Profile

Wheat cultivation has traditionally been dominated by the northern region of India. The northern states of Punjab and Haryana Plains in India have been prolific wheat producers. Madhya Pradesh has dethroned state of Punjab to become India’s top wheat producer. The central Indian state had already picked up more than 12.9 million tons by June 8 2020, ahead of Punjab’s 12.8 million tons, mostly procured from Bhopal, Indore, and Ujjain and Dewas districts; the difference might have grown substantially. MP has already secured around 33 per

cent of India’s total 38.7 million tons in wheat procurement. State has the ability to export wheat for boosting economy and making farmers self-reliant. The quality parameters of the wheat should be in compliance with the global export standards. The Durum or hard wheat is cultivated in clayey soil and is highly sought after for its physical characteristics. Its high gluten strength and uniform golden color makes it ideal for bread making and pasta preparation unlike the softer commercially high yielding wheat, which lacks the strength and consistency of durum. Today, India is exporting sufficient quantities of all types of wheat and extensive research efforts are underway for improving its cereals and grain output in the years to come. With a production reaching ten times in past five years, India is today the second largest wheat producer in the whole world and Madhya Pradesh can play an important role in export of good quality wheat. The quality of Wheat plays a major role in export and consumption. Moisture content and protein content are the 2 important parameters that determine the quality of wheat. There are other laboratory tests performed to determine these two parameters which will fulfill the criteria of product to compete with Export Product policy and may include:

- **Tests to measure Ash Content**
- **Falling Number Test:** Falling numbers is a test that helps identify the structural integrity of the starch chains or measure of the level of alpha amylase activity that has occurred within a grain sample.
- **Flour Color Analysis:** Flour color is determined by measuring the whiteness of a flour sample with the Minolta Chroma Meter.
- **Single Kernel Characterization System:** To evaluate wheat kernel texture.
- **Glutamates:** To determine quality of gluten in wheat samples.

Products of Wheat: Bread wheat, or common wheat, is the primary species used to make various bakery products.

Whole wheat flour: It contains various components like ground bran, germ and endosperm of whole kernel. It is used to make various products like chapathis, puris, whole wheat bread, etc.

Wheat Bran: It is also a product of wheat and has various health benefits and a great source of insoluble fiber.

Wheat Germ: Product of wheat rich in vitamins and minerals and a great source of vegetable proteins.

Wheat Rava: It is broken wheat used to make upma, bisi bela, pongal etc.

Wheat Flakes: They are a good source of dietary fiber and are usually fortified with numerous vitamins and minerals.

Maida: The separation of bran and germ results in white flour or Maida also called as refined flour. It is used to make various bakery products.

Semolina: It is coarsely ground endosperm used to make various products.

Macaroni products: These products are also called pasta. These products include macaroni, spaghetti, vermicelli and noodles.

5.4.1.1 Wheat Quality Parameters

Wheat Quality Parameters		
	Parameters	Value
1	<i>Protien</i>	<i>11.8gms</i>
2	<i>Fat</i>	<i>1.5 gms</i>
3	<i>Minerals</i>	<i>1.5 gms</i>
4	<i>Fiber</i>	<i>1.2 gms</i>
5	<i>Carbohydrates</i>	<i>71.2 gms</i>
6	<i>Calcium</i>	<i>41 mg</i>
7	<i>Phosphorus</i>	<i>306 mg</i>
8	<i>Iron</i>	<i>5.3 mg</i>

Table 6: Source Nutritive Composition of Indian Foods, NIN (ICMR), Hyderabad.

Wheat kernel consists of four main parts:

- Seed coat (10 per cent of the kernel weight).
- Aleuronic layer (6 per cent).
- Starchy middle, the endosperm (81 per cent).
- Germ (3 per cent).

However, these laboratory methods are difficult to perform and are also time consuming, thus making them less favorable to determine quality characteristics. The need for advancements has developed a realization and need for this project in JNKVV so as to adopt rapid, cost effective and very accurate techniques to measure the quality parameters of agricultural commodities like wheat. The department has purchased three Equipment’s viz Farinograph, Amylograph and Extensograph for carrying out the above mentioned quality tests. These equipment’s have wide

range of applications in the wheat grain industry ranging from physical analysis to chemical composition analysis and identification of contaminants.

5.4.2 Rice Quality Profile

Rice is the staple food for more than half of the population and is considered as chief grain of India, country has the largest area under rice cultivation, therefore considered as principle crop of India. Almost 10000 varieties of rice are grown in the world out of which 4000 are grown in India. India is leading consumer of rice crop and largest producer of rice. The quality of rice can be determined by various quality tests like;

- ✓ **Moisture content**
- ✓ **Milling quality and degree**
- ✓ **Broken grain/chalky grain**
- ✓ **Yellow/damaged discolored grain**
- ✓ **Foreign matter,**
- ✓ **Weight and length,**
- ✓ **Protein Content**
- ✓ **Starch**
- ✓ **Specific weight and infestation.**

5.4.2 Potato Quality Profile

Potato is the widely used vegetable in India and is cultivated in almost all states of India. India is the second largest producer of potato in the world. The major potato growing states in India that grow are Uttar Pradesh, West Bengal, Bihar, Gujarat, Madhya Pradesh, Punjab, Haryana and Assam. The volume of potato produced throughout India accounted for 48 million metric tons in 2020. India’s production of potatoes has increased 51%to 52.5 million tons in over a decade. Madhya Pradesh is the 5th largest potato producing state, thus among top ten potato growing state in India. Potatoes grow best in loose, well-drained loam soil, Heavy clay soil retains too much moisture and tends to become hard as it dries, which can eventually slow water absorption and make it difficult for tubers to grow. The major components in potato are carbohydrates, proteins, fibre, fat, minerals like calcium, copper, iron, magnesium, phosphorus, potassium, sodium, thiamine, riboflavin, niacin, total folate, pyridoxine, vitamin C, amylose and amylopectin etc. Various tests performed on potato are as follows

- **Starch test**
- **Mineral analysis**
- **Moisture content**
- **Protein content**
- **Ash content**
- **Carbohydrate Analysis**

5.4.3 Onion and Garlic Quality Profile

Madhya Pradesh is the second largest producer of onions after Maharashtra. In MP, onion is primarily grown in the Malwa, Nimar Sagar and Damoh regions. Onions are rich in calcium, magnesium, iron, folate, phosphorus, potassium, anti-oxidants quercetin and sulphur. Onion also known as bulb onion is a vegetable that is the most widely cultivated species of the genus *Allium*. The country's overall onion production to increase by seven per cent to 24.45 million tons in the current 2019-20 crop year. Onion is a temperate crop but can be grown under a wide range of climatic conditions such as temperate, tropical and subtropical climate. Onions can be best obtained in a mild weather without the extremes of cold and heat and excessive rainfall. It can grow well in places where the average annual rainfall is 650-750 mm with good distribution during the monsoon period. Onion has been found to contain quercetin, fructose, quercetin-3-glucoside, isorhamnetin-4-glucoside, carbohydrates, organo sulfur compounds, ally sulfides, flavonoids, flavonols, S-alk(en)yl cysteine sulfoxides, cycloalliin, selenium, thiosulfates, and sulfur and seleno compounds, fats, proteins, dietary fiber, vitamins, minerals etc. Garlic is a species of onion grown in mild climatic conditions. The total world production of garlic is more than 26.6 million tons.

India is the second largest producer of garlic and accounts to almost 5% of the total world production. Madhya Pradesh is the first garlic producing State in India. Various tests performed on onion include;

- **Sugar analysis.**
- **Organic acids analysis.**
- **Pungency analysis.**
- **Anti-oxidant analysis.**

- **Polyphenols and extraction of volatile compounds using spectrophotometer, GC-MS analysis and HPLC etc.**

Tests performed on garlic to check the quality include:

- **Antioxidant assay.**
- **Alkaloid content.**
- **HPLC, total sugars.**
- **Proteins.**
- **Mineral content.**
- **Size, shape, density, weight, sprout percent etc.**

5.4.4 Orange Quality Profile

Madhya Pradesh is second leading producer of orange mandarin and accounts for 21% of the production of orange mandarin production in the country with productivity of 18.00 MT/ha. Madhya Pradesh is the fourth largest citrus producing state in the country and accounts for 10.7% of the total production in the country. Juicy and sweet and renowned for its concentration of vitamin C, oranges make the perfect snack and add a special tang to many recipes; it is no wonder that they are one of the most popular fruits in the world. The nutritional profile of orange includes Vitamin C, Fiber, Vitamin B1, Pantothenic acid, copper, calcium, potassium, folate etc.

Various tests performed on orange include:

- **Moisture content.**
- **Soluble sugars.**
- **Proteins.**
- **Fat.**
- **Total ash content.**
- **Total flavonoids.**
- **Vitamin C.**
- **Anti-oxidant assay using spectrophotometer.**

5.4.5 Pulses Quality Profile

India is the largest producer of pulses in the world, both in variety and quantity. Madhya Pradesh has been the major pulse producing state in the country. Madhya Pradesh ranked first both in terms of area (19.8 percent) and production (20.9 percent) of pulses in India. Over 20 percent of the Gross Cropped Area (GCA) of Madhya Pradesh is under pulses. Though ranked first in terms of area and production, it ranked sixth after Uttar Pradesh, Bihar, Haryana, West Bengal and Gujarat in terms of average yield.

Madhya Pradesh has been the major pulse producing state in the country and is among the top five pulses producing States. Major crops grown in Madhya Pradesh are pigeon pea in kharif and chickpea (bengalgram) in rabi are the most important ones, followed by black gram (urad bean) in kharif and lentil in rabi, mung, pea, lentil, urd, Soybean, Groundnut and Mustard among Oilseeds etc and are all valuable sources of protein as well as being low in saturated fat, sodium and also cholesterol free. They are also good sources of fibre, complex carbohydrates, vitamins and minerals including thiamine (B1) riboflavin (B2), niacin (B3), folate, calcium, potassium, iron and phosphorus, vitamins and minerals, such as iron, zinc, folate, and magnesium. Various tests performed on pulses include moisture content, proximate composition and adulteration tests. Minor millets are also traditional to Madhya Pradesh, Of the six minor millets grown in India, the most important in Eastern Madhya Pradesh are kodo millet (*Paspalum scrobiculatum*) and little millet (*Panicum sumatrense*), known locally as kutki. They have a very high nutritional value, kodo and kutki are gluten-free and non-acid forming foods and have a very high nutritional value.

Chapter 6

Key Findings

6.1 Findings related to Beneficiaries:

As far as current project is concerned, The department of Food Science and Technology, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur approached Department of Farmers and Agriculture welfare, Government of Madhya Pradesh (RKVY Cell) with the proposal to strengthen the Crop and Food Testing laboratory which will help in conducting the quality tests of Agricultural produce throughout the region and will ensure the farmers to increase their produce quality, which will also fulfill the criteria of Agricultural export zone policy, thereby giving a boost to the economy. The project was based on the infrastructural (Repairing and maintenance of old Labs), purchase of modern equipment's for conduction of quality testing of grains and testing of farmers produce to improve export policy. Therefore, Report has first covered the Quality parameters which need to be followed upon to fulfill the objectives as submitted by Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur to Department of Farmers and Agricultural Welfare, for release of Funds.

The project was suggested to be completed (2017-18) in one-year timeline, with some important objectives in the interest of Farmers Welfare but Implementing agency was unable to start the laboratory operations after study team visited the laboratory till October 2020. The important key findings of study team with respect to its objectives are as follows:

- I. **It was proposed that Analysis of samples of various crops will be carried out for improving under export zone purpose. Study team found no such record of analysis of crop samples as there was some equipment's which were not purchased till now.**
- II. **It was proposed to analyze breeding material at different stages prior to release for biochemical quality attributes but no such testing was conducted for farmer's benefit.**
- III. **The identification of new crop varieties of economic and nutritional significance, Analysis of raw materials and processed food products produced by Food processing industries for export promotion purpose and providing of consultancy services to impart training among farmers and Entrepreneurs was also among the objectives to be achieved by the completion of this project. It was also estimated to benefit more than 20000 farmers in getting their crop and food products tested,**

which could have been impacted the Agro-Economic condition of the state and highly benefited farmers income. These objectives were not fulfilled and hence impact assessment with respect to its objectives cannot be assessed for study. The report of the Audited Utilization Certificate provided by the department shows that 80% of the funds granted for the project has not been utilized as on date March 2020 attached in Annexure-A.

The project has not been completed and one major part (i.e. Impact on testing of crops and benefits to farmers produce for income generation) of it is yet to be done. This report will cover only the renovation and purchase of equipment's. An attempt has been made to map the findings against the various parameters of the project. The following equipment's proposed in the detailed project report have been purchased from the funds released for the project along with the corresponding findings.

Details of various equipment's Purchased under RKVY Funding			
S.No	Name of Equipment/Machine	Pre-execution of RKVY funds	Post Execution of RKVY Funds
1.	Laboratory Wheat flour mill (Buhler type)	Not available	1
2.	Farinograph	Not available	1
3.	Extensograph	Not available	1
4.	Amylograph	Not available	1
5.	Pasta making machine	Not available	1
6.	Rotary Baking oven	Not available	1
7.	Dough sheeting molding and biscuit cutting Machine	Not available	1
8.	Mini Rice Mill (Satake type)	Not available	1
9.	Mini Rice Polisher (Satake type)	Not available	1
10.	Rapid Visco analyzer	Not available	1
11.	Rice Flake (Poha) processing machine	Not available	Not Purchased Yet
12.	Miner Millet processing machine	Not available	1
13.	Lab Split air conditioners	Not available	8
14.	Digital weighing balance (High Precision)	Not available	1
15.	Water analysis kit	Not available	Not Purchased Yet
16.	Chemicals and glassware	Not available	1
17.	Sand filter, Activated Charcoal filter Ultrafiltration and Reverse osmosis membrane	Not available	Not Purchased Yet

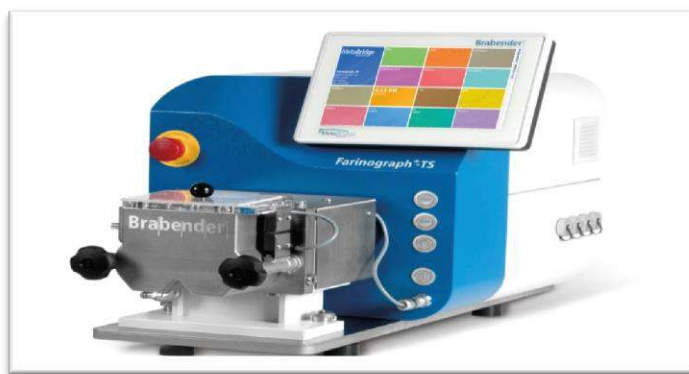
Table 7: Details of equipment's purchased

As per the data submitted by the implementing agency, above mentioned table of equipment's were previously not present in Quality testing laboratory of Department of Food Science and Technology, JNKVV, Jabalpur. After receiving funds from the RKVY scheme, all the equipment's were purchased in order to strengthen the Laboratory.

6.2 Findings related to Purchase of Machinery and Instruments:

The study team has validated the data by visiting the department of Food science and Technology, College of Agriculture, JNKVV Jabalpur. The team has thoroughly analyzed the working of equipment's with their proper crop quality testing for validation. Further, interacted with the implementing authorities for qualitative data validation and simultaneously interacted with department officials and Departmental Purchase Committee for the qualitative assessment of the project in the University. Open interviews were also conducted with the official technical staff of the concerned department to get a picture of the implementation of the scheme and its impact across the stakeholders. Following equipment's was found in working condition in lab.

6.2.1 Farinograph: Farinograph is a tool to assess baking qualities and performance of wheat flour dough. It records the resistance to deformation, or the consistency of dough mixed from flour and water. Farinograph also enables monitoring the influence of additives, and thus allows optimization of flour processing in terms of standardization of flour quality produced from raw materials of variable quality. It measures force or torque during mixing of small quantities of dough and is generally used as a physical dough-testing machine in cereal laboratories. It will be helpful in predicting the amount of water to be added to flour to get a fixed consistency during mixing, measures mixing characteristics and also predicts baking performance. Farinograph is essential for:



1. Adjusting dough mixing parameters absorption, time, and pre-hydration ratio.
2. Studying the effect of flour improver's dough handling properties.

3. Establishing quality control measures to properly handle wheat crop changeovers. Preparing wheat and flour blends to comply with flour specifications.

6.2.2 Extensograph: is designed to measure the balance of the elastic and viscous properties of dough, in other words, an Extensograph is a tool used for measuring the flour quality and stretching behavior of dough. Results from an Extensograph are useful in determining the gluten strength and bread-making characteristics of flour. Changes to formulas such as fermentation time, type of flour or new supplier, dough additives can all be evaluated by an Extensograph. Brabender Farinograph and Extensograph are two of the main analytical instruments that are commonly used for evaluation of rheological properties of dough and prediction of baking quality of flour in Cereal Chemistry and Technology Laboratories. The quality of bakery products depends on these properties as well.



6.2.3 Amylograph: An instrument that measures and records the gelatinization temperature and viscosity of pastes of starch and flour. The amylase activity has traditionally been measured with the Hagberg falling number, the Rapid Viscoanalyser, or the Amylograph. Two major amylases exist in wheat: α -amylases and β -amylases. Measurement of starch paste viscosity using the Amylograph or Rapid Viscoanalyser (RVA) has become standard for determining the pasting properties of starches. The Amylograph-E from Brabender accurately will help in measuring the gelatinization of starch and its enzyme activity in wheat, rye, corn (maize) and rice flour according to international standards.



6.2.4 Spectrophotometer: Spectrophotometer is an instrument used to measure how much a chemical substance absorbs light by measuring the intensity of light as a beam of light passes

through sample solution. The basic principle is that each compound absorbs or transmits light over a certain range of wavelength. This measurement can also be used to measure the amount of a known chemical substance. The instrument is routinely used as a quality assurance tool to determine compositional and functional analysis of food ingredients, process intermediates, and finished products. The other application also include in wheat and wheat products has included flour yield, damaged starch, water absorption, dough development time, and extensibility and loaf volume measurements. It is also used to determine the protein and moisture contents of both wheat and flour is now routine practice in flour mills worldwide. It will be used in Laboratory for testing wheat in order to make decisions about export acceptance, price and binning, determination of conditioning time from measurement of hardness and for analyzing flour to check whether it complies with export specifications.



6.2.5 Mini Rice Mill (Satake Type): It is a compact machine that can be used to determine approximate total milling recovery in the grain whitening process and is widely used throughout the world in research based laboratories. The mill is a breakthrough in the quality testing and production of rinse-free rice of enhanced quality in terms of both taste and appearance. Many rice flour producers require a sized product rather than just a ground powder. Typical production of rice/semolina involves producing a sized product smaller than 720 microns, but with fines less than 500 or 250 microns removed. The infinitely adjustable roll gaps and flexibility of Satake machines are ideally suited to this application, producing far less fines than a pin type mill. When the plant needs to produce flours of sub-250 microns, the grinding pressures that can be achieved by the Satake Roller mill will ensure high production rates.



6.2.6 Pasta Making Machine: A pasta maker or pasta machine is a medium-sized laboratory tool designed to simplify the process of rolling macaroni or noodles, or other kinds of dough to make fresh pasta. The machine is used to roll pasta dough into a progressively thinner sheet with each pass through the machine. When the desired thickness is reached, the sheet can be used as it is to make ravioli. The machine have inbuilt cutters where the sheet can be passed through a cutter and separated into strips of the appropriate width. Unlike an extrusion type pasta maker, the machine has a crank attached or in most cases, slots for a crank on the side. The crank turns a series of rollers, some interlocking to cut, and others just to flatten. An adjuster wheel on one side controls the distance between the flat roller wheels.



6.2.7 Dough Cutting, Molding and Biscuit cutting Machine:

Dough is compressed between two or more rotating rollers. When done the right way, a smooth and consistent dough sheet is produced. The dough then passes one or several gauging rollers (mostly on conveyors) that reduce the dough to the required thickness. After this the dough sheet is shaped into a desired dough product. This technology is mainly used in Bakery production machines for (semi) laboratory bakeries and the food industry. Most dough sheeters can handle a wide variety of dough depending on the machine manufacturer. Most commonly dough sheeting technology is used for the production of laminated dough products like croissants and pastries, but it is also suitable for the production of bread, flat bread and pizza.



Molding and Cutting Machine: Dough moulding is the final step of the makeup stage in high-speed production of pan or loaf-type bread. It is a continuous mode operation, always receiving dough pieces from the intermediate proofer and placing them into pans. The function of moulding and cutting is to shape the dough piece, according to the bread variety being produced, so that it properly fits into pans. Dough moulding equipment can be set to achieve the desired shape with a minimum amount of stress and strain on the dough. Also Cookie dropping and cutting machine will provide a mechanical support to JNKVV in formation of various shapes of cookies.



6.2.8 Rotary Baking Oven:

Large Rotary Rack Oven Machine in Bakery Industry enables bakers them to improve best quality products with uniform operational efficiency, these ovens bake the food products at an optimum temperature, with uniform dissipation of heat across the breads, cakes and hence ensuring that necessary nutrients are retained in the cooked items. Since these ovens facilitate baking in bulk, and will be helpful to commercial food processing Laboratory.



6.2.9 Mini Rice Polisher (Satake Type): The Satake Rice Polisher cleans the surface of rice, significantly enhancing the quality of finished products. The Satake Vertical. Rice Polisher incorporates the most advanced technologies available and has proved to be superior to competitive machine in rice mills throughout the world. The versatility of the VBF for milling rice of all degrees of whiteness with minimum broken pieces makes it the ideal machine for modern rice mills. Its processing capability ranges from all kinds of rice (long, medium, and short) to other cereal grains such as maize.



6.2.10 Rapid Visco Analyzer: The Rapid Visco Analyzer (RVA) has been widely used and is well known for assessing the pasting properties of flour or starch. However, it is important to highlight its versatility due to its capability of analyzing the viscosity in heating-cooling cycles. These features also make it suitable for simulating step processes on a small scale under controlled conditions, as well as monitoring changes in the viscosity as the manufacturing process progresses. Therefore, the RVA can serve as a useful tool for elucidating multiple quality indicators which could help to optimize many different food step processes. Generally, to measure rheological behavior, a controlled, well-defined deformation or strain is applied to a material over a given time and the resulting force response is measured (or vice versa) to give an indication of material parameters such as stiffness, modulus, viscosity, hardness, strength or toughness of the material.



6.2.11 Minor Millet Processing Machines:

The Millet Processing Centre consists of the following millet processing machinery viz., Destoner, Millet Mill, Pulveriser,

Destoner: The machine is for removal of stone, impurities from small millets. The machine consists of deck of sieve of size 450 x 800 mm, made of perforated dimple sheet for fluidization and effective separation with provision to adjust the inclination of the deck and outlet for cleaned grain and stones.

Millet mill: The machine is used for removing the outer husk of minor millets. It could be operated by a single phase electric motor. It consists of two abrasive rollers where dehusking takes place. The clearance between the surfaces could be adjusted for different millets. The unhusked millets are fed through a hopper which falls between the abrasive plates due to the centrifugal action. The dehulled grains are then collected through an outlet provided at the bottom. The husk and dust particles are collected in a cyclone separator.

Pulveriser: It is used for size reduction of minor millets into flour. It is a heavy duty machine, provided with hammers for



pulverizing action. It consists of a grinding chamber provided with suitable lid/ cover and locking mechanism, sieve of ISS 40 of suitable size for mounting in the grinding chamber, cloth bag for easy collection of flour in to container. The power needed for operation of this machine is 7.5 hp three phase motor with starter.

6.2.12 Digital Weighing Balance (High Precision):

Precision balances are used in laboratories for weighing. Precision balances are calibrated by the manufacturer or factory. ISO-calibrated precision balances are calibrated by an ISO-certified laboratory. An optional ISO calibration certificate is available for purchase as an accessory to any precision balance product offered by PCE Instruments (PCE). The precision balance is equipped with a USB port, RS-232 interface or Bluetooth adapter to allow the weighing data to be transferred to a computer for detailed analysis and documentation. Different precision



balances offer different weighing ranges and levels of accuracy. When selecting a precision balance, be sure to consider the anticipated weight of the object to be measured, and make sure the precision balance you decide upon has a maximum weighing capacity. In addition, this precision balance has different functions such as full-range tare, part counting and drying programs. The precision balance scale is a scale for daily laboratory use. Another function besides the normal measurement function of the precision balance scale is the piece counting function. This function allows the precision balance scale to determine the number of screws.

6.3 Findings related to Renovation of Laboratories:

Food testing laboratories, deploying a comprehensive range of state-of-the-art analytical techniques are a necessary and vital arm of a responsible, responsive food regulatory system, important for robust implementation and enforcement. These laboratories with adequate infrastructure, facilities, equipment, supplies, reference materials, access to calibration and

maintenance, and operating under an international quality assurance Programme, are benchmarks that support the increasingly stringent quality and safety standards.

The Department of Food Science and Technology, JNKVV as per the proposal submitted to Department of Farmers and Agriculture Welfare, clearly mentioned that ample amount of funds will be utilized to renovate the old infrastructure into modern laboratory setup in compliance with the Standards and guidelines set by NABL and Food Authority FSSAI. The research team conducted a visit to the department for study and data collection, It was found that Renovation has been done by utilizing the funds received from the RKVY scheme. The list of the renovated laboratory as proposed in the Detailed project report submitted by the implementing agency to Department, which includes (Roof treatment/repairing of floor/Lab work station Partitioning and furnishing including electrification work) setup is shown in Table below. The work done for renovation has been an exceptionally good quality work as observed during the team visit.

• Under Graduate Laboratory
• Post Graduate Laboratory
• Under Graduate Laboratory
• Sensory Evaluation Lab
• Rheology Laboratory
• Cereal Science Laboratory
• Food Packaging Laboratory
• Cold Room
• Processing Hall 1 2 and 3



Instrumentation Lab



Microbiology Lab



Under-graduate Lab



Post-graduate Lab



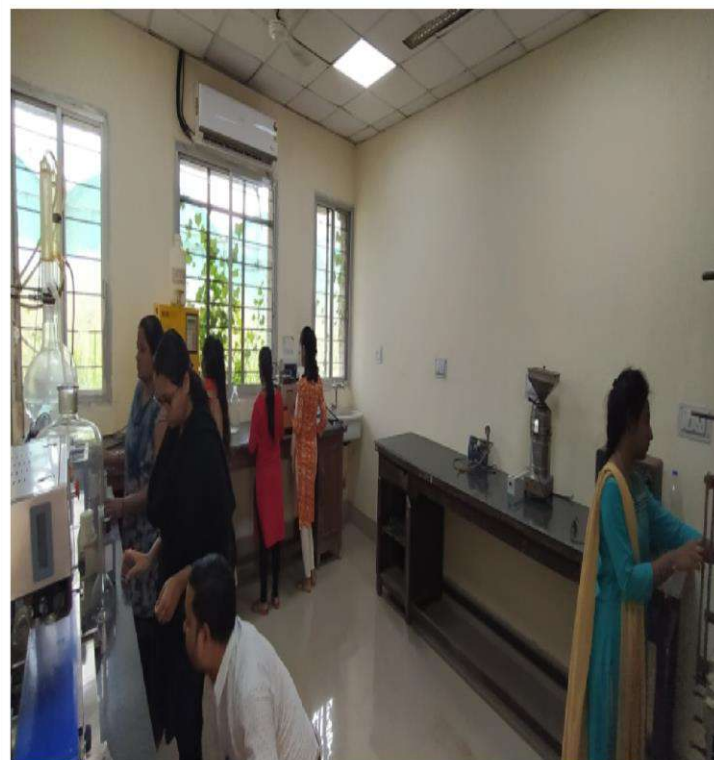
Sensory Evaluation Lab



Rheology Lab



Cereal Technology Lab



Packaging Technology Lab



Food Processing Hall-1



Processing Hall-2



Processing Hall-3

Chapter- 7

Recommendations

Recommendations for the effective implementation of The Project “**Strengthening of Crop Quality Analysis and Food Product Testing Laboratory**” under RKVY, for improving the export potential and usefulness of project in terms of better output and expected outcomes, through our observations, we tried to give some technical suggestions, as mentioned below:

1) Maintenance of the Equipment’s purchased under RKVY:

The equipment’s purchased for the quality testing are sensitive in nature and needs regular maintenance and servicing. For any Quality testing Laboratory, equipment and machinery is the cornerstone for testing set-up. The overall outcome and accuracy of a test to be performed in future will be solely, dependent on following factors which needs to be documented on daily basis after operations:

1. The quantum of parameters and samples being tested.
2. The optimization is highly dependent on the efficiency.
3. Run-time, maintenance and competency of equipment.

It is pertinent to mention that additional technical staff needs to be deputed so department should initiate the deputation on priority basis. The University must ensure that the papers related to warranty/guarantee of the equipment’s to be kept in order and necessary maintenance (AMC) should also be done.

2) A Private Public Partnership Model:

Before grant of any funds for this kind of project, to any governmental institution, it is recommended for outsourcing of the project implementation agency for timely completion of the project. A Private Public Partnership model is recommended for making this project functional and operational in the interest of the Farmers welfare.

3) Novel methods for Research and Development:

The laboratory has now been equipped with comprehensive range of equipment’s with the latest technologies and capacity to conduct crop and food product quality analysis as per global standards. Hence it becomes mandatory for the Department of Food Science and Technology, JNKVV Jabalpur to undertake following steps:

- a) To undertake analysis of different varieties of crop and food product samples received from farmers to assure timely result report in prescribed format as per the parameters mentioned by Export authority of India, APEDA.
- b) Since The department of food science and technology is being funded by various national organizations viz ICAR, ASRB, ICMR and other internal agencies for conducting agricultural research on various issues related to improvisation of Agricultural produce, new crop varieties. It is recommended that new novel methods in food and crop processing be carried out under ATMA Nirbhar Madhya Pradesh Programme with the assistance of Scholars perusing PHD and PG courses in Research and Developmental programmes. It will prove fruitful in utilization of Infrastructure and increase in export potential of the state.
- c) To undertake analysis of imported crop varieties, food products and samples drawn from various parts of the state as per Food Safety Standards, Act rules and regulations 2011.
- d) To conduct training programmes for students/analysts/staff of various related departments in the area of Agriculture and farmers under Agricultural Technology Management Agency program (ATMA) and Technical education quality improvement Programme (TEQIP).

4) Creation of New Employment Opportunities:

Since Quality and Food Safety have become competitive edge in the global market for the enterprises producing and marketing good quality crops and foods products. For its successful accomplishment, various aspect of Total Quality Management (TQM) such as quality control, quality system and quality assurance should function in a horizontal fashion for total success. The quality infrastructure built through RKVY scheme has helped JNKVV in developing a world class facility which is at par with any of the good infrastructural laboratory and complies with the standards set by NABL and APEDA for ensuring good quality crop produce. For quality check and testing, Food Testing Laboratory plays very important role. Laboratory testing is an important process, which relies on scientific analysis to identify various problems with agricultural crops and food products.

The main focus of the JNKVV should rely on providing opportunities for farmers and entrepreneurs, who have chosen food processing and agriculture as career option. This will encompass the entire food spectrum from farmer’s production to end consumer consumption; there should be development of short term vocational courses for local farmers on development of value added products and household methods for preservation and processing techniques. If implemented efficiently, it will enable higher returns for farmers, creation of new employment opportunities, and fostering entrepreneurship.

5) Crop Quality testing at feasible and nominal rates for Farmers:

After the completion of the project, Laboratory has been equipped with modern sophisticated equipment’s. It has now developed the potential of testing varieties of crops and food products. Apart from equipment’s, Staff and faculty of the department can play a vital role in getting farmers produce for quality testing. The testing of various crops should be performed on nominal prices for local farmers and awareness of the same to be imparted so that maximum farmers will be benefited. It will generate income and revenue for laboratory which can be utilized for hiring of professional certified technologists, thereby creating an opportunity of employment for qualified youth.

6) NABL Accreditation and ISO certification

- 1. It is highly recommended that formal recognition of competence of a laboratory by National Accreditation board for testing and calibration be carried out in accordance with international criteria.**
- 2. ISO/IEC 17025:2017, ISO 22000 is a certifiable standard that sets the overall requirements for a food safety management system and will define the steps taken to demonstrate its ability to control food safety hazards and ensure safe consumption. It is also considered mandatory for a testing laboratory to be deemed technically competent.**

These certifications will ensure following benefits in the interest of farmers/FBO’s:

- A ready means for farmers and food business operators to identify and select reliable testing, measurement and calibration services that is able to meet their needs.

- Increased confidence in Testing/ Calibration Reports issued by the testing, calibration and medical testing laboratories which emphasize on accuracy and reliable results.
- The results from NABL accredited laboratories are used extensively by Food and Agricultural regulators for the public benefit in the provision of services that promote an unpolluted environment, safe food, Improved crop quality and social care services.
- Better control of laboratory operations and feedback to laboratories as to whether they have sound Quality Assurance System and are technically competent.

7) Sustainability and Operations

For any project to sustain it is mandatory for any implementing agency to resume the operations on regular basis.

The equipment's purchased under this project will remain as dead non-functioning assets, if laboratory is not resumed immediately. Due to the irregularities during implementation and execution of the project, the equipment's were not purchased on time, which led to the incompleteness of the project for fulfilling the outcomes and objectives as earlier proposed by the implementing agency to the department.

In this regard the quantitative analysis of the impact made on the farmers could not be measured. But the equipment's have been purchased recently for the purpose of strengthening of the crop quality laboratory and infrastructure; if utilized in efficient way it, can prove a boon to the farmers in boosting their economic status.

It is also recommended that a Buffer time interval of Six(6) months be given to Jawaharlal Nehru Krishi Vishwa Vidyalaya, Department of Food Science and Technology , Jabalpur for ensuring the timely resumption of laboratory work and testing of crop and food product samples as per the quality standards set by APEDA,ICAR,FCI as earlier mentioned in the chapter 5 of this report, with proper recording and documentation of beneficiaries which in future can be re-studied upon for measurement of Impact Evaluation.

References

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- https://apeda.gov.in/apedawebsite/six_head_product/cereal.html
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Annexure-A

**DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY
COLLEGE OF AGRICULTURE, JNKVV, JABALPUR**

FST/RKVY/2020/ 483

Date: 25/6/2020

To,

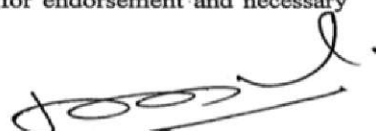
The Director Research Services
JNKVV Jabalpur

Through Proper Chanel

Sub: Utilization Certificate of RKVY project for endorsement

Sir

Please find enclosed herewith utilization Certificate of Year 2019-20 of RKVY Projects on Strengthening of Crop Quality and Food Product testing Laboratory for endorsement and necessary action please.



Professor and Head

PROFESSOR & HEAD

Department of Food Science & Tech
J. N. Krishi Vishwa Vidyalaya
Jabalpur (M.P.)

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DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY
J. N. KRISHI VISHWA VIDYALAYA JABALPUR

AUDIT - UTILIZATION CERTIFICATE

Name of the Scheme/Project:- Strengthening of Crop Quality Analysis and Food Product Testing Laboratory, Budget Head C-1 (99) RKVY-13 project.

S.No	Particulars	Amount (Rs.)
1.	Opening balance for the year as on 1 st April, 2019 As per VV order No.Compt./Fin./2019-20/833/ Dated 08.07.2019	2,02,34,334=00
2.	Remittance by the council during 2019-20	Nil
	Total	2,02,34,334=00
3.	Actual expenditure for the year 2019-20	31,49,314=00
4.	Closing balance at the end of the year 2019 as on 31 st March, 2020	1,70,85,020=00

CERTIFIED

- A. That the grant has been utilized for the purpose for which it was made by the council.
B. That the accounts of the scheme/project as summarized above have been audited

DETAILS OF THE EXPENDITURE AND SANCTION FOR THE YEAR 2019-20

S. No	Particulars	Opening balance (Rs.) Lakh	Sanctioned provision of the year 2019-20	Expenditure incurred during the year 2019-20	Balance
1.	Non Recurring Contingency (Equipments and Machines)		1,99,79,059=00	28,94,144=00	1,70,84,915 =00
2.	Recurring Contingency		2,55,275=00	2,55,170=00	105 =00
	Total		2,02,34,334=00	26,38,974=00	1,70,85,020=00

DDO
College of Agriculture
Jabalpur

Dean, CoA
College of Agriculture
J.N.K.V.V., JABALPUR

Principal, Scheme
Department of Food Science & Tech.
J.N.K.V.V., Jabalpur (M.P.)

Resident Senior Auditor
Local Fund Audit
J.N.K.V.V., JABALPUR (M.P.)

Comptroller
J.N.K.V.V., Jabalpur (M.P.)

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