Information for reply to Lok Sabha Question Dy. No. 8156 for 01/01/2019 regarding ‘Agricultural Research’

(b) whether any advances / achievements in agricultural technology have been made in any of the agricultural research institutes in the country;

(c) if so, the details thereof during each of the last three years and the current year;

i. Grape variety Manjari Medika

ICAR-NRCG developed a hybrid of Pusa Navrang × Flame Seedless which has been released as ‘Manjari Medika’. Manjari Medika is a teinturier variety (coloured pulp apart from coloured skin) suitable for juice making. The variety matures in 130-140 days after fruit pruning and yields 22-25 t/ha. The berry diameter is 12-14 mm and the TSS is 20-22 °B. This variety is one of the most suitable variety for processing industry and has proposed a “zero waste” processing model for this variety so that none of the by-products is underutilized. Juice recovery is 70-72% and the juice is naturally sweet with attractive red colour and very well accepted by consumers. It contains exceptionally high amount of anthocyanin (4.0 g / kg) which have antioxidant and anti-cancerous properties. The seeds and the skin after extraction of the juice can be dried and powdered and this ‘pomace’ can be used for enhancing nutraceutical properties of bakery products like cookies and bread, by partly replacing fine wheat powder by pomace. These bakery products have also been very well accepted by the public. The technology for preparation of spray dried anthocyanin powder, its formulation and delivery system in the form of capsules is also standardized by this Centre. The seeds can be used for extraction of oil with recovery of 10 to 12% of seed weight. Grape seed oil fetches premier price in international and domestic market. The seed oil obtained from Manjari Medika is rich in vitamin E (tocopherol) and other nutritional lipids and may fetch higher prices. Thus the juice and the “zero waste” processing model for this variety can substantially enhance farmers’ income.

ii. Demonstration of water use efficiency

Irrigation schedule for Thompson Seedless on Dogridge rootstock: Pan evaporation and growth stage based irrigation schedule is developed for Thompson Seedless vines raised on Dogridge rootstock. The water use efficiency with techniques such as sub-surface irrigation, mulching and spray of anti-transpirants is further improved by 25% over recommended surface drip irrigation schedule. Partial root zone drying, another technique was also tested. These techniques were also successfully demonstrated on growers’ vineyards in drought prone areas in Maharashtra. Demonstration of these techniques saved 20 to 46.8% of irrigation water over farmers’ practice with increase in yield.

Irrigation schedule for Fantasy Seedless: The developed schedule, indicated that the quantity of water required by Fantasy Seedless is 20% less than Thompson Seedless vines. This
variety can be recommended in areas where availability of irrigation water is less (drought prone). Combining this variety with subsurface irrigation (water saving approach) will produce 116 kg grapes/mm irrigation water as compared to 75 kg grapes/mm irrigation water recommended irrigation schedule for Fantasy Seedless vines. The total water utilized with subsurface irrigation is 58% of the recommended irrigation schedule.

iii. Integrated Decision Support System for Grapes

ICAR-NRCG had introduced decision support system for diseases during 2007-08 in the form of mobile application and had more than 7000 total subscriptions. Impact analysis studies were conducted by ICAR-IASRI with 400 app users and non-users. The impact analysis indicated average 31% increase in productivity in vineyards of advisory users and there was about 13% reduction in use of various vineyards inputs. On same lines, decision support systems for nutrition and irrigation and insect pests have been developed and field validated. An Integrated weather information based advisory app has been developed to provide advisory on irrigation and nutrition, disease and insect management.

iv. Bio-intensive management of powdery mildew to produce residue free grapes

Powdery mildew is one of the important disease in grape and its occurrence usually troubles during fruit development stage. Use of fungicides for its control leads to detection of their residues at harvest. Therefore, it was very important to make the management of powdery mildew bio-intensive to reduce use of fungicides. It was successfully done and demonstrated in growers’ vineyards at four locations for two consecutive years. Following research findings contributed to the success of these field demonstrations.

- Induced Systemic Resistance (ISR) inducing Trichoderma and Bacillus: We have identified *Trichoderma asperelloides* strain 5R and *B. amyloliquefaciens* strain TL-171 which can be applied to the soil in the drip region and which induces systemic resistance in grapevines against powdery mildew disease and keeps the disease at low intensity.

- Sulfur tolerant strains of Trichoderma: Trichoderma afroharzianum strain NAIMCC-F-01938 and *Bacillus amyloliquefaciens* strain TL-171 were identified as sulfur tolerant strains (up to 1% of sulfur). It made possible to stop the use of triazole / SDHI fungicides after fruit set, and only sulfur and *Trichoderma* strains were used in alternation from fruit set to veraison for management of powdery mildew.

- Possibility of use of chlorine di oxide (50 ppm), silver complex of H$_2$O$_2$ (0.2%, 30% of formulation) for management of powdery mildew after veraison, especially under hot and dry climate when efficacy of biocontrol agents can be less than expectations.

- Bioremediation through *Bacillus subtilis* strain DR-39: DR-39 selected strain of *B. subtilis* for its ability to increase the rate of dissipation of nine commonly used fungicides / insecticides toward fruit maturity period was exploited to reduce residue on fruits. The formulation having > 108 cfu/g was developed and used for spray @ 2.5 g/litre on bunches about 20 days before harvest. It helped to reduce the residues either below Maximum Residue Limit (MRL) or at Below Limit of Quantification (BLQ)

v. NEH and TSP:

Under the NEH and TSP project, the institute is working with Department of Horticulture, Mizoram State for Development of grape industry in Mizoram.
Two field experiments were conducted in farmers’ field i) To study the effect of hydrogen cyanamide on uniform and early sprouting in Bangalore Blue vineyards and ii) Effect of stage wise nutrient application schedule on grapevine productivity.

Training programmes were organized for the Horticulture Extension Officers and grape growers: at the institute and at Champhai (Mizoram). An automatic weather station was installed in Vengsang village in Champhai dist.

Technical guidance is provided for establishment of scientific nursery for the production of quality planting material.

(d) whether these advances / achievements have been adopted by farmers in the country;

Yes

(e) if so, the details thereof and if not, the reasons for the same;

i. **Grape variety Manjari Medika:** Manjari Medika will be planted by five farmers during January 2019. Farmers had approached ICAR-NRCG for technology on processing of the variety.

   In Cumbum valley, two farmers have planted about five acres and able to market the fruits as preferred juice variety over local ‘Gulabi’.

ii. **Integrated Decision Support System for Grapes:** The technology has given to three service providers and service providers have about 8000 subscribers who are getting advisory online.

iii. **Bio-intensive management of powdery mildew to produce residue free grapes:** The technology was demonstrated on growers’ vineyards at four locations during 2016-17 and 2017-18, and now many are using the guidelines during current season.

iv. **NEH and TSP:** During fruiting season 50 litres of hydrogen cyanamide was made available to growers in Champhai and about seven farmers used it successfully.

(f) the steps taken / being taken by the Government to import agricultural technology from other countries?

Nil.