



Supporting Agriculture in North America

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Agriculture and
Agri-Food Canada



18th Annual Meeting of the Board of Directors of PROCINORTE

Task Force on Tree Fruits 2016 Report

**Peter Toivonen (Canada), Samuel Salazar-García (Mexico),
Ricardo Goenaga (USA), and Jorge A. Osuna-Garcia (Mexico)**

Mexico City, October 24-25, 2016

Activities undertaken in 2016 by the Tree Fruit Task Force

- a) **Task Force Annual Meetings - August 21st, 22nd and 26th.**
Discussed progress future research goals. Also discussed external funding (FONTAGRO) and issues around instrumentation.
- b) **Attended the 4th Avocado Congress Jalisco on August 24th to 26th.** PROCINORTE banner was displayed and Dr. Jorge Osuna made a presentation on the Tree Fruit Task Force.
- c) **Loan of a DA meter from Canada to US beginning October 2016 to facilitate evaluation of the utility of this specialized spectrometer for mamey sapote.**
- d) **Dr. Osuna Garcia is undertaking training at the Summerland Research and Development Centre (November – December, 2016) on the use of the Felix F750 spectrometer.**
- e) **Canada developed a dry matter model for sweet cherries using a Felix F750 vis/infrared spectrometer and is collaborating with industry on the use of the DA meter for apples.**



Avocado Congress, Jalisco 2016



Taskforce members next to PROCINORTE banner in Main Hall



Taskforce members in closing ceremony



Dr. Osuna presenting Taskforce results on determining avocado maturity.



Certificate received by Dr. Osuna from Congress organizers.



Responses to presentation by Dr. Osuna

Generally summed up by the comments

“When can I have an instrument?”

“Where can I buy an instrument?”

There is a real interest in non-destructive, field ready measures for quality, and particularly dry matter content in avocado – potential for future co-funding of technology transfer research if good model can be built for a handheld spectrometer like the Felix F750. The cost of this instrument is no longer a barrier to adoption since it is slightly over \$7,000 US.

Peruvian avocado growers were also interested in this technology as it will save hundreds of tons of avocados that are currently destroyed every year to assess dry matter by conventional microwave oven method.

IICA office received feedback from interested parties (involved in EU project) in Central America for more information on the Task Force activities and data. The email was passed on to the Task Force for our action.



Issues around instrumentation

Requested and obtained approval to buy a commercial spectrometer from an Italian supplier.

The process of acquisition was not completed until late summer 2016, too late for planned activities – i.e. delay in work plan.

The instrument was found to be unsuitable for use in avocados – miscommunication with the supplier. It was determined that the instrument was not capable of being reset for other fruits. Agreement from the supplier to accept return for refund.

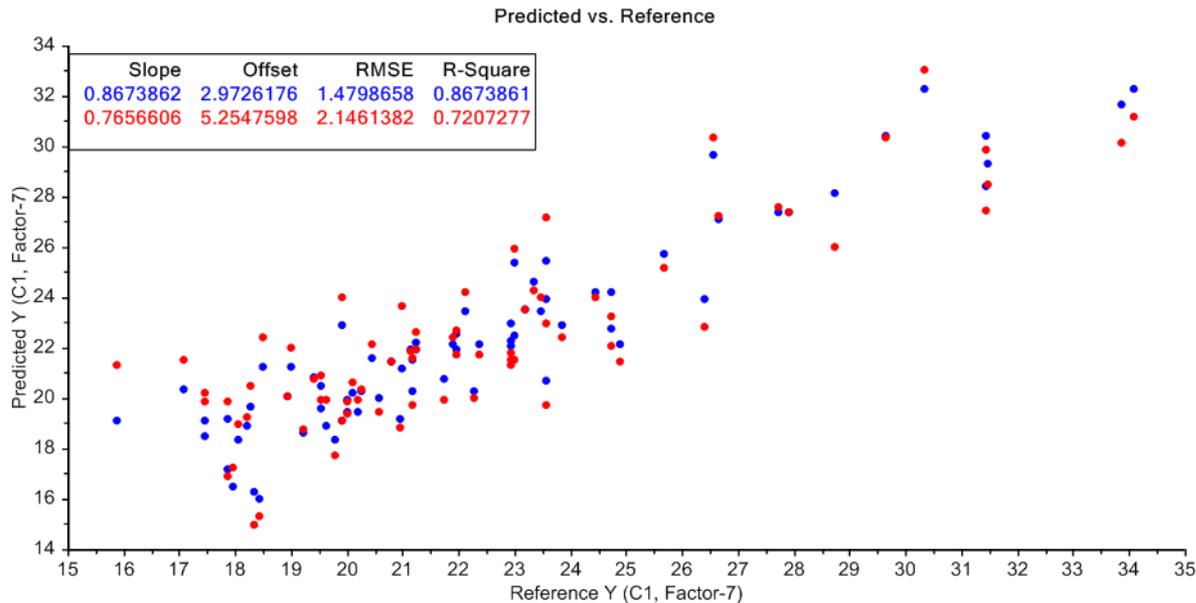
Dr. Ricardo Goenaga interacted with US supplier of a spectrometer (Felix F750 vis/NIR) at the American Society for Horticultural Science Conference in Atlanta and found that this instrument had come down in price from ~\$ 15K US to \$7,275.00 US. He obtained a quote for the system and worked with Dr. Audia Barnett to explore the option for purchase of the instrument by IICA for use by the task force as an alternative to the one which was being returned.



Issues around instrumentation

The technical issues and feasibility of the use of the Felix F750 was discussed at the Task Force annual meeting.

Data collected using a 1st generation Felix F750 spectrometer at Summerland on avocado in 2015 was analyzed using a multivariate analysis package (CAMO, The Unscrambler). The license to this package was finally transferred from St.-Jean-sur-Richelieu, Quebec to Summerland, allowing it to be used for this project.



Issues around instrumentation

At the annual meeting it was determined that the F750 would clearly be useful for mango, since this particular instrument was originally developed for use in Australian mangos (different varieties than those grown in Mexico). Now in commercial use by Australian industry.

Results of the analysis from 2015 avocado work was completed after the annual meeting.

Discussion during the Task Force video conference on October 6, 2016 led to the conclusion that the Felix F750 spectrometer would be useful for all the fruits in the Task Force portfolio, including avocado.

Drs. Audia Barnett and Ricardo Goenaga working on plan for acquisition and delivery to INIFAP in Mexico for initial use by Dr. Jorge Osuna on avocado and mango.

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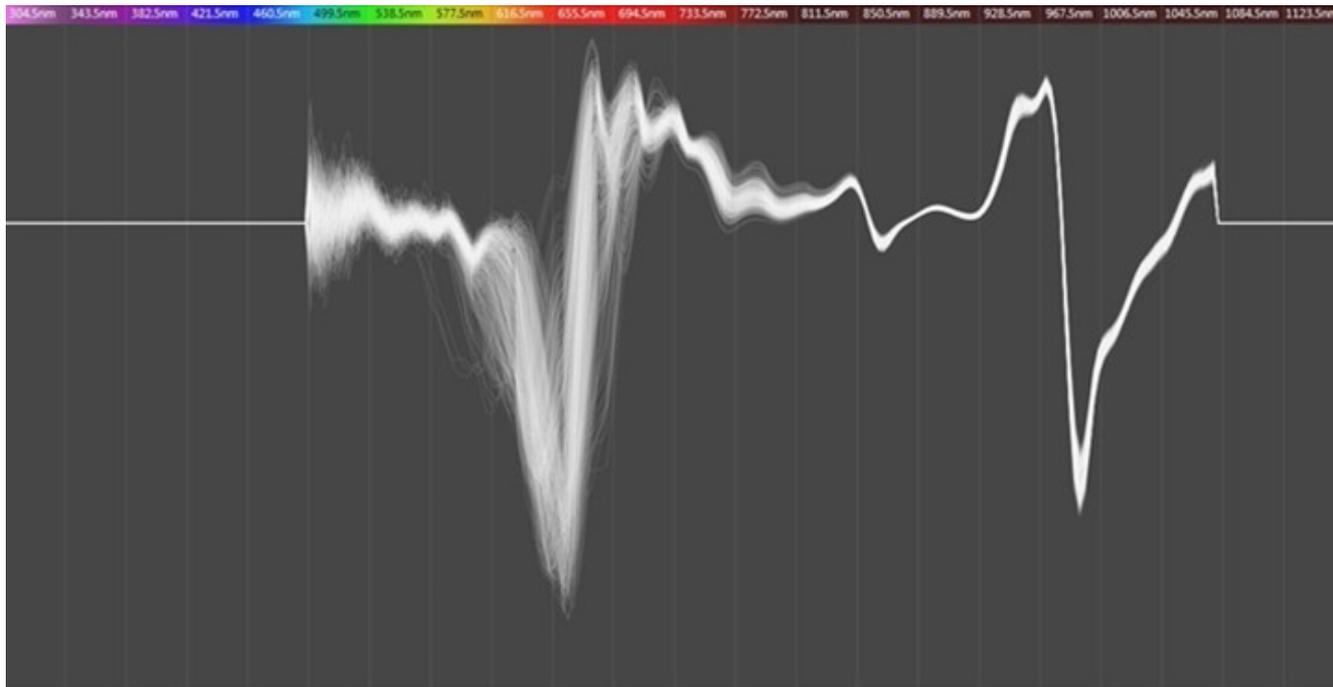
Strumento non distruttivo
per controllo maturazione





Issues around instrumentation

Results on F750 for Sweet Cherries - 2016



Issues around instrumentation

Results on F750 for Sweet Cherries - 2016

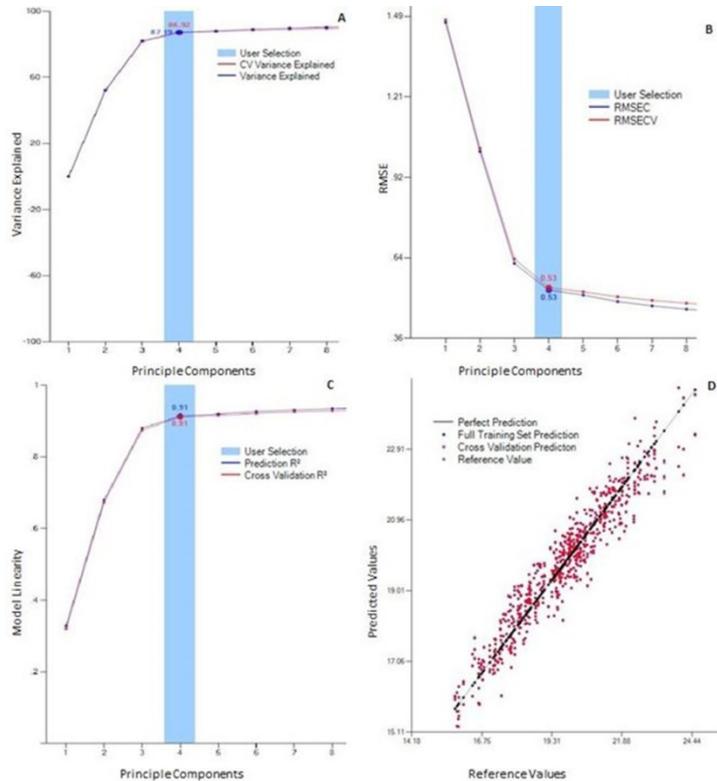


Fig 5. Explained variance (A), RMSE (B), linearity (C), and prediction error (D) graphs for model 2.

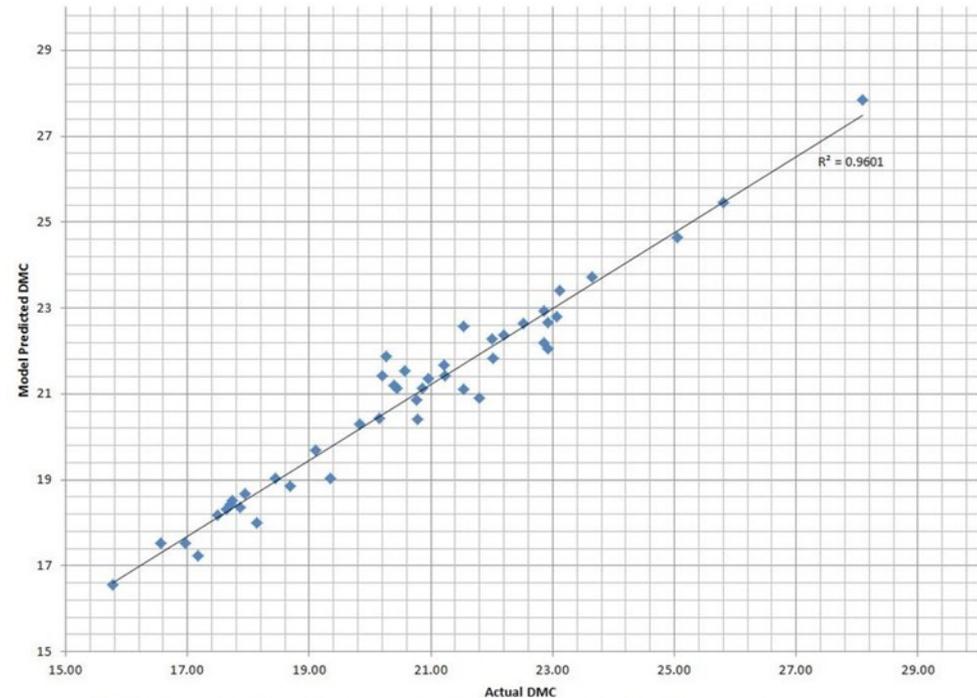


Fig 6. DMC as predicted by model 2 plotted against the DMC measured using destructive measurements

Verification of model for using cherries from three different cultivars (Staccato, Sentennial and Sovereign)

Testing of DA meter for use in mamey sapote

Dr. Ricardo Goenaga, USA (Puerto Rico)



Mamey Sapote (*Pouteria sapota*)

Training for Dr. Jorge Osuna on the use of the Felix F750 vis/NIR handheld spectrometer.

The 1st generation F750 purchased by AAFC at Summerland in 2013 has been upgraded with hardware parts, firmware and software upgrades so that it is identical to the current model of the F750 spectrometer.

The purchase of the F750 spectrometer by IICA is expected accelerate the progress of the Tree Fruits Task Force in completion of work with avocado and allow rapid initiation of work on other fruits such as Mexican mango.

Training for use of the F750 by Dr. Osuna at Summerland is expected reduce the time required for useful measurements by the instruments from 2 years down to 2-3 months, since it took approximately 2 years to begin obtaining good results with the instrument in Summerland.

Plan for training of Dr. Osuna

Dr. Osuna arrives on November 27th, the paperwork for letter of invitation and completing security screening completed on October 7th.

Avocados to be shipped to Langley, BC from Mexico by industry co-operators in State of Michoacan . Fruit to be picked up by Dr. Toivonen and Dr. Osuna.

At Summerland Research and Development Centre, Dr. Osuna will work with student (Morgan King, student from University of Victoria, BC) to learn how to use the instrument to collect spectra, how to establish a three temperature protocol, how develop a model and then input it into the instrument. Dry matter will be determined on all samples by Dr. Osuna and used as reference values in the model building.

Once the model is validated, it can be directly input into the F750 instrument being purchased by IICA for use by the Task Force.

Productivity

Publications (extracted from website maintained by USDA)

2016

Visible spectroscopy I_{AD} measures in apple: impact of stress and shading on maturity indexing. *Acta Horticulturae* 1119: 243-250.

Evaluación inicial de algunos aspectos de calidad del fruto de aguacate 'Hass' producido en tres regiones de México. *Revista Mexicana de Ciencias Agrícolas. Publicación Especial Vol. 7 (2):277-289.*

Influencia del riego y radiación solar sobre el contenido de fitoquímicos en la piel de frutos de aguacate 'Hass'. *Revista Mexicana de Ciencias Agrícolas. Publicación Especial Núm. 13: 2565-2575.*

Presencia de fruto partenocárpico en mango 'Ataúlfo' y su relación con la temperatura ambiental y tratamientos de fertilización. *Revista Mexicana de Ciencias Agrícolas. Publicación Especial Núm. 13: 2615-2626.*

Descriptores morfológicos de hoja y fruto de selecciones comerciales de nanche (*Byrsonima crassifolia* (L.) HBK) en Nayarit, México. *Revista Bio Ciencias. 3(4):269-285.*

Tejidos alternativos al foliar para evaluar la respuesta a la fertilización con Zn o B en aguacate 'Hass'. *Revista Fitotecnia Mexicana. 39(3): 247-252*

TREE FRUIT TASK FORCE

Relevance – The work being conducted pertains to developing non-destructive tools to measure composition/maturity of tree fruits and these tools are becoming recognized, in many other jurisdictions, as a new and essential standard for managing quality of fruits. It is therefore important for the member countries of PROCINORTE to become capable in the use of such tools.

Impact – Non-destructive spectral analysis for quality using portable instruments will significantly reduce waste in industry which now destroys significant amounts of fruit for making destructive measures to assess quality for harvest. Standardized tools will enable development of a modernized and harmonized quality standard regulations for tree fruits between the US, Canada and Mexico.

Effectiveness of the Task Force – Current activities include participation of industry partners who have great interest in adopting the technology (i.e. it is pre-sold). Other countries in Central and South America are indicating interest in interacting with the Task Force in developing/adopting this instrument.

TREE FRUIT TASK FORCE BUDGET EXECUTION 2016

TASK FORCE	EVENT / ACTIVITY	TOTAL SPENT / PROJECTED	BUDGETED	SURPLUS / SHORTFALL
TREE FRUIT	Task Force Meeting + Avocado Congress - Aug. 22-26, 2016	\$ 2,677	\$ 10,000	\$ 7,323
	Sponsorship of Dr. Samuel Salazar - INIFAP	\$ 1,158		
	Sponsorship of Dr. Jorge Osuna - INIFAP	\$ 1,158		
	Transportation Expenses - TF Meeting	\$ 170		
	Registration fee - Dr. Peter Toivonen - Avocado Congress	\$ 95		
	Registration fee - Dr. Ricardo Goenaga - Avocado Congress	\$ 95		
	Purchase of the New Spectrometer - Felix Instruments	\$ 7,275	\$ 5,000	-\$ 2,275
	Spectrometer + Laptop put in place	\$ 1,680	\$ -	-\$ 1,680
	Delivery of the laptop from Washington to Mexico	\$ 173		
	Customs - Spectrometer in Mexico	\$ 794		
	Customs - Laptop in Mexico	\$ 713		
	Training on the new Spectrometer - Summerland - Nov. 27	\$ 4,000	\$ -	-\$ 4,000
Sponsorship of Dr. Jorge Osuna - INIFAP	\$ 4,000			

TOTAL	\$ 15,632	\$ 15,000	-\$ 632
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% of Execution	104%	-4%
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Activity	Expected result	Date	Responsible	IICA (US \$)	INIFAP, AAFC, ARS/USDA (In-kind) (US \$)	Industry (US \$)
Completion of existing data set processing and analysis of visible/near infrared spectra for avocado samples with varying dry matter content. Validation of spectral analysis with a new spectral model.	Completion of correlation analysis of Vis-NIR with harvest maturity of analyses/measures to determine fruit skin's temperature stability of spectral analysis under varying field temperature conditions.	November 2017	P. Toivonen, J. Osuna, S. Salazar, R. Goena	\$0	\$40,000	\$10,000
Initiate research to use spectroscopy to measure quality in major Mexican mango	Preliminary results for use of spectroscopy for measuring quality of Mexican mango	December 2017	J. Osuna, S. Salazar, R. Goena, P. Toivonen	\$12,000	\$20,000	\$5,000

Justification of budget request items for 2017

Research to use spectroscopy to measure quality in major Mexican mango varieties

Request is \$12,000 US. The intent is to provide a stipend, travel costs, and other costs to a 4th year undergraduate student to conduct an undergraduate thesis on measuring dry matter in Mexican mango. The expected outcome is the development of a highly qualified person who would be hired by the Mexican industry to implement commercial use of vis/NIR spectroscopy of mango or other tree fruit.

Taskforce meeting, participation in the V Latin-American Avocado Congress to be held in Jalisco, Mexico

Request is \$6,000 US. The intent is to cover the costs of Drs Salazar and Osuna for travel, lodging and per diems as well as registration to participate at the Congress. The congress travel will be piggy-backed onto the Tree Fruit Task Force annual meeting to update on progress with avocado, mango, mamey sapote, sweet cherry and apple, and therefore some of the request is to fund the travel, lodging and per diems for Drs Salazar and Osuna for the Task Force meeting.





ACKNOWLEDGEMENTS

The Task Force would like to thank the board of directors for their approval of the purchase of a commercial spectrometer.

The Task Force would like to thank Audia Barnett for her responsiveness, guidance and support over the past year.

The Task Force would like to also thank Cristina Jimenez for excellent logistical and administrative support over the past year.

