Short training course on agricultural product quality and safety system in China

The courses were held in NERCITA, Beijing on 2014. More than 40 staff and students joined the training courses.

1. Title: Vegetable Production in Spain

Teacher: Prof. Dr. Pedro Hoyos Echevarría

Education

- Ph.D. in Agriculture Engineering from the Technical University of Madrid
- Agricultural Engineer. Technical University of Madrid

Teaching at the University

- Professor of Vegetable Production at the Department of Plant Production at the Technical University of Madrid, for more than 30 years.
- Director of more than 250 Master Thesis

Expertise in Horticulture and Vegetable production

- Between 1981 and 1987, Manager of MIGJORN SA, the largest outdoor vegetable farm in Spain (550 ha). Pioneer in the use of tomato harvester in Spain. Director of the first trials in Spain with lettuce "Lollo Rosso" or Chinese cabbage.
- National coordinator for the vegetable training program of Ministry of Agriculture of Spain. Publishing books about tomato, lettuce, melon, carrot, leek production.
- Director of videos about horticulture for the Ministry of Agriculture of Spain.
- Advisor for the contents about horticulture on the website of the Ministry of Agriculture of Spain.
- Member of the advisory Committee of Argentina Horticultural Society
- Member of the Spanish (SECH) and International Society of Horticultural Science (ISHS).

Research and Innovation

His main research topic is the use of grafted plants in vegetables and rootstocks selections in different growing conditions.

Some highlights:

- Director of more than 20 research projects with both public and private funding.
- Project coordinator in horticulture production during more than 25 years for different Spanish regions: Castilla-La Mancha, Castilla y León and Madrid.
- Publications in Scientia Horticulturae, Acta Horticulturae and in the most important Spanish agricultural magazines.

- Author of the chapter “Vegetables production in Spain” in the special issue “IBERIA” of the journal Chronica Horticulturae (ISHS).

He introduced the global situation of vegetable production in brief.

TABLE 27: Top vegetable producers and their productivity

FAO,2013	Vegetables (including melons) area total thousand ha	area p.a. growth %	yield total thousand hg/ha	yield p.a. growth %	production total thousand tonnes	production total thousand tonnes	production p.a. growth %	production p.a. growth %
China	23 458	2.6	230	0.8	522 686	539 993	8.5	4.3
India	7 256	2.9	138	0.5	90 635	100 405	4.0	3.3
United States of America	1 120	−2.2	318	1.2	37 289	35 609	2.5	−1.0
Turkey	1 090	0.9	238	−0.4	26 702	25 901	3.9	0.5
Iran (Islamic Republic of)	767	3.3	261	2.2	18 421	19 995	7.3	5.5
Egypt	775	2.2	251	0.5	21 350	19 487	4.9	2.7
Italy	537	−1.2	265	−0.3	15 082	14 201	0.8	−1.5
Russian Federation	759	−1.4	175	2.0	14 827	13 283		0.6
Spain	348	−1.1	364	1.5	13 457	12 679	1.3	0.4
Mexico	681	0.4	184	1.6	11 727	12 515	5.3	2.0
Nigeria	1 844	0.6	64	2.5	10 399	11 830	5.7	3.2
Brazil	500	1.7	225	2.7	11 027	11 233	3.1	4.5
Japan	407	−1.1	264	−0.6	11 383	10 746	−1.5	−1.7
Indonesia	1 082	1.8	90	1.5	9 620	9 780	6.0	3.4
Republic of Korea	268	−4.8	364	2.7	11 269	9 757	1.6	−2.2
Viet Nam	818	3.7	110	−0.4	9 064	8 976	6.7	3.3
Ukraine	551	−0.9	162	5.3	9 011	8 911		4.3
Uzbekistan	220	2.8	342	6.3	6 776	7 529		9.3
Philippines	718	2.0	88	0.4	5 814	6 299	1.5	2.4
France	245	−1.4	227	−0.0	5 273	5 572	−1.5	−1.4
Morocco	190	1.8	288	3.8	5 256	5 487	2.6	5.6
Myanmar	378	3.0	137	1.5	4 841	5 195	5.0	4.5
Algeria	303	2.8	171	4.3	4 748	5 175	4.1	7.2
Pakistan	401	1.2	126	−0.7	5 269	5 064	3.9	0.4
Poland	165	−4.0	306	2.4	5 805	5 056	0.2	−1.7
Netherlands	88	2.7	545	0.1	4 746	4 788	1.2	2.7
Romania	262	−0.8	147	2.1	3 902	3 864	1.1	1.3
Democratic People's Republic of Korea	345	1.1	112	−1.0	3 999	3 847	−1.1	0.1
Thailand	516	−1.8	74	1.3	3 817	3 812	2.7	−0.5
Kazakhstan	182	2.5	203	3.9	3 310	3 696		6.5
Bangladesh	488	5.0	75	2.3	3 421	3 661	3.5	7.3
Iraq	273	−2.4	129	2.6	3 476	3 532	1.2	0.2
Greece	107	−3.0	315	0.6	3 638	3 370	0.8	−2.4
Argentina	185	0.2	181	1.2	3 273	3 351	2.2	1.3
Germany	108	0.7	312	−2.1	3 662	3 351	1.2	−1.5
Sudan (former)	230	2.1	143	2.4	3 115	3 296	6.2	4.5
Nepal	247	4.9	124	2.4	2 819	3 077	3.9	7.4
Syrian Arab Republic	147	4.3	204	1.0	3 089	2 983	−0.3	5.3
Tunisia	146	1.6	203	2.0	2 825	2 961	5.3	3.7
Peru	214	1.3	133	2.6	2 679	2 847	6.5	3.9
World	55 598	2.0	188	1.6	1 019 114	1 044 380	5.3	3.3
Africa	7 076	2.4	101	2.1	68 799	71 157	4.6	3.8
Eastern Africa	1 600	5.5	63	0.3	8 918	10 073	3.6	5.3
Middle Africa	785	5.0	44	−0.0	3 428	3 427	6.0	4.2
Northern Africa	1 709	2.1	219	2.4	38 207	37 354	4.5	4.0
Southern Africa	163	1.6	170	3.0	2 485	2 763	1.0	2.5
Western Africa	2 820	0.2	62	1.6	15 761	17 539	5.5	2.7
Americas	3 915	0.3	207	1.0	82 068	81 153	3.4	0.9
Latin America and the Caribbean	2 703	1.4	160	1.2	42 399	43 226	4.5	2.4
Northern America	1 212	−2.2	313	0.9	39 669	37 926	2.4	−0.9
Asia	40 241	2.5	197	2.2	765 675	794 278	6.6	3.9
Central Asia	569	2.8	260	4.8	13 459	14 800		8.3
Eastern Asia	24 487	2.5	231	1.2	549 450	564 461	7.7	4.0
South-Eastern Asia	3 824	2.0	97	1.6	35 828	36 962	4.7	3.1
Southern Asia	9 340	3.0	143	0.9	122 288	133 927	4.4	3.8
Western Asia	2 021	0.9	218	1.4	44 649	44 129	4.1	1.4
Europe	4 197	−1.3	225	2.2	99 049	94 227	0.6	0.4
Eastern Europe	2 004	−1.8	180	3.4	38 880	35 993	0.4	1.3
Northern Europe	194	−1.9	221	1.8	4 504	4 276	−0.7	−1.0
Southern Europe	1 468	−1.2	254	1.8	38 998	37 280	1.2	−0.3
Western Europe	531	0.2	314	2.0	16 667	16 678	0.4	0.4
Oceania	169	−0.8	211	0.7	3 523	3 565	3.4	0.2
Australia and New Zealand	107	−2.2	273	2.2	2 883	2 920	3.5	−0.0
Melanesia	52	1.7	113	1.2	583	587	2.9	1.3
Micronesia	1	0.4	155	−2.0	16	16	3.7	−0.3
Polynesia	9	0.7	47	−0.7	42	42	5.7	0.7

The most important crops are vegetables: tomato, lettuce, onion, melon and pepper. Cucumber, watermelon, carrot, green beans and strawberry are also important.

Outdoor crops are used for growing both fruit and vegetables and are distributed throughout the territory. Although, in some regions there is a greater production concentration for exporting: Catalonia, Valencia, Murcia, Andalusia, Extremadura

Greenhouses are mainly located in the regions along the Mediterranean coast, Andalusia and the Canary Islands. These operations have very diverse structures, both from a productive and commercial point of view. Most are Limited Companies, cooperatives, and agricultural processing companies. They vary in size, both in terms of turnover and number of shareholders, being many of them recognised as producer organisations.

Many information, from **Fepex**, the spanish federation of associations of producers and exporters of fruits, vegetables, flowers and live plants, is a private, non-profit making, industry based organisation.

After the presentation, Prof. Pedro and Fernando visited a strawberry greenhouse base in Tongzhou district, Beijing.

2. Monitoring Cold Chain Logistics

Prof. Luis Ruiz-Garcia

CURRENT POSITION

Professor. *Full dedication*

Department of Agriculture Engineering. College of Agriculture.

Technical University of Madrid (Universidad Politécnica de Madrid)

Teaching and researching about: Farm machinery, Tractors, Traceability, RFID, web services and applications in agriculture

EDUCATION

Ph.D. Agricultural Engineering . "Doctor Europaeus" Mention

College of Agriculture. Physical Properties and Advanced Technology in Agrofood

Universidad Politécnica de Madrid

Dec 2008

M. A. Agricultural Engineering

Universidad Politécnica de Madrid

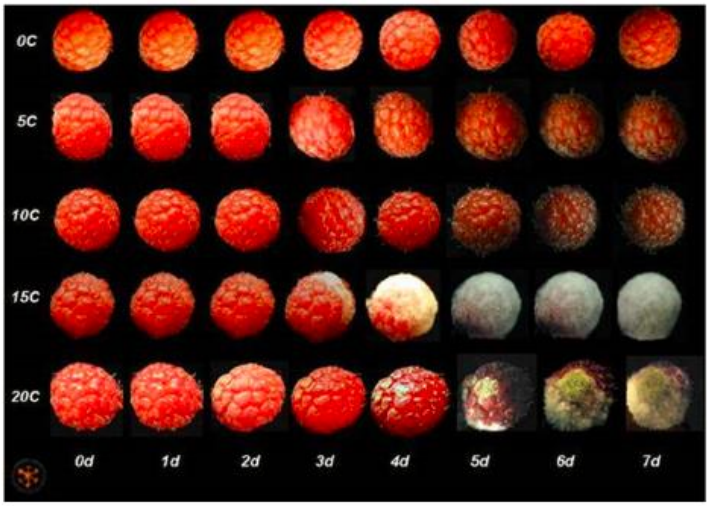
June 2003

B. A. Agricultural Engineering.

Universidad Politécnica de Madrid

June 2000

Temperature vs. *Shelf life*



University of Florida (Nunes et al., 2003)

The Quality of perishable food products can not be improved during transportation, storing and distribution. It is only possible to maintain it.

- Loss of quality can only be delayed.
- Quality loss is accumulative and depends of several factors and interactions
- Inadequate conditions can happen in any step of the cold chain.

Inadequate temperature is second on the list of factors causing foodborne illness, surpassed only by the initial microflora present in foods (Sánchez López & Daeyoung, 2008). It is estimated that 300 million tons of produce are wasted annually through deficient refrigeration worldwide (IIR/UNEP, 2002).

The Cool Chain Association (CCA) estimates that 30% of temperature-sensitive products are lost during transport (Hoffman, 2006). In USA temperature-controlled shipment rise above the specified temperature in 30% of trips from the supplier to the distribution centre, and in 15% of trips from the distribution centre to the store (White, 2007).

Problems in cold chain logistics

Perishable food products: fruits, vegetables, meat, fish, flowers…

- **Inappropriate cooling** → Wrong postharvest evolution, cool injuries, heat injuries
- **Transpiration** → Loose of weight
- **Condensation** → spoilage, Fungal rots
- Accidents, robberies, fires, **etc.**

WITHOUT DISRUPTION

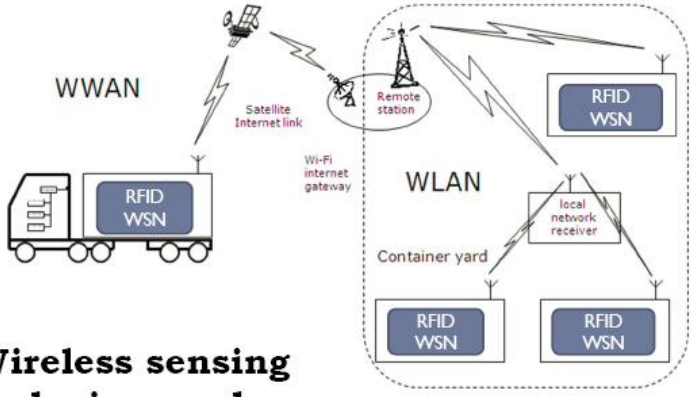
9 HOURS DISRUPTION

Orange with mold

CFDR, University of Florida

How can we monitor cold chain logistics?

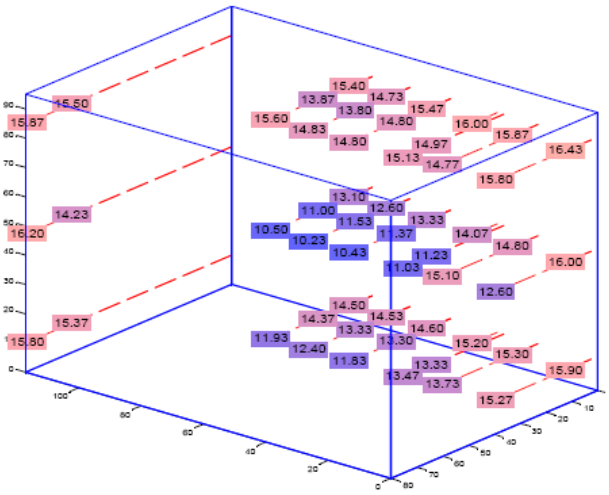
Development of Monitoring systems for cold chain transportation



Wireless sensing devices and communications

Ruiz-García et al., 2007

RFID applied in cold chain monitoring



Temperature distribution in one pallet

- Dairy products
- Set point: 6°C
- 48 RFID tags
- After 60 hours without refrigeration

Jedermann et al., 2009

Monitoring Cold Chain Logistics

Testing ZigBee Motes for Monitoring Refrigerated Vegetable Transportation under Real Conditions

Ruiz García, L. Barreiro, P., Robla J. I., Lunadei, L. 2010.

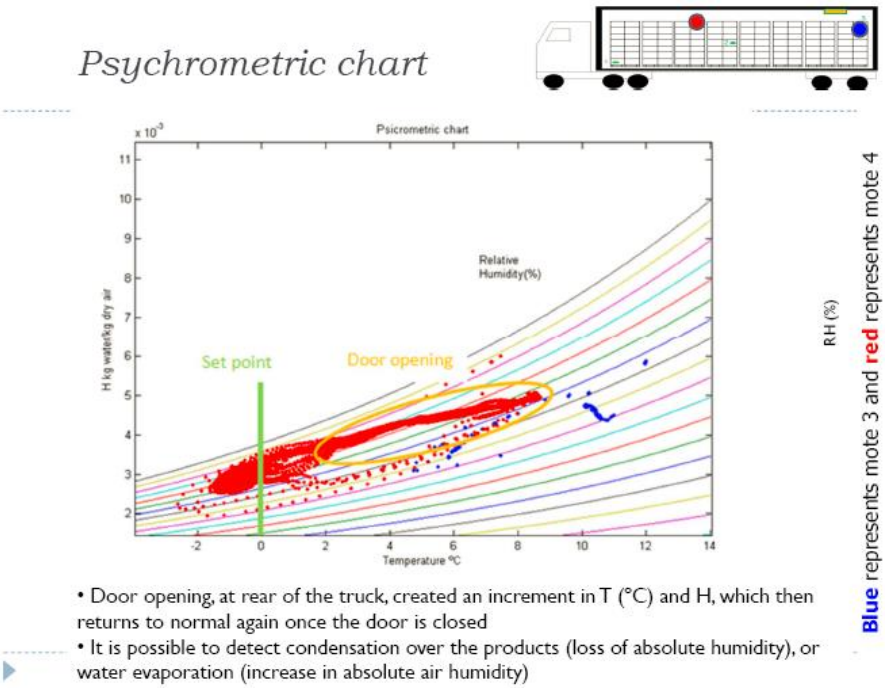
Objective

- **Monitoring a real transportation** of vegetables by truck, using a multihop WSN based in the ZigBee/IEEE 802.15.4 protocol
- Analyzing the communications reliability and the psychrometry during the shipment

Experimental work

- ✓ Murcia (Spain) - Avignon (France)
- ✓ 23h 41m 21s
- ✓ 1051 kilometers
- ✓ 28 pallets
- ✓ **Set point:** 0ºC

- ✓ 14000 kg aprox. de Lettuce var. *Little Gem* (Cogollos)
- ✓ Optimum conditions (UC Davis):
- ✓ 0°C
- ✓ >95% RH



3. Summary

The two courses gave the Chinese partners a general profile on the global situation on vegetable production in Spain's view. We have talked RFID monitoring for temperature and traceability, quality prediction and real application in agri-product transportation, which is very useful for cold chain logistics research and development in China.