Journal of Sustainable Development; Vol. 7, No. 1; 2014
ISSN 1913-9063 E-ISSN 1913-9071
Published by Canadian Center of Science and Education

Assessment of Agricultural Options Available for Saving Orange Cultivation in Ribera Baixa (Valencia, Spain)

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Received: October 6, 2013 Accepted: December 6, 2013 Online Published: January 22, 2014

doi:10.5539/jsd.v7n1p115 URL: http://dx.doi.org/10.5539/jsd.v7n1p115

Abstract

Orange cropping has been in practice in Ribera Baixa (Valencia, Spain) for several centuries. During the past decade, orange cropping has been under severe economic stress arising from increasing competition from less-costly foreign imports. Consequently, farm-gate prices are depressed, under the regime of fixed percentage distribution of retail pricing. Orange groves are being abandoned in many instances. A practicable and sustainable solution to this persistent economic problem would require a re-structuring of the marketing system to facilitate the sales of organic products and introduction of organic growing practices for oranges as well as secondary organic tree crops.

Keywords: farming economy, marketing, oranges, organic, Ribera Baixa, Valencia

1. Introduction

Orange (*Citrus sinensis* (L.) Osbeck), one of the most widely grown tree fruit crops in the World, is native to southern China. Cultivation of oranges in the western Mediterranean region began during the times of Al-Andalus (Watson, 1974; FSTC, 2012).

During the past few years, the orange cropping economy has been in significant decline as the farm-gate income covers the production costs only marginally at best. Rising input costs and foreign competition have been cited frequently to be the principal causes. Direct government subvention for orange growers has been solicited actively during the past few years (Anon, 2011).

Ribera Baixa is the most intensive orange-cropping area in the Valencia province. In recent years, many abandoned plots are filled with weeds and trash. And debris accumulated in the absence of maintenance increases the risk of fires during the dry summer months. Although orange farmers are starting to change their traditional practices such as diversification into the cropping of persimmon and pomegranate, and organic cropping, the underlying economic problem may remain unresolved. The prevailing structure of small holdings structure prevents consolidation to reduce production cost of traditional orange cropping.

This project was undertaken to examine the underlying causes of this decline and to devise possible remedies. Ribera Baixa was chosen as the study area.

2. Methods

Pubic-domain documents, including reports, statistics and journal publications were used for the present development and analysis of various scenarios for the remediation of the declining orange-cropping economy in Ribera Baixa.

Sample cropping cost data published by the Extension Service of the University of California for the Central Valleys, viz., Sacramento Valley and San Joaquin Valley, were used extensively for reference because of the considerable regional similarities in the climatic conditions and cropping practices between the Central Valleys (California) and Ribera Baixa. Figure 1 illustrates similar patterns of average incident solar radiation, temperature and precipitation. For the comparison of organic orange production, data from California's South Coast (e.g., Orange County and Riverside County) were also included.

California agronomic data were adjusted on an as-required basis using the Consumer Price Index calculator published by the US Bureau of Labor Statistics (2013). The US currency was converted to Euro using reference values published by the European Central Bank (2013) for the indicated time. Typically, US-dollar cost or price was first adjusted for inflation, and then the inflation-adjusted value would be converted to Euros at the specified time period.

Except where noted, yield of oranges denotes saleable product, after sorting at packing houses.

3. Results and Discussion

3.1 Orange Cropping

Typically, full production of oranges starts at about 10 years after planting (Morton, 1987). The productive life of an orange tree might be 40 to 50 years (O'Connell, 2009). Stand management such as pruning and topping manually is only undertaken periodically throughout the life span of the stand.

Historically, orange production was not undertaken as monoculture over a large area in Ribera Baixa. Other tree crops such as almonds, olives and peaches were also grown. Application of fertilizers, pesticides and herbicides has become standard cultural practice in intensive monoculture cropping since 1970's.

3.1.1 Comunitat Valenciana Production

In 2010, Comunitat Valenciana produced ~1.51 million tonnes of oranges (*naranjo dulce*), accounting for about 57% of the total orange production in Spain (IVE, 2012). The other two major producer regions are Andalusia and Murcia. The geographical locations of principal orange production areas within the Comunitat Valenciana are shown in Figure 2. Most of the oranges are grown in the province of Valencia. It may be noted that within the Comunitat Valenciana, most of the tangerines (*mandarino*) are grown in Castellón province. The province of Alicante has most of the production of lemon and lime (*limonero*).

The largest production area is La Ribera (comprising of Ribera Alta and Ribera Baixa) which account for more than 38% orange cropped area of Valencia, or about 28% of the entire Comunitat Valenciana (GVA, 2011). Table 1 shows that Ribera Baixa has the highest orange cropping intensity in the Comunitat Valenciana.

The principal varieties grown in Ribera Baixa are Navel-lane-late, Navelina and Valencia Late. Fresh oranges are effectively available year round except for July, August and September (GVA, 2010a).

3.1.2 Inputs

Oranges as well as other citrus fruits are harvested traditionally by hand (GVA, 2010a). The practice in California is not different (O'Connell et al., 2009). Figure 3 shows the comparative production costs for conventional oranges grown in California and in the Comunitat Valenciana. Labour cost is the largest cost component in both regions.

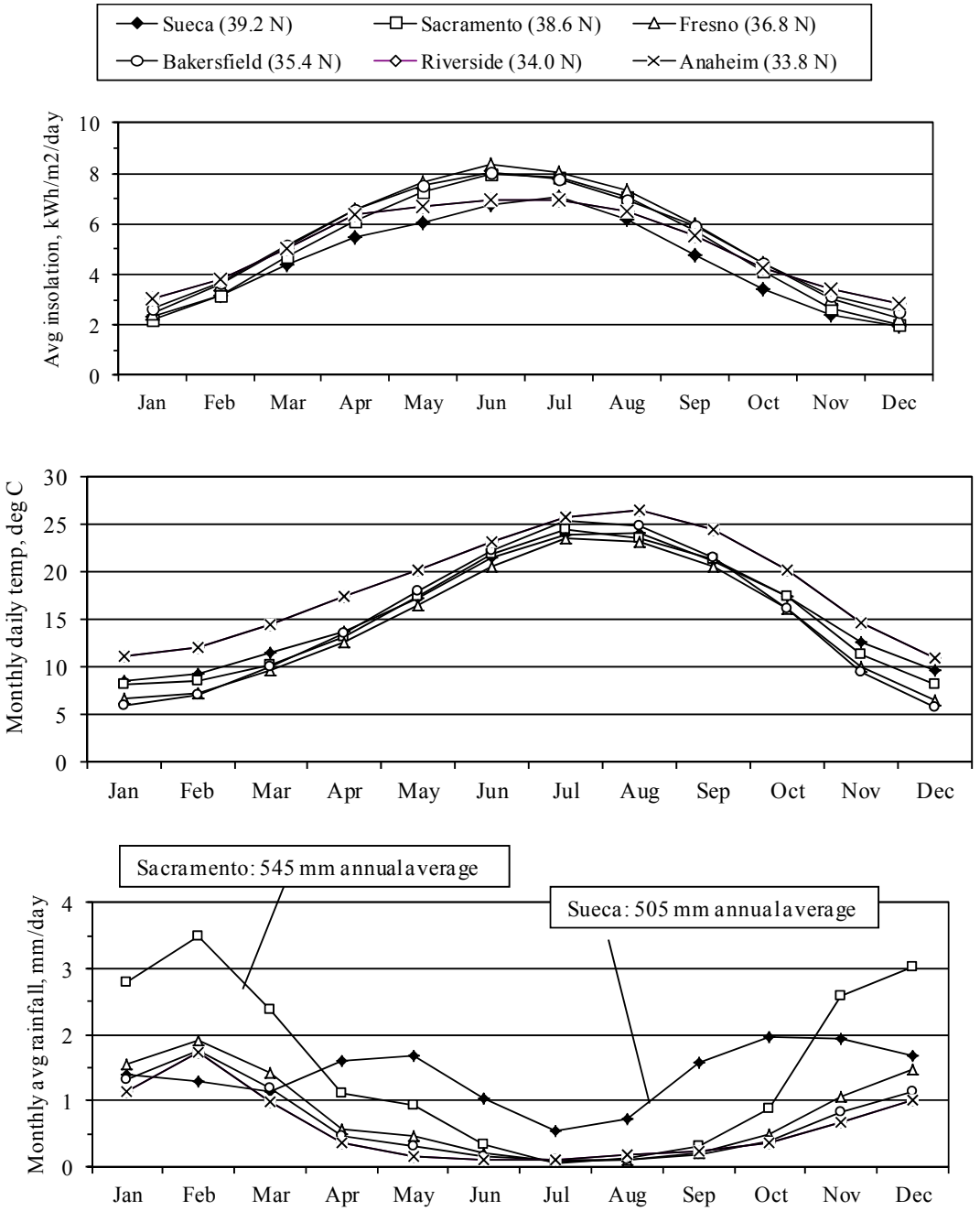
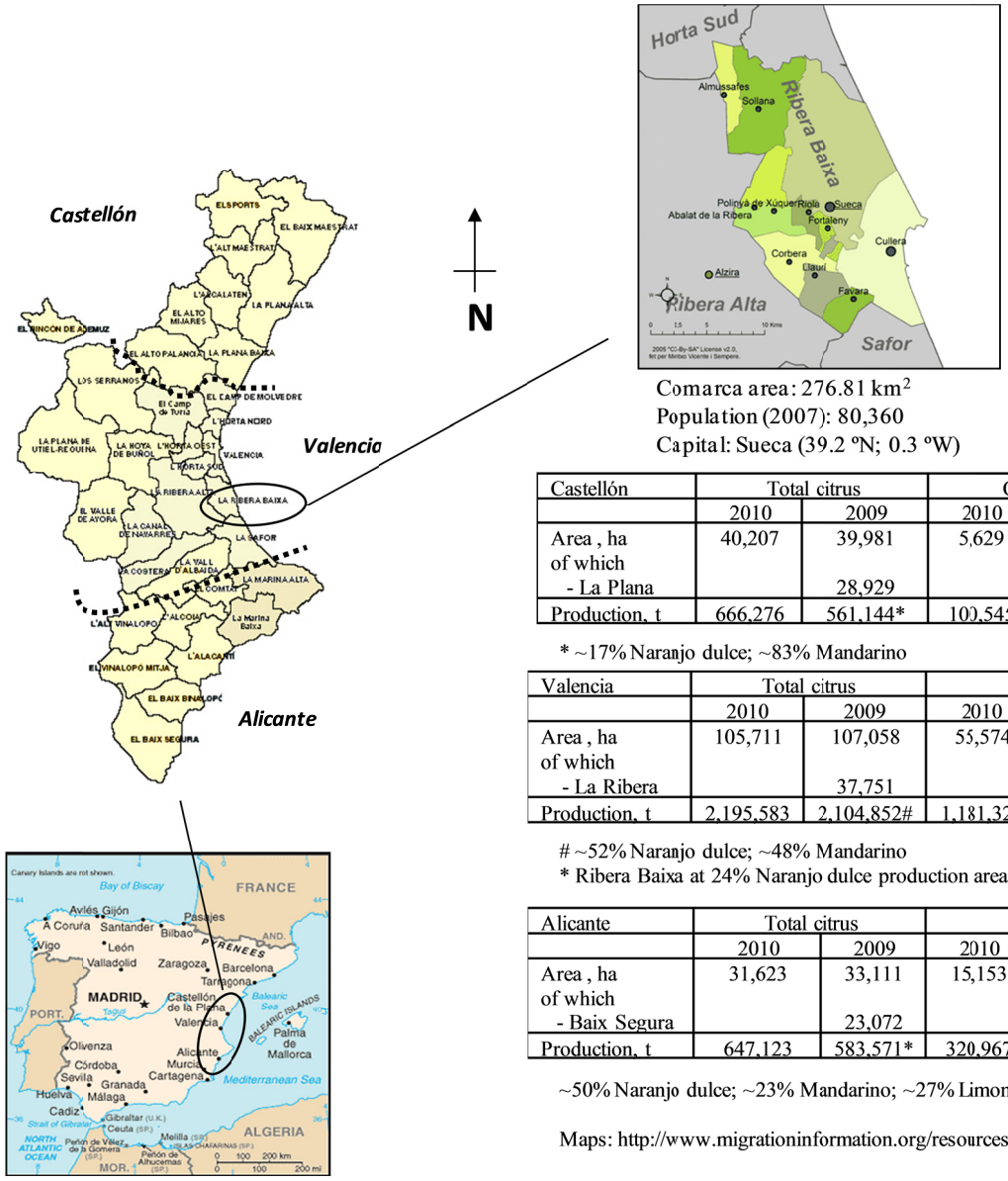


Figure 1. Selected meteorological characteristics

Source: ASDC, 2012.



Comarca area: 276.81 km^2
Population (2007): 80,360
Capital: Sueca (39.2 ºN; 0.3 ºW)

Castellón	Total citrus		Orange	
	2010	2009	2010	2009
Area , ha	40,207	39,981	5,629	5,704
of which				
- La Plana		28,929		2,880
Production, t	666,276	561,144*	100,545	93,894

* ~17% Naranjo dulce; ~83% Mandarino

Valencia	Total citrus		Orange	
	2010	2009	2010	2009
Area , ha	105,711	107,058	55,574	55,627
of which				
- La Ribera		37,751		21,471*
Production, t	2,195,583	2,104,852#	1,181,328	1,094,508

~52% Naranjo dulce; ~48% Mandarino
* Ribera Baixa at 24% Naranjo dulce production area of La Ribera.

Alicante	Total citrus		Orange	
	2010	2009	2010	2009
Area , ha	31,623	33,111	15,153	15,765
of which				
- Baix Segura		23,072		10,692
Production, t	647,123	583,571*	320,967	290,240

~50% Naranjo dulce; ~23% Mandarino; ~27% Limonero

Maps: http://www.migrationinformation.org/resources/spain.cfm

Figure 2. Principal orange-growing regions of Comunitat Valenciana

Table 1. Citrus cropping intensity of major districts

			2009 data	Land use intensity, % total	
Provincia	Comarca	Total land area, ha	Citrus crop, ha	Citrus total	Orange
Castellón	La Plana Baixa	60,500	20,618	34	3
Valencia	Ribera Alta	95,186	30,282	32	17
	Ribera Baixa	27,681	7,469	27	19
	El Camp de Turia	82,400	15,636	19	12
Alicante	Baix Segura	95,730	23,072	24	11

Source: GVA, 2010b.

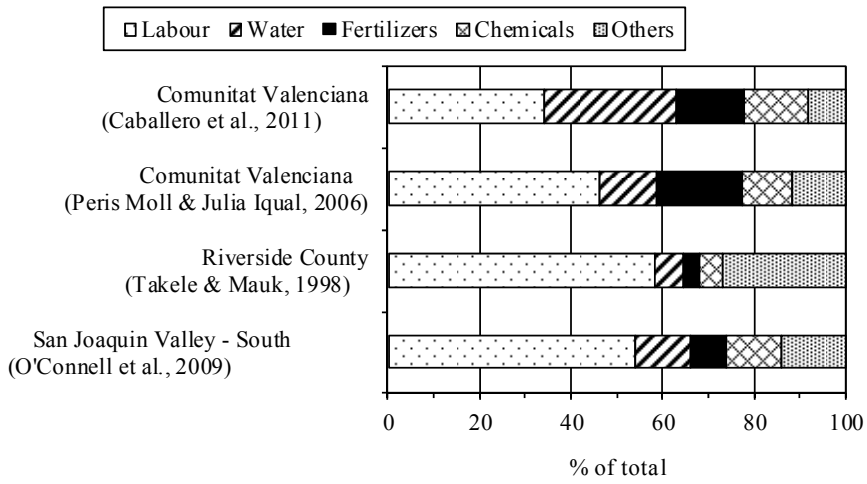


Figure 3. Comparative unit cost of conventional orange production

In Ribera Baixa, the required labour at the farm level may be contracted to farmers which specialize in among other things, planting, pruning, chemical application and picking. During the past decade, Spanish agriculture has become increasingly dependent on migrant labourers (principally from Africa) for its economic well-being. This agronomic situation is also very common in most developed countries (including USA and Canada) in which farm labour is a large component of production operations. There is no remedy as once-prevalent "unpaid" family labour in the Spanish citrus sector has largely become extinct. During the past few decades of economic prosperity in Spain, non-principal family members have better off-farm wage-paying work opportunities (Picazo Tadeo & Reig Martínez, 2005). The underlying problem is that there is no place for an agrarian society in a developed economy.

In the regime of continuing globalization of freer trade, the market threat is expected to be more acute in coming years (Anon, 2012e). The underlying issue is that the basic wages of field workers paid by ex-EU competitors are substantially lower than those of Spain. The labour-cost offset deployed to date by Spanish producers has been to employ, legal as well as illegal, migrant workers from Africa and Latin America (Mendoza, 2001; Padilla & Peixoto, 2007; Anon, 2010) at minimum wages or below.

Table 2 illustrates the substantial official wage gap for field workers between Spain and its 3 major competitors in the production of oranges. It is evident that the basic wage gap is too large to be narrowed. Moreover, there is certainly no guarantee that migrant farm workers are paid the minimum wage in the cited African countries. In Egypt, only government workers have a set minimum wage of International $5,680 per year.

Table 2. Minimum wage scales of Spain and its top 3 competing countries in 2012

	Spain	Egypt	Morocco	South Africa
International $ per year*	11,426	Nil	2,696	2,471
€ per year (= €744.92 x 12 months)	8,939	---	---	---

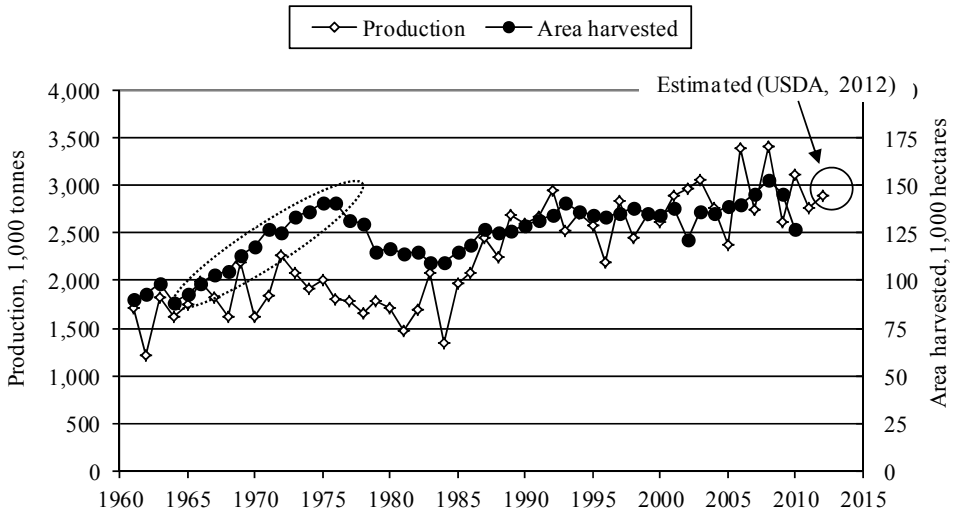
* "International dollar: is a hypothetical unit of currency that has the same purchasing power parity as that the U.S. dollar had in the United States at a given point in time (IMF, 2010).

Source: ILO, 2013.

3.1.3 Market

As shown in Figure 4, the production of oranges in Spain has nearly doubled since 1961, to nearly 2.9 million tonnes in 2012. The reported yield per hectare which has been relatively static should be considered to be saleable yield, i.e., after sorting for size, shape and other visual imperfections. For comparison, the field yield might be approximated to be 20% higher (O'Connell et al., 2009). Note the overall rapid expansion of orange harvested area during 1965-1970. Spain remains the largest producer of citrus fruits in the European Union.

Table 3 shows that the Spanish share of fresh oranges in the UK market has varied between 20 to 30% by quantity, over the past 20 years. During the past decade, fresh oranges from Spain have been competing routinely against those imports from South Africa, Egypt and Morocco, in the UK market. About 20% of the Spanish orange production is diverted customarily for the production of orange juice in Spain as well as in other importing EU member states (USDA, 2012).



Yield	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	10-y avg
kg/ha	20,989	24,398	22,318	20,397	17,124	24,258	18,788	22,227	17,929	24,471	21,290

Sources: FAOSTAT, 2012; USDA, 2012.

Figure 4. Orange area harvested, production and yield in Spain

Table 3. UK importation of fresh oranges, 1990-2010

	Quantity, tonnes		Landed value, US$1,000		Calculated value, US$/kg		% ES share of UK market		Next 3 major competitors
Year	Total	ES	Total	ES	Total	ES	Quantity	Value	By quantity
2010	275,646	68,395	211,457	63,900	0.767	0.934	25	30	ZA, EG, MR
2005	339,733	75,459	213,964	54,389	0.630	0.721	22	25	ZA, EG, MR
2000	316,774	94,582	141,606	54,343	0.447	0.575	30	38	ZA, MR, IL
1995	321,692	69,317	164,316	34,980	0.511	0.505	22	21	ZA, IL, MR
1990	390,441	78,780	205.798	36,702	0.527	0.466	20	18	IL, MR, CY

CY = Cyprus; EG = Egypt; ES = Spain; IL = Israel; MR = Morocco; ZA = South Africa

Source: FAOSTAT, 2012.

With the EU signing of a freer trade agreement with Morocco in early 2012, it is now expected that the Moroccan shares of the EU citrus market (including the UK) would increase steadily in coming years (Anon., 2012a; Carrasco, 2012). Although the quality of Moroccan imports are considered to be presently lower than that of Valencia products, it is reasonable to expect that it would only be a matter time before this "inferior quality" issue is resolved.

3.2 Economy of Orange Cropping in Ribera Baixa

3.2.1 Grove Size

The average size of an orange farm in the Comunitat Valenciana has been reported to be about 3.35 hectares (Beltrán Esteve et al., 2012). However, the average size has also been cited to be less than 1 hectare (Peris Moll

& Juliá Iqual, 2006). Glick (1970) has noted that in 1963, more than 70% of the land holdings in Valencia were less than 0.5 hectare. The actual average and range of size of holdings, particularly in Ribera Baixa, remain largely unclear. In Ribera Baixa, the average orange grove has been suggested to be only 0.3 hectare (Daniel Burguera, personal communication, 2013).

The La Ribera area, consisting of two sub-regions of Ribera Alta and Ribera Baixa, has been very valuable and productive since the 11th Century (Garrido, 2007). In successive generations, the land holding was also divided among the sons to result in substantial fragmentation of orange groves in present days. In the 1930s, a land holder of 4 hectares was considered to be wealthy (Brenan, 1950). The economy then was that the value of one *arroba* (= 12.5 kg) of oranges was sufficient to pay one day's salary of a worker. The common land unit in Valencia was the *hanegada.* One *hanegada* (= 1/12 hectare) producing 300 arrobas of oranges was sufficient to provide sustaining income for one family. Although some smaller 100% self-worked farms are continuing in Ribera Baixa, their economic viability is considered to be largely marginal. In present day, the gross income has become too small to sustain a family unit. Supplementary off-farm paid work has become an economic necessity.

Because citrus production became very profitable during the 1960s-1970s, citrus farming was extended to other places where water was scarce or expensive. In Ribera Baixa, old cropping practices were abandoned as olive, almond and peach trees were replaced with citrus trees. Calatayud i Giner (1989) had chronicled the mixed farming practice in La Ribera up until the 1930s. Wheat was even grown in the area until the early 1950s (Daniel Burguera, personal communications, 2013).

In present day Ribera Baixa, a full time farmer may crop several non-contiguous small plots, owned or rented, for achieving a minimum level of personal income. The classical approach of amalgamation of small holdings into a single large contiguous unit for improved productivity would not be workable for this fragmented structure of multiple small holdings. Agustí (2002) had proposed a political-technical solution to consolidate holdings and cooperatives, with the ultimate aim to reduce mechanization costs. Over the years, the Generalitat has promoted such a "land consolidation" policy with little or no success.

3.2.2 Water Supply

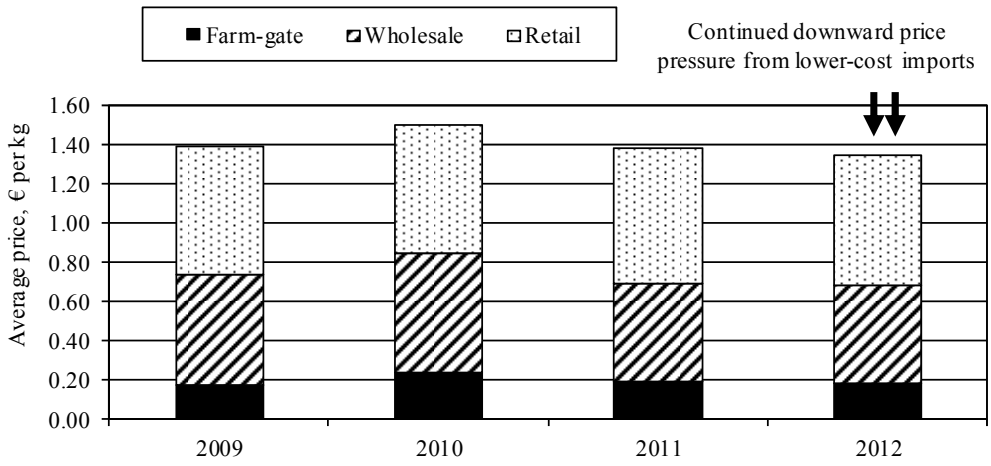
During the summer months, citrus orchards need to be irrigated in this arid zone of Spain. Availability (and affordability, to a lesser extent) of water is steadily becoming a critical issue. The three major rivers of the Comunitat Valenciana, viz., Túria, Xúquer and Segura, are essentially delivering water at their maximum capacities. The irrigation of Ribera Baixa fields is based largely on water drawn from the Riu Xúquer. In contrast, in Ribera Alta, groundwater and/or well water is pumped to irrigate the fields. The practice of deficit irrigation (Gasque et al., 2010; Ruiz Sanchez et al., 2010) is being promoted as a good water conservation practice. The last potential under-utilized water supply is recycling treated wastewater at least for irrigation purposes (Alcon et al., 2010).

In Ribera Baixa, irrigation is also made, to a large extent, by gravity flow in water channels (*acequias*) for the delivery of water to the orchards. This 1,000-year old mode of irrigation (Glick, 1970; Bolens, 1972) has been very efficient as all irrigation water is used. Water leaking in flows through water channels (*escorrentias*) is directed for use in the rice fields or Albufera lagoon area.

Historically, water rights are attached to the land in this region (Glick, 1970). In comparison, large citrus groves such as the 600-hectare "El Realengo" citrus orchard in Rafelguaraf (Ribera Alta) are located far from the coast in more arid areas where there was no gravity irrigation. Prior to the 1960s, almond, olive and other dryland (*secano*) crops were farmed. Because of low productivity, large land parcels, largely unwanted then, were maintained without extensive fragmentation. In the present time, irrigation (including drip irrigation via pumping from wells) has changed the subsistence farming (of these larger farms) into industrial farming.

3.2.3 Farm-Gate Economy

As shown in Figure 5, the producer (farm-gate) price of Spanish oranges had been hovering at the level of about €0.20 per kg throughout 2011. In 2012, the average farm-gate price has been only €0.15 per kg, well below those for the First Quarter in the previous 2 years. For Ribera Baixa orange producers, the current cost of production is about €0.25 per kg, and the selling price at the farm-gate has been at best €0.24 per kg (Daniel Burguera, personal communication, 2013). It has also been commented that the transacted year-end orange farm-gate price was only €0.16 per kg.



Adapted from USDA, 2011; USDA, 2012.

Figure 5. Average annual prices of navel oranges in Spain along different levels of the supply chain

The problem of lower retail prices is attributed to, among other things, increased duty-reduced importation of oranges from North Africa, Middle East and South America into the EU as well as the market penetration by foreign producers into the traditional near-EU markets such as Ukraine (USDA, 2012).

Even with the economic recession in Spain for the past few years, the internal deflation has been insufficient to off set the increasing non-labour input costs such as fossil fuel, fertilizers and pest-control chemicals. In the recent past, conversion of orange groves to housing estates and golf course has been the easiest assured pathway to "instant" economic prosperity. But the real estate boom time is now over in eastern coastal Spain. Production of oranges has become increasingly unsustainable financially. The outlook for the continuation of orange farming in the Ribera Baixa area, indeed perhaps the entire Comunitat Valenciana, is somewhat dismal (Anon., 2012f, 2012h, 2012i). Indeed some orange groves have been reported to be simply abandoned by the farmers in the Comunitat Valenciana (Anon., 2012c, 2012g; USDA, 2012).

3.3 Alternatives Production Strategies

3.3.1 Tree Nut Crops

Almonds

Almond (*Prunus dulcis* (Mill.) D.A. Webb) is a well-established crop in Spain. In 2010, Spain ranked as the second largest producer after the USA, with a production of 220,000 tonnes (FAOSTAT, 2012). Almonds have been grown in Ribera Baixa decades ago. Its re-introduction may however be problematic in view of the large commercial production by others elsewhere in Spain presently. However, a small production of organically-grown almonds might be of significant economic value (Holtz et al., 2007). The target markets in the EU would be Germany and the UK where the public eco-consciousness is notably high.

Pistachios

Pistachio (*Pistachia vera* L.), a desert plant, could be an alternative tree crop in place of traditional oranges in Ribera Baixa. It has a wide temperature-tolerant range from -10 °C to 40 °C. Significant biennial production is achieved in 7 to 10 years, after orchard establishment. It is interesting to note that pistachio cropping was started in the San Joaquin Valley in California (USA) only in about 1975. Thirty years later, California production (accounting for more than 98% of commercial production in the USA) was ~237,000 tonnes, ranking second behind Iran's production of ~445,000 tonnes. The total global production in 2010 was reported to be about 944,000 tonnes (FAOSTAT, 2012). Interestingly, USA is not a major supplier of pistachios to the UK. Within the EU, Greece has been the sole producer until the entry of Cyprus in 1978 and Italy in 1985. Both Italy and Greece were producing about 9,000 tonnes each in 2010 (FAOSTAT, 2012). It may be noted that the Sicilian "Pistacchio di Bronte" and Greek "Aegina Fistiki" pistachios have the important *Protected Designation of Origin* (PDO; EC Directive 1263/96), which afford certain premium pricing in the EU market. Spain is not known to have any significant commercial production of pistachios presently. In 1995, small-scale commercial production of pistachios were introduced in Castilla-La Mancha, Aragon, Extremadura and Andalucia regions, in substitution of other tree nut crops such as almonds. For example, in 2001, Lleida has about 30% of the

1,000-hectare pistachio plantation area of Spain. Successful commodity-scale production of pistachios depends, among other things, on selected cultivars for resilience under different climatic and soil conditions. Sueca (Ribera Baixa) has lower average annual rainfall than Lleida. The average temperature and relative humidity patterns of both localities are not substantially different.

Most of the Italian pistachios are grown in Bonte (Catania) at about 700 m altitude where farm land for tree cropping is available. The most well-known Greek pistachio plantation area is on the island Aegina, a small 87-km^2 island located about 25 km south of Athens. Pistachio has been grown in Aegina for nearly 100 years. The meteorology data showed that a) the average daily temperature of Aegina (and Bonte) generally warmer than Sueca, and b) the average rainfall and relative humidity of Aegina (and Bonte) about the same as Sueca. Thus, there are no known *a priori* reasons as to why pistachios could not be grown successfully in Ribera Baixa, especially if the practice was undertaken in a small organic cropping scale.

Based on a representative yield of 1,765 kg per hectare and farm-gate price of €9.06/kg reported for pistachio production in Greece in 2010 (FAOSTAT, 2012), the estimated farm-gate income of PDO pistachios could be nearly €16,000 per hectare in Ribera Baixa. In contrast, the average farm-gate value of oranges in Spain was only ~€6,100 per hectare at a yield of 24,471 kg per hectare and a farm-gate price of €0.248 per kg (FAOSTAT, 2012). An analysis of the sample cost for pistachio production in California, i.e., San Joaquin Valley – South (Beede et al., 2008) is particularly instructive. Upon updating the production cost from 2008 to 2012, and converting US$ to € at the nominal exchange rate of US$1.25 per €, the total production cost is estimated to be €7,784 equivalent per hectare, and the gross revenue would be €9,594 equivalent per hectare. The gross margin of pistachio production would certainly be substantially higher than that for orange cropping achieved during the past few years. This promising outcome suggests that the prospective pistachio cultivation in Ribera Baixa is worthy of a detailed investigation.

The UK market is of particular interest, with an average (1990-2010) importation of about 6,300 tonnes of pistachios annually at an average value of about US$4.15 per kg. See Table 4. Organically-grown pistachios are rarely available from major producers. Such a product could be expected to realize significantly greater value in the UK market.

Table 4. UK importation of pistachios, 1990-2010 selected data

Year	Quantity, tonnes	Landed value, US$1,000	Calculated value, U$/kg	Comments
2010	3,554	32,086	9.03	Germany and Netherlands (combined 45% market share; probable product origin was Iran)
2005	11,096	32,451	2.92	Netherlands (58% of market share; probable product origin was Iran)
2000	5,257	21,342	4.06	Germany (81% market share; probable product origin was Iran)
1995	6,883	23,522	3.42	Iran (73% market share)
1990	4,881	22,177	4.54	Iran (82% market share)
Avg	6,334	26,316	4.15	Simple 1990-2010 average

Source: FAOSTAT, 2012.

Table 5 shows that the consumption of water for selected tree crops. One important factor of importance is that Ribera Baixa has an annual rainfall of about 500 mm (ASDC, 2012). Unlike other drier orange cropping regions of Comunitat Valenciana, irrigation of orange groves in Ribera Baixa is undertaken sparingly only during the very dry summer months. Thus, the net irrigation water demand for orange cropping in Ribera Baixa would be substantially less than the values cited by Ribal et al. (2009). Note that the water demand for pistachio cropping could be as much as 1.4 times higher than that for orange cropping, at the same reference location of San Joaquin Valley - South. Even with a likely off-set of about 5,000 m^3/ha from natural precipitation, this undertaking of pistachio cropping should be approached cautiously in view of the potentially higher water requirement. It is recognized that pistachios grow best in dry climatic conditions, including lower air humidity. In view of the prior

history of successful almond cropping in Ribera Baixa, pistachio cropping could also be practicable, despite the "slightly wetter conditions" arising from its close proximity to the Mediterranean Sea.

3.3.2 Organically-Grown Products

Within the framework of the 2003 Common Agricultural Policy, organic farming is promoted by the EC through, among other programs, the "European Agriculture Fund for Rural Development" (EC, 1999; Peris Moll & Juliá Igual, 2003; Peris Moll et al., 2005; Bonny, 2006; Lehner, 2010). The production and labeling of organic products are regulated in the EU (EC, 2007).

Table 5. Comparative demand of irrigation water of selected tree crops

Crop	Location	Reference	m^3/ha/year
Almonds - Organic	San Joaquin Valley - North	Holtz et al., 2007	10,670
Almonds	Sacramento Valley	Connell et al., 2012	9,652*
Moringa	Ribera Baixa (prospective)	-----	Zero#
Olives (table) – Manzanillo var.	Sacramento Valley	Ferguson et al., 2009	9,144*
Oranges - Valencias	Riverside County	Takele & Mauk, 1998	12,192
Oranges – Navels/Valencias	San Joaquin Valley - South	O'Connell et al., 2009	7,620
Oranges - Navelina	Comunitat Valenciana	Ribal et al., 2009	5,000 – 6,000
Peaches (July-August harvest)	San Joaquin Valley - South	Day et al., 2009	11,176
Peaches (cling, late harvest)	San Joaquin Valley	Norton et al., 2011	10,668
Peaches (cling, extra early)	San Joaquin Valley	Duncan et al., 2011	9,144
Pistachios	San Joaquin Valley - South	Beede et al., 2008	10,670

* plus 3,048 m^3/ha from rainfall expected in the winter months in the Sacramento Valley. The average annual rainfall in Sacramento (city) is 545 mm.

probably sufficient from average annual rainfall of ~500 mm in Sueca (Ribera Baixa).

The public interest in purchasing organic food products is growing steadily as supply becomes more prevalent (Jánský et al., 2004; Jánský & Živělová, 2007; DG Environment, 2009). The driving force appears to the consumers' self-interest for better personal health (Wier et al., 2005), instead of the protection of the broader environment from destructive agricultural practices (Lillywhite et al., 2012; Swagemakers et al., 2012). The prospect of premium pricing is a critical driving force for farmers to undertake organic farming practices (Beltrán Esteve et al., 2012). There are also instances in which farmers will undertake voluntarily to organic farming because of the extensive use of pesticides and herbicides is harming the health of all farm workers. In monoculture cropping, there is always a constant need to use ever more potent pest control chemicals. Conversion of conventional farming to organic farming will require significant effort and determination from farmers (Nettier et al., 2012).

Increase in organic market in the EU will certainly attract competitive supplies from non-EU countries (Kamp, 2008). However, this problem may be mitigated. To a certain extent, the EU organics (including oranges) market is still largely unfulfilled and the "Valencia" provenance could be deployed as an effective marketing feature.

Organic orange cropping has been suggested as a value-added opportunity. But this approach has been assessed to be uneconomical under the small-farm circumstances of Valencia (Peris Moll & Juliá Iqual, 2006). Figure 6 shows the comparative costs of organic orange production in California and in the Comunitat Valenciana. Note that the labour cost component is largely the same in both locations. Peris and Juliá (2006) have cited that the shortage of approved organic fertilizer is a substantial cost factor in the Navelina cropping in the Comunitat Valenciana. There is an abundant source of rice straw uniquely available in Ribera Baixa for composting into soil fertilizer. More than 30,000 tonnes of surplus straw available annually from rice cropping activities in the Albufera wetlands of Ribera Baixa (Modesto et al., 2005) could be composted to provide the required economical "natural" fertilizer. The technology of composting rice straw, with and without additional nitrogen sources, is generally known (See, for example, Daly, 2002; Luu et al., 2002; Iranzo et al., 2004; Roca-Peréz et al.,

2004; Ciaccia et al., 2008; Tran et al., 2008). Moreover, there is already direct field experience in the composting of rice straw in the Valencia province (Ayuntamiento de Valencia, 2004).

Alternatively, moringa cultivation could be undertaken as an intercrop to provide nitrogen-rich leaves for the preparation of rice straw-based compost for qualification as an organic fertilizer for the growing of oranges and pistachios (Navarro & Wong, 2013).

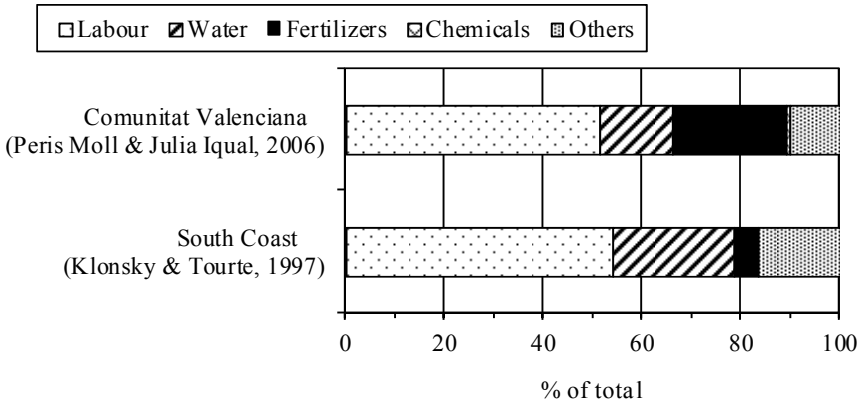


Figure 6. Comparative unit cost of organic orange production

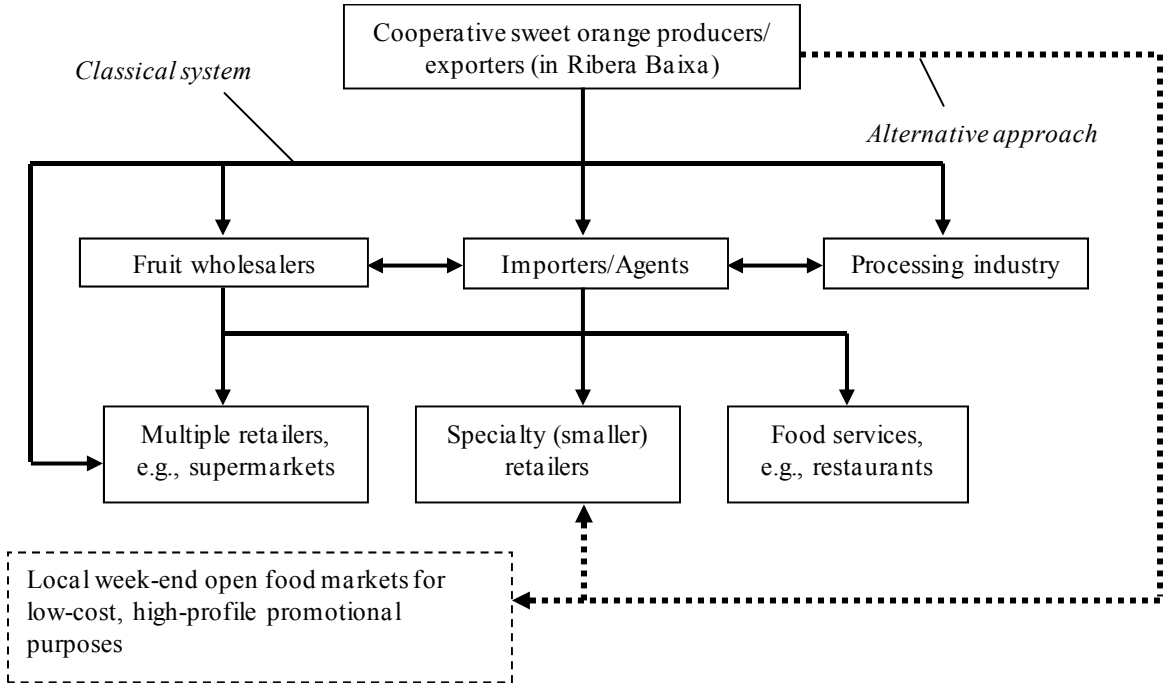
3.3.3 Direct Marketing

The traditional and alternative means of marketing oranges are illustrated in Figure 7. The classical approach affords inequitable distribution of wealth to the growers. The majority of the produce value is retained by the distributors (wholesalers) and the retailers. Figure 8 shows that the share of the retail price retained by the growers has been in the range of 12 to 16% during the period of the 2009 to 2011. In the First Quarter, 2012, the grower had retained just average 12% of the retail price. In absolute terms, the farm-gate price had fallen to average €0.15 per kg. It is recognized that in the low-price retail market, all parties earn less. Note that the margin retained by each of the three margins is essentially unchanged. But in the case of growers, the lower income could reach a critical level in which the orange-growing operation becomes financially unsustainable. It is evident that an alternative means to achieve a more equitable revenue distribution is acutely needed.

This pattern of wealth distribution is interestingly similar to that of export-oriented producers of bananas and fresh vegetables in low-wage countries (Wong & Hallsworth, 2013). In essence, the fixed-proportion revenue distribution regime could not provide any enduring improvements to the orange farming economy as reduction in production costs has reached the practical limit. An alternative marketing scheme is needed.

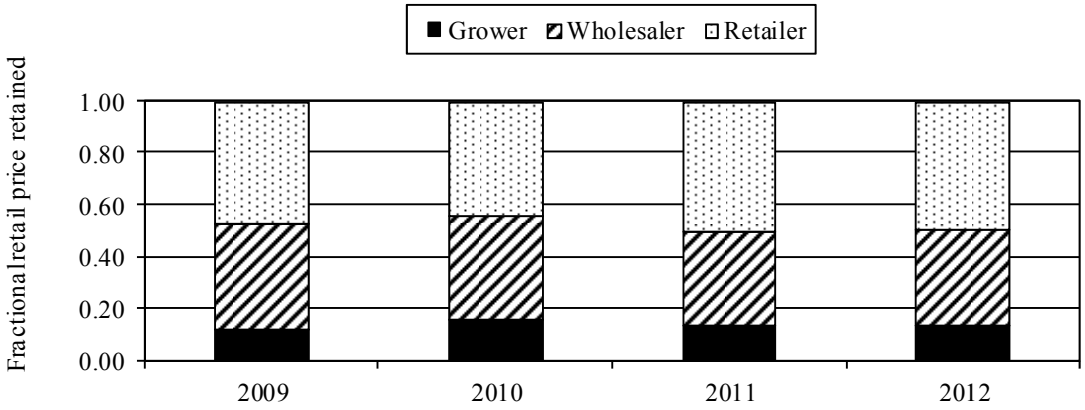
Even with declining retail prices, the wholesalers and retailers still retain the largest portion of the total revenue. Because of the structure of market control by the major retailers, the mark-up by the retailers could not be altered. The retailer will retain its customarily 45 to 50% of the retail price revenue. The “wholesaler” would be the only place where a re-structuring could shift a larger portion of the remaining revenue to the grower. In order to reduce the wholesaler’s margin, Ribera Baixa growers would need to implement alternative ways and means to sell directly, with just-in-time delivery of goods from Valencia to the retailer. In any market re-structuring scenario, the retailer can be expected to maintain the same gross revenue as a fixed % of retail price. This outcome of direct marketing can be expected even if the retailers were smaller specialty stores which are more inclined to consider selling organic produce with well-defined “attractive provenance and ecological production basis”.

Moreover, direct marketing is the only effective and durable defense against “low-price imports based on cheap labour”. In essence, direct marketing assures a more equitable economic return for the farmers.



Adapted from CBI, 2006

Figure 7. Example trade pattern of oranges from Comunitat Valenciana to the UK



Adapted from USDA, 2011; USDA, 2012

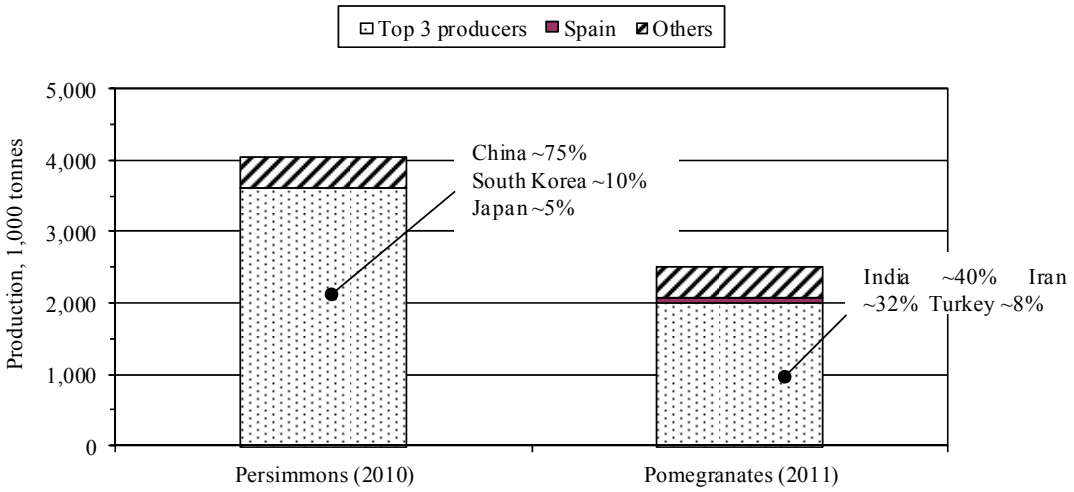
Figure 8. Average annual fresh Navel orange revenue distribution at different levels of the supply chain in Spain

Additional opportunities to promote the sale of fresh organic oranges and organic pistachios from Ribera Baixa farmers could be realized through sales in weekend farmers' market in south England, for example. The weekend farmers' market approach is a low-risk approach and it is directed largely to eco-conscious consumers who have sufficient disposable income for the purchase of healthier fresh food. This approach would of course require a concerted transition to organic farming and diversification in the former monoculture orange groves.

Some orange farmers are attempting to sell oranges directly via the Internet (Anon., 2012b). But the cost structure is highly unfavourable as oranges are very "heavy weight, low value" goods for economical shipping in small quantities. The cost of shipping might be as much as the cost of goods.

Other farmers have tried diversification into growing specialty tree crops such as persimmon, pomegranate, etc. (Anon., 2012d). This strategy does not appear to be very practical as intrinsic demand for persimmons and pomegranates is quite small in Europe. The export market is already dominated by low-cost producers in China and other low-wage countries. In the case of persimmons, China already has 75% of the World's production of ~4 million tonnes in 2010 (FAOSTAT, 2012). See Figure 9. It has been reported that about 95% of Spain's

production of about 80,000 tonnes of pomegranates has already been "absorbed" in the EU states outside of Spain (AMAIL, 2012). Even if persimmons and pomegranates produced in Ribera Baixa could be marketed without any limitations, the underlying problem remains the same, i.e., the retailers and distributors will retain the most of the retail value of these products. In essence, the growers would encounter the same problem as orange production, in the longer term.



Sources: Persimmons: FAOSTAT, 2012; Pomegranates: AMAIL, 2012.

Figure 9. Global production of persimmons and pomegranates

3.4 Path Forward

Continuation of orange cropping in Ribera Baixa requires a different strategy of sustainable development involving new marketing and crop production models. The foremost undertaking is the establishment of a new direct marketing regime to shift more cash margin to the growers. Otherwise, the same unsatisfactory net farm-income would prevail because of the fixed inequitable distribution of retail product value. This situation applies during the high and as well as the low price market. Rapid transition to organic cropping and additional diversification to pistachios or other crops could then follow. Direct marketing is an essential first step to permit the effective positioning of Ribera Baixa's organically grown produce into the desired group of consumers in the UK market. It may be noted that the availability of organic pistachio is still a rarity in the market place. Moreover, large scale producers, especially those located in low-wage countries, are expected to have considerable difficulties in shifting production from commodity grades to organic grades. For small individual producers in Ribera Baixa, there is essentially no future in the commodity orange business.

Table 6 summarizes the analysis of the options available for the re-structuring of orange cropping in Ribera Baixa. It is evident that selling organic oranges through conventional marketing channel does not afford any increase in economic viability. Peris Moll and Juliá Iqual (2006) had concluded that organic cropping to be an economically unattractive option. Compare non-organic Scenario "A" and organic Scenario "B" in Table 6. Note the economic attractiveness of organic Scenarios "C" and "D".

Table 6. Preliminary economics of proposed new cropping regime

Reference	Peris Moll & Julia Iqual, 2006 (data from 2003-2004 season)		This work (a)			
Scenario	A	B	C		D	
Product	Navelina	Navelina	Navelina	Pistachio	Navelina	Pistachio
Cropping system	Standard	Organic				
Land allocation, ha	1.0	1.0	0.9	0.1	0.9	0.1
Yield, kg/ha	42,229	30,187	30,187	2,243 (b)	30,187	2,243 (b)
Farm-gate price, €/kg	0.15	0.26	0.26	4.38 (c)	0.26	4.38 (c)
New marketing margin, % of base farm-gate price	0	0	50	50	100	100
Extra income from new marketing regime, €/kg	0	0	0.13	2.19	0.26	4.38
Total farm-gate price, €/kg	0.15	0.26	0.39	6.57	0.52	8.76
Gross production, kg	42,229	30,187	27,168	224	27,168	224
Gross farm-gate revenue, €	6,334	7,849	10,596	1,474	14,128	1,965
Total production cost, €	3,582 (d)	5,889 (e)	5,300 (f)	643 (e)	5,300 (e)	643 (f)
Net farm-gate income, €	2,752	1,960	6,126		10,149	

Notes: 2004 base year used for illustration purposes

(a) All 2008 data of Beede et al. (2008) adjusted to 2004 base year using the procedure described earlier in the "Methods" section. US Consumer Price Index: US$1.00 in 2008 = US$0.88 in 2004; ECB exchange rate: US$1. 2439 = €1.00 in 2004.

(b) Applying same 29% decrease from reference conventional yield for Navelina (Peris Moll & Juliá Iqual, 2006) to reference 3,138 kg pistachio yield per hectare (Beede et al., 2008).

(c) Applying same 26% increase in reference price for Navelina (Peris Moll & Juliá Iqual, 2006) to reference price of €3.06 per kg pistachio (Beede et al., 2008)

(d) Excluding depreciation and opportunity costs (Peris Moll & Juliá Iqual, 2006)

(e) Excluding depreciation and opportunity costs (Peris Moll & Juliá Iqual, 2006); notwithstanding the high cost of organic fertilizers used

(f) Including capital recovery (calculated from Beede et al., 2008)

4. Concluding Remarks

The problem of orange cropping in Ribera Baixa is persistent and difficult to solve in view of continued globalization of freer trade with competitive fresh oranges arriving into the EU from low-wage producing countries. Incremental gains in productivity could not overcome the structural problems. The fragmented holding structure of orange groves in Ribera Baixa offers an interesting opportunity to devise a practicable and sustainable solution. The essential rectification steps might include a) implementation of an alternative direct marketing system to capture a higher proportion of the variable retail pricing, and followed by b) conversion to organic cropping with progressive phasing out monoculture practice with inter-cropping of novel tree nut crops such as pistachios. It is recognized that there is no assurance that the recommended remedial steps would ever be undertaken by orange growers, in view of the historical solutions applied to the recurring economic difficulties of orange farming in Spain. Short-term financial subvention by the government has been the standard practice in troubled economic times.

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