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**PRIORITY DEVELOPMENT PROGRAMS FOR PROCESSING OF
AGRICULTURAL PRODUCTS IN EASTERN CROATIA**

**PRIORITETNI PROGRAMI RAZVITKA PRERADE
POLJOPRIVREDNIH PROIZVODA U ISTOČNOJ HRVATSKOJ**

ABSTRACT

In the Eastern Croatia, there are natural conditions for developing food industry and small family entrepreneurship for agricultural product processing. Favorable conditions include sufficient areas of high quality soil, good climate conditions for agricultural production and irrigation possibility. In addition, there are many years of experience in the production, the old tradition, a sufficient number of highly trained personnel and quality of research institutes in that area. Production of agricultural products is relatively well developed in relation to the other regions in Croatia. However, production of certain agricultural products is not sufficiently developed and represented in relation to the natural capacities (fruits, vegetables industrial crops and cattle products). In the Eastern Croatia, there are certain capacities for processing of agricultural products. That processing involves mostly so-called basic food industry, namely, production of sugar, flour, meat, milk and to some extent edible oil. In the past several decades, the development of agricultural product processing was not sufficiently monitored the possibilities of the agricultural production. Because of that, the basic food industry was not enough developed and less than above mentioned was developed the food industry with higher level of product finalization. Croatia, but especially the Eastern Croatia is lagging in the production of foods preserved by low temperatures, cooling and freezing. In this paper, the production, import, export and consumption of food in Croatia from 1997 to 2010 years were analyzed. The priority programs of processing of agricultural products and other conditions necessary to initiate the development of these processing, were defined too. Guidelines of structural sowing changes in agricultural production were given and identified the other problems important for development of agricultural processing.

Key words: Eastern Croatia, economy, development, agricultural products, processing, food industry

SAŽETAK

U istočnoj Hrvatskoj postoje prirodni uvjeti za razvoj prehrambene industrije i malih obiteljskih gospodarstava na području prerade poljoprivrednih proizvoda. Pod prirodnim uvjetima podrazumjevaju se dovoljne površine kvalitetnog poljoprivrednog zemljišta, povoljni klimatski uvjeti za poljoprivrednu proizvodnju i mogućnost navodnjavanja. Pored toga postoji dugogodišnje iskustvo u toj proizvodnji i višestoljetna tradicija, dovoljan broj visoko obrazovanih kadrova i kvalitetne znanstvene institucije na tom području. Proizvodnja poljoprivrednih proizvoda je relativno razvijena s obzirom na druge regije u Hrvatskoj. Međutim proizvodnja nekih poljoprivrednih proizvoda nije dovoljno razvijena i zastupljena u odnosu na prirodne uvjete (voće, povrće, industrijsko bilje, stočarski proizvodi). Na području istočne Hrvatske postoje izvjesni kapaciteti za preradu poljoprivrednih proizvoda. Ta prerada obuhvaća pretežito tzv. osnovnu prehrambenu industriju sa proizvodnjom šećera, brašna, mesa, mlijeka i manjim dijelom jestivog ulja. U prethodnih nekoliko desetljeća razvoj prerade poljoprivrednih proizvoda nije dovoljno pratio mogućnosti poljoprivredne proizvodnje. Zbog toga niti tzv. osnovna prehrambena industrija nije dovoljno razvijena, još manje je razvijena prehrambena industrija s višim stupnjem finalizacije. Istočna Hrvatska je pored prirodnih uvjeta i solidne sirovinske osnove zaostajala u razvoju prehrambene industrije i sve više postajala sirovinska baza. Zaostajanje je evidentno u svim granama prehrambene industrije a posebno u proizvodnji i preradi voća, povrća, mlijeka i preradi industrijskog bilja i mesa. U cijeloj Hrvatskoj ne postoji mokra prerada kukuruza dok je proizvodnja kukuruza najzastupljenija u ratarskoj proizvodnji. Također Hrvatska zaostaje a posebno istočna Hrvatska u proizvodnji hrane konzervirane niskim temperaturama hlađenjem i smrznute hrane. U ovom radu analizirana je proizvodnja, uvoz, izvoz i potrošnja hrane u RH od 1997 do 2010 godine. Definirani su prioritetni programi prerade poljoprivrednih proizvoda i ostali uvjeti koji su potrebni za pokretanje razvitka prerade poljoprivrednih proizvoda. Dane su smjernice promjene strukture sjetve u poljoprivrednoj proizvodnji te identificirani ostali problemi bitni za razvitak prerade poljoprivrednih proizvoda.

Ključne riječi: Istočna Hrvatska, gospodarstvo, razvitak, poljoprivredni proizvodi, prerada, prehrambena industrija

1. Introduction

Agriculture, food industry and processing of agricultural products are the most important branches of Eastern Croatia economy. Besides tourism, these natural resources should be the priority directions of Croatia economic development. The time in which we live today is marked as a transition from industrial to information society. Economic trends in developed countries are showing increase of information and services in the economy and decrease of agricultural and industrial production (Baotić, 1997). Croatia cannot completely avoid these trends and development cannot be based only on the development of agriculture, food industry and tourism but also on the development of other sectors of the economy. To achieve development and prosperity Croatia must primarily develop agriculture, processing of agricultural products and tourism as natural advantages.

2. Resources for food production in Croatia

- Significant areas of fertile and quality agricultural land especially in Slavonia, Baranja and Srijem,
- Favorable climatic conditions for food production,
- The experience and population traditions in agricultural production,
- The possibility of irrigation,
- A sufficient number of qualified personnel,
- Universities and research institutions.

Thus there are the conditions for producing enough food for their own needs, the needs of tourism and the export (Pozderović, 1997-2011).

3. The situation in the production and consumption of food in Croatia

Besides all above mentioned potentials Croatia doesn't produce enough food to feed its population. The situation in the food sector is the following:

- Lack of processing of agricultural products and food industries,
- Lack of refrigeration and cold storage space for receiving, processing, storage and packaging of fresh food primarily of fresh fruit and vegetables,
- Unsatisfactory structure of agricultural production,
- Insufficient food production,
- Excessive import and further increase in food import.

Table 1. Import and export of some vegetables in Croatia in the period 1997-2010

Vegetables	Import (t)				Export (t)			
	1997	2000	2005	2010	1997	2000	2005	2010
Tomato	9672	8377	10191	8987	200	129	179	116
Onion, shallots, fresh chilled	10446	12290	11980	13919	181	56	499	1258
Garlic	1814	2209	2385	2040	7	11	1	0,16
Leek	561	245	181	223	14	4	8	8,4
Cauliflower, broccoli	2385	792	1638	1704	30	12	20	330
Cabbage	2701	2265	2054	3485	590	113	1025	291
Lettuce	1908	517	534	3345	181	68	6	164,5
Carrots, turnips	4756	431	7748	7397	35	1	12	28,2
Other root veget.	1047	630	194	384	11	10	0	9,3
Seed potatoes	5729	7820	8239	6793	24	-	22	0
Potatoes, other, fresh chilled	4108	17051	17325	19218	3126	210	393	1268
Brussels sprout	290	6	79	43	10	-	1	13
Other edible brassicas	491	184	639	441	22	83	16	3,4
Chicory, radish	870	1404	635	526	-	1	0	0
Cucumbers and gherkins	2304	1063	1953	5969	520	321	197	62
Peas fresh	18	2	5	8	2	-	-	0
Green beans and other	368	671	79	321	16	1	5	0
Eggplant	303	11	479	700	63	-	0	9
Celery	315	465	680	628	3	1	50	0,2
Paprika	3847	2844	2324	5945	350	388	1058	423
Spinach	452	132	67	123	-	1	0	0
Other veget.	1100	1 441	1333	1181	21	94	125	320,7
Total	55485	60850	70742	83380	5 406	1 504	3617	4304,8

Source: Croatian Bureau of Statistics

The current food industry in Croatia, especially in Slavonia and Baranja is not sufficiently developed with regard to the possibilities of agricultural production. The basic food industry, which includes the wet processing of corn in starch, hydrolysate and modified starches, production of quality wheat and corn flour, soybean processing plants, production of vegetable oils, meat and fish, milk and oil isn't sufficiently developed. Processing with higher degree of finalization such as: production of frozen food, fruit, vegetable, meat, milk and vegetable oils processing are even less developed. The development of food industry must be based on agricultural production adjusted according to the needs for processing of these products. Better evaluation of these products with higher degree of finalization would give the new added value contributing to employment rate and food import reduction (Pozderović, 1997-2011). Data in Table 1 shows that in 2010 import of fresh vegetables was significantly greater than 1997, it increased from 55 485 t to 83 380 t which represents an enormous increase in import. Import of fresh fruit (Table 2) significantly decreased in last five years from 77 858 t in 2005 to 35 416 t in 2010 due to higher domestic production and less import of apples and grapes for processing. However there is still insufficient production and high import of fresh fruit. An enormous import of fresh vegetables is due to the lack of its domestic production.

Table 2. Import and export of some fruit in Croatia in the period 1997-2010

Fruit	Import (t)				Export (t)			
	1997	2000	2005	2010	1997	2000	2005	2010
Apple	10621	14250	20372	8840	3774	1943	9245	19598
Pear and melon	7076	2675	7210	5476	11	11	2	79
Sweet and sour cherry	541	209	919	1302	-	-	43	189
Apricots	1916	1569	2204	1679	1	-	2	16
Peaches	7328	8124	9282	7380	67	7	0	0
Strawberries, raspberries	1169	737	5416	988	2	3	17	133
Plums	2362	1686	894	660	6	15	65	400
Grapes for processing	11776	8831	14343	1327	224	11	26	8
Grapes for eating	9475	8771	13917	7293	5	10	25	37
Other fresh fruit	699	252	3301	471	1	1	6	32
Total	52963	47104	77858	35416	4091	2001	9431	20492

Source: Croatian Bureau of Statistics

There are several reasons for the insufficient production of fruit and vegetables. One of the most important reasons is that there are no cold storage and facilities for receiving, washing, screening, storing and packing of fresh fruit and vegetables. Compared to Europe and the World Croatia is lagging behind in the production and consumption of frozen food and application of refrigeration for food preservation. The annual consumption of frozen food per capita in Croatia was 15 kg and thus multiple smaller than that in some West Europe countries with 50 kg per capita and US over 60 kg per capita (Figure 1). Even more significant was that Croatia with its agricultural potential in total annual consumption of frozen food in 2010 with 80 434 tones, imports 87,4 % or 70 295 t.

Table 3. Production and consumption of frozen food in Croatia in the period 1997 – 2010

Product	Production (t)				Consumption (t)			
	1997	2000	2005	2010	1997	2000	2005	2010
Other bakery products, fresh, frozen	4515	5247	6007	240	4515	5247	6007	240
Fruit pulp and mash frozen	100	0	0	0	311	1187	905	0
Frozen fruit	25	0	0	651	201	2279	2032	0
Frozen paprika	0	0	0	0	1162	317	66	480
Other frozen fruit	5	55	0	0	6562	6611	12415	18281
Frozen semi-prepared meat dishes, shaped meat	-	-	-		1445	396	37	199
Sea fish, frozen, crustaceans and molluscs	154	185	364	3677	3463	18795	33580	27735
Semi-frozen fish dishes	588	92	78	903	2574	1547	1743	2775
Ice cream	8548	9503	9293	13524	10387	10604	10683	13067
Edible offal by-products frozen	11	230	4	0	365	535	230	513
Poultry sliced frozen	2	-	-	5340	87	542	1 616	17144
Total	13948	15312	15746	24335	31072	48060	70114	80434

Source: Croatian Bureau of Statistics

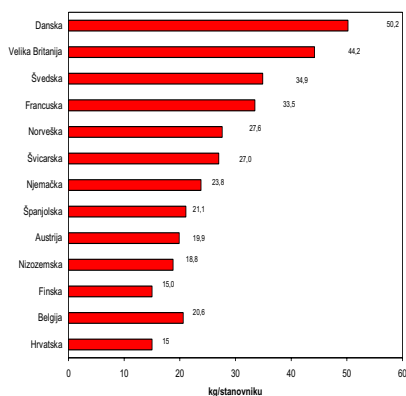
Production of frozen food in Croatia increase from 1997 to 2010. In 1997 it was 13 948 t and in 2010 24 335 t. However, the consumption of frozen food significantly increased from 31 072 t in 1997 to 80 434 t in 2010 which is more than double (Table 3). Due to such large increase in consumption of frozen food import enormously increased from 18 779 t in 1997 to 70 295 t in 2010 (Table 4).

Table 4. Import and export of frozen food in Croatia in 1997-2010

Product	Import (t)				Export (t)			
	1997	2000	2005	2010	1997	2000	2005	2010
Fruit pulp and mash frozen	212	1187	926	-	1	-	21	-
Frozen fruit	395	3243	3689	1537	219	964	1657	2609
Frozen paprika	1163	382	66	480	1	65	-	-
Other frozen veget.	6629	6621	12482	19954	72	65	67	1673
Frozen semi-prepared meat dishes, shaped meat	1 455	1 003	884	264	10	607	47	65
Sea fish, frozen, crustaceans and molluscs	3629	19296	34040	28758	320	686	824	4700
Semi-frozen fish dishes	1986	1461	1735	2047	-	6	70	175
Ice cream	2686	2631	2735	2343	847	1530	1345	2800
Edible offal by-products frozen	432	305	226	1029	78	-	-	516
Poultry sliced frozen	192	1329	3686	13883	107	787	2 070	2079
Total	18779	37458	60469	70295	1655	4710	6101	14617

Source: Croatian Bureau of Statistics

Figure 1. Consumption of frozen food in Europe per capita without ice cream



Source: Croatian Bureau of Statistics; Frigoscandia, Sweden

Table 5. Import and export of animal meat (beef, pork etc.) in Croatia in the period 1997 – 2010

Meat	Import (t)				Export (t)			
	1997	2000	2005	2010	1997	2000	2005	2010
Beef, fresh chilled	3084	596	5514	5259	1621	703	528	5586
Beef, frozen	6637	4890	3589	3122	10	27	27	8
Pork, fresh chilled	9753	1772	17594	12057	20	0	82	787
Pork, frozen	11767	13474	20522	27696	67	57	74	123
Sheep, goat, fresh chilled	1102	456	1468	1439	0	0	0	0
Sheep, goat, frozen	279	21	934	103	140	0	0	0
Total	32622	21209	49621	49676	1858	787	711	6504

Source: Croatian Bureau of Statistics

In our previous works (Pozderović, 1997-2011) we estimated increase in consumption of frozen food and that it needs to be used to develop our own processing of agricultural products, but it was not achieved although there are ready-made projects and feasibility studies.

Table 6. Import and export of poultry in Croatia in the period 1997-2010.

Meat	Import (t)				Export (t)			
	1997	2000	2005	2010	1997	2000	2005	2010
Chicken, fresh chilled	39	213	20	1381	100	364	131	1139
Chicken, frozen	247	266	967	8245	712	444	58	1437
Hen, fresh chilled	17	0	304	84	264	0	2355	42
Hen, frozen	0	1 037	3896	2721	75	326	752	268
Turkey, fresh chilled	0	0	135	88	484	0	68	487
Turkey, frozen	20	20	1228	2557	74	17	127	374
Other poultry (duck, goose...)	35	12	60	99	1	0	0	0
Total	358	1548	6610	15175	1710	1151	3491	3747

Source: Croatian Bureau of Statistics

According to the data in Table 4 export of frozen food increased from 1 655 t in 1997 to 14 617 t in 2010. Export structure analysis reveals that this was a result of import because of export, rather than increasing domestic production of frozen food. In addition Croatia doesn't have enough production of other basic food like meat, milk, semi-finished food products, food with higher degree of finalisation or preserved by other methods. Because of that such products are imported (Table 5 and 6). Due to the range and quality of products the highest degree of development in Croatia has milk processing industry, though this industry is far behind in Eastern Croatia in relation to other parts. However, the production of these products is not enough and these products are imported significantly (Table 7).

Table 7. Import and export of milk, cream and milk products in Croatia in the period 1997 – 2010

Product	Import (t)				Export (t)			
	1997	2000	2005	2010	1997	2000	2005	2010
Milk and cream	83506	80910	13030	45009	15524	11436	19826	25998
Other dairy products	48176	26604	26913	32345	11462	16362	19088	24658
Total	131682	107514	39943	77354	26987	27798	38914	50656

Source: Croatian Bureau of Statistics

Over the past few years began the production of organically produced food. Previous attempts were related to agricultural production, but there wasn't some significant processing of these products. Without adequate refrigerated space for the storage and processing capacity it will be difficult to evaluate these products. Given the lack of processing there is unfavorable structure of the sowing and the total agricultural production. Due to the underdevelopment of the food industry and the lack of processing many agricultural products in Croatia are deteriorating and Croatia import significant quantities of food. With development of food industry and processing of agricultural products according to the natural capabilities Croatia could become from importer a significant exporter of food.

4. Trends in food production

In the last few decades significant improvements in food production technology are achieved based on the results of research and technology development (development of new process solutions). Current trends in food production and food technology are:

1. Storage and use of food in fresh state as much as possible,
2. Preserving of food by freezing,
3. Minimally processed food and the application of nonthermal preservation methods,
4. Application of physical processes in the preservation of food,
5. Preserving the quality and nutritional value of food as much as possible during processing,
6. Organic food production.

The best nutritional value and food quality are achieved by using fresh food for cooking and eating. An attempt is made to certain agricultural products to keep them as much as possible in the fresh state for use in diet. It is successfully achieved by storing such products in the refrigerator. Agricultural production of these products must be accompanied by the presence of cold storage for keeping them in the fresh state or the appropriate processing primarily by freezing.

5. Priority development programs for processing of agricultural products in Eastern Croatia

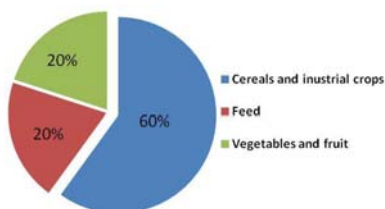
Due to the natural resources and current trends in food technology processing of agricultural products in Slavonia and Baranja are necessary to develop in the following directions:

1. Construction of cold storage for receiving, packaging and storage of fresh fruits, vegetables and other agricultural products.
2. Construction of the plants for the production of frozen food.
3. Construction of the food industry plants with a higher degree of finalisation, processing of fruit and vegetable, meat and milk, vegetable oil processing, production of semi-finished products.
4. Construction of the plants for basic food industry that are not sufficiently developed or nonexistent. Wet and dry corn processing, manufacturing quality and targeted types of wheat flour, oilseeds processing, vegetable oil and meat production, processing soybeans.
5. Small and medium-sized family farms for the production and processing of agricultural products. Production, processing and reffridgerating of fruit and vegetables, meat, milk, flour, production of quality and high quality wines and brandies.
6. Organic production and processing of biologically valuable food
7. Other measures.

Modify the structure of agricultural production, coordinate it with processing programs and population needs. Use state measures to stimulate the production of processing products. Encourage the cultivation of vegetables, fruit, meat, fish, milk, wheat varieties, subsidies and purchase price to align it with the quality of wheat.

According to our estimation agricultural production in Eastern Croatia should be as shown on figure 2.

Figure 2 Structure of agricultural production.



Source: authors

For each segment there must be appropriate processing, at feed milk and meat production and at vegetable and fruit processing in frozen products and cold storage of fresh produces. Agricultural producers must to decide for one of these segments. Farmers with smaller agricultural surfaces (less than 80-100 acres) must decide for fruit and vegetables with which they can achieve higher revenue per unit area or feed with meat or milk production, because on smaller areas they can not achieve cost-effective production of cereals and industrial crops. State incentives and other measures should encourage such commitment. This will ensure production of fruit and vegetables for use in fresh state and raw materials for processing primarily frozen fruit and vegetables that are significantly imported.

Use state measures to stimulate foreign and domestic investors to invest in processing of agricultural products, tax exemption, allocation of state land to build new factories and plants, etc.

6. Conclusion

The main objectives in Croatian food production should be: Fulfilling our own needs, needs of tourism and manufacturing for export. In the Development Strategy of Croatian food industry and processing of agricultural products it should be given the same meaning as agriculture. The Development Strategy must to define priority directions of food industry development and processing of agricultural products and agricultural development and manufacture of these products comply with these directions. It is our wish that this work contribute to this strategy which should be based on the facts presented in this paper.

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