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Maize to the People!

Cultivation, Consumption and Trade in the North-Eastern Mediterranean (Sixteenth-Nineteenth Century)

Edited by Luca Mocarelli and Aleksander Panjek

Zgodovina
History

maize to the people!

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Contents

Maize in the north-eastern Mediterranean: new insights and researches

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This volume is a first attempt at examining one of the most important and yet little studied aspects of the Colombian exchange: the introduction and diffusion of maize in some countries of Southern Europe. While the potato and its impact on European history have been examined in quite some detail, thanks to a large number of articles and monographs (McNeill 1948; Langer 1975; Salaman, 1985; Komlos 1998; McNeill 1999; Ó Gráda, Paping, Vanhaute 2007; Gentilcore 2012), the same cannot be said for maize – despite the incontrovertible importance this crop has achieved as a foodstuff in many rural areas of the Mediterranean region, as is probably most true of Italy (Alfani, Mocarelli, Strangio 2017, 46-47). But even in the case of Italy, after the seminal work of Messedaglia (1927), we can mostly find only short contributions or a few insightful syntheses (Mantelli 1998; Doria 2002; Finzi 2009; Gasparini 2015). However, much the same may be said with regard to other Mediterranean regions and countries since the historiographical 'state of the art' regarding maize is quite similar if not even more scarce (Panjek in this volume). Apart from the generally unsatisfying number of specific regional studies on maize in the earlier stages of its diffusion, one thing is certainly even more true: we lack a comprehensive vision and a comparative perspective on this process that would embrace the whole of Southern Europe.

For this reason, this volume is made up of a collection of contributions, each with a specific geographical scope. By combining regional

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historiographical reviews, case studies and researches, it gathers and offers a wider spectrum of information about maize introduction and diffusion, which enables a comparative perspective. Such an approach to investigating this topic seems extraordinarily useful, and that is the reason why we have brought together scholars from different countries who are dealing with the same issues. We decided to focus on the eastern part of the Mediterranean taking into consideration certain countries facing the Adriatic Sea. We have involved scholars from Italy, a country that, thanks to its position and size, has a central place in the Mediterranean world as well as a known historical role in maize pioneering, along with Austria, Slovenia, Croatia and Serbia. The idea was to embrace the Adriatic area from the Alps to the Danube, asking these scholars to tackle the same issues in order to produce a steady basis for a truly comparative work.

The first question to be answered pertained to the *chronology and geography* of the diffusion of maize in the countries considered. Although it is a well-known fact that the diffusion of maize followed a west to east direction starting from Spain, a full and comparative overview of the spread of this plant is still lacking; we can mainly count on researches carried out at a narrower regional scale, also in the case of Italy (Coppola 1979, Levi 1979, Fornasin 1999, Gasparini 2002; Mocarelli, Vaquero Piñeiro 2018). The countries between the eastern Alps and the eastern Adriatic coast, addressed in this volume, represent the ideal extension of such a west-east maize diffusion route. It was our intention to check whether and when this is confirmed by historical evidence. In the case of the Balkans, it will be also fruitful to investigate the presence of another possible line of maize diffusion on a south-north axis from the Black Sea and the Ottoman Empire to Central Europe. Moreover, particular attention had to be focused on the time when maize became a widespread and familiar commodity. A good proxy for this would be the date on which maize prices began to be recorded on regulated grain markets. In Lombardy, for example, that happened in 1681 in Bergamo, in 1717 in Milan, etc. (Maffi, Mocarelli forthcoming). To both locate and map the areas where maize cultivation and consumption had become preponderant is an important issue, because there are signs of a discrepancy between the two aspects, since in many cases the areas of production and consumption did not overlap (Mocarelli 2019).

A second important issue to deal with were the *reasons for a greater or lesser success* of maize. An important reason, although not the only one, that explains the spread of maize, or indeed its failure to do so, would

seem to be linked to the prevailing climate and, especially, to the amount of rainfall (Alfani 2010). On the contrary, territories where rainfall was scarce, such as most of southern Italy, seem unfavourable for maize diffusion (Venturi 1987, 237-238). Even more important for explaining the greater (or lesser) success of maize are land ownership patterns and the types of agrarian production relations and contracts. This is a really crucial issue since there is evidence that not all forms of land ownership and types of contracts favoured the introduction of maize cultivation. Thus, for example, in central Italy the predominance of a sharecropping system would appear to have made the adoption of maize more problematic than in northern Italy (Mocarelli, Vaquero Piñeiro 2018). Moreover, equally relevant in order to explain the ways in which the diffusion of maize took place seems to be the cultural dimension, that is to say the attitude of peasants with regard to this new crop (Gentilcore 2017). This will be illustrated with two different examples. It is well known that the introduction of the potato in the Italian Peninsula encountered more problems than that of maize (Gentilcore 2012, 36-63). On the other hand, a relevant role may have been played by the existing tradition in local agriculture, because the diffusion of maize seems also linked to the availability or, inversely, lack of other foodstuffs that could feed peasants easily (Lazarevic in this volume).

A third relevant issue deals with the supposed *dichotomy between self-consumption and market*. Usually scholars think of maize as a cereal destined above all for self-consumption, even though there is a large amount of evidence regarding the marketed sale of maize. This is a crucial point since not many studies deal with how wheat and maize interacted on the grain markets and in what way their prices might have been correlated. In particular, it would be of great interest to get a reading on the different kinds of consumer behaviour in 'normal' years as compared to years of scarcity. Were there shifts in consumption from wheat to maize and, if so, in what way did they influence prices (Mocarelli 2015, 58-63)? Another telltale regarding prices could be comparing the prices of maize with other cereals, since maize was prevalently a food for the common people; in this sense it was not so much in direct competition with wheat, but more so with rye, millet, buckwheat and the like, depending on local circumstances (comprising ecological factors, production relations and perhaps even the cooking tradition).

Self-consumption and the market both relate to the final important topic, that is *nutrition and demographic impact*. The impact of maize on

peasant life is a quite well-studied issue, mainly with regard to the great diffusion of pellagra due to the exclusive consumption of polenta (De Bernardi 1984), although a proper chronology and geography of pellagra diffusion are still lacking. At the same time, it would be important to also empirically test the demographic consequences of maize diffusion and in particular the hypothesis that the widespread diffusion of maize, especially from the eighteenth century onward, was crucial in diminishing famines in Southern Europe, thus allowing a faster growth of the population than before (Alfani, Mocarelli, Strangio 2017, 46-47). By shedding more light on this aspect, it would be possible to conduct a more steady and convincing comparison between maize and its northern competitor, the potato, whose demographic consequences are interpreted in an established manner in northern European historiography (for example Nunn, Quian 2011).

The contributions of this volume give relevant insights into the aforementioned issues. If we look at the chronology of diffusion, for example, it is easy to find significant differences within countries, as the case of the Italian Peninsula clearly shows. As a matter of fact, in northern Italy maize was already known in the middle of the sixteenth century in some territories of the Venetian mainland, such as Rovigo and Este (in the Province of Padua); the famines of the 1590s accelerated its diffusion (Alfani 2011), as did the plague of 1630-1631. At the end of the seventeenth century, maize was sown throughout the Venetian mainland – from eastern Lombardy, that is the provinces of Bergamo and Brescia, to the Friuli region, in the rest of the Lombardy region, in Piedmont, and in the Papal Legations south of the Po River. During the eighteenth century it consolidated its advance both in the countryside, as demonstrated by the frequent cases of pellagra in the State of Milan (Mocarelli 2015), and in the cities, where it was becoming more and more important on the urban regulated markets, mainly in towns close to the Alpine area such as Como or Bergamo (Costantini 2016 e 2019).

On the other hand, the situation was quite different in central Italy where maize appeared later than in the northern part of the peninsula. The new crop remained a botanic curiosity for a long time and its diffusion began only at the end of the seventeenth century in Tuscany and Marche, reaching Umbria in the following century where it did not become truly important until the nineteenth century (Vaquero in this volume). In southern Italy, on the other hand, the situation was very different as the dry climate and the indisputable dominance of wheat in local agriculture left lit-

tle room for maize diffusion, which was mostly limited to the Apennines area or to places where the geopedological characteristics and the peculiar nature of settlements greatly limited the production of wheat, as in Valdemone in Sicily. In this area in the second half of the eighteenth century, maize acted as an alternative crop grown by the population to combat production shortage and the increase in taxes on wheat and flour following the Mediterranean scarcity of 1763-64 (Fazio 2018).

Moving northeast, that is toward Carinthia, it is equally possible to note some differences as maize had the status of a botanical rarity until the early eighteenth century, even though its first appearance can be documented as early as 1559. Moreover, its spread during the century was not homogeneous since in south-eastern Carinthia (Lower Carinthia) there was no evidence of maize cultivation until the early nineteenth century, unlike in Upper and Central Carinthia. It is important to note that the first areas where maize had spread were those north of the Alpine Divide and it is possible to suppose a maize penetration through Alpine passes linking Carinthian valleys with South Tyrol and Friuli.

If we move southeast, that is east of the Republic of Venice and the eastern Adriatic coast, i.e. to the present-day Slovenia and Croatia, the situation was even more complex. The case of the Slovenian region is exemplary in this regard since we can find many differences in the timing of the diffusion of maize and in its geographical distribution. In the middle of the seventeenth century maize was sown and consumed quite often in the south-western part, close to the Adriatic coast and Venetian Friuli, and perhaps even more so in the north-eastern part of the region (Styria), but it was almost unknown in the central area and even its wide diffusion during the eighteenth century reached the central part of the region (Carniola) only marginally; there, the population relied on maize solely in times of food crises. This was the case for a long time since in 1913 only 8% of arable land was devoted to maize in Carniola, compared to 32% and 40% in Gorizia-Gradisca and Istria, respectively (Lazarević in this volume).

It is also worth noting that during the eighteenth century the maize trade, centred around the harbours of Trieste and Rijeka, was becoming more and more important for import, especially (but not only) during the food crises, and for export. While the imports signal that the consumption surpassed local production capacities, the exports of maize through both sea ports seem to be linked to another very interesting trait that has emerged in our case studies. In fact, in the Slovenian region it is possible to

point out two different main axes of maize diffusion. The first line of diffusion followed the west-east axis (the Po Plain, Venice, Friuli, Trieste and Rijeka). The second one, which might explain the early diffusion and importance of maize during the seventeenth century in eastern Slovenia (and Austrian Styria), as well as the exports in the eighteenth century, is the diffusion of maize in and from the Balkans, following the Danube and its tributary rivers from the south-east to the north-west. In Slovenia we see these two axes converge.

It is evident that, in order to explain these different timings and grades of maize diffusion, it is necessary to reflect on the reasons for its greater or lesser success. In the cases considered in this volume, climate seems to matter but is less important than the agricultural conditions, i.e. landownership and contracts, cultural habits and the presence of alternative plants.

With regard to climate, it will suffice to note that the areas where maize encountered its first success were characterized by favourable climatic conditions, namely warm and sufficiently moist summer months. At the same time, maize cultivation was common in the lowlands and flatlands and wherever it was possible to rely on streams. However, from the eighteenth century onward, the introduction of varieties which could be successfully cultivated in colder areas and the extraordinary yield ratios of maize favoured a widespread diffusion to such an extent that during the nineteenth century wherever the soil and the climate allowed maize cultivation the peasants would plant it. Afterwards the diffusion was unstoppable until it reached the point that in Carinthia maize for silage and grain was grown on 24,943 hectares or 62.5% of the arable land (Drobesch in this volume). The same can be said for some areas of Slovenia and, even more so, of Serbia where 46% of arable land was already devoted to maize in 1867 (Lazarević in this volume).

However, during the first phases of maize diffusion in the early modern period, climate was a necessary precondition but not the only one. The local agricultural conditions could be even more important. I refer mostly to landownership and tenure conditions, that is to say the "relations of production". Where peasants did not own the land, which was mostly the case in the areas where agriculture was more productive, the landowner's choices regarding what to sow were determinant. In Bergamasco, for example, at the beginning of the seventeenth century the Consorzio della Misericordia Maggiore, the main landowner of the province, opposed maize introduction since it did not want to run the risk of reducing the amount of land

devoted to wheat (Moioli 1983, 630-631). The same happened in the areas shaped by the predominance of sharecropping, such as central Italy, where the introduction of maize was similarly slowed down. In fact, within the economy of the sharecropping *podere*, despite the splitting of the yield between the landowner and peasants, the former was in a stronger position and was mainly interested in wheat, wine and oil production (Mineccia 1983).

In northern Italy the diffusion of maize increased after the plague of 1630-1631, owing to the growing contractual power of peasants who survived the epidemic and the awareness of landowners that maize, due to its high productivity and the fact that its growth did not overlap with that of wheat, could become pivotal for peasants' alimentation without compromising wheat production. Moreover, being more productive than the other crops eaten by peasants such as millet or buckwheat (notwithstanding it required hard work) and being suitable for sowing together with other crops, such as vines or pumpkins, it soon found favour with both the landowners and the peasants.

Thus, starting with the eighteenth century, wherever the soil and weather conditions and the agricultural framework allowed it, maize diffusion was becoming unstoppable. In the case of the possessions of Bonate di sopra, Comun Nuovo e Nova owned by the Consorzio della Misericordia Maggiore in the plain of Bergamasco where the production of maize, which had still been marginal in the decade 1650-1660, overtook that of wheat in the decade 1711-1720, mostly thanks to the pressure and requests of peasants (Moioli 1983, 688-707).

In some territories, however, the features of local agriculture left no room for a remarkable diffusion of maize. That is the case in most of southern Italy where, on the one hand, wheat cultivation for export predominated, as in the case of Sicily, and where, on the other hand, the centrality of transhumant breeding, as in Tavoliere of Apulia, limited grain cultivation (Russo 2016). On this plain about 110,000 hectares of land were used by the Dogana, the institution that regulated sheep transhumance, eight months a year, after which time the land was given to the landowners for their own use during the summer (Mercurio 1990, 12). At the end of the warmest season, in fact, millions of sheep left Abruzzo and the mountains of Molise and headed for the Apulian Plain, as did the flocks of central Italy, but they headed for the Tuscan Maremma, where Dogana dei Paschi operated, and to the Pontine Marshes south of Rome (Ciuffetti 2019, 220-225).

The case of the large area east of Italy is different since the current state of historiography only allows for hypothesizing. First of all, in the present-day Carinthia, Slovenia, Croatia and Serbia, a late feudal or manorial system prevailed for centuries, as it had in a large portion of southern Italy, although it differed significantly here since the peasant population lived on their farms in small villages. In this part of Europe, landlords and peasants alike had been conditioned by the fact that the tributes were defined a priori in official registers, meaning that the landlord had to receive and the peasant had to cultivate precise amounts of certain grains. This limited the possibility of agricultural modernization, as Sandgruber noted decades ago (1982, 260-263).

On the other hand, it is well known that in Slovenian lands, for example, landlords tended to change the nature of tributes from in kind to money since the fifteenth century and through the early modern period, although it was not a linear process (Panjek 2011). In these cases, peasants could more freely choose which kind of crop to cultivate or what else to produce and then sell it to get the money needed to pay tributes. In such a situation, maize cultivation could become a strategic choice since it was suitable for self-consumption but also had a growing market – on the other hand, it is documented how peasants in the present-day western Slovenia would sell their produce and use the revenue to buy maize on the market for their own consumption (Panjek in this volume).

The issue of taxation is really an interesting one to deal with in order to understand peasants' choices. In some parts of Sicily, for instance, peasants started to cultivate maize precisely because, being a new crop, it was free of taxes. However, its increasing cultivation was soon noticed by the authorities and, consequently, a tithe was imposed on maize, making peasants abandon its cultivation (Fazio 2018). Something similar happened in Slovenia with buckwheat from the sixteenth century onwards. In short, unlike on the Italian Peninsula, where we may lean on numerous studies, the relation between landownership and tenancy conditions on the one hand and maize diffusion on the other is still an open research question in the eastern Alpine and Adriatic regions.

The decision to sow maize, however, did not depend only on the institutional framework or on economical evaluations, but also on cultural habits. As a matter of fact, the introduction of a new crop required an open mind and an interest in innovations since it was necessary in many cases to abandon the well-known plants and ways of cultivation. One of the rea-

sons for the late diffusion of potatoes in Italy was the peasants' indifference toward a crop that grew under the soil and was consequently considered dangerous and even capable of transmitting leprosy. After all, in 1765 the *Encyclopédie* defined the potato thus: "elle ne sauroit être comptée parmi les alimens agréables... On reproche avec raison à la *pomme de terre* d'être venteuse; mais qu'est-ce que des vents pour les organes vigoureux des paysans & des manoeuvres?" (Encyclopédie 1765, ad vocem).

The same could be said of maize since at the beginning peasants had to make do with a crop suitable for both animal and human nutrition; later on, some doubts arose mostly in the areas where peasants were used to other crops. Thus, for a certain period the consumption of maize among the rural population was hindered due to mistrust (Levi 1979), although there is evidence that in northern Italy maize substituted the traditional food of the peasants during the crises of the second half of the sixteenth century (Cazzola 1991). In other territories, as Zarko Lazarevic clearly shows in this volume, the local population could be very strongly attached to traditional crops. That was the case in some parts of Slovenia, where buckwheat dominated for centuries, slowing the advance of maize.

Despite these important differences among territories, maize cultivation has increased impressively in the countries considered in this volume, especially from the eighteenth century onward. This huge increase in production requires tackling an important, usually underestimated, issue, namely that of maize as a marketable crop that is not used only for self-consumption. It is necessary to overcome the simplistic idea that "a dualistic cereal growing… took place: the wheat one, market-oriented; the maize one, the key element of subsistence and a poor economy" (Doria 2002, 572). In fact, in many territories, starting with the eighteenth century, it is easy to find a dual grain market based on wheat on the one hand and on maize on the other.

In northern Italy, wheat and white bread dominated only in the main cities such as Milan, where the consumption of wheat accounted for more than 80% of total consumption. In Como, a much smaller town close to the mountains, the consumption of wheat in normal years was just below 50% of total consumption. Maize made up the difference, particularly in bad harvest years. In fact, on the Como market wheat amounted to between 45% and 48% of cereals sold during the good harvest years, while in the bad years, wheat only amounted to between 35% and 37% of the total (these data were taken from the State Archive registers in Como, Archivio storico civ-

ico, cc. 396-411 and refer to the period 1808-1834). Finally, in mountainous and rural communities, it is normal to find places where 80-90% of cereal consumption was represented by maize.

Thus, it seems very interesting to examine this dual grain market, taking into account different variables and, in particular, the population distribution, i.e. the presence or absence of a significant urban network, and the population density. The case of northern Italy shows a peculiar situation since we can find some big cities, many towns and "quasi-towns" close together, and a high and widespread population density, even in the large Alpine area. That is particularly true of Lombardy as the following table clearly shows.

Table 1. Mountain area in Lombardy, inhabitants and population density (1790)

Territories	Surface (km²)	% of mountain area	Population	Density (in./km²)
Bresciano and Riviera	4,882	55	340,000	70
Bergamasco	2,490	82	220,000	88
Cremasco	572	0	41,000	71
State of Milan	7,892	23	1,117,000	141
Lombardy	15,836	42	1,718,000	108

Sources: for Eastern Lombardy Mocarelli 1996, 342-343 and Mocarelli 1997, 267-268; for the State of Milan Romani 1950, 25, 43

Let me focus on two issues that emerge from this situation: on the one hand, the grain market outside the cities and the kind of grain sold on it, and the price trend on the other. Usually, historians dealing with prices and markets in the early modern period refer almost exclusively to the big cities and to the *annone*, ignoring the fact that most of the population lived outside the cities. Even in one of the most urbanized areas of Europe in that period, such as northern Italy, urbanization rates varied between 20-30%, meaning that around 70-80% of the population lived in rural areas. Therefore, rural markets, where maize was gaining a growing importance, played a relevant role in the supply of the rural population since the countryside was not characterized only by self-consumption.

These markets were important especially for the supply of areas with a high demand for grain (villages with thousands of inhabitants or those engaged in manufacture) or with low grain production (e.g. mountain areas). The case of the Italian Alpine area, which met both conditions, is exemplary since it suffered, as did the biggest European cities, a structural lack of

food; in its case it was due to the small plots of arable land that were usually barren. It is precisely the poorness of agriculture in the hilly and mountainous areas and the necessity for their inhabitants to work in manufacturing activities in order to get the money to buy grain that is at the core of Mendels' model (Mendels 1972), recently reinterpreted in a convincing way by Aleksander Panjek (2017).

Therefore, same as Milan or Paris, the Alpine areas had to buy grain elsewhere but, unlike the big cities of the plain, they could not count on the production of their surrounding areas, because the environmental situation was unfavourable. As a result, they had to pay exceptionally high grain prices due to the transport costs. On the southern rim of the Alps were located several small towns with grain markets where every year thousands of tons of grain were produced and sold at high prices. That was the case, for example, of the grain market in Desenzano that supplied the villages of the riviera of Lake Garda and southern Trentino inhabited by around 45,000-60,000 people, equalling the size of a big city (Bertoni 2014).

In spite of the availability of grain transportation along an important waterway, i.e. Lake Garda, the costs of reaching Desenzano and the pressure of a substantial demand made prices on the market very high, mostly in the years of bad harvests. In 1782, for example, wheat was sold at 81.8 lire per hectolitre, while in a big city like Milan the price was only 59.7 lire. It is interesting to note that the prices in Desenzano were perfectly aligned with those of markets close to the Alpine area, where there was a structural lack of grain, such as Bergamo and Udine, where the prices in 1782 were 80.8 and 81.2 lire per hectolitre, respectively (these data are from the forthcoming database built by Giulio Ongaro and myself on grain prices in Italy during the eighteenth century).

It is true, however, that in these rural markets, maize was becoming increasingly important. If we consider the sessions of the Desenzano market in August, when the availability of wheat was at its peak, and in December, when the same applied to maize, we can find these data for the period between 1751 and 1791: in August 1751, 306 *some* of wheat and 621 of maize were sold; in August 1791, 608 and 1,384, respectively; in December 1751, 159 *some* of wheat and 332 of maize; in December 1791, 568 and 1,434, respectively. If millet is also considered, it is easy to note that on the Desenzano market wheat accounted only for 20-30% of the grain sold. Even more interesting is the fact that on such markets close to the hills and mountains the centrality of maize during the eighteenth century was reflected in the prices; in some

years, it is possible to observe an unusual phenomenon, namely that maize prices overtook those of wheat. That happened especially during food crises, e.g. in May 1764, July-August 1773, July 1794 (Zalin 1990, 351). On the contrary, in markets located in areas with great producers of grain the difference between wheat and maize prices was huge, often more than double, as it is possible to note in the case of Mantua (Vivanti 1967, 423).

Prices and their trend are the second important issue to deal with considering markets. As Manuel Vaquero clearly shows in this volume, many questions are still open. If and how wheat and maize prices interacted; if there are any co-movements; if the prices show a possible integration of markets or not; who the buyers were; the kind of relation existing between production and market (in the case of Umbria, it seems that the sale of maize on markets preceded its widespread cultivation). I can add two other issues. The first is the relation between the level of prices and the availability of grain. In the case of Desenzano, there is, in fact, evidence of high prices in spite of a good availability of grain. In 1780, for example, 71,000 *some* of wheat were sold at prices between 36 and 38 lire per *soma*, while in 1790, when 86,000 *some* were sold, the price exceeded 70 lire (Zalin 1990, 345, 349-351). The same happened in Cuneo where in 1765 93,000 *emine* of wheat were sold at an average price of 2.16 lire, and in 1776 only 12,450 *emine* at 2.14 lire. Therefore, it is possible to think that the prices depended not only on the quantity of supply, as is usually believed, but in some cases also on the level of demand. Such is the case of Cuneo, where in 1765 an extraordinary demand from the army was recorded (Bonelli 1968, 824-828).

The second issue is the role played by maize on the market. According to Coppola, the growing production of maize in the State of Milan, starting in the eighteenth century, resulted in a lower price of wheat, to the point that maize determined the general price of grain in Milano (Coppola 1979, 104). But if it is true that people bought maize when wheat prices rose, then there is the problem of determining at which price level this shift occurred. Moreover: what happened when wheat and maize prices were similar? Did consumers shift toward wheat or not?

In my opinion, the only certainty is that the advent of maize not only offered peasants the opportunity to escape hunger but also made the grain market wider and more complex. This evidence calls for a radical re-thinking of the debate about the standard of living and the "great" or "little" divergence that dominated economic history over the last two decades. In fact, we have a bulk of studies in which real wages, the living condi-

tions and divergence are calculated taking into account only the urban prices of wheat, mainly in the big cities, ignoring other towns, rural markets and maize. The flaw of such an approach seems very evident (Hatcher, Stephenson 2018) and has produced unconvincing general statements as to the little divergence between Northern and Southern Europe (Mocarelli, Ongaro 2019, 131-140).

The last important issue to deal with is the demographic consequences of maize diffusion and, in particular, the hypothesis that its widespread diffusion was crucial in diminishing famines in Southern Europe. In consequence, starting in the eighteenth century, there was room for the population to grow faster than before (Alfani, Mocarelli, Strangio 2017, 46-47). However, in some territories, this change happened even earlier. As Alessio Fornasin clearly shows in this volume, the spread of maize in an area of Friuli during the seventeenth century directly affected population growth. This connection "seems to work in Malthusian terms: the introduction of maize stimulated population growth and not vice versa". This path of research seems very interesting but not yet well practised. More studies in this direction will allow us to abandon a negative view of the consequences of maize diffusion, focused only on the spread of pellagra, and to make fruitful comparisons with the growth of potato consumption in Northern Europe. It is an important issue because, if maize in Southern Europe played the same role as potatoes in northern countries, we find nothing comparable to the Irish potato famine in southern countries.

In conclusion, I think that the contributions in this volume show the importance of dealing with maize diffusion, its modalities and consequences, and offer us some stimulating new insights into this issue. The awareness that we need more studies on Mediterranean countries, such as France, Spain, the Balkans, in order to get a more comprehensive view of the history of this pivotal crop is surely a good start.

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Maize diffusion in the Republic of Venice: the case of the Province of Vicenza (sixteenth-eighteenth century)

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The paper has a threefold aim: on the one hand, it wants to contribute to the dating of the first examples of the diffusion of maize in the Republic of Venice, specifically in the Province of Vicenza. In other words, it aims to determine *when* this cereal appeared for the first time in that area. On the other hand, the chronology and geography of its first appearance can provide some useful hints regarding *why* and *where* maize started to be cultivated. Finally, the paper will propose a first and provisional analysis of *how* this happened. Indeed, as many scholars who dealt with this topic have underlined, maize was not extensively cultivated at the beginning, and its production was not a market-oriented one; this is also true of those areas (such as the Veneto and Friuli regions) where most of the rural population lived on this cereal until the late twelfth century. Moreover, it is still not clear if the use of the so-called *sorgo turco* for feeding animals preceded its introduction in peasants' gardens in order to integrate the diet of the day labourers and of the small tenants and landowners. The analysis of certain archival sources related to the Province of Vicenza has helped in proposing a hypothesis about the itinerary that maize followed since the last thirty years of the sixteenth century in the Piedmont area of the province: from the presence of small amounts among the provisions of cereals in households, to its – quite precocious – inclusion in the market mechanisms.

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Maize in the Republic of Venice and in the Province of Vicenza: a state of the art

Since Luigi Messedaglia's studies, who dedicated many pages to maize diffusion from the Americas to Europe, and particularly in the Republic of Venice (Messedaglia 1924; 1927; 2008), many researches have dealt with the chronology and characteristics of the gradual 'conquest' of the countryside by this cereal. Danilo Gasparini (2000; 2002; 2015) in particular analysed maize cultivation in the Venetian area. Sometimes these researches focused, with "rustic erudition" (Gasparini 2002, 12), on the long-standing problem of when and where maize appeared for the first time; however, research into the chronology of its diffusion is not simply a question of who was first. In fact, understanding when and where this happened is crucial in order to establish the why and how.

At the beginning of the sixteenth century, maize reached Spain from the Americas, where it was extensively used, even if in a quite different way compared to its milling and processing into polenta that characterized the countryside of northern Italy. Then it spread with "rapid advancements and prolonged interruptions" (Cazzola 2014, 311) in the Mediterranean area, from the Iberian Peninsula to the Ottoman Empire. Already from the 1620s onward, it was cultivated in Andalusia, Catalonia, Galicia and Portugal; afterwards, it rapidly crossed the Pyrenees and spread throughout the southern part of France, where its use in human diet struggled to take hold[1]. The new cereal reached the Italian Peninsula in the mid-sixteenth century; the Republic of Venice was quite probably one of the first areas where maize was accepted not only as an exotic crop, perhaps used as a model for marble friezes, but also for intensive cultivation. This happened in the Province of Rovigo already in the mid-sixteenth century and in the territory of Este (in the Province of Padua) in the 1580s[2]. In conjunction with the famine of the 1590s (Alfani 2010, 232-233; 2011; Clark 1985), maize spread rapidly in the provinces of Treviso and Verona and in the Papal Legations south of the Po River, reaching in the seventeenth century the Province of Belluno, the

1 Cazzola 2014, 311-315; 1991, 110-112; 2002, 236; 2015, 35-38; Slicher Van Bath 1972, 368; Finzi 2009, 17-18, 28; Levi 1991, 156; Montanari 1993, 128.

2 Fassina 1982, 34-36; Cazzola 1991, 112-113; 2014, 315-316; 2015, 38-39; Finzi 2009, 19; Doria 2002, 571; Vecchiato 1979, 71-72; Mocarelli and Vaquero Piñeiro 2018, 23.

Friuli region, the provinces of Brescia and Bergamo, and finally the rest of the Lombardy region and the Piedmont one[3].

While sketching the geographical expansion of maize, some elements should be underlined and will be recalled on the following pages: firstly, the introduction of maize initially occurred on marginal fields, usually characterized by a high humidity level that made them unsuitable for the cultivation of wheat[4]. Secondly, it is important to keep in mind that in these fields maize gradually substituted the minor cereals, especially during the famines – we have already referred to the food crisis of the 1590s – because its high yield was a useful instrument in rebalancing the relationship between population and resources[5]. Besides these elements, we should not forget that the importance of the yield was accompanied by the 'newness' of maize; indeed, given that it was a previously unknown cereal, it was not included in the farming contracts and in the tithe obligations (Levi 1979, 1095; 1991, 156; Cazzola 2002, 236; 2015, 38, 40, 44). This 'exemption' guaranteed to the peasants the possibility to keep the entire harvest for their families. Finally, Franco Cazzola and Roberto Finzi in particular emphasized the strong relationship between the introduction of maize and the characterization of the agrarian contracts, underlining that the diffusion of this cereal happened initially where the fields were cultivated by day labourers. Indeed, maize became a part of their salary in order to place a greater part of wheat on the market. On the contrary, according to Cazzola with reference to the Emilia Romagna region, "the areas of more ancient cultivation and where there were well-established sharecropping structures […] experienced generally a greater resistance to the new cereal" (Cazzola 1991, 118-120; 2014, 318; 2015, 40, 44-45). Therefore, if in Emilia Romagna the sharecropping areas were characterized by a later diffusion of maize, Giovanni Levi asserts that, at least in Piedmont, also "the areas characterized by the

3 Fassina 1982, 38-50; Coppola 1979; Levi 1979, 1092-1100; Finzi 2009, 28-31; Cazzola 2014, 317; 2015, 39-42; Fornasin 1999; 2000, 11-31; Pezzolo 2011, 101; Rombai and Boncompagni 2002, 188; Doria 2002, 571; Vecchiato 1979, 72; Mocarelli and Vaquero Piñeiro 2018, 26; Sereni 1982, 231; Gasparini 2015b, 138-141.

4 Cazzola 1991, 112-113; 2015, 39, 43; Finzi 2009, 19-20, 28; Cazzola 2014, 314; 2002, 236; Gasparini 2002, 34; Fassina 1982, 32-33, 55; Levi 1991, 160; Montanari 1993, 128-129; Coppola 1979, *38-39*.

5 Levi 1991, 156-157, 162; 1979, 1094-1095, 1098; Cazzola 1991, 112, 114-115, 118; 2014, 310-311, 317-319; 2002, 236; 2015, 35, 42-44; Doria 2002, 571; Finzi 2009, 34-35, 43-45; Gasparini 2002, 16, 20-22; Montanari 1993, 163-165; Pezzolo 2011, 101; Fassina 1982, 52-53; Rombai and Boncompagni 2002, 188; Mocarelli and Vaquero Piñeiro 2018, 24; Coppola 1979, *39, 41, 44; Sereni 1982, 231*.

presence of small estates and ones where wheat and grapevines were cultivated experienced a strong resistance" (Levi 1979, 1096). Furthermore, both Cazzola and Finzi have underlined that even if the arrival of maize often coincided with conflicts that involved landowners and peasants, and with situations of relevant changes in the power relationships and in the contracts, they did not happen because of the introduction of the new cereal, even if maize did play a role in these transformations. Finzi, in particular, wrote that "maize cultivation, far from being the cause of changes in the production relationships, seems to be used within processes that started *because of other causes*" (italic in the original text Finzi 2009, 67; Coppola 1979, 76-77, 105-134).

That being said, when did maize reach the Province of Vicenza? Messedaglia asserted that this happened at the beginning of the seventeenth century (Messedaglia 2008, 174); the subsequent research by Fassina on Lisiera and Mason Vicentino seem to confirm this periodization (Fassina 1982, 45; 1981). Danilo Gasparini recalls Fassina but at the same time refers to a book published by Silvano Fornasa and Sergio Zamperetti on the history of Castelgomberto (a village in the Piedmont area of the province) (Fornasa 1999, 168-169), where maize was found as early as in 1595, "in inventories and in leases where the landowner reserved the *strammi* [i.e. the mulch] of the previous harvest, including the canes of the *sorgo rosso* and of the *sorgo turco* [i.e. the maize]". Then, recalling Gasparini, since the beginning of the seventeenth century maize played a prevalent role in shaping the food provisions of the peasants of Vicenza (Gasparini 2002, 27-28). These few lines show (prove?) that in the Province of Vicenza too, as in other areas, the history of maize is a history of gradually moving the chronology of its diffusion further back, and this paper is no exception.

Before maize: food consumption and characteristics of the Province of Vicenza in the sixteenth century

In order to understand when, where, how and why maize spread throughout the Province of Vicenza, we should first reconstruct the geographical, economic and demographic context in which this process happened. In the early modern period, the Province of Vicenza was a bordering province of the Republic of Venice, and it was characterized by the presence of many "almost cities" (rural villages with thousands of inhabitants) and by a morphology that was mainly hilly and mountainous. In its northern part, there was the Asiago upland and mountains more than 2,000 metres

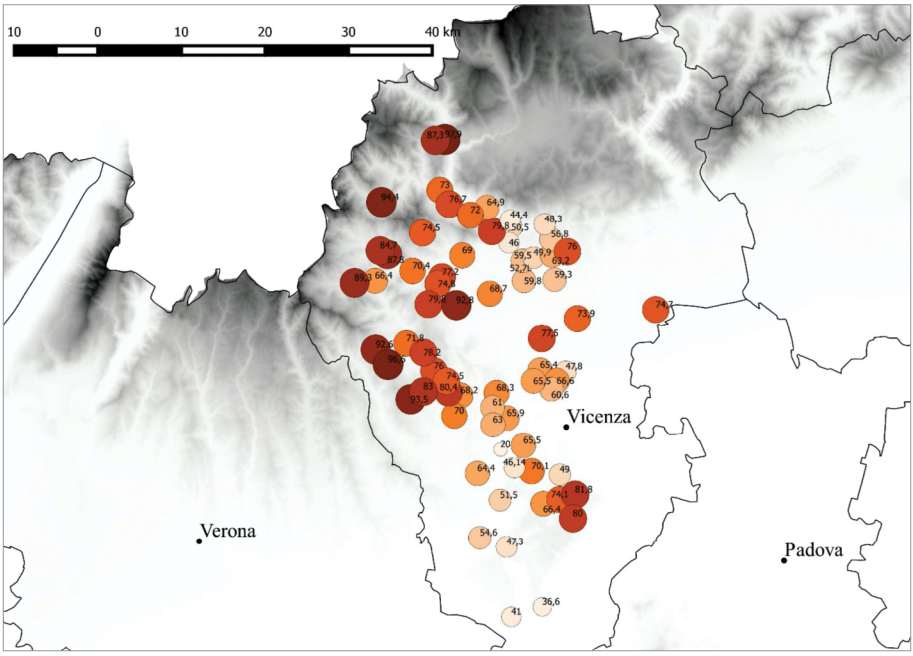
high, while in the central southern part there were the *Colli Berici*, hills of lower heights. Indeed, according to the data included in the "Provincial Territorial Plan – Environmental Report" prepared in 2009 by the Province of Vicenza (Province of Vicenza, 2009, 7), among the 2,722.2 square km of the present province (almost corresponding to the early modern one), 1094.25 square km, i.e. 40.2%, are mountainous, 814.25 square km (29.9%) are hilly, and just 813.7 square km (29.9%) are level. Generally speaking, we can therefore say that it was a far from level territory, which had relevant effects on its economic structure. Despite this, from a demographic point of view, the Province of Vicenza was densely populated: according to Fornasin and Zannini (Fornasin and Zannini 1999, 115), in 1548 there were 124,760 inhabitants in the countryside of the province, and 30,948 in the city – so there was a total population of 155,708. It was a relevant demographic weight (Ongaro 2020): referring to the present borders of the province, it means around 56 inhabitants per square km, including the city, or 46 inhabitants per square km including only the countryside. Just think that at the end of the eighteenth century the areas that would be the first to industrialize, i.e. England and the Low Countries, had a population density of, respectively, 61 and 51 inhabitants per square km. These figures are even more relevant if we consider the morphology of the territory that implies the concentration of population in the few level areas. Looking at a "food and mouths" (Galletti 1994) register dated 1546 (BCB, *AT*), which will also be mentioned on the following pages and which records the population of 81 villages of the countryside of Vicenza, we can observe that 24 of them greatly exceeded 1,000 inhabitants and that, among these, seven were characterized by a very relevant population, sometimes nearly reaching 5,000 inhabitants: Brendola (4,728 inhabitants), Montecchio Maggiore (3,178), Thiene (2,187), Arzignano (4,834), Schio (4,958), Lonigo (2,884), Valdagno (3,070). Almost all these villages were located in the Piedmont area of the province; especially Schio, Arzignano and Valdagno were the fulcrum of the development of manufacture in the countryside of Vicenza in the sixteenth century. Moreover, we must consider that the 1546 survey is incomplete, meaning that other villages (such as Marostica) that were demographically relevant are not included in the register.

As regards the economic structure of the province, especially in the last twenty years, many researchers have outlined the main characteristics of the secondary sector, both in the city (Demo 2001; 2004; 2006) and in the countryside (Vianello 2004; Demo and Vianello 2011); however, the

agricultural sector was left in the shadow (Ongaro 2017), despite some exceptions (Ferrarese 2008). During the fifteenth and sixteenth century, the city of Vicenza, approximately at the centre of the province, experienced a relevant economic and demographic development (same as many villages in the countryside) thanks to the wool production (first) and to the silk one (second). Furthermore, significant ore bodies in the Piedmont area had been attracting investments by citizens and Venetian patricians since the end of the fifteenth century (Fontana and Vergani 2003). However, beyond the mining activities, since the sixteenth century – and with an almost uninterrupted growth until the nineteenth century – the Piedmont area of the province was characterized by a relevant production of wool textiles and raw silk. In the large villages recalled above (Arzignano, Valdagno, Schio), some inhabitants asserted that during their lives they were employed only in the secondary sector, as weavers or wool combers (Vianello 2004). Moreover, even those who were not specialized workers in the textile sector, were involved in the context of a pronounced integrated peasant economy (Panjek, Larsson, and Mocarelli 2017); daily work in the fields was often accompanied by transporting goods for rural merchants, by breeding silkworms, silk reeling and spinning, weaving in peasants' houses, and working in kaolin mines (Demo and Ongaro 2020).

Regarding the agricultural sector, as anticipated there are no specific researches able to clarify the size of the estates, the contracts used, and the cultivation techniques: Andrea Ferrarese wrote, referring to the first phase of expansion of the urban properties in the countryside between the fifteenth century and the beginning of the sixteenth, that the agrarian landscape of the Province of Vicenza was characterized by "a general absence of *appoderamento* processes, a strong fragmentation of the estates, and by a persistent rigidness of agrarian structures" (Ferrarese 2008, 289). During the sixteenth century, it seems that the situation changed, precisely because of the gradual increase in the urban properties in the countryside, but recent research seems to confirm the absence of large estates with sharecropping contracts and, on the contrary, the potential persistence of small estates or the presence of large estates cultivated by day labourers (Ongaro 2020).

In this context of a mountainous/hilly territory, with a relevant demographic weight, an economic structure based mainly on the secondary sector, especially in the Piedmont area, and characterized by the absence of relevant sharecropping structures, what was the food of the peasants in the sixteenth century? When is it possible to date the introduction of



Map 1. Percentage of minor cereals in the total amount of cereals (minor and wheat) produced in 1545

maize? Many sources seem to exclude the presence of the new cereal until the 1570s, or at least it was not reported in the state surveys on agricultural production and was not used as payment in kind for workers in the fields or in factories. Obviously, this does not mean that maize was unknown (even if there is no proof of the contrary), however, if it was cultivated in the gardens of peasants, it did not play a relevant role in terms of human nutrition. Indeed, the analysis of the accounting books of a rural merchant who lived and operated in Schio, Antonio Razzante, dated 1550-1574, shows that even if almost all the workers who came from a wide geographical area and who were employed in various economic sectors received part of their remuneration in kind and often in minor cereals (millet and rye mostly), maize was completely absent (Demo and Ongaro 2020). The role played by rye, millet, barley, buckwheat, oat and spelt in feeding the peasants, especially in the Piedmont area of the province, is confirmed by the already mentioned survey of "food and mouths" dated 1546. Figure 1 show the percentage of minor cereals and wheat reported to the Venetian authorities in various villages.

The picture is not surprising and it is certainly not typical only of the Province of Vicenza: in almost all the rural villages, more than 50 percent of food availability was guaranteed by legumes and minor cereals, and often wheat played a marginal role. Certainly, we are in the period before the "boom" of wheat production in the Republic of Venice (in the second half of the century) (Zannini 2010), but it is quite probable that the situation was the same also in the following decades. Furthermore, especially in the Piedmont and mountainous areas, the consumption of minor cereals and legumes was quite high, between 75 and 97 percent.

Maize in the countryside of Vicenza

When and where can we place the arrival of maize in the countryside of Vicenza? Fassina was quoted on the previous pages, who asserts that the first example of maize cultivation is dated 1611 and located in the north-eastern part of the province, in the plain between the Tesina and Brenta rivers. Moreover, we referred above to new discoveries that seem to anticipate the arrival of maize – still in the Piedmont area – at the end of the previous century.

Beyond these examples, new researches help to redefine the chronology and geography of maize diffusion in the Province of Vicenza: Silvano Fornasa wrote that an inventory dated 1570, which referred to goods owned by the Panciera family in a village close to Creazzo, reports "a basket with a small amount of *sorgo turco*" (Fornasa 2013, 200-201). Furthermore, a survey of agricultural products in private houses drafted by the public officers of San Vito di Leguzzano (a village close to Schio) in 1572 reports "half a *staio* of *sorgo turco*" (Snichelotto 2019, 146-148) owned by a local family; that equalled roughly 13 litres, given that one *staio* of Vicenza amounted to 27,043175 litres (Martini 1883, 823). These amounts are not enormous, but neither are they irrelevant; in those years, maize was probably already a well-known and cultivated product, at least in small quantities, even if we do not know whether it was used for human feeding or for the animals.

However, in the 1590s, its diffusion was much more widespread; in 1595 for example, some *staia* of maize (i.e. dozens of litres) were reported not in peasant houses, but in the estates of the noble families of Trissino and Piovene in Castelgomberto – close to Valdagno, in the Agno Valley (Fornasa 2002). Moreover, another element that suggests that maize was fully included in the local agricultural structure already in the 1590s is its mention in contracts – such as the *strammi* in Castelgomberto referred

to above – and especially the fact that it was no longer excluded from the tithes. On the contrary, as anticipated, this was an element that characterized the first steps of its diffusion. In 1597 for example, Girolamo and Asdrubale Trissino, who owned some estates in the Agno Valley, between Arzignano and Trissino, shared the tithes of the *sorgo turco* cultivated in Castelgomberto (Fornasa 2002). Moreover, in 1599, Natale Faggion signed the contract for the collection of the "*sorgo turco* tithe"; according to Fornasa, in the same year the production of the new cereal in Trissino was around 500 *staia* (around 10,000 kg) (Fornasa 2003, 126).

Therefore, in the mid-1590s, maize – at least in the Piedmont area – spread out from the peasant gardens and was cultivated on the estates of the noble families of Vicenza (and included in the tithes); however, an archival source leads us to anticipate the diffusion of the new cereal at the end of the previous decade. Indeed, the historical archives of the Municipality of San Vito di Leguzzano include a relevant price series of agricultural products, dated 1587-1708 (ASCSVL). In the sixteenth century, San Vito was a village with around 1,000 inhabitants and part of the administrative district (*Vicariato*) of Schio in the Piedmont area of the Province of Vicenza (Snichelotto 2019; Ranzolin, Snichelotto, and Zuccollo 2007; De Tomasi 1993). Prices are recorded at the end of the books that collected the fines imposed by the *marighi* and *saltari* (rural police officers) because of damages to public and private properties (Ongaro and Savio 2019; Ongaro 2016; Snichelotto 2005). This means that they were probably the prices used to fix the refunds due by the transgressors to the owners of the fields and woods that had been damaged; therefore, they were not real market prices, but were certainly closely related to them, given that the price of every agricultural product was established on the basis of the market price recorded for that product every year. The price series of San Vito di Leguzzano is particularly interesting because already in 1587 the price of maize (*sorgo turco*) was recorded almost uninterruptedly, together with the prices of wheat, sorghum, buckwheat, millet, rye, *panìco*, vetch and other legumes, chestnuts and various fruits; it is interesting, even if not for the aims of this paper, that the prices of mulberry leaves, which were widely used for the rearing of the silkworms, were also included.

The fact that, as we will see on the following pages, the prices of maize were strongly related to those of other cereals and particularly to those of wheat, suggests that already at the end of the 1580s, so before the famine of

the 90s, the *sorgo turco* was widespread and used especially for human consumption, together with other cereals.

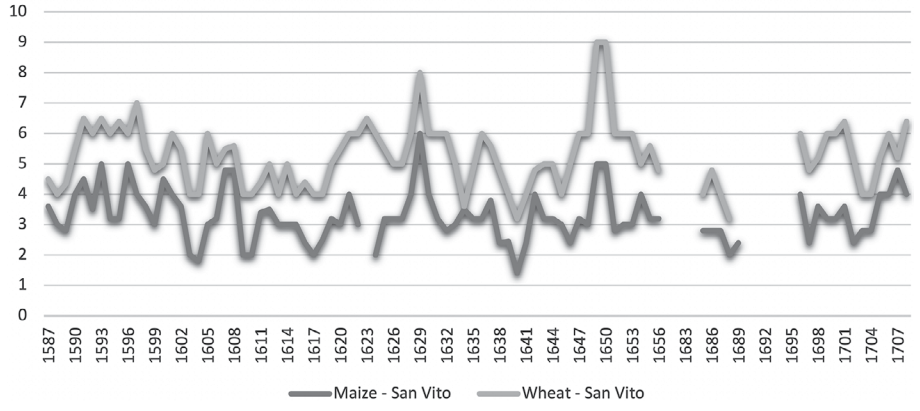
Before a more specific analysis of the transition of maize from being a 'garden cereal' to its complete inclusion in the market dynamics, it is interesting to propose a hypothesis about the geography and chronology of this process. First, it is clear that, at least according to the archival sources which have come to light so far, maize appeared for the first time in the villages in the north-western part of the Province of Vicenza: it was the most densely populated area of the province, where relevant villages, such as Arzignano, Schio or Valdagno, were located. Therefore, it was an area with an important demographic pressure in terms of the equilibrium between population and food resources, given also that the Piedmont area and its valleys (Chiampo, Leogra and Agno) were certainly not the most suitable for the cultivation of wheat. As shown in Figure 1, in this area consumption of minor cereals assured the survival of the population: quoting Fornasa, who refers to the Agno Valley (where Valdagno, Trissino and Castelgomberto were located), in that valley "peasants preferred to cultivate the minor cereals that guaranteed a more certain yield"; during the early modern period "the yellow maize polenta and the grey one made with buckwheat stood out in the peasant diet in the Agno Valley, with a difference due to the elevation: in the villages on the valley floor the first one prevailed, while the second one characterized the villages in the hills and in the high valley" (Fornasa 2012, 38-39). The case of San Vito in the Leogra Valley is another clear example of this: in this village, according to the 1546 survey, 92% of the harvest consisted of minor cereals; an absolutely preponderant percentage. Therefore, it is not surprising that that was exactly where maize found fertile ground for a rapid diffusion, also for human nourishment. Indeed, not only was the morphology of the area not suitable for the extensive cultivation of wheat – contrary to the southern part of the province – but the economic structure also developed according to this characterization: as anticipated, between the fifteenth and sixteenth century a flourishing textile industry was strengthened in these very villages and valleys. At the moment, there is a lack of specific research on this topic, but we can hypothesize that this element also affected the diffusion of maize. Similarly, specific research on agrarian contracts and on the agricultural production could provide useful information on the cultivation techniques and varieties of products.

Moreover, if it is true that in this area, too, the general cultivation of maize and especially the moment in which it substituted the other minor cereals in the harvests and in the peasant diet – as we have observed, this often depended on the elevation of the villages – happened during the famine of the 1590s, and then completely between the seventeenth and eighteenth century, it is also true that a previous situation of food scarcity could have facilitated its inclusion in the rural alimentary regimen. In this sense, especially the 1569-1572 famine that affected central and northern Italy has a chronology that is entirely compatible with the examples referred to in the previous lines (Alfani, Mocarelli and Strangio 2015, 4, 7-8, 10, 26; Alfani and O' Grada 2017, 8-9; Alfani, Mocarelli and Strangio 2017, 29-35).

Maize in the Province of Vicenza: self-consumption or market? A hypothesis.

Before concluding this short and preliminary analysis of the diffusion of maize in the Province of Vicenza in the early modern period, it is interesting, referring to the examples quoted above, to propose a hypothesis on the use of the new cereal and especially on its connection with the market dynamics. This topic is widely recalled in the historiography on maize: Marco Doria wrote that, within a process that continued to intensify until the eighteenth century, "a dualistic cereal growing […] took place: the wheat one, market-oriented; the maize one, the key element of subsistence and a poor economy" (Doria 2002, 572; Levi 1991, 161). Montanari recalls this bipartition that seems to link maize consumption to poverty and wheat to richness, given its high price; however, this does not exclude the inclusion of maize in market dynamics, to which especially the day labourers and the salaried workers resorted (Montanari 1993, 167). Furthermore, the importance of maize in the organization of both the rural and the urban market has been extensively demonstrated thanks to the research on the Lombardy and Umbria regions conducted by Luca Mocarelli and Manuel Vaquero Piñeiro (Mocarelli and Vaquero Piñeiro 2018, 25, 42-43), however, their focus is on the eighteenth century; scholars who analysed the first steps of maize diffusion stressed the fact that the new cereal appeared initially in peasant gardens, because it 'eluded' the tithes and the obligations to transport part of the cereals to the cities, first for use in animal breeding, and later for self-consumption (Gasparini 2002, 17; Alfani 2010, 232-233; Cazzola 1991, 112-113). The examples referring to Creazzo (1570) and San Vito (1572) can be read in this sense, even if the sources do not refer explic-

itly to the real use of the cereal. The cultivation of maize on aristocratic estates, the increase in the amounts harvested, and the inclusion of the cereal in agrarian contracts and in the tithes in the 1590s suggest its precocious diffusion and, almost certainly, its inclusion in the local and supralocal commercial channels. The research by Mocarelli and Vaquero Piñeiro on the grain market in Lombard and Umbrian cities in the eighteenth century, among others, confirms the validity of the price trend as an indicator of the market integration and of the role played in it by maize (Mocarelli and Vaquero Piñeiro 2018, 21, 25, 42-43). Briefly, a high correlation of price series suggests the development of a commercial space, thanks to the cereals that show common trends. For this reason, the connection of the price trends of various cereals has been interpreted as a valid indicator of their level of commercialization (Mocarelli and Vaquero Piñeiro 2018, 21, 42; Gasparini 2002, 13); therefore, if this level is high, their consumption would be released from mere self-consumption (that could exist regardless) and they were certainly included in broader commercial circuits. Giovanni Levi, too, asserts that maize "reached the markets later compared to when it became a relevant crop, and was even more slowly included in the surveys of market prices". This strengthens the importance of the prices (and of their control) in defining a product's level of commercialization (Levi 1991, 156).



Graph 1. Wheat and maize prices in San Vito, 1587-1708 (decimalized Venetian *lire* per *staio*)

Graph 1 shows the price trends of wheat and maize in San Vito between 1587 and 1708; the trends are fundamentally synchronized, and their correlation index is 0.67. If we look at the correlation between the two series in shorter periods, the picture is even more interesting (Table 1).

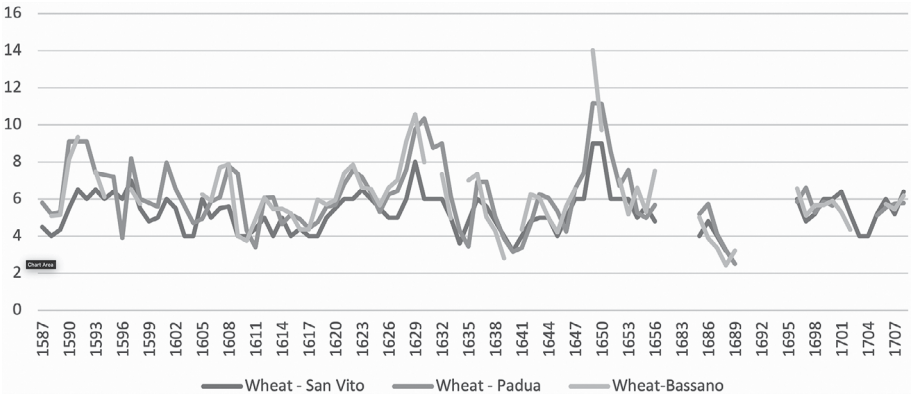
Table 1. Correlation index of maize and wheat prices in San Vito (1587-1689)

Period	Number of years	Correlation index
1587-1601	15	0.52
1602-1616	15	0.73
1617-1631	15	0.79
1632-1646	15	0.46
1647-1656	10	0.80
1685-1689	5	0.82

Source: ASCSVL

Table 1 shows – even if it was not possible to select fifteen-year samples especially for the last period, which may have produced a partial distortion of the results – that during a century there was a clear increase in the correlation, and therefore in the degree of integration of the maize and wheat markets. Moreover, it shows also a disintegration of the cereal market after the seventeenth century plague; however, for this paper it is important to underline that in the fifteen-year period of 1587-1601 the correlation index is 0.52. Certainly, this value is lower compared to the ones in the seventeenth century, but it suggests a relevant correlation between the two price series; therefore, a probable influence of the wheat prices on the trend of the maize ones and, finally, the resulting precocious introduction of this cereal in the market dynamics.

The presence of maize in the cereal market at the end of the sixteenth century is certified, but how ample was this market? In other words, was its commerce limited to San Vito or, on the contrary, was there already in that period at least a regional market? In this case the analysis of price series again provides useful information, as Graph 2 shows.



Graph 2. Wheat prices in Padua (decimalized Venetian *lire* per *staio* of Padua), San Vito and Bassano (decimalized Venetian *lire* per *staio* of Vicenza)[6]

In this case too, the coefficients of correlation between the series are quite high: 0.77 between Padua and San Vito; 0.79 between San Vito and Bassano. Moreover, the comparison of the maize prices in San Vito and the wheat prices in Padua and Bassano produces coefficients of correlation of, respectively, 0.5 and 0.72; therefore, the correlation is quite higher between San Vito and Bassano.

In conclusion, not only did the maize in San Vito start its process of inclusion in the cereal market in the 1580s, but the market itself went beyond the borders of the Province of Vicenza, and it was strongly related to the price trends in the bordering markets. Furthermore, as anticipated, the mechanism of the tithes itself testifies to the relevance of the new cereal already at the end of the sixteenth century; however, beyond this, it would be relevant to understand, as Gasparini suggests, "why and when […] it was included in the rentals as were the other cereals, and which were the contract terms" (Gasparini 2002, 13), because these elements could contribute to understanding its emergence.

Conclusions

The picture sketched on the previous pages testifies, on the one hand, to the precocious inclusion and diffusion of maize in the villages of the Piedmont

6 About the sources for prices of wheat in San Vito see ASCSVL; for Bassano see Lombardini 1963; the data for Padua have been collected by Professor Luciano Pezzolo. I want to thank him for having shared them with me.

area of the Province of Vicenza. The first examples of the presence of the new cereal are dated as early as 1570; by the 1580s and 90s maize seems to have been included in the market mechanisms – as proved by the correlation of prices with other cereals and the prices of wheat in various markets – in the tithes, and in the agrarian contracts. It spread in an area with a high demographic pressure that affected the relationship between population and food resources, especially taking into account the morphology of the area that was less suitable for the cultivation of wheat. As it happened in other areas, in Veneto and specifically in the Province of Vicenza too, maize spread where there was already a relevant consumption of minor cereals (Gasparini 2002, 13; Pezzolo 2011, 101; Fassina 1982, 52-53, 55), which it substituted gradually as the main foodstuff in peasant diet – with the resulting problems of pellagra and malnourishment[7]. However, it is difficult to link the diffusion of maize with the structure of the agricultural sector: indeed, on the one hand, according to Cazzola the new cereal spread firstly where there were large estates farmed with cattlemen and *schiavenza* contracts (work in exchange for money and in-kind payments), and later in the areas with the prevalence of sharecropping (Cazzola 1991, 118-120; 2014, 318; Finzi 2009, 66-72). However, this does not explain why in the Province of Bergamo for example, "where sharecropping lasted for a long time, it supported […] a wider expansion of maize", and there the new cereal was well received quite early, roughly since the second decade of the seventeenth century (Coppola 1979, 17-18, 107-109). This is maybe due to the fact, as Cazzola himself underlines, that not all the sharecropping relationships were the same; what was valid for the provinces of Bologna and Ferrara and their "rich" sharecroppers, could not apply to the poorer families of sharecroppers that had a lower bargaining power with the landowners. Indeed, probably the definition of the contracts, the choices of the landowners or of the tenants on what should be sown and on the subdivision of production affected the diffusion of maize more than the sharecropping structure itself. There is no specific research on the agrarian structure of the Province of Vicenza, therefore it is not possible to confirm or reject these interpretations; however, it seems that in the Piedmont area of the province, which was characterized by strong manufacturing professions, the sharecropping of ample estates was absent; but we do not know if there was a prevalence of sharecropping of small properties, if peasants owned or rented small plots,

7 Coppola 1979, *114-134;* Doria 2002, 572-573, Gasparini 2002, 103-110; Finzi 2009, 81-134; Cazzola 1991, 121-122; 2015, 35.

or if there were large estates cultivated by day labourers or salaried workers (Ongaro 2020).

Instead, we can confirm that maize tended to spread first in marginal fields (Fassina 1982, 55) and in areas located in the hills or close to the mountains (Gasparini 2002, 34); indeed the villages where the first examples of its cultivation have been found were situated close to the Prealps, often in valleys that were not suitable for the cultivation of wheat. However, in the mountains the cultivation of maize was more difficult. There, the peasants consumed other crops, e.g. chestnuts in the Piedmont mountains (Levi 1991, 160), or buckwheat in the Agno Valley. Similarly, we can confirm that the difficulties in maintaining the delicate equilibrium between population and resources was exactly what facilitated the diffusion of maize and its use for human consumption (Levi 1991, 162; Cazzola 2002, 236; 2014, 317-319); indeed, not only are the case studies in the Province of Vicenza characterized by a relevant population density, but the chronologies of the introduction and of the spread of maize cultivation are linked to two situations of relevant food scarcity: the famine of 1569-1572 and the far more severe one in the 1590s.

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Maize in Umbria (central Italy). Market, prices and farms between the eighteenth and nineteenth centuries

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Introduction

Among all the plants shipped in cargo holds from the New World (*Plantes et cultures* 1992), there is no doubt that maize exerted a special influence on both the old continent's food habits and the crucial changes which occurred in its agricultural landscape during the modern age (Sereni 1997). In 1511, Pietro Martire d'Anghiera, from Lombardy, wrote about it for the first time in his book *Decade de Orbe Novo* and, in 1532, maize was already mentioned in Italian herbals (Doria 2002, 570-571; Gentilcore 2017). As was usual with rare and exotic plants which originated from distant lands and bore suggestive names evocative of the East (Heine 2017), maize initially found its placement in the gardens, where it drew attention and curiosity (Ambrosoli 1992). However, its transition from gardens to cultivated fields took place quickly (Rebourg 2002), since the use of this plant from the Indies immediately took hold in livestock feeding (Cazzola 2014). Moreover, maize waste produced useful fuel and mulch. At the end of the sixteenth century, Agostino Gallo from Brescia devoted several pages of his essay *Le giornate di agricoltura* to the subject of maize, thus demonstrating that this cultivation was becoming familiar as well as widespread in many areas of the Italian countryside.

Imported in Italy from Spain towards the end of the fifteenth century, maize was already being cultivated in the Venetian mainland during the first half of the sixteenth century (Finzi 2009). During the following dec-

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ades, the maize-planted area in the Italian Peninsula grew so much that it included Tuscany and Terra di Lavoro, before reaching its final state in the early seventeenth century. In 1620, maize made its appearance in the irrigated lands of Bergamasco, therefore taking hold in the Ferrara area. Around the 1660s, maize spread in Lombardy where, in 1649, the Municipality of Milan had ordered the city to be supplied with this new cereal (Coppola 1979; Cova 1992). Maize crops continued to propagate during the second half of the seventeenth century by reaching Treviso, Vicenza and Padua. Over this same period, it made its appearance, though episodic, in Umbria and Marche. In the eighteenth century, it spread further to Piedmont and to the Bologna area. The *blé de Turquie* even arrived in the southern areas (Cuocco 2008) where, due to the climate, wheat was the most common crop. However, during the modern age, a dualism in cereal cultivation took shape which immediately affected the landscape: on the one hand, there was the south with its wheat fields, which were an emblem of dry agriculture, while, on the other hand, there were the northern valleys, where the coexistence of maize and wheat produced a much more variegated agricultural space, far richer in feeding options, both for people and livestock. At the same time, the spreading of maize crops improved peasants' as well as merchants' commercial strategies which, starting from the mid-seventeenth century, had a greater choice of products to be placed on the market, according to trends in harvests and prices (Levi 1991).

Public authorities and large landowners, merchants and small street vendors started to impose the cultivation of maize on the peasants, though facing much resistance due to the fact that, in several lands, its planting resulted in a reduction in other cereal crops, such as rye and millet, which had been for centuries essential parts of diets and cultivation practices. Anyway, in the light of the immediate advantages that it offered, maize took hold as a minor grain, soon becoming the typical food of both rural and urban lower classes (Mocarelli 2015). Although representing a makeshift food, compared with the finer wheat, maize provided peasants and the poor urban class with a useful solution to satisfy hunger and remove the threat of it. Moreover, other reasons favoured the peasants' overcoming their initial resistance and contribute to explaining the spreading of maize in the European, and consequently Italian, countryside. First of all, as mentioned above, maize represented a fairly reliable and steady food not only for people, but also for the livestock, which was soon fed with it. Even though specific research concerning the connections between the in-

crease in maize crops and the increase in livestock, especially bovine, is still lacking, the latter increase was a rather manifest phenomenon during the eighteenth century. Research focused on the role played by maize in peasant self-consumption (Visceglia 1991) should be deepened too, so as to include, for instance, the use of waste in the production of mattresses and fuel, which became more common in popular houses. These themes should in fact find their place within the articulate debate devoted to the gradual improvements in the rural classes' health and quality of life, which represented a fundamental prerequisite of the demographic acceleration of the eighteenth century (Livi Bacci 1987).

On the basis of a rich bibliography, which allows us to compose a solid historiographic framework, this work aims at moving from a general approach towards a more regional one, focused on companies' behaviour. The case study of Umbria, a region located in the centre of the Italian Peninsula, offers the possibility to verify the general theories. The chronological frame selected for this investigation ranges from the early eighteenth century, when maize – called *mais*, *granoturco* or *formentone* in Italian – began to regularly appear in the region (Franconie 1997; Messedaglia 1927), to 1861, the year the Italian Kingdom was founded. This research, embracing almost a century and a half, aims at better defining the time frame of the spreading of maize in Umbria; from its first appearance to its systematic presence among the cereals traded in the regional markets and grown on local farms. Available data from companies' and markets' accounting books (from Assisi, Gubbio, Perugia and Orvieto) provide us with information not only relevant for understanding the regional features, but also for elaborating long-term interpretations.

Other than determining the phenomenon's time frame, the goal of this study is to elaborate tables regarding trends in maize prices by composing a single regional picture through the aggregation of data derived from different sources. A comparison of maize prices from different markets and different companies allows us to identify potential strong differences among them or rather a general convergence tendency. As is well known, research aimed at identifying divergences or convergences in the *Ancien Régime* markets (Epstein 2002) usually refers to wheat prices, for obvious reasons. Without overlooking the relevance of wheat in the preindustrial society, this case study refers to maize prices in order to achieve two main goals: firstly, to ascertain whether trends in maize prices are diverging or converging depending on the examined commercial areas and, secondly, to

draw a comparison between the evolution of maize and wheat prices in order to eventually verify the possible emergence in the early modern period of a single market of cereals made up of finer grains, such as wheat, and of grains reputed to be of lower quality, such as maize (Vivanti 1967).

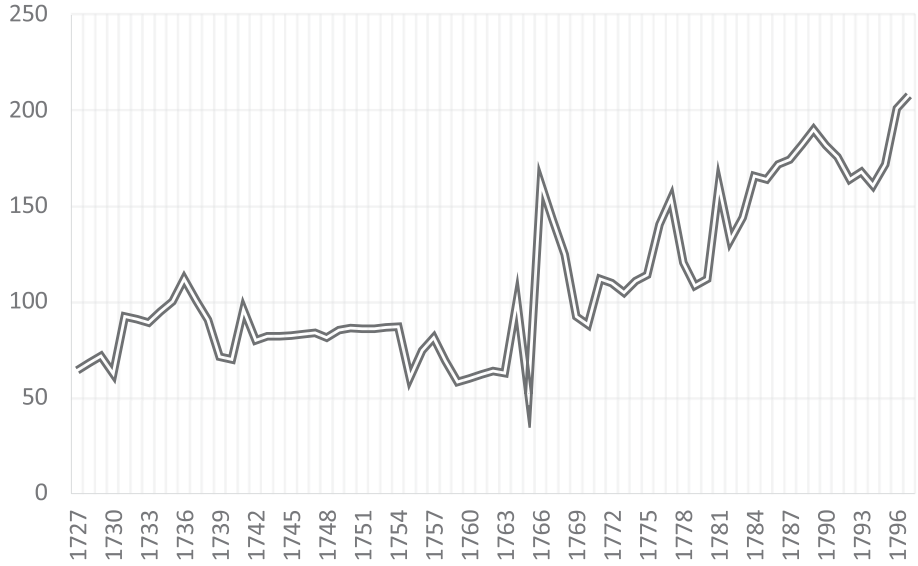
The third goal of this research is that of assessing the information derived from the accounting records of farms in order to specifically appraise the relevance of maize among their crops. Moreover, large companies' accounting records give more than a hint regarding food prices (Poni 1978) which, in some cases, allow us to compose fairly consistent and prolonged series. These series are an interesting key to the understanding of the big owners' economic strategies, while at the same they allow us to evaluate trends in maize prices from two points of view which are comparable: "market prices" from records in the accounting books of city markets, and "company prices" from records in the companies' accounting books.

Maize in Umbria's markets and farms

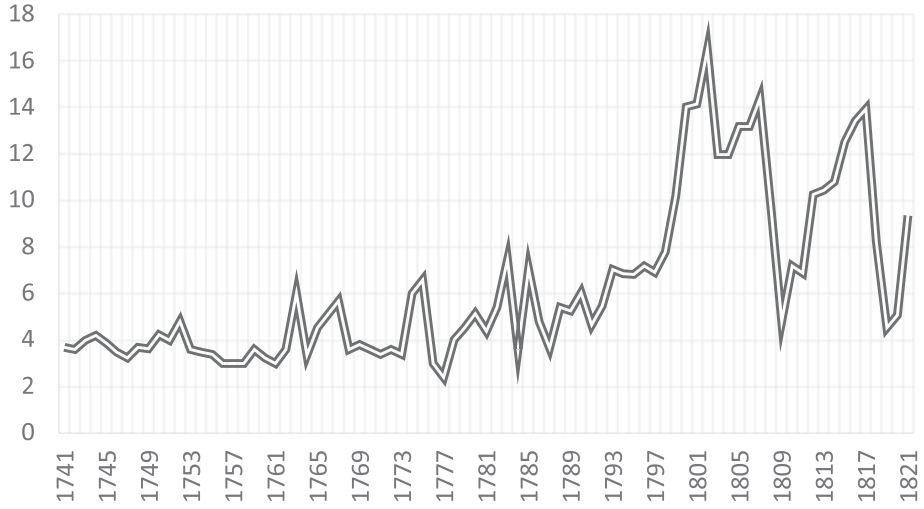
Sharecropping affected the evolution of agricultural activities in Umbria until the second half of the twentieth century (Nenci 1989), while maize began to spread throughout this Italian region in the early eighteenth century. At the beginning of the eighteenth century, maize had indeed made its appearance, not only on farms but also in urban markets, thus demonstrating that this new plant, which would soon transform the agricultural landscape, was not restrained to the agricultural sphere. On the contrary, urban markets played a fundamental role in the success of this plant from the Americas. Records from the market of Gubbio provide evidence of the price of a *mina*[1] of maize since 1727 (Graph 1). Chronological findings from other cities place the appearance of maize around the mid-eighteenth century: in Assisi in 1741 (Graph 2) and in Perugia in 1766.

Evidence concerning the second half of the eighteenth century reveals that the maize crops had already taken hold in the lands around Perugia; a situation which would improve further under French domination. Nonetheless, maize became a steady presence in the Orvieto market only after 1813 (Graph 4). This timeline is the same as in the nearby cities of Tuscany (Mocarelli and Vaquero Piñeiro 2018) where maize trade also took hold around the end of the eighteenth century: since 1780 in Sarteano, 1793 in Castiglione Fiorentino, and 1802 in Cortona.

1 73.00 litres

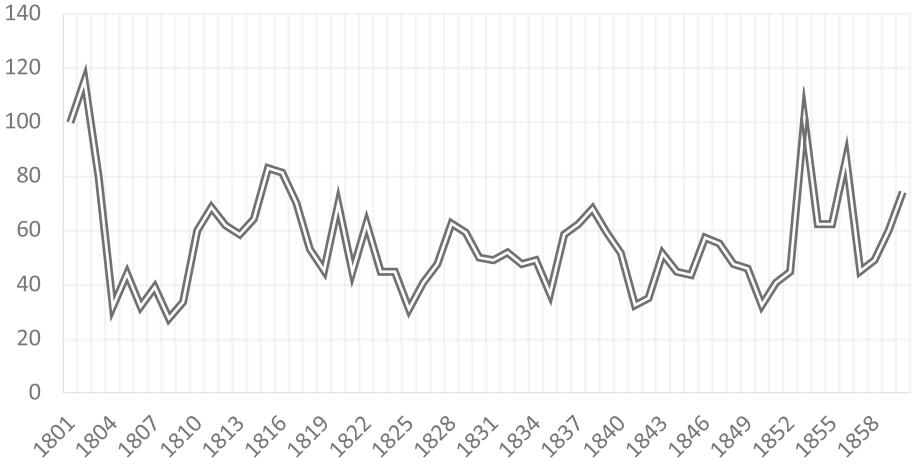


Graph 1. Maize prices in Gubbio, 1727-1796 (in *Baiocchi* per *mina*)
Source: Mocarelli and Vaquero Piñeiro 2018.



Graph 2. Maize prices in Assisi, 1741-1821 (in *Scudi* per *rubbio*)
Source: Mocarelli and Vaquero Piñeiro 2018

Graph 3. Maize price index in the markets of Gubbio and Assisi, 1727-1821
Source: Author's data processing of Graphs 1 and 2.



Graph 4. Price of a *staio* of wheat, Sicily's wheat and Orvieto's maize, 1801-1860.
Average index (1810 = 100)
Source: Mocarelli and Vaquero Piñeiro 2018.

Once established that maize entered Umbria's market during the eighteenth century and took hold there in the transition to the nineteenth century, it is important to verify its presence in individual city markets and to determine in which period it started to actually be cultivated in local

farms. Theoretically, these two phenomena may not concur since city market supplies of seeds and cereals hinged upon several factors other than the companies' production, such as imports from other regions and the dissemination capability of seed and cereal traders. By examining the phases of maize expansion in Umbria, a complex scenario emerges. On the basis of available findings regarding this region, it seems therefore possible to introduce some variations to the theory according to which maize firstly appeared on farms and, later, in the markets (Levi 1991, 156). In our case study, in fact, the two processes have proved to be concurrent. Before addressing the data derived from the farms' accounts, it is necessary to focus on two of Umbria's neighbouring regions: Marche and Tuscany. In the Marche region, first records about the presence of maize among the local crops refer to the last years of the seventeenth century when initial small quantities were attested, which demonstrate that maize was still a novelty (Moroni 2016). In the case of Tuscan farms too, maize made its appearance among other crops during the last years of the seventeenth century and then took hold in the early eighteenth century (Mineccia 1983). The available information suggests that maize arrived on Umbrian farms at the very beginning of the eighteenth century, following a north-to-south route through the Tiber Valley. Awaiting new findings which will prove this hypothesis, we can only affirm at the moment that maize firstly appears in the accounting records of the Bufalini family from San Giusto in 1707 (AB, 359, 110). This is a relevant piece of information because, due to the closeness of Bufalini's lands to Tuscany and their commercial relations with the Emilia region, it allows to hypothesize that this geographical area was one of the main paths of maize to Umbria. Not by chance, data concerning the central part of the region are chronologically successive. In the Pio Collegio of the University of Perugia, the first reference to maize dates back to 1766 (AUP, *LEU*, 1766-1784); on the properties of the noble family of Bourbon di Sorbello the first reference to maize appears in 1806 and, in this case, it is called "Sicily wheat" (ASP, *ABS*, I, 59). Another evidence of the nineteenth century consolidation of maize presence on large Umbrian farms comes from the Degli Oddi family's lands where, in 1802, the distribution of small quantities of maize seeds was noted for the first time among small farmers. After these first steps, maize was able to spread quickly. Likewise, in the case of the lands of the Benedictine monastery of San Pietro in Perugia, maize regularly appears on the list of crops only after 1816 (AMSPP, *LE*, 49). At present, it is therefore evident that in the early eighteenth century,

maize had arrived in Umbria almost concurrently in both city markets and farms and afterwards continued to strengthen its presence until the first half of the nineteenth century. It still remains to be clarified whether the maize traded on Umbrian markets was actually cultivated on local farms or was rather imported from other regions. Compared with the well-researched subject of the wheat commercial circuits, however, maize marketing is much less known, as if it was exclusively meant for family consumption (Galli 2016). Actually, alongside the self-consumption among peasant families, the steady presence of maize in city markets induces to envision the emergence of a diversified cereal trade during the early modern period, no longer dominated by wheat but by two cereals: wheat and maize. Moreover, with the entry of maize into the markets a greater range of trade options emerged with regard to demand and offer.

Although fresh research is needed in order to deepen this analysis, especially regarding the main actors of the maize trade, a plausible starting point is the knowledge that maize was systematically cultivated in Umbria at the beginning of the nineteenth century. From that moment on, farming activities were based on a wheat/maize alternation which endured until the mid-twentieth century (Desplanques 1969; Vaquero Piñeiro, Giommi 2017). Moreover, though a direct connection between the spreading of maize and population growth still needs to be proved, the strong population growth registered in Umbria, lasting almost a century, should be seen as more than a mere chance. Between 1802 and 1911, an 88% population increase was recorded (Bonelli 1967, 29). In order to understand such a positive trend, it is necessary to consider both the physical and the psychological effects that the greater availability of food produced on the lower classes. Despite its poor nutritional properties, in fact, maize offered a precious alternative to the constant danger of hunger and famine (Alfani 2010; Alfani and Ó Gráda 2017). Obviously, the downside of the unbalanced maize consumption was pellagra, though the link between this disease and maize did not become commonly known until the nineteenth or even the early twentieth century (De Bernardi 1984; Finzi 1982).

Maize prices in Umbria (1700-1861)

There is no need to remind you that trends in wheat prices have brought about the elaboration of detailed series of prices and several theories about economic and demographic cycles in the *Ancien Régime* European society (Romano 1967). At any rate, while researching the trends in prices and

wages in Milan during the eighteenth century, Aldo de Maddalena brought scholars' attention to the need to include maize among the commodities which determined offer and demand on the Milan market (De Maddalena 1974, 108).

It must be emphasized that the results of the analysis based on data concerning Umbria are still partial and provisional. However, despite difficulties in interpreting different currencies and units of measurement, depending on different markets and geographical areas, the collected findings highlight perfectly synchronized prices in all the markets considered. This allows us to recognize some general phases relevant for all the areas examined. The first long phase of relatively steady market prices can be identified from the first half to the 80s of the eighteenth century, which was interrupted between 1765 and 1767 and between 1774 and 1775 by two intervals of growing prices. In Assisi, from 1741 to 1764 the average price of a *staio*[2] of maize was around 3.69 *scudi*[3], which later grew to 5 *scudi* between 1765 and 1767; once the subsistence crisis of the 1760s had been overcome (Gori 1989, 573), a *staio* fell to 3.5 *scudi*, with the exception of the 1774-1775 interval when the maize price started to rise again up to 6-6.6 *scudi*. Between 1778 and 1798, average prices in the Assisi market (Graph 2) began to move upwards, reaching 5.68 *scudi*. This represented a 54% increase compared with the mid-century prices. These data can be compared with those from the Gubbio market, where maize prices were expressed in *baiocchi* for a *mina* (Graph 1). In this second case too, we can observe a phase of price stability lasting until 1765, followed by a phase of increasing prices between 1766 and 1768, when the price of a *mina* of maize reached 143 *baiocchi* (between 1766 and 1768 the average price was 77.9 *baiocchi* for a *mina*) before dropping again to 103.20 *baiocchi* in 1775. Both in Gubbio and in Assisi, from the mid-70s to the end of the eighteenth century, maize prices experienced a significant growth: between 1776 and 1797 a *mina* reached the average price of 161.5 *baiocchi* per year, that is a 107% increase since the middle of the century.

The examined dynamics show that, during the eighteenth century and before the 1798 breakdown triggered by the arrival of French armies, it is possible to identify four phases in the trend of cereal prices in the Umbrian city markets: the first phase (1730-1764) marked by steady and low pric-

2 24.36 litres

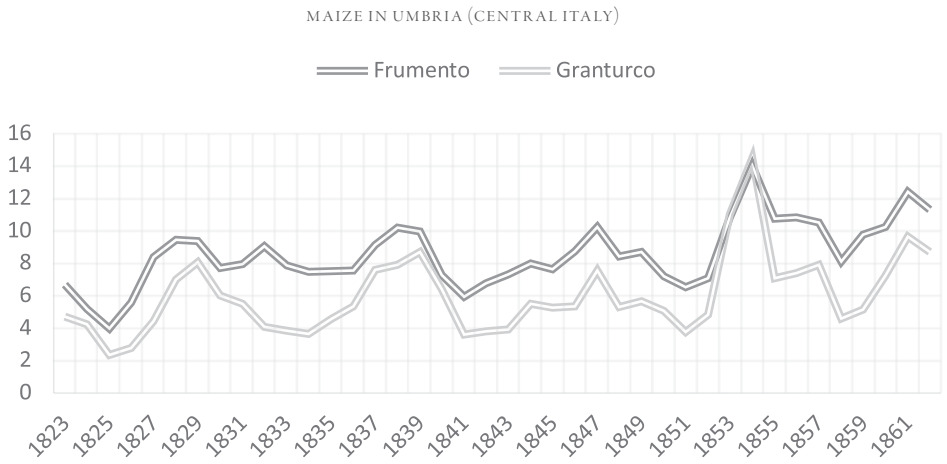
3 The *scudo* was the currency of the Papal States until 1866. It was divided into 100 *baiocchi*.

es; the second phase marked by a price growth between 1765 and 1768; the third phase marked by a new stability lasting until the second half of the 1770s and, lastly, the fourth phase of a new increase between 1776 and 1778, which stopped with the end of the century due to the invasion of Jacobin armies. Generally speaking, the increases in agricultural prices that occurred during the second half of the eighteenth century favoured, for several reasons, the expansion of production (Caracciolo 1973, 547-548). By examining the cereal price fluctuations in the urban markets, it is possible to better understand the rationale for maize propagation in a region with Umbria's features, where soil and climate were not particularly suitable for this crop. In fact, it is possible to assume that the increasing prices induced to replace the traditional fallow fields with more useful crops, thus contributing to the shaping of a binary agricultural structure (wheat/maize) which would last until the great changes of the second half of the twentieth century.

Between the end of the eighteenth and the beginning of the nineteenth centuries, during the French military invasion, the available data regarding Umbrian markets show a significant increase in the price of maize. In Assisi, the average price of a *staio* between 1798 and 1817 was about 11.35 *scudi*, though it reached the value of 14 *scudi* in 1800-1801 and in 1807, and even of 16 *scudi* in 1802 (Graph 2). By comparing this trend with those of a few decades earlier, an increase of well above 127% can be registered. A mild slowdown took place only between 1808 and 1811, when the *staio* price fell to 6.80 *scudi*. However, even after 1818, notwithstanding a significant fall in prices, the average maize value remained double compared with the mid-eighteenth-century trend. In the nearby Tuscan city of Castiglione Fiorentino similar trends can be observed. Between 1794 and 1801, the price of a *staio* of maize was steadily around 6.6 *libre*[4], with a 64% increase from the 4.05 *libre* of the previous years. Similarities between these trends and those in Assisi allow us to speak about a contraction in 1801 followed by a substantial increase between 1810 and 1816, when a *staio* of maize reached the value of 6 *libre*. In 1817 a long phase of low prices began, thus determining a new trend which lasted until the birth of the Kingdom of Italy in 1861. The only exception is the 1853-1856 interval, when the price of a *staio* of maize reverted to 9-11 *libre*.

During the nineteenth century, similar trends can be observed in the Cortona, Orvieto and Sarteano markets. The phase of increasing prices

4 Coin of the Papal States.



Graph 5. Wheat and maize market prices in Perugia, 1823-1862 (in *Scudi* per *rubbio*)
Source: ASPG, *AA*, series 7, no. 5.

which marked the period between the end of the eighteenth century and 1817, with a temporary contraction between 1804 and 1810, was followed by decades of stable and low prices, with the exception of short periods of price recovery (1828-29, 1838-39, 1853-54). It is important, at this stage of the research, to point out the strong chronological synchrony exhibited by the different markets examined, which were located on both sides of the border between the Grand Duchy of Tuscany and the State of the Church (Biagioli 2000, 523). In fact, this means that, though belonging to two different political institutions, these markets shared a common price trend due to the sharing of a common commercial network, thus contributing to the shaping of a single and integrated economic space (Persson 1999).

Another important issue to address concerns the interaction among prices of different cereals. Our first study case in Umbria is the city of Orvieto (Graph 3), where the price trend of different cereals on the city market (wheat, Sicily wheat and maize) can be traced from the beginning of the nineteenth century until the birth of the Kingdom of Italy in 1861. Looking at this trend, it is possible to notice that increases and contractions in the prices of different cereals follow a similar pattern during the first half of the nineteenth century, thus confirming the emergence of a single market despite the adoption of different cereal policies on the part of the pre-unitary Italian States (Pescosolido 2007). A synchronized pattern also marked wheat and maize prices in the Perugia cereal market (Graph 5). Even in the main Umbrian city it is indeed possible to identify, during the first half of the nineteenth century, a prolonged phase of partial stability which start-

ed in the 1820s and ended in the early 1850s, when sudden surges in prices took place between 1852 and 1853 and between 1856 and 1857. During its last ruling years, the Church reimposed low prices especially for maize, while wheat prices continued to be high, on the backdrop of an overall fluctuating trend which endured from 1857 to 1861.

In the market of Sarteano, a small town located between the State of the Church and Tuscany, the price trends of the two main cereals appear perfectly synchronized from 1780 to 1835, with parallel surges and downward trends. Overall, five phases can be identified in the markets of the cities examined. The first phase of moderate prices lasting until 1792 was followed by the second phase of a price increase between 1793 and 1803 (an 85% increase for wheat and a 152% increase for maize), the third phase of a new downward trend until 1810, and by another remarkable increase between 1811 and 1817 (a 62% increase for wheat and 90% for maize). At the end of the French invasion, prices decreased again until they reached the same levels as in the 1780s. Alongside this synchronized trend of wheat and maize prices, it is possible to observe that in the most critical periods (1793-1803 and 1811-1817) there was a clear reduction in the value difference between the two cereals, due to a more sensitive increase in maize prices. In fact, in the three phases of market calm (1780-92, 1804-10 and 1818-35), the gap between wheat and maize prices reached 43-47%, while it dropped to 28-37% during the periods of greater instability (1793-1803 and 1811-1817). As demonstrated by research carried out on both French (Labrousse 1932) and Italian study cases (Malanima 1976; Gori 1989, 573), this was due to the fact that, in a time of crisis, reduced food supplies tend to favour the most expensive cereals by neglecting the humbler ones. In consequence, in these periods many peasants and small owners who would have been able to satisfy their family food needs with their own production under normal conditions, were forced to resort to the market, thus triggering a price increase due to the growing gap between an increased demand and a reduced offer. This twofold mechanism is clearly manifest in the case of maize which, in times of famine, tended to disappear from urban markets and become a rare and expensive commodity for the low classes, while coming back in periods of a price decrease.

Maize cultivation on large agricultural estates

Having retraced the timeline of the spreading of maize in Umbria and examined its price trends, with special attention paid to the emergence of a

single commercial space marked by converging prices, we can now focus on sources concerning farms' activities in order to investigate, though in the form of a primary survey, the role played by large landowners in determining the maize offer. To this end, it is possible to consider the data regarding some Umbrian farms' activities throughout the nineteenth century. Between 1816 and 1850 the Casalina company (Table 1) – the core of the land property of the San Pietro Benedictine monastery in Perugia – produced about 2,960 *staia* of maize and wheat, with a clear predominance of wheat which amounted to 63% of the company's entire cereal harvest. Obviously, over an almost 30-year period there were significant fluctuations, during which maize moved from a minimum percentage of 14% in 1817 to a maximum of 63% in 1844. Between these two extremes, it averagely ranged from 37 to 44% of the cereal crops.

Table 1. Wheat and maize production in the Casalina company of the Perugia San Pietro monastery, 1816-1861 (*Staia*).

Years	Wheat	Maize	Total	% of maize in total amount
1816	2,113	808	2,921	28
1817	3,507	572	4,079	14
1818	2,515	1,019	3,534	29
1841	1,916	870	2,786	31
1842	2,135	1,593	3,728	43
1843	1,312	1,052	2,364	44
1844	1,312	1,052	1,656	63
1845	892	737	1,629	45
1846	854	475	1,329	36
1847	1,894	1,186	3,080	38
1848	1,392	823	2,215	37
1849	2,484	1,121	3,605	31
1850	2,850	1,650	4,505	37
1850	2,542	1,477	4,019	37
Median	1,966	994	2,960	37

Source: AMSPP, LE, 409 and 410.

On other Umbrian farms, maize production was probably even greater, though the available data do not provide a precise overview since they

often lack details about cereal quantities and qualities (Bonelli 1967, p. 154). Not even the Gregorian Land Register, compiled in the State of the Church, allows us to go beyond the generic divisions of cultivated plants. By not providing precise indications of the different types of cereals, the information obtained allows us only to speak of "sown" plants (simple or those with trees and vines). This lack of information confirms the companies' habit, already demonstrated during the previous centuries, of taking only generic records about their cereal crops, without adding details about their production (Chiacchella 1996; Biagioli 1975). In Umbria the seeds were intended for about 35% of the cultivated land but it is completely impossible to know the precise part destined for the production of wheat, maize and other minor cereals (Chiapparino and Moroni 2006). In the absence of more precise findings, the information taken from the accounts of farms, at least the largest and best organized ones, offers the possibility of obtaining an image that better reflects the agricultural reality of the region.

Considering the limits of the sources available, the findings concerning cereal production in the lands belonging to the Marquis Bourbon di Sorbello indicate that the cultivation of maize had a greater relevance there.

Table 2. Wheat and maize production in the Marquis Bourbon di Sorbello's properties, 1809-1820 (*Staia*).

Years	Wheat	Maize	Total	% of maize in total amount
1809	1,710	1,242	2,952	42
1811	704	1,164	1,868	62
1812	1,770	2,426	4,196	56
1816	1,924	1,406	3,330	42
1818	2,296	2,198	4,494	49
1819	2,258	2,966	5,224	57
1820	1,676	3,346	5,022	67
Median	1,762	2,107	3,869	54

Source: ASP, *ABS*, series I, n. 59, 10.

In fact, on the properties of the Marquis Bourbon de Sorbello at the beginning of the nineteenth century, maize averagely represented 54% of cereals, with the peaks of production of 62% and 67% in 1811 and 1820 respectively. These high rates lasted a long time, since from 1868 to 1879 maize still

represented 55% of the cereal crops on this family's properties. This is an indisputable demonstration of the relevance of the maize crops, though a further investigation is still needed in order to better understand the farming choices of any single landowner. Unfortunately, this research did not consider the production choices of the small owners, with reference to both the owners who lived in a composite rural society as well as those who owned agricultural plots close to their homes. In order to draw a wider picture combining both larger and smaller production strategies, it will be necessary to broaden this research by including data from the accounting books of other local properties, regardless of their dimension. It will be further necessary to analyse not only the general trend, but also the choices made by any single producer, both large and small ones, as well as urban and rural ones, in order to adapt their activities to the commercial policies imposed by the public authorities during the nineteenth century (Pescosolido 2004, 100-102).

In any case, the existing documentation concerning large farms allows us to examine other examples of cereal cultivation practices, such as the case of the *beni adiacenti* property, a cultivated land owned by the San Pietro monastery in Perugia. As the name reveals (*beni adiacenti* = adjacent properties), this property consisted of the cultivated lands located just outside the religious building and therefore considered a privileged asset, managed with special care for the introduction of the latest agricultural innovations. On this property, in fact, the production scenario was much more diversified than one could imagine, with a variety of cereal crops which included wheat, maize and durum wheat (*grano duro*). By comparing the volumes of the Casalina company's production with those of the *beni adiacenti*, it is possible to observe that in quantitative terms the first company was undoubtedly the larger one, while the second company prevailed in terms of wheat and durum wheat production, two kinds of cereals traditionally employed in the pasta industry. The *beni adiacenti* company therefore demonstrates a much more varied cereal production, combining different wheats and maize, together with the search for a finer quality in order to satisfy the demand of the nascent pasta factories. Evidence of the presence of these three cereals on the *beni adiacenti* lands dates back to the early nineteenth century and, though it needs to be confirmed by further research, it suggests that this company had adopted a diversified production strategy that, between 1824 and 1860, allowed it to obtain an average production of 610 *rubbii*[5] of wheat, 346 of maize, and 290 of durum wheat per year.

5 Between 284 and 294 litres.

Regardless of the differences among the single study cases, the existence of a cereal crop diversity demonstrates the emergence, from the first decades of the nineteenth century onward, of an agricultural strategy aimed at satisfying different demands, from the consumption of peasant families and monasteries to supplying urban markets and the pasta industry. This production segmentation, which derived from a growing diversification of demand, is confirmed by the price differences among cereals. In the case of the company of the Perugia San Pietro monastery, for instance, at the beginning of the nineteenth century a *rubbio* of maize was worth 5.1 *scudi*, a *rubbio* of wheat 7.7 *scudi*, and a *rubbio* of durum wheat 8.28 *scudi*, thus demonstrating the existence of different commercial as well as consumer circuits.

From a different point of view, large landowners' accounting books also allow a comparison between the cereal company prices and the cereal urban market prices. Regardless of the difficulties caused by the use of different ancient currencies and units of measurement, it is possible to compare the prices of the examined companies with the series of prices from the Orvieto market for the years from 1824 to 1860. The result is surprising: the price of a *rubbio* of maize turns out to be 5.1 *scudi*, the same in both the *beni adiacenti* company of the Perugia San Pietro monastery and the Orvieto market. We have therefore identified a uniform price which demonstrates once again the existence of widespread market relations that induced a progressive integration of commercial spaces (Herranz Loncan 2016) by overcoming the restrictions of the single local economies (Malanima, 2009). Other clues point in this direction. Between 1825 and 1853, a *rubbio* of wheat on the lands of the Marquis Bourbon di Sorbello's company was worth 8 *scudi*, exactly as in the company of the San Pietro monastery and in the Orvieto market. All these data confirm the shaping, during the eighteenth and nineteenth centuries, of an integrated economic area for cereals. Wheat and maize crops, as mentioned above, were progressively integrated and they gave life to a single commercial space.

Conclusions

The paper confirms the chronology of the spreading of maize on the Italian Peninsula. Using the region of Umbria as a case study, it has been shown how maize arrived in the early eighteenth century. In addition to the need for more information on the routes through which maize spread, what is evident is the existence of a time difference between the appearance of maize

in urban markets and on farms. The relationship between urban markets and farms must be better studied in order to learn about the economic and agricultural context that allowed the consolidation of maize. The work also highlights how a single cereal market was formed during the 18th century. The trends of maize and wheat prices are convergent. From this point of view, the research should be deepened, however, the data presented are very clear. The prices of wheat and maize show a total convergence and this applies to a large geographical area where unique prices prevail. This aspect is of great importance to better understand the functioning of preindustrial markets. The existence of a single cereal market is confirmed by the convergence not only of the prices on city markets but also of the similarities between the predominant prices on urban markets and farms. The study shows the need to increase our knowledge of the commercial and production circuits that were formed in Europe during the modern age, following the consolidation of maize on markets and farms.

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AB: Archivio Bufalini, San Giustino, Perugia, Italia

AMSPP: Archivio del Monastero di San Pietro, Perugia

LE: *Libri Economici*

ASPG: Perugia Archivio di Stato di Perugia

AA: *Archivio Antonini*, serie 7, numero 5.

ABS: *Archivio Bourbon di Sorbello*

AUP: Archivio Università di Perugia.

LEU: Archivio Collegio Pio della Sapienza, Libri entrate e uscite

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Innovations in agriculture and population growth in Friuli (north-eastern Italy, seventeenth century)

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Introduction

More than two centuries after the publication of Thomas Malthus' *Essay on the Principle of Population* (1798), the debate about the relations between population and resources continues. According to Malthus, population grows as long as there are sufficient food resources for its livelihood. If the number of inhabitants in a given territory exceeds the land capacity to produce enough food for its maintenance, then repressive checks restore the equilibrium. This return to balance is achieved by famines, by epidemics, and by wars. Alternatively, populations may put in place preventive checks that leverage their ability to contain their growth by postponing the age at marriage, increasing celibacy, and abstaining from sexual relations.

In more recent times, Malthus' vision was overturned by Ester Boserup (1981). According to this scholar, a population increase would push innovations in agriculture that would allow an increasing number of people to be sustained by the same land surface. The conflict between the two perspectives, though it has generated a vast literature, is still unresolved, and there is no lack of attempts at conciliation[1].

Even within the framework proposed by Malthus, technical advancements may occur that allow an increase in production. In this case, the population can grow to higher numbers, but always without exceeding the

1 I have given here a brief summary of much larger debates. For a broad overview see Livi Bacci 2017.

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limits of land-carrying capacity. After a certain period, the pressure of the population on resources begins to make its effects felt again and, depending on the demographic behaviour adopted, a new, often unstable, balance is restored.

This paper proposes, within the framework outlined by Malthus, an empirical verification of population growth, determined by the increase in the carrying capacity of a territory. The paper explores this topic with reference to Friuli (north-eastern Italy) during the seventeenth century when maize cultivation began to spread.

The links between the spread of new crops and population dynamics have already been explored in the literature. It has, in fact, often been noted that where new crops can guarantee an increase in production, they stimulate population growth (Crosby 1972). Although this process has become common knowledge, there is little evidence of the causal relationship between the two factors.

Perhaps the most discussed example is potatoes and population growth in Ireland. The first studies date to the middle of the last century (Salaman 1949; Connell 1950). Malthusian assumptions about the relationship between these two elements have been critically reviewed, particularly in later works, but the pattern whereby the potato fuelled Irish population growth in the second half of the eighteenth century has been confirmed (Mokyr 1981). Recently, with reference to the whole of Europe, it has been estimated that the introduction of the potato increased the population of the continent by some 25% (Nunn and Qian 2011). There are also studies in this direction with regard to maize, though the diffusion of this cereal has been given an economic rather than a demographic reading. However, recently Chen and Kung (2016) studied the effect of the introduction of maize in China from the seventeenth to the twentieth century. They estimated a population increase of 19% between 1776 and 1910.

In Italy this topic was addressed by Giovanni Levi (1991). According to this author, "Technological evolution, particularly in agriculture, has not led, over the course of the three centuries from the sixteenth century to the end of the eighteenth century, to decisive turns of immediate effectiveness such as to allow production and the population to grow in a lasting and consistent manner. Only one innovation has had a truly revolutionary character: the spread of maize" (Levi 1991, 141). According to Levi, the introduction of maize allowed both a population increase and economic growth. However, the difficulty in identifying causal relationships has

also raised doubts about the real role of maize in population dynamics: "Presently, lacking reliable evidence on rural diets before maize introduction, any conclusion about its function in eighteenth-century population growth is premature, not very useful, and perhaps even misleading" (Finzi and Baiada 1985, 335). The issue, in short, is still under discussion. Here I intend to propose a further element of reflection on this topic, introducing some new aspects regarding the use of sources, the territorial scale, the time scale, and the reference period. It should be noted that: 1) The studies on the topic usually concentrate on the macro-territorial level, and propose comparisons between different areas. In this work, instead, the scale is regional and comparisons are made between communities. The research hypothesis is that what is observed at a regional level should also be observed at a more circumscribed level. 2) The time scale is typically measured in centuries. In this case, however, the time span is only three decades. The hypothesis here is that population growth can be observed as soon as the availability of resources begins to increase. 3) The reference period is usually the eighteenth century, when continental population growth is unequivocal. In this paper, instead, the first half of the seventeenth century is studied. If the cause of population increase is to be attributed to the introduction of the new culture, then the growth would surely be seen from the moment in which the innovation had its effects in terms of food availability.

After the introduction, I divided the paper into six parts. In the first part, making use of the literature on the subject, I briefly retrace the way that maize spread in Italy. In the third paragraph I describe, from an economic and social point of view, the territorial context of the study and present the sources. In the next part I reconstruct the distribution of maize in Friuli in the middle of the seventeenth century. In paragraph five, I illustrate the connections between the use of maize and population growth. In paragraph six, I analyse the results, and offer conclusions in the last part.

The spread of maize in northern and central Italy

We do not know for sure when maize was first grown in Europe. We know, however, that it began to appear in sources in the early 1500s. For Italy, the way in which maize spread has been known roughly for many years, not least thanks to Antonio Messedaglia (1927). Over the years, the growth of

maize research has better clarified its diffusion both regionally[2] and nationally (Cazzola 1991; Finzi 2009; Mantelli 1998). The cereal was also introduced in Friuli in the late sixteenth and early seventeenth centuries[3]. The price lists of Udine, the reference market for the whole Friuli region, included maize for the first time already in 1622, but its presence is certified in notarial contracts only after 1630 (Fornasin 1999).

At first, maize was considered a curiosity and its cultivation was limited to botanical gardens; then in later stages it spread to the countryside. It requires large quantities of water for its cultivation, so it is believed that it first spread on wetlands, where there were also higher yields. Afterward, it gained more and more space on dry soils, where, although the yields were much lower, its greater resistance compared to other cereals was useful. Maize competed with other spring cereals. In Piedmont, the initial success of the new crop was limited to areas where sorghum was preferred (Levi 1979, 1094). In Lombardy, the introduction of maize did not alter traditional rotation systems, but was limited only to replacing spring cereals (Coppola 1979). Finally, the same propagation models were observed for Emilia and Romagna (Poni 1963, 48; Cazzola 1991, 115-117; Bolognesi 1986, 167), and for Tuscany, where the spread of maize mainly replaced legumes (Mineccia 1983, 327). The new crop competed with other cereals that had a similar growing season. For this reason, therefore, its diffusion had only a limited influence on the cultivation of wheat and rye which, in Italy, were sown in autumn and harvested in June[4].

The spread of the American cereal in the countryside did not automatically mean that it was used for food. This question is fundamental for the present study, as we cannot speak of connections between this crop and population growth unless the stages of its consumption are outlined first. In Friuli, as in other areas of central and northern Italy, the peasant family, who worked on the farms of large landowners, used winter cereals, in particular wheat, for the payment of rents and as exchange goods. The rural population was mainly fed with spring cereals, while the urban population typically ate winter cereals. From this point of view, therefore, the spread of maize should represent a good approximation to the consumption of this cereal in the countryside. According to numerous studies, mistrust had

2 Piedmont, Levi 1979; Lombardy, Coppola 1979; Venetian, Fassina 1982, Gasparini 2002; Emilia, Finzi, Baiada 1985; Romagna, Bolognesi 1986; in comparative form, Mocarelli and Vaquero Piñeiro 2018.

3 The first attestation, however, dates back to 1600 (Morassi 1997, 184).

4 Regarding the agricultural calendar in Italy, I point out Istat 1937.

hindered the consumption of maize among rural populations (Levi 1979). There was also the fact that, at least according to Roberto Finzi (2009), it provided little energy, and after consuming it the satiety effect was short lived. In any case, these reserves were eventually overcome when maize presented itself as an alternative to hunger. As illustrated by Giovanni Levi, in relation to northern Italy, it became an important part of the peasant diet only after the great plague of 1630. But there is evidence that already during the crises of the second half of the sixteenth century it substituted the traditional food of the peasants (Cazzola 1991).

In Friuli, as in other areas of northern Italy, there was initial resistance to its consumption. Then, from the famine of 1629 onward, maize, in the form of polenta, began to spread on the peasants' tables, until it became, in the late nineteenth century, the dominant, and in many cases exclusive, food of a large part of the population (Fornasin 1999; Bof 2005). This spread had, as we know, significant consequences, not least in terms of health. Maize is heavily vitamin deficient, as it is low in niacin. Therefore, a diet based exclusively or almost exclusively on this cereal could lead to pellagra. This disease, though, is only observed frequently in Friuli and northern Italy during the nineteenth century, and therefore far from the period we are dealing with, when the diet of the rural poor was evidently more varied (De Bernardi 1984; Livi Bacci 1986; Robiony 2003).

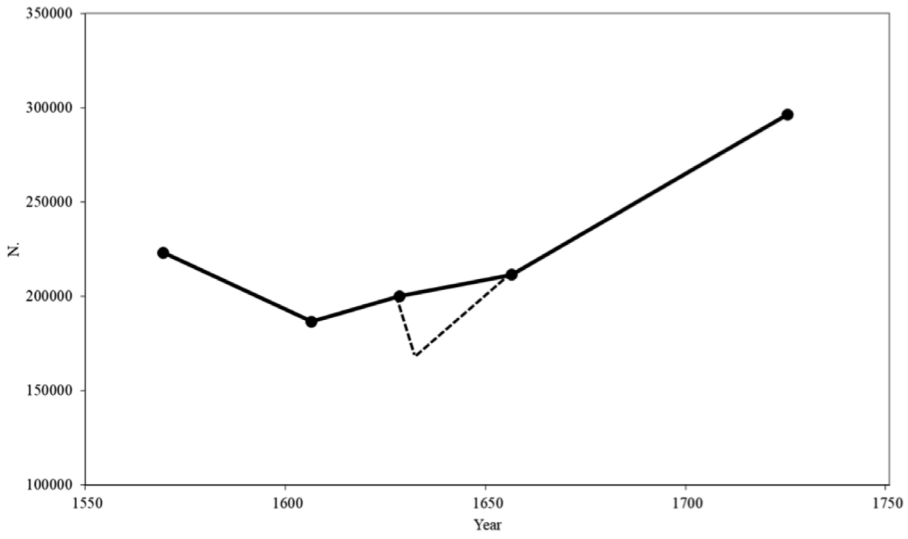
Despite initial difficulties, maize eventually became an important part of the diet. The new cereal was not only an efficient way to overcome crises. It was also the most advantageous crop, at least from the point of view of the grower/consumer, compared to the traditional spring cereals common in Friuli, such as red sorghum, buckwheat and millet. Although its nutritional value is close to other cereals that were cultivated in Friuli at the time[5], maize enjoyed other advantages over competing crops, in particular in terms of the yield ratio per unit area of land, and of the seed/crop ratio. Renzo Corritore estimated that, at the end of the eighteenth century, in some areas of the Po Valley the quintals/hectare ratio was 7.6 for maize, 5.1 for wheat, or 3.3 for other crops. The seed/crop ratio was 36.5 for maize, 4.1

5 In the tables of CREA (Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria) we see that there are no significant differences between cereals. They range from 1376 kJ of buckwheat to 1492 kJ of maize (red sorghum is not included in this database). Website: https://www.crea.gov.it/web/alimenti-e-nutrizione, accessed on 10 February 2020. Of course, varieties grown in the past could have given different results. For example, according to Malanima (1998, 163), the energy yield of wheat equalled 100, while that of maize equalled 162.

for wheat, and even lower for other crops (Corritore 2000, 41). The figures presented by Paolo Malanima for eighteenth-century Lombardy are different, but take us in the same direction: a hectare of land provided on average about 7.7 q of wheat, and 12.9 q of maize (Malanima 1998, 163).

Context and sources

The territory studied in this paper is the Patria del Friuli, the eastern part of the Venetian mainland. Friuli was economically backward compared to most of the kingdom's provinces. On the plains, the economy was based on agriculture, while in the mountains there were lively economic activities based mainly on the itinerant trade and some craft activities, but in the context of multi-activities (Morassi 1997; Bianco 1994; Fornasin and Lorenzini 2017). Craft activities were concentrated in urban areas.



Graph 1. Population of Friuli (1566-1725)

From the demographic point of view, Friuli was a sparsely populated area compared to the rest of the mainland states (Zannini and Fornasin 1999). According to the most recent studies (Fornasin 2001; Fornasin and Lorenzini 2016), there were about 225,000 inhabitants in the second half of the sixteenth century (Graph 1). At the end of the century, the population had decreased significantly. The causes of this decline are to be found in the plague of 1575-76, and in other mortality crises at the end of the sixteenth

century, but it is difficult to think only of short-term causes. After reaching one of its lows, the population began to rise. In 1606, there were fewer than 190,000 inhabitants; in 1628, about 200,000. The following year, the territory faced the greatest modern-age demographic crisis. Contrary to what had occurred in much of northern Italy, the crisis was not brought about by the plague, which only marginally affected Friuli in 1630, but by a terrible famine that plagued the territory in 1629. We do not know the quantitative outcome of the mortality crisis of that year, although it could have caused a decrease of about 20% of the population.

Many poor people, driven from the countryside, sought refuge and salvation in urban centres, e.g. in Udine, the capital of Friuli, and also in Venice. According to the Venetian chronicles of the time, 1629 was long remembered as "the year of the Friulians" (Ulvioni 1989, 39). Although we do not know how serious the decline in the population was from the year before the crisis to 1656, the population there reached only 210,000 inhabitants. From 1656 to 1725 we observe a further increase which saw the population reach 300,000 by the end of the period.

The period investigated in this paper belongs to the phase of population growth that extends from the crisis of 1629 to the mid-seventeenth century. The analysis is based on two documents, one drawn up at the end of 1629 or at the beginning of 1630, and the other in 1656. Like all the censuses carried out by the Republic until the second half of the eighteenth century, the territorial unit of reference for the collection of information was the community, and the trackers were the village heads (Fornasin and Veronese 1999; Fornasin 2001; Fornasin and Lorenzini 2019).

The first survey considered was directly promoted by the Venetian government following the crisis of 1629. The authorities wanted to know the quantitative results of the famine to predict with reasonable approximation what might happen in the near future, in particular with regard to population flows. As I have already noted, the crisis led to a very strong rise in mortality, but it also gave rise to important migration towards certain urban centres, in particular Venice. It was, therefore, important to understand what the consequences would be for the consumption of cereals in the city. One of the objectives, therefore, was to establish what quantities of grains Venice should bring together from the other provinces of the domain to deal with the emergency. The census results consisted of a list of 628 villages, for each of which the inhabitants are divided between *homeni*, *done* and *putti* (men, women and children). Then there are two further

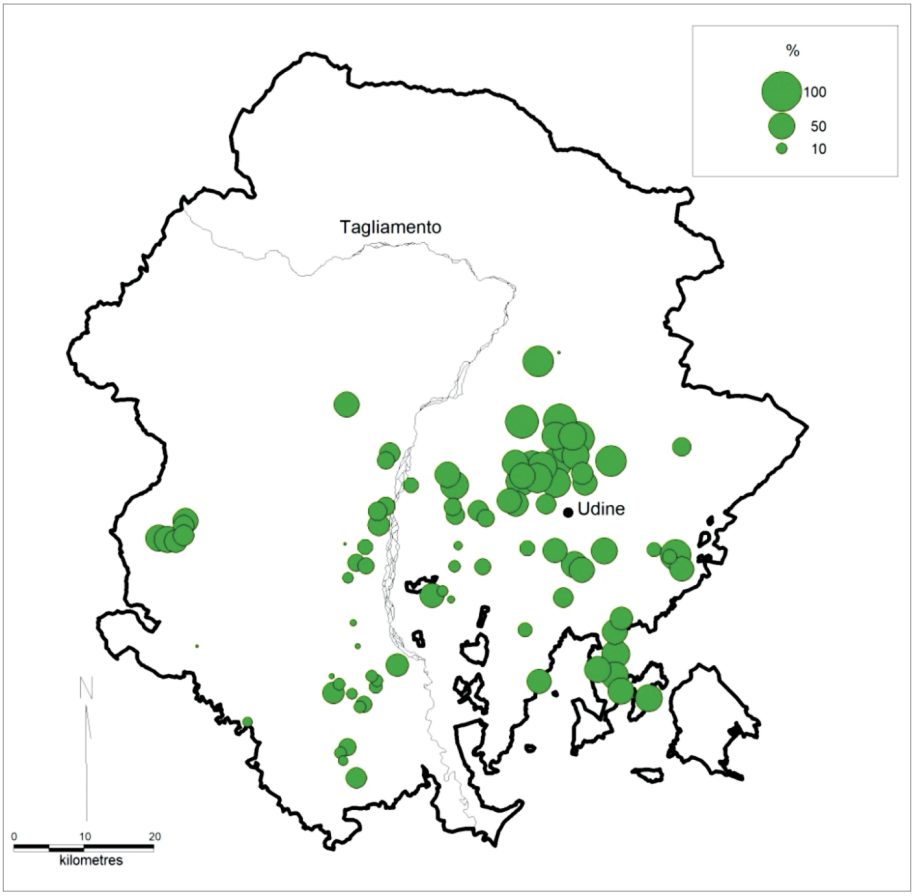
pieces of information: the number of deaths and the number of *assenti*, people who had temporarily emigrated to escape the crisis. Although the results of the census provide an important body of information, the territorial coverage was only partial. In fact, we estimate that several hundred villages are missing. In addition, the numbers of the deceased and absent were omitted for some centres. Some locations are repeated more than once and there are several other inaccuracies. Despite its shortcomings, however, the document is the most complete survey that has been passed down to us regarding the population of seventeenth-century Friuli.

The second census, called the Grimani Survey, the name of the Venetian governor in Friuli, was promoted by the central authorities in 1656. The War of Candia had been fought for more than ten years and the Republic was constantly looking for resources to continue the struggle. In this context, it decided to carry out a survey relating to Friuli to assess whether there was the possibility of extracting grains for the supply of the fleet. The survey has reached us largely incomplete and concerns 137 villages scattered throughout the country. To determine how much grain to extract, however, it was necessary to establish what the province's needs were. For this reason, the survey has two parts[6]. In the first one, all the households of individual communities are listed, often including the number of males, females and *putti*, and in some cases the names of individual family members. In the second part, information is provided on the stocks of cereals and legumes kept by the households in their granaries. In this regard, two clarifications must be made: 1) The investigation took place in November, therefore a short time after the harvest of the spring cereals, when only a small part of these cereals had been consumed, while more than five months had passed from the harvest of the winter cereals. 2) Spring cereals, since they were the basis of the rural classes' diets, were kept in private homes, while winter cereals were largely transferred to the manor houses, to monasteries, and to the public granaries of urban centres. The 1656 survey is an important and, in some ways, unique document, because it allows us to connect the demographic and the economic characteristics of a considerable number of villages. Used jointly with the survey of 1629, it also allows us to study the evolution of the population of the Patria del Friuli, taking into consideration the different diffusion of maize in the territory at the end of the period.

6 The source was used partly in Pietra (1944) and in Fornasin (1999).

Maize in Friuli in the mid-seventeenth century

Before moving on to an analysis based on the information contained in the 1656 document, I am able to draw the distribution and diffusion of maize in the territory concerned in the survey. For this operation I do not use absolute data, but rather the percentage quantities at village level. That is to say, the percentage of maize compared to the total of cereals with the same sowing and harvesting period. The results of this processing are summarized in Map 1. The map gives an account of the territorial distribution of the centres involved in the survey and also of the distribution of maize. The size of the circles is in direct proportion to its percentage.



Map 1. Maize percentage in total spring cereals. Friuli 1656

Although the survey is incomplete in terms of territorial coverage, the map allows us to identify quite clearly the areas where maize was most widespread. The geography thus outlined also shows us the spread of the new cereal a few decades after the start of its use as a food.

In the lower eastern Friuli region, all the villages involved in the survey were rich in maize. This situation seems to be the same towards the north, in the villages near Udine. Here the diffusion area opens, and involves a wide range of locations north of the city. The substantial number of observations relating to this area assigns, without exception, high percentages of maize. It can be concluded that this was the Friulian area most suited to the cultivation of maize. To the east of the Tagliamento River, the new crop was an important reality in some villages of the western foothills, perhaps for the same reasons it was widely cultivated in the nearby Belluno area (Fassina 1982, 47-50). In the rest of the Patria, with a few notable exceptions, maize was present to a lesser extent or was completely absent. To the east of the north-south axis that passed roughly through Udine, maize was, in the areas covered by the Grimani Survey, completely absent in the eastern mountain district. In these territories, wheat, rye or even oats were alternated in crop rotations with red sorghum and buckwheat. To the west of this same axis, maize is attested in much smaller quantities than the average, both in the low and the medium plains. Similar results have been obtained by analysing the plain to the east of the Tagliamento River, where the cereal was used least. A different situation applies to the more northern territories. The location of maize in seventeenth-century Friuli, as it emerges from the Grimani Survey, is in some ways surprising. To date, it has been frequently suggested that maize cultivation began in the marshy areas of the Veneto countryside. These data suggest, however, that an early start was not followed by an equally early affirmation. In 1656, a good part of the lower plain was still poor in terms of maize. Most of the American cereal was found in its eastern part, while in the western part it was only found in the foothills. There is absolutely no information on the northern part of the province, but since it is an Alpine area, the relevant territory imported most of the cereals from the outside. This distribution of maize only partially follows the physical and climatic subdivisions of the province, and seems rather the result of other processes which, at the moment, I am not able to identify. One hundred and fifty years later, things were very different. According to a nineteenth-century survey, maize was widespread with percentages close to 90% across the region.

On the basis of the information contained in the surveys of 1629 and 1656, I am able to study the evolution of the population of 116 villages, which rose from 26,649 inhabitants to 28,760. Considering that the most terrible famine in the history of Friuli had occurred close to the first date, there is no doubt that the population was resilient. However, although the population had grown between 1629 and 1656, there were different trends in different communities. In 38 villages the population, in fact, decreased. It is possible, of course, that some of the results are incorrect, but the general trend that emerges from the available information cannot be subverted.

Maize and population growth

In this part of the paper I use data on population and on the availability of cereals to build a statistical model that allows us to see if the spread of maize determined the population growth of Friuli in the first half of the seventeenth century. The model is a multiple regression in which the dependent variable, or the characteristic that is explained by the other variables, is population growth between 1628 and 1656.

With this model I am not proposing a simple association between the presence of maize and population growth, but I introduce other variables that can help to explain its increase. The first, and the main one, concerns the diffusion of maize in individual villages, recognized as the percentage of the quantity of maize stored in the granaries of a village and the total amount of spring cereals. The second variable concerns the availability in absolute terms of spring cereals and legumes at the village level. This information was introduced as the quantities of per capita consumer products, limited to those used by rural populations, without considering wheat and rye, which may also influence population growth. The assumption is that there is a direct relationship between the availability of consumer goods and the population. It must also be said that, due to the survey methods, I suspect there is a serious bias in this information. The census trackers, who, as we have seen, were the heads of village councils, had every interest in underestimating the quantities of cereals. This underestimation, which we can consider systematic, certainly varied from subject to subject. On the contrary, I think that, if only to preserve a certain consistency in the data, these same officers were more careful to ensure a balance in the proportions of the different cereals, which is the method used in this paper to reconstruct the spread of maize across the territory. The third variable is the average number of members per household at the village level. The basic as-

sumption is that in a period of population growth, families tend to be larger than in phases of decline. This effect may be due to an increase in fertility, i.e. more children per household, but also to a decline in mortality, i.e. more members per household distributed in other age groups. The fourth and last variable is the percentage of deaths and emigrants out of the total population of 1628. It has already been said that these data are incomplete, but I wanted to take into account, at least partially, the effects of the 1629 crisis on the population. The hypothesis is that the more consistent the loss of population during the crisis, the smaller the population growth recorded between the pre-famine data and 1656. The results of the model are shown in Table 1.

Table 1. Determinants of the increase of population in Friuli (1628-1656)

	Coef.	P>t
Maize/other cereals	0.212	0.005
Kg of cereals per inhabitant	-0.062	0.118
No. of family members	0.088	0.006
% of deaths and emigrants between 1628 and 1629	-0.008	0.045
Number of obs	116	
F (4, 111)	4.30	
Prob > F	0.003	
Adj R-squared	0.10	

To make the table easier to read, I would like to state that the sign of the coefficient (second column) indicates whether the relationship between the variable considered is direct (positive value) or inverse (negative value) with respect to population growth, while the higher its value, the greater its influence. The third column of the table indicates whether these values are statistically significant. Following a consolidated practice in the social sciences, values lower than 0.05 are considered significant. Below this threshold, the smaller the data shown, the more certain the result achieved. Having said this, when we look at the results of the model, we can see that the share of maize among other cereals is positively correlated with population growth. In communities where there was more maize, therefore, the population grew a little faster. On the contrary, the amount of cereals available per capita is not a significant data. This aspect was expected and it is consistent with the starting hypothesis that the source is not reliable be-

cause it specifies the absolute quantities of goods, but because it indicates to us, according to the modalities previously described, the different diffusion of maize. The average number of members *per* household is positively correlated with population growth and is also statistically significant. This result seems to me to be particularly important because, as we shall see in the next section, it helps to explain through which mechanisms population growth may have occurred. Finally, the effects of the famine of 1629 had a depressive effect on growth, since, in the face of greater losses in terms of deaths and emigrations, it was more difficult to return to the number of inhabitants before the crisis. This means that the villages that had been most affected by the crisis grew more slowly than the others. However, the relationship is weak, and the level of significance is also close to the limit.

Discussion

In seventeenth-century Friuli, there was a relationship between maize diffusion and population increase. However, there are at least two fundamental interpretative aspects that the model cannot resolve because there are several possible data readings. 1) It does not solve the basic dilemma: was it maize that determined population growth or, on the contrary, was it the demographic increase that stimulated the spread of maize? 2) It does not explain the mechanisms through which the cause-effect relationship between these two variables has been achieved.

With regard to the first point, the Malthusian rather than the Boserupian perspective seems to me much more plausible. This belief is not based on the way maize spread through the territory, which could also be consistent with the second perspective. It is based, instead, on the dynamics related to its consumption. As we have seen, the consumption of maize in Friuli, as in other territories, began to take hold in order to alleviate situations that had arisen following Malthusian crises: famines and epidemics. The introduction and, above all, the beginning of maize consumption took place, as I have already pointed out, in the context of a supply and not a demand crisis. In the Boserupian scheme, population growth is the driving force behind innovation in agriculture, but this does not seem to me to be the case in seventeenth-century Friuli. With regard to the second question, from a theoretical point of view, i.e. relating only to demographic accounting aspects, population growth may have manifested itself through one of these three factors or through a combination of the three: 1) increase in fertility; 2) decline in mortality; 3) positive net migration.

Unfortunately, the sources used in this work do not allow for a clarification of these points. Both surveys report some overly approximate information on the structure of the population, which, in principle, could be used to estimate fertility and mortality. The survey of 1656, though it allows us to distinguish in many cases between adults and *putti*, is not detailed enough to resolve the issue. The age limit between these two components of the population is not fixed with precision and, much more serious for any analysis, it differs from village to village depending on who carried out the survey. An opportunity for further study is given by the collection and processing of data, which we can draw from the records of baptisms and burials kept in the parish archives. But precisely for this period, and partly due to the serious upheavals caused by the famine, the parish registers are very patchy. The possibility of collecting information on migratory flows, the quantification of which depends on parish registers, remains very problematic.

It is currently impossible, without information that allows a quantitative analysis, to reconstruct the mechanisms that may have come into action to trigger this growth. However, it seems to me that the same explanation that has been used to justify the growth of the Irish population after the introduction of the potato (Connell 1950) can be temporarily adopted for Friuli. In fact, this hypothesis is consistent with the data available and, also, with the results of the model. As we have seen, in the communities where we have observed greater population growth, there is also a greater increase in the average size of households. This effect may, of course, be due to two very different factors: 1) the increase in fertility, which translates into a higher number of children within the family, and therefore into an enlargement of the base of the population pyramid; 2) the increase in survival. In this case, since mortality was concentrated mainly among babies, we should see the growth of younger family members. On the other hand, infant mortality is not in direct correspondence with the consumption of maize, which concerns, mainly, the ages following weaning. If it is a consequence of increased survival, we should also see, in the data, its effects on the adult and elderly population. We have no other element to justify the growth of the population except a greater availability of food, which occurs, among other things, when there is no population pressure on the resources[7]. To reach a provisional conclusion,

7 Greater availability of food can also lead to an increase in mortality which can be balanced by greater fertility (Livi-Bacci 2017).

it is more plausible to think of an increase in fertility. It remains to be seen how this could have happened. On the other hand, a phenomenon already invoked in the Irish context may have occurred, i.e. an advance in the age at marriage and/or a decrease in celibacy. Although I personally favour this hypothesis, it must be recognized that even this element is very difficult to verify empirically, since the relevant sources are the parish registers. In addition to the difficulties already mentioned, we must also add the fact that in the marriage registers of this period, the age of the spouses is not normally reported. This can be calculated only by linking together information from different registers.

Conclusion

In the context of seventeenth-century Friuli, and in particular after the great subsistence crisis of 1629, the consumption of maize became more widespread. Not all of Friuli was interested in this phenomenon in the same way. By linking two different datasets built at the village level, it was possible to demonstrate that the spread of the new crop directly affected population growth and that this growth was more sustained in those territories that had adopted it earlier. The causal relationship between the spread of maize and population increase, and the mechanisms that underlie this growth, are not yet clear. However, the evidence emerging from this study is consistent with an interpretation that has also been used in other circumstances to explain the mechanisms of population growth. With the introduction of maize and its spread, more resources became available for the general population and for families. Thanks to this improved situation, the balance between population and resources became looser and, therefore, the preventive behaviours that populations had adopted to contain fertility also slackened. In this context, there may have been a reduction in the age at marriage and also a reduction in celibacy. In populations with natural fertility, the growth of nuptiality also led to an increase in fertility, which is the factor that directly determines population growth. It cannot be excluded, however, that the decrease in mortality, that of children in particular, played a role in demographic dynamics. Although the mechanisms of growth in the Friulian population of the seventeenth century cannot be fully clarified, at least at this stage, the link between innovation in agriculture and demographic development is reflected in this analysis. This connection seems to work in Malthusian terms: the introduction of maize stimulated population growth and not vice versa.

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Tracing maize in the Slovenian regions, sixteenth–eighteenth century. An interpretive historiographical essay

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Introduction

The aim of this article is to outline the state of the art in the field of research on maize diffusion in the Slovenian regions, from its earliest appearance until the end of the eighteenth century. In doing so, it concentrates on a period about which our knowledge is not satisfactory yet, due to a lack of in-depth and specifically focused research, but also due to scattered and mostly incidental mentions in the primary sources. With the first decades of the nineteenth century, the situation becomes much clearer, since we may rely on the systematic mentions contained in the Austrian Franciscean Cadastre (1819-1830), but at the same time it is already mature, in the sense that maize is quite well known and widespread.

The real breakthrough in the spread of both new plants [maize and potato] came after three consecutive poor harvests in 1815-17. At that time, potatoes were fully established in Carniola; maize was widely spread in Carinthia and in the Province of Gorizia, while in Styria both cultures were. It was only after these changes in the cultivation of potatoes and maize that the catastrophic famine disappeared, which had often affected the population in the Slovenian lands (Gestrin 1969b, 66).

Our interest is to reconstruct the times and the ways by which such results had been reached. In the attempt to fulfil our goal, we will base on existing historical literature, which is mostly not recent, revealing a scarce interest in this topic over the last decades. The article starts by presenting the

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situation as shown by the earliest known mentions of maize in the wider area between the eastern Alps, the Adriatic Sea and the Pannonian Plain. It continues by reconstructing the diffusion of maize as a crop, a foodstuff, and a trade good, proceeding through half-century timespans and distinguishing by different provinces or micro-areas, in order to get a picture of the progression and of the provenience of maize diffusion. In some cases, the reconstruction overlaps today's Slovenian boundaries to better cover the wider Slovenian ethnic area, but more so to achieve a better comprehension and a fuller picture of the dynamics of diffusion.[1] In the end, I integrate existing interpretations with some preliminary new ones, outlined based on the achieved results.

1. Surrounded by early mentions of maize in the eastern Alpine-Adriatic area

The earliest mention of maize in the area, known so far, dates back to the 1559, when an unknown amount of seeds was sent for test planting to a village (Kraig) near the town of Sankt Veit an der Glan in Central Carinthia. Although this should mean that maize was "a great rarity" there at that time (Brunner 1994, 7, citing Wadl), already a dozen years later (1572) in a village near the Styrian capital of Graz (Hardt, Thal parish) the earliest known proof of maize cultivation was detected. Two peasant women were sent on trial for having illicitly picked up 150 branches they used to support maize seedlings, or literally "Turkish grain or what for an odd seed they planted" (Brunner 1994, 9-10). The next year some tithe registers in South Tyrol started mentioning maize (1573-1585), which must have reached the area from the Italian regions (Brunner 1994, 7, Sandgruber 1982, 45); however, we have already moved a bit too far from the Slovenian regions. Much closer is the mention of maize in 1602 in a register of grain prices from the town of Gradisca d'Isonzo in the County of Gorizia (Valenčič 1970, 258). One might say that the Slovenian regions were very closely surrounded by these earliest mentions – that is to the northwest (Carinthia), northeast (Styria) and southwest (County of Gorizia).

1 I wish to thank Peter Teibenbacher who very kindly handed me the literature on Austrian Styria used in this article.

2. The first half of the seventeenth century: clear traces in the east, much less so in the west

Information about maize in the first half of the seventeenth century is quite rare and interpretations sound rather vague. Since we have just mentioned the County of Gorizia, we will proceed from there, that is from the west towards the east. Carlo Morelli, who reorganized the county's archives in the eighteenth century and consequently had a very good insight into its history, when mentioning the 1629 famine commented how "the province had the disadvantage that the Turkish grain, which today [around 1780] serves as the main nourishment for the common people, was almost unknown in our area until the middle of that century" (Morelli 1855, II, 144-145). His judgment may be at least partially confirmed by the fact that maize is not mentioned among the landlords' revenues in most of the county in the 1620s and 1630s (Panjek 2011). Simon Rutar's mention is not helpful to define a precise chronology for the mountain area in the Upper Isonzo Valley, as he writes that "following the example of the Friulians, who began cultivating maize already around 1600, the people from the Tolmin area took it up as well and started sowing it increasingly from year to year" (Rutar 1882, 150). In a trial for misdeeds that happened in the Adriatic port town of Trieste around 1650, a person is mentioned with the nickname "Cinquantin" (SLaG). Seeing that it was the name of a fast-growing sort of maize, this may be interpreted as a quite clear sign that it was known well enough for someone to be named after it. On the other hand, in nearby Istria, maize would not be cultivated until 1650 (Ivetic 1999, 81). All in all, we may conclude that although maize was undoubtedly known (Gradisca 1602, Trieste 1650), in the western and south-western Slovenian regions its diffusion was seemingly still quite limited throughout the first half of the seventeenth century. Information differs as far as the extreme north-western Alpine area is concerned, since in the Gail Valley (Ziljska dolina, Carinthia) maize was well known since the early seventeenth century (Sandgruber 1982, 46).

With a swift move to the east, we encounter various confirmation that maize continued to be quite well known in Styria also after its early documented appearance among the peasants near Graz. In 1608, maize is mentioned in the Milling Rules of Graz (*Grazer Müllerordnung*), although in last place among all the grains (Sandgruber 1982, 47), while in 1636, a small quantity is mentioned in the probate inventory of a peasant in the Stainz manor, located in the same part of Styria, southwest of Graz (Brunner 1994, 11). These, more recent findings, confirm earlier writings about maize being

demonstrably present there since the first half of the seventeenth century, the main area of its distribution being, from the very beginning, the present-day south-western Austrian Styria (Pferschy 1976, 27), that is the area closest to Slovenia, although I found no explicit mention of maize in the present-day Slovenian Styria in this period. What seems particularly remarkable is that in this part of Styria maize is found among peasants early (and repeatedly so).

On the other hand, we may notice that none of the above-cited documented mentions originated from the central Slovenian region, the Duchy of Carniola, nor from today's territory of Slovenia. All of them are located on the outskirts of the (then and/or present) Slovenian ethnic area. In fact, in the poorhouse of Ljubljana, the capital town of Carniola, there was no maize on the menu in 1638 (nor in 1718; Makarovič 1986 58-59). For a wider picture, even Makarovič, who wrote a thematic article about food in Slovenia in the seventeenth century, mentions maize only once, namely in the second half of that century, although he based his work on numerous sources and mentioned several different types of grain. Whether such a 'state of the art' derives from the researchers' paying less attention to this subject, from a lack of preserved archival documents, or from the factual absence of maize is not completely clear. In any case, if maize was already present in the first half of the seventeenth century, it seems that it has to be sought in the south-western (Littoral) and north-eastern (Styria) regions and not in central Slovenia (Carniola).

3. The second half of the seventeenth century: diffusion pattern on a local basis, seemingly more in the east

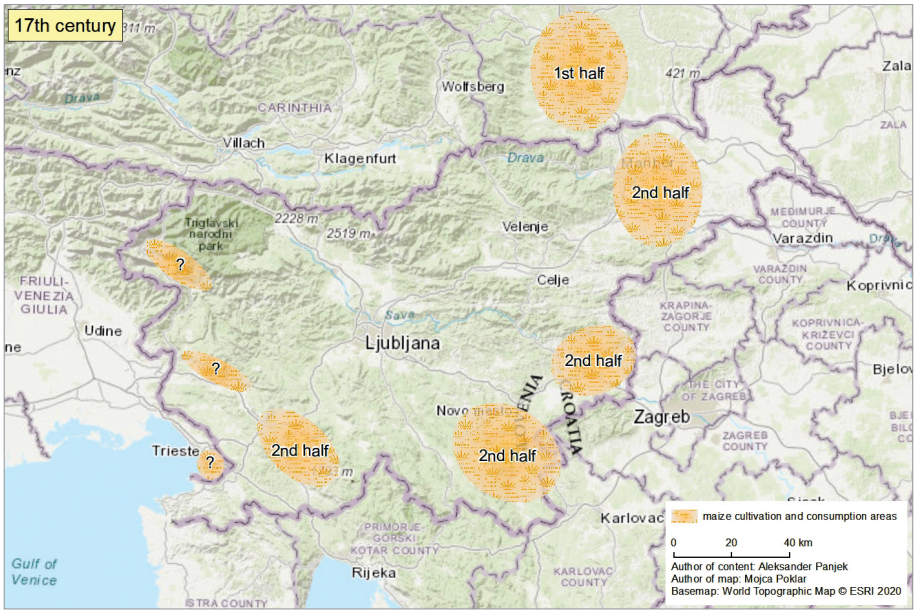
For the next timespan we will again proceed from the west to the east, but in this case, we will not overlook Carniola, since we may find mentions there, too. Another difference compared to the previous period is that I was not able to find any explicit and documented information about maize in the western Slovenian areas for the second half of the seventeenth century, except for the indirect and rather vague ones already mentioned in the previous paragraph, indicating that it started to spread after the mid-century. An additional piece of information is that while grain import through the Adriatic port towns of Trieste and Rijeka was increasing in the bad harvest years of the seventeenth century, maize is not mentioned among such imports (Valenčič 1977, 31, 48-9). This may mean that maize was not yet avail-

able in the Adriatic Sea trade or that it was not yet used locally as food for the hungry and poor, thus not attracting its import.

No Slovenian historian can write about this period without referring to Valvasor, whose writings reflect the situation in the mid-decades of the second half of the seventeenth century, and we will make no exception here. He reports that within Carniola maize was cultivated only in some places, mostly in southern and western Carniola (Dolenjska, Kočevska; Notranjska). Its yield was 1:30 and it was also used to bake bread (Britovšek 1958/9, 128; Valenčič 1970, 259). Notranjska, the south-western part of Carniola, represents the hinterland of the Littoral region and may well be included in the south-western part of Slovenia, rounding up our picture of this geographical segment. According to Britovšek, maize here "naturalized faster" than elsewhere in Carniola and "they started including it in the everyday food already at the end of the seventeenth and the beginning of the eighteenth century" (Britovšek 1958/59, 132). Another part of Carniola where maize appears in the literature concerning the second half of the seventeenth century is its southern areas (Dolenjska, Kočevska, Bela Krajina, Metlika). Again basing on Valvasor, Makarovič wrote that at that time "in Dolenjska they did already cultivate maize and used to mix it with wheat to make a good maize bread" (Makarovič 1986, 62). Although with a less precise chronology, we may also read that in the Metlika area "the peasants have gotten to know maize well already since the seventeenth century" (Britovšek 1964, 207).

For an overall picture, we will rely once again on Britovšek, the author of one of the most documented works on Slovenian early modern agrarian history: "In general, we may affirm that maize in the seventeenth century was still a rarity in Carniola. It was restricted to various gardens and it is not mentioned in the fields". Concurrently, in the second half of the seventeenth century maize crops are "very rarely" mentioned in the accounting books of manors and monasteries, as well as in landlords' probate inventories (Britovšek 1964, 205). If this is the 'large picture', we have noticed so far that the situation was a bit more varied, especially if we expand the view to the whole of the western Slovenian regions. Maize was apparently gaining ground in the County of Gorizia, in the Trieste area, in Notranjska, as well as in some locations of southern Slovenia. Its cultivation was seemingly still far from being widespread, but in some areas, maize had made its way into the peasants' plots and to their dining tables, surely faster than in the noblemen's barns.

As far as the present-day Slovenian Styria is concerned, mentions of maize by Slovenian historians refer generally to the seventeenth century as the time of its appearance; even for the second half of the century there is no clear evidence in the literature I was able to review. The most likely confirmation of its presence is a statement by the provincial estates of Styria (that governed in the Slovenian area as well), which stated in 1670 that the peasants lived on maize, buckwheat and millet the whole year round, because the heavy grains were used to pay their dues (Sandgruber 1982, 47; Brunner 1994, 12). In fact, discussing Slovenian Styria, Valenčič mentions how maize was "considered an important part of popular nutrition already at the end of the seventeenth century" (Valenčič 1970, 259).



Map 1. Maize diffusion in the seventeenth century

The signs of maize in the present-day Austrian Styria are more numerous, and again one wonders if this might not be a consequence of a lack of specific research rather than a reflection of historical reality. In fact, in addition to the already mentioned provincial parliament's statement, quite numerous other proofs may be added, especially of maize in peasants' probate inventories in the already known area southwest of Graz (Brunner 1994, 11-12).

Nevertheless, interpretations by Austrian historians are somewhat contradictory or at least cautious. On the one hand, we may read that maize was generally cultivated and appreciated as food, but that it was still not the main crop (Brunner 1994, 11-12). On the other hand, basing on accounting books, it is not possible to demonstrate that maize was cultivated in larger amounts before the beginning of the eighteenth century anywhere in Austrian Styria (Sandgruber 1982, 47).

4. The first half of the eighteenth century: a seemingly sudden booming

Our review now returns to the western regions and starts from there towards the east. After the lacking or at least loose historians' statements regarding the presence of maize in the western Slovenian areas in the first and second half of the seventeenth century (except for Carinthia), in the following century it seems to suddenly become rather widespread in some areas, especially by the Adriatic coast. Around Trieste, for example, "already in the first half of the eighteenth century, maize was in first place among all the crops" (Britovšek 1964, 210). In nearby Istria, we find it especially in the area around the coastal town of Koper and, more generally speaking, in the wetlands of northern Istria (Ivetic 1999, 81), i.e. in today's Slovenian territory and very close to Trieste. Quite the same may be said about the other side of the Istrian Peninsula. In the surroundings of Rijeka in the first half of the century, where maize "very quickly" gained first place among the crops, as is shown for example by the peasants of St Augustin's monastery, who sowed mostly maize and made it their everyday food by the mid-eighteenth century. "Quite a lot" of maize was to be found in some areas of inland Istria, too, such as the lands belonging to the monastery of St Peter in the Woods and the Pičen Diocese. At the same time, in the nearby Brkini area, the peasants of the Podgrad manor were cultivating as much maize as wheat (Britovšek 1964, 210).

Surprisingly, somehow, we have no explicit and documented proof of maize cultivation or consumption in the westernmost County of Gorizia, apart from a few generic mentions regarding the entire seventeenth and eighteenth centuries already cited above (Rutar 1882, 150; Gestrin 1969a, 3). On the contrary, it is possible to report a few mentions of maize in the south-western part of Carniola, that is in Notranjska, located west of the County of Gorizia and north of Istria. Here we may find maize cultivated in the fields in the first half of the eighteenth century, although in a "still

insignificant" quantity; in fact, it would not expand beyond the climatically more favourable areas throughout the century. Nevertheless, among all the areas of the Duchy of Carniola it was precisely in the Notranjska and Dolenjska regions that maize became most present by the mid-eighteenth century, based on the Theresian cadastres, "which are the first to provide maize statistics as somewhat reliable statistical evidence on maize" on landlords' and peasants' land (Britovšek 1964, 206, 210).

It is now time to turn towards Dolenjska, the south of Slovenia, although there too maize crops were still "very small" until the mid-eighteenth century. In some circumscribed areas (Mokrice), "maize was cultivated by the vast majority of peasants, but the crops were very small" (Britovšek 1958/59, 130).

> *In general, we may say that in the mid-eighteenth century, maize was already widespread in the Dolenjska region, but it still remained a garden crop and rarely succeeded in being classified as a field crop. Maize crops were so exiguous that they did not significantly affect the diet of the peasant population.* […] *Compared to other cereals, maize was in the last or penultimate place. In fact, it was to be found more on landlords' than on peasants' land, and it was used primarily for poultry feeding, while peasants used to plant it only at the edges of cabbage orchards* (Britovšek 1964, 206, 209).

Much more than in the Dolenjska region, maize was most widespread within southern Carniola (and Slovenia) in the first half of the eighteenth century in the nearby Bela Krajina area. On the demesne land of the Metlika commandery, maize was the third most cultivated crop (with a yield of 1:40 to 1:50). There, maize was indeed widespread among peasants as well, both in their fields and on their tables, since it already entered their everyday menu. Most of all it was present in the Podbrežje manor, where some peasants were sowing up to 30 litres of maize seeds (Britovšek 1958/59, 130; Britovšek 1964, 207). In the nearby Kočevje area it was much less sown, and mostly as an orchard crop (Britovšek 1964, 208).

On the other side of the Slovenian lands, in Styria to the northeast, in the first half of the eighteenth century, evidence is unambiguous. In the area south of Graz (today's Westseiermark) already observed above, shortly after 1700 maize gained additional importance in nutrition, its quantities increasing significantly in peasant probate inventories, in which it became

the most recorded cereal by the mid-eighteenth century (Stainz manor, 1733). It may also be found in the form of mixed maize and wheat flour (Thal parish), signalling that it was meant for human nutrition and not as fodder (Brunner 1994, 11-12). Still, this evidence places us outside today's Slovenian Styria, but official administrative documents undoubtedly state that maize was present there, too. In 1732-1733, conflicts arose about peasants' tithes – levies on maize to their landlords. Some historians mention that the ruler issued a decree ordering the payment of such a tithe (in fact, it referred to the twentieth part of the harvest), while others mention its abolition. Anyhow, we may abide by Gestrin's and Sangruber's interpretation that the decree and the related conflicts prove there was "a considerable amount of maize cultivation in this region during the first half of the eighteenth century", and that by 1733 maize was widespread enough to trigger such conflict (Gestrin 1969a, 3; Sandgruber 1982, 47). After it was exempted from the tithe in 1733, maize was cultivated everywhere in Central and Lower Styria (*Mittel- und Untersteiermark*), as Brunner writes basing on Fritz Posch (Brunner 1994, 9). Central and Lower Styria means the southern part of today's Austrian Styria (that is the area around and south of Graz reaching the Slovenian border) and today's Slovenian Styria. Around 1750, dishes such as *türkische Koch* and *Türkensterz*, which could be translated as maize mash and maize polenta,[2] were already defined as "popular food" (ordinary people's nourishment) in Styria (Sandgruber 1982, 47; Brunner 1994, 12).

5. The second half of the eighteenth century: the final conquest of ordinary people's dishes

Returning to the west, I could not find an earlier and clearer evidence of maize in the peasant diet than the contract regarding the yearly alimonies in favour of the widow Marina Sivic in the Classical Karst near Trieste, dated 1753. This date can be considered mid-eighteenth century and most probably indicates that in this area maize entered the dishes of the common people already in the first half of the century. In Marina's case, among the five different cereals she received, maize was in second place, representing one quarter of the total quantity (Table 1).

2 In Slovene that would be *koruzna kaša* and *koruzni žganci*.

Table 1. Yearly alimonies (cereals only), Marina Sivic (Skopo - Križ / S. Croce), 1753

Cereals	Litres	Percentage
Wheat	30.8	10%
Rye	30.8	10%
Spelt	92.4	30%
Buckwheat	77.0	25%
Maize	77.0	25%
Total	308.0	100%

Source: Panjek 2008, 26.

When describing "production and trade" in his long and detailed report on the Gorizia and Gradisca counties of 1775, the chief of the local administration began thus: "The productions of the region are as follows: 1) the various cereal crops, such as wheat, maize, rye, oats and barley" (Cavazza et.al. 2003, 174). Maize was in second place among the cereals, signalling its importance. The observations of two contemporary writers are completely in line with this, even accentuating the importance of maize as a popular foodstuff. In his book *Clima Goritiense* (1781) the physician Anton Muznik wrote that in the Gorizia area "great quantities" of maize were cultivated and that besides vegetables, bread and wine, the people of the valleys predominantly ate "polenta, a thick porridge seasoned with salt, butter, bacon", made of maize (Fakin Bajec 2015, 25, 28, citing Muznik). This means that maize dominated the dishes also in the larger Vipava and Soča valleys and in the smaller mountain valleys in the area. Balthasar Hacquet, whose work describes the situation in the last decades of the eighteenth century, confirms that. Writing about the Vipava Valley and Idrija, he mentions how "the food consists of the so-called polenta of Turkish maize; they consume little meat", whereas because of the stony and Alpine landscape only in the "narrow valleys some maize can be cultivated" (Hacquet 1801, 79, 82). Therefore, maize had conquered even the plots in the mountain valleys, not only the plain around Gorizia.

On the other side, east of Trieste, the cultivation of maize spread in Istria along its western Adriatic coast towards the south (present-day Croatia) during the second half of the eighteenth century, or after 1763 in particular (Ivetic 1999, 81). Hacquet, who visited the area in those decades (for the first time in 1774), confirms this also for maize consumption. From his description, we may understand that he referred to central and northern Istria, including the surroundings of Trieste, in particular the coastal

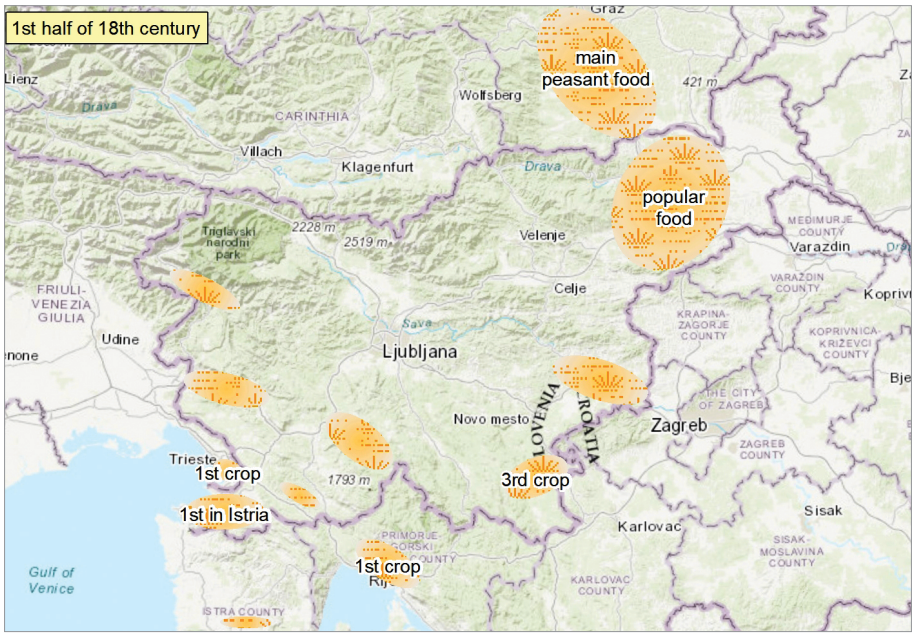
area but at least in part inland Istria, too, especially as far as maize is concerned. "The daily diet is mostly polenta, and since the wine is sold at lower prices, it is the refreshing drink of the poor countryman. The inhabitants of the coast do not lack good fish, among which tuna fish (*Tonina*) is common, but the sardines (*Sardellen*) surpass all others" (Hacquet 1801, 42).

For the other areas of western and southern Slovenia (Notranjska, Dolenjska and Bela Krajina) we must rely on the indications mentioned in the previous paragraph, registering the presence of maize both as a crop and as a foodstuff by the mid-eighteenth century and afterwards. On the other hand, the diffusion of maize in the rest of Carniola was still in its beginnings or not even that. In the Alpine area of north-western Carniola, Gorenjska, "due to the lack of more resistant maize species, the new plant was not established until the second half of the eighteenth century […]; only then did it begin to take root in larger amounts" (Britovšek 1964, 211). This situation echoes that of the nearby Carinthia, situated to the north, although there maize was known early and seems to have spread a bit faster.[3] "From the mid-eighteenth century onwards, maize spread along the Drava River into Lower Carinthia and the lateral Alpine valleys; therefore, the prevalence of maize in Carinthia cannot be discussed until the end of the eighteenth century (Sandgruber 1982, 46).

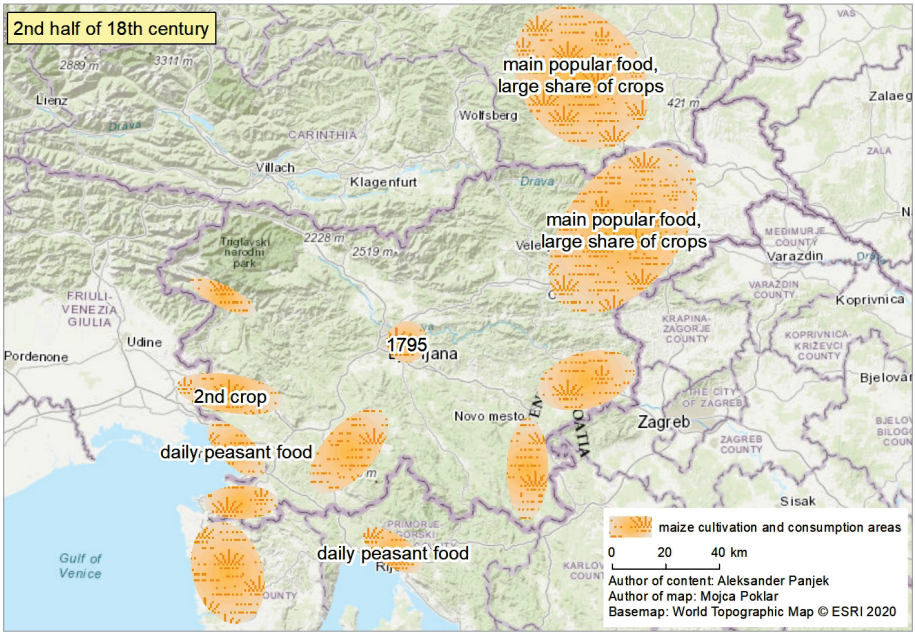
In the rest of Carniola, we find no trace of maize whatsoever. It seems a telltale sign that even the administration of the large quicksilver mine in Idrija, where a relevant concentration of wage workers lived, which used to buy the grain supplies for its miners from the provincial estates of Carniola, was not provided with any maize at least until 1780 (Valenčič 1977, 36-8). Since those provisions came from the Carniolan landlords' granaries, this can only mean there was no relevant maize production. In the tables of cereal prices in the capital of Ljubljana, maize appears for the first time as late as in 1795 (Valenčič 1977, 88, 157-160). As a final piece of evidence, when describing nutrition in Carniola in the last decades of the eighteenth century, Hacquet does not mention maize (nor potato), but only buckwheat, rye, sauerkraut and turnip (Hacquet 1801, 20-21).

As Vlado Valenčič, the author of the most complete history on grain trade in Carniola and of other works on Slovenian agricultural history, put it shortly, maize in Carniola "until the end of the eighteenth century did not spread to a larger extent. Relatively more maize was sown in Styria" (Valenčič 1970, 259). Yet again, mostly Austrian scholars provide informa-

3 Carinthia is the topic of another article in this book by Werner Drobesch.



Map 2. Maize diffusion in the 1st half of the eighteenth c.



Map 3. Maize diffusion in the 2nd half of the eighteenth c.

tion on Styria that is more precise. We will stick to Roman Sandgruber, the author of a still fundamental work on consumption history in Austria, who had a broad insight and was therefore able to evaluate the situation in comparative terms. Sandgruber found Burger's evaluation, according to which, at the end of the eighteenth century, maize occupied a quarter of the arable land in the Graz district (present-day Austria) and slightly less in the Maribor and Celje districts (present-day Slovenia), to be exaggerated, since later data from the early nineteenth century testify to much lower numbers. Nevertheless, in his opinion, it was in the late eighteenth century that maize reached the position of the most important basic cereal in central and southern Styria (*Mitte- und Unterland*, present-day Austria and Slovenia). Maize was then an exclusively peasant foodstuff used to bake bread, since the citizens of Graz did not eat it, but instead used it as animal fodder (Sandgruber 1982, 47). We may conclude with a look into the peasant probate inventories of the repeatedly cited area south-west of Graz, in which, towards the end of the eighteenth century, maize took up from one fifth to one third of all cereals (Brunner 1994, 11).

6. Maize trade in the eighteenth century: import, provenience and trade centres

We have so far concentrated on maize cultivation and consumption only, but to evaluate its diffusion, as a foodstuff in particular, one must not disregard trade. Up to and including the sixteenth century, the Duchy of Carniola was a cereal exporter and would not import it. In the seventeenth century, mostly in the second half, grain imports in Carniola through the Adriatic ports of Trieste and Rijeka increased, although they were still "exceptional", limited to bad harvest years and to its karstic areas (south-western and southern Slovenia) (Valenčič 1977, 31, 48-9).

Among such imports, maize was not mentioned until the first decades of the eighteenth century. In fact, a description of the economic situation in Carniola in 1712-1721 reports that, especially in bad harvest years, maize started to be imported "from Italy, Dalmatia and the Balkan regions" through Trieste and Rijeka. Since a livelier sea trade was developing there after both towns had been declared duty-free ports by the Austrian ruler, in the first decades of the century "larger quantities of maize were arriving from the Republic of Venice, the Romagna region [Papal States] and Turkish lands". Such maize was then sold mostly in the Classical Karst hinterland, but also to Dolenjska (the Ribnica area in particular) and even to

Gorenjska, meaning that its buyers were to be found "in the less fertile areas" of Carniola (Valenčič states also that maize was not yet cultivated in the region). These imports seem to have quickly achieved an important role in granting the subsistence of the rural population especially in south-western Slovenia in years of scarcity. In fact, while the provincial estates of Carniola in 1727 asked the ruler to prohibit maize imports, seeking protection for landlords' grain from such a concurrence, the ruler's representative in the duchy (*Vizedom*) immediately commented that "had maize not have arrived from the Papal States to Rijeka and Trieste, there would have been famine in the Classical Karst and Pivka" (Notranjska region). The provincial estates insisted on an import ban and tried to justify such a request, among other things, with the fact that "maize was partly imported from Turkish lands". Nevertheless, imports continued, as was the case in the bad harvest year of 1740, when grain prices rose high in Carniola and "a large amount of maize was bought from abroad" (Valenčič 1977, 31-33, 48-9, 125).

In the Slovenian literature cited so far, mentions of maize imports in the second half of the eighteenth century are missing. Some information about maize trade in the Trieste seaport was published, although the data made available are not completely satisfactory, not least because the authors of such works posed different research questions than the ones we have here. The overall picture that we get from them is that maize trade can be detected in the form of import, export and transit, both by sea and land. In 1760, a very scarce amount of maize was "imported" through Trieste from Dalmatia, its destination being Austria (the Vienna area): maize was among the very last goods according to value (153rd out of 156), a trifling amount compared to the total (12 florins : 5.3 million Fl., transit excluded, Erceg 1970, 29, 69). In any case, no import to the Slovenian lands was registered in that year, nor data on maize transit trade in Trieste (Erceg 1970, 151). Five years later, we get a completely different picture of maritime transit trade (from abroad to abroad) through Trieste. In 1765, over one million pounds (1,060,400 *Pfund*) of maize were registered arriving from "Italy" with the destinations "Genoa, Lisbon, Messina, Livorno, and Dalmatia", meaning the considerable amount of nearly 60,000 tons, which represented 27% of the total weight and 7% of the total value of transited goods.[4]

In the next year, 67,890.5 *stara* of wheat, 13,599 of maize, 1,582 of barley, 780 of rye, and 251 of oats were "exported" by sea through Trieste (January-October 1766). The destinations of these cereals were the nearby Venetian

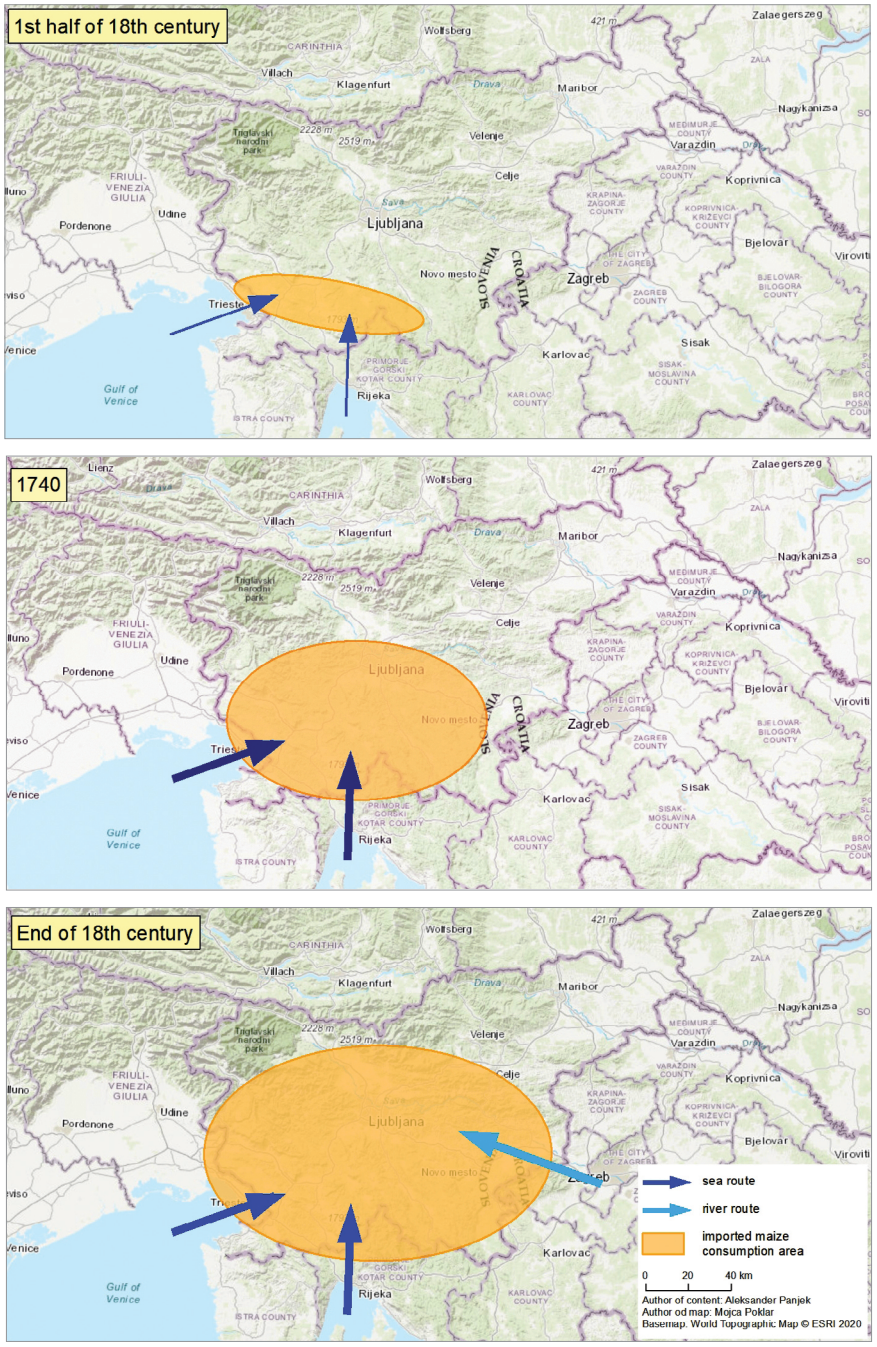
4 Calculations on data in Erceg 1970, 181.

and Austrian northern Adriatic towns, but much more so the Italian Peninsula (the Po River mouth area, the Papal States, Ancona, Genoa, Civitavecchia, Livorno and probably Apulia). As far as maize is concerned, its (specified) destinations were Malta (1,701 *stara*), Koper (100 *stara*), Rijeka area (50 *stara*), Monfalcone (25 *stara*), and, last but not least, San Giovanni near Duino with 1,190 *stara*.[5] The latter was a small port that traditionally supplied the Classical Karst, the city of Gorizia and the countryside, and the mountains along the Isonzo Valley, meaning that these 100,000 litres of maize (assuming these *stara* were Venetian) were probably intended for rural consumption in these areas.

The origin of the maize exported through Trieste in that year (1766) is not reported, but in general the cereals from Hungary and the Banat reached Trieste via Ljubljana, while the other route was through Karlovac to Rijeka (Andreozzi 2019, 55, 60, 62, 66). In both cases it is very likely that the first part of the transport was carried out along the Sava River which reaches both Zagreb (then the land route to Rijeka) and Ljubljana (then the land route to Trieste). We shall notice that the more costly land route from Zagreb to Rijeka is about twice as long as that from Ljubljana to Trieste, making the latter presumably more convenient. For these reasons, we may assume that maize, same as the other cereals, also arrived to Trieste and Rijeka at least partly from "Hungary" (comprising the Banat, the present-day Serbia and Romania). In evaluating this hypothesis, it may be considered that maize had been cultivated in the Sava and Danube basin area (Slavonia, Serbia) at least since the seventeenth century, if not earlier: in 1611-12 it is mentioned in Požega (now Croatia, some 20 km from the Sava River), while in 1722 in Serbia as much as 31% of the cereal-growing land was cultivated with maize (and 50% with wheat, Stoianovich 1966, 1027-1028).

This Sava hypothesis is strengthened by the fact that half a century later (1817-22) consistent amounts of maize were imported to Ljubljana from the south via the Sava River waterway (Valenčič 1977, 68). Apart from this probable mainland route, during the year 1766 additional 16,996 *stara* of wheat, 61,452 of maize, 1,225 of barley, 1,860 of rye, and 8,013 of oats of unspecified provenience arrived to Trieste by sea. Later on (1782), Trieste exported maize to the *Levante*, while wheat was arriving from Lombardy and the Province of Ferrara in Italy (Andreozzi 2019, 60, 68), and in 1873 the export by sea of "wheat, rye and maize" continued (Panjek G. 2003, 275).

5 I wish to thank Daniele Andreozzi for the additional information he gave me on these quantities; see his article cited below.



Map 4. Maize import directions in the eighteenth century (sea and river).

Our task here is to outline a chronological and a geographic pattern of maize trade imports to Slovenian lands, and not of the maize sea trade in the Adriatic and the Mediterranean. That makes it perhaps a bit easier for us to trace a couple preliminary conclusions that comprise the above-mentioned Sava hypothesis. The proveniences of maize imported via the Adriatic seaway through Trieste and Rijeka in the eighteenth century may be simplified as follows: The Republic of Venice and the Papal States from the southwest, and the Balkan regions (including Dalmatia) and Turkish lands from the southeast. In addition, there was the Sava River waterway quite likely bringing in maize from Hungary (comprising Croatia) and the Banat (inland Balkans, Serbia). Consequently, the second preliminary conclusion may be that a maize trade route of Pannonian provenience transited through Slovenian and Croatian lands towards the Adriatic ports. This may well have influenced the availability of maize for the local population. Much the same may be said about Trieste becoming a seemingly relevant Adriatic "hub" not only for cereals in general (Andreozzi 2019, 60, 69) but also for maize in particular. Such development of Trieste as an important regional centre in the cereal trade is parallel with that of Ljubljana in the inland. During the eighteenth century, Ljubljana strongly increased its role as a grain market place for a wider regional area, while trade passed from the hands of peasants into those of merchants. The grain imported from Hungary and Croatia was not meant to supply the needs of the city alone, but was directed further towards the Port of Trieste and exported. This was a period of a great development of grain trade in Ljubljana, which lasted until the railway construction (mid-nineteenth c.) that allowed a direct flow of Hungarian grain to the seaport of Trieste (Valenčič 1977, 4–5, 9, 27). This means that in the eighteenth century the Slovenian lands could count on two growing cereal-trade centres, Ljubljana and Trieste, with a capacity that exceeded the local needs and could supply maize provisions by land and sea.

The first impression we obtain from the rather short price series in Table 2 is that, at the end of the eighteenth century, maize in Ljubljana was unsurprisingly cheaper than wheat, yet not that much so if compared to other cereals, for example rye and buckwheat, which were common in the unwealthy and rural people's diet in Slovenian regions. Since the series is not only very short but also coinciding with the price instability of the 'French years', I would not interpret them further before more research is conducted on this aspect.

Table 2. Cereal prices in Ljubljana at the end of the eighteenth century: yearly averages for 100 litres in Austrian florins*

	1795	1796	1797	1798
Wheat	4.69	6.62	6.07	5.88
Rye	4.51	4.70	4.37	4.17
Barley	3.79	4.07	4.02	4.01
Oats	2.79	2.72	2.91	3.38
Buckwheat	3.21	4.24	5.70	4.51
Millet	4.36	4.54	4.52	4.24
Maize	4.15	4.52	3.85	4.29
Maize price index compared to				
Wheat (=100)	88.5	68.3	63.4	73.0
Rye (=100)	92.0	96.2	88.1	102.9
Buckwheat (=100)	129.3	106.6	67.5	95.1

* Convention value, 1 Fl. = 11.69 g of silver; calculation based on monthly averages in Valenčič 1977, 157-159.

7. Interpretive conclusions and hypotheses: chronology and trajectories of diffusion

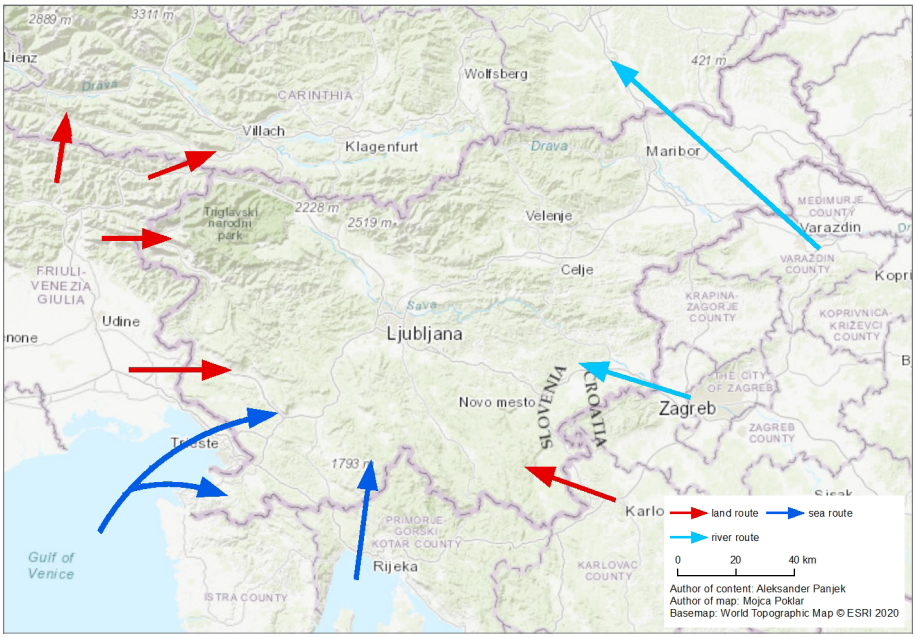
With these considerations about maize trade in the eighteenth century, we have somehow already anticipated the last part of this contribution, which is dedicated to conclusions and interpretations based on the information gathered so far. Starting with the chronology of diffusion, we have noticed how at the end of the sixteenth and the beginning of the seventeenth centuries the Slovenian regions seem to be surrounded by early mentions of maize cultivation and trade, while in the present territory of Slovenia such examples are lacking. The question is whether this reflects the historical situation or perhaps more so the state of research. A basic observation may be that while Austrian historians have engaged in tracing the earliest mentions and early evidence of the presence of maize, Slovenian historians have not concentrated specifically on maize, dedicating most of their attention to central Slovenia (Carniola), where maize had a later and more scarce diffusion, and to the richer eighteenth-century sources. This may be the reason why we lack more archival evidence about maize in Slovenia, and its western part in particular, for most of the period until the eighteenth century. Something Austrian and Slovenian historians have in common is that

both understand the naming of maize in the people's local tongue as an indicator of its provenience, where *sirek* would signal an "Italian" direction of diffusion (*sorgo turco*), while *turščica*, *kukuruz*, *türkische Koch* and *Türkensterz* would mean a "Turkish" (Balkan) origin.[6]

Nevertheless, Slovenian historians agree on the location of the first region where maize was cultivated and consumed in the south-western area, but without giving a precise time frame. At present, based on the viewed evidence, it seems that in western Slovenia in the first half of the seventeenth century maize was known but not yet a relevant presence in the fields and on the tables, with the possible (still hypothetical) exception of Trieste and Gorizia with their close surroundings. Somehow contrary to the so far accepted, although loose periodization, we have more evidence of the presence of maize in the first half of the seventeenth century from the eastern part of the Slovenian lands, in Styria, especially in and around Graz. The still small detected amounts do not really allow the conclusion that maize had already become an important crop or a relevant foodstuff, nor that it was present in the Slovenian-speaking area of the time or the present-day Slovenia. All in all, we may conclude that there were two areas, the east and the west, where maize diffusion ran independently from each other and perhaps even earlier in the eastern than in the western Slovenian lands. In the second half of the seventeenth century, maize is detected in a third region, i.e. southern Slovenia, but in restricted areas and with a very uneven, interspersed diffusion; however, where there was more, maize started entering the peasant diet. The same is true of the western and eastern regions: where maize is present as a cultivar, it starts having a greater role in the peasant diet, in the form of porridge and bread.

In the first half of the eighteenth century, we may observe three phenomena. On the one hand, maize is affirmed as an important crop and a popular foodstuff in the areas where it was present already before that time, with a possible geographical extension of the original narrow and interspersed diffusion areas. This is valid for the two main areas, east and west, while in southern Slovenia maize is lagging behind and remains an outsider crop and foodstuff. Thirdly, it is in this period that we have explicit and converging evidence of a relevant import of maize as a foodstuff through the Adriatic ports, especially in the years of scarcity – meaning

6 The way maize was named has been considered a sign of its origin and direction of diffusion for a long time. On the many names it had in the Balkan region and their possible meanings see Stoianovich 1966.



Map 5. Maize's gateways to Slovenian regions sixteenth-eighteenth c.

that it gained importance in the diet of the western region faster than it progressed in the fields. The second half of the eighteenth century marks a large and definitive affirmation of maize in both the east and west, with an attested relevant diffusion in the fields and omnipresence on the peasant tables. In central Slovenia, on the contrary, maize becomes a foodstuff in times of crisis and nothing more.

Just as in the case of timing, we may add some details to the directions via which maize entered the Slovenian lands. The prevailing picture of the trajectories of maize diffusion is indeed already half a century old and it goes as follows: "In the Gorizia region, maize spread under Venetian influence (named *sirk* from the Italian *sorgo*); in Carniola it was established only in some places in Dolenjska (as *turščica*, *turška pšenica* – Turkish wheat); but most of all they started to sow it in Styria, where it had arrived from Hungary in the seventeenth century (under the name *kukurutz*)" (Gestrin 1969, 3). The evidence we have collected allows us to agree with Gestrin on this, as well as with Valenčič, who wrote that maize came to the Slovenian lands independently from the West, that is from the Italian lands, and from the East or, as he put it, from "Turkey, Hungary and Croatia" (Valenčič

Map 6. Origin of imported maize (eighteenth c.)

1970, 258-9). Valenčič meant that maize appeared in Styria later than in the West, but we have seen that this is not necessarily confirmed by the existing evidence; rather the opposite seems to be true or, at most, a parallel process might be hypothesized.

Going back to the trajectories, it is probably more precise to speak of a south-western and a south-eastern direction of maize diffusion into the Slovenian lands, rather than of an "East" and "West" one. Moreover, I would propose a reading that is a little more complex than the "Venetian" and "Hungarian" influence. One gateway was from the southwest and it comprised mainland routes from Venetian Friuli and sea routes through the Adriatic ports of Trieste and Rijeka. Moreover, such maize did not come by boat only from the Venetian mainland territories, but most likely from the Papal States as well, as Valenčič seems to suggest by using the term "Italy". In fact, it is known from Gestrin's studies that at least since the Late Middle Ages and in the early modern period the Austrian Habsburg ports of Trieste and Rijeka had intense maritime trade connections with the western Adriatic coast (the Marche region in particular), not least to escape the Venetian navigation monopoly (Gestrin 1975; 1991, 113, 156-158). In addition to that, the maize entering by sea routes might as well have

arrived from the eastern Adriatic coasts and the eastern Mediterranean (Dalmatia and "Turkish regions"). The other main maize gateway into Slovenia was from the Balkan mainland to the eastern part of Styria, where the rivers very likely played a role. Evidence confirms this route and the role of river navigation in the eighteenth century, but we may assume this was also the case in earlier periods. That is, if we consider the opportunities provided by the river routes, which in the early modern period connected the Slovenian lands to the Black Sea region (Vilfan 1978, 79): I am thinking of the Danube (for today's Serbia and Hungary) and its tributary rivers Sava, Drava and Mura (for today's eastern Croatia, eastern and central Slovenia, and south-eastern Austria). This would mean that maize came to the eastern Alpine and subalpine area both from the west-southwest and the southeast, as German-language literature has been telling us since the sixteenth century. The addition to be made is that in both directions, maize arrived by land as well as by sea (as the stronger presence around the port towns shows), while we may imagine the rivers playing a role in the land route.

8. Interpretive conclusions: the factors of maize diffusion

By connecting the conclusions mentioned so far, and combining them with some existing interpretations about the conditions of maize diffusion by historians, I would propose the following updated interpretation of the factors of maize diffusion. To this purpose, I will distinguish between socioeconomic factors and localization factors as follows:

a) Socioeconomic factors

The Austrian historians Roman Sandgruber and Walter Brunner wrote that of crucial importance for the affirmation of maize in Vorarlberg and Styria during the seventeenth century must have been the worsening living conditions among the peasantry, who realized that maize granted very good yields and large harvests, and therefore started to increase its cultivation. Extending this interpretation to the Slovenian regions, I would add that – perhaps – only the hardship caused by the economic stagnation and crisis in the long period between the mid-seventeenth and mid-eighteenth centuries, made it reasonable for the peasants to engage in the hard and time-consuming work necessary for maize cultivation with the techniques used at that time.

b) Localization factors

Both Slovenian and Austrian historians point out the importance of the climatic factor influencing and limiting the diffusion of maize, in particular because throughout the eighteenth century no varieties were present which could be successfully cultivated in less warm areas. That is why in the earlier phase maize diffusion coincided quite precisely with the areas where vines would grow, and vines and maize were cultivated together. We could agree with this, but based on the evidence presented it seems sensible to upgrade the factors influencing the localization of maize cultivation in the region between the eastern Alps and the Adriatic, as stated below. By considering the shared features of the areas where maize first spread and became established, we may notice they were:

- Climatically suitable (summer and autumn warmth): localization factor 1.
- Located in lowlands and flatlands (plains and valley bottoms): localization factor 2.
- By water streams (large or small): localization factor 3.
- Along transit routes connected to areas where maize was already present (roads, Alpine passes, seaports, rivers): localization factor 4.

c) The 'potato factor' and the tripartition of Slovenia at the end of the eighteenth c.

Lastly, we may perhaps identify another factor influencing the diffusion of maize. Slovenian historians have identified a factor that limited the affirmation of maize in Slovenia in general, the rushed diffusion of the potato in the eighteenth century. The success of the potato would have hindered the affirmation of the other 'new food for the poor', i.e. maize. However, considering the evidence we have collected about the western and eastern Slovenian lands, we may conclude that this may be true for central Slovenia only and not for the whole country. We may therefore propose a tripartition of Slovenia by the end of the early period of the affirmation of the two new cultures (late eighteenth century), in which maize prevailed in the west and in the east, while the potato dominated central Slovenia.

It is fairly possible that I have overlooked some article or publication, but exhaustiveness was not among my primary goals. That said, I believe only renewed research on primary sources could help to draw a more precise picture of the dynamics and factors of the rooting of maize in Slovenia.

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Innovation in the south-eastern Alps: maize as a crop in Carinthia until the middle of nineteenth century

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Introduction

At the beginning of the twenty-first century, maize (*Zea Mays L.*) is of great importance in agricultural production in the south-eastern Alpine countries, and thus also in Carinthia, as a crop and food for humans and animals. There are mountains of maize. Of all the crops, it was the one that changed the agricultural structure and the landscape sustainably over the past two centuries. In 2013, silage maize and grain maize were grown on 24,943 hectares or 62.5% of Carinthia's arable land (Tschischej 2013, 6). This resulted in a harvest quantity of approximately 125,000 tons and an average harvest of 5 tons per hectare. Even though cultivable land is now declining, maize pushed the other grain types into the background. At the beginning of the twenty-first century, it is the most important arable plant within the grain cultivation system in Carinthia. Given its importance within the agricultural production process, it is surprising that the development of maize cultivation has only been marginally touched on in agricultural history research. Little attention is paid to it in the descriptions of the agricultural development and history of plant cultivation. The number of relevant publications is extremely marginal (Dinklage 1966; Erker 2003; Wadl 1987; Zeloth 2013). This study is an attempt to fill this research gap.

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Figure 1: Johann Burge

Observations and reflections by maize expert Johann Burger

Its ascent to the most important arable plant was slow. In other territories of the Alpine region, such as Tyrol or Vorarlberg, it prevailed earlier. For a long time, the thesis prevailed that it only became part of the crop rotation system in the second half of the eighteenth century, coming from Italy and Hungary (Dinklage 1966, 175). This assumption was based on Johann Burger (see Dinklage 1970), agricultural expert and professor of agriculture at the Klagenfurt Lyzeum, who published a comprehensive treatise on maize in 1809 (Burger 1809). For decades, his "maize monograph" was a standard work in agricultural science research. Even today, it is one of the

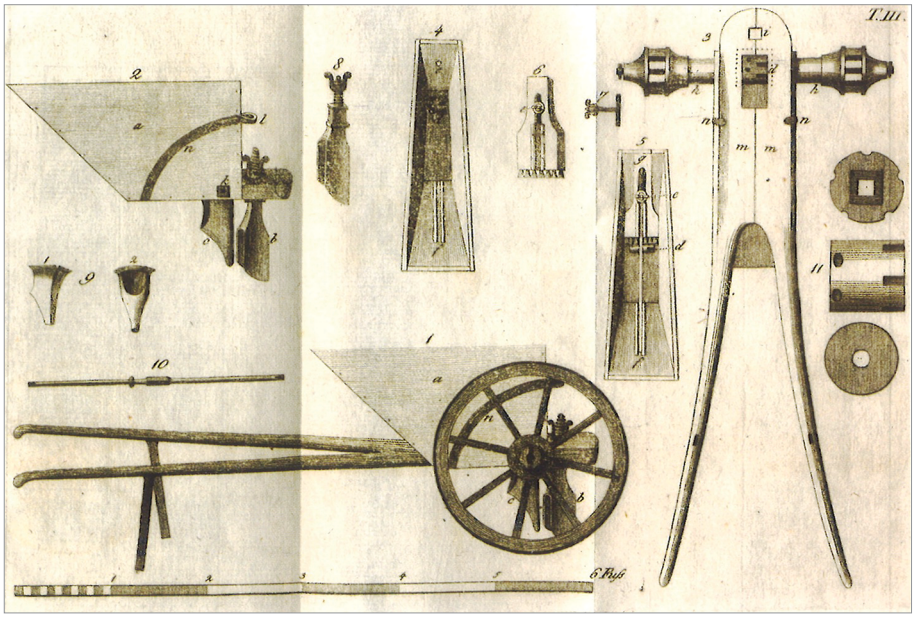


Figure 2: Maize seeder

"classics" of specialist literature on maize cultivation. The Carinthian agricultural scientist euphorically reports about the spread of maize at the turn of the nineteenth century: "Since maize cultivation has become more widespread in Carinthia, agriculture has started to ascend to a higher level. […] Now they produce the most abundant maize in fields that otherwise bore meagre amounts of rye, lentils and buckwheat. You have the richest harvests, [...] and you also get [...] more than half of the grain" (Burger 1809, 77f.), unlike before. What started on a small scale, spread especially in the *"wild and fertile"* Lavant Valley, but also "in the rough heights of the Gail Valley and Drau Valley, at the foot and sometimes even in the gorges of the Noric Alps" (Burger 1809, 79). Burger looked to the future expectantly: "It is impossible to determine how many yokes in Carinthia are being planted with this crop annually; I hope that maize cultivation will increase as it had over the past twenty years. If so, in fifty years the fifth of all the fields in the plains and valleys of this country will be sown with maize." (Burger 1809, 79).

Carinthia was not an isolated case in this regard. At that time, maize had already become homegrown in many areas of Central Europe: "Moravia produces quite a lot of maize in Brno and in the Hradischer Kreis, border-

ing Hungary. It is also often planted in Württemberg […] and its culture grows there every year. There is also extensive maize cultivation in Tyrol, Switzerland and Alsace, where they cultivate large fields with it." (Burger 1809, 79). On the other hand, in many territories of the Holy Roman Empire, namely in "Austria, Bohemia, Moravia, Silesia, Franconia, the Lower Rhine area, Saxony, [and] the Marches", which had an unfavourable climate for growing maize, no maize was grown at all, or it was of such "poor quality that it could not be grown as a crop" (Burger 1809, 83). The crop yields were correspondingly low. In Austria and Moravia there were no more than 12 hectolitres per 0.01 hectares. Carinthia was slightly better in this regard. There, the yield averaged 24 to 30 hectolitres per 0.01 hectares. That was a good amount because, according to Burger, 42 hectolitres per 0.01 hectares were "with our current knowledge and tools" the greatest possible yield (Burger 1809, 291).

Every beginning is hard

At this point in time, maize cultivation was no longer a revolution for Carinthian agriculture. It had spread too much, even if it was far from widespread. The beginnings go back to the middle of the sixteenth century. Its first appearance can be documented as early as 1559 (Wadl 1987, 240). A business letter between a landlord and his administrator is the oldest archival source in the area of present-day Austria in which maize is mentioned. It mentions that the economic administrator of the Gurk cathedral, Wilhelm Wernher von Wernhof – the "Wernhof" is a noble estate in central Carinthia near Althofen –, sent his brother-in-law Hans Raidhaupt an unspecified amount of maize with the request to forward it to the earl of Hardegg: "I would like to thank Wernher for the *türkischer Weizen* [Turkish wheat]" (Wadl 1987, 240). This mention proves that the maize which had come to Carinthia shortly before that time – here referred to as "Turkish wheat" – was occasionally cultivated in the Krappfeld region. However, it is not clear where it came from and whether Wilhelm von Wernhof harvested it at Krappfeld or received it from a third party. In view of the detailed mention and the special thanks for the gift, it may be assumed that maize was still a rarity in Carinthia in 1559. Wilhelm Wernher probably came into possession of the seeds due to the far-reaching relationships of the Gurk bishop. Bishop Antonius von Salamanca-Hoyos (1526-1551) had family ties with Spain, which would make a direct import from there possible (Wadl

1987, 241). This proof of the occurrence of maize remained an isolated case for a long time.

It is not possible to determine from the sources available whether maize was planted in the following decades and in the seventeenth century. Thus, it was limited to the status of a botanical rarity until the early eighteenth century. Around 1720, it appeared in the crop rotation of the Upper Drau Valley. In 1717, we come across it in the Spittal an der Drau area. In a bequest inventory 162.9 litres of *Türggen* are specified. Not far away, in the area around Greifenburg, it was also documented. In a dispute between the dominion of Greifenburg and its subjects, the latter claimed that maize was free of tithes, because it was a recently introduced crop. But it was not so. After studying the old inventories, it became apparent that the first very insignificant cultivation of maize occurred there in 1720 (Zenegg-Scharffenstein 1930, 55). However, maize was barely noticed until 1740 and was still in its infancy in the following years. The yields were very low due to the unorganized cultivation and its planting was not attractive due to the low market prices. The situation changed in the mid-1760s, when at the instigation of the Radlach Pastor Franz Xaver Presenn it spread across the entire valley (Zenegg-Scharffenstein 1930, 55). From the Upper Drau Valley, it spread down the Drau River in the second half of the eighteenth century towards Central and Lower Carinthia (Wadl 1987, 243).

Lesacht Valley and Gail Valley can be mentioned as another cultivation area during the same period. However, Johann Burger's statement claims that the "Turkish wheat" was naturalized there, mediated through Italy, and spread from there to the rest of Carinthia. In the first half of the eighteenth century, it was first encountered in the Lesacht Valley, replacing buckwheat. However, due to the climatic conditions, it could only be grown in the eastern part of the valley. At the same time, it replaced buckwheat as a staple. The cultivable land remained small (Neumann 1997, 205). On the other hand, there is no evidence of maize cultivation in the estate inventories of the farms in the neighbouring Gail Valley for the years before 1740. The first news of maize came from the dominion of Aichelburg in 1742 and 1743. In the following years, it established itself as a new field crop alongside the traditional cereals. The trail can be followed further. Almost at the same time, maize cultivation can also be demonstrated for the area around Villach, namely for the owners of the dominions of Landskron and Velden. The first mention refers to St Magdalen (1739), and the others to Rajach (1742), Föderlach (1755) and Kleinvassach (1756). Most of the evidence comes

from small peasants, who were able to improve their self-sufficiency with the more profitable maize (Wadl 2019, 243).

In this context, a linguistic specificity is of interest. The term *türkischer Weizen* (Turkish wheat) is a synonym for maize that was used in German until the nineteenth century. Afterwards, it was shortened to *Türken*. In this form, the term was adopted in other compounds such as *Türkensterz*, *Türkenmus* or *Türkentschurtschen*. There are two interpretations associated with the word *Türken*: one claims that it came to Carinthia via the Ottomans (= *Türken*). The other points out that the tuft of styles on the maize cob suggests associations with the beard of a Turkish man. Variations of the word *Türken* can also be found in the Slovenian dialects of Carinthia. In short: The development of maize cultivation is reflected in these two different names, which have a geographically clearly delineated distribution area: In the Jauntal and Lower Rosental valleys, it was or is referred to in Slovenian as *turšca* or *turščica*, while in the Upper Rosental Valley the term *sirk* dominates. Wadl assumes that both Slovenian terms derive from German, that is *turščica* from *Türken* and *sirk* from *türkische Hirse* (Turkish millet), since *Sürch* was used also in the German language island of Lusern in Trentino and was derived from the Italian *sorgo turco* (Wadl 1987, 250); on the contrary, Slovenian authors do not necessarily believe that these words came from German.[1]

From the middle of the eighteenth century onward, maize began to spread rapidly. It was not only reform politicians and agricultural scientists from the late eighteenth and early nineteenth centuries who sought to improve the self-sufficiency of the population by introducing new crops, so did the Carinthian agricultural society Agrarcultur-Societät. In some places, their initiatives were heard. By 1780, maize was probably more widespread. The inventories of a farm in Vorderberg for the years 1727, 1743 and 1786 documented the growth of maize cultivation very well. While the *türkischer Weizen* (Turkish wheat) was not mentioned in 1727, there were approximately 285 litres or 215 kilograms of it in 1743, and approximately 900 litres or 675 kilograms in 1786. That was not yet a great amount. It can also be found in the neighbouring dominion of Wasserleonburg. Already in 1719, polenta – a porridge made from maize grits – was on the menu of the subjects of the dominion as a main course for lunch or dinner. This is the earliest example of extensive maize consumption (Wadl 1987, 166). Maize continued to be grown in the following years. In 1750, maize cultiva-

1 See Panjek in this volume.

tion in Wasserleonburg had already reached such an intensity that the dominion felt compelled to secure its income by regulating the tithe with regard to the new crop. From about 20.5 litres of seed, peasants had to deliver 15 kreutzers as a tenth. In 1750, a total of 1,200 litres or approximately 860 kilograms were planted in Saak, Nötsch and Förk, which corresponded to a cultivated area of approximately 15 hectares. Maize was also an important crop for miners (Zeloth 2004, 156). This evidence corroborates the assumption that the maize coming from northern Italy first spread to Upper Carinthia and then to Central Carinthia. Since the middle of the eighteenth century, there was a more intensive spread along the Drava River towards Lower Carinthia. This is how the maize got into the Lavant Valley (Sandgruber 1982, 46). The Carinthian Agrarcultur-Societät, founded in 1764, played a significant role in its dissemination. In an effort to introduce new crops, the Societät also propagated maize cultivation – with success (Bäck 2005, 45). The peasants, especially on estates like Arnoldstein, focused more and more on the cultivation of "Turkish wheat". This was how they compensated "for the grain shortage […] to the extent that many peasants who previously had to buy grain could now sell maize themselves" (Roth 1970, 351). The decisive factor for getting to know each other and subsequently for the spread of the new arable crop was probably that the so-called Italienstraße led through these areas (Roth 1970, 351). Around 1780, maize was encountered sporadically in the Upper Lavant Valley, for instance on mountain farms near Frantschach, and in Central Carinthia near Krumpendorf or Hohenfeld (Dinklage 1966, 175). In 1794, the Agrarcultur-Societät started a new attempt to make maize an integral part of crop rotation in Carinthia. For this purpose, seeds from Venetia were permitted. In the end, maize did not succeed. A completely different development from that in Upper and Central Carinthia occurred in south-eastern Carinthia (Lower Carinthia). Until the early nineteenth century, there was no evidence of maize cultivation there.

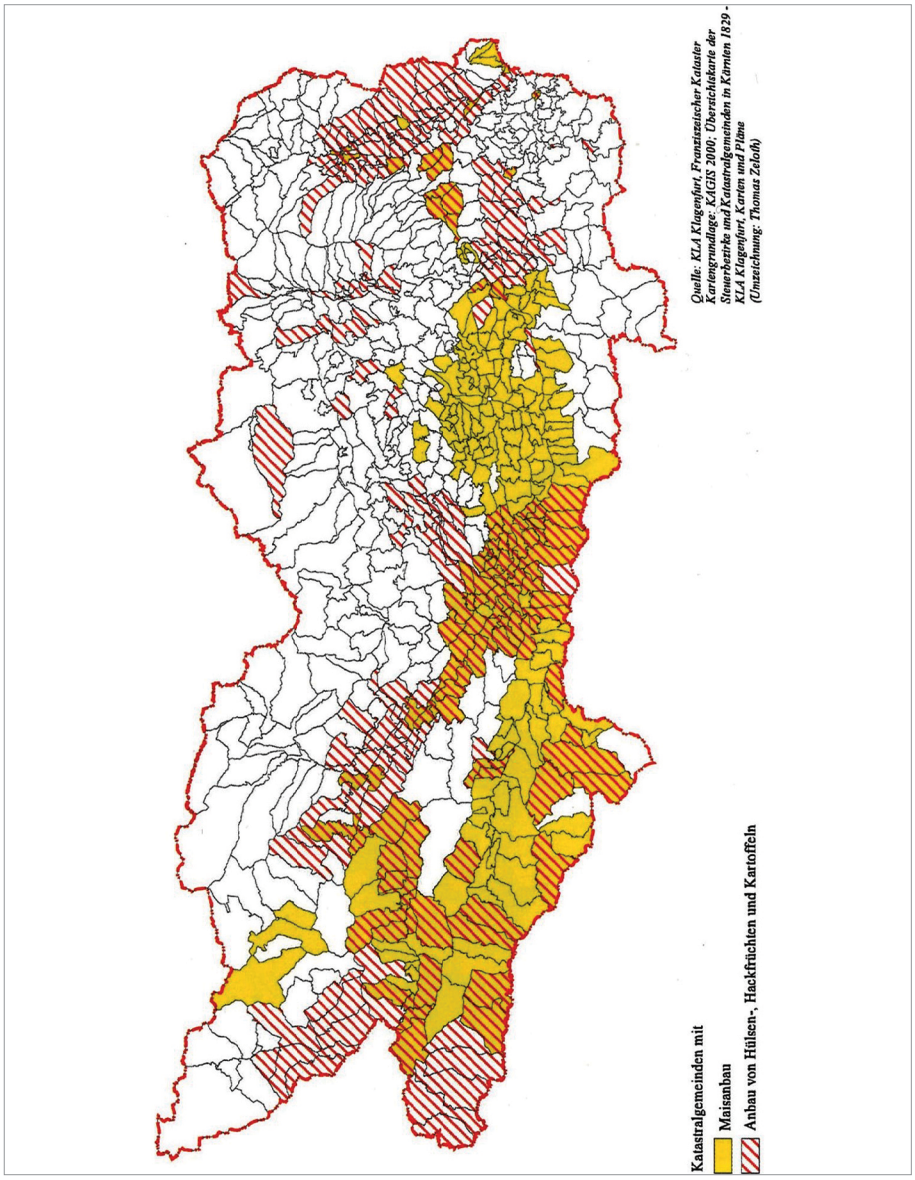
In the following two decades, a selective spread began. The same applies to the south-eastern Carinthia area. For example, it is not mentioned in the inventories of the largest dominion Bleiburg for the years before 1800 (Lackner 2014, 245). The reasons lie, on the one hand, in agricultural backwardness, and in the dominance of buckwheat, on the other. The inventory *Inventarium des Erbherzogtums Kärnten* (1780), written by Vinzenz von Rosenberg, provides a description of the status quo regarding maize. It reads: "In Upper Carinthia, the food of the peasant mostly consists of

Turkish wheat, whereas in Central and Lower Carinthia buckwheat, grain and wheat are paid as a tithe." (AT-KLA, 118-Rosenberg, Table 3). The period of the Napoleonic Wars initially delayed its further expansion. But the longer the armed conflict lasted, the greater the efforts made by politicians to improve self-sufficiency in agriculture due to the food shortage with the introduction of new, more productive crops. This also included the potato, which the people were still very reluctant to consume, and above all the expansion of maize cultivation. Johann Burger was the biggest advocate of the latter, because he saw maize as a more productive grain than the conventional ones. In 1804, he began extensive experiments with maize, which he was the first to sow in rows with the seeder. As a result of his multi-year trials, a comprehensive study (*Vollständige Abhandlung über die Naturgeschichte, Cultur und Benützung des Mais oder türkischen Weitzens*) emerged in 1809. Burger, who dealt with maize until the end of his life, believed that the "common peasant", even "if he is still as stupid and lagging far behind every other culture, as he is in Carinthia [...], would make a difficult decision to introduce new field systems and crop rotation; but it is wonderful how quickly the maize spreads. It is impossible to determine how many yokes are being planted with maize each year" (Burger 1809, 77). In the year of his death, 1842, a follow-up essay appeared in the *Carinthia* newspaper (Burger 1842, 4-6). In it, the Carinthian agricultural economist is surprised to find that the maize spread "along the entire length of the Drava River to Lienz". It was also grown in the Möll Valley. In Winklern, several peasants had started to cultivate it between 1780 and 1790. Between St. Veit an der Glan and Klagenfurt you could see the "most beautiful maize fields, the range of which increases every year" (Burger 1842, 6). However, it was not so easy to make maize known to the rural population as a crop and food. Burger describes in detail the problems associated with the introduction of maize at the beginning of the nineteenth century: "There was a time when aversion to maize was particularly strong in [...] Carinthia [...] But they were able to overcome this prejudice." (Burger 1809, 73).

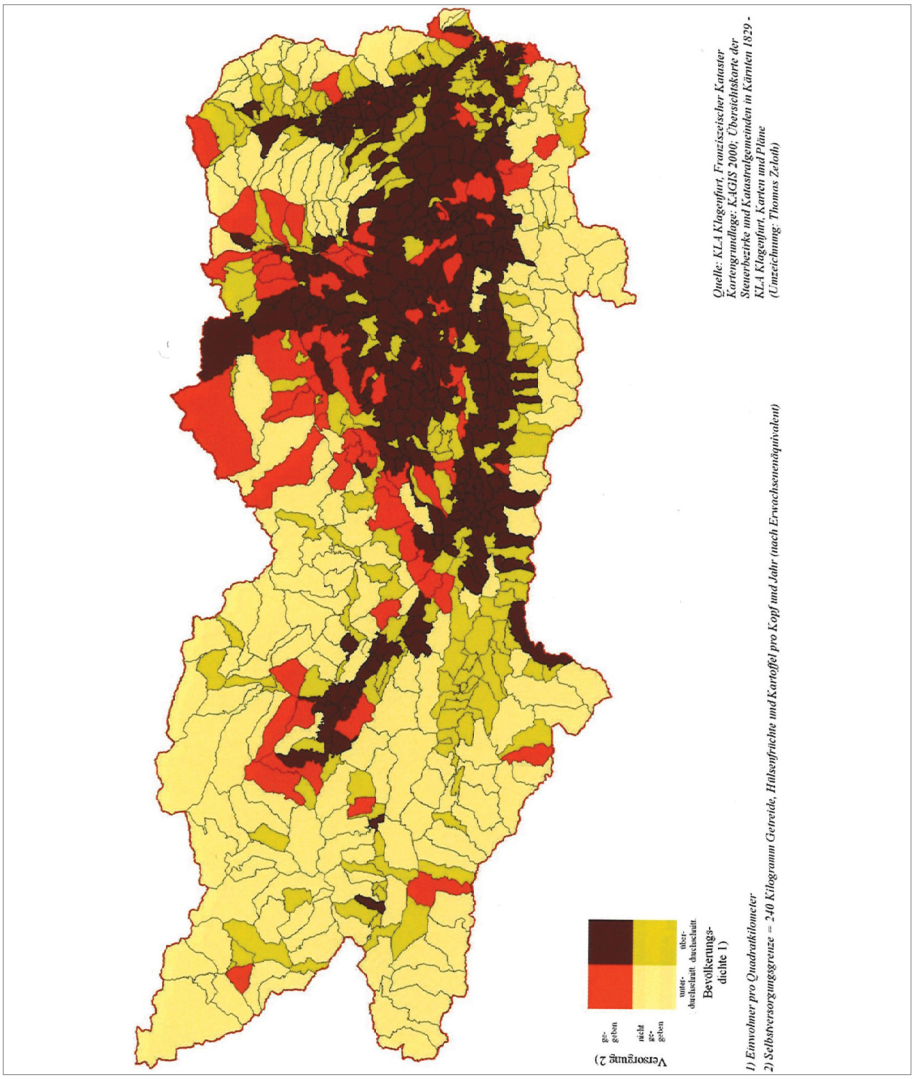
Maize becomes an integral part of agriculture and food

When Burger died, maize was already firmly anchored in people's minds as food. External constraints, the food shortage in the era of the Napoleonic Wars, and the poor harvests in the "year without summer" after the eruption of Mount Tambora (Indonesia, 1815) forced peasants to grow these new high-yielding crops after the failure in the buckwheat harvest. A virtue

was made out of necessity. Now the peasants were increasingly relying on maize. Joseph Hain noted in his *Handbuch der Statistik* that in addition to the two main crops, oats and rye, maize was grown as a crop in the flatter southern regions of the country (Hain 1853, 26). The scepticism was gone. The first signs of its increasing acceptance can be found in 1803 when it was first offered on the Klagenfurt weekly market. However, it did not begin its triumphal march as a market crop and foodstuff (*Türkensterz,* polenta) until the 1830s, when it also gained acceptance as a food outside the cultivation centres, thanks to the support of the Agrarcultur-Societät. In 1830, its president considered the expansion and promotion of maize cultivation a priority objective. He noted that maize cultivation had made great strides in some areas of Carinthia, but it "has not yet been introduced in others areas where it would also thrive" (Mayr 1831, 26f.). In that year the acreage was about 2,700 hectares (= 2 percent of the arable land) (Sandgruber 1982, 46). However, the cultivation was mainly for local use. A comparatively tiny area of 0.1–0.2 hectares was enough to achieve self-sufficiency. The Franciscean Cadastre provides comprehensive information about its distribution during the pre-March period. Of the 809 cadastral communities in Carinthia, 279 (34.5 percent) reported growing maize. By 1830, the maize acreage already comprised 2,742 hectares, or 2.1 percent of the total arable land. The Klagenfurt district accounted for 46.6 percent (see Map 1). For all of Carinthia, the harvest yield was 4,484 tons, of which 2,144 tons were in the Klagenfurt district and 2,432 tons in the Villach district. Across the country, 1,636 kilograms were harvested per hectare. That was more than twice as much as for wheat, oats, rye or barley (Table 1). In the Klagenfurt district, the yields were 1,676 kilograms per hectare; in the Villach district, 1,601 kilograms per hectare. The increase in yield was accompanied by higher per capita consumption. In the Klagenfurt district, consumption equalled 14 kilograms per capita; in the Villacher district, 22 kilograms per capita, which was significantly above the national average (17.3 kilograms per capita) (Table 2). Maize had become an important nutritional alternative (Drobesch 2003, 95). In comparison, the consumption of potatoes at 5.4 kilograms per person per year was still low. Wherever maize was planted, the level of supply of the population was given (compare Map 2 with Map 1). Regardless of the increasing yields, the cultivation was classified as not very intense. But in the rural households the so-called *Türkenhauen* (Turkish skins) and *Türkenkrallen* (Turkish claws) devices were increasingly to be found, which were needed for the maize harvest. *Türkenfedern* (Turkish



Map 1. Maize cultivation by cadastral communities around 1830
Legend:
Katastralgemeinde = cadastral community
Maisanbau = maize cultivation
Anbau von Hülsenfrüchten, Hackfrüchten und Kartoffeln = cultivation of legumes, root crops and potatoes



Map 2. Degree of self-sufficiency and population density by cadastral communities around 1830

Legend:

Bevölkerungsdichte = population density[1]; überdurchschnittlich = above average; unterdurchschnittlich = below average

Versorgung = supply[2]; *gegeben* = factual; *nicht gegeben* = non factual

1) *Einwohner pro Quadratkilometer* = *inhabitants per square kilometer*

2) *Selbstversorgungsgrenze* = self-sufficiency level – 240 kg grain, legumes and potatoes per capita and year (adult equivalent)

feathers) were used to fill pillows. An "American Turkish maize ginning machine" was also known (Khackl 1845, 60).

Table 1. Cultivation and yields of cereals, legumes and root crops, as well as potatoes, in Carinthia, 1830 (Zeloth 2013, 148)

Crop	Yields in tons	Cultivation in hectares	Share in the cultivated area in percent	Yields in kilograms per hectare
Rye	35,875	45,459	35.1	788
Oats	22,871	32,289	24.9	707
Buckwheat	7,279	18,320	14.1	397
Wheat	10,505	13,736	10.6	764
Barley	7,949	9,262	7.1	773
Maize	**4,485**	**2,742**	**2.1**	**1.636**
Millet	1,891	2,275	1.8	831
Mixed cereals	1,465	1,908	1.5	766
Foxtail millet	511	556	0.4	919
Linseed	123	381	0.3	322
Beets	8,034	1,705	1.3	4.712
Potatoes	3,391	510	0.4	6.649
Lentils	160	310	0.2	516
Beans	133	115	0.1	1.156
Collectively	**104,673**	**129,568**	**100.0**	**808**

The pre-March period was a time of upheaval in the everyday living habits. The results of the cadastral estimates show that the cultivation of maize was increasing throughout the province. In Upper Carinthia, it had penetrated into the mountain valleys. In parts of the Möll Valley and the Lesacht Valley it was used as food, although in very small quantities. In 1834, the estimates for the Franciscean Cadastre stated that the main food of the population of the Lesacht Valley was polenta. It was prepared less with maize and more with barley or oats. Maize was cultivated only to a very small extent (Neumann 1997, 205). Not much had changed there, compared to the eighteenth century, because of the lack of population pressure.

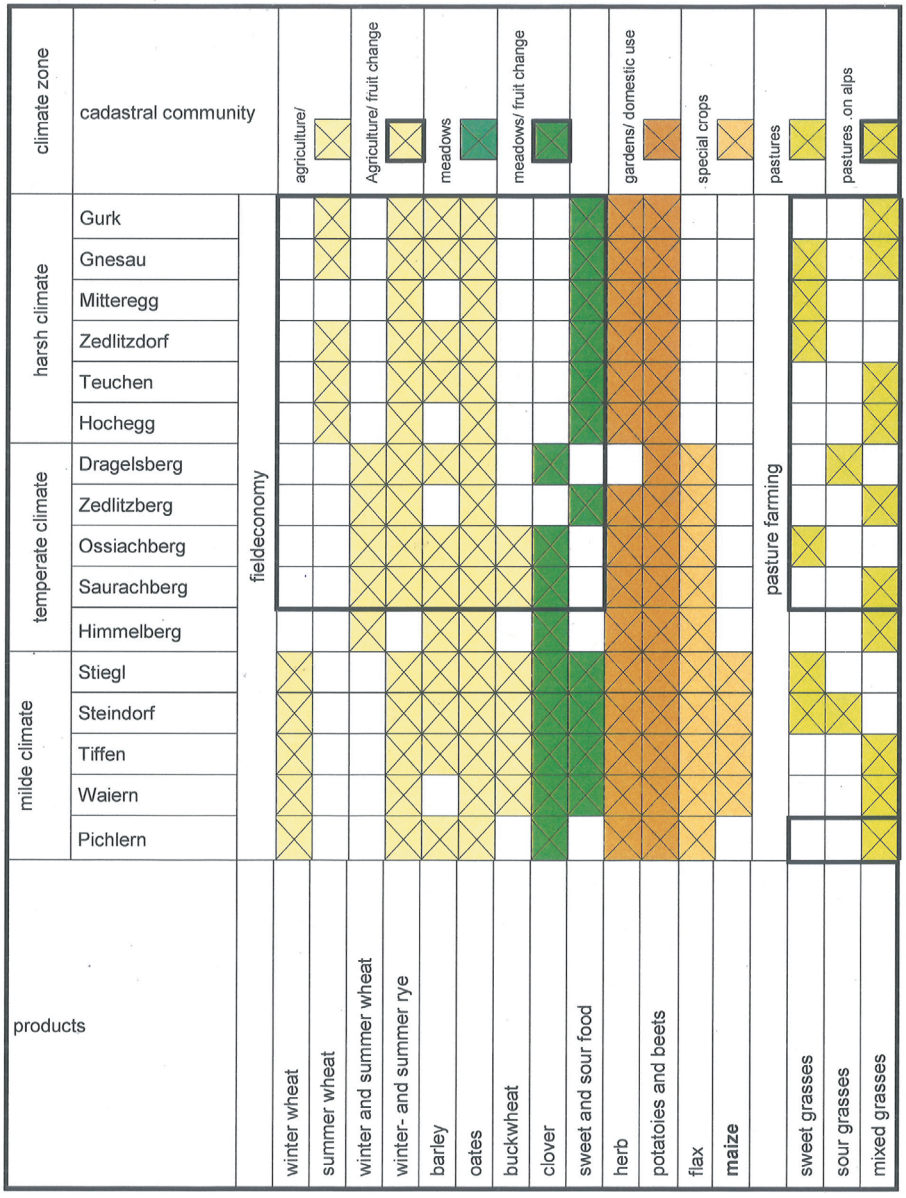
The centres of maize cultivation with yields of 100 kilograms and more per capita and per year were the Lower Gail Valley, the area around Villach, the western Rosental, the area west of Völkermarkt and the central Carinthian area with the Klagenfurt basin. In the cadastral community of Maria Saal, it was the second most cultivated cereal with more than a quar-

Table 2. Per capita consumption in kilogram per year in Carinthia, 1830 (Zeloth 2013, 149)

Crop	District		Carinthia
	Klagenfurt	Villach	
	in kilograms		
Rye	124.9	64.3	100.1
Wheat	33.8	20.0	28.1
Oats	32.7	15.0	25.5
Buckwheat	31.9	7.7	22.0
Maize	**14.0**	**22.0**	**17.3**
Barley	12.6	24.0	17.2
Millet	11.9	0.3	7.2
Mixed cereals	7.5	0.0	4.4
Foxtail millet	2.5	1.1	1.9
Linseed	0.0	1.2	0.5
Potatoes	4.6	6.5	5.4
Beets	5.9	17.1	10.5
Lentils	0.7	0.0	0.4
Beans	0.8	0.0	0.5
Collectively	**283.7**	**179.2**	**240.9**

ter of the annual gross yield of all cereal cultivation, after rye. In some areas, such as Grafenstein in Central Carinthia or the cadastral community of Treffen, where the annual requirement was calculated at 16.2 hectolitres for ten people, it was used on an equivalent basis to other types of grain, such as buckwheat or millet.

Maize was an important nutritional factor in these areas. However, it was not only used as food for humans. In the area around Klagenfurt and St. Veit an der Glan, the peasants were already using it for fattening pigs. There it had become a true alternative to buckwheat, which it was slowly displacing from the crop rotation system. In some cadastral communities in Kanaltal, such as Flitschl (Fličl, Plezzut,) und Lusnitz (Lužnice, Lusnizza), maize was cultivated almost exclusively. Everywhere it became an integral part of the weekly menu of the rural population. In the cadastral communities of Edling and Spittal an der Drau they had *Plenten* (polenta) for dinner three times a week (Wadl 2013, 166). It was a popular dish and was enjoyed as a daily meal by the many Italians working in the country (Hermann 1860, 349). Although the focus of the nutrition around 1830 was still on the traditional porridge dishes made from oats, millet and barley, maize enriched the menu as an innovation. The "modern" or "non-tra-



Graph: Crops by climate zones/cadastral communities in the tax district of Himmelberg, 1831 (Johst 2011, 44)

Table 3. Harvest results in Carinthia, 1830/ 1871 (Zeloth 2013, 161)

Crop	1830		1871		cultivation	yield	yields in kilograms per hectare	
	cultivation in hectares	yields in tons	cultivation in hectares	yields in tons	1830-1871 in %		1830	1871
Wheat	13,736	10,505	16,071	20,332	116.8	193.6	765	1,268
Rye	45,459	35,875	39,530	45,846	86.8	127.8	789	1,162
Barley	9,262	7,949	9,533	12,062	102.7	151.8	858	1,268
Oats	32,289	22,871	24,759	28,838	76.5	126.1	708	1,167
Maize	2,742	4,485	8,527	11,071	310.4	246.9	1,636	1,301
Millet	2,831	2,402	2,031	2,166	71.6	90.2	848	1,069
Linseed	310	160	645	687	207.6	429.4	516	1,068
Beans	11305	133	115	839	265.0	630.9	1,157	2,753
Mixed cereals	1,908	1,465	525	531	27.5		768	0
Buckwheat	18,320	7,279	8,828	8,282	48.1	113.8	397	940

ditional" crops for self-sufficiency – including maize – were cultivated in Upper Carinthia across a larger arable area compared to Lower Carinthia. However, the hectare yields in the Villach district were significantly lower than those of the Klagenfurt district. Maize was harvested in 56 out of 75 tax districts in 1814 (Zeloth 2013, 150). In 1848, the administrator of the manor of Hunnenbrunn (near St. Veit an der Glan), Thomas Khackl, took stock of the development of maize cultivation in Carinthia in an article in the *Mitteilungen* über *Gegenstände der Landwirtschaft und Industrie Kärntens* (Khackl 1848, 12-14). According to his explanations, it had been grown in the Gail Valley since the mid-eighteenth century and in Central Carinthia since around 1800. But the maize, in which Khackl saw an alternative to traditional grain cultivation, was not only consumed in these areas, but also in others. Its yield was above that of traditional cereals. Especially in areas with a mild climate, it joined the "classic" cereals as a new crop, such as in the Himmelberg tax district in Central Carinthia. There it could be found in the inventories of those cadastral communities that were located in a zone with a mild climate.

In the dominion of Hunnenbrunn, also an area with a mild climate, Khackl registered an average of 16.6-33.8 hectolitres per 0.01 hectares between 1816 and 1846. In places with favourable soil, even 43.1 hectolitres per 0.01 hectares (approximately 6.5 tons per hectare) (Khackl 1848, 14). The peasants also got higher profits from the sale (Wadl 2009, 341).

The triumphal march of maize in Carinthia began at the latest in the 1840s. In the second half of the nineteenth century, the cultivation of a "young" grain such as maize was no longer a question of innovation or persistence, but only of whether it flourished in this or that landscape or not. It is therefore not surprising that cultivation tripled in the second half of the nineteenth century (Table 3).

The prejudices against maize were finally eliminated. It had established itself as a crop. Wherever the soil and the climate allowed it, the peasants planted it. The rest of its story in Carinthia need not be told here.

Conclusion: industrialization and population growth as accelerators of the spread of maize

From the sixteenth century to the first half of the nineteenth century, maize was becoming an increasingly important part of agriculture in Carinthia. But it also became an important food, especially in rural areas. The de-

velopment of its cultivation varied greatly from region to region and over time. Its more frequent occurrence in the areas which bordered on Italy (Lesacht Valley, Gail Valley) suggests that – as Burger suspects – it came to Carinthia from Italy. Gradually, it spread from the mid-eighteenth century onward in the climatically favourable Central Carinthia (Krappfeld, Zollfeld) and during the first half of the nineteenth century towards Lower Carinthia. Its increased spread came at a time when Carinthia's industry, especially the mining industry, experienced a boom. This confirms the thesis that its widespread distribution was the result of early industrialization. This is linked to the beginning of population growth that had far-reaching consequences. The population pressure made it necessary to cultivate maize on a larger scale. With the cultivation of maize, the "inexpensive nutrition of the population became possible [...] which was a prerequisite for the expansion of industrial production" (Sandgruber 1982, 46). After reaching the lowest level in 1812, Carinthia experienced a period of demographic recovery from around 1825 onward. In 1847, the province had 320,784 inhabitants. Compared to 1816, this growth meant an increase of 20.1 percent, whereby the number of inhabitants in the Klagenfurt district (+24.3 percent) increased more than in the Villach district (+14.4 percent). The population pressure was so great that it made maize cultivation even more necessary, as in the case of potatoes. In this respect, there was an interaction between the spread of maize and the industrialization process in Carinthia, same as elsewhere. Industrialization accelerated its triumphal march.

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Buckwheat or maize? Ultimately, potatoes! The Slovenian experience with maize in the nineteenth and twentieth centuries

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Introduction

In the nineteenth century, modernization or the introduction of the achievements of the agrarian technical revolution took place in Slovenian agriculture, as Jože Maček put it (Maček 1995). This process changed the technological aspects of agriculture, and new crops were being introduced. One of them – maize – had a far-reaching impact: it became the driving force of the changing structure of crops. We can hardly say that maize has been overlooked by historiography. Its rise has been simply impossible to ignore, as it influenced the structure of agriculture and people's diet. However, it never achieved the cult status of potatoes, which became known as the plant and crop that put an end to hunger and malnutrition. Much research has been dedicated to potatoes. The cult status of potatoes in Slovenia was established by the book with a very suggestive title *Kruh ubogih* ("The Poor Man's Bread", Stabej 1977). This work corroborated the thesis that only potatoes managed to ensure adequate nutrition of the population. Allegedly, they also contributed to population growth. Another emphasis of the book was social – we could even say class-related. The stratification of society was supposedly related to potatoes, which delivered the lower social strata from famine and food shortage. This thesis left no room for the importance of maize as a supplementary crop. With the exception of the western part of Slovenia, maize could not compete with potatoes as far as the nutrition of the population was concerned. In the majority of the territory, it was

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usually a supplementary foodstuff, but its value would occasionally spike, especially when the potato harvest was poor due to potato blight or unfavourable weather conditions. In such difficult times, people would resort to maize. We can thus state that both maize and potatoes contributed to the long-term stability of the food supply. The finding that potatoes and maize initially mostly established themselves in the poorer parts is indisputable (Makarovič 1991).

By the middle of the nineteenth century, maize had been successfully introduced: by that time, it had already become well known and present throughout the Slovenian territory. It arrived in this territory from two directions: the Padan Plain and the Pannonian Croatia. The stages of pre-adaptation and adaptation concluded in the eighteenth century. During the pre-adaptation stage, people familiarized themselves with the advantages and potentials of maize and introduced it to the fields. In the adaptation stage, maize production was already established: it was used as livestock feed and in the daily diet of the population. At the beginning of the nineteenth century, there was still much room for the expansion of this crop. The process was rather slow, the conditions varied from province to province, and the central Slovenian territory lagged behind the other parts for a long time. However, maize kept becoming more popular with time, and in the last decades of the nineteenth century, its establishment was indisputable. Its economic significance kept increasing, and by the onset of World War II, it had become the most important crop in Slovenia besides wheat and potatoes.

Similarly as in other countries, the fundamental advantage of maize was its productivity (Warman 2003). While it called for greater investment in terms of physical labour, it contributed to the growth of the yield and to the economic value of arable land. This was a significant development for the vast number of small peasants that dominated the land ownership structure. In the fields, maize was often accompanied by two other crops: beans and pumpkins. Maize stalks also provided support to beans or pumpkin tendrils. It could also serve as a stubble crop, planted after other sorts of cereals had already been harvested. The fast-growing varieties of maize, imported from Italy, represented a typical example of this, as they matured in less than two months. Furthermore, various uses were discovered for dry maize stalks and maize cobs, and nothing was discarded. In the long term, productivity contributed to the popularity of maize. This

was an essential element that explains why maize production expanded, replacing lentil or the older types of cereals like millet, spelt, or buckwheat.

Even language was affected by maize. The formation of what is allegedly an original Slovenian phrase represents a permanent trace. In the Slovenian language, the expression *biti na koruzi* ("to be on maize") or živeti na koruzi ("to live on maize") denotes an extramarital union. The phrase originated in the nineteenth century from the various practices of avoiding the control and restrictions of the profoundly traditional society of the time. This is where maize comes in: unmarried couples or lovers would secretly meet in the haven of maize fields or spend their nights in barns lying on the maize stover. The practice has since disappeared, but the idiom persists and attests to the fact that even completely economic historical phenomena can attain social connotations (FRAN 192).

The penetration of maize into the peasant economy and mentality therefore represents an extensive and complex historical issue. It is also an integral part of the long-term restructuring of agricultural activities and accompanying social processes, especially in the field of nutrition. This discussion presents a condensed overview of the significance of maize in Slovenia during the nineteenth and the first half of the twentieth century, until World War II. Two different economic contexts, separated by World War I, existed during this lengthy period. After World War I, the majority of the Slovenian territory was included in the Yugoslav state – an environment where the economic and social importance of maize was significantly higher. However, approximately one third of the Slovenian territory in the west was governed by Italy, where maize had, even traditionally, played a vital role. If Slovenia was a land of potatoes, Serbia, for example, was a land of maize. In the interwar period, Yugoslavia was one of the biggest maize producers and exporters. Slovenia and Serbia are examples of the development of regionally dissimilar economic structures with different roles of maize in farming and in agriculture in general. Therefore, this contribution also outlines the process of the introduction of maize in Serbia. Such a presentation is also useful because both of these traditions eventually merged into a single national economic space in the Yugoslav state and were influenced by the same economic and political forces.

Between tradition and modernity: buckwheat or maize?

The introduction already stated that maize had established itself completely in the first half of the nineteenth century. This was also reflected on the

linguistic level, as the names for the plant and its crops changed during the introduction and general adaptation of maize. Initially and for a long time in the nineteenth century, maize was referred to as *turšica/turščica*, meaning "Turkish wheat", which had been derived directly from *grano turco* or *türkischer Weizen*. During the nineteenth century, the term *koruza* became established, which is a derivative of the Turkish term *kokoroz/kukuruz* (FRAN 193). The Franciscean Cadastre attests to the fact that maize was present, in larger or smaller quantities, throughout the territory. The two surveys carried out in the Slovenian Styria during the pre-March period confirmed the presence of maize in practically the entire territory of this region (Kuret 1985–1993). It was least frequent in the central part of Slovenia (Gospodarska 1970, 262), Carniola, and in Prekmurje, the easternmost region of the country.

The various dynamics were not only caused by different natural conditions, however. The swifter expansion of maize in certain parts can be ascribed to the influences from the lands where it had established itself more quickly. The western parts of Slovenia were in close contact with the Italian lands, where maize had already become very frequent, for example in the Padan Plain or Friuli, to list two of the most extreme cases. Good models encouraged the introduction of maize in the nearby fields. The Styrian part of Slovenia is also an extension of the Pannonian Plain, where maize production expanded rapidly, also in Croatia. The climate was favourable for maize as well, as a continental climate with warm and sufficiently moist summer months is characteristic for the majority of the Slovenian territory, which experts have been underlining since as early as the middle of the nineteenth century (Poskušnje 1850). Despite these factors, in Prekmurje, which is a part of the Pannonian Plain and enjoys favourable natural conditions, the introduction of maize was slower than in the other regions. This fact is normally explained with the marginal position of the Prekmurje region and its lag in the processes of economic and social modernization (Gospodarska 1970, 262–265). The different dynamics of maize adaptation also depended on the social context rather than solely on the economic one. The penetration of maize into Carniola supports this claim. For a long time, the central part of the Slovenian territory was slow to introduce maize, as the local population was strongly attached to buckwheat. The fact that buckwheat was a stubble crop contributed to this, but maize could fulfil the same function as well. The buckwheat tradition persisted for a long time in the nineteenth century: with its superior production po-

tential, maize only gradually undermined the work organization and field structure adapted to buckwheat. This is also an opportunity to compare the various conceptions of the importance of individual crops and adaptation mechanisms, as well as to underline the components of the perception of either maize or buckwheat.

The introduction of maize was encouraged by professional organizations, agricultural societies, and the authorities. Despite the influence of these institutions, it took much convincing and practical demonstrations to persuade peasants to gradually dedicate a larger percentage of their fields to maize. The central part of the Slovenian territory, i.e. Carniola, represents an obvious example. The economic and social dilemmas and uncertainties that accompanied the introduction of maize are apparent from the contemporaneous press. Moreover, heated discussions took place in the newspapers between the advocates of either buckwheat or maize, as historians already noted decades ago (Gospodarska 1970, 262). The debate was relevant for the entire Slovenian territory, even though the articles focused on the conditions in Carniola. An article from 1846 is one such example: its very title – "Hvala ajde" or "Praise to Buckwheat" – indicated the clear standpoints of the text. Already in the introduction, the author employed the method of moral discrediting to support his arguments. First, he discredited "foreigners" who were not familiar with the local conditions yet reproached Carniolans for producing buckwheat, a less productive and more sensitive crop. This supposedly suggested that Carniolans prioritized tradition over "progress". The "learnedness" of certain natives represented another example of discrediting the "opponents" of buckwheat. This is an example of a preliminary discrediting of the expert approach aimed at increasing the overall productivity of agriculture and therefore calling for certain changes in the structure of crops and models of farming. It is an example of opposing the idea of "progress" and productivity as the driving force of the increasingly capitalist economy in agriculture. Such an expert approach supposedly neglected the experience of generations of peasants. Allegedly, experiments and models of good practices could not make up for their centuries of experience in farming. These reproaches were aimed at the advocates of maize in particular. The argument from the neighbouring Province of Carinthia – that the extensive introduction of maize had significantly improved the food situation and that famine was therefore no longer a permanent threat – did not carry much weight with the authors, whose concern was: "How shall we preserve the good name of our belov-

ed buckwheat?". The author lists the reasons against the partial replacement of buckwheat with maize. Maize was supposedly demanding for the soil, which was purportedly less suitable in Carniola. The main argument, however, was the increased labour intensity of maize production. Should more maize be sown, peasants would not have the time to work with other crops. Buckwheat straw with added turnips and leftovers from flax oil production was supposedly more than sufficient for animal consumption. Buckwheat was seen as an indispensable component of human nutrition. "If Carniolan peasants do not produce buckwheat, they will not eat much bread. Almost all white wheat is spent for holidays, tributes, nobility, and other purposes – only buckwheat remains at home for cooking and baking bread." The shortage of buckwheat would supposedly result in a famine that maize would be unable to stop. Maize was also discredited because of the alleged poorer taste of maize bread and its unsuitability for cooking. Furthermore, maize flour dishes (žganci, a sort of spoonbread or mush, similar to polenta) purportedly required more lard (dressing) to come anywhere near the taste of buckwheat dishes. "It is true that maize mush with a lot of lard tastes good, but buckwheat mush tastes even better, does not require so much dressing, and is also much better with milk." As frost was supposedly rare in Carniola, there was no need to reduce the areas dedicated to buckwheat. The author attempted to offset the higher productivity of maize by referring to the buckwheat yield. He claimed that in the most favourable circumstances, the ratio of seeds to crops in the case of buckwheat was 1 to 16, but he makes sure to refrain from mentioning the ratio for maize. Allegedly, buckwheat was indispensable because it ensured diversification and thus contributed to risk management in case of a potential shortage of other crops, like cereals or potatoes. The vital importance of buckwheat for honey production was brought up as well. In conclusion, the author also listed a few reasons related to the cultural landscape and nature that justified the extensive areas dedicated to buckwheat. Thus, he also described an idealized image of agricultural land and organization of agricultural work:

> *Buckwheat in flower bestows magnificent beauty on the landscape, as such fields appear to be sprinkled with flowers for weeks. They have a pleasant scent and provide the hardworking bees with so much honey and wax that beekeepers can earn quite a bit of money. Furthermore, buckwheat contributes and attests to the peasants' diligence. We often see them plough their fields and sow buck-*

wheat on one side, while they are still harvesting wheat or flax on the other side. It therefore happens that by the evening buckwheat has already been sown where wheat was still growing in the morning. A week later, such a field is already green again. In September, go visit the places and lands where buckwheat is not sown after other sorts of cereals, and you will see that the empty fields appear burnt. You will be eager to once again rest your eyes on fields covered in buckwheat and adorned with reddish-white flowers.

As a sort of a solemn promise, the author concludes the text by declaring: "In Carniola, we will therefore not give up buckwheat: it is ours and it will remain ours. Thank God for it!" (KRN 1846, Okra). Throughout the century, buckwheat persisted in the entire Slovenian territory, in particular as a stubble crop. In the last decades of the nineteenth century, a new, modernized frost-resistant variety of buckwheat was introduced. Its relevance was thus maintained for as long as the first decades of the twentieth century. Not including Istria, where it was not sown, the average percentage of buckwheat on arable land in 1875 amounted to approximately 16%, and Styria was the province with an above-average share. By 1913, however, the percentage of buckwheat as a stubble crop had been reduced in all the provinces – not so much in Styria than in the Goriška region, where it declined by three quarters. Even in Carniola, where buckwheat was defended by passionate advocates, its share was reduced by a third. The reduction in the percentage of buckwheat was mostly caused by the introduction of various fodder plants (Gospodarska 1970, 266).

The opposite standpoints – that buckwheat needed to be partially replaced with maize – were published in 1854. In that year, early frost considerably diminished the buckwheat harvest, as this crop was extremely sensitive to colder temperatures. Experts advised that larger quantities of maize be sown to avoid such a problem in the future. The process was not simple, however, because the opposing side claimed that buckwheat was irreplaceable in the concept of peasant economy for two reasons. One of its advantages was the fact that it was a stubble crop, which contributed to the economization of agricultural land. Another argument attested to the concept of an integrated peasant economy, as the buckwheat advocates kept underlining that this crop was indispensable for the widespread beekeeping. As bee pastures, buckwheat fields ensured the production of honey, which supplemented the peasants' income. The experts understood that changes could not be introduced instantaneously and that it was not sensible to put

an end to the coexistence between buckwheat and beekeeping too quickly. However, they warned that because of the sensitivity of buckwheat to early frost, risks had to be neutralized or reduced, which could be done by gradually increasing the percentage of maize over that of buckwheat. Initially, the peasants could allocate a quarter of their buckwheat fields to maize. In this manner, they would familiarize themselves with the production potentials and usefulness of maize first-hand. However, the process should involve the introduction of those varieties of maize that were the most suitable for the local pedological and climate conditions. Its purpose had to be taken into account as well: maize as a stubble crop called for varieties that matured rapidly – the so-called činkvantin (from *cinquantin*; KRN 1855) and *pignoletto* (KRN 1880, Porenta). Elsewhere, maize was more suitable as the main crop, as it boasted a higher yield (KRN 1848). The general usefulness of maize was emphasized as well, as maize stalks were highly convenient as livestock feed. Even stripped maize cobs were useful. The suitable pedological conditions for the cultivation of maize and its resistance to frost were underlined as well (KRN 1850). Should the soil be too heavy, fertilization could ensure suitable conditions.

Peasants were being persuaded that with the appropriate sowing distance to ensure sunlight and heat, they could take advantage of maize fields by also planting beans and pumpkins. As maize needed to be hoed and dressed, the workload increased. Therefore, peasants were concerned that they would be unable to handle the additional work and would need to hire workers, which would be a too great burden for the scope and profitability of their economy. Twenty workers were required to dress a single hectare of maize in a single day. Calculations indicated that between twenty and twenty-five workers were needed to hoe the same amount of maize in a day. These facts caused considerable concern. The experts recognized that the peasants' doubts were well founded, but believed that the long-term productivity of maize in combination with additional crops and weeded fields more than made up for the increased physical effort. Later, in the 1880s, one of the arguments in favour of maize that was often mentioned was the possibility of using machinery for these purposes (KRN 1881), as the one-time expense to purchase the required agricultural machinery was, in the long term, offset by the increased productivity. For this reason, however, it was necessary to plant maize with the correct spacing between the rows and within rows. The peasants also kept underlining the reduced harvest of wheat, should maize expand as the main crop rather than merely as a stub-

ble crop to replace buckwheat. The representatives of agricultural societies would respond to this concern by emphasizing the far greater productivity of maize and the necessity to increase the wheat yield in the remaining areas. The president of the Carniolan Agricultural Society thus concluded his appeal to the peasants – that they should consider the suitability of sowing buckwheat – with the following proclamation:

> *…that it is not prudent for those whose survival depends on their fields to rely solely on buckwheat. … Think about it yourselves, my friends! Do not take my words for granted, but consider it on your own and do not forget to take everything into account: seeds, labour and crop – both the grain and the straw harvest – as well as the value of every stalk. … Carniolans are hardworking people, it is only that they still keep relying on buckwheat too much!*

Agricultural societies would supply peasants with subsidized seeds to facilitate the introduction of maize. Generally, subsidies as an economic encouragement represented an important element for the acceptance of maize. On their own, education and persuasion were not enough to change the traditional models and structure of the peasant economy. Agricultural societies encouraged the peasants to experiment and learn from their own experience, as well as from the knowledge of others. As the experts argued: "And if we do not listen to experience – proven experience – we only confirm the old saying that old habits die hard" (KRN 1854, Terpinc). In this regard, the author was certainly right. The preoccupation with tradition, existing models of farming, and the fear of change represented obstacles for the swifter introduction of maize. Changes, however, called for a leap into the unknown. New crops – and maize was definitely one such crop – called for new technologies, a different work organization, and partially also investments into new facilities or adaptation of the existing buildings to ensure the proper storage of maize. However, the path had been paved despite the reservations, and maize slowly gained importance. As the process was gradual, the peasants had enough time to adapt to the new production capabilities and technological demands that maize involved.

Simultaneously, maize was also becoming a part of the people's diet. Polenta and maize mush soon appeared on people's tables, and mixing maize flour with wheat flour was a familiar practice throughout the Slovenian territory. However, in Istria and in the Goriška region (near the border with Italy), maize was more common: it was mostly eaten in the

form of polenta. The existing reports show that in the decades leading up to the turn of the nineteenth century, the maize harvest in Istria sufficed for four months. After that, peasants had to purchase additional maize. In the remaining part of the Slovenian territory, the crop allegedly sufficed for the annual needs of the population (Hrobat Virgolet 2018, 87). In Carinthia, maize mush was very popular, while Styria stood out in terms of mixing maize flour with other types of cereal flours. In the central part, cereal mushes still prevailed. Generally, the everyday diet of the rural population consisted mostly of mushes and potatoes. Maize dishes only supplemented or diversified everyday nutrition (Makarovič 1991, 156).

The quiet advance of maize

The statistical information about the percentage of maize confirms the nutritional patterns in the field of cultivation as well. These data reveal the long-term establishment of maize and its relation to other crops, which differed considerably from province to province. We can certainly claim that in the first half of the nineteenth century, the established relations between maize and other field crops persisted for a long time, until as late as World War I, as indicated in the following charts.

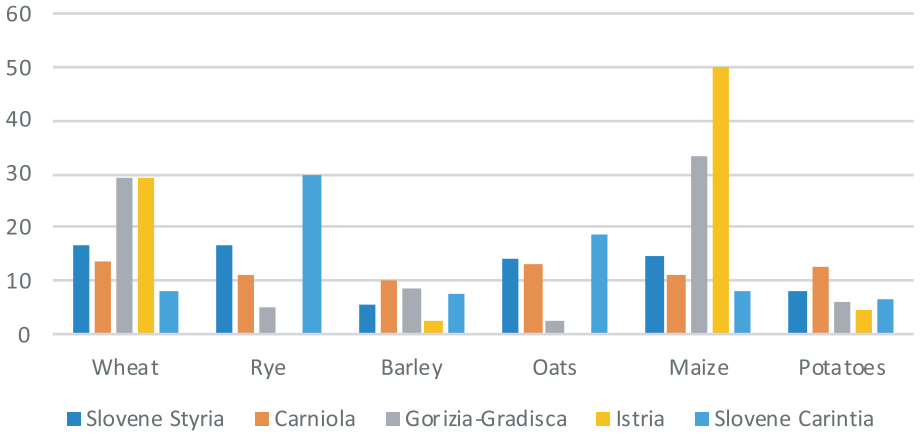

Chart 1: Field crops and arable land in Slovenia in 1875 (in %)
Source: Gospodarska 1970, 265.

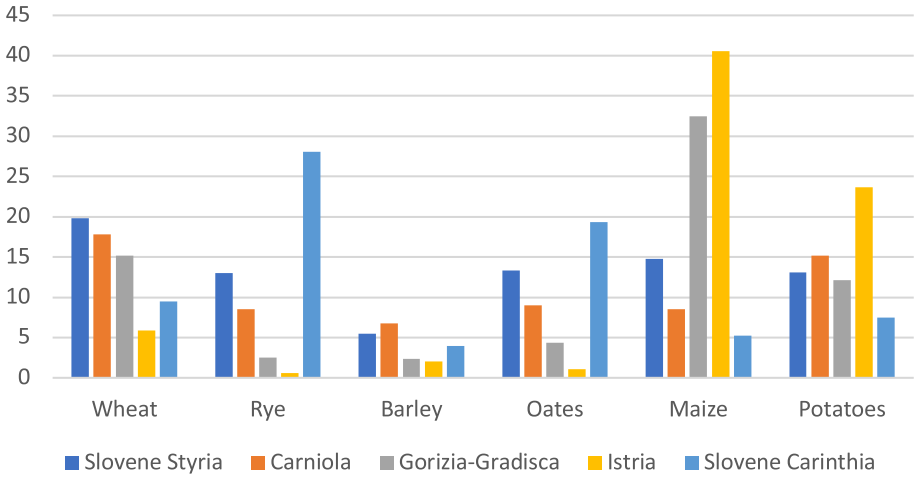

Chart 2: Field crops and arable land in Slovenia in 1913 (in %)
Source: Gospodarska in družbena, 1970, 266.

The role and share of maize varied notably between provinces. With the exception of western Slovenia (Goriška region and Istria), where maize was a staple crop whose share amounted to nearly one half, it was present in much more balanced percentages in the other provinces. In the east, the Slovenian Styria, where maize was sown in approximately 15% of the fields, exhibited a more diversified structure of crops in the long term. Meanwhile, in the central part of Slovenia (Carniola), maize did not establish itself to such a degree. In 1875, the percentage of arable land dedicated to it had amounted to approximately 12%, but even that diminished to around 9% by World War I. This decline resulted from the expansion of potatoes. An interesting trend emerges when the absolute data regarding the surfaces of individual crops at the level of the Slovenian average is taken into consideration. The growth of absolute surfaces was not only registered in the case of potatoes, for example in Carniola, but also for wheat and maize. Areas dedicated to wheat, maize, and potatoes kept increasing throughout the nineteenth century. Until as late as the end of that century, maize had an advantage over potatoes. Other cereals, apart from wheat, were in decline. This was, in part, a confirmation of the process pattern: the more modest the yield of a crop, the smaller the percentage of surfaces dedicated to it in the long term. We state this with caution because the high percentage of buckwheat deviated from this pattern throughout the nineteenth century. Meanwhile, maize and potatoes with their high yield represented typical examples that confirmed the pattern. The expansion of surfaces dedicated

to wheat was encouraged by its high price, however. Furthermore, the data reveal that the (poorer) population of (central) Slovenia increasingly prioritized potatoes, which assumed the role of staple food as the beginning of the twentieth century drew closer. Maize, on the other hand, was primarily used for animal consumption. The percentage of fields dedicated to potatoes tended to increase until World War I, which was a general Slovenian trend. Thus, it is not surprising that the majority of Slovenia soon attained the reputation of a land of potatoes in the self-image of its population. The western parts of Slovenia, where maize had an indisputable primacy, were too small to change the impression of Slovenia as a land of potatoes.

Regarding the yield per hectare, we can note an interesting tendency that maize yield was, in comparison with other cereals, the highest in the 1880s and 1890s. Later, it was characteristic that the differences in the yields between cereals, with the exception of buckwheat, diminished, but maize still retained an obvious advantage. If we also take into account the possibility of combining maize with beans and pumpkins, the advantage of maize was indisputable. However, neither other cereals nor maize could match potatoes in terms of productivity. In the case of potatoes, the yield per hectare gradually increased throughout the nineteenth century. This fact further contributed to Slovenia's eventual reputation as a land of potatoes.

Interesting relations surface when we only observe the data for maize. It is completely obvious that during the decades leading up to World War I, maize production kept changing in relation to weather conditions. After the beginning of the twentieth century, production and yield per hectare stabilized, indicating that in the context of the production technology at the time, further growth in productivity could not be expected. At the level of the entire Slovenian territory, the percentage of surfaces dedicated to maize remained more or less the same throughout the period under consideration. Only minimal deviations in individual years are notable, but they disappear when we calculate the areas as average five-year sequences.

Maize prices were directly dependent on production, demand, monetary value, and general economic circumstances. The long-term trends of maize prices in the Slovenian territory can be analysed based on the discussion by Vlado Valenčič (1977), who published the movements of cereal prices in Ljubljana spanning almost two centuries prior to World War I. The data include maize, even though they are the least complete, particularly for the first half of the nineteenth century. In Ljubljana, the first trad-

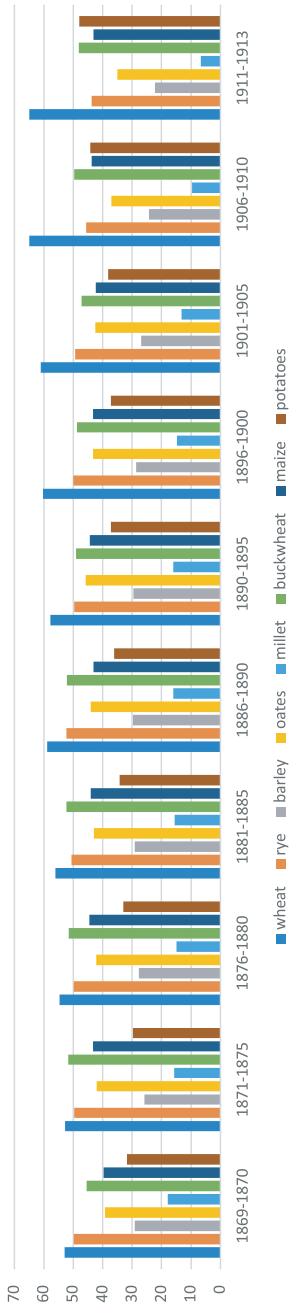

Chart 3: Surfaces dedicated to individual cereals and potatoes, 1869-1913 (in 1000 ha)
Source: Maček 1993, 18-37

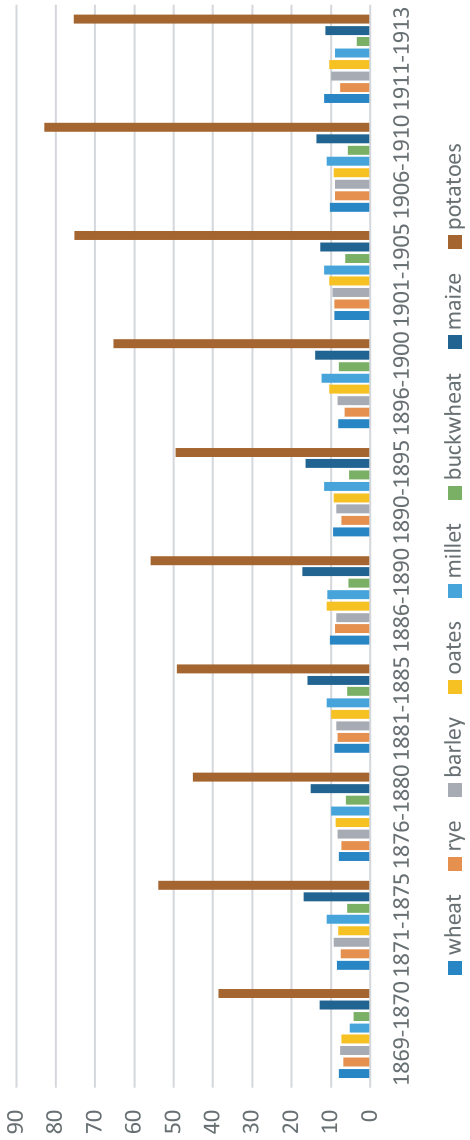

Chart 4: The yield per hectare of cereals and potatoes in Slovenia, 1869-1913 (in q/ha)
Source: Maček 1993, 18-37.

ing in maize was registered in 1795. Since then and until as late as World War I, a sequence of data on maize prices exists, even if with short interruptions. The analysis of price trends reveals that, except for a few oscillations,

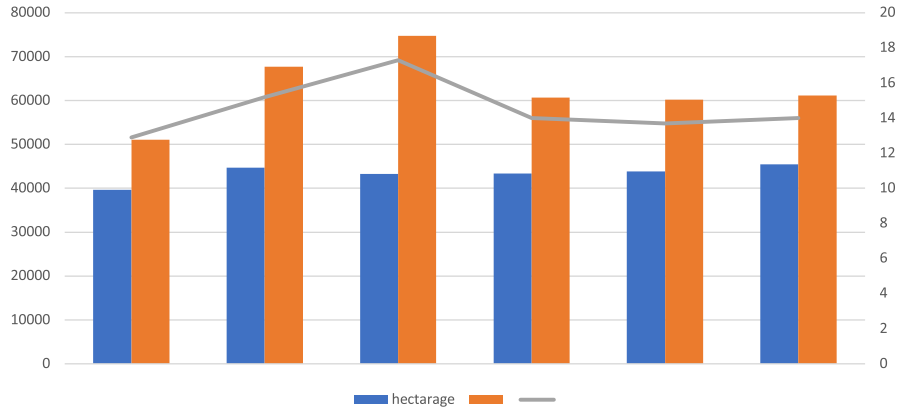

Chart 5: Surfaces, crops and yield of maize until World War I in Slovenia
Source: Maček 1993, 33-34.

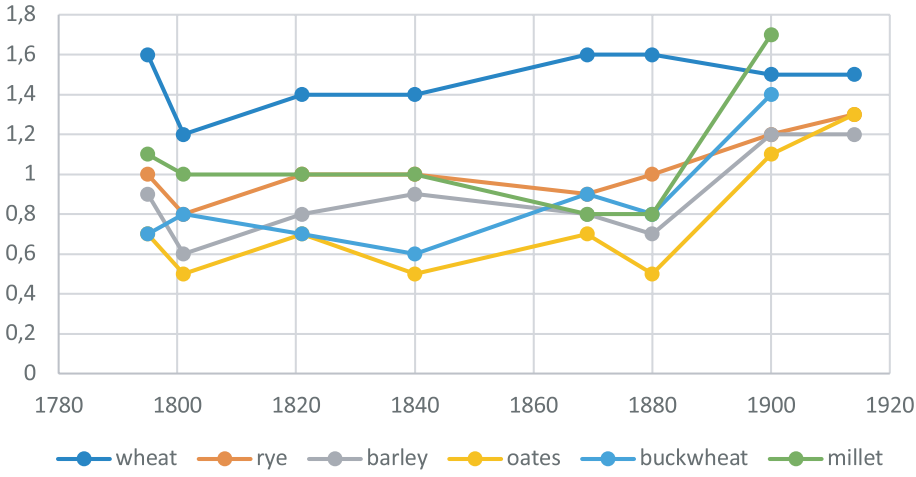

Chart 6. Relative price relations between maize and other cereals 1795-1914 (maize = 1)
Source: Valenčič 1977, 163-202.

they remained stable in the long term. From the 1870s until World War I, the maize prices kept increasing slowly yet persistently.

For as long as a century, the long-term relative price relation in comparison with wheat as the most important cereal was preserved as well. The verification of the relative price for an equal amount of wheat or maize every twenty years reveals that the relation was quite stable. In the first half of the nineteenth century, the relative price of maize came the closest ever

to that of wheat, amounting to approximately three quarters of the price of wheat. In the time up to World War I, the difference in prices increased and the relative price of maize settled at approximately two thirds of the wheat price. It is interesting that in the last decade of the eighteenth century, when the maize trade had only just begun in Ljubljana, the price relation was almost identical to that of shortly before World War I. These trends are also interesting in comparison with other cereals. With the exception of rye, whose relative price matched that of maize throughout the nineteenth century, other cereals (barley, oats, buckwheat, and millet) were relatively cheaper until the end of that century, when the relative price of maize diminished considerably in comparison with other cereals. This relative decrease in maize prices resulted from the increased supply, the slight expansion trend of the surfaces dedicated to maize, and the significantly higher yield per hectare.

3. The prevalence of maize in Serbia

The example of Serbia, which had a tradition entirely unlike Slovenia, will serve to illustrate a different role of maize. Naturally, maize was the fundamental driving force of field crop changes during the nineteenth century in Serbia, too. There, maize established itself much earlier than in Slovenia – already at the beginning of the eighteenth century. In 1722, as much as 31% of fields were dedicated to maize (Stoianovich 1966, 1028). In the next century this process advanced considerably; in the agricultural structure of 1846, the percentage of maize amounted to as much as 55%. In the following two decades, it then settled at approximately 45% and persisted at this level until as late as World War I (Sundhaussen 1989, 246). As the charts demonstrate (Chart 2), only two Slovenian regions – the two western provinces near the border with Italy – boasted such a high percentage, namely 49.7% and 33.1% in 1875, and only in the second half of the nineteenth century. However, they did not contribute much to the Slovenian average. The relations between the individual crops, explaining the long-term trends of the position of maize and its broader role in the Serbian peasant economy, are indicated in Chart 7.

In Serbia, the absolute numbers referring to the surfaces dedicated to maize kept increasing throughout the nineteenth century. This, however, was not due to the creation of new fields, but in fact reflected the process of the enlargement of the Serbian state, as it gradually expanded into the former territory of the Ottoman Empire. Therefore, the surfaces dedicated to

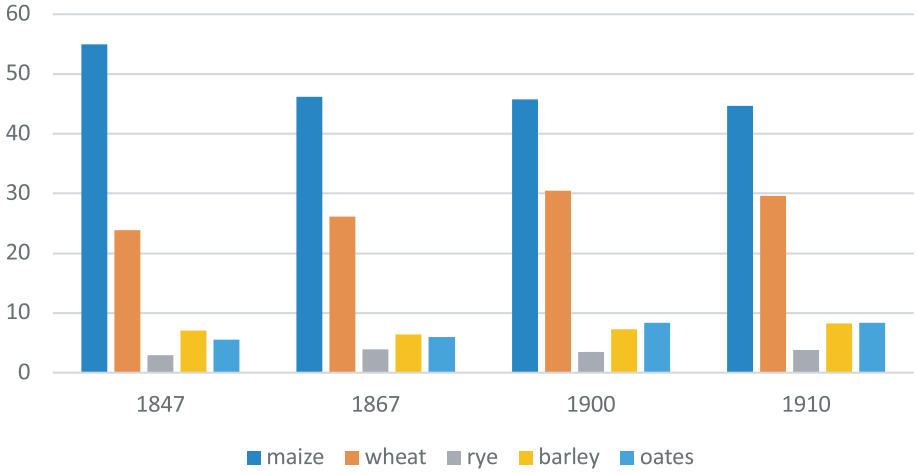

Chart 7: Field crops and arable land in Serbia (in %)
Source: Sundhaussen 1989, 246.

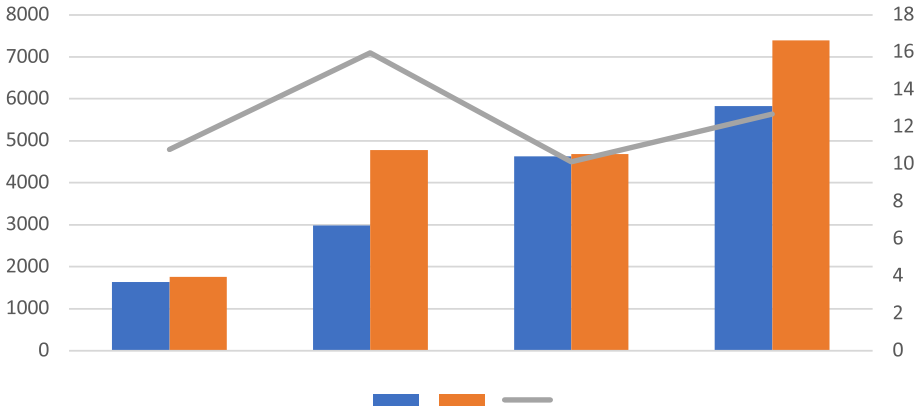

Chart 8: Maize crop in Serbia, 1867-1910
Source: Sundhaussen, 1989, 258.

maize kept increasing, as did maize production (Chart 8). Productivity or yield per hectare kept increasing most rapidly until the end of the 1880s, when they started to decline gradually until the end of the century. In the first decade of the twentieth century, however, they started increasing again. In the European context, Serbia was, in terms of productivity, among the countries with the lowest maize yield per hectare (Chart 9). The Pannonian Plain was the most productive area by far, followed by Spain and Italy. In terms of yield per hectare, the Slovenian areas were relatively high on the

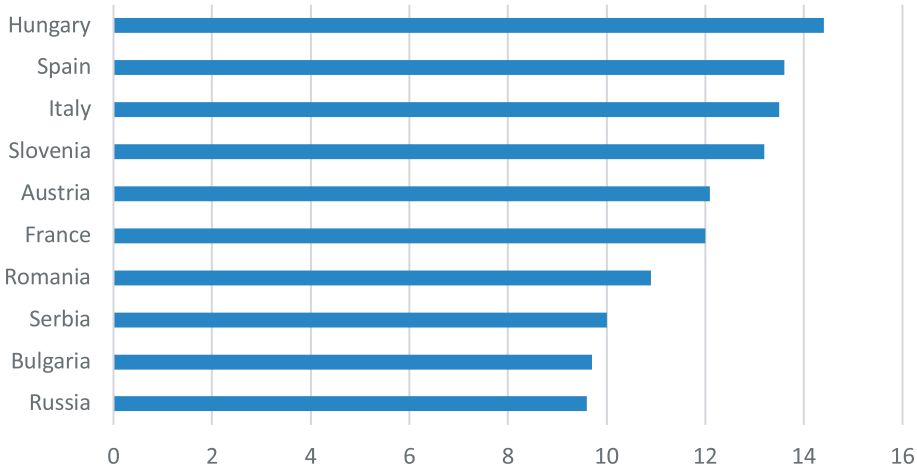

Chart 9: Maize yield per hectare in certain European countries, 1901-1910 (q/ha)
Source: Sundhaussen 1989, 261; Maček 1993, 33.

list. They were slightly different than the average in the Austrian half of the monarchy: thanks to Styria and the Prekmurje region – the two provinces located in the Pannonian Plain where the conditions were most favourable for the growth of maize – Slovenia boasted a higher yield per hectare. In the Pannonian Plain, the soil was sufficiently moist while summers were warm enough that maize could grow and mature properly.

The considerable share of maize in the agricultural structure resulted from the structure of the peasant economy that had established itself in Serbia. The vital importance of livestock farming was notable: live animals, especially pigs, were a dominant item, especially in exports. The Habsburg Monarchy was the most important market. Maize – in the form of young maize or maize grain – was irreplaceable as animal feed. It was widely used for cattle production and the dairy industry in particular. Pig farming was entirely maize-based. Even in horse nutrition, it would often replace oats and barley (Garić Petrović 2017, 109–110). At the same time, for a considerable part of the twentieth century, maize remained an important part of the everyday diet of the Serbian population (unlike the diet in the majority of Slovenia). Peasants would often sell wheat because of its higher price and purchase maize for food (Tomasevich 1955, 477). The majority of the population would eat maize bread daily, and they would also use maize flour to prepare other cooked and baked dishes. The records – occasionally even studies of the role of maize in the quality of meat and bacon, or anal-

yses of its nutritional value for human and animal consumption – attest to the considerable role of maize in the peasant economy. Its influence on the quality of dairy products and on the taste and colour of eggs, when cattle and poultry were fed maize, was discussed as well (Nikolić 1931, 41). Such a role of maize also called for the use of different maize varieties, depending on its intended use. Varieties intended for maize flour differed from those meant for animal consumption. The selection of varieties and the creation of hybrids began very soon. As early as in 1872, Đorđe Radić published a book that presented maize as a plant, the most sensible means of its production, and the initial results of crossing (hybridizing) different varieties (Radić 1872). Through hybridization, Radić wanted to create different varieties of maize that would best suit different purposes, as well as the Serbian pedological and climate conditions.

4. The interwar period

The end of World War I represented a significant turning point for Slovenia. Most of the Slovenian territory was incorporated into the Yugoslav state. In the new Yugoslav national economic space, agriculture was adversely affected by a change in relative prices (Bićanić 1973, 11-21). Consequently, the relative purchasing power of the peasant population decreased. Peasants represented the largest part of the population, also in Slovenia. Therefore, it is not surprising that agriculture found itself in a crisis already in the 1920s, even before the onset of the Great Depression (Lazarević 1994). With regard to maize, it was significant that Slovenia was integrated into an environment where the role of maize was much greater, which also determined the macro relations between the individual crops as well as the price movements on the internal market. With the establishment of the Yugoslav state, vast areas of the Pannonian Plain, previously included in the Hungarian half of the Habsburg Monarchy, became an integral part of the new state. Maize became the most important crop besides wheat, and Yugoslavia was one of the most important producers and exporters of maize in Europe. On average, maize exports represented 12.35% of all the exports due to the agrarian character of the Yugoslav state before World War II. Consequently, the share of exports in the national economy as a whole was also low (Nikolić 1931, 108-112). The export data should be further relativized. At the beginning of the 1930s, Yugoslavia exported only 8% of its total maize harvest, while the rest was required to satisfy the domestic demand (Nikolić 1931, 78). Maize was cultivated in all parts of the state, often also in the moun-

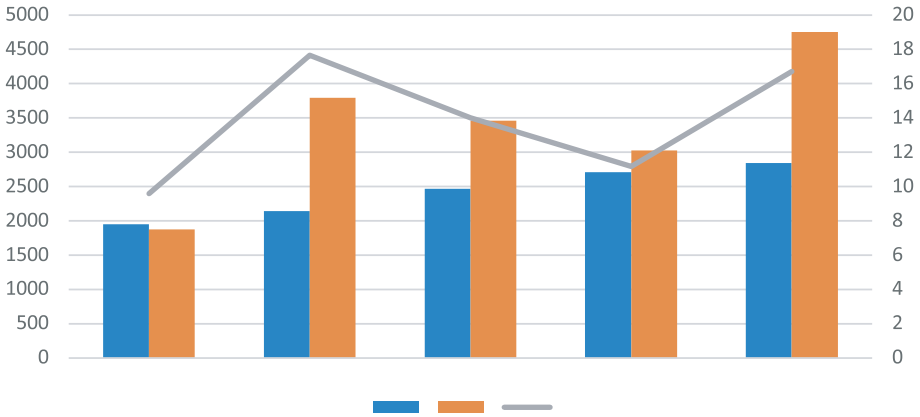

Chart 10: Maize production in Yugoslavia in the interwar period
Source: Tomasevich 1955, 476.

tains to the maximum altitude of 1,200 m, where special fast-growing varieties were cultivated. With its high yield and energy value, maize was indispensable in the diet of the people in the mountainous regions. In many parts of Yugoslavia, fertility rates were so high that only maize with its high yield was able to satisfy the demand for food. It is therefore not surprising that areas dedicated to maize cultivation kept expanding during the entire interwar period, while the productivity also increased (Chart 10). The greatest expansion of maize fields was recorded in the Yugoslav part of the Pannonian Plain – amounting to as much as 31% in the west, and up to 20% in the east. On average, since the 1920s and until the onset of World War II, the Yugoslav maize fields expanded by 21%. In the same period, productivity kept growing as well. The increases in yield slowed down somewhat only in the first half of the 1930s during the Great Depression, when exports were hampered and a few poor harvests were also recorded. The long-term growth in maize production could be explained with two factors. One of the factors was the international market, as Yugoslavia was one of the largest exporters of maize to the neighbouring countries, in the form of grain or live animals fed with maize. In the long-term, maize prices did not fluctuate as much as wheat prices, and the high level of demand remained stable. According to the studies of the period, the costs of maize were also relatively lower in comparison with those of wheat, although it required greater labour. At the same time, the relationship between the relative prices of maize and wheat tilted in favour of maize, as attested by the data from the areas in the Pannonian Plain that had the greatest influence

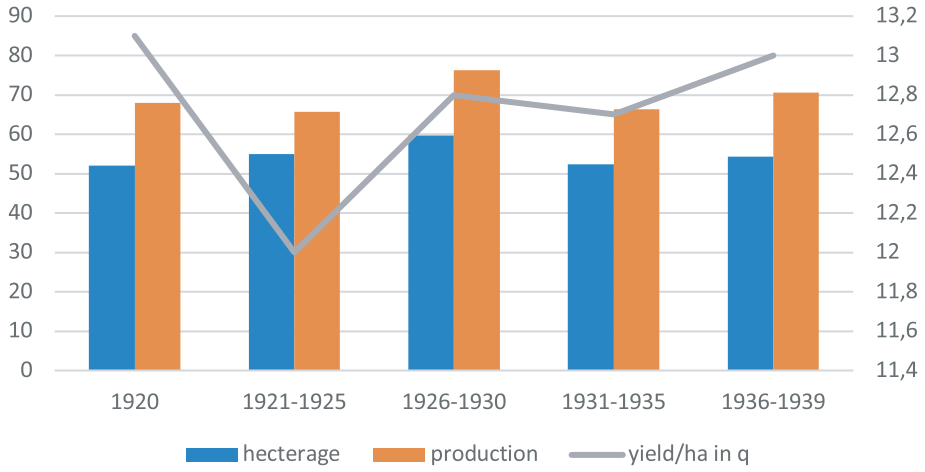

Chart 11: Maize production in Slovenia in the interwar period
Source: Maček 1993, 33-34.

over the formation of price relationships because most of the maize intended for the market was produced there (Vojvodina, Slavonija). In the 1930s, the ratio between the relative prices of wheat and maize amounted to 1.7:1, in line with the long-term values from the nineteenth century, as is also evident from Valenčič's calculations (Valenčič 1977, 163-202). On the other hand, the ratio between the yields of these two crops was 1:1.7 in favour of maize. In such circumstances, the increase of maize's share in the agricultural economy was evident (Tomasevich 1955, 482-488).

In the new macro-economic environment, the expansion of areas dedicated to maize also increased in Slovenia (Chart 11), although to a significantly lesser degree than in the other parts of the state. The areas expanded slightly in the second half of the 1920s, only to swiftly return to the steady long-term level. The harvest volume recorded higher growth due to the proportionately higher yield. In the interwar period, maize yield remained at the same level as before World War II. In the new environment, where the relationship between prices was determined by the producers from the Pannonian Plain, the Slovenian yield was lower in comparison with the state average (Chart 12). However, the state average was high due to the most productive areas in the Pannonian Plain that had been among the most productive at the European level already before World War I. When compared with the other regions directly, Slovenian peasants were highly productive

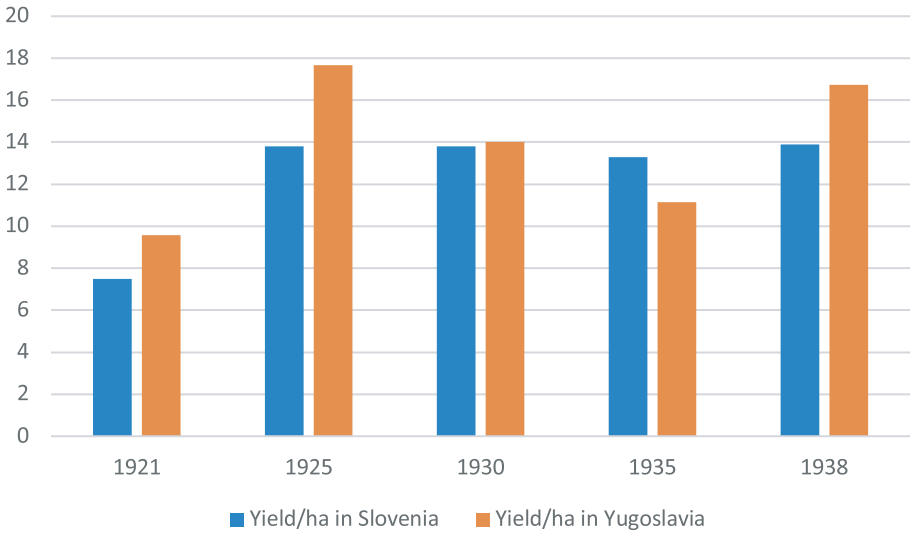

Chart 12: Maize yield in Yugoslavia
Source: Tomasevich 1955, 476; Maček 1993, 33-34.

maize growers. The role of maize for livestock farming was still considerable, but it was significantly less important for human consumption.

5. Ultimately, potatoes!

During the interwar period, the "hundred-year competition" between maize and buckwheat in Slovenia ended (Chart 13). The surfaces dedicated to buckwheat had declined drastically already during World War I – by approximately 40%. After the war, the decrease continued in the first half of the 1920s, when the presence of buckwheat in the fields was minimal. In 1939, only 2% of the fields where buckwheat had grown in 1913 were still dedicated to it, which demonstrates how steep the decline was. The crop itself suffered the same fate, as it virtually disappeared from the fields and the plates. On the other hand, the share of maize kept increasing. Buckwheat was therefore "collateral damage" of the altered macroeconomic environment in the new Yugoslav state. As the relative prices of agricultural products in comparison with industrial ones changed, peasants would more quickly abandon the poor-yielding crops, which buckwheat definitely was. Its yield per hectare was by far the lowest of all the cereals (Chart 14). Even millet had a better yield, and it nevertheless gradually disappeared from the fields. Growing buckwheat was completely irrational,

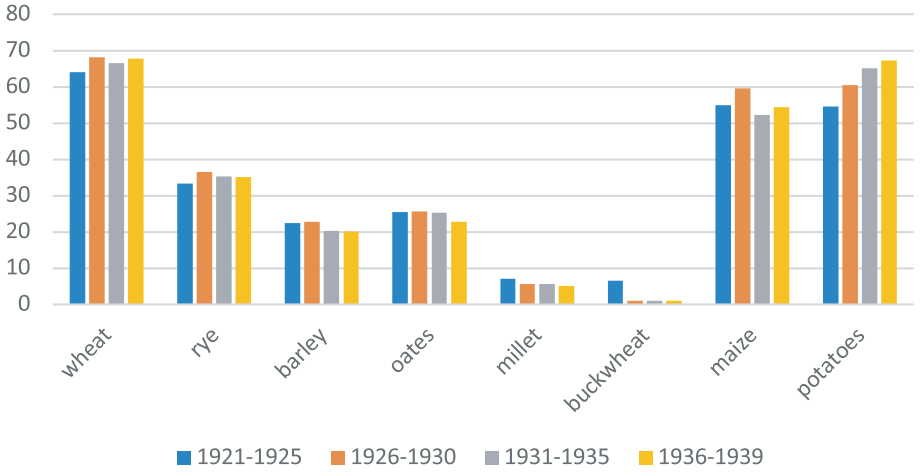

Chart 13: Field crops and arable land in Slovenia, 1921-1939 (in 1000 ha)
Source: Maček 1993, 18-34.

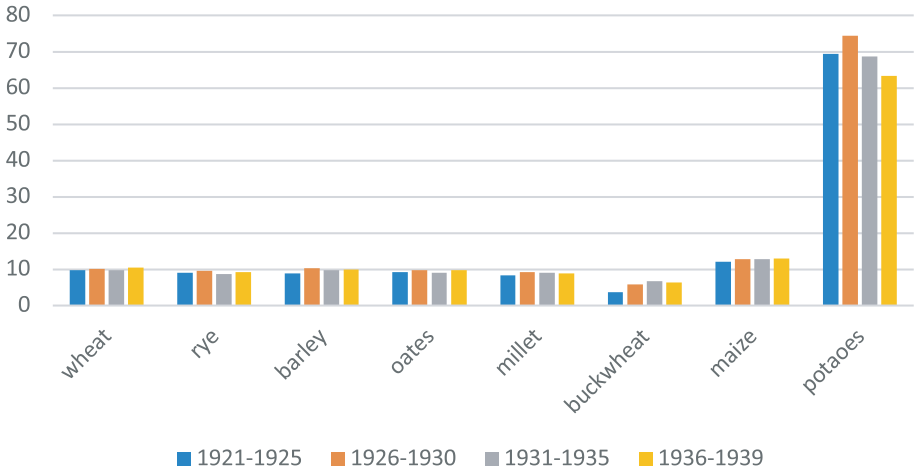

Chart 14: Yield per hectare of cereals and potatoes in Slovenia, 1921-1939 (in q/ha)
Source: Maček 1993, 18-34.

as it called for too much time and labour. The peasants' "emotional attachment" to buckwheat, which had been so characteristic for the Slovenian circumstances a century earlier, succumbed to the efforts to ensure a rational economization of agricultural work. On the other hand, the value of wheat, maize, and potatoes was preserved or even increased in the new Yugoslav environment. It is understandable that fields where these crops were grown kept expanding during the two decades before World War II.

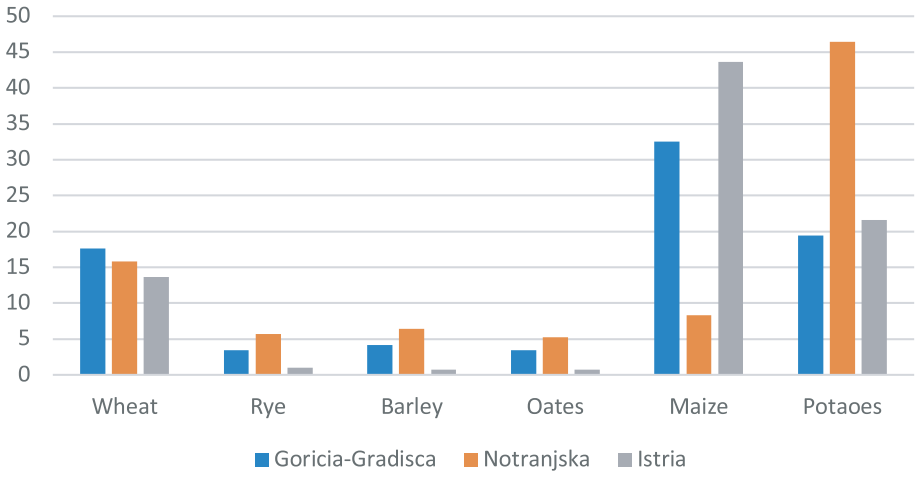

Chart 15: Field crops and arable land in western Slovenia in 1929 (in %)
Source: Gospodarska 1970, 269.

The western parts of Slovenia were exposed to similar processes. In the interwar period, these parts – approximately one third of today's Slovenian territory – were a part of the Italian state. There, maize had already traditionally been a dominant crop as well as a staple food of the people. In spite of the two economic contexts – the Yugoslav and the Italian one – the forces that were at work in both of these states were very similar. The increasing production of two kinds of cereal, wheat and maize, and of course that of potatoes is obvious (charts 10 and 15). The prevalent role of maize was therefore by no means questionable after World War I. However, also in this part of Slovenia, the trend of the increasing importance of potatoes due to their superior yield per hectare was apparent.

In the entire territory populated by Slovenians, the nineteenth-century trend of focusing on crops with the highest yield per hectare therefore persisted. Furthermore, the yield per hectare of wheat, maize, and potatoes kept increasing steadily. In view of the presented data about the surfaces and yields, we can definitely conclude that the victory in the "hundred-year competition" between maize and buckwheat went to potatoes! Slovenia was indeed "a land of potatoes". The socioeconomic context of the time also contributed to this in a decisive way: as most of the population lived close to the existential minimum (Lazarević, 2015), sufficient nutrition was of primary concern.

6. Maize in the everyday diet during the interwar period

We have already stated that maize was an integral part of the nutrition of the Yugoslav population. However, as in all other cases, numerous differences existed within Yugoslavia. Yugoslavia was, after all, a land of contrasts. The roles of maize and potatoes were typical examples. In the interwar period, the share of potatoes among all crops in the territory of today's Republic of Slovenia amounted to a little more than a fifth. No other Yugoslav province had such a significant share of potatoes. Apart from Slovenia, potatoes were well represented only in certain parts of Croatia (Tomasevich 1955, 489). Serbia, where maize was the dominant crop and potatoes were introduced rather slowly, represented a contrast. It is therefore not surprising that Slovenia was deemed a land of potatoes, where this crop represented a staple food. In this sense, Croatia represented a transitional area on the way to Serbia, where maize had the role of staple food. In 1928, the Ministry of Agriculture published the results of a research on the nutrition of the population, which also attempted to evaluate the structure of nutrition in Yugoslavia. The results were published in the form of a state average, which obscured the profound regional differences in the structure of the everyday nutrition of the population (Table 1).

Table 1: Structure of the average annual consumption of cereals and potatoes per capita in Yugoslavia, 1928 (in kg)

Wheat	97
Maize	157
Barley	30
Rye	26
Oats	2
Potatoes	10
Total	322
Daily average	0.88

Source: Nikolić 1931, 35.

In terms of averages, maize represented half of cereal consumption. In reality, however, this average did not exist. If the results were still representative for the majority of the state, they certainly failed to reflect the situation in Slovenia and the structure of food items there. In the case of Slovenia, maize should be replaced with potatoes. In the interwar period, approximately 400 to 500 kg of potatoes were produced annually per capi-

ta, in comparison with only 75 kilograms of maize even in the best of years (Maček 1993, 34-38). The majority of potatoes were used for human consumption, some as animal feed, and the rest for industrial purposes. There was no doubt, however, that the research demonstrated that the daily diet of most of the population in the majority of the state depended on maize.

The significant percentage of maize in nutrition posed numerous questions regarding the health effects of this relatively monotonous dietary pattern in certain parts of the state. Concerns were raised about the excessive dependence on maize and the associated risks. Italy – the Padan Plain – provided an example of the phenomenon of pellagra, which the researchers were looking into as a consequence of a monotonous maize-based diet. On the basis of the information from the parts where maize was most common in nutrition, they concluded that the absence of pellagra could be ascribed to two factors. The first one was the extent of maize cultivation, and the other the consumption of beans. Peasants supposedly produced enough maize that they could discard whatever was spoiled (mouldy), and yet enough was left for human and animal consumption. Furthermore, the consumption of various types of beans that would normally be grown simultaneously with maize contributed to a more balanced diet in the long term (Nikolić 1931, 36-39).

7. Conclusion

During the nineteenth century, maize established itself completely in Slovenian agriculture. In the last decades of the century, the promotion of maize cultivation was no longer required. Instead, the press, the expert literature, and organizations for the promotion of agriculture shifted their focus to education. Their aim was to improve the maize production technology to ensure an even better yield and broaden its use. The effects of maize adaptation were important in the long term. The Slovenian territory with its dissimilar regional dynamics of maize cultivation, its various economic applications or dietary uses did not represent a very special example. Quite the opposite: it was merely a local manifestation of the wider European processes that altered the structure of agriculture in the nineteenth century. In Slovenia too, maize thus represented an integral part of the restructuring and modernization of agriculture as well as of the peasant economy. In terms of its significance and impact, maize was similar to potatoes. A broader look reveals the process of a long-term rational economization of agricultural labour, called for by the modern capitalist economy. During

this process, it was crucial to increase the yield or the profitability of agricultural labour to allow for the social modernization of the peasant population and encourage general economic development (Lazarević 1998). Until as late as World War II, peasants represented the most numerous stratum of the population. Due to the increased purchasing power of peasants, any increase in the profitability of agricultural labour had significant macroeconomic effects. Throughout the decades, the tendency that peasants should alter the patterns and shares of crops was strengthened in the organization of the agricultural economy. They would gradually adopt the most profitable crops with regard to the necessary investments of money and labour. Apart from potatoes, maize represented an impetus for changes in the agricultural structure and the foundations of the peasant economy. The considerable yield and multifaceted usefulness of maize contributed to its expansion. In the nineteenth-century central Slovenian space, it had to compete with buckwheat for its place in the fields. This, however, was only an apparent competition, as the actual rivalry took place between buckwheat and potatoes. Buckwheat – the dominant food item of peasants in the middle of the nineteenth century – was not replaced by maize. It was actually pushed out by potatoes. No cereal could compete with the economic value of potatoes – their extraordinary yield, nutritional value, and versatility. Maize and potatoes did not compete in the Slovenian territory. As imported and adapted crops, they supplemented each other in view of the pedological and weather conditions. They allowed the peasants, and the society in the broadest sense, to diversify and rationally exploit their economic potentials and avoid nutritional risks. In light of the increasing population and modest living standard, the latter was extremely important.

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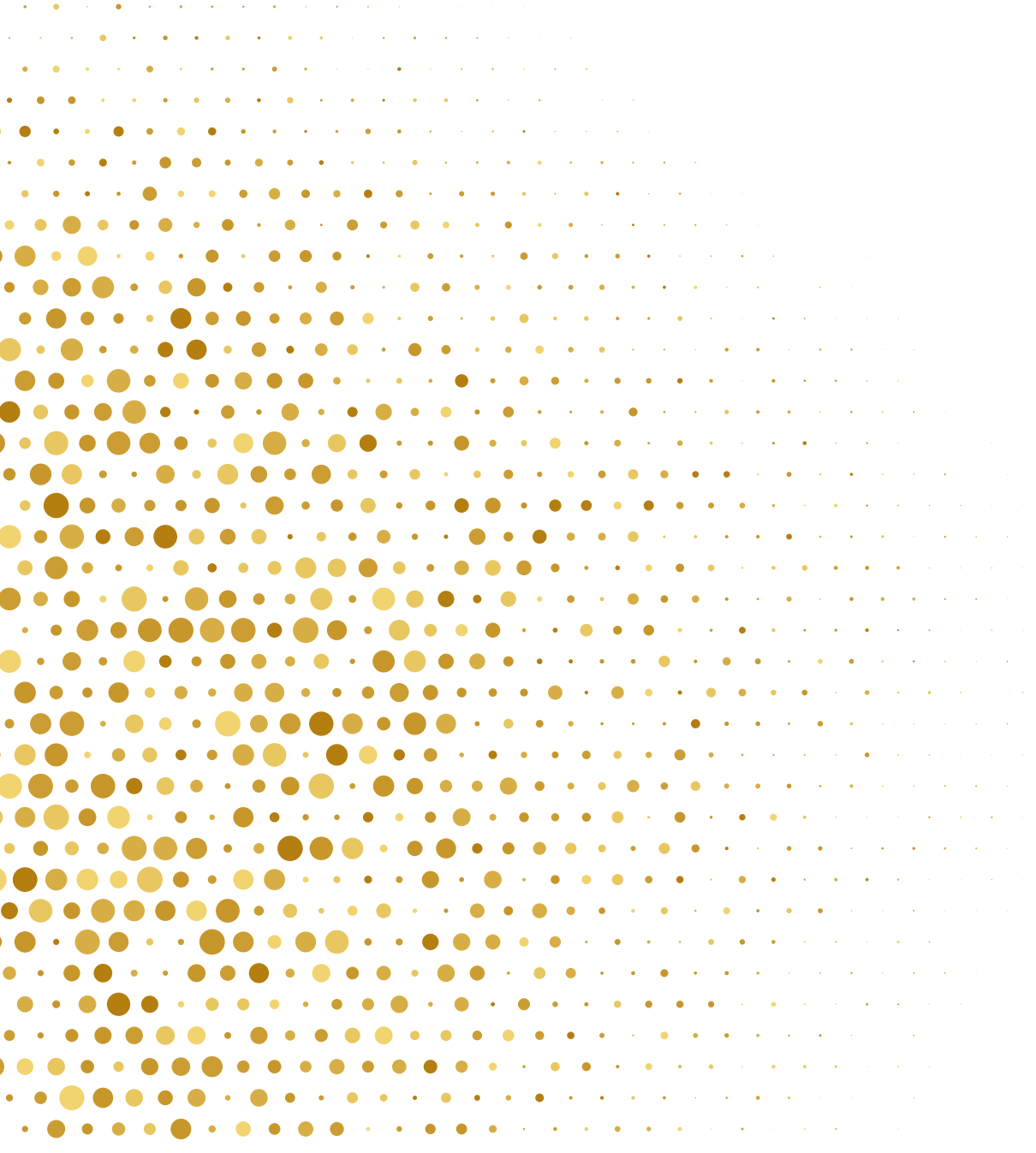

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